REPORT

Town of
SLAVE LAKE

Climate Change Risk and Vulnerability Assessment Adaptation Recommendations

Associated Engineering

All One Sky
FOUNDATION

EXECUTIVE SUMMARY

Project Overview and Approach

The Town of Slave Lake (the Town) engaged Associated Engineering and All One Sky Foundation to develop an understanding of climate vulnerabilities and risks to Town-owned infrastructure and assets. The Town is conducting this work with funding from the Municipal Climate Change Action Centre (MCCAC) Climate Resilience Capacity Building Program.

A series of risk identification and assessment workshops were conducted with the Town using the Public Infrastructure Engineering Vulnerability Committee (PIEVC) High Level Screening Guide (HLSG) Process. PIEVC is currently administered by the PIEVC Program Alliance consisting of Institute for Catastrophic Loss Reduction, the Climate Risk Institute, and Deutsche Gesellschaft fur Internationale Zusammernarbeit. The assessment was conducted on the following assets and areas:

- Water
- Wastewater
- Stormwater
- Solid Waste
- Airport
- Buildings/Facilities
- Roads
- Parks, Trails, Sports Field
- Fleet

The purpose of this assessment is to conduct a climate-based risk analysis for the Town's infrastructure and to summarize the highest-priority climate risks. In addition, the assessment also identified facilities that would benefit from additional assessment efforts.

The project scope can be illustrated in **Figure E-1** showing the scope of the climate risk assessment conducted on the following:

- Built environment with consideration of municipal infrastructure and building assets, as well as the level of service that these assets provide.
- Community-wide social, health, and local economy.

This encompassing evaluation allowed the assessment to recognize the dependencies between people and the services that the assets provide.

Figure E-1 Climate Risk Assessment on Community-Wide Asset and Services

The **PIEVC High Level Screening process** was used to assess the municipal assets and services. The assessment considered:

- **Direct physical damages/impacts to assets** – stormwater, water, wastewater, solid waste, roads, fleet, equipment, buildings/recreation facilities, parks, trails, sports field.
- **Direct services losses**, such as a flooded roadway that is impassable or outdoor facilities being closed because of smoke or heat.
- **Indirect effects of those direct impacts** –impact to the employees' ability do the work.

The **community-wide climate risk assessment** considered all potential climate-related impacts affecting the Town, including the natural environment, non-municipal assets and services, the economy, and the health and well-being of people in the community. This scope does not include details of each components listed, but a qualitative discussion.

Climate Hazards Impacts

Based on the climate model projection data for the Slave Lake area, some climate hazards are showing an increasing trend into the future. **The largest shifts are for extreme heat (days above +30°C), number of cooling days, frost-free seasons, annual total precipitation.** These climate hazards have likelihood scores increasing from 3 to 5. The climate changes to **lightning, hail storm, wildfire, drought and high winds**, although not specifically quantifiable, the projections are suggesting that more frequent and longer periods will be observed.

On the contrary, some climate events have a decreasing trend that may be beneficial to the Town. These climate events are **low temperature days (days below -30°C), and number of freeze-thaw events**. Precipitation with **extreme rainfall events and persistent rainfall** are increasing, but the climate model is not showing a high increase.

Results

Specific to the built infrastructure, the results for each infrastructure components aimed to answer the following two key questions:

1. Which climate hazards have the highest impacts on the infrastructure?
2. Which infrastructure components are the most vulnerable?

The two key questions illustrate which climate hazards may impact the asset the most and where efforts should be allocated. It is also important to note that other individual asset components of high-risk scores that are not necessarily listed under the risks are also noteworthy and should be reviewed as part of the Town asset management plan. The five highest risk climate hazards for the Town area are shown in **Table E-4.**

Table E-4 Five Highest Risk by Climate Hazards to Town Owned and Operated Assets

Rank	Climate Hazard		Potential Impacts
1		Hottest Days (Above 30°C)	• Increasing use of energy for cooling buildings. • Asphalt surface deterioration. • Equipment running hot resulting in potential damage. • Health impacts on employees working outdoor. • Increase of fires at landfills. • Higher temperatures impacting water quality.
2		Short Duration Intense Rainfall/Overland Flooding	• Flooding of stormwater systems, including storm ponds, catch basins, and drainage ditches. • Flooded parking and landscaped areas around buildings. • Disruption to transportation network. • Flooding of trails and playparks resulting in damage or closure. • Impacts at the landfill site include an increase in leachate. production, overfilling stormwater ponds, and ditches. • Overwhelming lift stations, sanitary collection lines, forcemains, and lagoons. • Sediment release impacting water quality.
3		Wildfire and Smoke	• Reducing visibility. • Increasing maintenance on equipment and building ventilation filtration system. • Increasing emergency services attending to health issues. • Health impacts on employees working outdoors. • High risk of landfill fires due to highly flammable waste.
4		High Winds	• Damaging buildings, structures, trees, signs. • Fallen trees/branches blocking roadways. • Increasing flying debris at landfills. • Injuries to outdoor workers and public. • Water spray when lagoon is full. • Impacting communication systems/SCADA.
5		River Flooding/Increase Lake Water Level	• Damaging trails and roads along the creek. • Impacting outfalls, increase maintenance and repairs. • High lake water levels and wave action impacting the shoreline at the airport.

The infrastructure systems that are most impacted (high risk scores) are Parks, Trails, Sports Field, Buildings, Roads, Stormwater Management, and Solid Waste Management. For the remaining assets, although they do not have high risk scores, there are still associated risks that require attention to ensure the expected level of service is maintained. (**Table E-5**)

Table E-5 Risk Scores of Infrastructure Systems

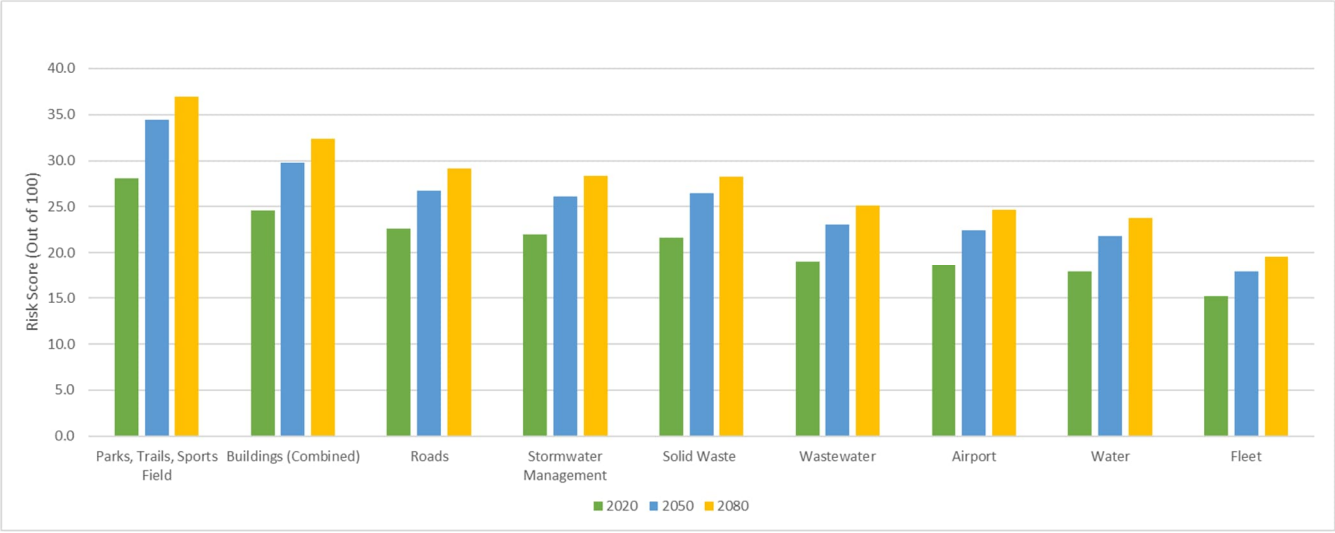

Table E-6 below shows highest rated climate hazards impacting the community, as determined through the community-wide risk assessment. The impacts noted are mainly affecting the health and well-being of the community.

Table E-6 Community-Wide Highest Risk Results

Climate Hazards	Highest Impacts	Description
	Loss of/reduced road access during winter	Loss of, or reduced access of roads during winter has economic impacts for businesses that support the resource sector (hotels, restaurants, supply stores, etc.), and recreational users that rely on these roads for access.
	Wildfire smoke – air transport disruption	Loss of, or disruption in air transportation due to low visibility from smoke, including patient emergency transport, and firefighting.
	Wildfire smoke – health impacts	Localized health impacts, particularly on vulnerable populations such as seniors, low income living in poor housing conditions and homeless.
	Wildfire smoke – reduced recreation	Reduced outdoor recreation opportunities and quality of life during smoke events.
	Increased space cooling costs	Increased costs for residents, businesses and the municipality to cool homes and buildings during the summer. Potential need to expand or add HVAC systems to existing homes and buildings.

Adaptation Planning

The Community Climate Adaptation Planning Guide developed by All One Sky Foundation was used in guiding the discussion. The recommended options for adaptation actions were listed in the following:

1. **No Action** – no additional actions required - business as usual.
2. **Conduct Research, Studies, or Assessments** to obtain further information on the nature of the risk to better inform the decision-making process.
3. **Update Policies, Plans, Standards, Guidelines or Bylaws** that considered climate risks and opportunities.
4. **Modify Operations and/or Maintenance Schedules, and Activities** that considered climate impacts.
5. **Build New or Upgrade Existing Infrastructure** to provide protection against climate risks.
6. **Increase Awareness and Education** to help community better understand risks and adaptation actions.
7. **Incorporate Emergency Management** such as response and evacuation planning, hazard mapping, and early warning or alert systems.
8. **Consider Human Resourcing** options and evaluate the need for additional staff time allocated to climate adaptation planning, implementation and establishing task force.

Associated Engineering facilitated the discussions, which identified the adaptation actions for each asset. These actions were examined for the medium to high-risk climate impacts. The discussions highlighted the following:

- Recommended adaptation actions
- Time frame of implementation
- Climate hazards scores (medium to high-risk)

Recommendations

The risk assessments and adaptation actions provided an overview of the risk and vulnerabilities of the existing built infrastructure and the socio-economic aspects for the Town. The following are recommendations for consideration as **Next Steps:**

1. **Prioritize Actions.** The critical infrastructure at the Town that has high impacts are Parks, Trails, and Sports Field, Buildings, Roads, and Stormwater Management. The Town should consider prioritizing these assets to ensure that the level of service provided to the community is maintained. The Solid Waste Management Facility operated and owned by the MD will also need to pay attention to the various hazards and risks to maintain service.
2. **Cross-Cutting Discussion and Information Sharing.** The Town is encouraged to share this information with other relevant departments and inform asset managers for future planning. Furthermore, the cross-departmental discussion can help to identify, assess, and address common problematic areas to protect assets.

Table ES-8 Potential Cross Cutting Adaptation Actions Applicable to All Departments/Corporations

All Departments/Corporation
Increase public engagement and community awareness of climate change impacts and adaptations through public open houses, schools, and other discussion forums.
Increase cross-departmental collaboration and information sharing to improve management of climate change risks and opportunities.
Increase education and public awareness of the health and safety impacts of climate change.
Create and disseminate climate related risk maps across Town's departments, and to residents, businesses, and other organizations to support more resilient development and planning.
Employ an adaptive management approach to climate adaptation planning.
Increase staff training on climate change impacts and adaptations across all departments.
Increase the resilience of Town's buildings, where applicable (for frequent use only), to climate hazards and extreme weather, including zoning, planning, and permitting.
Promote sharing of Town's maps and emergency information to improve emergency response.
Promote the use of renewable energy sources in homes and buildings.
Avoid flood prone areas through zoning, planning and development restrictions.
Identify funding opportunities for green infrastructure and buildings to increase resilience.

1. **Monitor, Assess, and Update Risk Scores and Adaptation Actions.** The Town is encouraged to identify performance or tolerance threshold (e.g., temperature, precipitation) of the asset so that it provides a baseline for monitoring. As the Town improves or makes modifications to reduce the risks and vulnerabilities to the assets, the adaptation plans can be updated. This encourages improvements and furthering the reduction and removal of risks.
2. **Continual Review of Climate Data.** The Town, overtime, should also monitor the ongoing evolution of climate projections. This will allow the Town to update the risk score and evaluate its vulnerabilities and exposure based on current and science-based information. Adaptation actions will be adjusted accordingly while staying flexible and adaptable to the potential market fluctuations.

ACKNOWLEDGEMENTS

We would like to acknowledge the following stakeholders who supported and participated in the workshops, and provided valuable feedback in this project:

Town of Slave Lake

- Kush Patel
- Calvin Beauchamp
- Cody Kelly
- Calvin Couturier
- Pierre Gauthier
- Tasha Albert
- Jillian Hutchings

Lesser Slave Regional Waste Management Commission

- Randy Peconi
- Anne Haney

This report was developed with the input and hard work of the listed stakeholders, and we appreciate the time, effort, and knowledge contributed to this assessment to help build resilience in community.

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1 INTRODUCTION

1.1 Project Background

The Town of Slave Lake (the Town) engaged Associated Engineering to develop an understanding of the climate vulnerabilities and risk for the Town's municipal infrastructure. The results of this risk assessment will guide future adaptation action planning to reduce the impacts of climate change. The Town is conducting this work with funding from Municipal Climate Change Action Centre (MCCAC) Climate Resilience Capacity Building Program.

Municipal Climate Change Action Centre

A series of risk identification and assessment workshops was conducted with the Town using the Public Infrastructure Engineering Vulnerability Committee (PIEVC) High Level Screening Guide Process. PIEVC is currently administered by the PIEVC Program Alliance consisting of Institute for Catastrophic Loss Reduction, the Climate Risk Institute, and Deutsche Gesellschaft fur Internationale Zusammernarbeit. The assessment was conducted on the following assets and areas owned by the Town:

- Water
- Wastewater
- Stormwater
- Solid Waste
- Facilities
- Roads
- Parks, Trails, Sports Field
- Fleet
- Airport

In addition, the risk assessments also captured discussions on impacts to municipal operations staff, public users, and the impacts to service delivery.

1.2 Purpose

The purpose of this assessment is to conduct a climate-based risk analysis for the Town's infrastructure and to summarize the highest-priority climate risks. In addition, the assessment also identified facilities that would benefit from additional assessment efforts. The assessment was conducted on Town-owned infrastructure and assets. To

provide a robust assessment, Slave Lake Airport Commission and the Lesser Slave Regional Waste Management Commission were invited to participate in this assessment. The Town's Community Services was also engaged in the community-wide risk assessment and adaptation planning.

The results of this study will assist the Town in integrating climate risks discussion and adaptation measures into capital upgrades, maintenance, future land use planning, engineering design standards, operational practices, infrastructure assessment, and human resource programming. The assessment included:

- Analysis of climate hazards relevant to the Town considering historic values and future climate projections.
- A high-level climate risk assessment of the Town's assets.
- High level community-wide risk assessment relevant to the well-being, and economic health of the community.
- Development of a list of high-level adaptation measures to address the highest risks facing the community's infrastructure.

1.3 Project Scope

The project scope can be illustrated in **Figure 1-1** showing the scope of the climate risk assessment conducted on the following:

- Built environment with consideration of municipal infrastructure and building assets, as well as the level of service that these assets provide.
- Community-wide social, health, and local economy.

This encompassing evaluation allowed the assessment to recognize the dependencies between people and the services that the assets provide.

Figure 1-1 Climate Risk Assessment on Community-Wide Asset and Services

The **PIEVC High Level Screening Guide Process**, lead by Associated Engineering, was used to assess the municipal assets and services. The assessment considered:

- **Direct** physical damages/impacts to assets – stormwater, water, wastewater, solid waste, roads, fleet, equipment, buildings/recreation facilities, playparks, sports field.
- **Direct** services losses, such as a flooded roadway that is impassable or an outdoor facility being closed because of smoke or heat.
- **Indirect** effects of those direct impacts –impact to the employees' ability do the work.

The **community-wide climate risk assessment** was led by All One Sky Foundation and considered all potential climate-related impacts affecting the Town. The assessment considered the natural environment, non-municipal assets and services, the economy, and the health and well-being of people in the community. The work follows best practices for municipal climate change risk assessment, namely the International Organization for Standardization (ISO) guideline 14092 – Climate adaptation planning for local governments and the **Climate Resilience Express – Community Climate Adaptation Planning Guide** developed by All One Sky Foundation, who will lead the work. The assessment considered:

- **Direct Impacts** to public safety (loss of life, morbidity, injury, disease, etc.), quality of life (recreation, lifestyle, evacuations, etc.), municipal finances, and the local economy.
- **Indirect Impacts** to public safety (loss of life, morbidity, injury, disease, etc.), quality of life (recreation, lifestyle, etc.), or the local economy, as a result of impacts and damage to property & infrastructure, and interruption of services.

The scope is limited to the following:

- Impacts within the geographic boundaries of the Town of Slave Lake; however, solid waste services that provide services to the Town was included.
- Impacts on the Town of today. While considering climate projections out to the 2080's, changes were considered in terms of the Town today (in terms of development, land use patterns and resource capacity). This allowed us to determine the climate adaptations that were necessary to implement now, to be resilient to climate changes anticipated in the future.
- Impacts that are worsening (becoming more frequent or severe) because of climate change.
- Climate change may also provide some benefits, in terms of increased opportunities for recreation or agriculture. These potential benefits were excluded.
- Risk assessment of economic analysis and human well-being are based on qualitative discussions and knowledge of the project team as well as the participants from the Town.

Note that the risk assessment did not consider impacts outside the influence of the Town. For example, provincial policy or legislative changes, broad economic impacts, or impacts related to demographic or population changes that might affect the workforce.

1.4 Risk Assessment Process

The risk assessment process adopted for this project was based on the ISO 31000's principles of risk management. The principles followed a systematic cycle of actions to create and protect the value of the community. **Figure 1-2** illustrates the process starting from integration of organizational activities that requires the collaboration of all departments, using a structured approach to assess risk that was customized for the appropriate context. The

discussion was also inclusive and dynamic, drawing from evidence-based information. Finally, the risk management process identified a continual improvement through leaning and experience.

Figure 1-2 Principals of Risk Management (ISO 31000)

1.5 Definitions

In the PIEVC guidance, **Risk** is defined as the product of the likelihood of the "impact" and the consequence of the "impact" on the system. The "impact" in this discussion referred to the climate change impacts or climate hazards.

Figure 1-3 ISO 31000 Risk Management Process (High Level Screening)

Vulnerability is defined as how the system fares against the climate hazards when exposed. It can also be viewed as the ability of the system to absorb the inundation of the climate hazards. In other words, vulnerability is the inability of a system to cope with the adverse effects of climate change and the climate variability. The sensitivity of the system when exposed to the climate change is often evaluated based on level of use, service life/age, maintenance/operations costs, and replacement costs. Adaptive capacity is assessed based on the cost and time required for the system to resume to its original service.

In this report, vulnerability was not assessed in detail for all services, but was assessed qualitatively within the consequence scoring. During consequence scoring, which took place in a series of workshops, Town of Slave Lake staff, and the Commissions were asked how their infrastructure systems would behave when exposed to the various climate hazards at their current conditions. Their qualitative assessment was based on their engineering/technical experience and their understanding of their assets/infrastructure. This **qualitative vulnerability**

discussion, coupled with the risk assessment, provides an overall understanding of the current status of the Town's asset/infrastructure. This initial assessment of risk will allow the Town to formulate a more focused and detailed risk and vulnerability assessment for the components of each infrastructure system.

The **adaptation** measures identified in this report will provide the Town will potential activities to consider, plan and implement. The international standard for risk management, ISO 31000, shows the progression from risk assessment to risk treatment that will require monitoring, review, consultation, and communication (**Figure 1-3**).

In this project, risks to service lines and buildings were identified, setting the stage for the development of risk reduction and risk treatment measures. Beyond this project, the Town can identify site-specific risk reduction strategies and activities.

2 CLIMATE PROJECTIONS

2.1 Climate Data

The Government of Canada has several data sources where historical climate data and future climate projections can be obtained. The PIEVC High Level Screen Guideline (HLSG) indicates that although climate data is now available in higher spatial and temporal resolution, there are some climate parameters and geographic areas that are more difficult to obtain. Where possible, proxy datasets and modelled data was used to cover the gaps. Some complex parameters including extreme wind, complex precipitation events like hail, snowfall, and lightning do not have quantitative modelled data for evaluation, but they are based on accumulative of research indicating the likelihood of increasing or decreasing trend. For this Assessment, the Climate Atlas of Canada and Climate Data Canada were used to obtain data and projections. The climate parameters, projections and sources are listed in **Appendix A**.

2.2 Timescale and Parameters

For this project, the time horizons for assessment were chosen to align with the design life/expected lifecycle of the infrastructure, or period of time before a planned retrofit or reassessment of climate impacts. This assessment considered the following climate periods:

- 2020s (2011 – 2040)
- 2050s (2041 – 2070)
- 2080s (2071 – 2100)

Parameters were selected based on potential ongoing and future impacts to the physical infrastructure, as well as impacts to operation and maintenance. In all cases, the Representative Concentration Pathway 8.5 (RCP 8.5, i.e., upper-end, most emissions) scenario was chosen to reflect a worse-case scenario for the infrastructure. Climate parameters investigated in this assessment are noted in **Table 2-1** below. For the risk assessment, not all the climate parameters apply to the infrastructure evaluated. We have used the 19 most relevant climate parameters to municipal infrastructure and services. These parameters are noted in bold font in **Table 2-1**.

Table 2-1 Climate Parameters

Climate Parameters	Climate Sub-Parameters
Temperature	• **Mean annual temperature (◦C)** • Mean Summer Temperature (◦C) • **Number of Days Above +30◦C** • Number of heatwaves • **Hottest Day** • **Cooling Degree Days (days above 18◦C)** • Mean Winter Temperatures • **Number of Days below -30◦C** • Mild Winter Days below -5◦C • **Frost-free Season (days)** • **Freeze/Thaw Events**
Precipitation	• **Annual Total Precipitation** • Number of days >10 mm

Climate Parameters	Climate Sub-Parameters
	• Wet Days > 20 mm • **Maximum 1-day Total Precipitation** • **Maximum 5-day Consecutive Precipitation** • **Short Duration 1:100-year Rainfall (mm/hr) – Overland Flooding** • **Winter Precipitation (mm)** • **Hailstorm**
River Flooding	• **24 hour 100-year Rainfall (mm/hr)**
Drought	• **Relative Change in Standardized Precipitation Evapotranspiration Index-based**
Wildfire	• **Change in Average Annual Forested Area Burned**
Heavy Winds	• **1-in-50 Year Gust Pressures**
Lightning	• **Lightning**
Shifting Ecosystem	• **Changing seasons and ecosystem, insect, invasive plants, and disease**

For all parameters, quantitative present and future values were determined from reputable and widely used national climate data sources, and peer-reviewed scientific literature. Datasets were sourced to be as relevant as possible to identified infrastructure vulnerabilities. Detailed climate data, projections for each Climate parameter for each timeframe, and a brief description are included **Appendix A**.

3 RISK ASSESSMENT

3.1 Method

The project was conducted in the phases shown in **Figure 3-1** below.

Figure 3-1 Project Overview

During the **Workshop 1A, PIEVC Orientation**, Associated Engineering provided a discussion of climate change principles and parameters, the PIEVC High Level Screen Guide (HLSG) process, and an overview of the project. Following this, we provided a presentation template for Town staff to help understand the types and scale of assets for different service lines. Each group presented the information on the assets during **Workshop 1B, Tell Us About Your System**. The initial information was used to create asset lists and provide insights for **Workshop 2, Risk Assessment**. The last series of workshop, **Workshop 3, Adaptation Planning,** looked at how to reduce the risks with high level adaptation planning for infrastructure and vulnerable community members at medium to high risk.

The risk assessment workshops were conducted virtually using Mural Board to facilitate the discussions. The workshops occurred between June and December 2023:

Workshop 2 Series, Risk Assessment, consisted of the following sessions:

- **Workshop 2A:** Water, Wastewater, Stormwater
- **Workshop 2B:** Buildings, Parks, Trails, Sports Fields
- **Workshop 2C:** Airport
- **Workshop 2D:** Solid Waste
- **Workshop 2F:** Roads and Fleet
- **Workshop 2E:** Community-wide (social, health, and local economy aspects)

Workshop 3 Series, Risk Reduction/Treatment (Adaptation), was conducted in the following sessions:

- **Workshop 3A**: Water, Wastewater, Stormwater
- **Workshop 3B**: Buildings, Parks, Trails, Sports Fields
- **Workshop 3C**: Airport, Road, and Fleet
- **Workshop 3D:** Community-wide

3.2 Risk Identification and Assessment

Risk is discussed in terms of likelihood and consequences. The likelihood is described as the hazards, events or conditions that could occur, and consequence as the result occurring in varying levels of negative or positive impacts or effects. In quantitative terms, risk is evaluated as the product of the likelihood and consequence.

In terms of climate risk, we begin to understand how the variability of climate patterns impact the built environment and environment, and in turn, how this impacts the society. For this project, the PIEVC HLSG process was used in assessing the built infrastructure and assets. The methods are discussed in the following sections.

3.3 Climate Likelihood Scoring

The likelihood scoring in PIEVC High Level Screening was based on the climate projections. The climate parameter trends and projections were translated into likelihood scores (L), with increasing/decreasing values reflecting increasing/decreasing occurrence over the specified time horizon. Translation into likelihood scores normalized the various climate change trend measures into a common numerical ranking. For each climate parameter, an appropriate likelihood score was applied to determine the direction-of-change for potential impact. **Table 3-1** lists the method for determining climate likelihood scores. For the Town of Slave Lake assessment, we have used the PIEVC Middle Baseline Approach for likelihood scoring.

Table 3-1 PIEVC Likelihood Scoring

Likelihood Score (L)	Middle Baseline Approach – Establish Base	Method
1		Likely to occur less frequently than current climate
2		
3	Establish Current Climate Baseline Per Parameter	Likely to occur as frequently as current climate
4		
5		Likely to occur more frequently than current climate

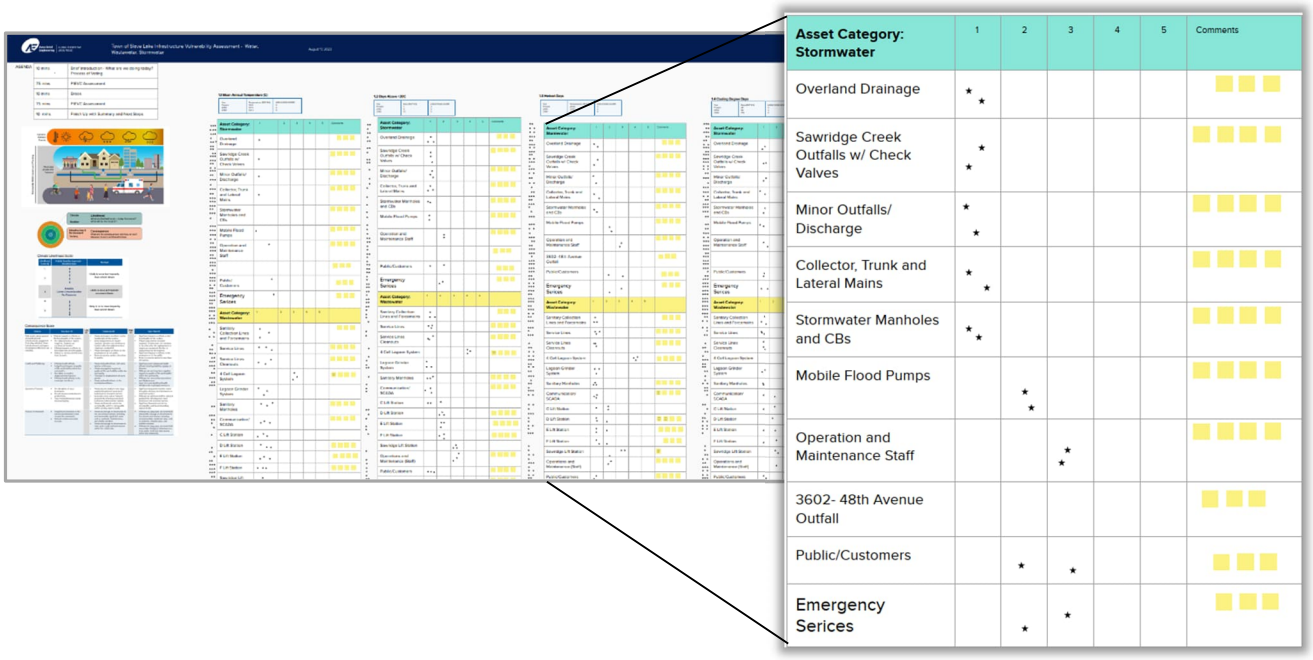
3.4 Consequence Scoring

The assessment was completed by evaluating the consequences of the interactions between each climate parameter and each piece of infrastructure or assets. The determination of consequence was guided by a consequence rubric shown in **Table 3-2**, which focus on the following general categories:

- Built assets including linear and vertical infrastructure
- Health and Wellbeing
- Economic/Finance
- Natural Environmental/Parks

During the virtual workshop, each participant from the Town provided the consequence scoring (**Figure 3-2**) of the asset categories that were described in **Workshop 1A**.

Figure 3-2 Virtual Workshop Consequence Scoring



Asset Category: Stormwater	1	2	3	4	5	Comments
Overland Drainage	★ ★					
Sawridge Creek Outfalls w/ Check Valves	★ ★					
Minor Outfalls/ Discharge	★ ★					
Collector, Trunk and Lateral Mains	★ ★					
Stormwater Manholes and CBs	★ ★					
Mobile Flood Pumps		★ ★				
Operation and Maintenance Staff			★ ★			
3602- 48th Avenue Outfall						
Public/Customers		★	★			
Emergency Serices		★	★			

Table 3-2 Consequence Scale

Criteria	Very Low (1)	Low (2)	Moderate (3)	High (4)	Very High (5)
Built assets; above ground and underground Infrastructure; equipment (including vehicles). Green Infrastructure/Low Impact Development Elements are included.	• Minimal impacts or effects on the functionality of the system. • No replacements or repairs required. Systems can continue to function. • Minimal impacts or effects to the employees or to the public. • Return to services period is less than 1 month.		• Moderate impacts or effects on the functionality of the system. • Some replacements or repairs required. Systems can continue to function after the replacements or repairs are conducted. • Moderate impacts or effects to the employees or to the public. • Return to service period is less than 5 months.		• Significant impacts or effects on the functionality of the system. • Major replacements or repairs required. Systems may not continue to function after the replacements or repairs are conducted. Further re-engineering may be required. • Significant impacts or effects to the employees or to the public. • Return to service period is more than 10 months.
Health and Wellbeing	• Minimal health effects. • Insignificant impacts to quality of life and livability within the community. • Not likely to result in displacement of anyone • Minimal health effects to the municipal workforce.		• Moderate health effects with some injuries or illnesses. • Moderate negative impacts to quality of life and livability within the community. • Potential for displacement of some people. • Moderate health effects to the municipal workforce.		• Significant and widespread health effects including fatalities, injuries, or illnesses. • Widespread and long-term negative impacts to quality of life and livability within the community. • Widespread community evacuations and displacement. • Long-term and significant health effects to the municipal workforce.
Economic/Financial	• No disruption of local businesses. • No job losses or reductions in productivity. • Very minimal financial cost to the municipality.		• Moderate and medium-term (days-weeks) disruption of some local businesses or economic sectors. • Some job losses and/or reduced productivity affecting some local businesses and economic sectors. • Moderate financial costs to the municipality, which is manageable within existing reserve funds.		• Significant long-term (months-years) disruption of many local businesses or economic sectors. • Widespread job losses and/or reduced productivity affecting most local businesses and economic sectors. • Significant financial costs to the municipality, well beyond existing reserve funds.
Natural Environment/Parks	• Insignificant alteration of the natural environment in and around the community. • Natural systems can easily recover.		• Moderate damage or disturbance to the natural environment, including environmentally significant areas such as wetlands, forested areas, and wildlife corridors. • Moderate damage or disturbance to trees, parks, trails, and open spaces within the community.		• Widespread, long-term, and potentially irreversible, damage or disturbance to the natural environment, including environmentally significant areas such as wetlands, forested areas, and wildlife corridors • Widespread, long-term, and potentially irreversible damage or disturbance to trees, parks, trails, and open spaces within the community.

3.5 Risk Scoring

Using the likelihood and consequence scoring, the final risk score for each infrastructure component falls on a scale between **0 and 25** (shown as an example on **Figure 3-3**):

- Between 0 and 9 are considered low risk
- Between 10 and 19 are considered medium risk (yellow)
- Between 20 and 25 are considered high-risk (**red**) items

Upon completion of the risk assessment, the risk scores across all climate-infrastructure interactions were assessed.

This review was completed to establish confidence in the professional judgement employed in the process, as well as to identify any unexpected or surprising results in terms of risk. Unexpected results were not necessarily erroneous, as they highlighted where climate changes were anticipated to introduce new issues and challenges.

The results of the assessment for each infrastructure category were compiled on a master worksheet.

5	CONSEQUENCE	Catastrophic	0	5	10	15	20	25
4		Major	0	4	8	12	16	20
3		Moderate	0	3	6	9	12	15
2		Minor	0	2	4	6	8	10
1		Insignificant	0	1	2	3	4	5
0		No Effect	0	0	0	0	0	0
			Negligible Not Applicable	Highly Unlikely Improbable	Remotely Possible	Possible Occasional	Somewhat Likely Normal	Likely Frequent
			LIKELIHOOD					
			0	1	2	3	4	5

Figure 3-3 Risk Assessment Matrix Example Scoring

Section 4 summarizes the results of the assessment.

4 RESULTS

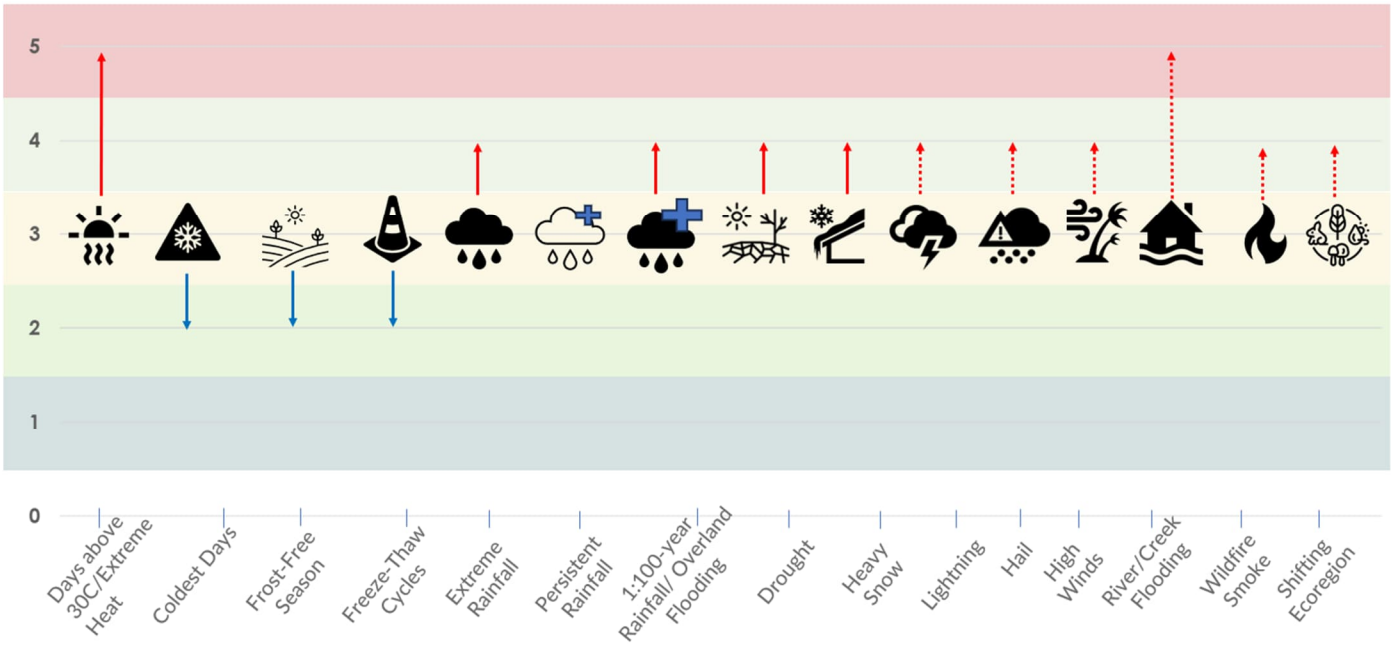
4.1 Change in Climate Hazards Over Time

Many hazards will see an increase in likeliness to occur between now and 2080. The largest shifts are for extreme heat (days above +30°C), number of cooling days, frost-free seasons, annual precipitation. These climate hazards have likelihood scores increasing from 3 to 5. The climate changes to lightning, hail storm, wildfire, drought, and high winds, although not specifically quantifiable, the projections are suggesting that more frequent and longer periods will be observed.

The climate hazards that could see a decrease in likelihood between now and 2080 are low temperature days (days below -30°C), and number of freeze-thaw events. Precipitation with extreme rainfall events and persistent rainfall are increasing, but the climate model is not showing a high increase.

The change in climate hazard likelihood scores is shown in **Figure 4-1** with the base line starting at "3", either increasing or decreasing. Tables for the change in each climate parameter are given in **Appendix A**.

Figure 4-1 Change in Hazard Likelihood (2020 to 2080)



4.2 Results for All Assets (PIEVC HLSG Assessment)

The risk scores for each asset were calculated for each climate hazard and asset by multiplying the likelihood score (1 to 5) by the consequence score (1 to 5), with the highest risk score of 25. The total risk score across all the assets in the system was calculated to determine which hazards posed the greatest risk and which assets were most at risk from those hazards. Specific to the built infrastructure, the results for each infrastructure components aimed to answer the following **two key questions**:

1. Which five climate hazards have the highest impacts on the infrastructure?
2. Which top five infrastructure components are the most vulnerable?

The two key questions illustrate which climate hazards may impact the asset the most, and where efforts should be allocated. It is also important to note that other individual asset components of high-risk scores that are not necessarily listed under the top five risks are also noteworthy and should be reviewed as part of the Town asset management plan.

The **five highest risk climate hazards in 2080** are shown in **Table 4-1.**

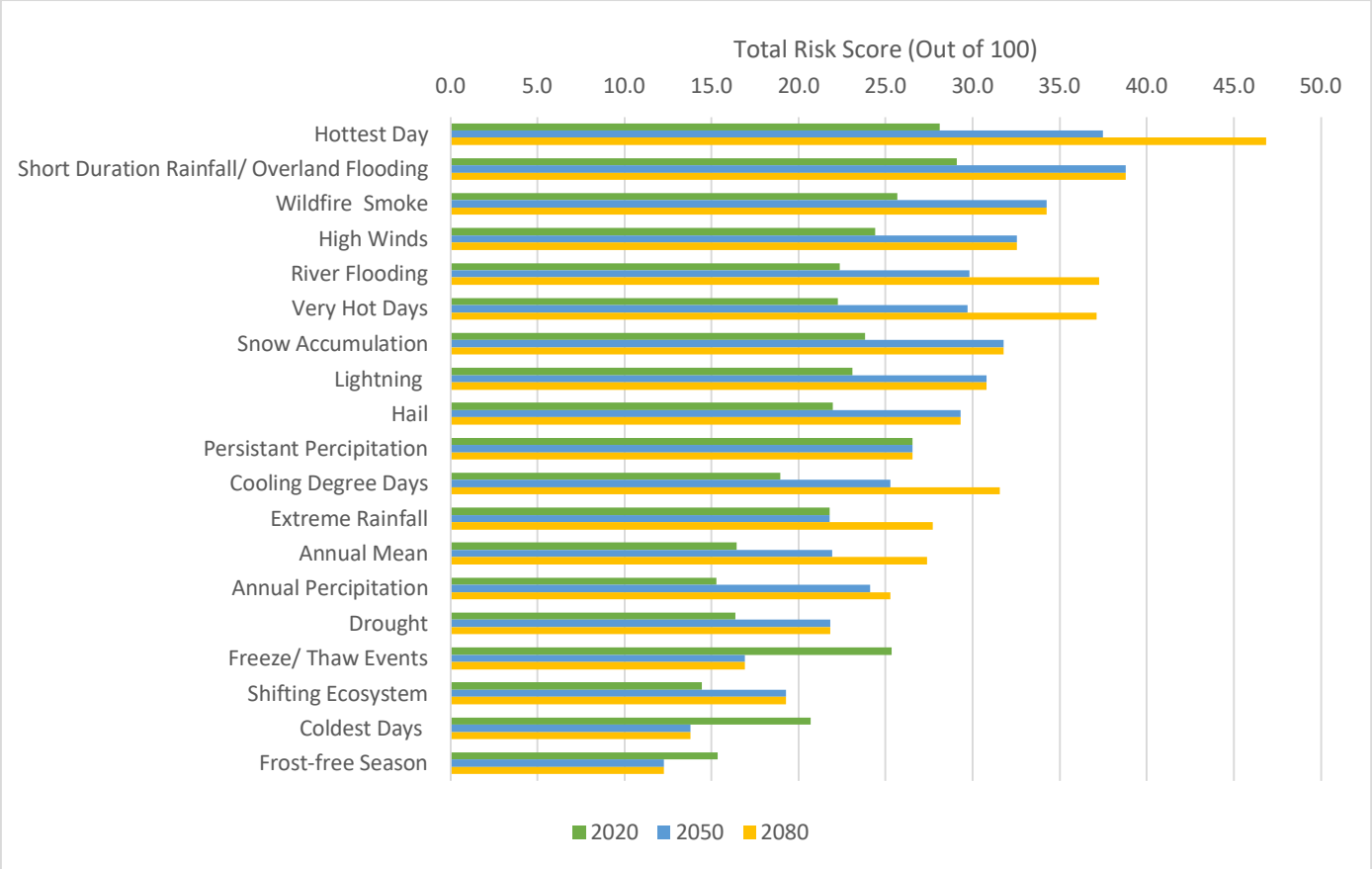
Table 4-1 Five Highest Risk by Climate Hazards to Town Owned and Operated Assets

Rank	Climate Hazard		Potential Impacts
1		Hottest Days (Above 30°C)	• Increasing use of energy for cooling buildings. • Asphalt surface deterioration. • Equipment running hot resulting in potential damage. • Health impact on employees working outdoors. • Fires at landfills. • High temperatures impacting water quality.
2		Short Duration Intense Rainfall/Overland Flooding	• Flooding of stormwater systems, including storm ponds, catch basins, and drainage ditches. • Flooded parking and landscaped areas around buildings. • Disruption to transportation network. • Flooding of trails and playparks resulting in damage or closure. • Impacts at the landfill site include an increase in leachate. production, overfilling stormwater ponds, and ditches. • Overwhelming lift stations, sanitary collection lines, forcemains, and lagoons. • Sediment release impacting water quality.
3		Wildfire and Smoke	• Reducing visibility. • Increasing maintenance on equipment and building ventilation filtration system. • Increasing emergency services attending to health issues. • Health impacts on employees working outdoors. • High risk of landfill fires due to customers bringing highly flammable wastes.
4		High Winds	• Causing damage to buildings, structures, trees, signs. • Fallen tree /branches blocking roadways. • Increasing flying debris at landfills. • Injuries to outdoor workers and public. • Causing water spray when lagoon is full. • Impacting communication systems/SCADA.

Rank	Climate Hazard	Potential Impacts
5	River Flooding/Increase Lake Water Level	• Damage to trails and roads along the creek. • Impacting outfalls, increase maintenance and repairs. • High lake water levels and wave action impacting the shoreline at the airport.

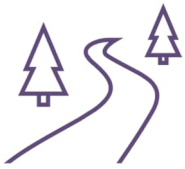
The change in risk for each climate hazard across all assets over time is shown in **Figure 4-2.** The risk scores were normalized to 100 for comparison of climate hazards. Also noting that coldest days and freeze-thaw days are decreasing in risk progressing towards 2080.

Figure 4-2 Change in Risk by Climate Hazards (Present to 2080)



When we analyze the risk data for the assets based on these climate hazards, the five highest risk infrastructure systems are shown on **Table 4-2**. Highest risk can also be viewed as most vulnerable when exposed to the climate hazards resulting in damage and more frequent maintenance, replacements or repairs.

Table 4-2 Infrastructure Systems of Highest Risk

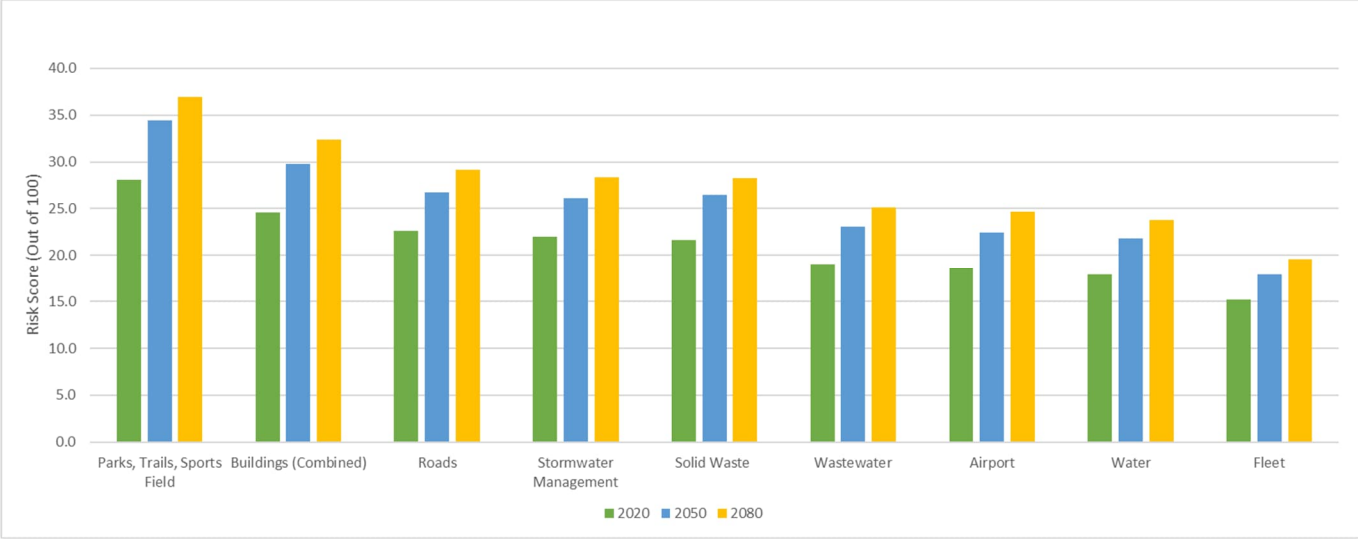
Rank	Infrastructure System	Assets Impacted (High Score)	Top Impacts
1	 **Parks, Trails, Sports Field**	• Community Trails • Barton Park • Charity Ball Diamonds • Conner Lukan Memorial Fitness Park • Fournier Place Park • Hilda Eben Park • Kinnettes Park • Kinsmen Pine Park • Maple Crescent Park • Poplar Grove Park	• Hot temperatures increase usage of parks and increase water usage at spray parks. • Drought results in replacement of vegetation and die-offs. • Increase operations and maintenance after heavy precipitation and runoff to clean up and repair damage to sports field and trails. • Shorter season for winter activities. • High winds and hail result in trees/vegetation and structural damage. • River flooding resulting in damage to the parks and trails near the river. • Smoke inhalation and irritation to employees working outdoors. • Wet snow or snow accumulation damage trees and vegetation.
2	 **Buildings**	• Multi-Rec Centre • GOA Building • Legacy Centre	• Hot temperatures increase the need for cooling buildings. Day Care at the Wildfire Legacy Center Building does not have air conditioning and can get over-heated. • Cold temperatures require increased heating. • Shoulder season of freezing and thawing (Freeze/thaw) resulting in icy surfaces hazardous to public and users of the buildings. Ice plugged roof drains. • Heavy precipitation and runoff causing some flooding in parking, and landscaped areas. • Hail damaging exterior building and windows. • Lightning storms and high winds knock out power to the building. • Wildfire smoke affecting the HVAC system. • Wildfire damage resulting in loss of property. • Snow accumulation and additional loading on roofs.
3	 **Roads, Signs, Parking Lots, Traffic Signals**	• Sidewalks • Gravel and Asphalt Roads • Traffic Signals and Flashing Crosswalks • 3 and 4-way Flashing Stop Light • Railroad Crossings • Road Signs and Lighting • Public Parking Lots • Operations and Maintenance • Emergency Services	• Extreme cold temperatures cause contraction and result in surface cracking. • Heavy snow results in more wear and tear on roads due to more snow ploughing, sanding, and scraping. • Freeze-thaw cycles result in subgrade heaves and damage to paved surfaces. • Heavy rainfall or persistent rain events result in subsoil saturation and ponding resulting in road structure deterioration. • Overland flooding and river floods causing road washouts. Increase operations responding to flooding and ponding. Flooding may result in road closures affecting public transport and emergency routes. • Drought results in drying out of subgrades and more maintenance on gravel roads, as well as dust control.

Rank	Infrastructure System	Assets Impacted (High Score)	Top Impacts
			• High winds result in debris or fallen objects (trees, poles) blocking roadways. • Drought resulting in more dust generation from gravel roads and increase maintenance. • Wildfire smoke results in low visibility.
4	 Stormwater Management	• Overland drainage • Sawridge Creek Outfalls w/Check Valves • Minor Outfalls/Discharge • Collector, Trunk, and Lateral Mains • Storwmwater Manholes and Catch Basins • Mobile Flood Pumps • Operations and Maintenance • Emergency Services	• Freeze/thaw events impacting the underground structures due to movement in the subgrades and backfills. • Creek flooding and persistent rainfall impacting Sawridge Outfalls – creek overflowing the banks. • Overland resulting in overflowing stormwater manholes and catch basins. Increase pumping required. • Hail storms plugging the stormwater manholes and catch basins resulting in overland flooding. • High winds resulting in fallen debris resulting in blockage in Sawridge Creek may impact the outfall. • Increase operations and maintenance activities to clean and repair damages.
5	 **Solid Waste Management Facilities and Collection**	• Recycling Facility • Transfer Sites • Honda Facility • Boyle Facility • Waste Collection Vehicles • Operations and Maintenance	• Equipment running hot during hot days. • Fires in landfills (from batteries) during hot and dry days. • Heat stress on outdoor workers. • High wind resulting in blown waste - debris management required. High winds knock out power and communications. • Slippery roads for collection vehicles during cold weather and heavy snow. • High leachate generation during heavier, and persistent rainfall. • Heavy precipitation and runoff resulting in wash outs of access road. Road deterioration due to saturated surface and subbase. Difficult access for the public. Increase leachate generation. Increase operations and maintenance of the site. • Clean ups from extreme events (wildfire, high winds, river flooding, overland flooding) resulting in high waste volume. • Extreme cold requiring more heating in the facility office. • Freeze/thaw event may result in subgrade heaving at the transfer station. • Snow accumulation resulting in increased snow removal. • Wildfire resulting in property damage – landfill has high fuel content for serious damage. • Increase waste disposal at the landfill due to property damage from climate hazards.

The normalized risk scores for all of Town's assets in 2020 up to 2080 is shown in **Figure 4-3**. Solid Waste Management facility is not owned and operated by the Town, but they provide major service to the community, therefore, they are included in this discussion.

It is important to prioritize investments and actions to improve the resilience of these top five assets, which are presented as the highest risk; however, it is also important to consider the risks associated with Wastewater, Water System, Airport and Fleet to ensure proper and reliable performance. Adaptation Planning to reduce risk is further discussed in **Section 5**.

Figure 4-3 Change in Risk by Infrastructure



The **detailed results of the risk assessment completed using PIEVC HLSG** for each infrastructure system as well as each components are provided in **Appendix B**. The results show the likelihood and consequence scoring of each asset with the calculated risk scores.

4.3 Results for Community-Wide Assessment

As part of the community-wide assessment, the potential climate impact scenarios for the Town are described in **Table 4-3**. The impact scenarios outlined how the climate hazards identified in **Section 2** could **affect social systems, community assets and/or the local economy**. The impact scenarios characterized the cause-and-effect relationship, or impact chain, between climate hazards (or changes) and consequences. The impact scenarios were identified based on the information gathered through **Workshop 1B (Tell us About Your System**), and our team's experience with and review of, climate risk assessments from similar communities. The scenarios, listed in **Table 4-3**, were reviewed and updated with Town staff and stakeholder at the climate risk assessment workshop.

Table 4-3 Climate Risk Assessment Results – Community Wide Impact

	Climate Driver	Climate Projection(s)	Impact	Description
1	Hotter Temperatures	2 heat waves per year on average with at least three days in a row that reach or exceed 30°C (0.1 heat waves historically)	Extended heat wave with health impacts	A heat event similar, or worse, than the 2021 heat wave with localized health impacts, particularly on vulnerable populations such as seniors and those with low income and/or housing challenged.
2		196 Cooling Degree Days (CDDs), a 750% increase from 23 CDDs historically	Increased space cooling costs	Increased costs for residents, businesses and the municipality to cool homes and buildings during the summer. Potential need to expand or add HVAC systems to existing homes and buildings.
3	Warmer Winter Temperatures	108 'winter days' in the future with temperatures below -5°C, compared to 143 historically.	Loss of outdoor winter tourism and recreation opportunities	Reduced quality of life for residents that enjoy winter recreation (Nordic skiing, hockey, ice fishing, snowmobiling, etc.). Potential reduction in winter tourism visitation (hotels, restaurants, events) and impact on local businesses and the economy.
4	Drought (SPEI)	Generally drier conditions in the summer	Drought damage to trees, gardens and landscaping	Drier summer conditions overall with implications for local natural assets -trees, gardens, landscaping, etc.
5		Generally drier conditions in the summer	Increased water consumption	Increased costs for water use for residents, businesses, and municipalities, including financial/economic implications for high water use businesses/sectors.
6	Extreme Weather (High Wind)	Minor changes projected	High wind event with gust up to 90 km/hr and more	Health impacts (injuries/fatalities), particularly on vulnerable populations.
7		Minor changes projected	High wind event with gust up to 90 km/hr and more	Damage to property, homes and businesses, repair costs and potential power outages.
8	Extreme Weather (Hailstorm)	Increasing future likelihood – about 1 additional large hail day per season	Major hail event with hail stones of 45 mm ("golf ball" sized) or greater	Damage to property, homes, businesses (roofing, siding), vehicles, repair costs and potential power outages.
9	Hotter Temperatures/ Extreme Weather	Increasing future likelihood	Freezing rainstorm - injuries	Risk of traffic accidents, including injuries and fatalities, and transport network disruption (including emergency services) due to slippery sidewalks and roads.
10	Hotter Temperatures/ Extreme Weather	Increasing future likelihood	Freezing rainstorm	Damage to property, homes, businesses (trees, power lines), repair costs and potential power outages.

	Climate Driver	Climate Projection(s)	Impact	Description
11	Heavy Rainfall	Increased likelihood of short duration high-intensity rainfall event. 1:100 year 24-hour event = 4.6mm/hr. in the future, compared to 4.2mm/hr. historically	Overland flooding	Flood inundation of buildings/properties in low lying areas impacting residents and businesses, clean up and repair costs.
12	Creek Flooding	Projected upward trend in high flow conditions under climate change conditions.	Creek flooding	1:500-year flood event on Sawridge Creek / Diversion Canal.
13	Hotter Temperatures, Drier Conditions	Projected 10% and 42% increases in area burned by in annual number of fires greater than 50 ha by the 2020s and 2080s respectively.	Wildland fire – property damage	A wildland urban interface fire occurs, causing damage to property, homes, businesses, potential power outages, clean up and repair costs.
14		Projected 10% and 42% increases in area burned by in annual number of fires greater than 50 ha by the 2020s and 2080s respectively.	Wildland fire – community evacuation	A wildland urban interface fire occurs, leading to community evacuation, displacement of population, potential health impacts, and impacts to quality of life and livability within the community.
15	Hotter Temperatures	Projected 30-70% increase in wildfire spread days in fire zones that could affect smoke levels in the region.	Wildfire smoke – health impacts	Localized health impacts, particularly on vulnerable populations such as seniors, low income living in poor housing conditions and homeless.
16		Projected 30-70% increase in wildfire spread days in fire zones that could affect smoke levels in the region.	Wildfire smoke – reduced recreation	Reduced outdoor recreation opportunities and quality of life during smoke events.
17		Projected 30-70% increase in wildfire spread days in fire zones that could affect smoke levels in the region.	Wildfire smoke – air transport disruption	Loss of, or disruption in air transportation due to low visibility from smoke, including patient emergency transport.
19	Hotter Temperatures	Projected 2.1°C increase in mean annual temperature by the 2030s. Increased air temperatures are likely to increase temperatures in natural water bodies.	Reduced water quality (non-potable)	Reduction in water quality in local water bodies (Lesser Slave Lake) with potential health (blue-green algae) and recreational (fishing) impacts affecting quality of life.
18	Warmer Winter Temperatures	108 'winter days' in the future with temperatures below -5°C, compared to 143 historically.	Loss of/reduced road access	Loss of, or reduced access of roads during winter has economic impacts for businesses/sectors and recreational users that rely on these roads for access.

The risk score for each climate impact scenario was determined based on the multiplication of likelihood and consequence score, as discussed. The following **Table 4-4** shows the top five highest risks to the community. The details of the lower risk results are shown in **Appendix C**. Only those climate impact scenarios that were assessed as "very high" and "high risks" will be considered in the climate adaptation action planning process. Twelve of the climate impact scenarios have been assessed to be "very high" (score of 4 or 5); these will be discussed in **Section 5**.

Table 4-4 Community-Wide Highest Risk Results

Impact	Description	Historic Likelihood	Future Likelihood	Consequence Score	Risk Score	Risk Level
Loss of / reduced road access during winter	Loss of, or reduced access of roads during winter with economic impacts for businesses that support the resource sector (hotels, restaurants, supply stores, etc.), and recreational users that rely on these roads for access.	3	5	5	25	HIGH
Wildfire smoke – air transport disruption	Loss of, or disruption in air transportation due to low visibility from smoke, including patient emergency transport, and firefighting.	3	5	4.5	22.5	HIGH
Increased space cooling costs	Increased costs for residents, businesses and the municipality to cool homes and buildings during the summer. Potential need to expand or add HVAC systems to existing homes and buildings.	3	5	4	20	HIGH
Wildfire smoke – health impacts	Localized health impacts, particularly on vulnerable populations such as seniors, low income living in poor housing conditions and homeless.	3	5	4	20	HIGH
Wildfire smoke – reduced recreation	Reduced outdoor recreation opportunities and quality of life during smoke events.	3	5	4	20	HIGH

5 ADAPTATION ACTION PLANNING

A series of adaptation workshops, **Workshop 3**, were conducted in November 2022 with the Town's departmental leads. For continuity, the departmental leads who attended **Workshop 1** and **Workshop 2** attended this Workshop. The workshops facilitated by Associated Engineering and All One Sky Foundation are listed in the following:

- **3A:** Water, Wastewater, Stormwater
- **3B:** Buildings and Parks
- **3C:** Airport, Road and Fleet
- **3D:** Community-wide (social aspects and local economy)

The Community Climate Adaptation Planning Guide developed by All One Sky Foundation was used in guiding the workshop discussion. The recommended options for adaptation actions are listed in the following:

1. **No Action** – no additional actions required/business as usual.
2. **Conduct Research, Studies, or Assessments** to obtain further information on the nature of the risk to better inform the decision-making process.
3. **Update Policies, plans, standards, guidelines, or bylaws** that consider climate risks and opportunities.
4. **Modify Operations and/or Maintenance** schedules, activities with the consideration of climate impacts.
5. **Build New or Upgrade Existing Infrastructure** to provide protection against climate risks.
6. **Increase Awareness and Education** to help community better understand risks and adaptation actions.
7. **Incorporate Emergency Management** such as response and evacuation planning, hazard mapping, and earl warning or alert systems.
8. **Consider Human Resourcing** options and evaluate the need for additional staff time allocated to climate adaptation planning, implementation and establishing task force.

5.1 Infrastructure Systems

Associated Engineering facilitated the discussions during **Workshops 3A, B and C**, and adaptation actions were identified for each asset. These actions were examined for the medium to high-risk climate impacts. The discussions were summarized and tabulated in **Appendix D** for each infrastructure system and their respective components. Each summary table highlights the following:

- Recommended adaptation actions
- Time frame of implementation

The time frames were grouped into:

- 0 to 5 years as immediate to short-term
- Up to 10 years for longer term implementation.

5.2 Community-Wide Adaptation Consideration

The goal of the climate adaptation action planning process was to identify potential future actions that can be implemented by the Town to manage high priority climate change risks affecting the Community and Local Economy. An **Action Planning Workshop** was held on December 12, 2023 to consider:

1. What actions are currently being implemented to manage the social/economic consequences of each impact?
2. What new actions, or improvements/updates to existing actions, are needed to manage the social/economic consequences of each impact more effectively?

Table 5-1 provides a summary of recommended actions to be implemented by the Town to manage high priority climate change risks affecting the local economy and community. For each recommended action, the following information was provided:

1. **What is the estimated timeframe for having this action implemented (operational)?**
    a. Ongoing
    b. Near-term (next 1-2 years)
    c. Short-term (2-5 years)
    d. Medium-term (5-10 years)
    e. Long-term (10+ years)
2. **Which priority climate impact does the action help to manage?**
    a. **Road Access:** reduced road access and with economic and recreational impacts.
    b. **Wildfire Smoke**: Disruption of air transportation, localized health impacts, and reduced summer recreation from wildfire smoke.
    c. **Heat**: Increased costs to cool homes and buildings.

Table 5-1 Climate Adaptation Action Consideration – Community-Wide

Recommended Action	Time	Road Access	Wildfire Smoke	Heat
1. **Improve communications about climate risks and adaptation**. Develop and disseminate educational materials, in partnership with local and regional stakeholders, about climate projections, impacts, and climate resilience actions. Educational materials could be disseminated via the Town website, social media, printed materials and/or at community events.	Near-term	✓	✓	✓
2. **Develop a road access plan**. Work with the Municipal District of Lesser Slave Lake, Government of Alberta, and business and industry stakeholders to develop solutions for the impacts of climate change on road access across the region.	Short-term	✓		
3. **Develop an emergency air transportation plan**. Work with Alberta Health Services to improve emergency air transportation, including improved communications and plans for emergency patient transport during low visibility from wildfire smoke.	Ongoing		✓	
4. **Install an air quality monitoring station**. Replace the existing purple air monitor with one that is approved by Alberta Health Services and Environment and Climate Change Canada.	Near-term		✓	
5. **Monitor smoke forecasts**. Allocate staff resources to track wildfire smoke forecasting to proactively manage wildfire smoke impacts, including better communications and guidance for residents, businesses and local organizations.	Ongoing		✓	
6. **Develop a wildfire smoke response plan**. Develop a smoke alert response plan and incorporate it into the Emergency Management Plan. The smoke alert response plan should include: identification of at-risk populations in the community; an alert protocol and triggers for activation of wildfire smoke responses; a communications plan to provide guidance to residents and local organizations; and a designated clean air centre(s) and a plan to transport vulnerable populations there[1].	Short-term		✓	

[1] For resources on communications during wildfire smoke events see: BC Centre for Disease Control: Wildfire Smoke: http://www.bccdc.ca/health-info/prevention-public-health/wildfire-smoke; Government of Canda: Wildfire Smoke 101: https://www.canada.ca/en/health-canada/services/publications/healthy-living/wildfire-smoke-health.html

Recommended Action	Time	Road Access	Wildfire Smoke	Heat
7. **Develop an extreme heat response plan**. The Response Plan should identify heat-related triggers at which point the activation of heat wave response is required. Triggers should be aligned with heat alerts issued by Environment and Climate Change Canada[2]. Heat responses should be focused on providing public education and communications, particularly targeted at vulnerable populations, for example, directing people to appropriate Town buildings and facilities for cooling, and a plan to transport vulnerable populations there[3]. The Extreme Heat Response Plan should be incorporated into the Emergency Management Plan.	Short-term			✓
8. **Improve the energy efficiency of Town's buildings and facilities.** Apply for grant funding and support for energy efficiency improvements at key buildings and facilities. Improvement should focus on improved performance of buildings during extreme heat events, for example: insulation, energy efficient windows and doors, and updated or new mechanical cooling systems.	Long-term			✓
9. **Implement the Community Energy Improvement Program (CEIP).** To provide low interest loans to help residents with energy efficiency improvements such as insulation, energy efficient windows and doors, and updated or new mechanical cooling systems.	Medium-term			✓
10. **Adjust recreation programming during extreme heat**. Adjust recreation facility programming, including operating hours, and modify staff schedules to accommodate increased indoor recreation activities during extreme heat and wildfire smoke events	Ongoing		✓	✓

[2] Public alerts are issued by Environment and Climate Change Canada when there are *2 or more consecutive days of daytime maximum temperatures above 29°C, and nighttime minimum temperatures above 14°C*. Source: https://www.canada.ca/en/environment-climate-change/services/types-weather-forecasts-use/public/criteria-alerts.html#heat

[3] The Government of Alberta has a toolkit of resources available related to communications for extreme heat events, see: https://www.alberta.ca/extreme-heat

6 RECOMMENDATION

The risk assessments and adaptation actions provided an overview of the risk and vulnerabilities of the existing built infrastructure, and the socio and economic aspects for the Town. The assessment enabled the Town to identify high-risk areas and allocate resources to take actions in preventing, reducing, or eliminating potential risks. The assessment focused on the Town's current condition and how the assets fared with future projected climate hazards. The following recommendations for consideration as **Next Steps**:

1. **Prioritize Actions**. The critical infrastructure at the Town that has high impacts are Parks, Trails, and Sports Field, Buildings, Roads, and Stormwater Management. The Town should consider prioritizing these assets to ensure that the level of service provided to the community is maintained. The Solid Waste Management Facility operated and owned by the MD will also need to pay attention to the various hazards and risks to maintain service.

   A list of recommended actions has been provided for the Town in **Appendix D** for specific asset and **Section 5** for overall community resilience to consider and implement. Starting with low costs actions, these can be implemented with planned policy or bylaw updates. Other considerations include mainstreamed into the infrastructure renewal, community planning and development projects.

2. **Cross-Cutting Discussion and Information Sharing.** The Town is encouraged to share this information with other relevant departments and inform asset managers for future planning. Furthermore, cross-departmental discussion can help to identify, assess, and address common problematic areas to protect assets.

Table 6-1 Potential Cross Cutting Adaptation Actions Applicable to All Departments/Corporations

All Departments/Corporation
Increase public engagement and community awareness of climate change impacts and adaptations through public open houses, schools, and other discussion forums.
Increase cross-departmental collaboration and information sharing to improve management of climate change risks and opportunities.
Increase public education and awareness of the impacts of climate change, and how residents can protect their properties and stay safe.
Create and disseminate flood risk maps across Town's departments, and to residents, businesses, and other organizations to support more resilient development and planning.
Employ an adaptive management approach to climate adaptation planning.
Increase staff training on climate change impacts and adaptations across all departments.
Increase the resilience of Town's buildings to climate hazards and extreme weather including zoning, planning, and permitting, and the use of climate resilient design practices[4].
Promote sharing of Town's maps and emergency information to improve emergency response.
Promote the use of renewable energy sources in homes and buildings.

[4] For information on climate resilient design practices see: US Green Building Council, Designed for enhanced resilience; Sustainable Sites. US Green Building Council (2020); or RELi 2.0. Rating Guidelines for Resilient Design and Construction.

All Departments/Corporation
Avoid development in flood prone areas through zoning, planning and development restrictions.
Identify funding opportunities for green infrastructure and buildings to increase resilience.

3. **Monitor, Assess, and Update Risk Scores and Adaptation Actions.** The Town is encouraged to identify performance or tolerance threshold (e.g., temperature, precipitation) of assets to provide a baseline for monitoring. As the Town improves or makes modifications to reduce the risks and vulnerabilities to assets, adaptation plans can be updated. This encourages improvements and furthering the reduction and removal of risks.
4. **Continual Review of Climate Data.** The Town, overtime, should also monitor the ongoing evolution of climate projections. This will allow the Town to update the risk score and evaluate its vulnerabilities and exposure based on current and science-based information. Adaptation actions can be adjusted accordingly while staying flexible and adaptable to potential market fluctuations.

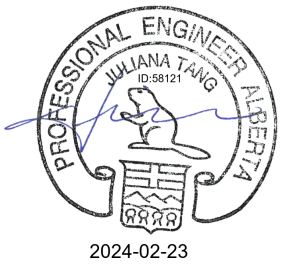
7 CLOSURE

A Climate Change Risk Assessment was conducted to identify and evaluate the potential impact climate change may have on the Town of Slave Lake's infrastructure and community, as a whole.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

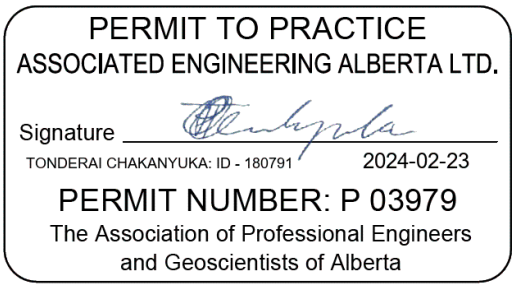
Respectfully submitted,

Associated Engineering Alberta Ltd.



Juliana Tang, M.Sc., P.Eng., ENV SP
Project Manager

Jeff Zukiwsky, MRM, RPP
Climate Adaptation and Resilience,
Director All One Sky Foundation



APPENDIX A – CLIMATE PROJECTED DATA

Climate Variable	Brief Description	Baseline (1976-2005)	Near Future (2021-2050)	Distant Future (2051-2080)	Resource
Mean Annual Temperature (°C)		1.6°C	3.7°C	5.8°C	Climateatlas.ca
Mean Summer Temperature (°C)		14.8°C	16.8°C	18.9°C	Climateatlas.ca
Number of days above +30°C (#)	The number of days with a maximum temperature (Tmax) greater than 30°C. Use the Variable menu option to view annual, monthly or seasonal values for this index.	1 days	5 days	13 days	Climatedata.ca
Number of heatwaves (#)	The average number of heat waves per year. A heat wave occurs when at least three days in a row reach or exceed 30 °C	0.1	0.6	1.9	Climateatlas.ca
Hottest Day	The Hottest Day describes the warmest daytime temperature in the selected time period. In general, the hottest day of the year occurs during the summer months.	28.4°C – 29.8°C	30.2°C – 33.8°C	32.7°C – 37.5°C	Climatedata.ca
Cooling Degree Days	The number of degree days accumulated above 18°C in the selected time period. Use the Variable menu option to view the annual, monthly or seasonal values for this index. Visit the Analyze page to calculate degree days using different threshold temperatures.	23 degree days	82 degree days	196 degree days	Climatedata.ca
Mean Winter temperature (°C)	The average temperature of the day in winter.	-13.3°C	-10.9°C	-8.4°C	Climateatlas.ca

Climate Variable	Brief Description	Baseline (1976-2005)	Near Future (2021-2050)	Distant Future (2051-2080)	Resource
Number of days below -30°C (#)	The number of days with a minimum temperature (T_{min}) less than -30°C.	13.1	6.6	2.7	Climateatlas.ca
Mild Winter Days below -5°C	A Mild Winter Day is a day when the temperature drops to at least -5 °C.	143.2	125.3	108.3	Climateatlas.ca
Frost-free season (days)	The number of days between the date of the last spring frost and the date of the first fall frost, equivalent to the number of consecutive days during the 'summer' without any daily minimum temperatures below 0°C. Use the Variable menu option to view values for this index on the map.	119	142	166	Climatedata.ca
Freeze-thaw cycle	A freeze-thaw cycle occurs when the daily maximum temperature (T_{max}) is higher than 0°C and the daily minimum temperature (T_{min}) is less than or equal to -1°C.	85.9	76.9	69.2	Climateatlas.ca
Annual Total Precipitation (mm)	The total amount of precipitation (mm) accumulated in the selected time period. Use the Variable menu option to view the annual, monthly or seasonal values for this variable. Rain and snow included.	443 mm	463 mm	482 mm	Climatedata.ca
Number of days with >10mm precipitation (#)	The number of days with precipitation >= 10 mm.	7 to 11 days	8 to 12 days	9 to 12 days	Climatedata.ca
Wet Days >= 20mm	The number of days with precipitation >= 20 mm. Rain and snow included.	2	3	3	Climatedata.ca

Climate Variable	Brief Description	Baseline (1976-2005)	Near Future (2021-2050)	Distant Future (2051-2080)	Resource
Maximum 1-day Total Precipitation	The largest precipitation total that falls in a single day in the selected time period. Includes both rain and snow.	33 mm	34 mm	37 mm	Climatedata.ca
Maximum 5 -day consecutive precipitation (mm)	The maximum total precipitation that falls over a consecutive 5-day period.	60 mm	62 mm	64 mm	Climatedata.ca
Short Duration Rainfall / Overland Flooding	Based on 1:100 year 24 hour event. RCP8.5	4.2 mm/hr	4.3 mm/hr	4.6 mm/hr	ClimateData.ca
Maximum No. of Consecutive Dry Days	The maximum number of consecutive days with precipitation below 1mm/day, within the selected time period.	25 days	25 days	24 days	Climatedata.ca
Drought (SPEI)	SPEI (12 months), The Standardized Precipitation Evapotranspiration Index (SPEI) is a drought index based on the difference between precipitation (P) and potential evapotranspiration (PET). Negative (positive) values indicate water deficit (surplus).	General drier conditions in the summer; however, noting that the excessive moisture due to extreme rainfall with annual variability also increase with warmer climate.			Conversation with Dave Sauchyn, August 18, 2023.
		0.2	-0.5	-0.7	Climatedata.ca (rounded up to nearest 10th decimal)
Winter Precipitation	Snow accumulation over winter months (December, January, February)	69 mm	74 mm	79 mm	Climateatlas.ca
Lightning		Complex model generated considering wind shear, temperature, moisture. Increasing severe weather events modelled increasing lightning occurrence.			Dominique Paquin, et. Al., 2014. Change in North American Atmospheric Conditions Associated with Deep Convection and Severe Weather using CRCm4 Climate Projections, ISSN 0705-5900

Climate Variable	Brief Description	Baseline (1976-2005)	Near Future (2021-2050)	Distant Future (2051-2080)	Resource
Hailstorm	Precipitation in the form of lumps	Historical likelihood is 1 large hail day every 6-7 years [3.5-5 large hail days over period 1971-2000]. ~14% annual probability of large hail day occurring historically. There is an increasing likelihood of about 1 additional large hail day per season [1 large hail day every 5-6 years]. ~18% annual probability of large hail day occurring. Report indicates an historic likelihood of 4 (likely). Likelihood is noted as health and well-being (2 – low), economic (4 – high), natural environment (2 – low), built environment (4 – high)			Brimelow, J. et al., 2017, The changing hail threat over North America in response to anthropogenic climate change, Nature Climate Change, DOI: 10.1038/NCLIMATE3321.
Tornado	Violently rotating column of air that extends from a cumuliform cloud to the surface.	There has been one "strong" or higher tornado in the region—Edmonton, Beaumont, Millet, etc. on 31.07.1987 <1% annual probability of strong tornado	Insufficient evidence to determine trend <1% annual probability of strong tornado	Insufficient evidence to determine trend <1% annual probability of strong tornado	• Beaumont, Millet, etc. on 31.07.1987. • Elsner, J. et al, 2014, Tornado Intensity Estimated from Damage Path Dimensions, PLoS ONE 9(9): e10757
High Wind	Sustained wind at 70 km/hr or gust up to 90 km/hr and more.	Minor changes from 2020 to 2080. Some data are inclusive and will need more research.			https://www.canada.ca/en/environment-climate-change/services/types-weather-

Climate Variable	Brief Description	Baseline (1976-2005)	Near Future (2021-2050)	Distant Future (2051-2080)	Resource
					forecasts-use/public/criteria-alerts.html#wind https://publications.gc.ca/collections/collection_2021/eccc/En4-415-2020-eng.pdf
Riverine Flooding	Excessive rainfall raises the water level in rivers and creeks across the region overflows onto the neighboring land. High flows: 1:100 year, 24- hour stream flow to 200 year flood level.	Alberta Innovate and AE conducted a study on river water levels causing potential threat to water treatment plants in Alberta. The study showed upward trends of high flow conditions under climate change conditions.			AEPA Flood Map, Alberta Floods Portal AE's project with Alberta Innovate: Drinking Water Infrastructure Risk and Vulnerability Assessment, 2023.
Wildfire Smoke	Wildfire smoke causes health conditions. Wildfire smoke reduces visibility to 2km or less causing unhealthy air quality conditions.	16 occurrences where visibility fell below 2km between 1961-2021 Annual probability about 27%	Increasing. Projected 30-70% [mid-point of 50%] increase in the number of wildfire spread[1] days in fire zones that could affect smoke levels in the region.		Edmonton International Airport for "smoke days". Based on studies for the Edmonton Municipal Region in 2023.
Wildfire	Uncontrolled ground fire spread resulted from flammable biomass, weather, topography and ignition sources. Ignition sources may be natural (eg. lightning) or due to human error.	Using the resource data, AE generated a data base showing the potential increase of burned area from baseline 1981 to 2080s. Based on RCP 8.5 scenario, the projected % change in annual number of fires greater than 50 ha is 10% from 2020s to 42% in 2080s. % change in average annual area burned increases from 33% in 2020s to 190% in 2080s.			Wang, Xianli, Tom Swystun, and Mike D. Flannigan. "Future wildfire extent and frequency determined by the longest fire-conducive weather spell." *Science of the total environment* 830 (2022): 154752. Wang, Xianli, et al. "One extreme fire weather event determines the extent and frequency of wildland

Climate Variable	Brief Description	Baseline (1976-2005)	Near Future (2021-2050)	Distant Future (2051-2080)	Resource
					fires." *Environmental Research Letters* 16.11 (2021): 114031. Wang, Xianli, et al. "Projected changes in daily fire spread across Canada over the next century." *Environmental Research Letters* 12.2 (2017): 025005. Wang, Xianli, et al. "The potential and realized spread of wildfires across Canada." *Global change biology* 20.8 (2014): 2518-2530.
Shifting Ecosystem	Changing seasons and ecosystems	Unknown, as it depends on disturbances to the landscape (to create windows for change) as well as changes to the climate envelope of each ecoregion			Schneider, R., 2013, Alberta's Natural Subregions Under a Changing Climate: Past, Present and Future, Report prepared by Department of Biological Sciences, University of Alberta for the Biodiversity Management and Climate Change Adaptation Project, 97p.

APPENDIX B – ASSETS RISK RESULTS FROM PIEVC HLSG PROCESS

PIEVC Risk Matrix
Airport

Consequence Score

0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter

			Temperature															
			Mean Annual Temperature (◦C)				Days above +30ºC				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)			
			Annual Mean				**Very Hot Days**				**Hottest Day**				**Cooling Degree Days**			
	Climate Projections	Present	1.6	3			1	3			29.8	3			23	3		
		2050	3.7	4			5	4			33.8	4			82	4		
		2080	5.8	5			13	5			37.5	5			196	5		
	Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1	Runway 10-28	Present		3		3		3		9		3		12		3		3
		2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	1	4
		2080		5		5		5		15		5		20		5		5
2	Taxiway A	Present		3		3		3		3		3		6		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
		2080		5		5		5		5		5		10		5		5
3	Taxiway B	Present		3		3		3		9		3		12		3		3
		2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	1	4
		2080		5		5		5		15		5		20		5		5
4	Taxiway C	Present		3		3		3		3		3		6		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
		2080		5		5		5		5		5		10		5		5
5	Taxiway D	Present		3		3		3		3		3		6		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
		2080		5		5		5		5		5		10		5		5
6	Main Apron	Present		3		3		3		6		3		9		3		3
		2050	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	1	4
		2080		5		5		5		10		5		15		5		5
7	HAC Base Apron	Present		3		3		3		3		3		6		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
		2080		5		5		5		5		5		10		5		5
8	Forestry Apron	Present		3		3		3		9		3		12		3		3
		2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	1	4
		2080		5		5		5		15		5		20		5		5
9	Airport Road	Present		3		3		3		3		3		9		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	1	4
		2080		5		5		5		5		5		15		5		5
10	Paved Parking Lot	Present		3		3		3		6		3		6		3		3
		2050	Y	4	1	4	Y	4	2	8	Y	4	2	8	Y	4	1	4
		2080		5		5		5		10		5		10		5		5
11	Shop and Office Building	Present		3		6		3		6		3		9		3		9
		2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	3	12
		2080		5		10		5		10		5		15		5		15
12	Terminal Building	Present		3		6		3		6		3		9		3		9
		2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	3	12
		2080		5		10		5		10		5		15		5		15
13	FEC Building	Present		3		6		3		3		3		6		3		9
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	3	12
		2080		5		10		5		5		5		10		5		15
14	Fencing	Present		3		3		3		3		3		6		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
		2080		5		5		5		5		5		10		5		5
15	Airfield Lighting	Present		3		3		3		3		3		6		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
		2080		5		5		5		5		5		10		5		5
16	Utilities Corridor	Present		3		3		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		5		5		5		5		5		5		5		5
17	Shoreline	Present		3		3		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		5		5		5		5		5		5		5		5
18	Drainage	Present		3		3		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4

			Temperature											
			# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events			
			Coldest Days				**Frost-free Season**				**Freeze/ Thaw Events**			
	Climate Projections	Present	13.1	3			119	3			85.9	3		
		2050	6.6	2			142	4			76.9	2		
		2080	2.7	2			166	4			69.2	2		
	Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1	Runway 10-28	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
2	Taxiway A	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
3	Taxiway B	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
4	Taxiway C	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
5	Taxiway D	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
6	Main Apron	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
7	HAC Base Apron	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
8	Forestry Apron	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
9	Airport Road	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
10	Paved Parking Lot	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
11	Shop and Office Building	Present		3		3		3		3		3		6
		2050	Y	2	1	2	Y	4	1	4	Y	2	2	4
		2080		2		2		4		4		2		4
12	Terminal Building	Present		3		3		3		3		3		6
		2050	Y	2	1	2	Y	4	1	4	Y	2	2	4
		2080		2		2		4		4		2		4
13	FEC Building	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
14	Fencing	Present		3		6		3		3		3		9
		2050	Y	2	2	4	Y	4	1	4	Y	2	3	6
		2080		2		4		4		4		2		6
15	Airfield Lighting	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
16	Utilities Corridor	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6
		2080		2		2		4		4		2		6
17	Shoreline	Present		3		3		3		3		3		6
		2050	Y	2	1	2	Y	4	1	4	Y	2	2	4
		2080		2		2		4		4		2		4
18	Drainage	Present		3		3		3		3		3		9
		2050	Y	2	1	2	Y	4	1	4	Y	2	3	6

			Precipitation											
			Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)			
			Annual Percipitation				**Extreme Rainfall**				**Persistant Percipitation**			
	Climate Projections	Present	443	3			33	3			60	3		
		2050	463	3			34	3			62	3		
		2080	482	4			37	3			64	3		
	Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1	Runway 10-28	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
2	Taxiway A	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
3	Taxiway B	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
4	Taxiway C	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
5	Taxiway D	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
6	Main Apron	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
7	HAC Base Apron	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
8	Forestry Apron	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
9	Airport Road	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
10	Paved Parking Lot	Present		3		3		3		3		3		6
		2050	Y	3	1	3	Y	3	1	3	Y	3	2	6
		2080		4		4		3		3		3		6
11	Shop and Office Building	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
12	Terminal Building	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
13	FEC Building	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
14	Fencing	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
15	Airfield Lighting	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
16	Utilities Corridor	Present		3		3		3		3		3		3
		2050	Y	3	1	3	Y	3	1	3	Y	3	1	3
		2080		4		4		3		3		3		3
17	Shoreline	Present		3		6		3		6		3		6
		2050	Y	3	2	6	Y	3	2	6	Y	3	2	6
		2080		4		8		3		6		3		6
18	Drainage	Present		3		6		3		6		3		6
		2050	Y	3	2	6	Y	3	2	6	Y	3	2	6

			Precipitation											
			Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months			
			Short Duration Rainfall/ Overland Flooding				**Drought**				**Snow Accumulation**			
	Climate Projections	Present	4.2	3			-	3			69	3		
		2050	4.3	4			+	4			74	4		
		2080	4.6	4			++	4			79	4		
	Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1	Runway 10-28	Present		3		6		3		3		3		6
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8
		2080		4		8		4		4		4		8
2	Taxiway A	Present		3		6		3		3		3		6
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8
		2080		4		8		4		4		4		8
3	Taxiway B	Present		3		6		3		3		3		6
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8
		2080		4		8		4		4		4		8
4	Taxiway C	Present		3		6		3		3		3		6
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8
		2080		4		8		4		4		4		8
5	Taxiway D	Present		3		6		3		3		3		6
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8
		2080		4		8		4		4		4		8
6	Main Apron	Present		3		6		3		3		3		6
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8
		2080		4		8		4		4		4		8
7	HAC Base Apron	Present		3		6		3		3		3		6
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8
		2080		4		8		4		4		4		8
8	Forestry Apron	Present		3		6		3		3		3		6
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8
		2080		4		8		4		4		4		8
9	Airport Road	Present		3		6		3		3		3		6
		2050	Y	4	2	8	Y	4	1	4	Y	4	2	8
		2080		4		8		4		4		4		8
10	Paved Parking Lot	Present		3		9		3		3		3		6
		2050	Y	4	3	12	Y	4	1	4	Y	4	2	8
		2080		4		12		4		4		4		8
11	Shop and Office Building	Present		3		3		3		3		3		6
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8
		2080		4		4		4		4		4		8
12	Terminal Building	Present		3		3		3		3		3		6
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8
		2080		4		4		4		4		4		8
13	FEC Building	Present		3		3		3		3		3		6
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8
		2080		4		4		4		4		4		8
14	Fencing	Present		3		3		3		3		3		6
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8
		2080		4		4		4		4		4		8
15	Airfield Lighting	Present		3		6		3		3		3		9
		2050	Y	4	2	8	Y	4	1	4	Y	4	3	12
		2080		4		8		4		4		4		12
16	Utilities Corridor	Present		3		3		3		3		3		6
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8
		2080		4		4		4		4		4		8
17	Shoreline	Present		3		9		3		3		3		6
		2050	Y	4	3	12	Y	4	1	4	Y	4	2	8
		2080		4		12		4		4		4		8
18	Drainage	Present		3		9		3		3		3		6
		2050	Y	4	3	12	Y	4	1	4	Y	4	2	8

			Extreme Events											
			Lightning				Hail Storm				High Wind/ Tornado			
			Lightning				**Hail**				**Tornado**			
	Climate Projections	Present	-	3			-	3			-	3		
		2050	+	4			+	4			+	4		
		2080	+	4			+	4			+	4		
	Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1	Runway 10-28	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
2	Taxiway A	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
3	Taxiway B	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
4	Taxiway C	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
5	Taxiway D	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
6	Main Apron	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
7	HAC Base Apron	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
8	Forestry Apron	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
9	Airport Road	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
10	Paved Parking Lot	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
11	Shop and Office Building	Present		3		6		3		9		3		6
		2050	Y	4	2	8	Y	4	3	12	Y	4	2	8
		2080		4		8		4		12		4		8
12	Terminal Building	Present		3		6		3		9		3		6
		2050	Y	4	2	8	Y	4	3	12	Y	4	2	8
		2080		4		8		4		12		4		8
13	FEC Building	Present		3		9		3		9		3		6
		2050	Y	4	3	12	Y	4	3	12	Y	4	2	8
		2080		4		12		4		12		4		8
14	Fencing	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
15	Airfield Lighting	Present		3		9		3		9		3		6
		2050	Y	4	3	12	Y	4	3	12	Y	4	2	8
		2080		4		12		4		12		4		8
16	Utilities Corridor	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
17	Shoreline	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		4		4		4		4		4		4
18	Drainage	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4

			Extreme Events								Shifiting Natural Ecoregions			
			Flooding				Climate Moisture Deficit				Shifiting Natural Ecoregions			
			River Flooding				**Wildfire Smoke**				**Shifting Ecosystem**			
	Climate Projections	Present	-	3			-	3			-	3		
		2050	+	4			+	4			+	4		
		2080	++	5			+	4			+	4		
	Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1	Runway 10-28	Present		3		9		3		3		3		3
		2050	Y	4	3	12	Y	4	1	4	Y	4	1	4
		2080		5		15		4		4		4		4
2	Taxiway A	Present		3		9		3		3		3		3
		2050	Y	4	3	12	Y	4	1	4	Y	4	1	4
		2080		5		15		4		4		4		4
3	Taxiway B	Present		3		9		3		3		3		3
		2050	Y	4	3	12	Y	4	1	4	Y	4	1	4
		2080		5		15		4		4		4		4
4	Taxiway C	Present		3		9		3		3		3		3
		2050	Y	4	3	12	Y	4	1	4	Y	4	1	4
		2080		5		15		4		4		4		4
5	Taxiway D	Present		3		9		3		3		3		3
		2050	Y	4	3	12	Y	4	1	4	Y	4	1	4
		2080		5		15		4		4		4		4
6	Main Apron	Present		3		9		3		3		3		3
		2050	Y	4	3	12	Y	4	1	4	Y	4	1	4
		2080		5		15		4		4		4		4
7	HAC Base Apron	Present		3		9		3		3		3		3
		2050	Y	4	3	12	Y	4	1	4	Y	4	1	4
		2080		5		15		4		4		4		4
8	Forestry Apron	Present		3		9		3		3		3		3
		2050	Y	4	3	12	Y	4	1	4	Y	4	1	4
		2080		5		15		4		4		4		4
9	Airport Road	Present		3		9		3		3		3		3
		2050	Y	4	3	12	Y	4	1	4	Y	4	1	4
		2080		5		15		4		4		4		4
10	Paved Parking Lot	Present		3		6		3		3		3		3
		2050	Y	4	2	8	Y	4	1	4	Y	4	1	4
		2080		5		10		4		4		4		4
11	Shop and Office Building	Present		3		6		3		6		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	1	4
		2080		5		10		4		8		4		4
12	Terminal Building	Present		3		6		3		6		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	1	4
		2080		5		10		4		8		4		4
13	FEC Building	Present		3		6		3		6		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	1	4
		2080		5		10		4		8		4		4
14	Fencing	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		5		5		4		4		4		4
15	Airfield Lighting	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		5		5		4		4		4		4
16	Utilities Corridor	Present		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	1	4
		2080		5		5		4		4		4		4
17	Shoreline	Present		3		12		3		3		3		9
		2050	Y	4	4	16	Y	4	1	4	Y	4	3	12
		2080		5		20		4		4		4		12
18	Drainage	Present		3		12		3		3		3		3
		2050	Y	4	4	16	Y	4	1	4	Y	4	1	4

PIEVC Risk Matrix
Airport

Consequence Score

- 0 - No Effect
- 1 - Insignificant
- 2 - Minor
- 3 - Moderate
- 4 - Major
- 5 - Catastrophic

Climate Parameter

Temperature

Infrastructure Components		Mean Annual Temperature (◦C) – Annual Mean				Days above +30°C – Very Hot Days				Warmest Day Time Temperature – Hottest Day				Cooling Degree Days (Degree Days) – Cooling Degree Days				# of Days Below -30°C – Coldest Days				# Days Without Frost – Frost-free Season				# Freeze/ Thaw Events – Freeze/ Thaw Events			
		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Climate Projections	Present	1.6	3			1	3			29.8	3			23	3			13.1	3			119	3			85.9	3		
	2050	3.7	4			5	4			33.8	4			82	4			6.6	2			142	4			76.9	2		
	2080	5.8	5			13	5			37.5	5			196	5			2.7	2			166	4			69.2	2		
	2080		5		5		5		5		5		5		5		5		2		2		4		4		2		6
Operation and Maintenance	Present		3		3		3		6		3		9		3		9		3		6		3		3		3		9
	2050	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	3	12	Y	2	2	4	Y	4	1	4	Y	2	3	6
	2080		5		5		5		10		5		15		5		15		2		4		4		4		2		6
Public/Customers	Present		3		3		3		6		3		9		3		6		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	2	2	4	Y	4	1	4	Y	2	2	4
	2080		5		5		5		10		5		15		5		10		2		4		4		4		2		4
Emergency Services	Present		3		3		3		3		3		9		3		3		3		6		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	1	4	Y	2	2	4	Y	4	1	4	Y	2	1	2
	2080		5		5		5		5		5		15		5		5		2		4		4		4		2		2

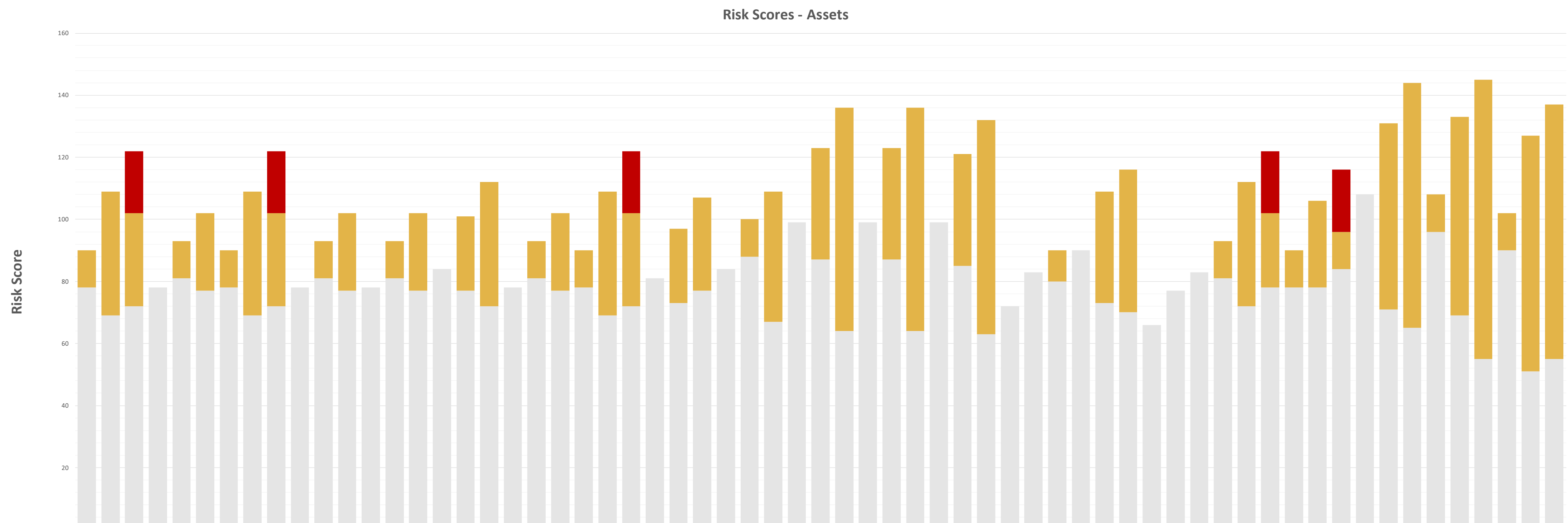
Precipitation

Infrastructure Components		Annual Total Percipitation (mm) – Annual Percipitation				Maximum 1-Day Total Percipitation (mm) – Extreme Rainfall				Maximum 5-day Consecutive Percipitation (mm) – Persistant Percipitation				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr) – Short Duration Rainfall/ Overland Flooding				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August) – Drought				Total Percipitation in the Winter Months – Snow Accumulation			
		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Climate Projections	Present	443	3			33	3			60	3			4.2	3			-	3			69	3		
	2050	463	3			34	3			62	3			4.3	4			+	4			74	4		
	2080	482	4			37	3			64	3			4.6	4			++	4			79	4		
	2080		4		8		3		6		3		6		4		12		4		4		4		8
Operation and Maintenance	Present		3		3		3		3		3		3		3		6		3		3		3		9
	2050	Y	3	1	3	Y	3	1	3	Y	3	1	3	Y	4	2	8	Y	4	1	4	Y	4	3	12
	2080		4		4		3		3		3		3		4		8		4		4		4		12
Public/Customers	Present		3		3		3		3		3		3		3		6		3		3		3		9
	2050	Y	3	1	3	Y	3	1	3	Y	3	1	3	Y	4	2	8	Y	4	1	4	Y	4	3	12
	2080		4		4		3		3		3		3		4		8		4		4		4		12
Emergency Services	Present		3		3		3		3		3		3		3		3		3		3		3		9
	2050	Y	3	1	3	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	1	4	Y	4	3	12
	2080		4		4		3		3		3		3		4		4		4		4		4		12

Extreme Events / Shifting Natural Ecoregions

Infrastructure Components		Lightning – Lightning				Hail Storm – Hail				High Wind/ Tornado – Tornado				Flooding – River Flooding				Climate Moisture Deficit – Wildfire Smoke				Shifting Natural Ecoregions – Shifting Ecosystem			
		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Climate Projections	Present	-	3			-	3			-	3			-	3			-	3			-	3		
	2050	+	4			+	4			+	4			+	4			+	4			+	4		
	2080	+	4			+	4			+	4			++	5			+	4			+	4		
	2080		4		4		4		4		4		4		5		20		4		4		4		4
Operation and Maintenance	Present		3		9		3		6		3		3		3		9		3		6		3		3
	2050	Y	4	3	12	Y	4	2	8	Y	4	1	4	Y	4	3	12	Y	4	2	8	Y	4	1	4
	2080		4		12		4		8		4		4		5		15		4		8		4		4
Public/Customers	Present		3		3		3		9		3		6		3		9		3		12		3		3
	2050	Y	4	1	4	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	1	4
	2080		4		4		4		12		4		8		5		15		4		16		4		4
Emergency Services	Present		3		9		3		9		3		6		3		9		3		12		3		3
	2050	Y	4	3	12	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	1	4
	2080		4		12		4		12		4		8		5		15		4		16		4		4

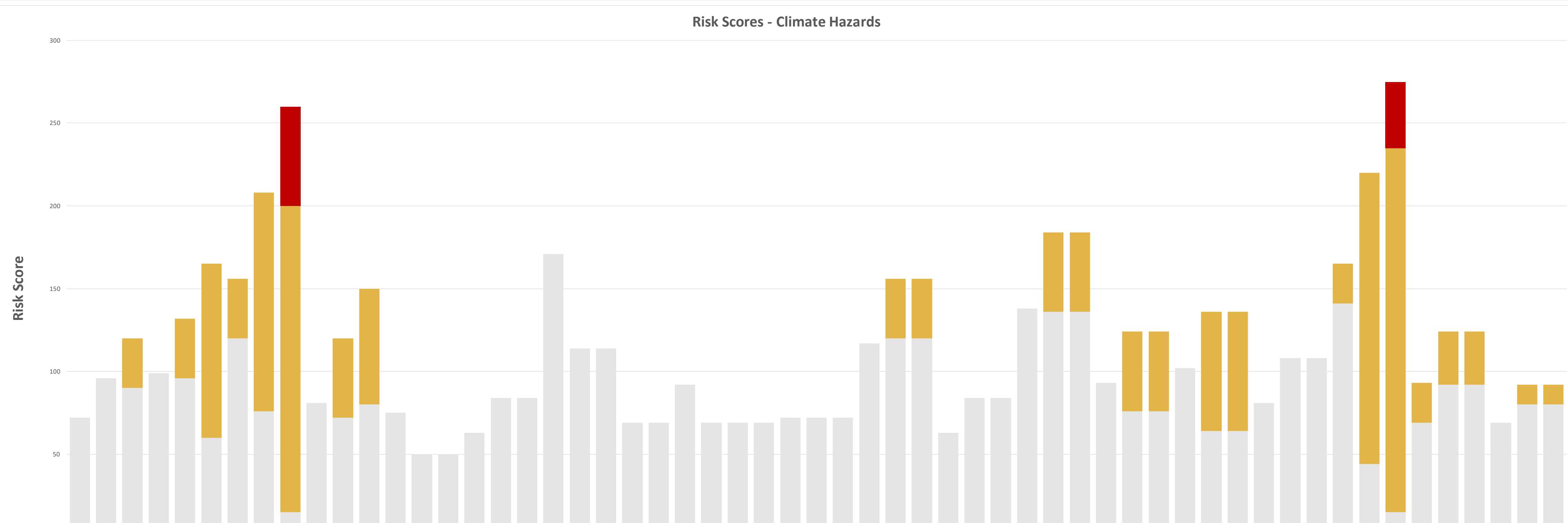
PIEVC Risk Scores
Airport



	Runway 10-28			Taxiway A			Taxiway B			Taxiway C			Taxiway D			Main Apron			HAC Base Apron		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	20	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk Score	12	40	30	0	12	25	12	40	30	0	12	25	0	12	25	0	24	40	0	12	25
Low Risk Scores	78	69	72	78	81	77	78	69	72	78	81	77	78	81	77	84	77	72	78	81	77

	Forestry Apron			Airport Road			Paved Parking Lot			Shop and Office Building			Terminal Building			FEC Building			Fencing		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk Score	12	40	30	0	24	30	0	12	42	0	36	72	0	36	72	0	36	69	0	0	10
Low Risk Scores	78	69	72	81	73	77	84	88	67	99	87	64	99	87	64	99	85	63	72	83	80

	Airfield Lighting			Utilities Corridor			Shoreline			Drainage			Operation and Maintenance			Public/Customers			Emergency Services		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	0	0	0	0	0	0	20	0	0	20	0	0	0	0	0	0	0	0	0
Medium Risk Score	0	36	46	0	0	0	12	40	24	12	28	12	0	60	79	12	64	90	12	76	82
Low Risk Scores	90	73	70	66	77	83	81	72	78	78	78	84	108	71	65	96	69	55	90	51	55



	Annual Mean			Very Hot Days			Hottest Day			Cooling Degree Days			Coldest Days		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0
Medium Risk	0	0	30	0	36	105	36	132	185	0	48	70	0	0	0
Low Risk Scores	72	96	90	99	96	60	120	76	15	81	72	80	75	50	50

	Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low Risk Scores	63	84	84	171	114	114	69	69	92	69	69	69	72	72	72

	Short Duration Rainfall/ Overland Flooding			Drought			Snow Accumulation			Lightning			Hail		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	36	36	0	0	0	0	48	48	0	48	48	0	72	72
Low Risk Scores	117	120	120	63	84	84	138	136	136	93	76	76	102	64	64

	Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	40	0	0	0	0	0	0
Medium Risk	0	0	0	24	176	220	24	32	32	0	12	12
Low Risk Scores	81	108	108	141	44	15	69	92	92	69	80	80

PIEVC Risk Matrix
Buildings - GOA Building

Consequence Score

- 0 - No Effect
- 1 - Insignificant
- 2 - Minor
- 3 - Moderate
- 4 - Major
- 5 - Catastrophic

Climate Parameter — Temperature

		Mean Annual Temperature (-C)				Days above +30°C				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events			
		Annual Mean				**Very Hot Days**				**Hottest Day**				**Cooling Degree Days**				**Coldest Days**				**Frost-free Season**				**Freeze/ Thaw Events**			
Climate Projections	Present	1.6	3			1	3			29.8	3			23	3			13.1	3			119	3			85.9	3		
	2050	3.7	4			5	4			33.8	4			82	4			6.6	2			142	2			76.9	2		
	2080	5.8	5			13	5			37.5	5			196	5			2.7	2			166	2			69.2	2		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Electrical - Electrical and Communications	Present		3		3		3		9		3		9		3		9		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	3	12	Y	4	3	12	Y	4	3	12	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		15		5		15		5		15		2		4		2		2		2		4
2 Mechanical - HVAC	Present		3		6		3		9		3		12		3		12		3		9		3		3		3		9
	2050	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	4	16	Y	2	3	6	Y	2	1	2	Y	2	3	6
	2080		5		10		5		15		5		20		5		20		2		6		2		2		2		6
3 Structural - Building Envelop	Present		3		6		3		6		3		9		3		6		3		9		3		3		3		6
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		10		5		10		5		15		5		10		2		6		2		2		2		4
4 Plumbing - Water, Wastewater	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		5		5		5		2		2		2		2		2		4
5 Civil - Site, Parking, Landscaped Areas, Stormwater	Present		3		6		3		6		3		9		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		10		5		10		5		15		5		10		2		4		2		2		2		4
11 Building Staff	Present		3		3		3		9		3		12		3		9		3		9		3		3		3		6
	2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	3	12	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		5		5		15		5		20		5		15		2		6		2		2		2		4
11 Operation and Maintenance	Present		3		6		3		9		3		12		3		9		3		6		3		3		3		6
	2050	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	3	12	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		10		5		15		5		20		5		15		2		4		2		2		2		4
11 Public/ Users	Present		3		6		3		9		3		12		3		9		3		6		3		3		3		6
	2050	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	3	12	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		10		5		15		5		20		5		15		2		4		2		2		2		4
11 Emergency Services	Present		3		3		3		9		3		12		3		6		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	2	8	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		15		5		20		5		10		2		4		2		2		2		4

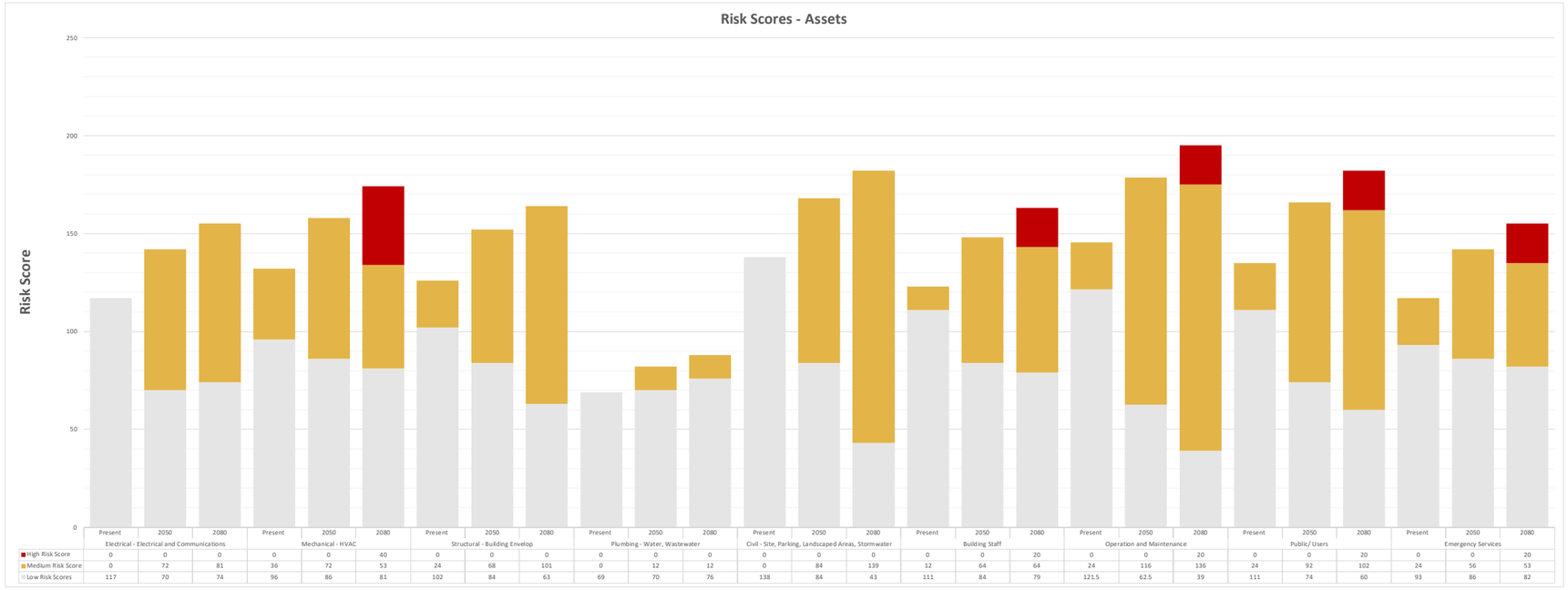
Climate Parameter — Precipitation

		Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months			
		Annual Percipitation				**Extreme Rainfall**				**Persistant Percipitation**				Short Duration Rainfall/ Overland Flooding				**Drought**				**Winter Percipitation**			
Climate Projections	Present	443	3			33	3			60	3			4.2	3			-	3			69	3		
	2050	463	4			34	3			62	3			4.3	4			+	4			74	4		
	2080	482	4			37	4			64	3			4.6	4			++	4			79	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Electrical - Electrical and Communications	Present		3		6		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8
2 Mechanical - HVAC	Present		3		6		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8
3 Structural - Building Envelop	Present		3		6		3		6		3		6		3		9		3		3		3		12
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	3	12	Y	4	1	4	Y	4	4	16
	2080		4		8		4		8		3		6		4		12		4		4		4		16
4 Plumbing - Water, Wastewater	Present		3		3		3		3		3		3		3		3		3		3		3		9
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	1	4	Y	4	3	12
	2080		4		4		4		4		3		3		4		4		4		4		4		12
5 Civil - Site, Parking, Landscaped Areas, Stormwater	Present		3		9		3		9		3		9		3		9		3		9		3		9
	2050	Y	4	3	12	Y	3	3	9	Y	3	3	9	Y	4	3	12	Y	4	3	12	Y	4	3	12
	2080		4		12		4		12		3		9		4		12		4		12		4		12
11 Building Staff	Present		3		6		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8
11 Operation and Maintenance	Present		3		6		3		7.5		3		9		3		9		3		9		3		9
	2050	Y	4	2	8	Y	3	2.5	7.5	Y	3	3	9	Y	4	3	12	Y	4	3	12	Y	4	3	12
	2080		4		8		4		10		3		9		4		12		4		12		4		12
11 Public/ Users	Present		3		6		3		6		3		6		3		9		3		6		3		9
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	3	12	Y	4	2	8	Y	4	3	12
	2080		4		8		4		8		3		6		4		12		4		8		4		12
11 Emergency Services	Present		3		6		3		6		3		6		3		9		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	3	12	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		12		4		4		4		8

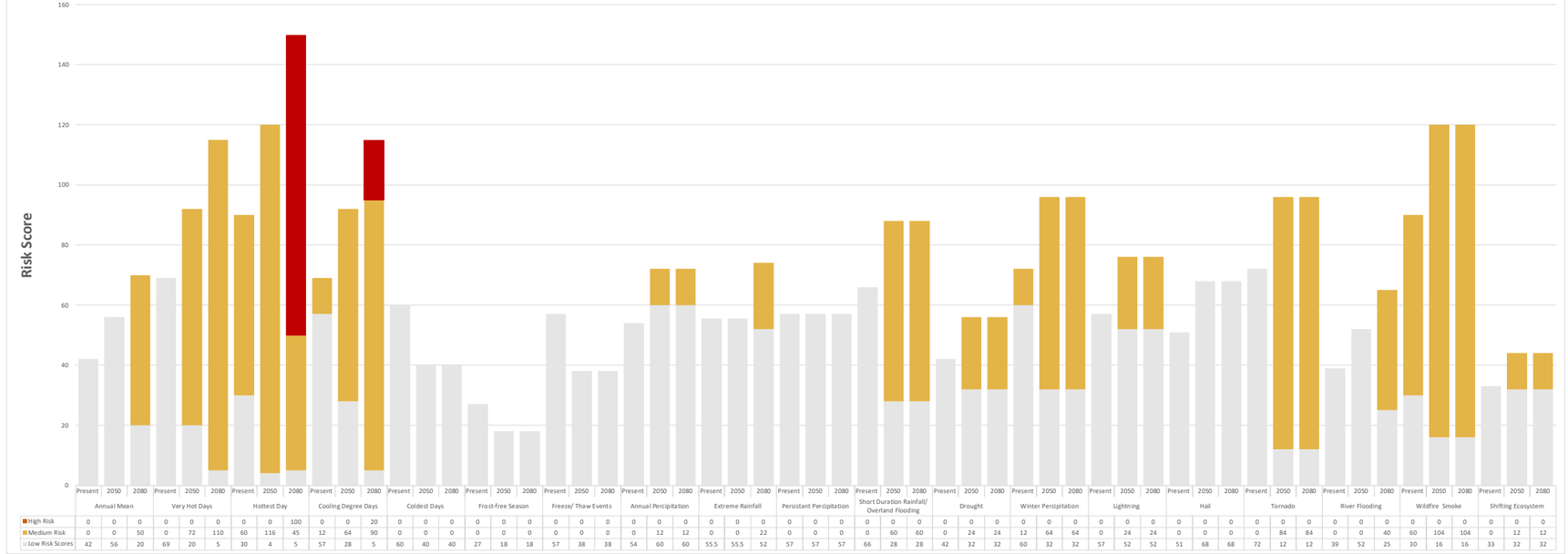
Climate Parameter — Extreme Events / Shifting Natural Ecoregions

		Lightning				Hail Storm				High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifting Natural Ecoregions			
		Lightning				**Hail**				**Tornado**				**River Flooding**				**Wildfire Smoke**				**Shifting Ecosystem**			
Climate Projections	Present	-	3			-	3			-	3			-	3			-	3			-	3		
	2050	+	4			+	4			+	4			+	4			+	4			+	4		
	2080	+	4			+	4			+	4			++	5			+	4			+	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Electrical - Electrical and Communications	Present		3		9		3		6		3		9		3		3		3		9		3		3
	2050	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	4	3	12	Y	4	1	4
	2080		4		12		4		8		4		12		5		5		4		12		4		4
2 Mechanical - HVAC	Present		3		6		3		6		3		9		3		3		3		12		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		12		5		5		4		16		4		4
3 Structural - Building Envelop	Present		3		6		3		6		3		9		3		3		3		12		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		12		5		5		4		16		4		4
4 Plumbing - Water, Wastewater	Present		3		3		3		3		3		3		3		3		3		6		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		4		4		4		4		4		4		5		5		4		8		4		4
5 Civil - Site, Parking, Landscaped Areas, Stormwater	Present		3		6		3		6		3		9		3		6		3		6		3		9
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	2	8	Y	4	3	12
	2080		4		8		4		8		4		12		5		10		4		8		4		12
11 Building Staff	Present		3		6		3		6		3		9		3		6		3		9		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	1	4
	2080		4		8		4		8		4		12		5		10		4		12		4		4
11 Operation and Maintenance	Present		3		9		3		6		3		9		3		6		3		12		3		3
	2050	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	4	16	Y	4	1	4
	2080		4		12		4		8		4		12		5		10		4		16		4		4
11 Public/ Users	Present		3		6		3		6		3		9		3		6		3		12		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		12		5		10		4		16		4		4
11 Emergency Services	Present		3		6		3		6		3		6		3		3		3		12		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		8		5		5		4		16		4		4

PIEVC Risk Scores
Buildings - GOA Building



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Electrical - Electrical and Communications			Mechanical - HVAC			Structural - Building Envelop			Plumbing - Water, Wastewater			Civil - Site, Parking, Landscaped Areas, Stormwater			Building Staff			Operation and Maintenance			Public/ Users			Emergency Services					
High Risk Score	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	20	0	0	20	0	0	20	0	0	20	0	0	20
Medium Risk Score	0	72	81	36	72	53	24	68	101	0	12	12	0	84	139	12	64	64	24	116	136	24	92	102	24	56	53			
Low Risk Scores	117	70	74	96	86	81	102	84	63	69	70	76	138	84	43	111	84	79	121.5	62.5	39	111	74	60	93	86	82			



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Annual Mean			Very Hot Days			Hottest Day			Cooling Degree Days			Coldest Days			Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation		
High Risk	0	0	0	0	0	0	0	0	100	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	50	0	72	110	60	116	45	12	64	90	0	0	0	0	0	0	0	0	0	0	12	12	0	0	22	0	0	0
Low Risk Scores	42	56	20	69	20	5	30	4	5	57	28	5	60	40	40	27	18	18	57	38	38	54	60	60	55.5	55.5	52	57	57	57

	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Short Duration Rainfall/ Overland Flooding			Drought			Winter Percipitation			Lightning			Hail			Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem					
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Medium Risk	0	60	60	0	24	24	12	64	64	0	24	24	0	0	0	0	84	84	0	0	40	60	104	104	0	12	12			
Low Risk Scores	66	28	28	42	32	32	60	32	32	57	52	52	51	68	68	72	12	12	39	52	25	30	16	16	33	32	32			

PIEVC Risk Matrix
Buildings - Multi-Rec Centre Facility

Consequence Score

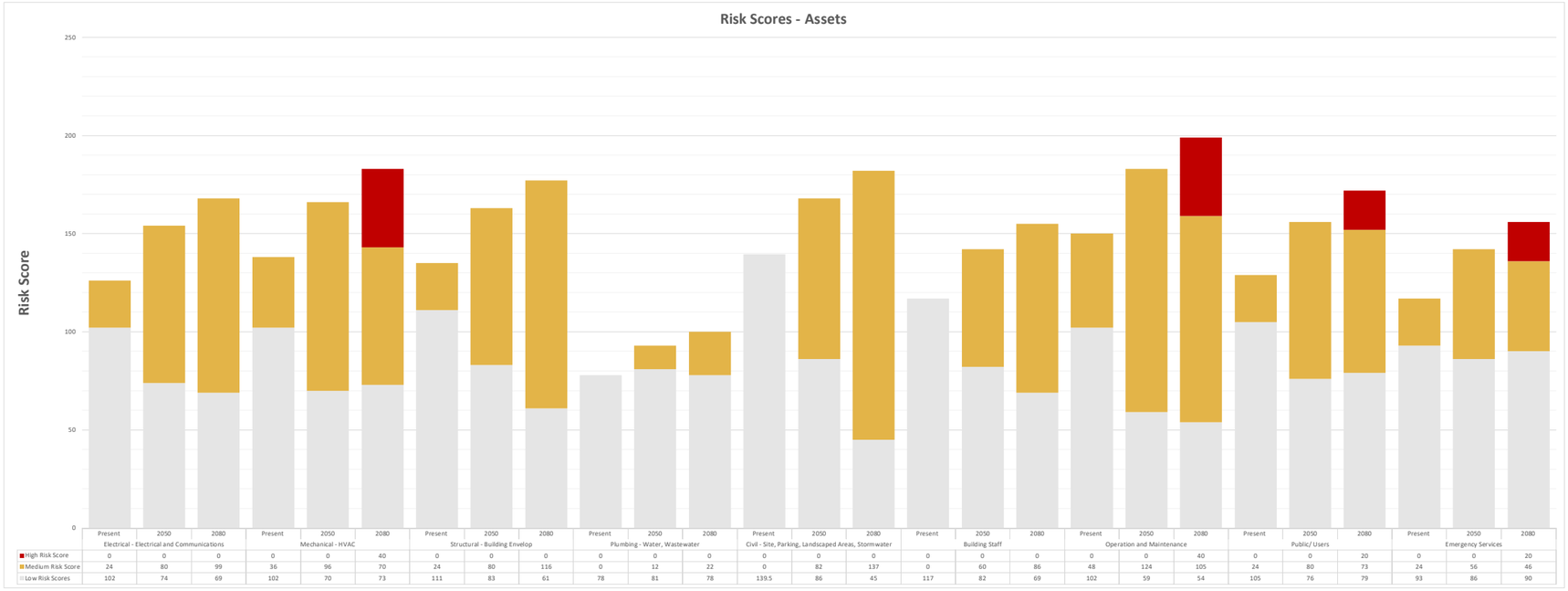
0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter		Temperature																											
		Mean Annual Temperature (◦C)				Days above +30°C				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events			
		Annual Mean				Very Hot Days				Hottest Day				Cooling Degree Days				Coldest Days				Frost-free Season				Freeze/ Thaw Events			
Climate Projections	Present	1.6	3			1	3			29.8	3			23	3			13.1	3			119	3			85.9	3		
	2050	3.7	4			5	4			33.8	4			82	4			6.6	2			142	2			76.9	2		
	2080	5.8	5			13	5			37.5	5			196	5			2.7	2			166	2			69.2	2		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
	Present		3		3		3		9		3		9		3		9		3		6		3		3		3		6
1 Electrical - Electrical and Communications	2050	Y	4	1	4	Y	4	3	12	Y	4	3	12	Y	4	3	12	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		15		5		15		5		15		2		4		2		2		2		4
	Present		3		9		3		9		3		12		3		12		3		9		3		3		3		9
2 Mechanical - HVAC	2050	Y	4	3	12	Y	4	3	12	Y	4	4	16	Y	4	4	16	Y	2	3	6	Y	2	1	2	Y	2	3	6
	2080		5		15		5		15		5		20		5		20		2		6		2		2		2		6
	Present		3		9		3		6		3		9		3		6		3		9		3		3		3		6
3 Structural - Building Envelop	2050	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		15		5		10		5		15		5		10		2		6		2		2		2		4
	Present		3		6		3		3		3		3		3		3		3		3		3		3		3		6
4 Plumbing - Water, Wastewater	2050	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		10		5		5		5		5		5		5		2		2		2		2		2		4
	Present		3		6		3		6		3		9		3		6		3		9		3		3		3		6
5 Civil - Site, Parking, Landscaped Areas, Stormwater	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		10		5		10		5		15		5		10		2		6		2		2		2		4
	Present		3		3		3		6		3		9		3		9		3		9		3		3		3		3
11 Building Staff	2050	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	3	12	Y	2	3	6	Y	2	1	2	Y	2	1	2
	2080		5		5		5		10		5		15		5		15		2		6		2		2		2		2
	Present		3		3		3		9		3		12		3		12		3		9		3		3		3		6
11 Operation and Maintenance	2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	4	16	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		5		5		15		5		20		5		20		2		6		2		2		2		4
	Present		3		9		3		9		3		12		3		9		3		9		3		3		3		6
11 Public/ Users	2050	Y	4	3	12	Y	4	3	12	Y	4	4	16	Y	4	3	12	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		15		5		15		5		20		5		15		2		6		2		2		2		4
	Present		3		3		3		9		3		12		3		9		3		6		3		3		3		6
11 Emergency Services	2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	3	12	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		15		5		20		5		15		2		4		2		2		2		4

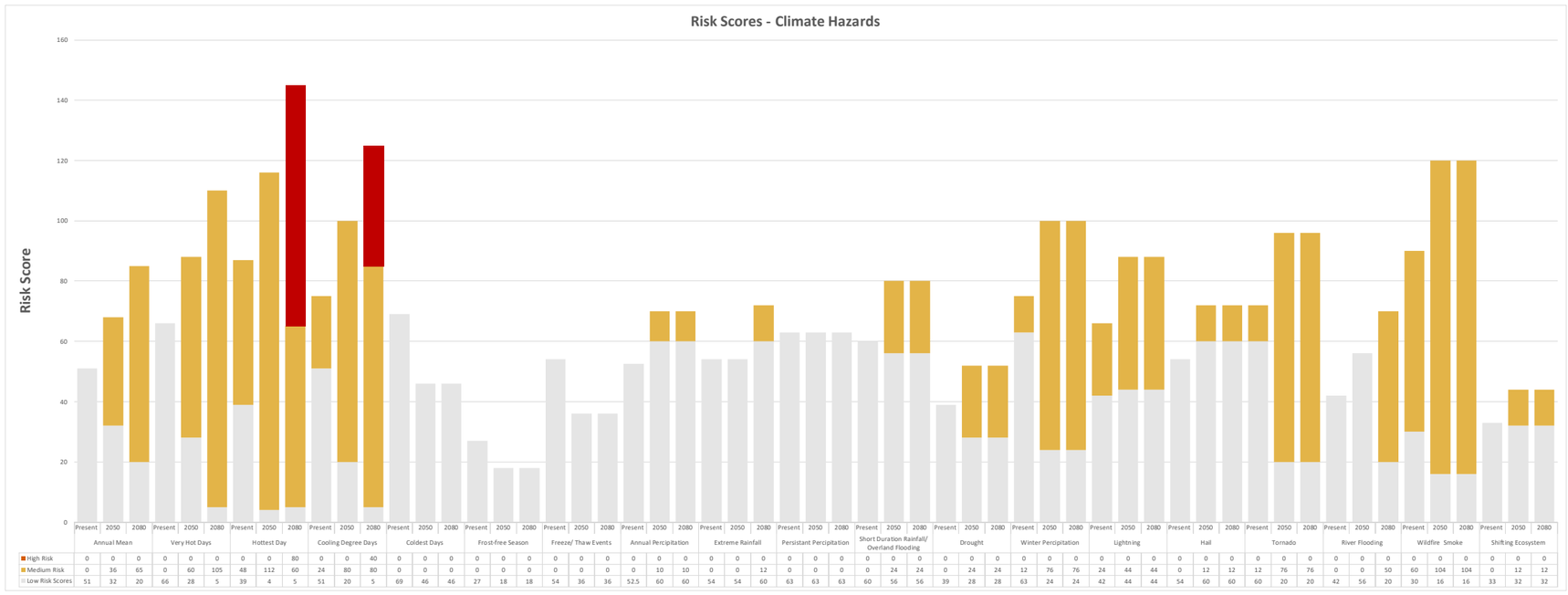
Climate Parameter		Precipitation																							
		Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months			
		Annual Percipitation				Extreme Rainfall				Persistant Percipitation				Short Duration Rainfall/ Overland Flooding				Drought				Winter Percipitation			
Climate Projections	Present	443	3			33	3			60	3			4.2	3			-	3			69	3		
	2050	463	4			34	3			62	3			4.3	4			+	4			74	4		
	2080	482	4			37	4			64	3			4.6	4			++	4			79	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
	Present		3		6		3		6		3		6		3		6		3		3		3		6
1 Electrical - Electrical and Communications	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8
	Present		3		6		3		6		3		6		3		6		3		3		3		6
2 Mechanical - HVAC	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8
	Present		3		6		3		6		3		9		3		6		3		3		3		12
3 Structural - Building Envelop	2050	Y	4	2	8	Y	3	2	6	Y	3	3	9	Y	4	2	8	Y	4	1	4	Y	4	4	16
	2080		4		8		4		8		3		9		4		8		4		4		4		16
	Present		3		3		3		3		3		6		3		6		3		3		3		9
4 Plumbing - Water, Wastewater	2050	Y	4	1	4	Y	3	1	3	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	3	12
	2080		4		4		4		4		3		6		4		8		4		4		4		12
	Present		3		7.5		3		9		3		9		3		9		3		9		3		9
5 Civil - Site, Parking, Landscaped Areas, Stormwater	2050	Y	4	2.5	10	Y	3	3	9	Y	3	3	9	Y	4	3	12	Y	4	3	12	Y	4	3	12
	2080		4		10		4		12		3		9		4		12		4		12		4		12
	Present		3		6		3		6		3		6		3		6		3		3		3		9
11 Building Staff	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	3	12
	2080		4		8		4		8		3		6		4		8		4		4		4		12
	Present		3		6		3		6		3		9		3		9		3		9		3		9
11 Operation and Maintenance	2050	Y	4	2	8	Y	3	2	6	Y	3	3	9	Y	4	3	12	Y	4	3	12	Y	4	3	12
	2080		4		8		4		8		3		9		4		12		4		12		4		12
	Present		3		6		3		6		3		6		3		6		3		3		3		9
11 Public/ Users	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	3	12
	2080		4		8		4		8		3		6		4		8		4		4		4		12
	Present		3		6		3		6		3		6		3		6		3		3		3		6
11 Emergency Services	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8

Climate Parameter		Extreme Events																				Shifiting Natural Ecoregions			
		Lightning				Hail Storm				High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifiting Natural Ecoregions			
		Lightning				Hail				Tornado				River Flooding				Wildfire Smoke				Shifting Ecosystem			
Climate Projections	Present	-	3			-	3			-	3			-	3			-	3			-	3		
	2050	+	4			+	4			+	4			+	4			+	4			+	4		
	2080	+	4			+	4			+	4			++	5			+	4			+	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
	Present		3		12		3		6		3		12		3		6		3		9		3		3
1 Electrical - Electrical and Communications	2050	Y	4	4	16	Y	4	2	8	Y	4	4	16	Y	4	2	8	Y	4	3	12	Y	4	1	4
	2080		4		16		4		8		4		16		5		10		4		12		4		4
	Present		3		9		3		6		3		9		3		3		3		12		3		3
2 Mechanical - HVAC	2050	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	4	4	16	Y	4	1	4
	2080		4		12		4		8		4		12		5		5		4		16		4		4
	Present		3		6		3		9		3		9		3		6		3		12		3		3
3 Structural - Building Envelop	2050	Y	4	2	8	Y	4	3	12	Y	4	3	12	Y	4	2	8	Y	4	4	16	Y	4	1	4
	2080		4		8		4		12		4		12		5		10		4		16		4		4
	Present		3		3		3		3		3		3		3		3		3		6		3		3
4 Plumbing - Water, Wastewater	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		4		4		4		4		4		4		5		5		4		8		4		4
	Present		3		6		3		6		3		9		3		6		3		6		3		9
5 Civil - Site, Parking, Landscaped Areas, Stormwater	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	2	8	Y	4	3	12
	2080		4		8		4		8		4		12		5		10		4		8		4		12
	Present		3		6		3		6		3		9		3		6		3		9		3		3
11 Building Staff	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	1	4
	2080		4		8		4		8		4		12		5		10		4		12		4		4
	Present		3		12		3		6		3		9		3		6		3		12		3		3
11 Operation and Maintenance	2050	Y	4	4	16	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	4	16	Y	4	1	4
	2080		4		16		4		8		4		12		5		10		4		16		4		4
	Present		3		6		3		6		3		6		3		3		3		12		3		3
11 Public/ Users	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		8		5		5		4		16		4		4
	Present		3		6		3		6		3		6		3		3		3		12		3		3
11 Emergency Services	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		8		5		5		4		16		4		4

PIEVC Risk Scores
Buildings - Multi-Rec Center Facility



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Electrical - Electrical and Communications			Mechanical - HVAC			Structural - Building Envelop			Plumbing - Water, Wastewater			Civil - Site, Parking, Landscaped Areas, Stormwater			Building Staff			Operation and Maintenance			Public/ Users			Emergency Services		
High Risk Score	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	20	0	0	20
Medium Risk Score	24	80	99	36	96	70	24	80	116	0	12	22	0	82	137	0	60	86	48	124	105	24	80	73	24	56	46
Low Risk Scores	102	74	69	102	70	73	111	83	61	78	81	78	139.5	86	45	117	82	69	102	59	54	105	76	79	93	86	90



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Annual Mean			Very Hot Days			Hottest Day			Cooling Degree Days			Coldest Days			Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation			Short Duration Rainfall/ Overland Flooding			Drought			Winter Percipitation			Lightning			Hail			Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem		
High Risk	0	0	0	0	0	0	0	0	80	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	36	65	0	60	105	48	112	60	24	80	80	0	0	0	0	0	0	0	0	0	0	10	10	0	0	12	0	0	0	0	24	24	0	24	24	12	76	76	24	44	44	0	12	12	12	76	76	0	0	50	60	104	104	0	12	12
Low Risk Scores	51	32	20	66	28	5	39	4	5	51	20	5	69	46	46	27	18	18	54	36	36	52.5	60	60	54	54	60	63	63	63	60	56	56	39	28	28	63	24	24	42	44	44	54	60	60	60	20	20	42	56	20	30	16	16	33	32	32

PIEVC Risk Matrix
Buildings - SLIP Storage Garage

Consequence Score

0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter

Temperature

Infrastructure Components		Mean Annual Temperature (◦C) – Annual Mean				Days above +30°C – Very Hot Days				Warmest Day Time Temperature – Hottest Day				Cooling Degree Days (Degree Days) – Cooling Degree Days				# of Days Below -30°C – Coldest Days				# Days Without Frost – Frost-free Season				# Freeze/ Thaw Events – Freeze/ Thaw Events			
Climate Projections	Present	1.6	3			1	3			29.8	3			23	3			13.1	3			119	3			85.9	3		
	2050	3.7	4			5	4			33.8	4			82	4			6.6	2			142	2			76.9	2		
	2080	5.8	5			13	5			37.5	5			196	5			2.7	2			166	2			69.2	2		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Electrical - Electrical and Communications	Present		3		3		3		3		3		3		3		6		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		5		5		10		2		4		2		2		2		4
Mechanical - HVAC	Present		3		6		3		3		3		3		3		6		3		6		3		3		3		9
	2050	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	2	2	4	Y	2	1	2	Y	2	3	6
	2080		5		10		5		5		5		5		5		10		2		4		2		2		2		6
Structural - Building Envelop	Present		3		6		3		3		3		6		3		3		3		6		3		3		3		6
	2050	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		10		5		5		5		10		5		5		2		4		2		2		2		4
Plumbing - Water, Wastewater	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		5		5		5		2		2		2		2		2		4
Civil - Site, Parking, Landscaped Areas, Stormwater	Present		3		3		3		3		3		3		3		3		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		5		5		5		2		4		2		2		2		4
Building Staff	Present		3		3		3		6		3		3		3		6		3		6		3		3		3		3
	2050	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	2	2	4	Y	2	1	2	Y	2	1	2
	2080		5		5		5		10		5		5		5		10		2		4		2		2		2		2
Operation and Maintenance	Present		3		3		3		6		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		10		5		10		5		10		2		4		2		2		2		4
Public/ Users	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		5		5		5		2		2		2		2		2		4
Emergency Services	Present		3		3		3		3		3		6		3		3		3		3		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		10		5		5		2		2		2		2		2		4

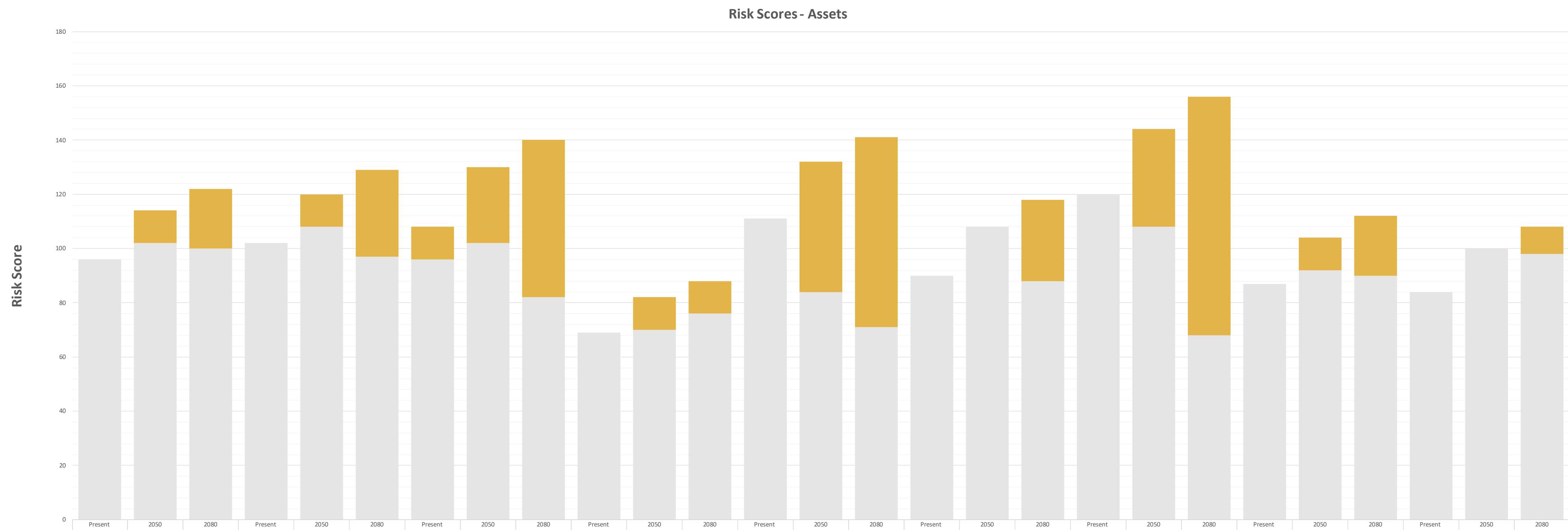
Precipitation

Infrastructure Components		Annual Total Percipitation (mm) – Annual Percipitation				Maximum 1-Day Total Percipitation (mm) – Extreme Rainfall				Maximum 5-day Consecutive Percipitation (mm) – Persistant Percipitation				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr) – Short Duration Rainfall/ Overland Flooding				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August) – Drought				Total Percipitation in the Winter Months – Winter Percipitation			
Climate Projections	Present	443	3			33	3			60	3			4.2	3			-	3			69	3		
	2050	463	4			34	3			62	3			4.3	4			+	4			74	4		
	2080	482	4			37	4			64	3			4.6	4			++	4			79	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Electrical - Electrical and Communications	Present		3		6		3		6		3		6		3		9		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	3	12	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		12		4		4		4		8
Mechanical - HVAC	Present		3		6		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8
Structural - Building Envelop	Present		3		6		3		6		3		6		3		6		3		3		3		12
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	4	16
	2080		4		8		4		8		3		6		4		8		4		4		4		16
Plumbing - Water, Wastewater	Present		3		6		3		3		3		3		3		3		3		3		3		9
	2050	Y	4	2	8	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	1	4	Y	4	3	12
	2080		4		8		4		4		3		3		4		4		4		4		4		12
Civil - Site, Parking, Landscaped Areas, Stormwater	Present		3		9		3		9		3		9		3		9		3		6		3		6
	2050	Y	4	3	12	Y	3	3	9	Y	3	3	9	Y	4	3	12	Y	4	2	8	Y	4	2	8
	2080		4		12		4		12		3		9		4		12		4		8		4		8
Building Staff	Present		3		6		3		6		3		6		3		3		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	1	4	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		4		4		4		4		8
Operation and Maintenance	Present		3		6		3		9		3		9		3		9		3		6		3		9
	2050	Y	4	2	8	Y	3	3	9	Y	3	3	9	Y	4	3	12	Y	4	2	8	Y	4	3	12
	2080		4		8		4		12		3		9		4		12		4		8		4		12
Public/ Users	Present		3		6		3		6		3		6		3		3		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	1	4	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		4		4		4		4		8
Emergency Services	Present		3		6		3		6		3		6		3		3		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	1	4	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		4		4		4		4		8

Extreme Events / Shifting Natural Ecoregions

Infrastructure Components		Lightning – Lightning				Hail Storm – Hail				High Wind/ Tornado – Tornado				Flooding – River Flooding				Climate Moisture Deficit – Wildfire Smoke				Shifting Natural Ecoregions – Shifting Ecosystem			
Climate Projections	Present	-	3			-	3			-	3			-	3			-	3			-	3		
	2050	+	4			+	4			+	4			+	4			+	4			+	4		
	2080	+	4			+	4			+	4			++	5			+	4			+	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Electrical - Electrical and Communications	Present		3		6		3		6		3		6		3		3		3		6		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		4		8		4		8		4		8		5		5		4		8		4		4
Mechanical - HVAC	Present		3		9		3		6		3		6		3		3		3		6		3		3
	2050	Y	4	3	12	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		4		12		4		8		4		8		5		5		4		8		4		4
Structural - Building Envelop	Present		3		6		3		6		3		9		3		6		3		6		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	2	8	Y	4	1	4
	2080		4		8		4		8		4		12		5		10		4		8		4		4
Plumbing - Water, Wastewater	Present		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		4		4		5		5		4		4		4		4
Civil - Site, Parking, Landscaped Areas, Stormwater	Present		3		3		3		6		3		9		3		6		3		3		3		9
	2050	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	1	4	Y	4	3	12
	2080		4		4		4		8		4		12		5		10		4		4		4		12
Building Staff	Present		3		6		3		6		3		6		3		6		3		3		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	1	4
	2080		4		8		4		8		4		8		5		10		4		4		4		4
Operation and Maintenance	Present		3		6		3		6		3		9		3		6		3		6		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	2	8	Y	4	1	4
	2080		4		8		4		8		4		12		5		10		4		8		4		4
Public/ Users	Present		3		6		3		6		3		9		3		6		3		3		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	1	4	Y	4	1	4
	2080		4		8		4		8		4		12		5		10		4		4		4		4
Emergency Services	Present		3		6		3		6		3		6		3		3		3		3		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		8		4		8		4		8		5		5		4		4		4		4

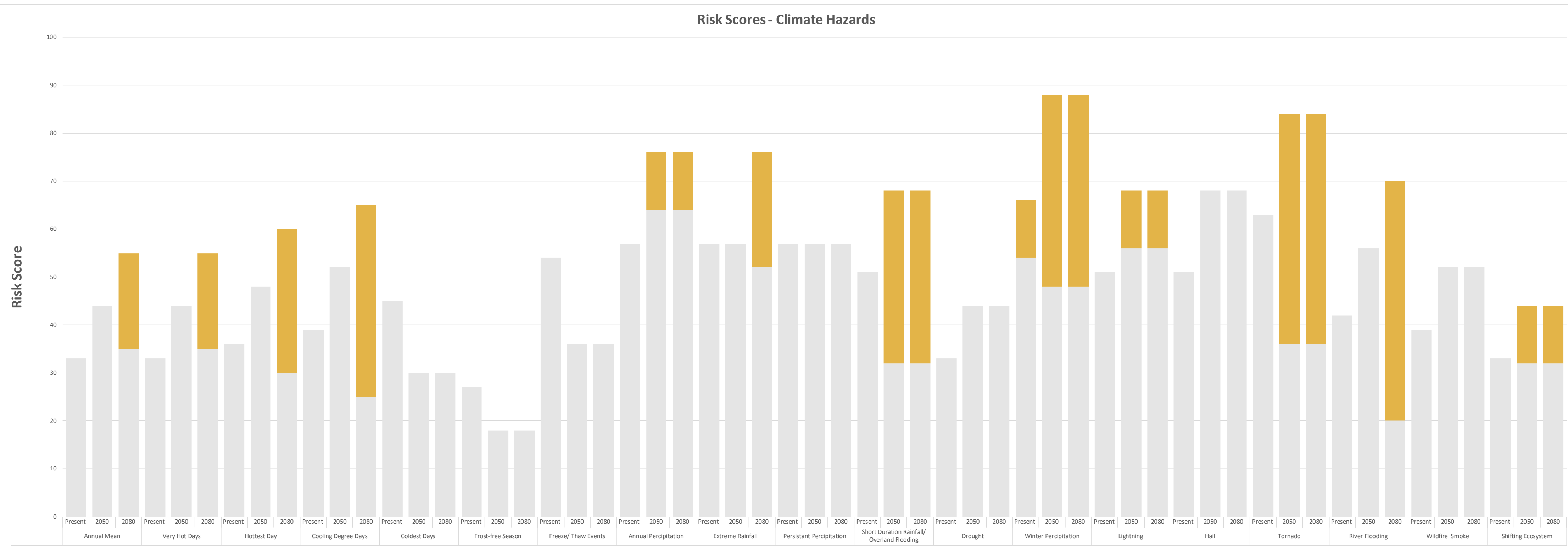
PIEVC Risk Scores
Buildings - SLIP Storage Garage



	Electrical - Electrical and Communications			Mechanical - HVAC			Structural - Building Envelop		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk Score	0	0	0	0	0	0	0	0	0
🟨 Medium Risk Score	0	12	22	0	12	32	12	28	58
⬜ Low Risk Scores	96	102	100	102	108	97	96	102	82

	Plumbing - Water, Wastewater			Civil - Site, Parking, Landscaped Areas, Stormwater			Building Staff		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk Score	0	0	0	0	0	0	0	0	0
🟨 Medium Risk Score	0	12	12	0	48	70	0	0	30
⬜ Low Risk Scores	69	70	76	111	84	71	90	108	88

	Operation and Maintenance			Public/ Users			Emergency Services		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk Score	0	0	0	0	0	0	0	0	0
🟨 Medium Risk Score	0	36	88	0	12	22	0	0	10
⬜ Low Risk Scores	120	108	68	87	92	90	84	100	98



	Annual Mean			Very Hot Days			Hottest Day			Cooling Degree Days		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk	0	0	20	0	0	20	0	0	30	0	0	40
⬜ Low Risk Scores	33	44	35	33	44	35	36	48	30	39	52	25

	Coldest Days			Frost-free Season			Freeze/ Thaw Events			Annual Percipitation		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk	0	0	0	0	0	0	0	0	0	0	12	12
⬜ Low Risk Scores	45	30	30	27	18	18	54	36	36	57	64	64

	Extreme Rainfall			Persistant Percipitation			Short Duration Rainfall/ Overland Flooding			Drought		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk	0	0	24	0	0	0	0	36	36	0	0	0
⬜ Low Risk Scores	57	57	52	57	57	57	51	32	32	33	44	44

	Winter Percipitation			Lightning			Hail			Tornado		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk	12	40	40	0	12	12	0	0	0	0	48	48
⬜ Low Risk Scores	54	48	48	51	56	56	51	68	68	63	36	36

	River Flooding			Wildfire Smoke			Shifting Ecosystem		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk	0	0	0	0	0	0	0	0	0
🟨 Medium Risk	0	0	50	0	0	0	0	12	12
⬜ Low Risk Scores	42	56	20	39	52	52	33	32	32

PIEVC Risk Matrix
Buildings - Wild Life Legacy Center

Consequence Score

0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter

Temperature

Infrastructure Components	Period	Mean Annual Temperature (°C)				Days above +30°C				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events			
		Annual Mean				**Very Hot Days**				**Hotest Day**				**Cooling Degree Days**				**Coldest Days**				**Frost-free Season**				**Freeze/ Thaw Events**			
Climate Projections	Present	1.6	3			1	3			29.8	3			23	3			13.1	3			119	3			85.9	3		
	2050	3.7	4			5	4			33.8	4			82	4			6.6	2			142	2			76.9	2		
	2080	5.8	5			13	5			37.5	5			196	5			2.7	2			166	2			69.2	2		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Electrical - Electrical and Communications	Present		3		3		3		7.5		3		9		3		9		3		9		3		3		3		6
	2050	Y	4	1	4	Y	4	2.5	10	Y	4	3	12	Y	4	3	12	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		5		5		12.5		5		15		5		15		2		6		2		2		2		4
2 Mechanical - HVAC (Lobby Only)	Present		3		6		3		9		3		12		3		12		3		9		3		3		3		9
	2050	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	4	16	Y	2	3	6	Y	2	1	2	Y	2	3	6
	2080		5		10		5		15		5		20		5		20		2		6		2		2		2		6
3 Structural - Building Envelop	Present		3		3		3		9		3		6		3		6		3		9		3		3		3		6
	2050	Y	4	1	4	Y	4	3	12	Y	4	2	8	Y	4	2	8	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		5		5		15		5		10		5		10		2		6		2		2		2		4
4 Plumbing - Water, Wastewater	Present		3		3		3		6		3		3		3		3		3		3		3		3		3		6
	2050	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		5		5		10		5		5		5		5		2		2		2		2		2		4
5 Civil - Site, Parking, Landscaped Areas, Stormwater	Present		3		6		3		6		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		10		5		10		5		10		5		10		2		4		2		2		2		4
11 Building Staff	Present		3		6		3		9		3		12		3		9		3		6		3		3		3		9
	2050	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	3	12	Y	2	2	4	Y	2	1	2	Y	2	3	6
	2080		5		10		5		15		5		20		5		15		2		4		2		2		2		6
11 Operation and Maintenance	Present		3		6		3		9		3		12		3		12		3		9		3		3		3		9
	2050	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	4	16	Y	2	3	6	Y	2	1	2	Y	2	3	6
	2080		5		10		5		15		5		20		5		20		2		6		2		2		2		6
11 Public/ Users	Present		3		6		3		9		3		12		3		12		3		9		3		3		3		6
	2050	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	4	16	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		10		5		15		5		20		5		20		2		6		2		2		2		4
11 Emergency Services	Present		3		3		3		9		3		12		3		9		3		9		3		3		3		6
	2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	3	12	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		5		5		15		5		20		5		15		2		6		2		2		2		4

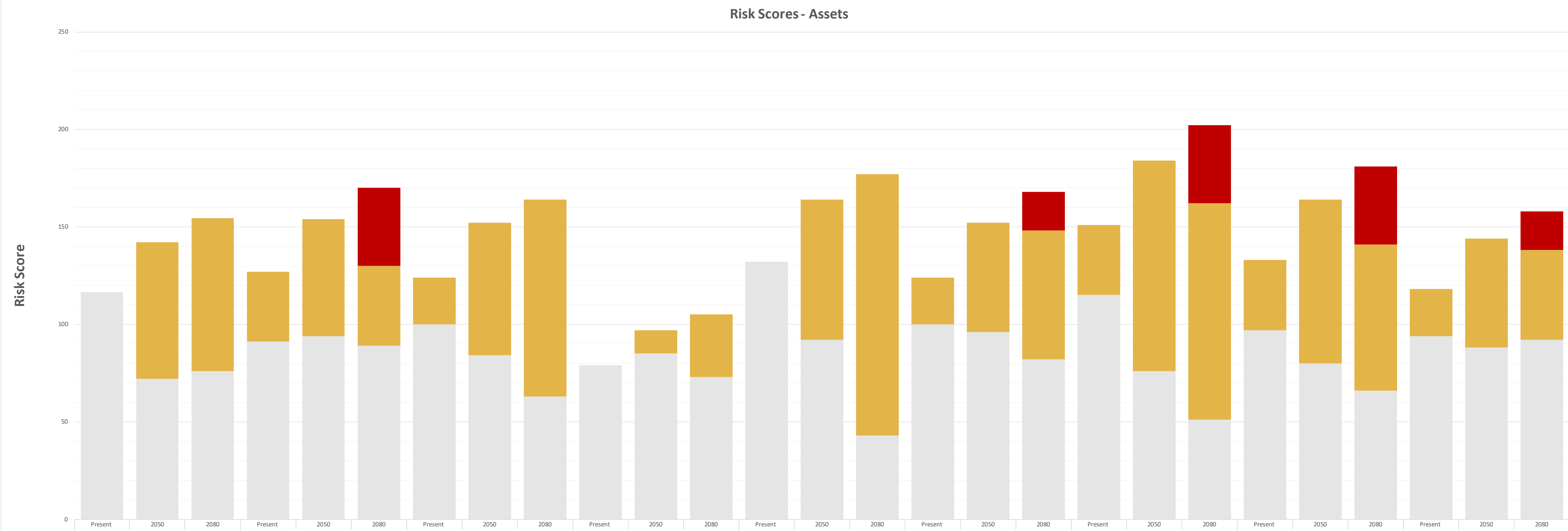
Precipitation

Infrastructure Components	Period	Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months			
		Annual Percipitation				**Extreme Rainfall**				**Persistant Percipitation**				**Short Duration Rainfall/ Overland Flooding**				**Drought**				**Winter Percipitation**			
Climate Projections	Present	443	2			33	3			60	3			4.2	3			-	3			69	3		
	2050	463	4			34	3			62	3			4.3	4			+	4			74	4		
	2080	482	4			37	4			64	3			4.6	4			++	4			79	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Electrical - Electrical and Communications	Present		2		4		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8
2 Mechanical - HVAC (Lobby Only)	Present		2		4		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8
3 Structural - Building Envelop	Present		2		4		3		6		3		6		3		9		3		3		3		12
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	3	12	Y	4	1	4	Y	4	4	16
	2080		4		8		4		8		3		6		4		12		4		4		4		16
4 Plumbing - Water, Wastewater	Present		2		4		3		3		3		6		3		3		3		3		3		9
	2050	Y	4	2	8	Y	3	1	3	Y	3	2	6	Y	4	1	4	Y	4	1	4	Y	4	3	12
	2080		4		8		4		4		3		6		4		4		4		4		4		12
5 Civil - Site, Parking, Landscaped Areas, Stormwater	Present		2		6		3		9		3		9		3		9		3		9		3		9
	2050	Y	4	3	12	Y	3	3	9	Y	3	3	9	Y	4	3	12	Y	4	3	12	Y	4	3	12
	2080		4		12		4		12		3		9		4		12		4		12		4		12
11 Building Staff	Present		2		4		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8
11 Operation and Maintenance	Present		2		4		3		9		3		9		3		9		3		9		3		9
	2050	Y	4	2	8	Y	3	3	9	Y	3	3	9	Y	4	3	12	Y	4	3	12	Y	4	3	12
	2080		4		8		4		12		3		9		4		12		4		12		4		12
11 Public/ Users	Present		2		4		3		6		3		6		3		6		3		3		3		9
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	3	12
	2080		4		8		4		8		3		6		4		8		4		4		4		12
11 Emergency Services	Present		2		4		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	1	4	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		4		4		8

Extreme Events / Shifting Natural Ecoregions

Infrastructure Components	Period	Lightning				Hail Storm				High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifting Natural Ecoregions			
		Lightning				**Hail**				**Tornado**				**River Flooding**				**Wildfire Smoke**				**Shifting Ecosystem**			
Climate Projections	Present	-	3			-	3			-	3			-	3			-	3			-	3		
	2050	+	4			+	4			+	4			+	4			+	4			+	4		
	2080	+	4			+	4			+	4			++	5			+	4			+	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Electrical - Electrical and Communications	Present		3		9		3		6		3		9		3		3		3		9		3		3
	2050	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	4	3	12	Y	4	1	4
	2080		4		12		4		8		4		12		5		5		4		12		4		4
2 Mechanical - HVAC (Lobby Only)	Present		3		6		3		6		3		6		3		3		3		12		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		8		5		5		4		16		4		4
3 Structural - Building Envelop	Present		3		6		3		6		3		9		3		6		3		12		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		12		5		10		4		16		4		4
4 Plumbing - Water, Wastewater	Present		3		3		3		3		3		3		3		6		3		6		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	2	8	Y	4	1	4
	2080		4		4		4		4		4		4		5		10		4		8		4		4
5 Civil - Site, Parking, Landscaped Areas, Stormwater	Present		3		6		3		6		3		9		3		6		3		6		3		9
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	2	8	Y	4	3	12
	2080		4		8		4		8		4		12		5		10		4		8		4		12
11 Building Staff	Present		3		6		3		6		3		6		3		6		3		12		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		8		5		10		4		16		4		4
11 Operation and Maintenance	Present		3		9		3		6		3		6		3		6		3		12		3		3
	2050	Y	4	3	12	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	4	16	Y	4	1	4
	2080		4		12		4		8		4		8		5		10		4		16		4		4
11 Public/ Users	Present		3		6		3		6		3		9		3		6		3		12		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		12		5		10		4		16		4		4
11 Emergency Services	Present		3		6		3		6		3		6		3		3		3		12		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
	2080		4		8		4		8		4		8		5		5		4		16		4		4

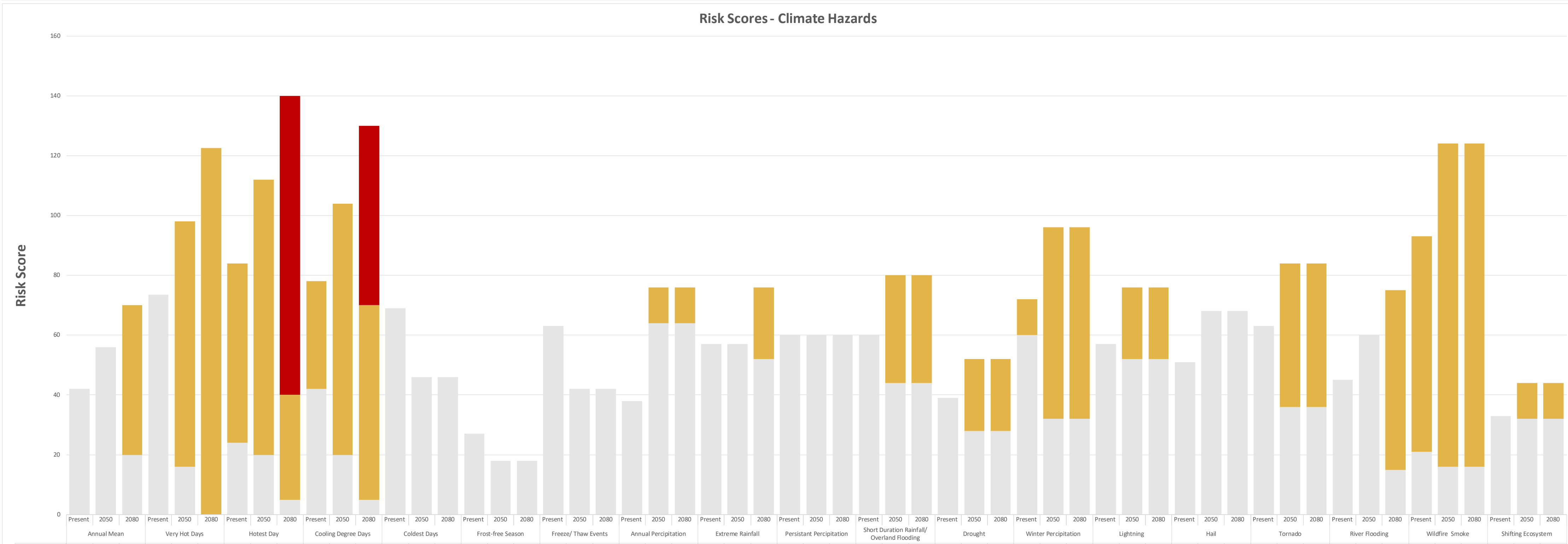
PIEVC Risk Scores
Buildings - Wildlife Legacy Center



	Electrical - Electrical and Communications			Mechanical - HVAC (Lobby Only)			Structural - Building Envelop		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	0	0	0	40	0	0	0
Medium Risk Score	0	70	78.5	36	60	41	24	68	101
Low Risk Scores	116.5	72	76	91	94	89	100	84	63

	Plumbing - Water, Wastewater			Civil - Site, Parking, Landscaped Areas, Stormwater			Building Staff		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	0	0	0	0	0	0	20
Medium Risk Score	0	12	32	0	72	134	24	56	66
Low Risk Scores	79	85	73	132	92	43	100	96	82

	Operation and Maintenance			Public/ Users			Emergency Services		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	40	0	0	40	0	0	20
Medium Risk Score	36	108	111	36	84	75	24	56	46
Low Risk Scores	115	76	51	97	80	66	94	88	92



	Annual Mean			Very Hot Days			Hotest Day			Cooling Degree Days			Coldest Days		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	100	0	0	60	0	0	0
Medium Risk	0	0	50	0	82	122.5	60	92	35	36	84	65	0	0	0
Low Risk Scores	42	56	20	73.5	16	0	24	20	5	42	20	5	69	46	46

	Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	0	0	0	12	12	0	0	24	0	0	0
Low Risk Scores	27	18	18	63	42	42	38	64	64	57	57	52	60	60	60

	Short Duration Rainfall/ Overland Flooding			Drought			Winter Percipitation			Lightning			Hail		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	36	36	0	24	24	12	64	64	0	24	24	0	0	0
Low Risk Scores	60	44	44	39	28	28	60	32	32	57	52	52	51	68	68

	Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	48	48	0	0	60	72	108	108	0	12	12
Low Risk Scores	63	36	36	45	60	15	21	16	16	33	32	32

PIEVC Risk Matrix
Fleet

Consequence Score

0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter

Temperature

Mean Annual Temperature (-C)	Days above +30ºC	Warmest Day Time Temperature	Cooling Degree Days (Degree Days)	# of Days Below -30°C	# Days Without Frost	# Freeze/ Thaw Events
Annual Mean	**Very Hot Days**	**Hottest Day**	**Cooling Degree Days**	**Coldest Days**	**Frost-free Season**	**Freeze/ Thaw Events**

Precipitation

Annual Total Percipitation (mm)	Maximum 1-Day Total Percipitation (mm)	Maximum 5-day Consecutive Percipitation (mm)	Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)	Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)	Total Percipitation in the Winter Months
Annual Percipitation	**Extreme Rainfall**	**Persistant Percipitation**	Short Duration Rainfall/ Overland Flooding	**Drought**	**Snow Accumulation**

Extreme Events

Lightning	Hail Storm	High Wind/ Tornado	Flooding	Climate Moisture Deficit
Lightning	**Hail**	**Tornado**	**River Flooding**	**Wildfire Smoke**

Shifting Natural Ecoregions

Shifting Natural Ecoregions
Shifting Ecosystem

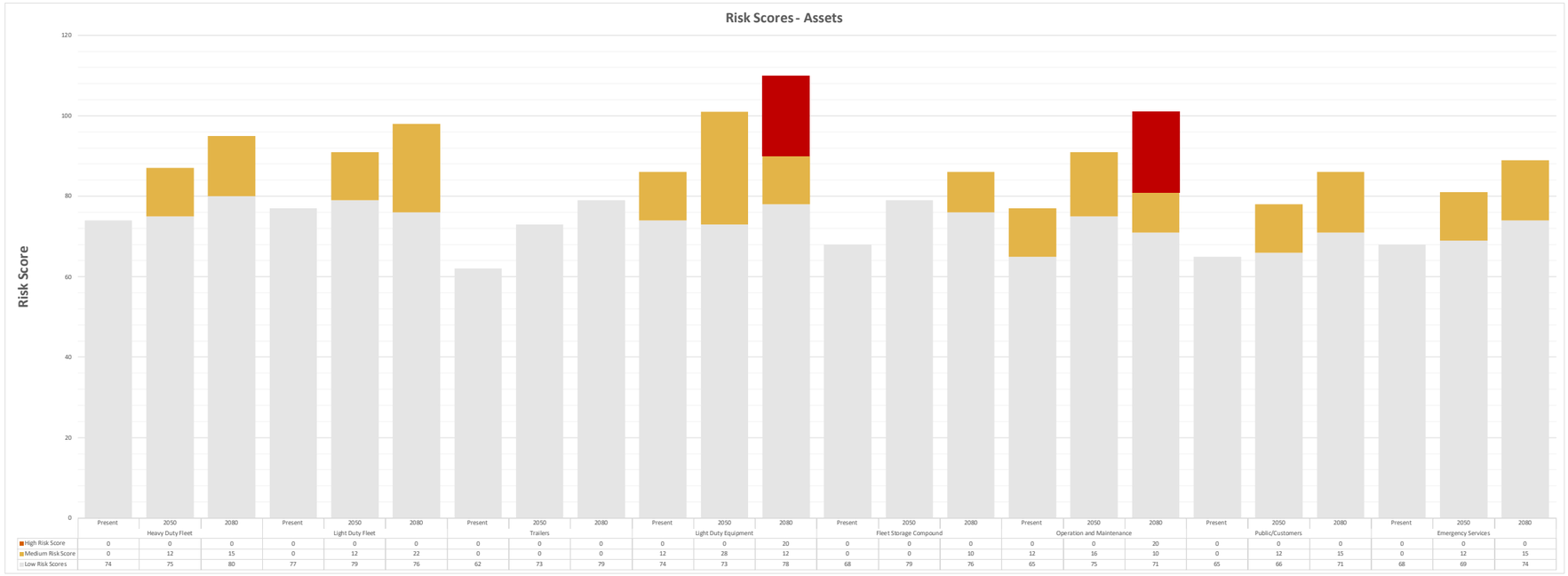
Climate Projections		Mean Annual Temperature (-C)				Days above +30ºC				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events			
		Annual Mean				Very Hot Days				Hottest Day				Cooling Degree Days				Coldest Days				Frost-free Season				Freeze/ Thaw Events			
	Present	1.6	3			1	3			29.8	3			23	3			13.1	3			119	3			85.9	3		
	2050	3.7	4			5	4			33.8	4			82	4			6.6	2			142	2			76.9	2		
	2080	5.8	5			13	5			37.5	5			196	5			2.7	2			166	2			69.2	2		

Climate Projections		Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months			
		Annual Percipitation				Extreme Rainfall				Persistant Percipitation				Short Duration Rainfall/ Overland Flooding				Drought				Snow Accumulation			
	Present	443	2			33	3			60	3			4.2	3			-	3			69	3		
	2050	463	4			34	3			62	3			4.3	4			+	4			74	4		
	2080	482	4			37	4			64	3			4.6	4			++	4			79	4		

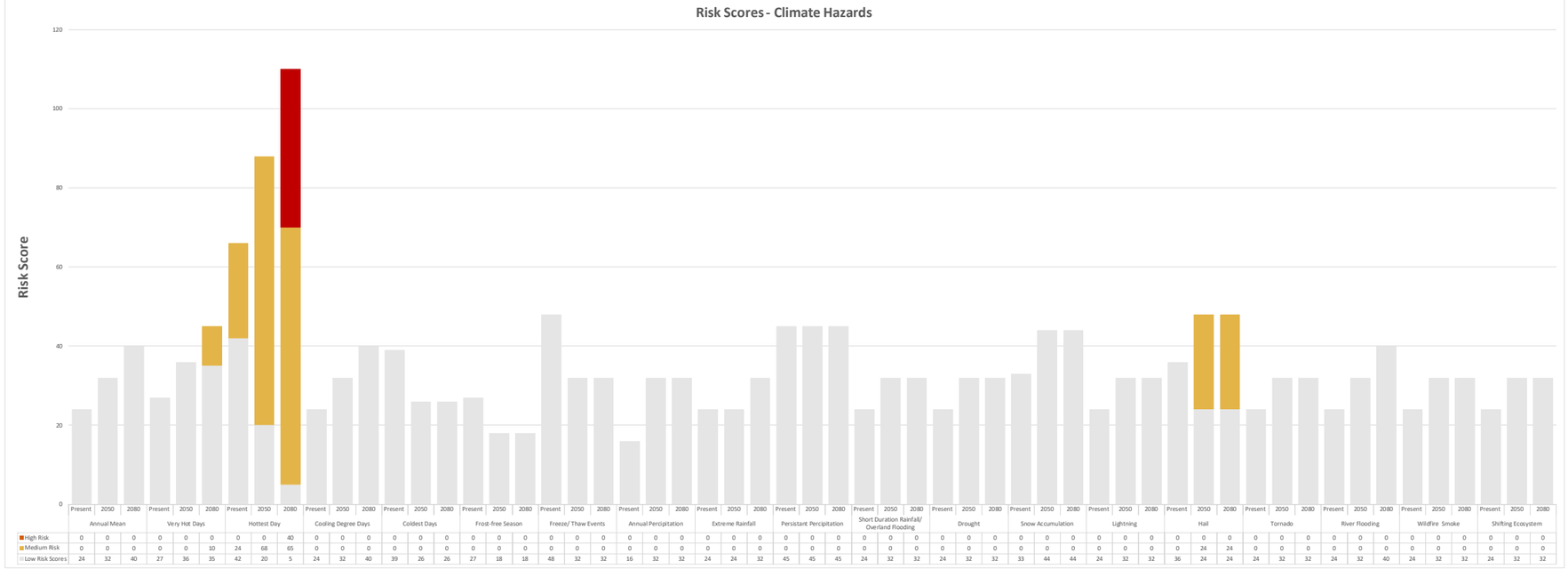
Climate Projections		Lightning				Hail Storm				High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifting Natural Ecoregions			
		Lightning				Hail				Tornado				River Flooding				Wildfire Smoke				Shifting Ecosystem			
	Present	-	3			-	3			-	3			-	3			-	3			-	3		
	2050	+	4			+	4			+	4			+	4			+	4			+	4		
	2080	+	4			+	4			+	4			++	5			+	4			+	4		

Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Heavy Duty Fleet	Present		3		3		3		3		3		9		3		3		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		15		5		5		2		4		2		2		2		4
Light Duty Fleet	Present		3		3		3		3		3		6		3		3		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		10		5		5		2		4		2		2		2		4
Trailers	Present		3		3		3		3		3		3		3		3		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		5		5		5		2		4		2		2		2		4
Light Duty Equipment	Present		3		3		3		3		3		12		3		3		3		6		3		6		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	4	16	Y	4	1	4	Y	2	2	4	Y	2	2	4	Y	2	2	4
	2080		5		5		5		5		5		20		5		5		2		4		2		4		2		4
Fleet Storage Compound	Present		3		3		3		3		3		6		3		3		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		10		5		5		2		4		2		2		2		4
Operation and Maintenance	Present		3		3		3		6		3		12		3		3		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	2	8	Y	4	4	16	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		5		5		10		5		20		5		5		2		4		2		2		2		4
Public/Customers	Present		3		3		3		3		3		9		3		3		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		15		5		5		2		4		2		2		2		4
Emergency Services	Present		3		3		3		3		3		9		3		3		3		6		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		5		5		5		5		15		5		5		2		4		2		2		2		4

PIEVC Risk Scores
Fleet



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Heavy Duty Fleet			Light Duty Fleet			Trailers			Light Duty Equipment			Fleet Storage Compound			Operation and Maintenance			Public/Customers			Emergency Services		
High Risk Score	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	20	0	0	0	0	0	0
Medium Risk Score	0	12	15	0	12	22	0	0	0	12	28	12	0	0	10	12	16	10	0	12	15	0	12	15
Low Risk Scores	74	75	80	77	79	76	62	73	79	74	73	78	68	79	76	65	75	71	65	66	71	68	69	74



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Annual Mean			Very Hot Days			Hottest Day			Cooling Degree Days			Coldest Days			Frost-free Season			Freeze/ Thaw Events			Annual Percipitation		
High Risk	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	0	10	24	68	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low Risk Scores	24	32	40	27	36	35	42	20	5	24	32	40	39	26	26	27	18	18	48	32	32	16	32	32

	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Extreme Rainfall			Persistant Percipitation			Short Duration Rainfall/ Overland Flooding			Drought			Snow Accumulation			Lightning			Hail			Tornado		
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	24	0	0	0
Low Risk Scores	24	24	32	45	45	45	24	32	32	24	32	32	33	44	44	24	32	32	36	24	24	24	32	32

	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	River Flooding			Wildfire Smoke			Shifting Ecosystem								
High Risk	0	0	0	0	0	0	0	0	0						
Medium Risk	0	0	0	0	0	0	0	0	0						
Low Risk Scores	24	32	40	24	32	32	24	32	32						

PIEVC Risk Matrix
Parks and Playgrounds

Consequence Score

0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter

Temperature

	Mean Annual Temperature (°C)	Days above +30°C	Warmest Day Time Temperature	Cooling Degree Days (Degree Days)	# of Days Below -30°C	# Days Without Frost	# Freeze/ Thaw Events
	Annual Mean	**Very Hot Days**	**Hottest Day**	**Cooling Degree Days**	**Coldest Days**	**Frost-free Season**	**Freeze/ Thaw Events**
Present	1.6	1	29.8	23	13.1	119	85.9
2050	3.7	5	33.8	82	6.6	142	76.9
2080	5.8	13	37.5	196	2.7	166	69.2

Precipitation

	Annual Total Percipitation (mm)	Maximum 1-Day Total Percipitation (mm)	Maximum 5-day Consecutive Percipitation (mm)	Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)	Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)	Total Percipitation in the Winter Months
	Annual Percipitation	**Extreme Rainfall**	**Persistant Percipitation**	**Short Duration Rainfall/ Overland Flooding**	**Drought**	**Winter Percipitation**
Present	443	33	60	4.2	-	69
2050	463	34	62	4.3	+	74
2080	482	37	64	4.6	++	79

Extreme Events

	Lightning	Hail Storm	High Wind/ Tornado	Flooding	Climate Moisture Deficit
	Lightning	**Hail**	**Tornado**	**River Flooding**	**Wildfire Smoke**
Present	-	-	-	-	-
2050	+	+	+	+	+
2080	+	+	+	++	+

Shifting Natural Ecoregions

Shifting Natural Ecoregions
Shifting Ecosystem
-
+
+

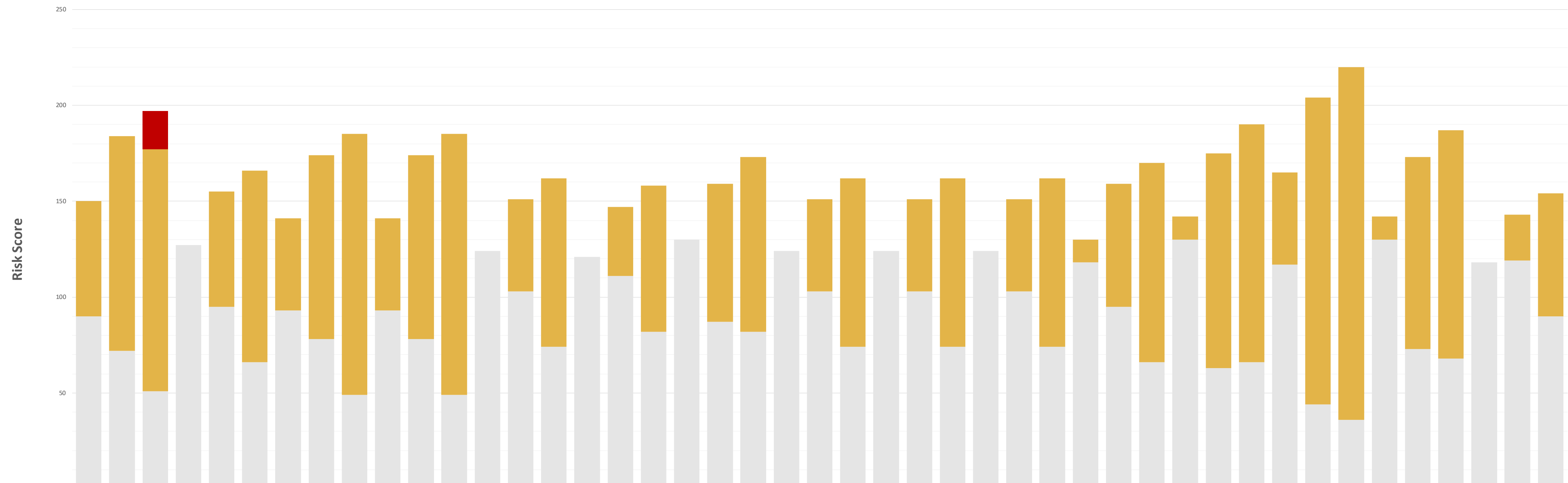
Infrastructure Components

	Present					2050					2080				
	Y/N	L	C	R		Y/N	L	C	R		Y/N	L	C	R	
Community Trails		3		6		Y	4	2	8			5		10	
Barton Park		3		6		Y	4	2	8			5		10	
Charity Ball Diamond		3		6		Y	4	2	8			5		10	
Sinclair Ball Diamonds		3		6		Y	4	2	8			5		10	
Conner Lukan Memorial Fitness Park		3		6		Y	4	2	8			5		10	
Fournier Place Park		3		6		Y	4	2	8			5		10	
Hilda Eben Park		3		9		Y	4	3	12			5		15	
Kinnettes Park		3		6		Y	4	2	8			5		10	
Kinsmen Pine Park		3		6		Y	4	2	8			5		10	
Maple Cresent Park		3		6		Y	4	2	8			5		10	
Popular Grove Park		3		6		Y	4	2	8			5		10	
Schuter Park		3		9		Y	4	3	12			5		15	
Operation and Maintenance		3		9		Y	4	3	12			5		15	
Public/ Users		3		9		Y	4	3	12			5		15	
Emergency Services		3		6		Y	4	2	8			5		10	

	Present					2050					2080				
	Y/N	L	C	R		Y/N	L	C	R		Y/N	L	C	R	
Community Trails		3		9		Y	4	3	12			5		20	
Barton Park		3		6		Y	4	2	8			5		10	
Charity Ball Diamond		3		6		Y	4	2	8			5		10	
Sinclair Ball Diamonds		3		6		Y	4	2	8			5		10	
Conner Lukan Memorial Fitness Park		3		6		Y	4	2	8			5		10	
Fournier Place Park		3		6		Y	4	2	8			5		10	
Hilda Eben Park		3		9		Y	4	3	12			5		15	
Kinnettes Park		3		6		Y	4	2	8			5		10	
Kinsmen Pine Park		3		6		Y	4	2	8			5		10	
Maple Cresent Park		3		6		Y	4	2	8			5		10	
Popular Grove Park		3		6		Y	4	2	8			5		10	
Schuter Park		3		9		Y	4	3	12			5		15	
Operation and Maintenance		3		9		Y	4	3	12			5		15	
Public/ Users		3		9		Y	4	3	12			5		15	
Emergency Services		3		6		Y	4	2	8			5		10	

	Present					2050					2080				
	Y/N	L	C	R		Y/N	L	C	R		Y/N	L	C	R	
Community Trails		3		6		Y	4	2	8			5		10	
Barton Park		3		6		Y	4	2	8			5		10	
Charity Ball Diamond		3		6		Y	4	2	8			5		10	
Sinclair Ball Diamonds		3		6		Y	4	2	8			5		10	
Conner Lukan Memorial Fitness Park		3		6		Y	4	2	8			5		10	
Fournier Place Park		3		6		Y	4	2	8			5		10	
Hilda Eben Park		3		6		Y	4	2	8			5		10	
Kinnettes Park		3		6		Y	4	2	8			5		10	
Kinsmen Pine Park		3		6		Y	4	2	8			5		10	
Maple Cresent Park		3		6		Y	4	2	8			5		10	
Popular Grove Park		3		6		Y	4	2	8			5		10	
Schuter Park		3		9		Y	4	3	12			5		15	
Operation and Maintenance		3		9		Y	4	3	12			5		15	
Public/ Users		3		9		Y	4	3	12			5		15	
Emergency Services		3		6		Y	4	2	8			5		10	

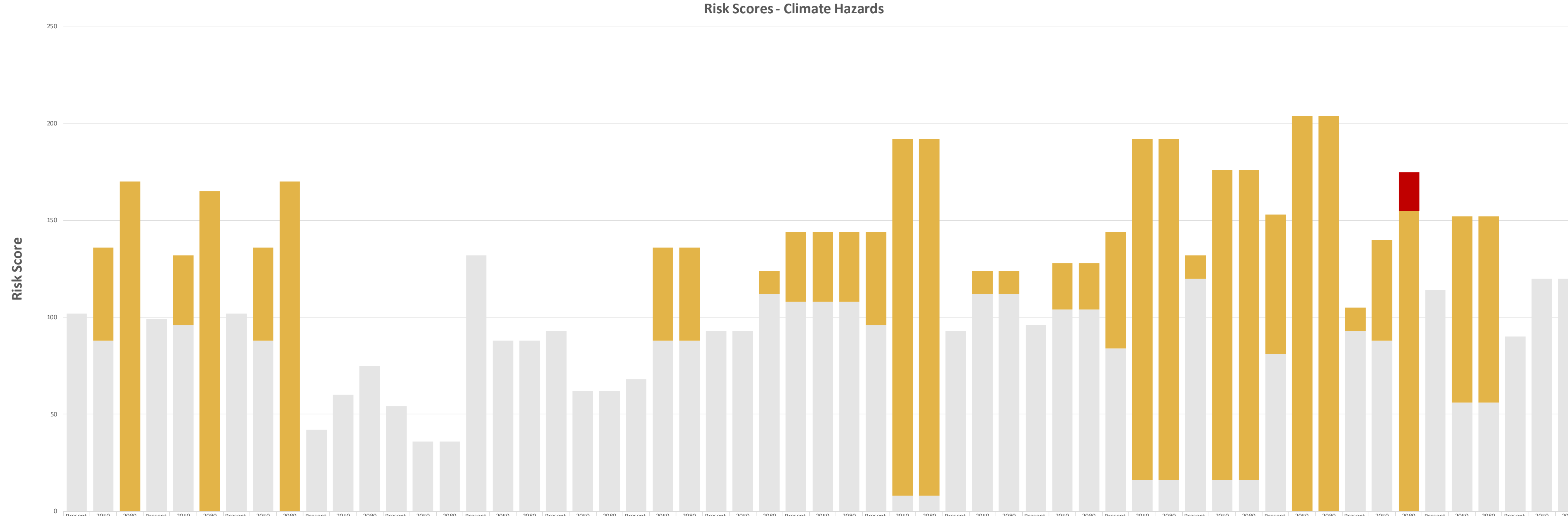
PIEVC Risk Scores
Parks and Playgrounds



	Community Trails			Barton Park			Charity Ball Diamond			Sinclair Ball Diamonds			Conner Lukan Memorial Fitness Park		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk Score	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk Score	60	112	126	0	60	100	48	96	136	48	96	136	0	48	88
⬜ Low Risk Scores	90	72	51	127	95	66	93	78	49	93	78	49	124	103	74

	Fournier Place Park			Hilda Eben Park			Kinnettes Park			Kinsmen Pine Park			Maple Cresent Park		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk Score	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk Score	0	36	76	0	72	91	0	48	88	0	48	88	0	48	88
⬜ Low Risk Scores	121	111	82	130	87	82	124	103	74	124	103	74	124	103	74

	Popular Grove Park			Schuter Park			Operation and Maintenance			Public/ Users			Emergency Services		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk Score	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk Score	12	64	104	12	112	124	48	160	184	12	100	119	0	24	64
⬜ Low Risk Scores	118	95	66	130	63	66	117	44	36	130	73	68	118	119	90



	Annual Mean			Very Hot Days			Hottest Day			Cooling Degree Days			Coldest Days		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk	0	48	170	0	36	165	0	48	170	0	0	0	0	0	0
⬜ Low Risk Scores	102	88	0	99	96	0	102	88	0	42	60	75	54	36	36

	Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk	0	0	0	0	0	0	0	48	48	0	0	12	36	36	36
⬜ Low Risk Scores	132	88	88	93	62	62	68	88	88	93	93	112	108	108	108

	Short Duration Rainfall/ Overland Flooding			Drought			Winter Percipitation			Lightning			Hail		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
🟨 Medium Risk	48	184	184	0	12	12	0	24	24	60	176	176	12	160	160
⬜ Low Risk Scores	96	8	8	93	112	112	96	104	104	84	16	16	120	16	16

	Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
🟥 High Risk	0	0	0	0	0	20	0	0	0	0	0	0
🟨 Medium Risk	72	204	204	12	52	155	0	96	96	0	0	0
⬜ Low Risk Scores	81	0	0	93	88	0	114	56	56	90	120	120

PIEVC Risk Matrix
Roads

Consequence Score

0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter

Temperature

	Mean Annual Temperature (-C)	Days above +30°C	Warmest Day Time Temperature	Cooling Degree Days (Degree Days)	# of Days Below -30°C	# Days Without Frost	# Freeze/ Thaw Events
	Annual Mean	**Very Hot Days**	**Hottest Day**	**Cooling Degree Days**	**Coldest Days**	**Frost-free Season**	**Freeze/ Thaw Events**
Climate Projections							
Present	1.6	1	29.8	23	13.1	119	85.9
2050	3.7	5	33.8	82	6.6	142	76.9
2080	5.8	13	37.5	196	2.7	166	69.2

Precipitation

	Annual Total Percipitation (mm)	Maximum 1-Day Total Percipitation (mm)	Maximum 5-day Consecutive Percipitation (mm)	Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)	Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)	Total Percipitation in the Winter Months
	Annual Percipitation	**Extreme Rainfall**	**Persistant Percipitation**	Short Duration Rainfall/ Overland Flooding	**Drought**	**Snow Accumulation**
Climate Projections						
Present	443	33	60	4.2	-	69
2050	463	34	62	4.3	+	74
2080	482	37	64	4.6	++	79

Extreme Events

	Lightning	Hail Storm	High Wind/ Tornado	Flooding	Climate Moisture Deficit	Shifting Natural Ecoregions
	Lightning	**Hail**	**Tornado**	**River Flooding**	**Wildfire Smoke**	**Shifting Ecosystem**
Climate Projections						
Present	-	-	-	-	-	-
2050	+	+	+	+	+	+
2080	+	+	+	++	+	+

Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Asphalt Roads	Present		3		3		3		9		3		12		3		3		3		9		3		6		3		9		2		6		3		9		3		12		2		6		3		9		3		6		3		9		3		6		3		9		3		12		3		3	
	2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	1	4	Y	2	3	6	Y	2	2	4	Y	2	4	8	Y	4	3	12	Y	3	3	9	Y	3	4	12	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	4	16	Y	4	1	4	Y	4	1	4
	2080		5		5		5		15		5		20		5		5		2		6		2		4		2		8		4		12		3		12		4		12		4		8		4		12		4		12		4		8		4		12		4		12		5		20		4		4	
Gravel Roads	Present		3		3		3		6		3		9		3		3		3		9		3		6		3		9		2		6		3		9		3		15		3		12		3		9		3		12		3		9		3		12		3		9		3		9		3	
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	2080		5		5		5		10		5		15		5		5		2		6		2		4		2		6		4		12		3		12		4		15		4		12		4		12		4		12		4		8		4		12		4		12		5		15		4		4	
Sidewalks	Present		3		3		3		6		3		9		3		3		3		9		3		6		3		9		2		4		3		6		3		9		2		4		3		6		3		9		3		3		6		3		6		3		6		3	
	2050	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	2	3	6	Y	2	2	4	Y	2	3	6	Y	4	2	8	Y	3	2	6	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		5		5		5		10		5		15		5		5		2		6		2		4		2		6		4		8		3		9		4		12		4		8		4		12		4		12		4		8		4		12		4		12		5		15		4		4	
Traffic Signals and Flashing Crosswalks	Present		3		3		3		6		3		9		3		3		3		6		3		6		3		6		2		2		3		3		3		3		1		3		3		3		3		3		3		3		3		3		3		3		3		3	
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	2080		5		5		5		10		5		15		5		5		2		4		2		4		2		4		4		4		3		3		4		4		4		4		4		4		4		4		4		4		4		4		4		4		4		4	
3-Way and 4-Way flashing stop light	Present		3		3		3		6		3		9		3		3		3		6		3		6		3		6		2		2		3		3		3		3		1		3		3		3		3		3		3		3		3		3		3		3		3		3	
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	2080		5		5		5		10		5		15		5		5		2		4		2		4		2		4		4		4		3		3		4		4		4		4		4		4		4		4		4		4		4		4		4		4		4		4	
Railroad Crossings	Present		3		3		3		6		3		9		3		3		3		6		3		6		3		6		2		4		3		6		3		9		2		4		3		6		3		9		3		3		6		3		6		3		6		3	
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	2080		5		5		5		10		5		15		5		5		2		6		2		4		2		6		4		8		3		9		4		12		4		8		4		12		4		12		4		8		4		12		4		12		5		15		4		4	
Road Signs and Lighting	Present		3		3		3		6		3		9		3		3		3		6		3		6		3		6		2		2		3		3		3		3		1		3		3		3		3		3		3		3		3		3		3		3		3		3	
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	2080		5		5		5		10		5		15		5		5		2		4		2		4		2		4		4		4		3		3		4		4		4		4		4		4		4		4		4		4		4		4		4		4		4		4	
Public Parking Lots	Present		3		3		3		9		3		12		3		3		3		9		3		6		3		12		2		6		3		9		3		9		3		12		3		9		3		12		3		3		6		3		6		3		6		3	
	2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	1	4	Y	2	3	6	Y	2	2	4	Y	2	4	8	Y	4	3	12	Y	3	3	9	Y	3	3	9	Y	4	4	16	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		5		5		5		15		5		20		5		5		2		6		2		4		2		8		4		12		4		12		4		12		4		8		4		12		4		12		4		8		4		12		4		12		5		20		4		4	
Operations and Maintenance	Present		3		3		3		6		3		9		3		3		3		6		3		6		3		6		2		4		3		6		3		9		2		4		3		6		3		9		3		3		6		3		6		3		6		3	
	2050	Y	4	1	4	Y	4	3	12	Y	4	4	16	Y	4	1	4	Y	2	2	4	Y	2	2	4	Y	2	3	6	Y	4	2	8	Y	3	2	6	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
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Public/ Customers	Present		3		3		3		9		3		9		3		3		3		3		3		6		3		6		2		4		3		6		3		9		3		9		3		9		3		6		3		3		6		3		6		3		9		3	
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	2080		5		5		5		15		5		15		5		5		2		2		2		4		2		4		4		8		4		8		3		9		4		12		4		4		4		4		8		4		4		4		8		5		15		4		8	
Emergency Services	Present		3		3		3		3		3		6		3		3		3		3		3		6		3		6		2		4		3		6		3		9		3		9		3		9		3		6		3		3		6		3		6		3		6		3	
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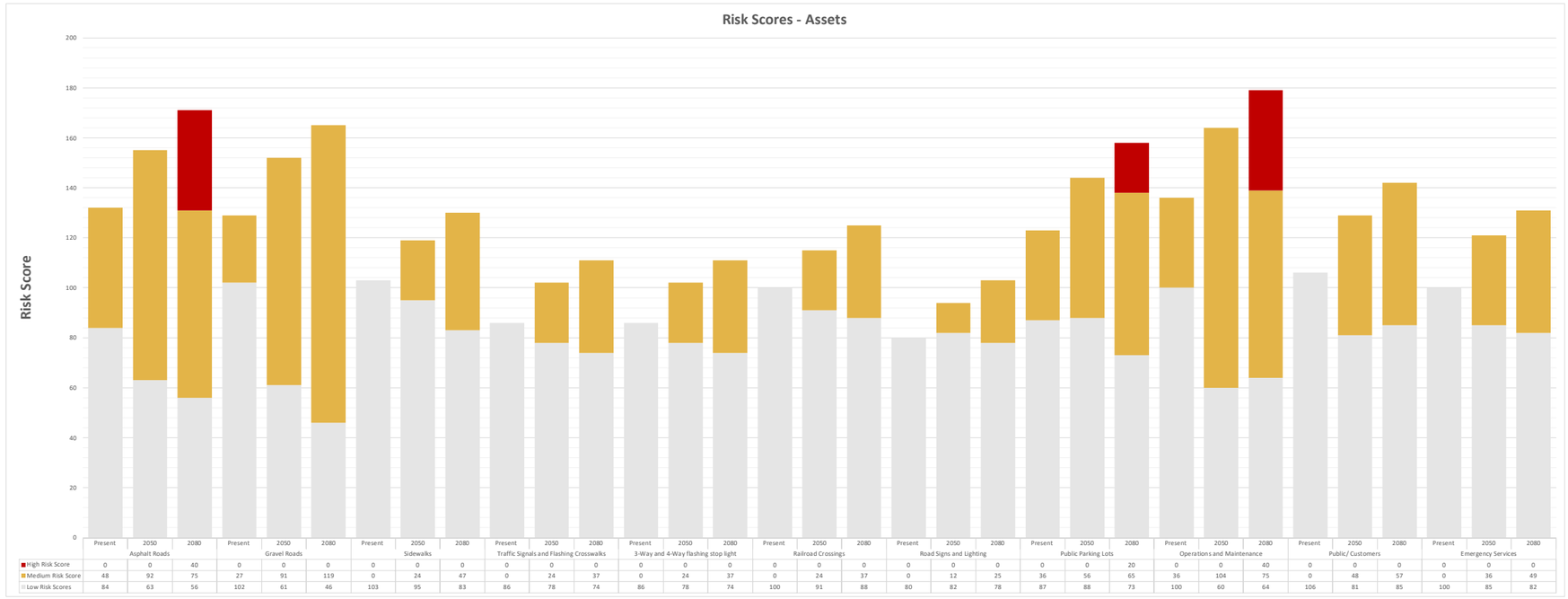
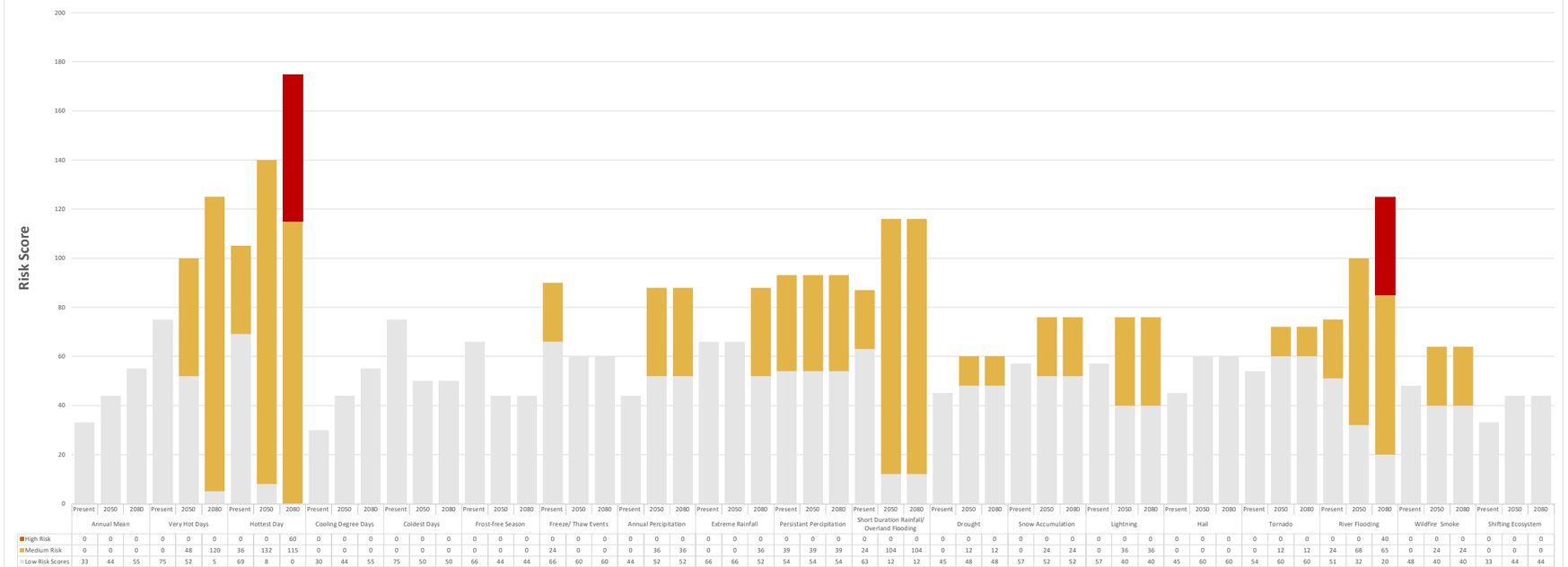
	2080		5		5		5		10		5		10		5		5		2		2		2		4		2		4		4		8		4		8		3		9		4		12		4		4		4		4		8		4		4		4		8		5		15		4		8	

PIEVC Risk Scores
Roads



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Asphalt Roads			Gravel Roads			Sidewalks			Traffic Signals and Flashing Crosswalks			3-Way and 4-Way flashing stop light			Railroad Crossings			Road Signs and Lighting			Public Parking Lots			Operations and Maintenance			Public/ Customers			Emergency Services		
High Risk Score	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	40	0	0	0	0	0	0
Medium Risk Score	48	92	75	27	91	119	0	24	47	0	24	37	0	24	37	0	24	37	0	12	25	36	56	65	36	104	75	0	48	57	0	36	49
Low Risk Scores	84	63	56	102	61	46	103	95	83	86	78	74	86	78	74	100	91	88	80	82	78	87	88	73	100	60	64	106	81	85	100	85	82



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Annual Mean			Very Hot Days			Hottest Day			Cooling Degree Days			Coldest Days			Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation			Short Duration Rainfall/ Overland Flooding			Drought			Snow Accumulation			Lightning			Hail			Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem		
High Risk	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	48	120	36	132	115	0	0	0	0	0	0	0	0	0	24	0	0	0	36	36	0	0	36	39	39	39	24	104	104	0	12	12	0	24	24	0	36	36	0	0	0	0	12	12	24	68	65	0	24	24	0	0	0
Low Risk Scores	33	44	55	75	52	5	69	8	0	30	44	55	75	50	50	66	44	44	66	60	60	44	52	52	66	66	52	54	54	54	63	12	12	45	48	48	57	52	52	57	40	40	45	60	60	54	60	60	51	32	20	48	40	40	33	44	44

PIEVC Risk Matrix
Solid Waste Management - Waste Collection

Consequence Score

- 0 - No Effect
- 1 - Insignificant
- 2 - Minor
- 3 - Moderate
- 4 - Major
- 5 - Catastrophic

Climate Parameter – Temperature

		Annual Mean				Very Hot Days				Hottest Day				Cooling Degree Days				Coldest Days				Frost-free Season				Freeze/ Thaw Events			
		Mean Annual Temperature (-C)				Days above +30°C				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events			
Climate Projections	Present	1.6	3			1	3			29.8	3			23	3			13.1	3			119	3			85.9	3		
	2050	3.7	4			5	4			33.8	4			82	4			6.6	2			142	4			76.9	2		
	2080	5.8	5			13	5			37.5	5			196	5			2.7	2			166	4			69.2	2		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Waste Collection Route Maintenance	Present		3		3		3		6		3		6		3		6		3		3		3		3		3		6
	2050	Y	4	1	4	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	2	1	2	Y	4	1	4	Y	2	2	4
	2080		5		5		5		10		5		10		5		10		2		2		4		4		2		4
2 Waste Carts - Residential	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	4	1	4	Y	2	1	2
	2080		5		5		5		5		5		5		5		5		2		2		4		4		2		2
4 Operation and Maintenance	Present		3		3		3		3		3		6		3		6		3		3		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	2	8	Y	2	1	2	Y	4	1	4	Y	2	2	4
	2080		5		5		5		5		5		10		5		10		2		2		4		4		2		4
5 Public/Customers	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	4	1	4	Y	2	1	2
	2080		5		5		5		5		5		5		5		5		2		2		4		4		2		2
6 Emergency Services	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	4	1	4	Y	2	1	2
	2080		5		5		5		5		5		5		5		5		2		2		4		4		2		2

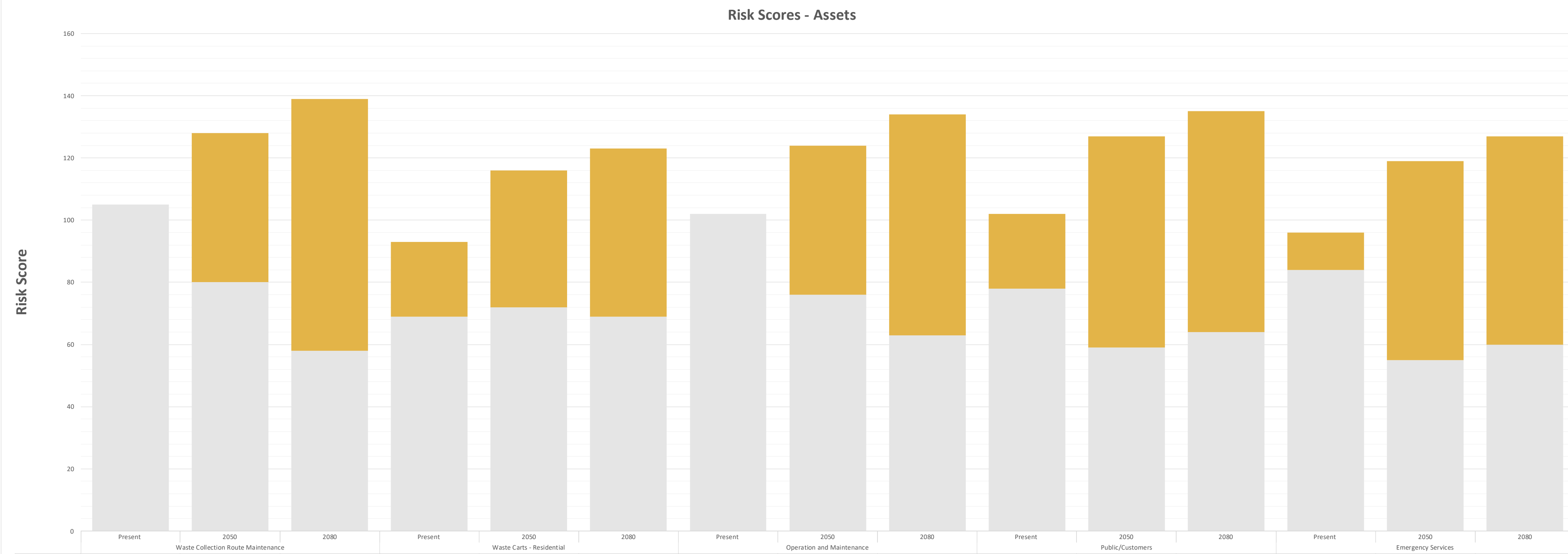
Climate Parameter – Precipitation

		Annual Percipitation				Extreme Rainfall				Persistant Percipitation				Short Duration Rainfall/ Overland Flooding				Drought				Snow Accumulation			
		Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months			
Climate Projections	Present	443	3			33	3			60	3			4.2	3			-	3			69	3		
	2050	463	3			34	3			62	3			4.3	4			+	4			74	4		
	2080	482	4			37	3			64	3			4.6	4			++	4			79	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Waste Collection Route Maintenance	Present		3		3		3		6		3		9		3		9		3		3		3		9
	2050	Y	3	1	3	Y	3	2	6	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	3	12
	2080		4		4		3		6		3		9		4		12		4		4		4		12
2 Waste Carts - Residential	Present		3		3		3		3		3		6		3		9		3		3		3		6
	2050	Y	3	1	3	Y	3	1	3	Y	3	2	6	Y	4	3	12	Y	4	1	4	Y	4	2	8
	2080		4		4		3		3		3		6		4		12		4		4		4		8
4 Operation and Maintenance	Present		3		3		3		6		3		9		3		9		3		3		3		9
	2050	Y	3	1	3	Y	3	2	6	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	3	12
	2080		4		4		3		6		3		9		4		12		4		4		4		12
5 Public/Customers	Present		3		3		3		3		3		9		3		9		3		3		3		9
	2050	Y	3	1	3	Y	3	1	3	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	3	12
	2080		4		4		3		3		3		9		4		12		4		4		4		12
6 Emergency Services	Present		3		3		3		3		3		9		3		9		3		3		3		9
	2050	Y	3	1	3	Y	3	1	3	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	3	12
	2080		4		4		3		3		3		9		4		12		4		4		4		12

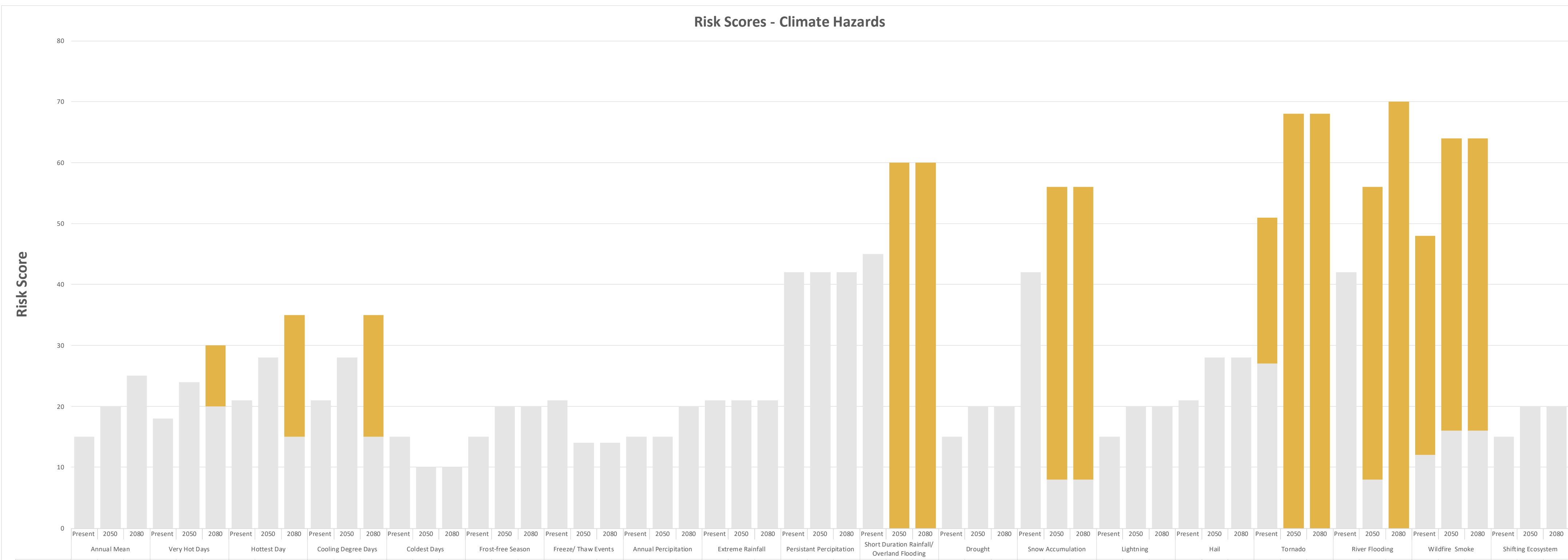
Climate Parameter – Extreme Events / Shifting Natural Ecoregions

		Lightning				Hail				Tornado				River Flooding				Wildfire Smoke				Shifting Ecosystem			
		Lightning				Hail Storm				High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifting Natural Ecoregions			
Climate Projections	Present	-	3			-	3			-	3			-	3			-	3			-	3		
	2050	+	4			+	4			+	4			+	4			+	4			+	4		
	2080	+	4			+	4			+	4			++	5			+	4			+	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Waste Collection Route Maintenance	Present		3		3		3		3		3		9		3		9		3		6		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	3	12	Y	4	2	8	Y	4	1	4
	2080		4		4		4		4		4		12		5		15		4		8		4		4
2 Waste Carts - Residential	Present		3		3		3		6		3		12		3		6		3		12		3		3
	2050	Y	4	1	4	Y	4	2	8	Y	4	4	16	Y	4	2	8	Y	4	4	16	Y	4	1	4
	2080		4		4		4		8		4		16		5		10		4		16		4		4
4 Operation and Maintenance	Present		3		3		3		3		3		9		3		9		3		6		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	3	12	Y	4	2	8	Y	4	1	4
	2080		4		4		4		4		4		12		5		15		4		8		4		4
5 Public/Customers	Present		3		3		3		6		3		12		3		9		3		12		3		3
	2050	Y	4	1	4	Y	4	2	8	Y	4	4	16	Y	4	3	12	Y	4	4	16	Y	4	1	4
	2080		4		4		4		8		4		16		5		15		4		16		4		4
6 Emergency Services	Present		3		3		3		3		3		9		3		9		3		12		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	3	12	Y	4	4	16	Y	4	1	4
	2080		4		4		4		4		4		12		5		15		4		16		4		4

PIEVC Risk Scores
Solid Waste Management System - Waste Collection



	Waste Collection Route Maintenance			Waste Carts - Residential			Operation and Maintenance			Public/Customers			Emergency Services		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk Score	0	48	81	24	44	54	0	48	71	24	68	71	12	64	67
Low Risk Scores	105	80	58	69	72	69	102	76	63	78	59	64	84	55	60



	Annual Mean			Very Hot Days			Hottest Day			Cooling Degree Days			Coldest Days		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	0	10	0	0	20	0	0	20	0	0	0
Low Risk Scores	15	20	25	18	24	20	21	28	15	21	28	15	15	10	10

	Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low Risk Scores	15	20	20	21	14	14	15	15	20	21	21	21	42	42	42

	Short Duration Rainfall/ Overland Flooding			Drought			Snow Accumulation			Lightning			Hail		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	60	60	0	0	0	0	48	48	0	0	0	0	0	0
Low Risk Scores	45	0	0	15	20	20	42	8	8	15	20	20	21	28	28

	Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	24	68	68	0	48	70	36	48	48	0	0	0
Low Risk Scores	27	0	0	42	8	0	12	16	16	15	20	20

PIEVC Risk Matrix
Solid Waste Management System - Solid Wate Site

Consequence Score

- 0 - No Effect
- 1 - Insignificant
- 2 - Minor
- 3 - Moderate
- 4 - Major
- 5 - Catastrophic

Climate Parameter – Temperature

No.	Infrastructure Components	Period	Mean Annual Temperature (°C)				Days above +30°C				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events			
			Annual Mean				**Very Hot Days**				**Hottest Day**				**Cooling Degree Days**				**Coldest Days**				**Frost-free Season**				**Freeze/ Thaw Events**			
	Climate Projections	Present	1.6	3			1	3			29.8	3			23	3			13.1	3			119	3			85.9	3		
		2050	3.7	4			5	4			33.8	4			82	4			6.6	2			142	4			76.9	2		
		2080	5.8	5			13	5			37.5	5			196	5			2.7	2			166	4			69.2	2		
	Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1	Internal Access Roads	Present		3		3		3		6		3		3		3		3		3		3		3		3		3		6
		2050	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	4	1	4	Y	2	2	4
		2080		5		5		5		10		5		5		5		5		2		2		4		4		2		4
2	Scale House and Scale System	Present		3		3		3		3		3		6		3		6		3		6		3		3		3		9
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	2	8	Y	2	2	4	Y	4	1	4	Y	2	3	6
		2080		5		5		5		5		5		10		5		10		2		4		4		4		2		6
3	Equipment & Maintenance Shop	Present		3		3		3		3		3		6		3		3		3		6		3		3		3		6
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	2	2	4	Y	4	1	4	Y	2	2	4
		2080		5		5		5		5		5		10		5		5		2		4		4		4		2		4
3	Recycling Storage Area - White Goods/ Tires/ Wood, Concrete Rubble, etc.	Present		3		3		3		6		3		9		3		3		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	2	1	2	Y	4	1	4	Y	2	1	2
		2080		5		5		5		10		5		15		5		5		2		2		4		4		2		2
3	Transfer Station	Present		3		3		3		3		3		9		3		3		3		3		3		3		3		6
		2050	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	1	4	Y	2	1	2	Y	4	1	4	Y	2	2	4
		2080		5		5		5		5		5		15		5		5		2		2		4		4		2		4
3	Take It- or Leave It/ Recycling Oils/ Floroscent bulbs	Present		3		3		3		3		3		6		3		3		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	2	1	2	Y	4	1	4	Y	2	1	2
		2080		5		5		5		5		5		10		5		5		2		2		4		4		2		2
3	Landfill Cell 1, 2, 3A/B - Leachate Pump out	Present		3		3		3		9		3		9		3		3		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	3	12	Y	4	3	12	Y	4	1	4	Y	2	1	2	Y	4	1	4	Y	2	1	2
		2080		5		5		5		15		5		15		5		5		2		2		4		4		2		2
3	Stormwater Pond and Ditches	Present		3		3		3		6		3		9		3		3		3		3		3		3		3		3
		2050	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	2	1	2	Y	4	1	4	Y	2	1	2
		2080		5		5		5		10		5		15		5		5		2		2		4		4		2		2
4	Public/ Customers	Present		3		3		3		3		3		6		3		3		3		6		3		3		3		3
		2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	2	2	4	Y	4	1	4	Y	2	1	2
		2080		5		5		5		5		5		10		5		5		2		4		4		4		2		2
5	Operation and Maintenance	Present		3		3		3		9		3		6		3		3		3		9		3		3		3		6
		2050	Y	4	1	4	Y	4	3	12	Y	4	2	8	Y	4	1	4	Y	2	3	6	Y	4	1	4	Y	2	2	4
		2080		5		5		5		15		5		10		5		5		2		6		4		4		2		4
6	Emergency Services	Present		3		3		3		9		3		9		3		3		3		9		3		3		3		6
		2050	Y	4	1	4	Y	4	3	12	Y	4	3	12	Y	4	1	4	Y	2	3	6	Y	4	1	4	Y	2	2	4
		2080		5		5		5		15		5		15		5		5		2		6		4		4		2		4

Climate Parameter – Precipitation

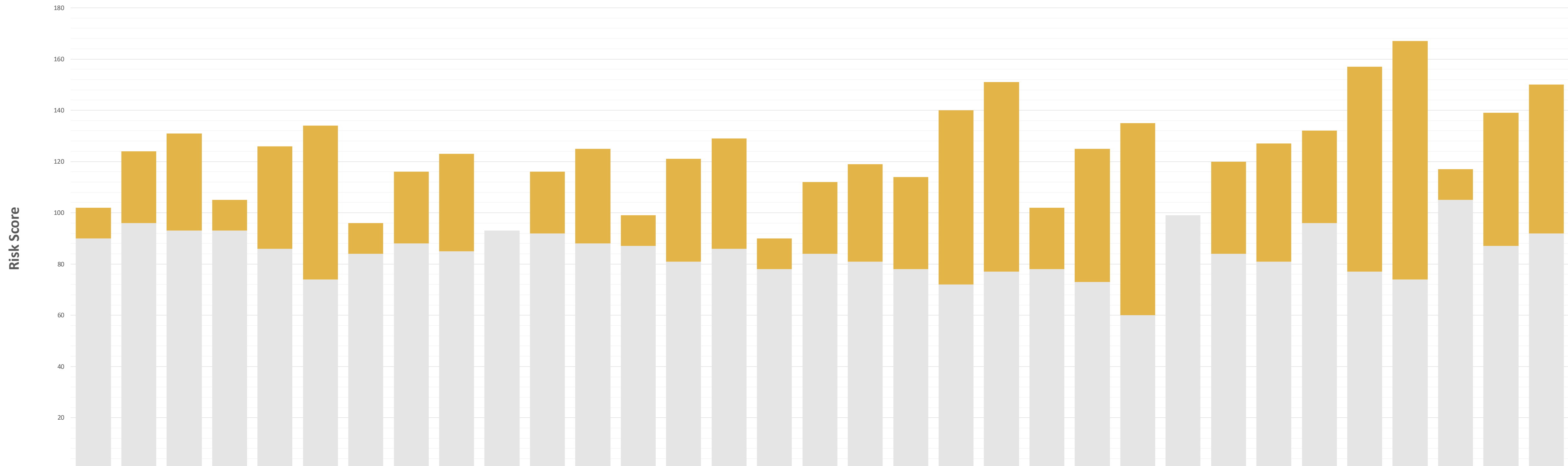
No.	Infrastructure Components	Period	Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months			
			Annual Percipitation				**Extreme Rainfall**				**Persistant Percipitation**				Short Duration Rainfall/ Overland Flooding				**Drought**				**Snow Accumulation**			
	Climate Projections	Present	443	3			33	3			60	3			4.2	3			-	3			69	3		
		2050	463	3			34	3			62	3			4.3	4			+	4			74	4		
		2080	482	4			37	3			64	3			4.6	4			++	4			79	4		
	Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1	Internal Access Roads	Present		3		3		3		6		3		9		3		12		3		9		3		6
		2050	Y	3	1	3	Y	3	2	6	Y	3	3	9	Y	4	4	16	Y	4	3	12	Y	4	2	8
		2080		4		4		3		6		3		9		4		16		4		12		4		8
2	Scale House and Scale System	Present		3		3		3		3		3		6		3		9		3		3		3		6
		2050	Y	3	1	3	Y	3	1	3	Y	3	2	6	Y	4	3	12	Y	4	1	4	Y	4	2	8
		2080		4		4		3		3		3		6		4		12		4		4		4		8
3	Equipment & Maintenance Shop	Present		3		3		3		3		3		6		3		9		3		3		3		6
		2050	Y	3	1	3	Y	3	1	3	Y	3	2	6	Y	4	3	12	Y	4	1	4	Y	4	2	8
		2080		4		4		3		3		3		6		4		12		4		4		4		8
3	Recycling Storage Area - White Goods/ Tires/ Wood, Concrete Rubble, etc.	Present		3		3		3		3		3		6		3		9		3		6		3		6
		2050	Y	3	1	3	Y	3	1	3	Y	3	2	6	Y	4	3	12	Y	4	2	8	Y	4	2	8
		2080		4		4		3		3		3		6		4		12		4		8		4		8
3	Transfer Station	Present		3		3		3		6		3		6		3		9		3		3		3		6
		2050	Y	3	1	3	Y	3	2	6	Y	3	2	6	Y	4	3	12	Y	4	1	4	Y	4	2	8
		2080		4		4		3		6		3		6		4		12		4		4		4		8
3	Take It- or Leave It/ Recycling Oils/ Floroscent bulbs	Present		3		3		3		3		3		6		3		9		3		3		3		6
		2050	Y	3	1	3	Y	3	1	3	Y	3	2	6	Y	4	3	12	Y	4	1	4	Y	4	2	8
		2080		4		4		3		3		3		6		4		12		4		4		4		8
3	Landfill Cell 1, 2, 3A/B - Leachate Pump out	Present		3		6		3		6		3		12		3		12		3		3		3		6
		2050	Y	3	2	6	Y	3	2	6	Y	3	4	12	Y	4	4	16	Y	4	1	4	Y	4	2	8
		2080		4		8		3		6		3		12		4		16		4		4		4		8
3	Stormwater Pond and Ditches	Present		3		3		3		6		3		12		3		12		3		3		3		3
		2050	Y	3	1	3	Y	3	2	6	Y	3	4	12	Y	4	4	16	Y	4	1	4	Y	4	1	4
		2080		4		4		3		6		3		12		4		16		4		4		4		4
4	Public/ Customers	Present		3		3		3		6		3		9		3		9		3		3		3		6
		2050	Y	3	1	3	Y	3	2	6	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	2	8
		2080		4		4		3		6		3		9		4		12		4		4		4		8
5	Operation and Maintenance	Present		3		6		3		9		3		12		3		12		3		3		3		6
		2050	Y	3	2	6	Y	3	3	9	Y	3	4	12	Y	4	4	16	Y	4	1	4	Y	4	2	8
		2080		4		8		3		9		3		12		4		16		4		4		4		8
6	Emergency Services	Present		3		6		3		6		3		9		3		9		3		3		3		6
		2050	Y	3	2	6	Y	3	2	6	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	2	8
		2080		4		8		3		6		3		9		4		12		4		4		4		8

Climate Parameter – Extreme Events and Shifting Natural Ecoregions

No.	Infrastructure Components	Period	Lightning				Hail Storm				High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifting Natural Ecoregions			
			Lightning				**Hail**				**Tornado**				**River Flooding**				**Wildfire Smoke**				**Shifting Ecosystem**			
	Climate Projections	Present	-	3			-	3			-	3			-	3			-	3			-	3		
		2050	+	4			+	4			+	4			+	4			+	4			+	4		
		2080	+	4			+	4			+	4			++	5			+	4			+	4		
	Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1	Internal Access Roads	Present		3		6		3		6		3		6		3		3		3		6		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	1	4
		2080		4		8		4		8		4		8		5		5		4		8		4		4
2	Scale House and Scale System	Present		3		6		3		9		3		6		3		3		3		12		3		3
		2050	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
		2080		4		8		4		12		4		8		5		5		4		16		4		4
3	Equipment & Maintenance Shop	Present		3		6		3		6		3		6		3		3		3		12		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
		2080		4		8		4		8		4		8		5		5		4		16		4		4
3	Recycling Storage Area - White Goods/ Tires/ Wood, Concrete Rubble, etc.	Present		3		6		3		6		3		6		3		3		3		6		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	1	4
		2080		4		8		4		8		4		8		5		5		4		8		4		4
3	Transfer Station	Present		3		6		3		6		3		6		3		3		3		12		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
		2080		4		8		4		8		4		8		5		5		4		16		4		4
3	Take It- or Leave It/ Recycling Oils/ Floroscent bulbs	Present		3		6		3		6		3		6		3		3		3		12		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
		2080		4		8		4		8		4		8		5		5		4		16		4		4
3	Landfill Cell 1, 2, 3A/B - Leachate Pump out	Present		3		6		3		6		3		6		3		3		3		12		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
		2080		4		8		4		8		4		8		5		5		4		16		4		4
3	Stormwater Pond and Ditches	Present		3		3		3		6		3		6		3		6		3		9		3		3
		2050	Y	4	1	4	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	1	4
		2080		4		4		4		8		4		8		5		10		4		12		4		4
4	Public/ Customers	Present		3		6		3		9		3		6		3		3		3		9		3		3
		2050	Y	4	2	8	Y	4	3	12	Y	4	2	8	Y	4	1	4	Y	4	3	12	Y	4	1	4
		2080		4		8		4		12		4		8		5		5		4		12		4		4
5	Operation and Maintenance	Present		3		6		3		9		3		9		3		3		3		12		3		6
		2050	Y	4	2	8	Y	4	3	12	Y	4	3	12	Y	4	1	4	Y	4	4	16	Y	4	2	8
		2080		4		8		4		12		4		12		5		5		4		16		4		8
6	Emergency Services	Present		3		6		3		6		3		6		3		3		3		12		3		3
		2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	4	4	16	Y	4	1	4
		2080		4		8		4		8		4		8		5		5		4		16		4		4

PIEVC Risk Scores
Solid Waste Management - Solid Waste Site

Risk Scores - Assets



	Internal Access Roads			Scale House and Scale System		
	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	0	0	0	0
Medium Risk Score	12	28	38	12	40	60
Low Risk Scores	90	96	93	93	86	74

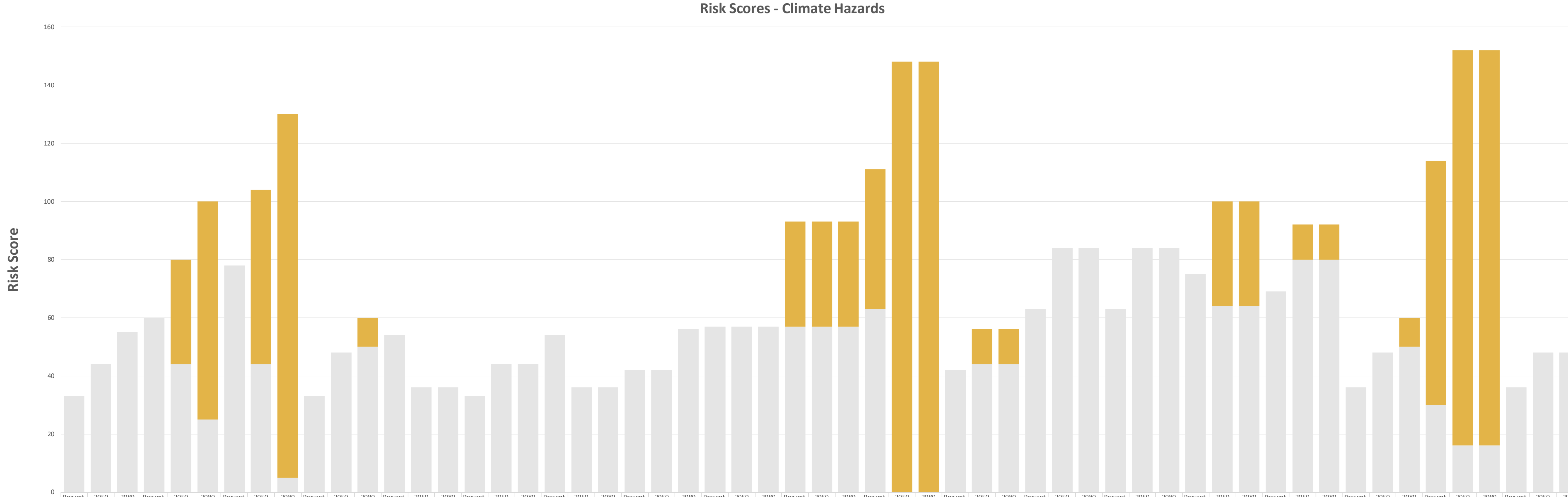
	Equipment & Maintenance Shop			Recycling Storage Area - White Goods/ Tires/ Wood, Concrete Rubble, etc.		
	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	0	0	0	0
Medium Risk Score	12	28	38	0	24	37
Low Risk Scores	84	88	85	93	92	88

	Transfer Station			Take It- or Leave It/ Recycling Oils/ Floroscent bulbs		
	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	0	0	0	0
Medium Risk Score	12	40	43	12	28	38
Low Risk Scores	87	81	86	78	84	81

	Landfill Cell 1, 2, 3A/B - Leachate Pump out			Stormwater Pond and Ditches		
	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	0	0	0	0
Medium Risk Score	36	68	74	24	52	75
Low Risk Scores	78	72	77	78	73	60

	Public/ Customers			Operation and Maintenance			Emergency Services		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk Score	0	0	0	0	0	0	0	0	0
Medium Risk Score	0	36	46	36	80	93	12	52	58
Low Risk Scores	99	84	81	96	77	74	105	87	92

Risk Scores - Climate Hazards



	Annual Mean			Very Hot Days			Hottest Day		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	36	75	0	60	125
Low Risk Scores	33	44	55	60	44	25	78	44	5

	Cooling Degree Days			Coldest Days			Frost-free Season		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	10	0	0	0	0	0	0
Low Risk Scores	33	48	50	54	36	36	33	44	44

	Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	0	0	0	0	0
Low Risk Scores	54	36	36	42	42	56	57	57	57

	Persistant Percipitation			Short Duration Rainfall/ Overland Flooding			Drought		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0
Medium Risk	36	36	36	48	148	148	0	12	12
Low Risk Scores	57	57	57	63	0	0	42	44	44

	Snow Accumulation			Lightning			Hail		
	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	0	0	0	36	36
Low Risk Scores	63	84	84	63	84	84	75	64	64

	Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem		
	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
High Risk	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	12	12	0	0	10	84	136	136	0	0	0
Low Risk Scores	69	80	80	36	48	50	30	16	16	36	48	48

PIEVC Risk Matrix
Stormwater Management System

Consequence Score

0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter

Temperature

		Mean Annual Temperature (°C)	Days above +30ºC	Warmest Day Time Temperature	Cooling Degree Days (Degree Days)	# of Days Below -30°C	# Days Without Frost	# Freeze/ Thaw Events
		Annual Mean	**Very Hot Days**	**Hottest Days**	**Cooling Degree Days**	**Coldest Days**	**Frost-free Season**	**Freeze/ Thaw Events**
Climate Projections	Present	1.6	1	29.8	23	13.1	119	85.9
	2050	3.7	5	33.8	82	6.6	142	76.9
	2080	5.8	13	37.5	196	2.7	166	69.2

Precipitation

		Annual Total Percipitation (mm)	Maximum 1-Day Total Percipitation (mm)	Maximum 5-day Consecutive Percipitation (mm)	Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)	Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)	Total Percipitation in the Winter Months
		Annual Percipitation	**Extreme Rainfall**	**Persistant Percipitation**	Short Duration Rainfall/ Overland Flooding	**Drought**	**Winter Percipitation**
Climate Projections	Present	443	33	60	4.2	-	69
	2050	463	34	62	4.3	+	74
	2080	482	37	64	4.6	++	79

Extreme Events

		Lightning	Hail Storm	High Wind/ Tornado	Flooding	Climate Moisture Deficit
		Lightning	**Hail**	**Tornado**	**River Flooding**	**Wildfire Smoke**
Climate Projections	Present	-	-	-	-	-
	2050	+	+	+	+	+
	2080	+	+	+	++	+

Shifting Natural Ecoregions

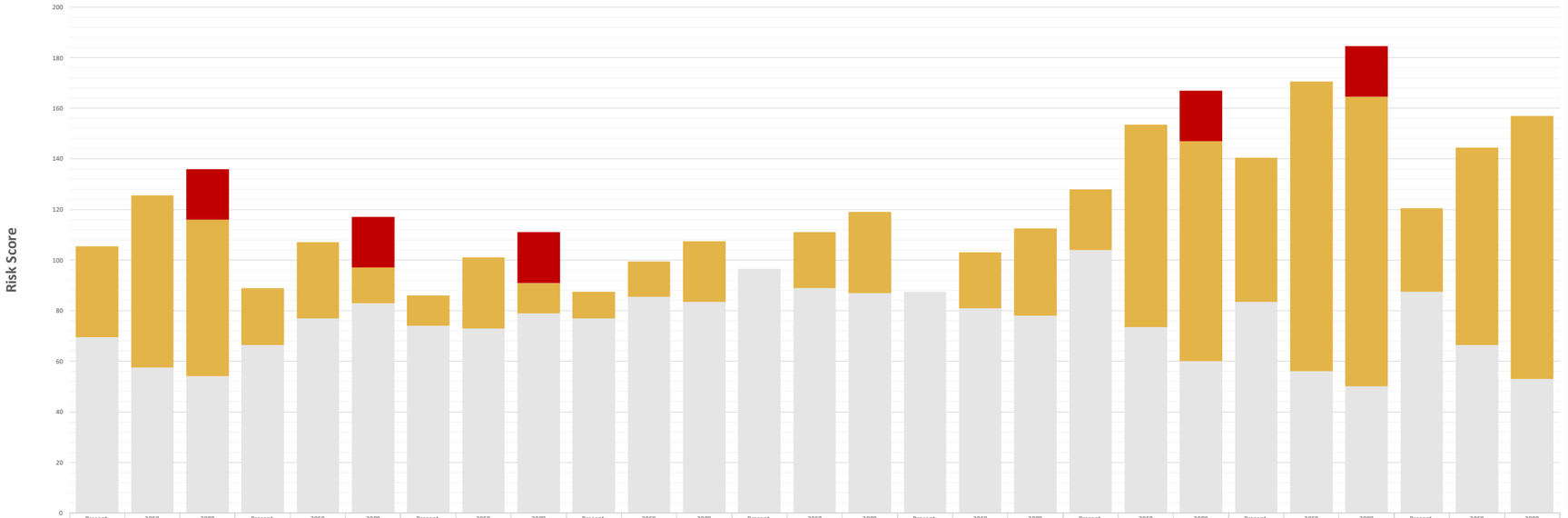
		Shifting Natural Ecoregions
		Shifting Ecosystem
Climate Projections	Present	-
	2050	+
	2080	+

Infrastructure Components

		Temperature																Precipitation																		Extreme Events																		Shifting Natural Ecoregions			
		Mean Annual Temperature (°C)				Days above +30ºC				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events				Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months				Lightning				Hail Storm				High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifting Natural Ecoregions			
		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Overland Drainage	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		9		2		2		3		7.5		3		12		3		12		3		3		9		3		3		9		3		3		12		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	3	6	Y	4	1	4	Y	3	2.5	7.5	Y	3	4	12	Y	4	4	16	Y	4	1	4	Y	4	3	12	Y	4	1	4	Y	4	3	12	Y	4	1	4	Y	4	4	16	Y	4	1	4	Y	4	1	4
	2080		5		5		5		5		5		5		5		5		2		2		2		2		2		6		4		4		4		10		3		12		4		16		4		4		4		12		4		4		12		4		4		5		20		4		4		4		4
Sawridge Creek Outfalls	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		6		2		2		3		6		3		9		3		11		3		3		6		3		3		6		3		3		12		3		3		3		4.5
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4	Y	4	1	4	Y	3	2	6	Y	3	3	9	Y	4	3.5	14	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1.5	6
	2080		5		5		5		5		5		5		5		5		2		2		2		2		2		4		4		4		4		8		3		9		4		14		4		4		4		8		4		4		8		4		4		5		20		4		4		4		6
Minor Outfalls/ Discharge	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		9		2		2		3		6		3		9		3		9		3		3		6		3		3		6		3		3		12		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	3	6	Y	4	1	4	Y	3	2	6	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	4	16	Y	4	1	4	Y	4	1	4
	2080		5		5		5		5		5		5		5		5		2		2		2		2		2		6		4		4		4		8		3		9		4		16		4		4		4		8		4		4		8		4		4		5		20		4		4		4		6
Collector, Trunk, and Lateral Mains	Present		3		3		3		3		3		3		3		3		9		3		3		3		3		9		2		2		3		6		3		7.5		3		11		3		3		6		3		3		6		3		3		11		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	3	6	Y	2	1	2	Y	2	3	6	Y	4	1	4	Y	3	2	6	Y	3	2.5	7.5	Y	4	3.5	14	Y	4	1	4	Y	4	1.5	6	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1	4
	2080		5		5		5		5		5		5		5		5		2		6		2		2		2		6		4		4		4		8		3		7.5		4		14		4		4		4		6		4		4		8		4		4		5		10		4		4		4		4
Stormwater Manholes and Catch Basins	Present		3		3		3		3		3		3		3		3		9		3		3		3		3		9		2		2		3		6		3		9		3		7.5		3		3		6		3		3		6		3		3		7.5		3		3		3		4.5
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	3	6	Y	2	1	2	Y	2	3	6	Y	4	1	4	Y	3	2	6	Y	3	3	9	Y	4	2.5	10	Y	4	1	4	Y	4	1.5	6	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1.5	6
	2080		5		5		5		5		5		5		5		5		2		6		2		2		2		6		4		4		4		8		3		7.5		4		10		4		4		4		6		4		4		8		4		4		5		10		4		4		4		6
Mobile Flood Pumps	Present		3		3		3		3		6		3		3		3		6		3		3		3		3		6		2		2		3		6		3		9		3		12		3		3		6		3		3		6		3		3		12		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	2	4	Y	4	1	4	Y	3	2	6	Y	3	3	9	Y	4	3	12	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	2.5	10	Y	4	1	4	Y	4	1	4
	2080		5		5		5		5		10		5		5		5		2		4		2		2		2		4		4		4		4		8		3		9		4		12		4		4		4		8		4		4		8		4		4		5		13		4		4		4		4
Operation and Maintenance	Present		3		3		3		6		3		9		3		3		3		9		3		3		3		7.5		2		2		3		7.5		3		9		3		12		3		3		3		9		3		6		3		3		12		3		6		3		3
	2050	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	1	4	Y	2	3	6	Y	2	1	2	Y	2	2.5	5	Y	4	1	4	Y	3	2.5	7.5	Y	3	3	9	Y	4	4	16	Y	4	1	4	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	4	16	Y	4	2	8	Y	4	1	4
	2080		5		5		5		10		5		15		5		5		2		6		2		2		2		5		4		4		4		10		3		9		4		16		4		4		4		12		4		8		4		4		12		5		20		4		8		4		4
Public/Customers	Present		3		3		3		6		3		7.5		3		3		3		6		3		3		3		9		2		4		3		11		3		12		3		12		3		3		3		9		3		3		6		3		3		12		3		6		3		6
	2050	Y	4	1	4	Y	4	2	8	Y	4	2.5	10	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	3	6	Y	4	2	8	Y	3	3.5	11	Y	3	4	12	Y	4	4	16	Y	4	1	4	Y	4	3	12	Y	4	3.5	14	Y	4	4	16	Y	4	2	8	Y	4	2	8
	2080		5		5		5		10		5		13		5		5		2		4		2		2		2		6		4		8		4		14		3		9		4		16		4		4		4		12		4		12		4		14		4		12		5		20		4		8		4		8
Emergency Services	Present		3		3		3		6		3		7.5		3		3		3		6		3		3		3		9		2		4		3		11		3		12		3		12		3		3		3		9		3		3		6		3		3		12		3		6		3		6
	2050	Y	4	1	4	Y	4	2	8	Y	4	2.5	10	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	3	6	Y	4	1	4	Y	3	2.5	7.5	Y	3	3	9	Y	4	4	16	Y	4	1	4	Y	4	3	12	Y	4	3	12	Y	4	3.5	14	Y	4	3	12	Y	4	1.5	6
	2080		5		5		5		10		5		13		5		5		2		4		2		2		2		6		4		4		4		10		3		9		4		16		4		4		4		12		4		12		4		14		4		12		5		18		4		6		4		4

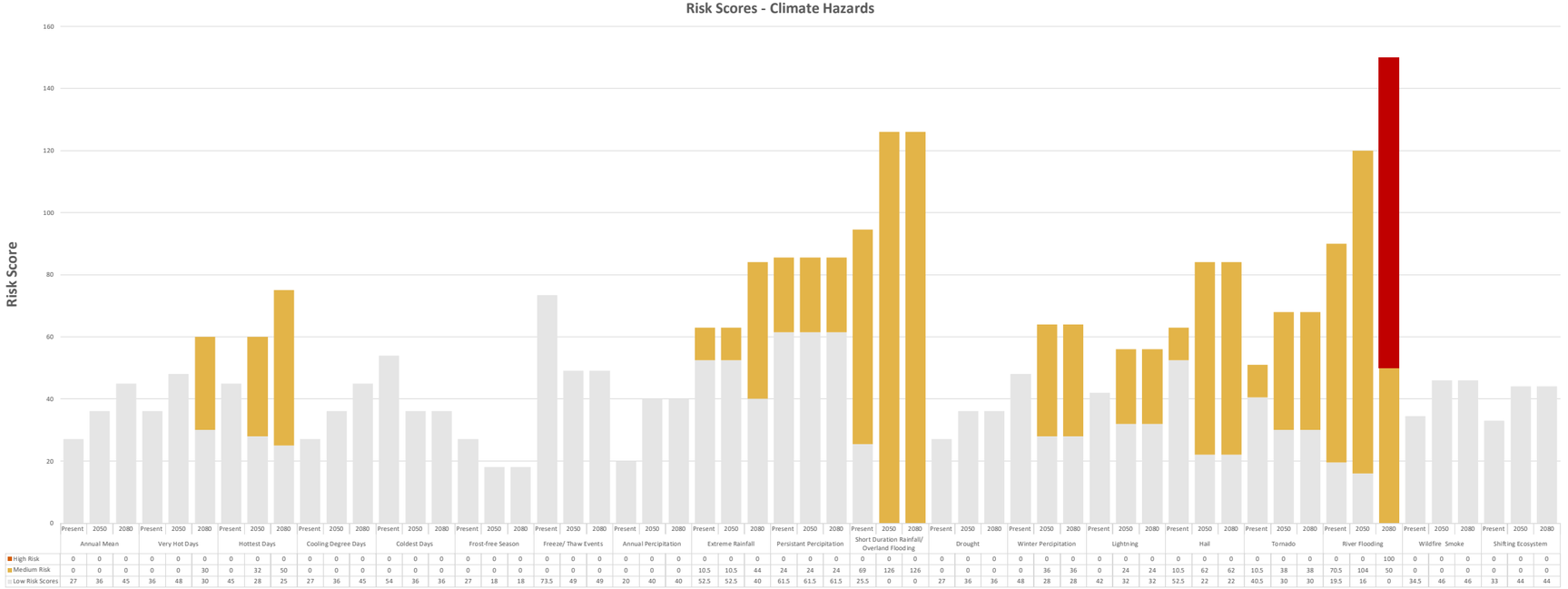
PIEVC Risk Scores
Stormwater Management System

Risk Scores - Assets



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Overland Drainage			Sawridge Creek Outfalls			Minor Outfalls/ Discharge			Collector, Trunk, and Lateral Mains			Stormwater Manholes and Catch Basins			Mobile Flood Pumps			Operation and Maintenance			Public/Customers			Emergency Services					
High Risk Score	0	0	20	0	0	20	0	0	20	0	0	0	0	0	0	0	0	34.5	24	0	20	0	0	20	0	0	0			
Medium Risk Score	36	68	62	22.5	30	14	12	28	12	10.5	14	24	0	22	32	0	22	34.5	24	80	87	57	114.5	114.5	33	78	104			
Low Risk Scores	69.5	57.5	54	66.5	77	83	74	73	79	77	85.5	83.5	96.5	89	87	87.5	81	78	104	73.5	60	83.5	56	50	87.5	66.5	53			

Risk Scores - Climate Hazards



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Annual Mean			Very Hot Days			Hottest Days			Cooling Degree Days			Coldest Days			Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation		
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	0	0	0	0	30	0	32	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10.5	10.5	44	24	24	24
Low Risk Scores	27	36	45	36	48	30	45	28	25	27	36	45	54	36	36	27	18	18	73.5	49	49	20	40	40	52.5	52.5	40	61.5	61.5	61.5

	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Short Duration Rainfall/ Overland Flooding			Drought			Winter Percipitation			Lightning			Hail			Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem					
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0			
Medium Risk	69	126	126	0	0	0	0	36	36	0	24	24	10.5	62	62	10.5	38	38	70.5	104	50	0	0	0	0	0	0			
Low Risk Scores	25.5	0	0	27	36	36	48	28	28	42	32	32	52.5	22	22	40.5	30	30	19.5	16	0	34.5	46	46	33	44	44			

PIEVC Risk Matrix
Wastewater Management System

Consequence Score

0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter

Infrastructure Components	Period	Temperature																			
		Mean Annual Temperature (◦C)				Days above +30°C				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C			
		Annual Mean				**Very Hot Days**				**Hottest Day**				**Cooling Degree Days**				**Coldest Days**			
Climate Projections	Present	1.6	3			1	3			29.8	3			23	3			13.1	3		
	2050	3.7	4			5	4			33.8	4			82	4			6.6	2		
	2080	5.8	5			13	5			37.5	5			196	5			2.7	2		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Sanitary Collection Lines and Forcemains	Present		3		3		3		3		3		3		3		3		3		6
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	2	4
	2080		5		5		5		5		5		5		5		5		2		4
2 Service Lines	Present		3		3		3		3		3		3		3		3		3		9
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	3	6
	2080		5		5		5		5		5		5		5		5		2		6
3 Service Line Cleanouts	Present		3		3		3		3		3		3		3		3		3		9
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	3	6
	2080		5		5		5		5		5		5		5		5		2		6
4 4 Cell Lagoon System	Present		3		9		3		12		3		12		3		12		3		6
	2050	Y	4	3	12	Y	4	4	16	Y	4	4	16	Y	4	4	16	Y	2	2	4
	2080		5		15		5		20		5		20		5		20		2		4
5 Lagoon Grinder System	Present		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2
	2080		5		5		5		5		5		5		5		5		2		2
6 Sanitary Manholes	Present		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2
	2080		5		5		5		5		5		5		5		5		2		2
7 Communication/ SCADA	Present		3		3		3		3		3		3		3		6		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	2	1	2
	2080		5		5		5		5		5		5		5		10		2		2
8 C Lift Station	Present		3		3		3		4.5		3		6		3		6		3		3
	2050	Y	4	1	4	Y	4	1.5	6	Y	4	2	8	Y	4	2	8	Y	2	1	2
	2080		5		5		5		7.5		5		10		5		10		2		2
9 D Lift Station	Present		3		3		3		6		3		4.5		3		6		3		3
	2050	Y	4	1	4	Y	4	2	8	Y	4	1.5	6	Y	4	2	8	Y	2	1	2
	2080		5		5		5		10		5		7.5		5		10		2		2
10 E Lift Station	Present		3		3		3		6		3		4.5		3		6		3		3
	2050	Y	4	1	4	Y	4	2	8	Y	4	1.5	6	Y	4	2	8	Y	2	1	2
	2080		5		5		5		10		5		7.5		5		10		2		2
11 F Lift Station	Present		3		3		3		6		3		4.5		3		6		3		3
	2050	Y	4	1	4	Y	4	2	8	Y	4	1.5	6	Y	4	2	8	Y	2	1	2
	2080		5		5		5		10		5		7.5		5		10		2		2
12 Sawridge Lift station	Present		3		3		3		9		3		9		3		6		3		3
	2050	Y	4	1	4	Y	4	3	12	Y	4	3	12	Y	4	2	8	Y	2	1	2
	2080		5		5		5		15		5		15		5		10		2		2
13 Operation and Maintenance	Present		3		3		3		9		3		6		3		9		3		9
	2050	Y	4	1	4	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	2	3	6
	2080		5		5		5		15		5		10		5		15		2		6
14 Public/Customers	Present		3		3		3		3		3		3		3		3		3		9
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	3	6
	2080		5		5		5		5		5		5		5		5		2		6
15 Emergency Services	Present		3		3		3		3		3		6		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	2	1	2
	2080		5		5		5		5		5		10		5		5		2		2

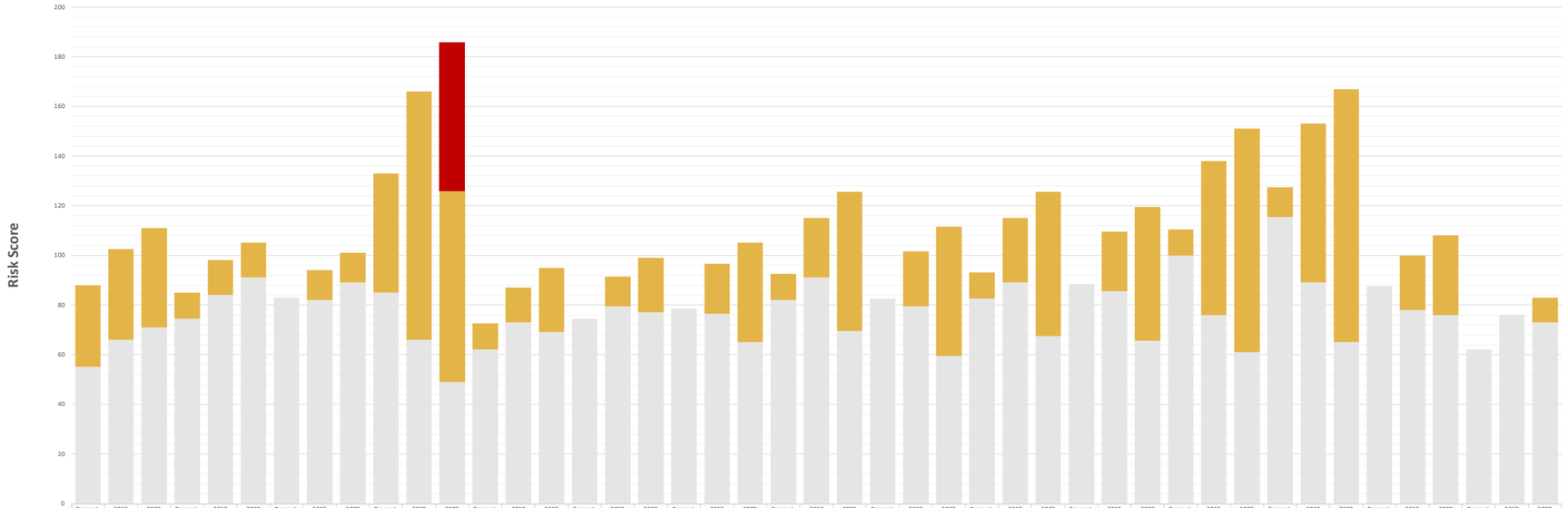
Infrastructure Components	Period	Temperature								Precipitation											
		# Days Without Frost				# Freeze/ Thaw Events				Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)			
		Frost-free Season				**Freeze/ Thaw Events**				**Annual Percipitation**				**Extreme Rainfall**				**Persistant Percipitation**			
Climate Projections	Present	119	3			85.9	3			443	2			33	3			60	3		
	2050	142	2			76.9	2			463	4			34	3			62	3		
	2080	166	2			69.2	2			482	4			37	4			64	3		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Sanitary Collection Lines and Forcemains	Present		3		3		3		6		2		4		3		11		3		12
	2050	Y	2	1	2	Y	2	2	4	Y	4	2	8	Y	3	3.5	11	Y	3	4	12
	2080		2		2		2		4		4		8		4		14		3		12
2 Service Lines	Present		3		3		3		9		2		4		3		6		3		6
	2050	Y	2	1	2	Y	2	3	6	Y	4	2	8	Y	3	2	6	Y	3	2	6
	2080		2		2		2		6		4		8		4		8		3		6
3 Service Line Cleanouts	Present		3		3		3		9		2		2		3		6		3		6
	2050	Y	2	1	2	Y	2	3	6	Y	4	1	4	Y	3	2	6	Y	3	2	6
	2080		2		2		2		6		4		4		4		8		3		6
4 4 Cell Lagoon System	Present		3		3		3		3		2		4		3		9		3		9
	2050	Y	2	1	2	Y	2	1	2	Y	4	2	8	Y	3	3	9	Y	3	3	9
	2080		2		2		2		2		4		8		4		12		3		9
5 Lagoon Grinder System	Present		3		3		3		3		2		2		3		9		3		6
	2050	Y	2	1	2	Y	2	1	2	Y	4	1	4	Y	3	3	9	Y	3	2	6
	2080		2		2		2		2		4		4		4		12		3		6
6 Sanitary Manholes	Present		3		3		3		3		2		4		3		7.5		3		6
	2050	Y	2	1	2	Y	2	1	2	Y	4	2	8	Y	3	2.5	7.5	Y	3	2	6
	2080		2		2		2		2		4		8		4		10		3		6
7 Communication/ SCADA	Present		3		3		3		3		2		2		3		7.5		3		3
	2050	Y	2	1	2	Y	2	1	2	Y	4	1	4	Y	3	2.5	7.5	Y	3	1	3
	2080		2		2		2		2		4		4		4		10		3		3
8 C Lift Station	Present		3		3		3		3		2		4		3		9		3		6
	2050	Y	2	1	2	Y	2	1	2	Y	4	2	8	Y	3	3	9	Y	3	2	6
	2080		2		2		2		2		4		8		4		12		3		6
9 D Lift Station	Present		3		3		3		3		2		3		3		7.5		3		6
	2050	Y	2	1	2	Y	2	1	2	Y	4	1.5	6	Y	3	2.5	7.5	Y	3	2	6
	2080		2		2		2		2		4		6		4		10		3		6
10 E Lift Station	Present		3		3		3		3		2		3		3		9		3		6
	2050	Y	2	1	2	Y	2	1	2	Y	4	1.5	6	Y	3	3	9	Y	3	2	6
	2080		2		2		2		2		4		6		4		12		3		6
11 F Lift Station	Present		3		3		3		3		2		3		3		7.5		3		6
	2050	Y	2	1	2	Y	2	1	2	Y	4	1.5	6	Y	3	2.5	7.5	Y	3	2	6
	2080		2		2		2		2		4		6		4		10		3		6
12 Sawridge Lift station	Present		3		3		3		3		2		4		3		9		3		9
	2050	Y	2	1	2	Y	2	1	2	Y	4	2	8	Y	3	3	9	Y	3	3	9
	2080		2		2		2		2		4		8		4		12		3		9
13 Operation and Maintenance	Present		3		3		3		7.5		2		3		3		9		3		9
	2050	Y	2	1	2	Y	2	2.5	5	Y	4	1.5	6	Y	3	3	9	Y	3	3	9
	2080		2		2		2		5		4		6		4		12		3		9
14 Public/Customers	Present		3		3		3		9		2		2		3		6		3		6
	2050	Y	2	1	2	Y	2	3	6	Y	4	1	4	Y	3	2	6	Y	3	2	6
	2080		2		2		2		6		4		4		4		8		3		6
15 Emergency Services	Present		3		3		3		3		2		2		3		3		3		3
	2050	Y	2	1	2	Y	2	1	2	Y	4	1	4	Y	3	1	3	Y	3	1	3
	2080		2		2		2		2		4		4		4		4		3		3

Infrastructure Components	Period	Precipitation												Extreme Events							
		Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months				Lightning				Hail Storm			
		Short Duration Rainfall/ Overland Flooding				**Drought**				**Winter Percipitation**				**Lightning**				**Hail**			
Climate Projections	Present	4.2	3			-	3			69	3			-	3			-	3		
	2050	4.3	4			+	4			74	4			+	4			+	4		
	2080	4.6	4			++	4			79	4			+	4			+	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Sanitary Collection Lines and Forcemains	Present		3		11		3		3		3		3		3		3		3		3
	2050	Y	4	3.5	14	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		14		4		4		4		4		4		4		4		4
2 Service Lines	Present		3		11		3		3		3		3		3		3		3		4.5
	2050	Y	4	3.5	14	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1.5	6
	2080		4		14		4		4		4		4		4		4		4		6
3 Service Line Cleanouts	Present		3		9		3		3		3		6		3		3		3		3
	2050	Y	4	3	12	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1	4
	2080		4		12		4		4		4		8		4		4		4		4
4 4 Cell Lagoon System	Present		3		12		3		3		3		3		3		9		3		6
	2050	Y	4	4	16	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	2	8
	2080		4		16		4		4		4		4		4		12		4		8
5 Lagoon Grinder System	Present		3		11		3		3		3		3		3		3		3		3
	2050	Y	4	3.5	14	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		14		4		4		4		4		4		4		4		4
6 Sanitary Manholes	Present		3		9		3		3		3		6		3		3		3		3
	2050	Y	4	3	12	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1	4
	2080		4		12		4		4		4		8		4		4		4		4
7 Communication/ SCADA	Present		3		7.5		3		3		3		3		3		7.5		3		6
	2050	Y	4	2.5	10	Y	4	1	4	Y	4	1	4	Y	4	2.5	10	Y	4	2	8
	2080		4		10		4		4		4		4		4		10		4		8
8 C Lift Station	Present		3		11		3		3		3		3		3		7.5		3		6
	2050	Y	4	3.5	14	Y	4	1	4	Y	4	1	4	Y	4	2.5	10	Y	4	2	8
	2080		4		14		4		4		4		4		4		10		4		8
9 D Lift Station	Present		3		9		3		3		3		3		3		7.5		3		3
	2050	Y	4	3	12	Y	4	1	4	Y	4	1	4	Y	4	2.5	10	Y	4	1	4
	2080		4		12		4		4		4		4		4		10		4		4
10 E Lift Station	Present		3		11		3		3		3		3		3		9		3		6
	2050	Y	4	3.5	14	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	2	8
	2080		4		14		4		4		4		4		4		12		4		8
11 F Lift Station	Present		3		9		3		3		3		3		3		9		3		6
	2050	Y	4	3	12	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	2	8
	2080		4		12		4		4		4		4		4		12		4		8
12 Sawridge Lift station	Present		3		11		3		3		3		3		3		9		3		6
	2050	Y	4	3.5	14	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	2	8
	2080		4		14		4		4		4		4		4		12		4		8
13 Operation and Maintenance	Present		3		12		3		3		3		6		3		9		3		6
	2050	Y	4	4	16	Y	4	1	4	Y	4	2	8	Y	4	3	12	Y	4	2	8
	2080		4		16		4		4		4		8		4		12		4		8
14 Public/Customers	Present		3		9		3		3		3		3		3		7.5		3		3
	2050	Y	4	3	12	Y	4	1	4	Y	4	1	4	Y	4	2.5	10	Y	4	1	4
	2080		4		12		4		4		4		4		4		10		4		4
15 Emergency Services	Present		3		4.5		3		3		3		3		3		4.5		3		3
	2050	Y	4	1.5	6	Y	4	1	4	Y	4	1	4	Y	4	1.5	6	Y	4	1	4
	2080		4		6		4		4		4		4		4		6		4		4

Infrastructure Components	Period	Extreme Events												Shifting Natural Ecoregions			
		High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifting Natural Ecoregions			
		Tornado				**River Flooding**				**Wildfire Smoke**				**Shifting Ecosystem**			
Climate Projections	Present	-	3			-	3			-	3			-	3		
	2050	+	4			+	4			+	4			+	4		
	2080	+	4			++	5			+	4			+	4		
Infrastructure Components		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
1 Sanitary Collection Lines and Forcemains	Present		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		5		5		4		4		4		4
2 Service Lines	Present		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		5		5		4		4		4		4
3 Service Line Cleanouts	Present		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		5		5		4		4		4		4
4 4 Cell Lagoon System	Present		3		9		3		6		3		3		3		3
	2050	Y	4	3	12	Y	4	2	8	Y	4	1	4	Y	4	1	4
	2080		4		12		5		10		4		4		4		4
5 Lagoon Grinder System	Present		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		5		5		4		4		4		4
6 Sanitary Manholes	Present		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		5		5		4		4		4		4
7 Communication/ SCADA	Present		3		6		3		3		3		3		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		8		5		5		4		4		4		4
8 C Lift Station	Present		3		6		3		3		3		3		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		8		5		5		4		4		4		4
9 D Lift Station	Present		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		5		5		4		4		4		4
10 E Lift Station	Present		3		6		3		3		3		3		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		8		5		5		4		4		4		4
11 F Lift Station	Present		3		4.5		3		3		3		3		3		3
	2050	Y	4	1.5	6	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		6		5		5		4		4		4		4
12 Sawridge Lift station	Present		3		9		3		3		3		6		3		3
	2050	Y	4	3	12	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		4		12		5		5		4		8		4		4
13 Operation and Maintenance	Present		3		9		3		6		3		6		3		3
	2050	Y	4	3	12	Y	4	2	8	Y	4	2	8	Y	4	1	4
	2080		4		12		5		10		4		8		4		4
14 Public/Customers	Present		3		3		3		6		3		3		3		3
	2050	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	1	4
	2080		4		4		5		10		4		4		4		4
15 Emergency Services	Present		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		5		5		4		4		4		4

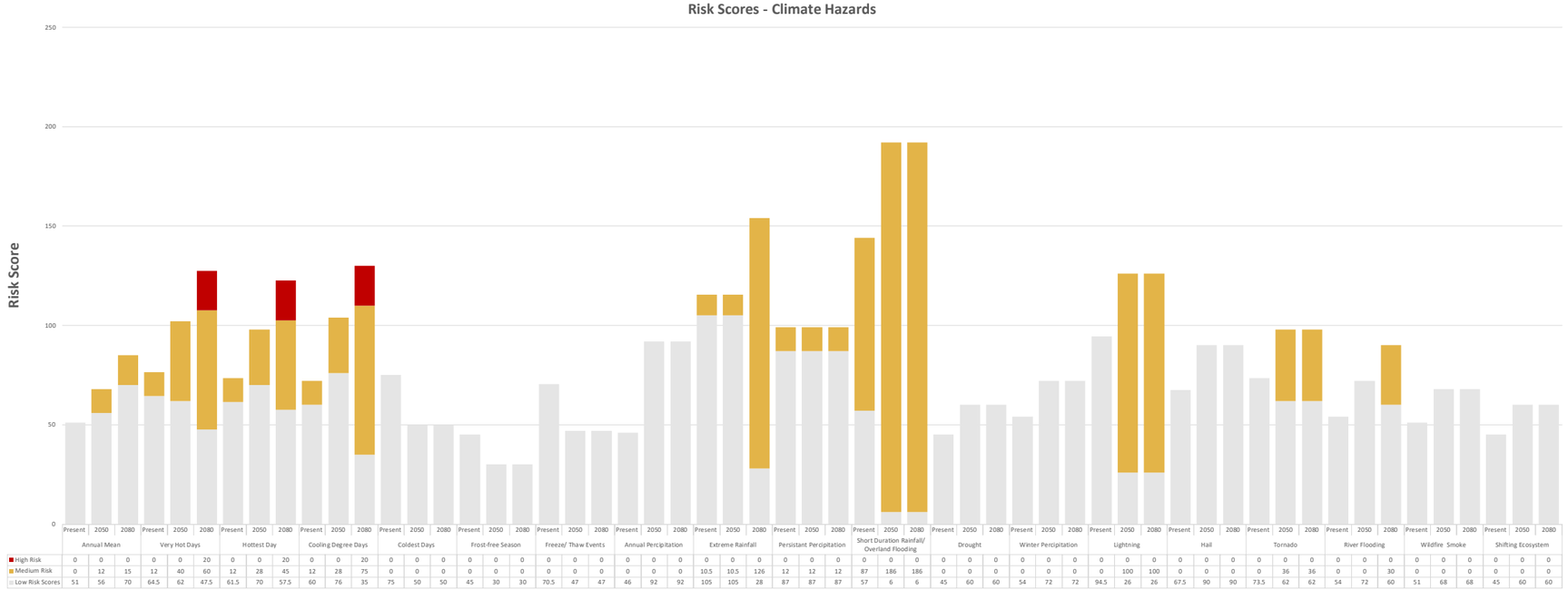
PIEVC Risk Scores
Wastewater Management System

Risk Scores - Assets



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Sanitary Collection Lines and Forcemains			Service Lines			Service Line Cleanouts			4 Cell Lagoon System			Lagoon Grinder System			Sanitary Manholes			Communication/ SCADA			C Lift Station			D Lift Station			E Lift Station			F Lift Station			Sawridge Lift station			Operation and Maintenance			Public/Customers			Emergency Services		
High Risk Score	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk Score	33	36.5	40	10.5	14	14	0	12	12	48	100	77	10.5	14	26	0	12	22	0	20	40	10.5	24	56	0	22	52	10.5	26	58	0	24	54	10.5	62	90	12	64	102	0	22	32	0	0	10
Low Risk Scores	55	66	71	74.5	84	91	83	82	89	85	66	49	62	73	69	74.5	79.5	77	78.5	76.5	65	82	91	69.5	82.5	79.5	59.5	82.5	89	67.5	88.5	85.5	65.5	100	76	61	115.5	89	65	87.5	78	76	62	76	73

Risk Scores - Climate Hazards



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Annual Mean			Very Hot Days			Hottest Day			Cooling Degree Days			Coldest Days			Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation			Short Duration Rainfall/ Overland Flooding			Drought			Winter Percipitation			Lightning			Hail			Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem		
High Risk	0	0	0	0	0	20	0	0	20	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	12	15	12	40	60	12	28	45	12	28	75	0	0	0	0	0	0	0	0	0	0	0	0	10.5	10.5	126	12	12	12	87	186	186	0	0	0	0	0	0	0	100	100	0	0	0	0	36	36	0	0	30	0	0	0	0	0	0
Low Risk Scores	51	56	70	64.5	62	47.5	61.5	70	57.5	60	76	35	75	50	50	45	30	30	70.5	47	47	46	92	92	105	105	28	87	87	87	57	6	6	45	60	60	54	72	72	94.5	26	26	67.5	90	90	73.5	62	62	54	72	60	51	68	68	45	60	60

PIEVC Risk Matrix
Water Distribution System

Consequence Score

0 - No Effect
1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Catastrophic

Climate Parameter

Temperature

Mean Annual Temperature (-C)	Days above +30ºC	Warmest Day Time Temperature	Cooling Degree Days (Degree Days)	# of Days Below -30°C	# Days Without Frost	# Freeze/ Thaw Events
Annual Mean	**Very Hot Days**	**Hotest Day**	**Cooling Degree Days**	**Coldest Day**	**Frost-free Season**	**Freeze/ Thaw Events**

Precipitation

Annual Total Percipitation (mm)	Maximum 1-Day Total Percipitation (mm)	Maximum 5-day Consecutive Percipitation (mm)	Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)	Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)	Total Percipitation in the Winter Months
Annual Percipitation	**Extreme Rainfall**	**Persistant Percipitation**	**Short Duration Rainfall/ Overland Flooding**	**Drought**	**Winter Percipitation**

Extreme Events

Lightning	Hail Storm	High Wind/ Tornado	Flooding	Climate Moisture Deficit
Lightning	**Hail**	**Tornado**	**River Flooding**	**Wildfire Smoke**

Shifting Natural Ecoregions

Shifting Natural Ecoregions
Shifting Ecosystem

Climate Projections		Mean Annual Temperature (-C)				Days above +30ºC				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events			
		Annual Mean				**Very Hot Days**				**Hotest Day**				**Cooling Degree Days**				**Coldest Day**				**Frost-free Season**				**Freeze/ Thaw Events**			
	Present	1.6	3			1	3			29.8	3			23	3			13.1	3			119	3			85.9	3		
	2050	3.7	4			5	4			33.8	4			82	4			6.6	2			142	2			76.9	2		
	2080	5.8	5			13	5			37.5	5			196	5			2.7	2			166	2			69.2	2		

Climate Projections		Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months			
		Annual Percipitation				**Extreme Rainfall**				**Persistant Percipitation**				**Short Duration Rainfall/ Overland Flooding**				**Drought**				**Winter Percipitation**			
	Present	443	2			33	3			60	3			4.2	3			-	3			69	3		
	2050	463	4			34	3			62	3			4.3	4			+	4			74	4		
	2080	482	4			37	4			64	3			4.6	4			++	4			79	4		

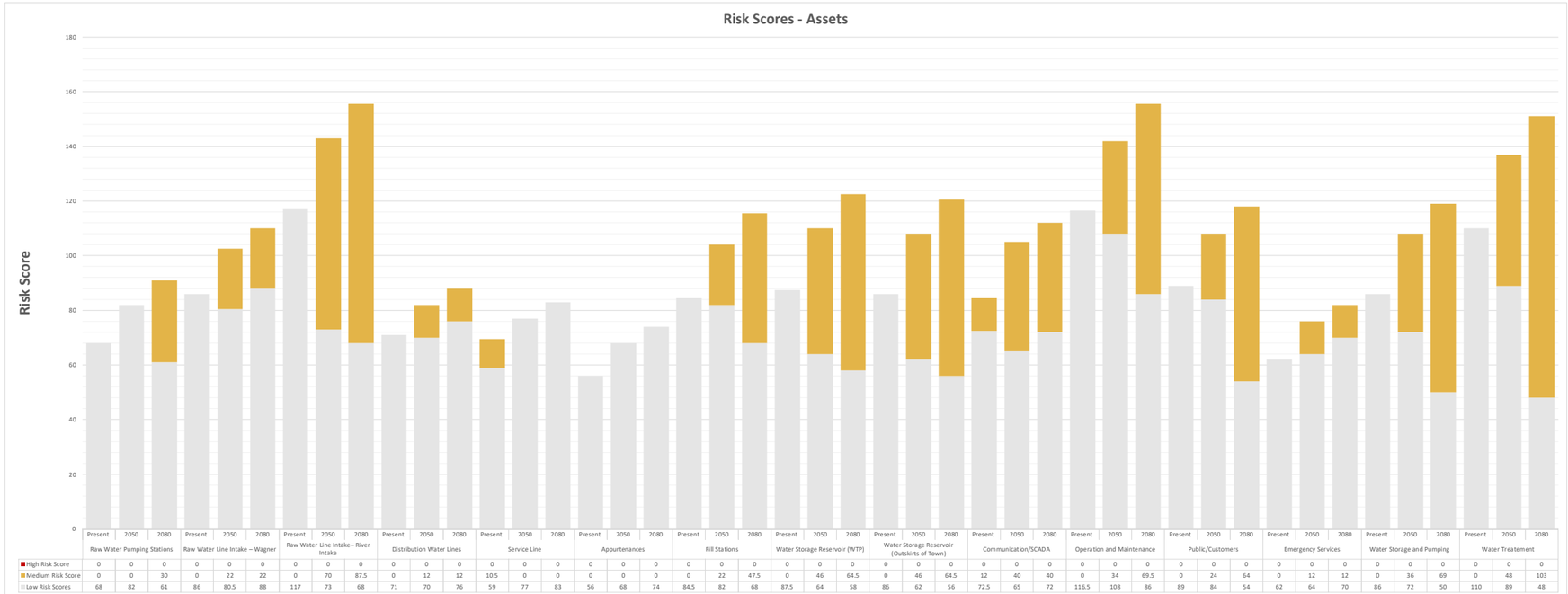
Climate Projections		Lightning				Hail Storm				High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifting Natural Ecoregions			
		Lightning				**Hail**				**Tornado**				**River Flooding**				**Wildfire Smoke**				**Shifting Ecosystem**			
	Present	-	3			-	3				3			-	3			-	3			-	3		
	2050	+	4			+	4				4			+	4			+	4			+	4		
	2080	+	4			+	4				4			++	5			+	4			+	4		

Infrastructure Components		Mean Annual Temperature (-C)				Days above +30ºC				Warmest Day Time Temperature				Cooling Degree Days (Degree Days)				# of Days Below -30°C				# Days Without Frost				# Freeze/ Thaw Events			
		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Raw Water Pumping Stations	Present		3		6		3		6		3		6		3		3		3		3		3		3		3		6
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	2	4
	2080		5		10		5		10		5		10		5		5		2		2		2		2		2		4
Raw Water Line Intake – Wagner	Present		3		4.5		3		4.5		3		4.5		3		3		3		6		3		3		3		7.5
	2050	Y	4	1.5	6	Y	4	1.5	6	Y	4	1.5	6	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	2.5	5
	2080		5		7.5		5		7.5		5		7.5		5		5		2		4		2		2		2		5
Raw Water Line Intake– River Intake	Present		3		7.5		3		4.5		3		4.5		3		3		3		6		3		3		3		7.5
	2050	Y	4	2.5	10	Y	4	1.5	6	Y	4	1.5	6	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	2.5	5
	2080		5		13		5		7.5		5		7.5		5		5		2		4		2		2		2		5
Distribution Water Lines	Present		3		3		3		3		3		3		3		3		3		6		3		3		3		9
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	2	4	Y	2	1	2	Y	2	3	6
	2080		5		5		5		5		5		5		5		5		2		4		2		2		2		6
Service Line	Present		3		3		3		3		3		3		3		3		3		9		3		3		3		11
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	3	6	Y	2	1	2	Y	2	3.5	7
	2080		5		5		5		5		5		5		5		5		2		6		2		2		2		7
Appurtenances	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	1	2
	2080		5		5		5		5		5		5		5		5		2		2		2		2		2		2
Fill Stations	Present		3		6		3		9		3		7.5		3		6		3		6		3		3		3		3
	2050	Y	4	2	8	Y	4	3	12	Y	4	2.5	10	Y	4	2	8	Y	2	2	4	Y	2	1	2	Y	2	1	2
	2080		5		10		5		15		5		13		5		10		2		4		2		2		2		2
Water Storage Reservoir (WTP)	Present		3		6		3		9		3		7.5		3		3		3		3		3		3		3		3
	2050	Y	4	2	8	Y	4	3	12	Y	4	2.5	10	Y	2	1	2	Y	2	1	2	Y	2	1	2	Y	2	1	2
	2080		5		10		5		15		5		13		2		2		2		2		2		2		2		2
Water Storage Reservoir (Outskirts of Town)	Present		3		6		3		9		3		9		3		7.5		3		9		3		3		3		6
	2050	Y	4	2	8	Y	4	3	12	Y	4	3	12	Y	4	2.5	10	Y	2	1	2	Y	2	1	2	Y	2	1	2
	2080		5		10		5		15		5		15		5		13		2		2		2		2		2		2
Communication/SCADA	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	1	2
	2080		5		5		5		5		5		5		5		5		2		2		2		2		2		2
Operation and Maintenance	Present		3		6		3		6		3		9		3		7.5		3		9		3		3		3		6
	2050	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	4	2.5	10	Y	2	3	6	Y	2	1	2	Y	2	2	4
	2080		5		10		5		10		5		15		5		13		2		6		2		2		2		4
Public/Customers	Present		3		6		3		6		3		6		3		6		3		6		3		3		3		6
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	2	2	4	Y	2	1	2	Y	2	2	4
	2080		5		10		5		10		5		10		5		10		2		4		2		2		2		4
Emergency Services	Present		3		3		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	2	1	2	Y	2	1	2	Y	2	1	2
	2080		5		5		5		5		5		5		5		5		2		2		2		2		2		2
Water Storage and Pumping	Present		3		6		3		6		3		9		3		3		3		3		3		3		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	2	1	2	Y	2	1	2	Y	2	1	2
	2080		5		10		5		10		5		10		5		15		2		2		2		2		2		2
Water Treatement	Present		3		6		3		6		3		9		3		3		3		3		3		3		3		6
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	3	12	Y	2	1	2	Y	2	1	2	Y	2	1	2
	2080		5		10		5		10		5		10		5		15		2		2		2		2		2		2

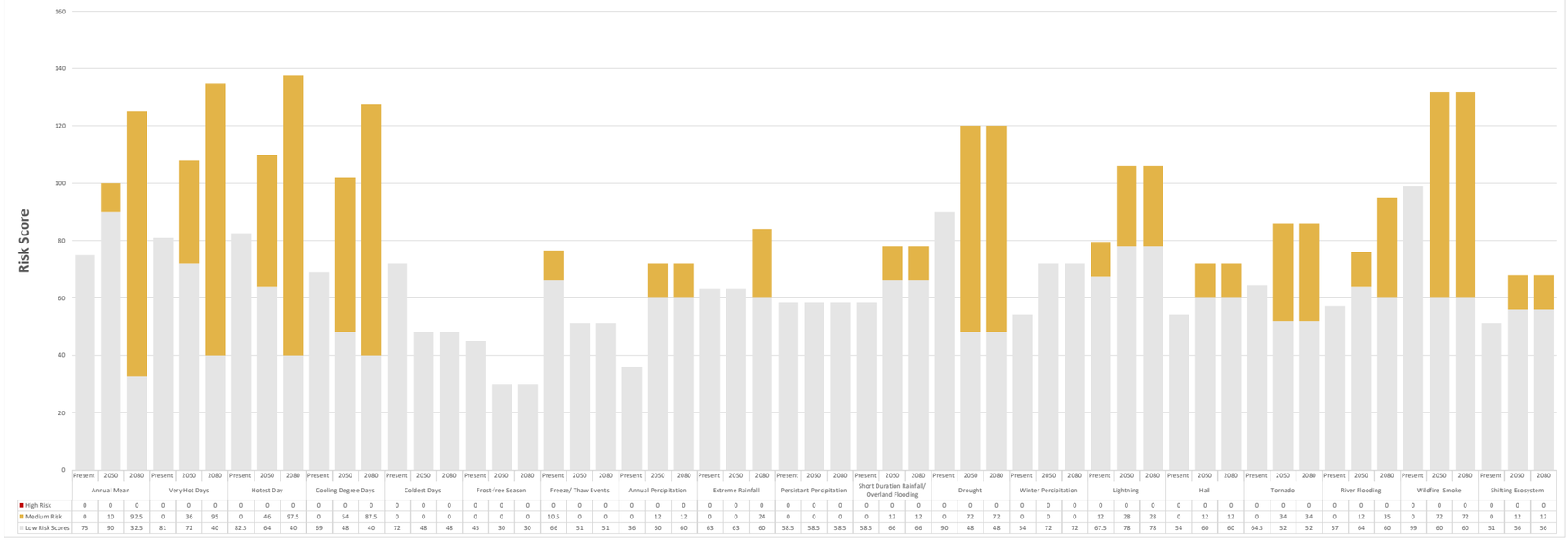
Infrastructure Components		Annual Total Percipitation (mm)				Maximum 1-Day Total Percipitation (mm)				Maximum 5-day Consecutive Percipitation (mm)				Short Duration Rainfall IDF Data: 1:100 year 24 hour event (mm/hr)				Relative Standardized Precipitation Evapotranspiration Index-based Drought Severity Scale for Agricultural Growing Season (May-August)				Total Percipitation in the Winter Months			
		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Raw Water Pumping Stations	Present		2		2		3		3		3		3		4.2		3		-		3		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4.3		4		+		4		3		3
	2080		4		4		4		4		3		3		4.6		4		++		4		3		3
Raw Water Line Intake – Wagner	Present		2		2		3		3		3		4.5		3		3		3		6		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1.5	4.5	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		4		4		4		4		3		4.5		4		4		4		8		4		4
Raw Water Line Intake– River Intake	Present		3		6		3		9		3		9		3		9		3		9		3		3
	2050	Y	4	3	12	Y	3	3	9	Y	3	3	9	Y	4	3	12	Y	4	3	12	Y	4	1	4
	2080		4		12		4		12		3		9		4		12		4		12		4		4
Distribution Water Lines	Present		2		2		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		3		3		4		4		4		4		4		4
Service Line	Present		2		2		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		3		3		4		4		4		4		4		4
Appurtenances	Present		2		2		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		3		3		4		4		4		4		4		4
Fill Stations	Present		2		2		3		3		3		3		3		3		3		6		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	2	8	Y	4	2	8
	2080		4		4		4		4		3		3		4		4		4		8		4		4
Water Storage Reservoir (WTP)	Present		2		2		3		3		3		3		3		3		3		6		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	3	12	Y	4	1	4
	2080		4		4		4		4		3		3		4		4		4		12		4		4
Water Storage Reservoir (Outskirts of Town)	Present		2		2		3		3		3		3		3		3		3		9		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	3	12	Y	4	1	4
	2080		4		4		4		4		3		3		4		4		4		12		4		4
Communication/SCADA	Present		2		2		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	3	2	6	Y	3	1	3	Y	4	1.5	6	Y	4	1	4	Y	4	1	4
	2080		4		4		4		8		3		3		4		6		4		4		4		4
Operation and Maintenance	Present		2		2		3		6		3		6		3		6		3		6		3		3
	2050	Y	4	2	8	Y	3	2	6	Y	3	2	6	Y	4	2	8	Y	4	2	8	Y	4	2	8
	2080		4		8		4		8		3		6		4		8		4		8		4		4
Public/Customers	Present		2		2		3		3		3		3		3		3		3		9		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	3	12	Y	4	1	4
	2080		4		4		4		4		3		3		4		4		4		12		4		4
Emergency Services	Present		2		2		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		3		3		4		4		4		4		4		4
Water Storage and Pumping	Present		2		2		3		3		3		3		3		3		3		9		3		3
	2050	Y	4	1	4	Y	3	1	3	Y	3	1	3	Y	4	1	4	Y	4	3	12	Y	4	1	4
	2080		4		4		4		4		3		3		4		4		4		12		4		4
Water Treatement	Present		2		2		3		3		3		3		3		3		3		9		3		3
	2050	Y	4	1	4	Y	3	3	9	Y	3	2	6	Y	4	2	8	Y	4	3	12	Y	4	2	8
	2080		4		4		4		12		3		6		4		8		4		12		4		4

Infrastructure Components		Lightning				Hail Storm				High Wind/ Tornado				Flooding				Climate Moisture Deficit				Shifting Natural Ecoregions			
		Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R	Y/N	L	C	R
Raw Water Pumping Stations	Present		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		4		4		5		5		4		4		4		4
Raw Water Line Intake – Wagner	Present		3		6		3		3		3		7.5		3		3		3		9		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	2.5	10	Y	4	1	4	Y	4	3	12	Y	4	1	4
	2080		4		8		4		4		4		10		5		5		4		12		4		4
Raw Water Line Intake– River Intake	Present		3		6		3		3		3		3		3		3		3		9		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	3	12	Y	4	2	8	Y	4	1	4
	2080		4		8		4		4		4		4		5		15		4		8		4		4
Distribution Water Lines	Present		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		4		4		5		5		4		4		4		4
Service Line	Present		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		4		4		5		5		4		4		4		4
Appurtenances	Present		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		4		4		5		5		4		4		4		4
Fill Stations	Present		3		3		3		3		3		3		3		3		3		6		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	2	8
	2080		4		4		4		4		4		8		4		4		4		8		4		4
Water Storage Reservoir (WTP)	Present		3		6		3		3		3		3		3		3		3		6		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		4		8		4		4		4		4		5		5		4		8		4		4
Water Storage Reservoir (Outskirts of Town)	Present		3		6		3		3		3		3		3		3		3		6		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	2	8	Y	4	1	4
	2080		4		8		4		4		4		4		5		5		4		8		4		4
Communication/SCADA	Present		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		4		4		5		5		4		4		4		4
Operation and Maintenance	Present		3		6		3		6		3		6		3		6		3		6		3		3
	2050	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	2	8	Y	4	2	8
	2080		4		8		4		8		4		8		5		10		4		12		4		4
Public/Customers	Present		3		6		3		6		3		6		3		6		3		9		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	3	12	Y	4	1	4
	2080		4		8		4		4		4		8		4		4		4		12		4		4
Emergency Services	Present		3		3		3		3		3		3		3		3		3		3		3		3
	2050	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4	Y	4	1	4
	2080		4		4		4		4		4		4		5		5		4		4		4		4
Water Storage and Pumping	Present		3		6		3		3		3		3		3		3		3		9		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	2	8	Y	4	1	4	Y	4	3	12	Y	4	1	4
	2080		4		8		4		4		4		8		4		4		4		12		4		4
Water Treatement	Present		3		6		3		3		3		3		3		3		3		6		3		3
	2050	Y	4	2	8	Y	4	1	4	Y	4	3	12	Y	4	2	8	Y	4	3	12	Y	4	1	4
	2080		4		8		4		4		4		12		5		10		4		8		4		4

PIEVC Risk Scores
Water Distribution System



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Raw Water Pumping Stations			Raw Water Line Intake – Wagner			Raw Water Line Intake– River Intake			Distribution Water Lines			Service Line			Appurtenances			Fill Stations			Water Storage Reservoir (WTP)			Water Storage Reservoir (Outskirts of Town)			Communication/SCADA			Operation and Maintenance			Public/Customers			Emergency Services			Water Storage and Pumping			Water Treatement		
High Risk Score	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk Score	0	0	30	0	22	22	0	70	87.5	0	12	12	10.5	0	0	0	0	0	0	22	47.5	0	46	64.5	0	46	64.5	12	40	40	0	34	69.5	0	24	64	0	12	12	0	36	69	0	48	103
Low Risk Scores	68	82	61	86	80.5	88	117	73	68	71	70	76	59	77	83	56	68	74	84.5	82	68	87.5	64	58	86	62	56	72.5	65	72	116.5	108	86	89	84	54	62	64	70	86	72	50	110	89	48



	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080	Present	2050	2080
	Annual Mean			Very Hot Days			Hotest Day			Cooling Degree Days			Coldest Days			Frost-free Season			Freeze/ Thaw Events			Annual Percipitation			Extreme Rainfall			Persistant Percipitation			Short Duration Rainfall/ Overland Flooding			Drought			Winter Percipitation			Lightning			Hail			Tornado			River Flooding			Wildfire Smoke			Shifting Ecosystem		
High Risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Risk	0	10	92.5	0	36	95	0	46	97.5	0	54	87.5	0	0	0	0	0	0	10.5	0	0	0	12	12	0	0	24	0	0	0	0	12	12	0	72	72	0	0	0	12	28	28	0	12	12	0	34	34	0	12	35	0	72	72	0	12	12
Low Risk Scores	75	90	32.5	81	72	40	82.5	64	40	69	48	40	72	48	48	45	30	30	66	51	51	36	60	60	63	63	60	58.5	58.5	58.5	58.5	66	66	90	48	48	54	72	72	67.5	78	78	54	60	60	64.5	52	52	57	64	60	99	60	60	51	56	56

APPENDIX C – COMMUNITY-WIDE RISK RESULTS

Table C-1 provides the full results of the community-wide climate risk assessment for the Town of Slave Lake, including:

- The impact and description
- The Historic and Future Likelihood Scores
- The **Consequence Score**, as determined at the climate risk assessment workshop
- The **Risk Score**, which is the Future Likelihood Score multiplied by the Consequence Score
- The **Risk Level** between **0 and 25,** whereby scores:
    - between 0 and 9 are considered low risk
    - between 10 and 19 are considered medium risk
    - between 20 and 25 are considered high-risk

Table C-1 Community-Wide Climate Risk Assessment Results

Impact	Description	Historic Likelihood	Future Likelihood	Consequence Score	Risk Score	Risk Level
Loss of / reduced road access	Loss of, or reduced access of roads during winter has economic impacts for businesses that support the resource sector (hotels, restaurants, supply stores, etc.), and recreational users that rely on roads for access.	3	5	5	25	HIGH
Wildfire smoke – air transport disruption	Loss of, or disruption in air transportation due to low visibility from smoke, including patient emergency transport, firefighting.	3	5	4.5	22.5	HIGH
Increased space cooling costs	Increased costs for residents, businesses and the municipality to cool homes and buildings during the summer. Potential need to expand or add HVAC systems to existing homes and buildings	3	5	4	20	HIGH
Wildfire smoke – health impacts	Localized health impacts, particularly on vulnerable populations such as seniors, low income living in poor housing conditions and homeless	3	5	4	20	HIGH
Wildfire smoke – reduced recreation	Reduced outdoor recreation opportunities and quality of life during smoke events	3	5	4	20	HIGH
Creek flooding	1:500-year flood event on Sawridge Creek / Diversion Canal	3	4	4	16	MODERATE
Wildland fire – community evacuation	A wildland urban interface fire occurs, leading to community evacuation, displacement of population, potential health impacts, and impacts to quality of life and livability within the community.	3	4	4	16	MODERATE
Extended heat wave with health impacts	A heat event similar, or worse, than the 2021 heat wave with localized health impacts, particularly on vulnerable populations such as seniors and those with low income and/or housing challenged	3	5	3	15	MODERATE

Impact	Description	Historic Likelihood	Future Likelihood	Consequence Score	Risk Score	Risk Level
Overland flooding	Flood inundation of buildings/properties in low lying areas impacting residents and businesses, clean up and repair costs	3	5	3	15	MODERATE
Increased water consumption	Increased costs for water use for residents, businesses, and municipalities, including financial/economic implications for high water use businesses/sectors.	3	4	3	12	MODERATE
Freezing rainstorm causes injuries	Risk of traffic accidents, including injuries and fatalities, and transport network disruption (including emergency services) due to slippery sidewalks and roads.	3	4	3	12	MODERATE
Wildland fire damages property	A wildland urban interface fire occurs, causing damage to property, homes, businesses, potential power outages, clean up and repair costs	3	4	3	12	MODERATE
High wind event damages property	Damage to property, homes and businesses, repair costs and potential power outages.	3	3	3	9	LOW
Drought damage to trees, gardens and landscaping	Drier summer conditions overall with implications for local natural assets - trees, gardens, landscaping, etc.	3	4	2	8	LOW
Reduced water quality (non-potable)	Reduction in water quality in local water bodies (Lesser Slave Lake?) with potential health (blue-green algae) and recreational (fishing) impacts affecting quality of life	3	4	2	8	LOW
Loss of outdoor winter tourism and recreation opportunities	Reduced quality of life for residents that enjoy winter recreation (Nordic skiing, hockey, ice fishing, snowmobiling, etc.). Potential reduction in winter tourism visitation (hotels, restaurants, events) and impact on local businesses and the economy.	3	5	1.5	7.5	LOW
High wind event with health impacts	Health impacts (injuries/fatalities), particularly on vulnerable populations.	3	3	2	6	LOW
Major hail event with hail stones of 45 mm or greater	Damage to property, homes, businesses (roofing, siding), vehicles, repair costs and potential power outages	3	4	1.5	6	LOW
Freezing rainstorm damages property	Damage to property, homes, businesses (trees, power lines), repair costs and potential power outages	3	4	1.5	6	LOW

APPENDIX D – ADAPTATION ACTIONS

Table D-1: Water Infrastructure and Treatment Recommended Adaptation Actions

No.	Categories of Actions	Recommended Actions	Time Frame
Water Infrastructure and Treatment			
1	Operations and Maintenance	**Persistent Rain/Heavy Rains/River Flooding**: On-going monitoring of turbidity at the intake. **Drought and Extreme Heat/Hot Days above 30ºC**: • On-going monitoring of water quality and quantity at intake, storage, and treatment. • On-going monitoring of equipment operating threshold at the microfiltration water treatment plant. • On-going review of capacity to meet future growth. **Lightning**: On-going monitoring of communication and SCADA equipment. **Other Hazards**: document threshold performance and determine when these issues need to be addressed.	0-5 years
2	Increase Awareness and Education	**All Hazards**: Review with Operations on all safe work policies, plans, and guidelines. Practice and remind staff of all potential climate hazards. Identify changes need to be made.	0-5 years
3	Emergency Services	**All Hazards:** Review ERP with Emergency Services to identify gaps in the emergency response plan with the consideration of climate impacts. Discuss water capacity for firefighting and provide contingency.	0-5 years

Table D-2 Wastewater Infrastructure and Treatment Recommended Adaptation Actions

No.	Categories of Actions	Recommended Actions	Time Frame
Wastewater Infrastructure and Treatment			
1	Conduct Research	**Persistent Rain/Heavy Rains**: On-going tracking of I/I and determine program for addressing the issue. Review the storage and treatment capacity of the lagoon. **Other comment**: potential future upgrades to address nutrient and ecoli removal with filtration and disinfection. Consider how climate hazards can impact this the performance of upgrades. Sawridge Lift station electrical systems will be reviewed for power reliability.	0-5 years
2	Increase Awareness and Education	**All Hazards**: Review with Operations on all safe work policies, plans, and guidelines. Practice and remind staff of all potential climate hazards. Identify changes need to be made.	0-5 years
3	Operations and Maintenance	**Overland Flooding/Persistent Rain:** On-going monitoring of equipment and threshold performance. Upgrades completed at lift station and will continue to monitor performance.	0-5 years

No.	Categories of Actions	Recommended Actions	Time Frame
		Extreme Heat/Hot Days above 30°C: Recent upgrades have been done at the Lagoon System; therefore, on-going monitoring of threshold performances of the new system. Other systems will also be monitor as an on-going basis. **Lightning:** On-going monitoring of all electrical systems and examine threshold performance. Replace and upgrade where necessary. **All Hazards**: Increase replacement budget and proactive planning, where applicable. protection to equipment.	
4	**Emergency Services**	**All Hazards**: Review all safe work policies, plans, and guidelines, and upgrade as required. **Other comments:** Review Emergency Response Plan for power failure scenario and identify contingencies for backup system (eg. additional portable pumps, back up power source).	5-10 years

Table D-3 Stormwater Recommended Adaptation Actions

No.	Categories of Actions	Recommended Actions	Time Frame
Stormwater Management			
1	**Conduct Research**	**River Flooding:** The Town has used AEPA's flood map to inform the Master Drainage Plan. The outcome of this Plan will be implemented. **Overland Flooding/Heavy Rains:** Conduct inundation studies on drainage infrastructure to understand the threshold and identify improvement for flood protection.	0-10 years
2	**Operations and Maintenance**	**Freeze-thaw Cycle:** On-going review and assess of damage of the collection trunk and lateral mains, stormwater manholes and catch basins; increase replacement and repair budget. Increase operations and maintenance budget to address issues. **Hail**: Plan for higher replacement and maintenance cost to unclog stormwater and mains. **River Flooding:** Increase operations and maintenance budget for clean up/water pumping at the river outfalls. **Other comments:** On-going monitoring of storm drainage systems to determine threshold performance. Evaluate backup plans for water pumping.	0-10 years
3	**Update Policies, Plans, Standards, Guidelines and Bylaws**	**All Hazards**: Review, revise or update safe work policies for staff working outdoors.	0-5 years
		River Flooding: Review, revise or upgrade policies, standards for construction within the flood zone.	5-10 years

No.	Categories of Actions	Recommended Actions	Time Frame
4	Increase Awareness and Education	**All Hazards**: Educate the public and internally on the hazards and discuss the expected level of service that the Town would or could provide.	0-10 years
5	Ermegency Services	**Overland Flooding/Heavy Rain Events**: Evaluate backup plans for water pumping.	

Table D-4 Solid Waste Recommended Adaptation Actions

No.	Categories of Actions	Recommended Actions	Time Frame
Solid Waste Management			
1	Conduct Research	**Wildfires**: For landfill sites, review if there is sufficient buffer between the key facility and tree lines for wildfire prevention.	0-5 years
2	Update Policies, Plans, Standards, Guidelines and Bylaws	**Lightning:** Review, update or upgrade policy to include safe work practices in the event of lightning. This will include stop work policy. **High winds:** Review, update or upgrade policy for include safe work practices and stop work policy. **Extreme Heat/Hot Days above 30°C**: Policy is already in place for staff working in extreme heat; however, need to communicate with staff on this policy. **Extreme Heat resulting in Landfill Fires**: Review, update, or upgrade waste handling procedures when encountering hot materials or fire potential materials. **Persistent Rain/Heavy Rains/River Flooding**: Review, update, or upgrade safe work practices on wet surfaces (waste, roads, etc.).	0-5 years
3	Increase Awareness and Education	**All Hazards**: Review with Operations on all safe work policies, plans, and guidelines. Practice and remind staff of all potential climate hazards. Identify changes need to be made. **Extreme Heat/Hot Days above 30°C**: Educate the public about not disposing e-waste in landfills, but rather at the designated transfer sites.	0-5 years
4	Operations and Maintenance	**Extreme Heat/Hot Days above 30°C:** Check that AC in equipment for proper operation. **Extreme Cold/Cold Days below -30°C**: Paying more attention to repeated starting of equipment in cold temperatures to avoid damage. **Persistent Rain/Heavy Rains/River Flooding**: Reschedule and plan out alternate haul routes if rain result in washouts or flooding in roadways. **Wildfire Smoke**: Plan for higher maintenance and replacement costs for equipment. Re-routing and plan out alternate haul routes. Reschedule waste collection to avoid health impacts on staff. **High Winds**: Ensure daily cover is placed and wind fences are used around the active face.	0-5 years

No.	Categories of Actions	Recommended Actions	Time Frame
		Hail: Plan for higher replacement and maintenance cost.	5-10 years
5	**Build New or Upgrade Existing Infrastructure**	**All Hazards**: During equipment replacement, review features that would be robust to reduce damage. **Wildfire/High Winds/Hail/Flood**: Plan for landfill cell capacity to receive more waste. Staging waste material (e.g. ash, soil, damaged building structures, tree trunks/branches) no suitable for cell disposal separately from existing waste.	5-10 years
6	**Emergency Management**	**Wildfire**: Collaborate with the Town that would coordinate effort on a waste disposal plan during recovery period.	0-5 years

Table D-5 Roads, Signals, Signs, Sidewalks, Public Parking Recommended Adaptation Actions

No.	Categories of Actions	Recommended Actions	Time Frame
Roads, Signals, Signs, Sidewalks, Public Parking			
1	**Conduct Research**	**Extreme Heat/Hot Days above 30°C**: Investigate asphalt mix design for hotter temperatures. **Freeze-thaw cycle**: Investigate/research on subgrade integrity and drainage requirements to reduce the impacts from freeze-thaw cycle. **Overland Flooding/Heavy Rain Events:** Work with Alberta Transportation to improve drainage downstream of the Town.	0-5 years
2	**Update Policies, Plans, Standards, Guidelines and Bylaws**	**Extreme Heat/Hot Days above 30°C**: Review, update or upgrade policy for asphalt road bans where applicable. Review, update or upgrade policy for include safe work practices and stop work policy. **Wildfire Smoke:** Review, update or upgrade policy for include safe work practices and stop work policy. **Lightning:** Review, update or upgrade policy for include safe work practices and stop work policy.	0-5 years
3	**Operations and Maintenance**	**Freeze-thaw cycle**: On-going repairs of sidewalks and roads; increase operations and maintenance budget. **Extreme Heat/Hot Days above 30°C:** Increase operations and maintenance budget for resurfacing and repairs. On-going monitoring of signal and lighting equipment and identify threshold performance. Specific to rail crossings, inspect/observe for sparks generated from hot rails. **Persistent Rain/Heavy Rains/River Flooding**: Increase in operations and maintenance budget for repairs and reconstruction of roads from washouts or flooding in roadways. **Winter Precipitation:** Increase operations and maintenance of snow removal; repairing wear and tear on the roads from blading.	0-10 years

No.	Categories of Actions	Recommended Actions	Time Frame
4	**Build New or Upgrade Existing Infrastructure**	**Overland flood/Heavy Rain Events:** Improve drainage to prevent future ponding and flooding resulting in wash outs of subgrade damage/deterioration.	
5	**Emergency Management**	**High Winds:** Obstruction removal to enable emergency vehicles to pass through. Review and update emergency routes.	0-5 years

Table D-6 Parks, Trails, Sports Field Recommended Adaptation Actions

No.	Categories of Actions	Recommended Actions	Time Frame
Parks, Trails, Sports Fields			
1	**Conduct Research**	**Drought:** Assess irrigation systems during prolonged dry periods for water reuse opportunities and review drought resilient seed mix and plant type for transition. Review including a drinking water station for public access at Fournier Place Park.	0-5 years
2	**Update Policies, Plans, Standards, Guidelines and Bylaws**	**Extreme Heat/Hot Days above 30°C**: Review, update or upgrade policy for include safe work practices and stop work policy. **Drought:** Review and update water conservation policies.	0-5 years
3	**Increase Awareness and Education**	**All Hazards:** Inform the public about hazards as they arise and potential shifts in service levels during climate events. Clear information on amenities closures.	0-10 years
4	**Operations and Maintenance**	**Hail, Overland Flooding, Lightning and High Winds:** Increase debris management, replacement and repair.	0-10 years

Table D-7 Fleet Recommended Adaptation Actions

No.	Categories of Actions	Recommended Actions	Time Frame
Fleet			

No.	Categories of Actions	Recommended Actions	Time Frame
1	**Update Policies, Plans, Standards, Guidelines and Bylaws**	**Drought:** Review and update policies to include increased maintenance during climate event. **Extreme Heat/ Hot Days above 30°C:** Review and update policies to include increased maintenance during climate event. **Hail:** Establish protocols for fleet evaluation, protection, and restoration. **Wildfire smoke:** Develop safe work policy for staff when working under this condition. Evaluate existing policies, identify deficiencies, and address equipment needs and shortages.	0-5 years
2	**Operations and Maintenance**	**Hail/High Winds/Wildfire Smoke:** Adjust operations to prevent working during adverse climate events. Check the weather forecast before commencing work. **All Hazards:** Increase operation and maintenance budget as needed. **Winter Precipitation:** Increase snow removal efforts and the maintenance of snow removal equipment.	0-5 years

Table D-8 Buildings Recommended Adaptation Actions

No.	Categories of Actions	Recommended Actions	Time Frame
Buildings – Multi-Recreation Centre			
1	**Conduct Research**	**Extreme Heat/Hot Days above 30°C**: Monitor performance of HVAC system under extreme heat conditions and replace units with better ratings if needed. Review additional sunshades, window films to cut down UV rays.	0-5 years
2	**Update Policies, Plans, Standards, Guidelines and Bylaws**	**Winter Precipitation**: Review snow clearing policies and update snow thickness threshold criteria based on the changing climate. **Extreme Heat/Hot Days above 30°C**: Review, update, or upgrade policy for include safe work practices and stop work policy. **Hail/High Winds/ Wildfire and Smoke:** Monitor frequency of adverse climate events. Review and upgrade insurance policies as required.	0-5 years

No.	Categories of Actions	Recommended Actions	Time Frame
3	Operations and Maintenance	**Extreme Heat/Hot Days above 30°C:** Increase allocation of funds for operation and maintenance (O&M) and the replacement of landscaping affected by die-offs. **Wildfire Smoke:** Monitor filtration systems and replace as needed. **Winter Precipitation:** Monitor roof conditions, including deterioration due to snow build-up. Adjust operation and maintenance (O&M) frequency as necessary. **All Hazards:** Increase maintenance frequency and replacement as required.	0-10 years
4	Emergency Services	**Wildfire:** Review emergency response plan for temporary facility that can be provided to shelters and displaced residents. **Other Comments:** Review contingency for backup power and identify where required.	0 – 5 years
Buildings – GOA Building			
1	Conduct Research	**Extreme Heat/Hot Days above 30°C**: Monitor performance of HVAC system under extreme heat conditions and replace units with better ratings if needed. Review additional sunshades, window films to cut down UV rays.	0-5 years
2	Operations and Maintenance	**Extreme Heat/Hot Days above 30°C:** Increase allocation of funds for operation and maintenance (O&M) and the replacement of landscaping affected by die-offs. **Wildfire Smoke:** Monitor filtration systems and replace as needed. **Winter Precipitation:** Monitor roof conditions, including deterioration due to snow build-up. Adjust operation and maintenance (O&M) frequency as necessary. **Overland flooding:** Ensure pumps are available for pumping water, if necessary.	0-5 years
3	Emergency Services	**Other Comments:** Review contingency for backup power and identify where required.	0 – 5 years
Buildings – SLIP Storage Garage			
1	Operations and Maintenance	**Extreme Heat/Hot Days above 30°C:** Monitor performance of building HVAC system. Increase maintenance frequency as needed. **Wildfire Smoke:** Monitor filtration systems and replace as needed.	0-5 years
Buildings – Wildfire Legacy Building			

No.	Categories of Actions	Recommended Actions	Time Frame
1	Conduct Research	**Extreme Heat/Hot Days above 30°C**: Building does not have air conditioning. Monitor building temperature during hot temperatures. Review additional sunshades, window films to cut down UV rays, and other sustainable solutions.	0-5 years
2	Update Policies, Plans, Standards, Guidelines and Bylaws	**Extreme Heat/Hot Days above 30°C**: Assess and monitor HVAC system performance and increase maintenance or replace as needed. Review work from home policy where applicable.	0-10 years
3	Increase Awareness and Education	**Extreme Heat/Hot Days above 30°C:** Inform users on how the building was designed to operate to prevent artificially heating up building.	0-5 years
4	Emergency Services	**Other Comments:** This building is designated as evacuation centre – ensure the building is in good working conditions to house the displaced residents. Evaluate the capacity to receive evacuees. Assess backup power requirement and provide if necessary.	0-10 years

Table D-8 Airport Recommended Adaptation Actions

No.	Categories of Actions	Recommended Actions	Time Frame
Airport			
1	Conduct Research	**Extreme Heat/Hot Days above 30°C**: Review how other airports are managing the asphalt surfaces hot temperatures. **Flooding/Shoreline Protection:** Conduct studies to understand the potential risk to the run way or property due to observed eroding shoreline. Identify risk reduction such as shoreline protection/hard armoring, and/or enforce buffer zones between the shoreline and the airfield. **Overland Flooding/Heavy Rainfall:** Assess drainage and ponding areas to determine upgrades to promote better drainage.	0-5 years
2	Operations and Maintenance	**Extreme Heat/Hot Days above 30°C:** Monitor the current performance of runways and taxiways and assess performance thresholds of paved surfaces. Plan for more frequent surface replacements. Replace surface with more durable material. Monitor the performance of cooling systems in buildings and replace, when necessary. **Overland Flooding/Heavy Rainfall:** More frequent pumping may be required, if required. **Wildfire Smoke:** Plan ahead for smoke and visibility issue. Plan to relocate planes to reduce risk of grounding air crafts. **Winter Precipitation:** Plan for more frequent snow removal.	0-10 years

No.	Categories of Actions	Recommended Actions	Time Frame
		Lightning: Monitor and check that the airfield lighting is in proper working condition and protected from lightning surges or strikes. **Hail/High Winds:** More frequent replacement of damaged lightings and signs to be budgeted.	