Memo

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To: Milpitas Energy and Environmental Sustainability Commission

From: Elaine Marshall (Deputy Public Works Director)

Subject: City of Milpitas Climate Action Plan Update, Climate Change Vulnerability Assessment Executive Summary

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EXECUTIVE SUMMARY

Global climate change is projected to exacerbate the impacts of certain hazards that the City of Milpitas (City) is already exposed to under current conditions. These hazards include indirect impacts from wildfires and effects on air quality, extreme heat, heat wave events, long-term drought, and flooding. Climate change is also projected to create a new set of hazards that the city has not experienced historically (e.g., sea-level rise). While many of these hazards have existed historically for the city, the frequency and intensity of these hazards will increase as a result of global climate change. As part of the City's Climate Action Plan Update (CAP Update) effort, the city is developing a Community Preparedness and Resiliency Plan (Resiliency Plan) that will serve to identify the primary and secondary physical impacts of climate change that will most directly affect the city and include a set of adaptation strategies to improve resiliency. The first portion of the Resiliency Plan includes a climate change vulnerability assessment and serves to inform development of adaptation strategies by analyzing the city's exposure to existing hazards, sensitivity to these hazards, potential climate-related impacts from these hazards, and the City's existing capacity to prepare and adapt for these impacts, known as adaptive capacity. The second portion of the Resiliency Plan includes a set of adaptation strategies to reduce the impacts from climate-related hazards and increase the city's overall resilience to climate change. This executive summary serves to highlight results of the vulnerability assessment portion of the Resiliency Plan.

1.1 VULNERABILITY ASSESSMENT

The vulnerability assessment prepared for the City identifies the city's exposure to effects of climate change, the sensitivity of population groups and community assets to climate change effects, potential climate change impacts, and the City's existing adaptive capacity to address those impacts. Potential impacts are ranked through a method known as "vulnerability scoring," which is the recommended method identified in the 2020 update of the California Adaptation Planning Guide (APG 2.0), prepared by the California Natural Resources Agency.

Though the precise extent of future climate change effects is uncertain, historical climate data and forecasted GHG emissions can be used to project climate change effects for the mid-century (2035–2064) and late-century (2065–2099) periods. To assess potential effects from climate change, the APG 2.0 recommends using Cal-Adapt, a tool developed by California Energy Commission and the University of California, Berkeley's Geospatial Innovation Facility that uses global climate simulation model data to identify how climate change might affect various geographies in California.

Cal-Adapt addresses the uncertainty in future GHG emissions by using Representative Concentration Pathways (RCPs) developed by the Intergovernmental Panel on Climate Change. These RCPs depict two different future emissions

scenarios. RCP 4.5 represents a low-emissions scenario in which greenhouse gas (GHG) emissions continue to rise through 2040 and then decrease to below 1990 levels by the end of the century. RCP 8.5 represents a high-emissions scenario, or business-as-usual scenario, where GHG emissions continue to increase through the end of the century. Because the future global GHG emissions trends are uncertain, a discussion of both emissions scenarios and their associated impacts is included in the vulnerability assessment.

EXPOSURE

Increased Temperatures

Annual Maximum Temperature

The city is expected to experience a warming trend, along with variable precipitation patterns over the next several decades. These changes are because of a global increase in GHG emissions which cause infrared radiation to be trapped in the atmosphere and result in a warming effect. The average maximum temperatures in the city are expected to increase by approximately 1.5 to 4.3 degrees Fahrenheit (°F) from a historical average of 68 °F by the end of the 21st century, depending on a low- or high-emissions scenario, as shown in Table VA-1. Though this increase may appear to be minimal, the slightest change in the Earth's atmospheric systems will cause cascading effects to other dependent systems.

Table VA-1 Changes in Annual Average Temperature in the City of Milpitas

Average Annual Temperature (°F)	Historic Average Annual Temperature (1961-1990)	Low-Emissions Scenario (RCP 4.5)		High-Emissions Scenario (RCP 8.5)	
		Mid-Century (2035–2064)	End of Century (2065–2099)	Mid-Century (2035–2064)	End of Century (2065–2099)
Maximum Temperature	68.3	72.8	73.6	73.7	77.1
Minimum Temperature	48.2	52.4	53.3	53.5	56.9

Notes: °F = degrees Fahrenheit, RCP = Representative Concentration Pathway

Source: CEC 2021

Annual Extreme Heat Events and Heat Waves

Based on historical data, the extreme heat day threshold in the city is defined as 91.6 °F. Historically, the city has experienced an average of four extreme heat days per year. As a result of rising annual average maximum temperatures from climate change, the city is projected to experience 20 to 38 extreme heat days by late-century depending on the emissions scenario. As a result of climate forcings, the city is projected to experience 1.4 to 3.2 heat waves (four consecutive extreme heat days) per year by the end of the century as compared to a historic average of less than one annually. Additionally, the length of heat waves is projected to extend for longer periods as compared to the city's historical average of two days. By the end of the century, heat waves could last between 4.7 to 7.2 days under a low- and high-emissions scenario, respectively.

Changes in Precipitation Patterns

In addition to increasing temperatures, climate models predict that precipitation volatility will intensify in future years in the city. Dry years are likely to become even drier, while wet years will become even wetter in the next several decades. For instance, annual precipitation in is expected to increase by 2.1 to 3.8 inches by end of century depending on the future emissions scenario, as shown in Table VA-2.

Table VA-2 Changes in Annual Average Precipitation in the City of Milpitas

Average Annual Precipitation	Historic Average Annual Temperature (1961-1990)	Low-Emissions Scenario (RCP 4.5)		High-Emissions Scenario (RCP 8.5)	
		Mid-Century (2035–2064)	End of Century (2065–2099)	Mid-Century (2035–2064)	End of Century (2065–2099)
Average Annual Precipitation	15.6	17.6	17.7	17.8	19.4

Notes: °F = degrees Fahrenheit, RCP = Representative Concentration Pathway

Source: CEC 2021

Notably, this increase in precipitation will likely occur from stronger and more short-lived precipitation events that may lead to localized flooding if local flooding infrastructure is overwhelmed. Historically, the city has experienced an average of one extreme precipitation events per year. For the city, this would be 1.05 inches of rainfall over a 2-day period. The city is expected to experience two to three extreme precipitation events per year by the end of the century under low- and high-emissions scenarios.

Sea-Level Rise

The city will also experience some vulnerability to sea-level rise. By the end of the century, the northwest boundary of the city along Coyote Bypass and Coyote Creek could be inundated by 4 to 6 feet of water from storm surge coupled with a 100-year flood event.

Human Health Hazards

Climate change is closely linked to human health and public safety. In addition to direct impacts on public health and safety from drought, extreme heat, flooding, landslides, wildfires, and sea-level rise, several indirect impacts threaten public health and safety. Some of the potential impacts on public health are listed below.

- Climate change could increase disparities in vulnerable communities, which are often already experiencing disproportionate pollution burden and environmental impacts.
- Extreme heat and wildfires can worsen air quality.
- Climate influences the spread of vector-borne infectious diseases.
- Climate-induced extreme weather events can affect mental health.

SENSITIVITIES AND IMPACTS

As these climate change-related hazards become more frequent and intense over time, threats to population groups and physical assets will increase. Key populations and assets identified for the city are organized into the following overarching categories: populations, transportation, energy, water, and emergency services.

Population Impacts

Population groups include the city's Environmental Justice Communities (EJCs), low-income persons, communities of color, linguistically isolated persons, senior citizens, persons with disabilities, and persons experiencing homelessness. Populations and assets that are most vulnerable to climate change effects were determined by evaluating current adaptation efforts in place.

While the city is not directly at high risk of the structural damage of catastrophic wildfire, the city's residences will be subject to indirect effects. The frequency and intensity of wildfires is expected to increase across the state due to the combination of fluctuations in wet and dry years coupled with century's long wildfire suppression tactics. These fires will result in the generation of air pollution. Wildfire smoke is composed of carbon monoxide; particulate matter; hydrocarbons; oxides of nitrogen and reactive organic gases, which combine to produce ground-level ozone; and

thousands of other compounds. The city's residents will be, and have already been, exposed to high concentrations of air pollution borne out of wildfire activity. For example, during the 2020 fire season, air quality in the Bay Area was rated the worst globally due to three major wildfire complexes in the East Bay, North Bay, and southern Peninsula burning concurrently. In addition to this human health hazard, the city's residents will also feel the pressure of Planned Safety Power Shutoff (PSPS) events by the Pacific Gas and Electric Company (PG&E) to minimize the risk of wildfire ignition from operation of the electrical grid.

Energy Impacts

Impacts on electricity resources from climate hazards can include stress and physical damage to the electricity generation, transmission, and distribution system. Extended drought periods may reduce the available surface water supply to generate hydroelectric power. Transmission facilities face increasing climate-related risks as a result of the increased frequency of wildfires, severe wind, and extreme heat events. Extreme heat events result in increased energy demand for cooling in residential and commercial buildings and can add stress to transmission systems, resulting in brownouts and damage to electricity infrastructure. Wildfires, flooding, landslides, and severe wind can cause physical damage to or destruction of transmission facilities. Due to a number of recent large-scale wildfires caused by electricity infrastructure exposed to extreme heat and high-winds, utilities have begun to implement PSPS events to avoid wildfire risk. PSPS events can result in communities experiencing no electricity for multiple days and prevent individuals from using prescribed medications and treatments that rely on electricity or refrigeration. PSPS events can also result in impacts to commerce and economic losses, particularly for businesses that rely on refrigeration such as grocery stores. Hazards such as landslides, wildfires, and flooding can also affect underground natural gas pipelines, exposing and/or damaging these pipelines. The damage resulting from climate change-related hazards on electricity and natural gas infrastructure can have a greater impact on disadvantaged populations, particularly communities that are low-income or individuals who have limited mobility or lack the financial means to make repairs to their property.

Stormwater/Flood Impacts

Extreme precipitation events that occur with more intensity over a short period could cause flooding, limiting access to or damage to water facilities. Snowmelt in Northern California is also projected to occur earlier in the year, causing springtime recharge to occur before the warmer and drier summer months when it is most needed. Reduced snowpack also reduces water captured for storage in surface water bodies and aquifers for potable drinking water. As a result, the city and region could experience decreased water supply during the spring and summer months, which are also projected to become drier and warmer as a result of climate change.

The city's stormwater infrastructure was developed to maintain flood control while directing water northwest to the San Francisco Bay. The system consists of conveyance pipelines known as municipal separate stormwater systems which discharge stormwater and non-stormwater. This system is based on historical trends in flooding, which may be altered from a changing climate. It is foreseeable that without additional bolstering, flood-related infrastructure may be degraded or overwhelmed.

Wastewater facilities are also threatened by climate change. Flooding during larger storm events increases the risk of sewage and hazardous and/or toxic materials being released into waterways if wastewater treatment plants are inundated, storage tanks are damaged, or pipelines are damaged. Wastewater treatment facilities in Santa Clara County have already been impacted during large storms that have caused sewage spills. During these flooding-induced spill events, there is an increased risk of contracting water-borne illnesses and fungal infections. The City does not treat wastewater; it pumps its wastewater through two force mains to the San Jose/Santa Clara Regional Wastewater Facility, also known as the RWF, which is located approximately 0.25-miles directly west of the northwestern boundary of the city. Though the City may not have jurisdiction over operations of the RWF, flooding-related incidences may be widespread and could affect city residents.

Transportation impacts

The public roadway system including bicycle and pedestrian facilities in the city are operated and maintained by the City's Public Works Department. One of the major effects of climate change on the city's roadway system is the reduction in the overall lifespan of transportation infrastructure (OPR, CEC, and CNRA 2018). Increased average temperatures and extreme heat can result in the degradation of pavement and could impact roadway, trail, and bicycle facilities. Increases in flooding-related hazards along roadways can result in increased erosion of subbase materials underneath roadways and further roadway degradation. This impact can result in secondary impacts on roadway facilities, including disruptions to vehicular access and commerce between cities. Roadway degradation overtime can increase the risk to human safety by damaging or blocking evacuation routes and limiting access for emergency responders.

Emergency Services Impacts

Emergency operation facilities are locations that provide essential products and services to the public, particularly during emergency events. Emergency operation facilities can include hospitals or other health care facilities, police and fire stations, and communication facilities. An increase in climate-related hazard event emergencies will place more demand on emergency operation facilities, emergency personnel, related infrastructure, and equipment in the city. The city is anticipated to experience more frequent hazard events including coastal storms, erosion, floods, wildfire impacts, drought, and extreme weather. Floods may threaten transportation routes, emergency services stations, and evacuation routes, which could hinder emergency response times during such events. PSPS events may place pressure on emergency generators, which are used during brownouts to power police, fire, and the emergency operations center.

Additionally, physical damage to emergency services facilities could occur as a result of climate change-related hazards. Within the city, four fire stations and one police station are located in within either the 100- or 500-year flood zones. Schools often serve as community resource centers and evacuation centers during emergencies. Based on the GIS analysis in the County of Santa Clara's *Operational Area Hazard Mitigation Plan*, 12 schools are located within Federal Emergency Management Agency floodplain designations. Notification of emergencies and evacuation instructions rely upon functioning communication facilities such as AM/FM antennas, broadband radio transmitter, and television transmitters. Communications facilities within the city may be affected by increases in frequency and severity of flooding events and extreme heat events.

1.2 FINDINGS

The vulnerability scoring summarized in the vulnerability assessment allows the City to understand which populations and assets will potentially face the greatest threats and where there are gaps in current planning efforts. The City will use the scoring process to determine where the potential impact is generally severe and existing adaptive capacity is low, and identified the following priority climate impacts:

- Increased human health risk (i.e., poor air quality, infectious diseases, mental health concerns, limited access to potable water, heat-related illnesses);
- Lack of electricity during PSPS events implemented during times of high wildfire risk;
- Increased impacts to evacuation routes and emergency access during hazard events;
- Increased demand for electricity generation during extreme heat events;
- Increased system stress during droughts and extreme heat events; and
- Increased exposure of emergency responders to heat-related sickness, smoke inhalation, and infectious disease.

These priority climate impacts drive the formation and development of the most applicable and necessary climate adaptation policies that the City will implement in the near future to improve its resiliency to a changing climate.

REFERENCES

California Energy Commission. 2021. Cal-Adapt Annual Averages Tool. Available: https://cal-adapt.org/tools/annual-averages/ Accessed December 28, 2020.

California Governor's Office of Planning and Research, California Energy Commission, and California Natural Resources Agency. 2018. *California's Fourth Climate Change Assessment Report: San Francisco Bay Area Region Report.* Available: https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-005_SanFranciscoBayArea_ADA.pdf. Accessed January 29, 2021.