Public Health Department Representative

Role: You represent the Muggytown public health department. Your charge is protecting the city's public health, community health education, and ensuring equitable distribution of health services. You are responsible for air quality monitoring and the alert system.

You are on the City Park Board and like to spend weekends there with your family. You live in the Riverwalk area.

Goals:

- Protect resident's public health and avoid heat-related casualties, especially among vulnerable populations
- Educate the community to make healthy decisions under heat stress or in emergency flooding situations
- Prepare for and mitigate the increased disease, vectors, and pest risk following increased heat and precipitation events

Transportation Planner

Role: You represent the interests of the Muggytown Transportation Agency (MTA), which maintains the town's roads and public transit, including buses, and light rail. You are actively involved in the city's planning initiatives and deeply care about sustainability and resilience.

You were in a car accident two years and are disabled from those injuries. You live along the Riverwalk area. You take your child to Daycare everyday by car.

Goals:

- Manage and plan reliable transportation options for the city
- Advocate with your agency's leadership to take the changing climate into account

Emergency Management and Preparedness Director

Role: You represent the Muggytown Emergency Preparedness and Response Department. Your role is to ensure the city is prepared for all emergency scenarios and has response plans in place. You rely on the city's police and fire departments for rescue and relief efforts.

Your brother was recently hospitalized following a heat-related illness while working on the farm outside of the city. You feel the worker-safety regulations aren't strong enough. You live in the houses near the city's Dam.

Goals:

- Operate effective response activities in the event of an emergency
- Assist the Public Health Department in diarrheal and vector-borne disease outbreak response following flood events
- Provide education to communities for emergency preparedness

Community Advocate

Role: You represent the underserved communities of Muggytown, especially those displaced through gentrification. In past extreme heat incidents and floods, you've noticed that low-income residents are affected first and worst; following the last flood, there was a large outbreak of diarrheal disease among the low-income communities due to direct and indirect exposure to floodwaters.

You are actively involved in the city's black churches network and regularly represent the faith-based community at city meetings. You live in the Townhomes.

Goals:

- Advocate for the prioritization of underserved populations in adaptation interventions, e.g., tree planting in low-income neighborhoods, and ensure that adaptation interventions don't further burden low-income residents
- Prevent displacement of residents in face of new development

(Transportation Planner, cont.)

Primary Concerns:
Transportation Hub, Light Rail, Roadways

Secondary Concerns:
Riverwalk, Daycare

Populations of Concern:
Residents, Businesses, Public transit riders, Cyclists, Disabled individuals

(Public Health, cont.)

Primary Concerns:
Hospital, Senior Center, Daycare, Emergency Services

Secondary Concerns:
Park/Green Space, Water Treatment Plant, Wastewater Treatment Plant, Power Plant, Riverwalk

Populations of Concern:
Elderly, Babies, Chronically / acutely ill, Outdoor workers, Pregnant women

(Community Advocate, cont.)

Primary Concerns:
Roadways, Public Housing

Populations of Concern:
Low-income residents, Homeless individuals, Faith-based community

(Emergency, cont.)

Primary Concerns:
Emergency Services, Public buildings, Hospital, Roadways, Residential areas, Wastewater Treatment Plant, Water Treatment Plant

Secondary Concerns:
Farm, Dam

Populations of Concern:
Residents, First responders

Mayor

Role: You are the Mayor of Muggytown, elected for your holistic view of the city's future, and an interest in balancing social, economic, and environmental concerns. You represent all residential and business interests. You have a primary interest in the business future of the city with the goal of attracting two new Fortune 500 companies to the city in the next 5 years.

Your family has worked in the city's agriculture industry for 50 years and your father still operates a local farm. You reside in Burns Estates.

Goals:

- Balance the competing interests of residents and businesses
- Advance adaptation to climate risk as much as possible but within the city's budgetary constraints

Water and Wastewater Treatment Plant Manager

Role: You represent the interests of the Water and Wastewater Enterprise (WWE). It is your role to ensure that the WWE achieves long-term sustainability while remaining fiscally responsible. You are concerned about combined sewer overflows which have occurred several times in the last few years during heavy rainfall events. This causes raw sewage to enter the local waterways, creating serious health concerns.

You immigrated to the U.S. from Mexico 15 years ago. Spanish is your first language. You live on the edge of the rural area of the city.

Goals:

- Ensure reliability of water and wastewater infrastructure
- Avoid rate hikes for customers related to increased maintenance costs

Burns Estates Neighborhood Association President

Role: You represent the interests of the Burns Estates community in which you reside, along the coast of Muggytown. You are concerned about the health of the waterways and the property value of the Burns Estates homes.

You are a proud parent of two children and serve on the school board. Your 6 year old attends the School every day and your 8 month old goes to the local Daycare. You live in Burns Estates.

Goals:

- Protect the coastline that protects your neighborhood from flooding
- Encourage economic opportunities for your neighborhood and surrounding natural areas

Power Plant General Manager

Role: You represent the interests of Energy Enterprise, the local electric utility. It is your role to provide electricity to the city, ensure the utility achieves long-term sustainability, and remain fiscally responsible.

Your mother recently moved into the city's Senior Center. She is receiving excellent care and you visit her regularly. You live downtown near the stadium and love attending games there.

Goals:

- Provide uninterrupted electricity services to the city
- Avoid rate hikes for customers resulting from unnecessary regulations or system upgrades
- Strive to achieve the state Renewable Portfolio standard

(Water and WWTP Manager, cont.)

Primary Concerns:
Wastewater Treatment Plant, Water Treatment Plant

Secondary Concerns:
Rural Area

Populations of Concern:
Residents, Businesses, New Americans

(Mayor, cont.)

Primary Concerns:
Businesses

Secondary Concerns:
Rural Area, Burns Estates

Populations of Concern:
Businesses, Tourism

(Power Plant GM, cont.)

Primary Concerns:
Power Plant, Hospital, Light Rail

Secondary Concerns:
Senior Center, Stadium

Populations of Concern:
Residents, Businesses

(Burns Estates, cont.)

Primary Concerns:
Burns Estates, Waterways, Park/Green Space

Secondary Concerns:
School, Daycare, Burns Estates

Populations of Concern:
High-income residents, Fisherpeople, Wetland tourists

Environmental Organization President

Role: You represent "Friends of the River", a small environmental organization focused on protecting the river and other natural features, e.g., Wetlands. As the city has developed, natural areas and habitat have shrunk. You also have a personal interest in the potential wind/solar site and think renewable energy should be key in the city's planning efforts.

Your niece, who lives with you, was recently diagnosed with asthma, triggered during high heat and humidity days, and has to go to the local hospital regularly to develop her new treatment plan.

Goals:

- Ensure that the city prioritizes nature as it continues to develop
- Encourage more renewables to protect health and the environment

Chamber of Commerce Representative

Role: You represent the Chamber of Commerce. Your primary interests are the economic development of the city and maintaining the small business community you've helped build in the city center and Riverwalk. You have seen an uptick in business since the building of the stadium.

You own a kayak rental shop right on the city's Riverwalk, which has been doing well with the city's thriving natural, historic, and economic resources located along the river. You live in the houses near the city's Dam.

Goals:

- Attract new businesses to the area and grow the city's economy
- Support tourism to the city particularly along the river

Blank for printing purposes

Blank for printing purposes

(Chamber of Commerce, cont.)

Primary Concerns:
Businesses, Riverwalk, River, Stadium

Secondary Concerns:
Dam

Populations of Concern:
Businesses, Tourists, Developers

(Environmental Organization, cont.)

Primary Concerns:
Townhomes, Public buildings,
Parks/Green space

Secondary Concerns:
Light rail, Roadways, Hospital, Future
Solar/Wind Farm Location

Populations of Concern:
Low-income residents

Blank for printing purposes

Blank for printing purposes

Muggytown Description

- ***History:*** *Originally settled in the late 1700s as a farming community. Early 1900s boom with additional farmland development and rapid urbanization.*
- ***Economy:*** *Still has a strong agriculture focus, but it has also expanded to include technology, tourism, and healthcare industries.*
- ***Demographics:*** *Current population of 422,000; 50% White, 30% Black or African American, 14% Hispanic or Latino, 5% Asian American, and 1% Native American; 20% of residents are below the poverty line and the city has a homeless population of roughly 4,000 people.*

SCENARIO

Scenario #1

Climate Condition Baseline

Water level rise: Existing coastline

Precipitation: 45 inches annually

Extreme heat: Currently experiences 15 extreme heat days (above 95°F) per year and 1 heat wave event per summer lasting 3 days; Average annual temperature is 60°F

Planning horizon: 2030

Water level rise: 12” by 2030

Precipitation: 20% increase in precipitation intensity

Extreme heat: 14 more extreme heat days than current day; 1 more heat wave event that lasts 1 more day than currently; 2°F increase in average annual temperature

SCENARIO

Scenario #2

Climate Condition Baseline

Water level rise: Existing coastline

Precipitation: 45 inches annually

Extreme heat: Currently experiences 15 extreme heat days (above 95°F) per year and 1 heat wave event per summer lasting 3 days; Average annual temperature is 60°F

Planning horizon: 2050

Water level rise: 24” by 2050

Precipitation: 20% increase in precipitation intensity

Extreme heat: 28 more extreme heat days than current day; 2 more heat wave events that lasts 2 more days than currently; 4°F increase in average annual temperature

SCENARIO

Scenario #3

Climate Condition Baseline

Water level rise: Existing coastline

Precipitation: 45 inches annually

Extreme heat: Currently experiences 15 extreme heat days (above 95°F) per year and 1 heat wave event per summer lasting 3 days; Average annual temperature is 60°F

Planning horizon: 2050

Water level rise: 12” by 2050

Precipitation: No change

Extreme heat: 28 more extreme heat days than current day; 1 more heat wave event that lasts 1 more day than currently; 3°F increase in average annual temperature

Scenario #1 *(cont.)*

Additional Estimated Annual Impacts of Projected Scenario:

- 2,000 homes would be impacted by flooding
- 30 people will fall ill to heat stress or heat stroke, 10 will be admitted to the emergency room, 2 will pass away
- 5% increase in roadway maintenance budget and labor
- 50 agricultural workers will lose their jobs due to profit loss by the local farms

Muggytown Description (continued)

- ***Urban Landscape:*** *Downtown area is made up of many impervious surfaces such as roadways, buildings, and parking lots.*
- ***Historical Heat:*** *In the past decade, the city has experienced three heat waves lasting longer than three days which have claimed at least 10 lives. Major urban heat island issues.*
- ***Historical Flooding:*** *Areas along river and along the coasts have experienced damaging precipitation-related and water level rise flooding several times in the past decade.*

Scenario #3 *(cont.)*

Additional Estimated Annual Impacts of Projected Scenario:

- 750 homes would be impacted by flooding
- 30 people will fall ill to heat stress or heat stroke, 10 will be admitted to the emergency room, 2 will pass away
- 8% increase in roadway maintenance budget and labor
- 30 agricultural workers will lose their jobs due to profit loss by the local farms

Scenario #2 *(cont.)*

Additional Estimated Annual Impacts of Projected Scenario:

- 3,000 homes would be impacted by flooding
- 60 people will fall ill to heat stress or heat stroke, 20 will be admitted to the emergency room, 4 will pass away
- 10% increase in roadway maintenance budget and labor
- 75 agricultural workers will lose their jobs due to profit loss by the local farms

BUDGET

Total City Budget Card 1

$14 million

BUDGET

Total City Budget Card 2

$11 million

BUDGET

Total City Budget Card 3

$8 million

BUDGET

Total City Budget Card 4

$5 million

Blank for printing purposes

Blank for printing purposes

Blank for printing purposes

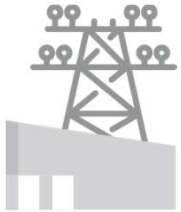
Blank for printing purposes

ASSET

Power Plant

The power plant was built in 1987 and becomes overwhelmed, i.e., experiences brown- and black-outs, by the city's electricity demand during extreme heat. Also, plant components themselves are increasingly stressed because of increases in average annual temperature.

During last year's heat wave, roughly 30% of the population was without power for several days. Two years ago, the heavy river flooding made the power plant inoperable.



ASSET

Water Treatment Plant

Originally built in the 1930s, the town's main water treatment plant supplies drinking water. It was renovated in 1970 to accommodate growing demand.

The plant is located along the waterfront and recent floods damaged several key components. The water pipes occasionally lose pressure in some parts of the city when water use is high for cooling needs and increased irrigation demands. During last year's flood, the city was put under a boil water advisory for several days. This created a major inconvenience, as well as increased risks for diarrheal disease amongst vulnerable populations.

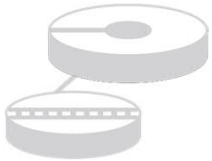
Maximum capacity is 20 MGD.

ASSET

Wastewater Treatment Plant

Originally built in the 1950s, the town's main treatment plant was renovated in 1975 to accommodate a growing population. It has not been upgraded since, and in the salty ocean air, significant components are degrading. It is located very close to the coast, and king tide flooding causes backflow in outfalls and extreme precipitation causes combined sewer overflows. If the wastewater treatment plant gets flooded there is a high risk that raw untreated sewage would flow into the city's waterways leading to elevated public health risks across the region.

Maximum capacity is 17 MGD, with an average dry weather flow of 4 MGD.



ASSET

Senior Center

The senior center, built in 1995, is home to some of the city's oldest residents. The center is frequently visited by the younger generation with the recent addition of a youth center to the grounds. The center's expansive grassy lawn is the location for many community gatherings and festivals.

The center does not have a back-up generator, and during heat and flood-related blackouts in the past four years, the power went out for several hours, and five residents became ill with heat exhaustion, and one sadly passed away.

Water Treatment Plant (cont.)

Adaptive Capacity

Increasing the capacity of the water plant is costly and difficult to implement.

Similarly, elevating electrical components of a water treatment plant is difficult and expensive.

Power Plant (cont.)

Adaptive Capacity

It is relatively expensive to increase the capacity of the existing plant or expand the power grid to provide redundancy in the event that the power plant capacity is exceeded.

It is also expensive to relocate or elevate a power plant.

Senior Center (cont.)

Adaptive Capacity

It is relatively easy and inexpensive to install and maintain back-up generators that enable continued power supply in the event of a blackout.

Planting more trees around the Center's grassy lawn will help provide shade and reduce temperatures on the property.

Making the building more energy efficient will help keep the building cooler. Low effort measures include ensuring windows are properly sealed, ensuring existing insulation is adequate, and applying a cool roof coating to the flat roof.

Wastewater Treatment Plant (cont.)

Adaptive Capacity

It is difficult and expensive to increase the capacity of a wastewater treatment system and replace critical components with new, non-corroding materials.

Options to prevent backflow are relatively inexpensive and easy to install.

ASSET

Hospital

The hospital was originally built in 1980 and was expanded and upgraded in 2010. This is the only medical center in town.

Patients and staff are reliant on electrical power for daily operations, electrified medical equipment, and elevators. These have failed during blackouts caused by extreme heat and flooding events.

Diesel-powered back-up generators in the basement provide power during outages and are stocked with fuel to power the hospital for eight hours. During a river flood six years ago, the basement flooded; power was maintained, but the generators were damaged and would have been inoperable had the power failed.

ASSET

Emergency Services (Police / Fire)

The Emergency Services (Police / Fire) buildings were built in 1980 and haven't undergone any major renovations.

The building was flooded six years ago, causing major delays in police and fire response times across the city. The flood also caused the police to lose irreplaceable case evidence that was stored in the basement.

Flooding also increases the emergency calls and water-rescue needs of the police and firemen in the city. This puts a strain on these individuals and the city's resources.

ASSET

Daycare Center

The Daycare Center was built in 1999. This is the primary location for infant to four year old child care for during the work day. There is a large recreational area outside including a large asphalt playground, picnic area, and tots soft play area.

The building was flooded five years ago and was inoperable during that time. Following that flood, the center suffered from mold in the walls, thought to have led to illness for several of the young children.

ASSET

Public Housing – The Townhomes

The Townhomes were built in the 1970s to provide public housing for low income renters. There are 300 2-bedroom units. The majority of residents are of color and / or immigrants. There is a community center for all residents located within the Townhomes.

The homes do not have central air conditioning and have poor insulation. During a recent 2-day heat wave, the homes became so hot that renters filed complaints against the city. Also, the water piping infrastructure is outdated and failing, therefore during and following flooding or low-pressure events people sometimes contract diarrheal illnesses and suffer from dehydration.

Emergency Services (cont.)

Adaptive Capacity

It is relatively expensive to relocate or elevate the building.

It would be inexpensive to move police evidence rooms out of the basement to avoid further flooding damage.

Hospital (cont.)

Adaptive Capacity

While not currently needed, it would be relatively easy to add additional back-up generators to the system. It would be relatively expensive, however, for the hospital to develop a micro-grid as an alternative to the generators. The addition of an on-site solar panel array and battery storage will provide alternative power source in case of an outage and provide redundancy to existing generators.

It is relatively inexpensive to elevate generators, assuming there is space available on upper floors that are above projected flood levels.

Public Housing (cont.)

Adaptive Capacity

Installing central air conditioning or insulation would be a moderately expensive modification. Providing window AC units to residents would be a relatively easy and cheap modification. Changing the pitched roof to a cool roof (light colored or reflective) would be a relatively expensive modification as the roof would need to be replaced/ retrofitted.

The homes could be made more energy efficient by properly sealing the windows and ensuring existing insulation is adequate.

Daycare (cont.)

Adaptive Capacity

Temporary flood protection measures, e.g., sandbags, are inexpensive and easy to install prior to a coming flood. Permanently elevating a building is expensive and difficult to implement.

A day care center would be relatively easy to relocate to a different building, out of the flood plain.

ASSET

High-income Housing – Burns Estates

The Burns Estates is an area with 100 new luxury homes. The homes are new and have central air conditioning, and most have back-up generators. The homes are located near the coast and, while they haven't flooded previously, residents have concerns about water level rise.

ASSET

Transportation Hub

The transportation hub, built in 2000, supports the town's growing commuter and tourist economy. The transportation hub serves as a central location for personal vehicle, bus, and light rail passengers to pass between the various forms of transportation. The transportation hub has significantly reduced traffic on the main roads and helped the town maintain its laid-back lifestyle.

The hub is located near the river and becomes inoperable when flooded. Three years ago, the hub was unusable for several days while the flood waters rose and subsided.

ASSET

Light Rail Transit Line

The light rail transit line opened in 2005 and was built to support the town's growing tourist economy. Visitors and locals take the light rail throughout town. The light rail system has the highest ridership among the city's public transit options. During past heat waves, there was some minor buckling of one stretch of rail line, and communication boxes lost power, leading to massive system delays. In addition, past riverine flooding made the tracks inoperable until flood waters subsided. Luckily, none of the electrical equipment was affected.

ASSET

Roadways

The roadways in town are essential for efficient passage through and around the city.

The city's roadways are deteriorating – suffering from potholes, cracking, and foundation scouring because of extreme heat, and flooding caused by water level rise and heavy precipitation. There has been a 15% increase in maintenance costs as compared to 25 years ago (accounting for inflation).

Transportation Hub (cont.)

Adaptive Capacity

Elevating buildings is expensive and difficult to implement. Relocating the hub would also be costly due to the fixed rail line passing through it. Erecting flood barriers would be moderately expensive.

High Income Housing (cont.)

Adaptive Capacity

Elevating homes and roadways for community access is expensive and difficult to implement. Temporary flood protection, e.g., sandbags, is easy to install and often inexpensive.

The addition of an on-site solar panel array and battery storage will lessen the possibility of a power outage, provide redundancy to the home with generators, and would be moderately expensive to install.

Roadways (cont.)

Adaptive Capacity

Cool pavement techniques (e.g., high-reflectivity coating) require a similar amount of effort and cost as normal road repairs. Installation of shade trees is relatively inexpensive and are easy to place.

Elevating or rerouting roadways is costly and difficult to implement, as would be most river defense measures.

Light Rail (cont.)

Adaptive Capacity

Elevating tracks to be above flood levels, or relocating / rerouting tracks is difficult due to right of way acquisition and is expensive.

Modifying established rail lines by, for example, re-laying track with expansion joints is relatively difficult and expensive.

Painting the rails white so they absorb less heat and are therefore less likely to buckle is relatively inexpensive.

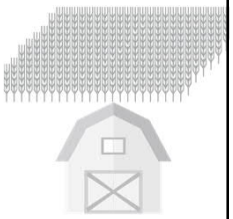
Adding a backup power supply, such as solar, battery storage, and/or generators, is generally an easy modification to the system in the event of a grid outage, but given the size of the system, would be expensive.

ASSET

Rural Area

The rural area on the outskirts of the city has many farms producing the area's primary cash crop, wheat. The farms' irrigation comes from the river. The farm has experienced crop losses during years with multiple high heat days. However, as the average temperature has increased, the growing season has lengthened allowing for more harvests.

In addition, there are several days every year that farm workers are not able to work because of the heat. This shuts down production, with negative impacts for the workers, farm owners and the city's economy. This and other farms employ 6% of the city, with many of the workers receiving minimum wage and living in public housing.



ASSET

Park/Green Space/Trees

The city's parks are filled with shade trees and are the place to go for locals to play ball on expansive athletic fields or enjoy a picnic on a summer evening.

The city has been focused on increasing the city's tree canopy, but still has a ways to go. The city spends a large amount of their park maintenance budget on battling flood-related erosion in city parks. The park floods in some areas during storm surge events, killing some trees from salt-water exposure. During heat waves, park usage declines even though the park is cooler than built-up parts of the city, as it's still too hot to be comfortable.

ASSET

Public School

The city paid for the construction of a brand new, state of the art, K-12 grade school in 2016. It is built just inland behind the athletic fields, looking out over the bay.

There haven't been any flood or heat-related impacts yet, but the school does not have back-up power, and is located quite close to the bay.

ASSET

Riverwalk

The historic Riverwalk area has recently undergone additional renovations to attract tourists and locals to enjoy the scenery along the river and shop at local businesses. Several historical buildings have been redeveloped for commercial and industrial uses along the Riverwalk. There is also a group of riverfront residences that are located along the Riverwalk, this is a mix of new and historical homes that primarily house the city's middle class.

Activity increases during heatwaves because the area is substantially cooler than other parts of the city. The area has experienced riverine flooding in the past.

Park/Green Space /Trees (cont.)

Adaptive Capacity

Engineering for flood and erosion control can be expensive to implement, whether through green or grey infrastructure. Relocating the park or elevating parts of it would also be difficult and costly.

It will be difficult to lower park temperatures through increased tree planting because the canopy is already relatively dense. Changing existing flora to native or drought-tolerant landscaping is a relatively easy modification to keep water usage reasonable.

Replanting the park with salt tolerant species could help with the die off resulting from regular seawater exposure. This would be expensive, as the park does not currently have many of these.

Planting more native or drought-tolerant tree species is a relatively easy modification to keep the trees alive and reduce water consumption.

Rural Area(cont.)

Adaptive Capacity

Changing to a strain of wheat better suited to hotter conditions is a relatively easy and accessible modification.

Providing shaded areas (tree canopy or other shade structure), as well as adding additional water breaks to the work day, are relatively easy ways to protect worker health and safety.

Riverwalk (cont.)

Adaptive Capacity

Although the Riverwalk area has some of the coolest temperatures in the city, there is room to expand the canopy cover in the long-term by planting additional trees with minimal cost or effort from the city.

School (cont.)

Adaptive Capacity

The addition of an on-site solar panel array and battery storage will lessen the possibility of a power outage and would be moderately expensive to install. A less environmentally friendly, but cheaper option would be the addition of a backup generator.

Temporary flood protection, e.g., sandbags, is often easy to install and inexpensive. Permanent flood protection is expensive and difficult to implement for an area as large as the school. Relocating the brand-new school is not politically feasible.

ASSET

Stadium

The stadium is where the locals love to go cheer on the Muggytown Marlins. This brings tourists and economic opportunity to the city every time there is a big game. The area is surrounded by multiple parking lots and no trees.

Being located in a heat island, the stadium often gets very hot during afternoon games for both the players and attendees. The players have to regularly stop the game for water breaks, extending game times. Also last year, five game attendees have had to leave a game due to falling ill from heat exhaustion.

ASSET

Wetlands

The wetlands provide a productive habitat for the city's diverse plant and animal populations. The wetlands, while small, do help buffer the city from floods due to their ability to absorb water and release it slowly.

The wetlands offer additional tourism opportunities with regular tours to see the area's rare bald eagle population.

ASSET

Dam

The city's dam is located in the river on the west side of town. It was constructed in the 1960s to regulate water flow for backup water supply.

In heavy rainfall events, the dam can help protect downriver sections of the city from flooding, but areas above the dam are quite susceptible to flooding. Heavy rains last year sent water spilling over the dam, spurring fears that it could collapse, but it held strong.

Blank for printing purposes

Wetlands (cont.)

Adaptive Capacity

Wetland protection, restoration, enhancement and creation can be incorporated into land use planning and management decisions to manage stormwater, floodwater conveyance, and storm surges. This would be moderately expensive.

Stadium (cont.)

Adaptive Capacity

Moving or elevating the stadium would be very costly due to the size.

Cool pavement techniques (e.g., high-reflectivity coating) require a bit more effort and cost than normal maintenance.

Establishment of shaded areas with tree canopy cover, as well as adding additional water breaks to the sporting events, are relatively easy ways to protect athlete and worker health and safety.

Blank for printing purposes

Dam (cont.)

Adaptive Capacity

Re-enforcing the dam can increase its stability and resistance to a breach. This would be expensive to complete.