Recycling, Reuse, and Waste Reduction Plan

Introduction and Background

As part of the FAA Modernization and Reform Act, signed into law in 2012, airports are required to address issues related to solid waste recycling in airport master plans. As such, the purpose of this Appendix to the Colorado Springs Airport Master Plan Update, is to review the Airport's current recycling, reuse, and waste program and suggest ways to reduce waste and improve recycling and reuse at the Airport.

The Airport is located at the foot of the Rocky Mountains' front range and in the southeast side of the City of Colorado Springs within El Paso County. The Airport is publicly owned by the City of Colorado Springs and open to the public. It provides the City, the County, and other communities within the region access to aviation facilities that accommodate a range of activities and users, including commercial airline service, general aviation operations, and military operations. A detailed airport description and background is available in the Airport Master Plan Update, completed in 2022.

Airport Operations

In 2020, the Airport supported 121,807 operations and 363,843 enplanements. Prior to 2008, COS consistently enplaned over 1 million annual passengers, and since that time, the economy and population have grown significantly. It is anticipated that operations and enplanements will fully recover from the effects of the COVID-19 Pandemic and continue to grow (as discussed in Chapter 3 of the Airport Master Plan Update).

The Airport is served by five different scheduled commercial air carriers: American, Delta, Frontier, Southwest, and United. Although airlines at COS have had wide and varied levels of enplanements, the expected population growth and the fundamental strength of the regional economy should drive air carriers to continue increasing their levels of passenger service.

Over the past 20 years, the share of air carrier operations at COS has generally declined, but stabilized at the 10 to 11 percent level over the past seven years (with the exception of 2020). Since 2015, the share of air taxi operations at COS has slowly grown from 8 percent to approximately 11 percent of total operations. Similarly, the share of general aviation operations at COS has steadily grown from 45 to 60 percent of total operations over the past six years.

Based Aircraft

As reported in the Airport's Master Record (FAA Form 5010), the number of based aircraft at COS has fluctuated, but generally increased over the past 20 years (see **Table 3-8** in **Chapter 3**). In 2021, the Airport was home to 251 based aircraft, most of which are single-engine aircraft. It is anticipated that the number of based aircraft will continue to increase.

Military Aircraft

The Airport plays a major role in military operations: as the host to Peterson Space Force Base (PSFB), and its proximity to other installations in the region. Peterson SFB occupies the northern portion of the airfield near Runway 13-31 and Taxiway B. Additional PSFB facilities are located east of Runway 17L-35R, but do not have airfield access.

It is expected that military operations at COS will return to pre-pandemic levels in the upcoming years. Given this likelihood, and the on-going interest by PSFB to expand into areas surrounding the Airport, the share of future military operations at COS are estimated to increase to 27 percent by the year 2041.

Existing Waste Sources

Identifying and analyzing an airport's sources of waste can be complicated. There are numerous groups, agreements, operational styles, and collection/disposal processes that play into the overall generation of waste at a given airport. The primary sources of waste at COS are listed below:

1. Airport Administration Offices
2. Airlines
3. Passengers
4. Rental Car Service Centers
5. Airfield Maintenance Shop
6. General Aviation Tenants
7. Airfield

The sources of waste, per the FAA's September 30, 2014 memo, can be further classified by the degree of control the Airport has on the generation and disposal of waste. There are three levels of control

1. Areas where the Airport has direct control of waste management (public space, office space, terminal building, airfield). The Airport controls these areas and can directly implement recycling, reuse, and waste reduction programs.

2. Areas where the Airport has no direct control but can influence waste management (tenants). These areas are owned by the Airport and leased out to tenants. The Airport can recommend that recycling, reuse, and waste reduction programs be used and can such include language in the tenant contracts but cannot realistically control what is done.

3. Areas where the Airport has no control or influence over waste management. These are areas the Airport neither owns nor leases (none of which are included in this chapter).

Table 0-1 lists the identified areas of waste generation, what waste is generated, how it is collected, amount of waste generated, and the Airport's level of control.

Table 0-1 Waste Generation

Area	Waste Generated	Collection process	Amount of Waste Generated	Control
Source 1: FBO's	Oil and batteries	Recycling vendors (i.e., Thermofluids, etc.)		No Direct Control but can Influence
Source 2: Hangars	Oil, batters, and tires	Picked up by or taken to recycling vendors		No Direct Control but can Influence
Source 3: Other GA Tenants	Scrap metal	Picked up by or taken to recycling vendors		No Direct Control but can Influence
Source 4: Terminal Area	Plastic bottles and containers, paper, paper cardboard, aluminum and other metal cans, glass bottles, lamps, electronics, batteries	Picked up by or taken to recycling vendors (Waste Mgmt., Veolia)	23.67 tons a month (8-month period) includes airlines/cargo	No Direct Control but can Influence
Source 5: Airlines/Cargo	Paper, plastic, aluminum	Airport recycling dumpster		No Direct Control but can Influence
Source 6: Rental Cars	Batteries, oil, oil filters, tires	Picked up by or taken to recycling vendors		No Direct Control but can Influence
Source 7: PSFB	Operate separately not tracked.			NA
Source 8: Airfield Maintenance	Used oil, antifreeze, solvents, lamps, batteries, electronic equipment, scrap metal	Picked up by or taken to recycling vendors		Direct Control
Source 7: Airfield				Direct Control

Source: Colorado Springs Airport, 2022

Waste Management Program

Airport Recycling

The Airport, as part of the City of Colorado Springs, contract with Waste Management to handle all waste, including recyclables. The current waste management program offers a single-stream recycling program where all recyclables can be commingled into one container and do not need to be separated. The Airport collects the following materials:

- Plastic bottles (#'s 1-7)
- Aluminum cans, foil and bakeware (with no food residue)
- Steel and tin cans (soup can, veggie cans, coffee cans, etc.)
- Corrugated cardboard
- Paperboard, office paper, magazines, and newspaper
- Glass bottles and jars

Recyclables are collected by the airport maintenance staff via recycling receptacles placed throughout the airport terminal. Recycling is then placed in one of three exterior dumpsters. These dumpsters are also available for tenants if they wish to recycle. Waste Management is contracted to remove the collected recyclables from the Airport.

The extent of recycling that occurs at COS is limited largely to the Airport itself. However, the Facilities/Attendant Supervisor is in the process of implementing new processes such as additional signage, education, and other opportunities to encourage participation and buy-in from tenants.

The location of recycling containers and dumpsters are depicted on **Figure 0-1**.

Figure 0-1: Recycling Locations

Source: COS
Note: Areas noted in green indicate recycling of tires, batteries, etc. and not necessarily commingled recycling

City and County Recycling

El Paso County and the City of Colorado Springs provide numerous recycling programs and opportunities for residents. The El Paso County Recycling Directory, found on the El Paso County website, offers instructions to properly recycle, compost, and dispose of household and commercial waste materials. The Directory also lists drop off-locations, times, and contact information for special material disposal.

Some unique City programs offer porcelain recycling or a free mulch pile to residents. The mulch program allows the city to dispose of excess mulch that residents can use at no extra cost. The porcelain recycling service accepts all types of fixtures including toilets, urinals, sinks, etc. The fixtures are recycled and reused as road base material in local paving operations.

Waste Audit

FAA guidance on the preparation of Airport Recycling, Reuse, and Waste Reduction Plans recommends that a waste audit be completed to identify and document the source, composition, and baseline quantity of airport waste streams. The Airport participated in a waste and recycling survey in 2017 as part of the Airport Cooperative Research Program's (ACRP) "Airport Waste and Recycling Practices" study[1]. Information from the study provides a baseline of recycling and waste management at COS.

Airport Recycling

The ACRP survey requested information regarding the type and quantity of recyclable material generated at COS. COS reported that approximately 172 tons of waste were generated by the Airport, of which approximately 4.9 percent was recycled. In 2021, as of November 9th, the Airport had generated approximately 252 tons of trash and 9 tons of recyclable material; approximately 3.51 percent of waste was diverted from landfills. It is likely that once the year is complete, the amount of diverted waste will be similar to what was reported in the ACRP survey.

The Airport reported that they recycle the following materials:

- Plastic bottles and containers
- Paper
- Paper cardboard
- Aluminum and other metal cans
- Glass bottles,
- Lamps
- Electronics
- Batteries

[1] "Airport Waste Management and Recycling Practices." Transportation Research Board, Airport Cooperative Research Program, 2018, https://www.trb.org/Publications/Blurbs/177866.aspx.

It was also reported that food waste was not recycled.

In addition to the recycled materials listed above, the Airport also minimized construction-related waste. COS implemented the following practices to reduce construction waste:

1. Suitable (clean) earthen fill material is stockpiled for future use, reducing the emissions associated with hauling off and on airport-property.

2. When possible, milled pavement is reused on future projects. This material is often stockpiled or placed on existing roads.

3. Used equipment is sold through surplus equipment auctions that allow airports with minimal budget to purchase usable equipment at a discounted price.

The survey also requested information regarding established recycling support infrastructure. As discussed previously, the Airport owns the recycling bins and maintains contracts for the recycling dumpsters. Recycling compactors, balers, scales, and hauling equipment are not in place.

In addition to recycling infrastructure, the Airport also reported that they collect and compost green/yard waste which is turned into mulch and used around the Airport. The quantity collected is unknown. Compost efforts occur on-site with no other infrastructure in place. Food waste is not composted; however, one tenant does donate leftover food.

The ACRP survey also assessed the Airport's waste disposal process. COS provides garbage cans for waste collection; garbage dumpsters, trash compacters, and hauling equipment are provided via contract to the Airport. **Figure 1-2**, **Figure 1-3**, and **Figure 1-4** illustrate the existing recycling and waste equipment. Waste is disposed of at one of two landfills in El Paso County:

1. Colorado Springs Landfill—located at 1010 North Blaney Road, Colorado Springs, CO

2. Fountain Landfill—located at 10000 Squirrel Creek Road, Fountain, CO

All waste reported is for airport-operated spaces. Terminal tenants are billed monthly for waste, while concession and general aviation tenants manage waste from their leased areas. Terminal tenants are provided access to the trash compactors and recycling roll offs located on the east ramp and west docking area. Concession tenants have a waste container as well as a used grease waste container; both of which they are responsible for.

The following provides a brief summary of additional recycling practices employed by airport tenants:

Figure 0-2: Trash and Recycling Cans

Source: COS

Figure 0-3: Recycling Dumpsters

Source: COS

Airport Waste Management

Figure 0-4: Trash Compactors

Source: COS

- Airlines manage their own waste with some participating in a recycling program.

- Food and beverage tenants participates in an excess food donation program; reducing the overall amount of waste generated.

- Other tenants such as rental car companies, fixed base operators, charter operations, etc., collect and recycle items such as batteries, oil, oil filters, and tires.

Operation and Maintenance (O&M) Requirements

The Airport has defined procedures outlined in their Standard Operating Procedure (SOP), "Environmental Guidelines and Standard Operating Procedure – Waste Management and Recycling." The purpose of the SOP is to reduce the potential for inappropriate waste disposal and stormwater pollution through proper waste handling and disposal practices. The practices include inspecting waste disposal areas, using proper waste disposal containers, and ensuring waste container lids are properly labeled and secured. The following bullets outline the procedures included in the SOP:

- Solid Waste: The Colorado Solid Waste regulations define solid waste as discarded material, including solid, liquid, semisolid, or contained gaseous material, resulting from industrial operations, commercial operations, or community activities. This category does not include solid or dissolved materials present in domestic sewage, agricultural wastes, irrigation return flows, or point-source industrial discharges (subject to permits under the provisions of the Colorado Water Quality Control Act. All non-hazardous solid waste can be disposed in the trash. The trash is removed by airport maintenance staff, placed in exterior dumpsters, and hauled to a local landfill via a contract with Waste Management.

- Hazardous Waste: Hazardous waste requires proper off-site disposal. This type of waste may include unused chemicals or specific chemical spills that are known to be hazardous as defined in the Colorado Hazardous Waste regulations. Airport employees are directed to contact the Airport Environmental Specialist if hazardous waste requires disposal.

- Universal Waste: Universal waste can be recycled instead of being managed as a hazardous waste. Universal waste includes electronic waste (electronic devices and components), mercury-containing lighting (fluorescent lamps) and devices (thermostats), used batteries, aerosol cans containing hazardous waste, and specific pesticides. Universal waste receptacles for recycling are located in the double-doored ramp-level offices between gates 5 and 7. The Airport contracts Waste Management to remove these materials.

- Special Waste: An example of special waste is used absorbent from spills usually considered non-hazardous. Special waste is typically disposed in a landfill after the completion and approval of a waste profile via waste management. Containers with special waste, including empty drums, must be properly labeled. Airport employees are directed to contact the Airport Environmental Specialist for profile approval and waste manifests. The Airport Environmental Specialist must make arrangements for the removal of special waste.

- Recyclable Materials: The Airport offers a single-stream recycling program. Recyclables should not be kept in plastic bags as the bags can become entangled in the recycling equipment. Also, the following trash items must be kept out of recycling bins to avoid contamination: food waste, foam containers, and used paper products (plates, cups, paper towels, etc.). Recyclable materials placed in the blue recycling containers (located in the passenger areas) or in the blue recycling bins (in offices, break rooms, etc.) need to be disposed of in the green recycling dumpsters. These dumpsters are located on the west ramp north of gate 3 and along the concrete wall on the west loading dock area. Recyclables are removed from the Airport via a contract with the Waste Management.

Per the Airport's SOP, waste logs and manifests are to be kept by the facilities manager and the environmental specialist. The Airport does not currently produce an internal report for airport employees nor is an external report produced for the website or press releases. It may be beneficial to release the waste logs internally to keep interest in the program and advertise a positive program.

Review of Waste Management Contracts

Current Contracts

As discussed, the Airport, as part of the City of Colorado Springs, is contracted with Waste Management for removal of solid waste and recycling materials. The waste and recyclable materials are collected from the Airport by airport maintenance staff and placed in exterior dumpsters. Waste Management then removes the waste and recyclables and transports them to landfill or recycling facilities. Terminal tenants are billed monthly for waste removal, while concession and general aviation tenants manage their own waste.

Purchasing

The City of Colorado Springs' Environmentally Preferred Purchasing (EPP) Policy directs the Airport to, when possible, buy more environmentally preferable goods and services. As stated in the Policy, "the City recognizes the value in evaluating the price, performance, availability, as well as environmental impacts of goods and services procured by the City. The City recognizes the opportunity to minimize long-term costs to the City through procuring sustainable goods and services with longer life cycles." The EPP requests that environmentally preferable goods and services only be purchased if they meet performance

needs, are available within a reasonable time period, and can be purchased at a reasonable cost.

All City departments that purchase goods or services, or contract for goods and services, are required to utilize the EPP in their purchasing decisions and encourage contracting vendors to do the same.

The objectives of the EPP Policy include the following:

- Minimize long-term costs to the City through procuring sustainable goods and services with longer life cycles
- Conservation of natural resources - by reducing water and energy use
- Reduction of materials sent to the landfill
- Minimization of pollution and waste - such as packaging materials and waste generated by use of the product or service
- Enhance availability of sustainable products within the City of Colorado Springs
- Utilization of high-performing, efficient, superior-designed products which are less harmful to the environment and our city
- Education of our employees and vendors on sustainable purchasing and materials management
- Maximization of recycling, reuse, and repurposing of materials
- Maximization of biobased content of products
- Introduction of products that are designed with the environment in mind
- Reduction in greenhouse gas emissions
- Reduction of toxins and hazardous materials

City vendors and contractors are encouraged to purchase products that are listed on the General Services Administration's Green Procurement Compilation (GPC). According to the EPP, "these products have been verified as part of green procurement and include products and services with credible certifications, or that have utilized tools or programs." The EPP provides additional guidance on purchasing items and services such as green building materials, office supplies, furniture, electronics, appliances, lighting, cleaning products, energy and water saving equipment, and landscaping.

Lastly, the EPP Policy encourages each department to evaluate the environmental impacts of each Response for Proposal in addition to the standard criteria of price, performance, and availability. It is encouraged that vendors follow the EPP Policy and indicate the sustainability specifications of their products and services.

Leases and Service Contracts

The Airport has numerous tenant leases as well as service and goods contracts. The agreements vary in duration and expire intermittently. Recycling, reuse, waste reduction, and environmentally preferred purchasing incentives are not included in existing contracts.

Funding

Expenses associated with waste management, to include the collection and disposal of solid waste and recyclables, are paid for by the Airport from the facilities operating budget. The management of tenant produced waste is the responsibility of tenants.

Potential for Cost Savings or Revenue Generation

The Airport contracts with Waste Management to rent the recycling and trash dumpsters. The following fees are related to the Waste Management contract:

- $22,426 annually for waste going to a landfill
  - Compactor east side of concourse $1,147.16/month
  - Compactor west side of concourse $573.58/month
  - Dumpster at field shop (6 yard) $148.06/month
- $2,800 annually for recycling
  - Recycle dumpster air at air cargo (3 yard) $45.01/month
  - Recycle dumpster at terminal (4 yard) $106.61/month
  - Recycle dumpster at terminal (8 yard) $81.73/month

These costs include container rental and service, scheduled material pickup, transfer to disposal site/recycler, and educational programs. As shown, the largest waste management expense is the annual cost for waste transported to a landfill. This cost can only be reduced by decreasing the amount of waste which goes into the landfill stream. The following section provides recommendations to minimize waste generation.

Minimize Solid Waste Generation

As the amount of recyclable material and waste increases, the costs associated with removal will also increase. To reduce costs, the amount of waste generated needs to be reduced. The Airport may consider the following condensed strategies to reduce waste and the associated removal costs.

1. Complete an initial comprehensive waste audit to fully understand where the most waste is being generated. This audit would inform a trackable baseline that can be used to develop future reduction plans.

2. Once a baseline is established, track annual volume of waste going to a landfill and the amount diverted through recycling, reuse, reduction, or donation.

3. Actively discuss baseline volume and future goals with waste generators. Initial reductions may occur through more transparency and awareness of is the waste being generated.

4. Discuss goals with Waste Management and other waste removal contractors to see if rebates or incentives are available.

5. Evaluate regular purchasing decisions and products to ensure the EPP is being considered. The Airport should actively encourage vendors and contractors to do the same—possibly including language in contracts requesting verification that the EPP was considered.

6. As new leases are signed or old leases renewed, the Airport could incentivize waste reduction (i.e., decreased rates if waste remains under a set threshold, additional fees if waste exceeds the rate, and requirements to participate in a recycling program).

7. Enhance the existing recycling program through additional receptables, signage, additional training and education outreach, and regular communication with airport staff regarding the success of the program.

8. Complete a cost-benefit analysis for adding recycling infrastructure such as trash balers, scales, and airport-owned dumpsters and compactors.

The strategies above would facilitate the Airport's commitment to become more sustainable. Ultimately, support and buy-in from airport administration and employees will have the most impactful influence on the success of the Airport's recycling, reuse, and waste reduction.

Recycling Feasibility

The extent of recycling that occurs at COS is limited, as the Airport is the most active participant in a recycling program. This limited reach stems from the Airport's partial control over leased areas and a lack of tenant buy-in on recycling programs. As discussed previously, the current recycling program is being updated to encourage more participation and support.

The City of Colorado Springs, and therefore the Airport, is committed to continue the current recycling program and improve waste reduction and participation in recycling programs. The incentive to change the current strategy is to ultimately reduce operating costs and move the Airport towards greater sustainability. A commitment to purchase additional waste collection infrastructure would also advance the Airport's recycling program. Additionally, COS can encourage more tenants to recycle by emphasizing participation in revised leasing contracts or by creating incentives that promote involvement.

The Airport is also committed to adhering to state and federal waste management regulations. The Colorado Department of Public Health and

Environment (CDPHE) provides numerous requirements for the generation and disposal of solid and hazardous waste. Division 1007 provides requirements related to hazardous materials and waste management. Lastly, the Code of Federal Regulations, Title 49 for Transportation, governs the domestic transportation of hazardous materials for all forms of transportation to, from, and within the United States.

2. Environmental Resiliency

The frequency of extreme weather events is increasing across the nation and the state of Colorado is no exception. The recent fires, floods, severe thunderstorms and hail, and drought have made the City of Colorado Spring and the Airport acutely aware of the need for proactive strategies. These extreme weather events heavily impact the aviation industry as a whole— potentially putting entire airport and airline operations at a standstill.

Resiliency and Sustainability

"The ability of communities to rebound, positively adapt to, or thrive amidst changing conditions or challenges—including human-caused and natural disasters—and to maintain quality of life, healthy growth, durable systems, economic vitality, and conservation of resources for present and future generations."

Source: Colorado House Bill 18-1394

Historically, airports are accustomed to change and have numerous standard operating procedures in place to best address this dynamic environment. This environment includes environmental challenges that COS is accustomed to, especially in the snowy winter months. However, as our climate changes the severity of these environmental challenges has escalated.

To raise awareness and inform preparedness efforts, the following sections provide a brief discussion of the environmental threats occurring near Colorado Springs, how they impact the Airport, and what the Airport can do to be best prepared while minimizing its impact to our changing climate. The 2020 Hazard Mitigation plan for Colorado Springs categorized the Airport as a critical facility. Critical facilities are considered essential to the health and welfare of the population and become especially important after a hazard event. In the near future, airlines and aviation tenants will be forced to prioritize the physical, technological, and cultural infrastructures of airports when choosing operational locations; and those airports that proactively address climate resilience will be most successful.

It should be noted that airport resiliency includes a multitude of challenges, many of which are unrelated to the natural environment. This Master Plan discusses resiliency in terms of the natural environment; however, it would be worthwhile for future resiliency discussions to be holistic and address a broader scope that includes risks such as pilot strikes, air traffic control (ATC) strikes, fuel/energy crises, national security incidents (like September 11, 2001) and their aftermath, recessions, and COVID-19 and other medical crises.

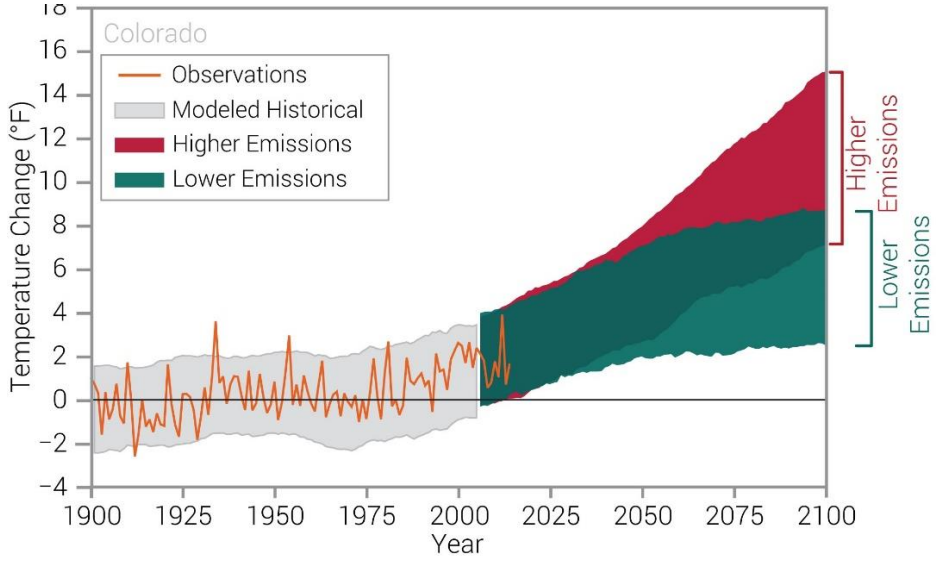
Local Climate

Temperature

A technical report (published by the National Oceanic and Atmospheric Administration's [NOAA] National Centers for Environmental Information [NCEI]) in the 2017 Colorado State Climate Summary attributed the state's variable climate to the inland location and varied topography. Colorado Springs sits next to the Rocky Mountains and in the southcentral part of the state.

The Technical Report states, "average annual temperatures for Colorado have remained consistently higher than the long-term average (1895–2015) over the past two decades (see **Figure 2-1**). Since 2000, the state has experienced the highest average spring and summer temperatures on record. The hottest year on record was 2012. In addition to the overall trend of higher average temperatures, the state has experienced an above average number of very hot days (days with a maximum temperature exceeding 95°F) and a decrease in the number of very cold nights (nights with a minimum temperature below 0°F) since 1990. Colorado rarely experiences warm nights (days with a minimum temperature exceeding 70°F) due to its high elevation and generally dry climate. The greatest number of warm nights occurred in the 1930s; however, the state, along with other parts of the United States, has seen an above average number in recent years."

Figure 2-1 - Observed and Projected Temperature Change for Colorado



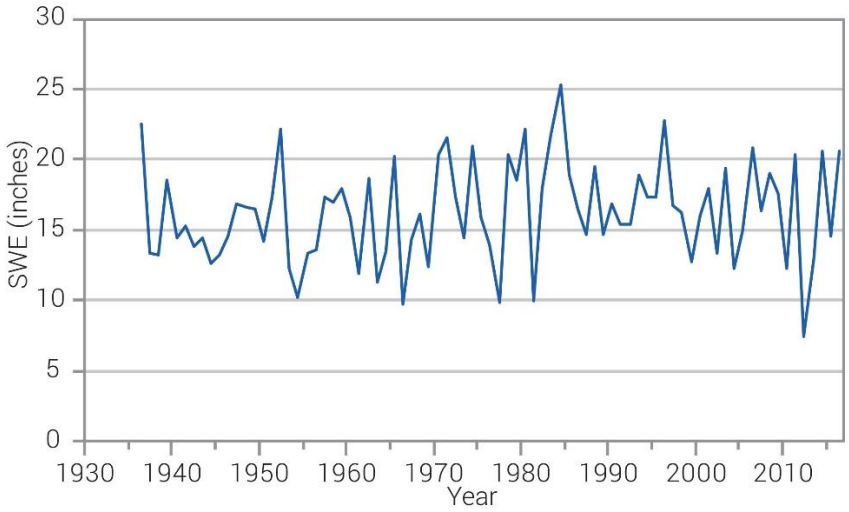
Source: CICS-NC and NOAA NCEI

Precipitation

Annual precipitation for the State of Colorado is 17 inches and has ranged from a low of 11.85 inches in 2002 to a high of 25.52 inches in 1941. Colorado Springs typically receives an average of 15-16 inches of precipitation, with most of the moisture coming from rains between April and August. The 1930s was the state's driest decade and only averaged approximately 12 inches of precipitation. The wettest decade occurred in the 1990's averaging approximately 19 inches of precipitation.

Headwaters are the initial sources of bodies of water, and Colorado is a headwater state. The sources of the Colorado, Rio Grande, Arkansas, and Platte Rivers are found in Colorado. Consequently, any changes in aggregate precipitation impact areas larger than the state itself. Because annual snowpack depths directly contribute to snowmelt levels, variations can result in limited water in low years and flooding in high years (when combined with spring rains). According to the USDA National Resource Conservation Service, snow water equivalent (SWE) is the amount of water contained within the snowpack and is highly variable from year to year with no long-term trend. The variation of SWE at Berthoud Pass, Colorado, a snow course site, is shown in **Figure 2-2.**

Figure 2-2 - Snow Water Equivalent at Berthoud Pass, CO



Source: USDA National Resources Conservation Service

Thunderstorms are common events in Colorado, with the more intense storms bringing large damaging hail and flash floods. Colorado Springs experiences numerous hail events of varying intensity each summer. Hailstorms in 2018 were especially destructive, with hail measuring up to 4 inches, and caused devastating damage to the area. Heavy storms such as these also result in flash floods causing road closures and infrastructure damage.

Winter storms are also a common occurrence in the state and include heavy snow, ice, and blizzard conditions. These conditions can paralyze a region: stranding travelers, blocking delivery and supply lines, and disrupting emergency and medical services. Heavy ice can collapse trees, electrical wires, telephone poles and lines, and communication towers resulting in wide-spread and lengthy power outages. The bomb cyclone of 2019 forced the closure of all major highways outside of the Denver area, including Interstate 25 to Colorado Springs. KOAA News, a local news station estimated that 1,500 motorists were left stranded in El Paso County alone, requiring more than 100 National Guard rescue operations. It is also reported that, at one time, 445,000 customers were without power.

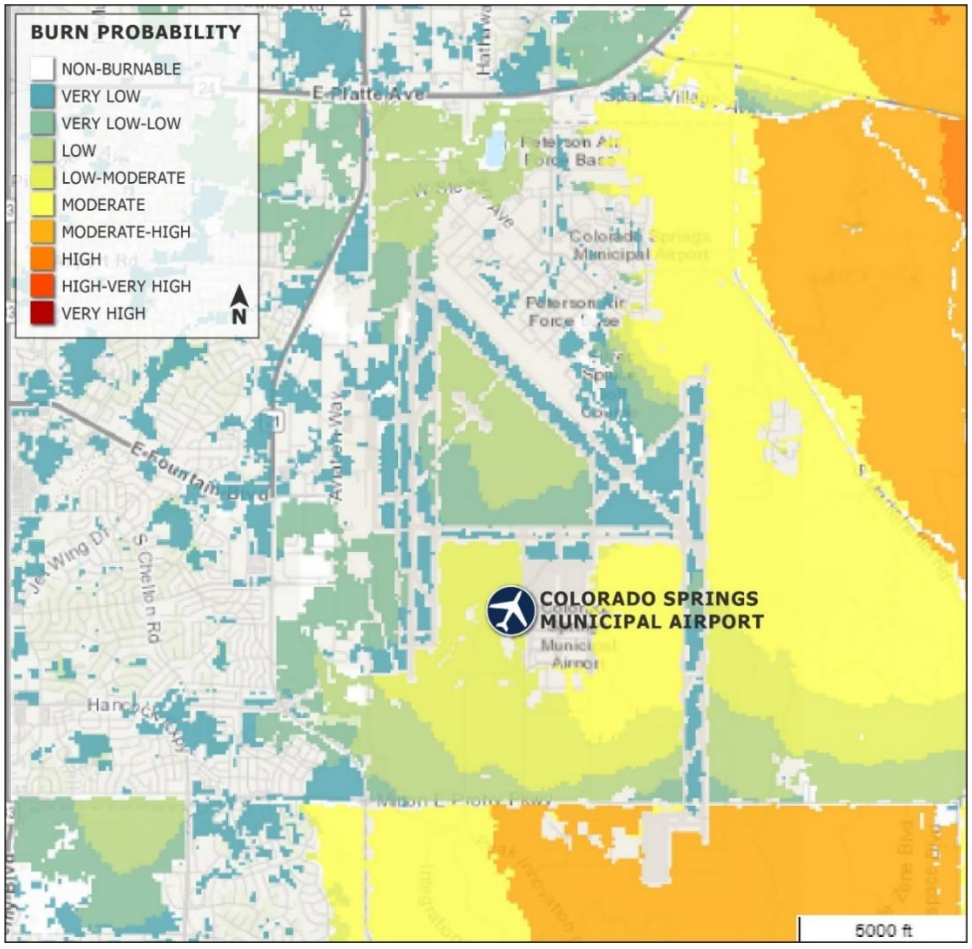
Drought/Wildfires

Conversely, the state also experiences times of severe drought, putting much of the region at risk of wildfire. It is projected that these periods of little precipitation and drought will last longer and become more severe. According to the NOAA Technical Report, in 2012, Colorado experienced one of the worst droughts and wildfire seasons. That year the High Park and Waldo Canyon Fires burned more than 85,000 acres. The Waldo Canyon fire started approximately four miles northwest of Colorado Springs and burned more than 18,000 acres, destroyed 347 homes, and resulted in insurance costs totaling $453.7 million. The following year, in 2013, the area was hit with the devastating Black Forest Fire. This fire burned an estimated 14,280 acres, destroyed 489 homes, and killed two residents while in an attempt to evacuate. Most recently, the 2021 Marshall Fire burned 6,000 acres and destroyed approximately 900 homes in Louisville, Superior, and unincorporated Boulder County.

Forest fires such as the Waldo Canyon fire not only destroy homes and infrastructure, but they also leave baren soil that is unable to naturally manage floods from snow runoff and rainstorms.

According to the Colorado State Forest Service, portions of COS are considered moderate risk for fire, while area to the south and east of the Airport are considered moderate to high risk of fire. **Figure 2-3** shows fire risk in relation to the Airport.

Figure 2-3: Fire Risk Map Near COS



Source: Colorado State Forest Service, Colorado Wildfire Risk Public Viewer, Accessed 11/20/2021

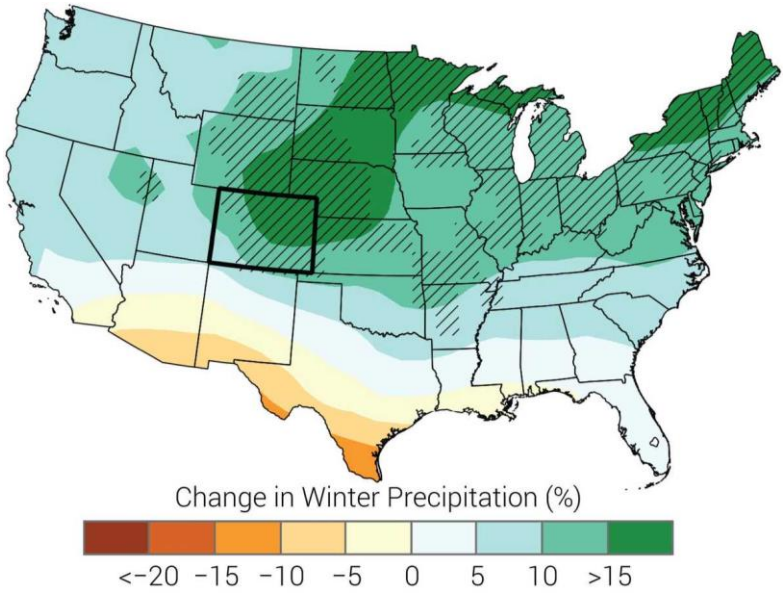
Climate Projections

Projected greenhouse gas emission models show varying degrees of warming, with the higher emission levels resulting in historically unprecedented warming and lower emissions producing only slightly warmer than historical records. **Figure 2-1** shows the varying projections and resulting temperature increases.

Similar projections, although uncertain, forecast increased precipitation in the winter and decreases in the summer (see **Figure 2-4**). As discussed, a heavier winter and increased snowpack would benefit the state and the regions that rely on the area as a water source; however, rising temperatures increase the lowest elevation at which snow falls. This results in more precipitation falling as rain that quickly evaporates instead of being stored as snowpack. It is also projected that extreme precipitation events could increase.

Drought severity is also projected to increase, as dryer summer months impact precipitation patterns that reduce agricultural and metropolitan water supplies. The increased droughts also result in a higher risk of wildfire rate and severity.

Figure 2-4 - Projected Change in Winter Precipitation



Source: CICS-NC, NOAA NCEI, and NEMAC.

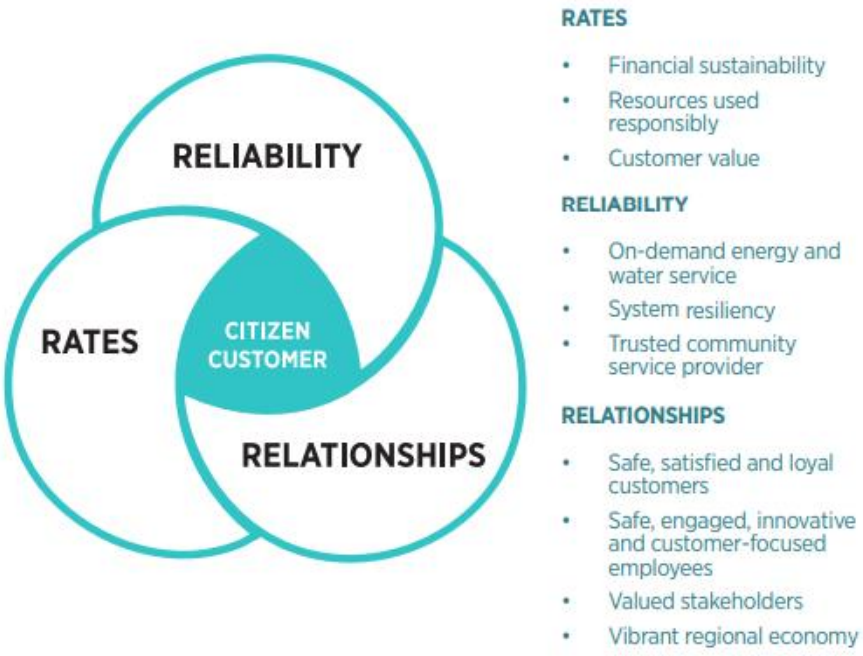
Energy Resiliency

Energy resilience ensures an entity has both a reliable, steady supply of energy, and contingency measures in place in the event of a power failure. As discussed previously, many of the natural weather events that commonly occur in Colorado—snow, wind, thunderstorms, and fire—result in power outages. These are real and common events likely impact the Airport on an annual basis and, if projections hold true, increase in severity and frequency.

Utility Providers

Utilities, including electric, natural gas, water, and wastewater services, are provided to the Airport by Colorado Springs Utilities (CSU. CSU is a community-owned, not-for-profit enterprise that provides utilities to the City of Colorado Springs). The vision and strategic direction of CSU are defined in the 2020 Strategic Plan: to "prepare, adapt and respond to industry changes to create the best possible value for citizens and customers." Their strategic focus specifically calls out their desire to provide system resiliency as shown in **Figure 2-5**.

Figure 2-5 - CSU Strategic Focus



Source: CSU 2020 Strategic Plan

Furthermore, a strength, weakness, opportunity, and threat (SWOT) analysis was included in the CSU Strategic Plan. The SWOT provides insight to the enterprise's resiliency—**Figure 2-6** summarizes these strengths, weaknesses, opportunities, and threats. As shown, the strengths and opportunities outnumber the weaknesses and threats, providing an optimistic outlook for CSU's ability to be resilient in the future and provide utilities to the Airport in the face of any adverse environmental event.

Figure 2-6 - SWOT Results (Resiliency Related)

Strengths	Opportunities
– Long-range energy and water supply capacity – Long-range planning initiatives and programs – Financial health – Emergency preparedness for business continuity and disaster recovery – Diverse generation portfolio	– Collaborating on regional water and energy projects – Implementing new energy solutions – Improving infrastructure resiliency – Assisting with military resiliency initiatives – Adapting to population growth – Improving cross-service coordination and efficiencies
Weaknesses	**Threats**
– Aging infrastructure – Fragmented and undocumented processed – Inability to react quickly	– Fuel price volatility – Weather variability – Water supply uncertainty – Population growth unpredictability

Source: CSU Strategic Plan

Energy Use Reduction

The Airport can reduce consumption of electricity and natural gas. Decreased consumption would not only lower the burden on CSU and reduce operating costs, but also diminish the Airport's overall carbon footprint and reliance on greenhouse gas emitting utilities.

With the help of CSU, the Airport completed energy audits in 2012 and 2020 that provided reduction strategies and before and after comparisons of energy use. The following changes were made between 2017 and 2019, accounting for the reduction in energy usage:

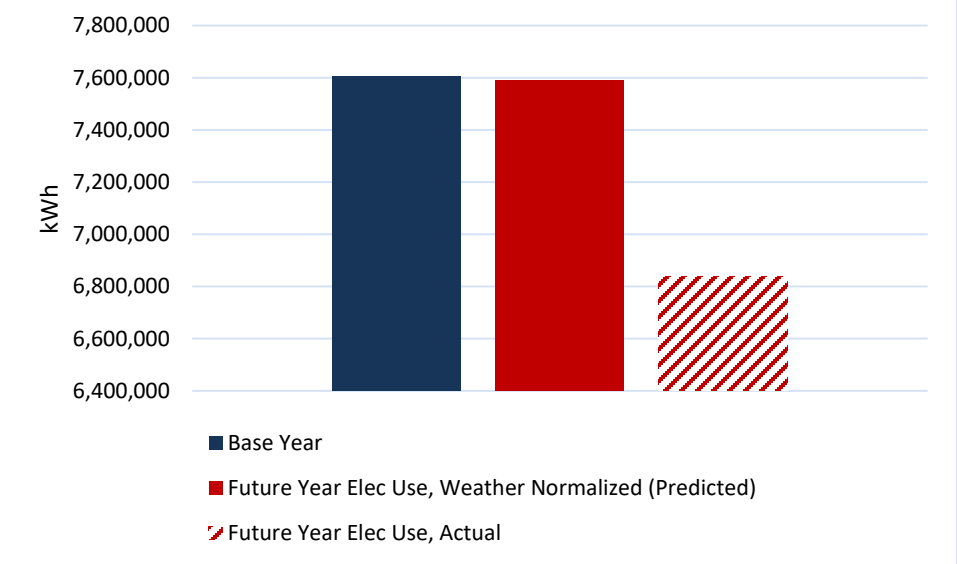
- One of the chillers was replaced with a variable speed mag-lev unit, 500 tons. This new unit is slightly larger than the 480-ton unit it replaced. It was installed in 2018 and started in early 2019. Notably, it was able to carry the cooling load by itself in summer of 2019, where it took two chillers before. This design is well known for excellent part load performance supplied by the variable speed compressor and low parasitic bearing loss.

- Approximately 40 ramp lights near aircraft parking were replaced with 300W LED lights. They were previously 1000W metal halide lamps.

- The lighting on Milton Proby roadway was replaced with 100W LED lights—previously 400W metal halide lamps.

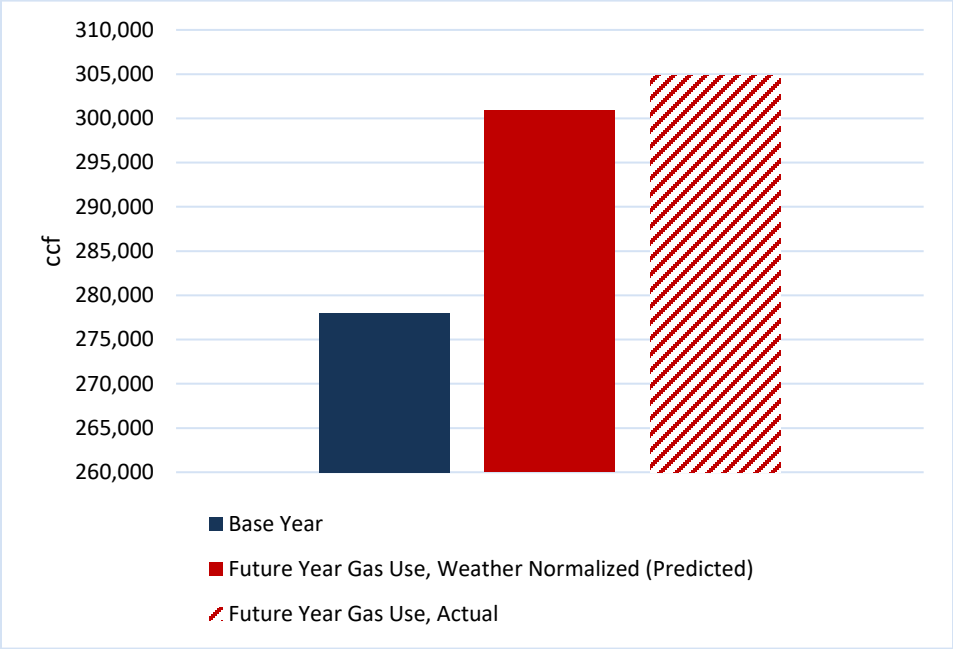
While the 2012 audit did not provide baseline gas and electric usage data, the 2020 audit did. **Figure 2-7** shows the reduction in electricity usage between 2017 and 2019, with the implementation of energy management strategies. **Figure 2-8** shows an increase in gas consumption over the same period.

Figure 2-7: Elec Use, Base Year (2017) vs. Future Year (2019)



Source: COS 2020 Energy Audit

Figure 2-8: Gas Use, Base Year (2017) vs. Future Year (2019)



Source: COS 2020 Energy Audit

The Energy Audit also provided energy management recommendations for the Airport to consider in the future. These recommendations were prefaced by guidance to first squeeze the most efficiency out of the existing systems before adding new technology. This recommendation reiterated that the consideration of new equipment is the last step in energy management. With that being said, new technologies to consider included those listed in **Table 2-1**.

Table 2-1: 2020 Energy Management Recommendations

Level of Investment	Recommendation
Low Cost	Consumptive Use Adjustment for Cooling Tower
Low Cost	Eliminate Unintentional Overlapping Mechanical Heating and Cooling
Low Cost	Interlock Baggage Tug Area Make Up with Exhaust
Low Cost	Occupancy or CO2 Control of Ventilation
Low Cost	Optimization Routines, Predictive Maintenance, Demand Limiting Control
Capital	Consider Options for Reheating in Summer – Install Jockey Boiler – Install Heat Recovery Chiller
Capital	Power Factor Correction
Capital	Synchronous (No Slip) Fan Drive Belts

Additional details supporting these recommendations can be found in the 2020 Audit.
Source: 2020 COS Energy Audit

Energy Resiliency

The Airport itself has emergency plans in place for utility outages that result from extreme weather. CSU is the sole provider of power, with no secondary providers in place. The following contingency plans are outlined in the Airport Emergency Plan:

1. All aircraft movement area lighting can be run on a back-up power generator. The generator is diesel operated and can hold up to 500 gallons of fuel.

2. FAA approach lighting systems are maintained by the FAA with a battery backup system.

3. A list of suppliers for items such as water, snacks, and blankets are maintained with the Airport operations and maintenance staff.

The emergency plan does not include specific contingency plans for power outages in an occupied area.

In addition to the contingency plans, the Airport has installed a solar covered carport and offers electric vehicle charging stations (EVCS). As of October 2021, the solar carport had generated 121.1 MWh of power. This equates to approximately 405,065.09 lb's of CO2 emission saved and equally as important provides an alternate power source for the Airport. The EVCS were installed in 2020; however, due to the COVID-19 pandemic, they were not open to the public until March 2022. There is limited usage data at the time this document was prepared; however, the data that is available shows a steady increase in usage. The EVCS support the industry's integration of electric powered vehicles and provides an alternate power source for surface traffic.

With resiliency in mind, future development and renovations should include design elements that offer contingency plans for utility outages. These elements may include passive building design that allows thermal comfort and natural daylight. Future designs should also include requirements that climate-controlled spaces incorporate back-up power or thermal control.

COS may also consider the addition of Airport-managed renewable energy sources. Although renewables are not capable of running the Airport on a daily basis, they can supplement what is being purchased from CSU and offer a backup in the event that CSU is unable to provide energy for a length of time. Renewable energy options are listed below:

- Solar: The Airport has numerous large open fields of mowed grass throughout the property, specifically south of the terminal building and parking areas. These areas can't be developed due to airspace constraints and would be an ideal location for a ground-mounted tracking photovoltaic (PV) array, potentially with low-maintenance native plantings under the array. Native plantings absorb water, provide pollinator habitat, and keep the ground temperature cool under a PV array. A PV field with native prairie plantings offers cost savings, reduced carbon emissions, and a highly visible STEM learning environment. The Airport has also considered installing PV arrays on covered parking; this option may occur in the future.

- Electric Vehicle Charging Stations: The Airport may consider supporting electric vehicles by retrofitting parking locations to accommodate electric vehicles with pay-as-you-go or sponsored public charging stations. The

Airport may also look for partners to bring free, subsidized, electric charging stations to the Airport.

- Wind: The Airport is not an ideal location for commercial-scale wind turbines due to required proximity to the runways and airspace constraints. Small, building-integrated, or demonstration-scale wind turbines could be a viable source of on-site renewable energy so long as they are life-cycle cost effective and are guaranteed not to cause frequency/signal /noise interference to the radar, testing, and remote sensing equipment used at the Airport.

Renewable energy sources can be a creative way to supplement traditional energy and potentially offer a contingency plan for utility outages; however, each proposed recommendation should go through a life-cycle cost analysis to ensure the initial investment provides adequate return.

Water Resiliency

The Airport is located in the Fountain Creek Watershed, which extends more than 900 square miles in southern Colorado. Sporadic and widely distributed precipitation in this region has caused flooding and sediment deposit in Fountain Creek and its tributaries, degrading this vital watershed. The Airport is located near the Denver Basin Aquifer; this aquifer is comprised of four smaller aquifers: the Dawson, Denver, Arapahoe and Laramie-Fox Hills. The Denver Basin Aquifer is used primarily for municipal, domestic, commercial, and agricultural purposes.

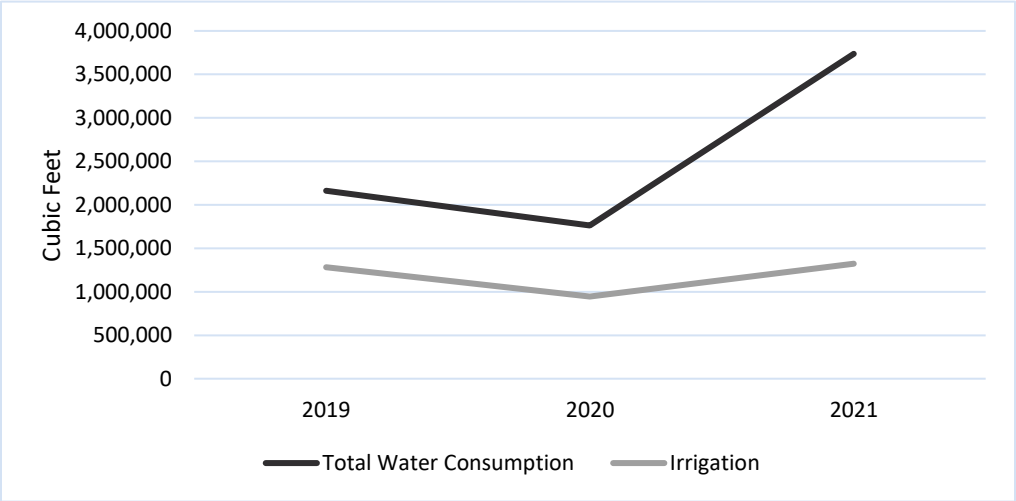
According to the City of Colorado Springs Stormwater Enterprise, nearly 80 percent of the area's water comes from the Western Slope of the Rocky Mountains, nearly 200 miles from Colorado Springs. CSU supplies water utilities to the Airport.

Although drought and groundwater pollution are real risks, water scarcity is an equally valid concern. Though this concern has become a national issue, it is a specific concern to the State of Colorado and the Colorado Springs area. Water availability is predicted to be a top concern, especially if projections showing increased temperatures and decreased snowpack hold true. To preempt potential shortages, water conversation strategies should be employed. It is also important that the water quality is maintained (or improved) to ensure available water is usable.

Airport Consumption

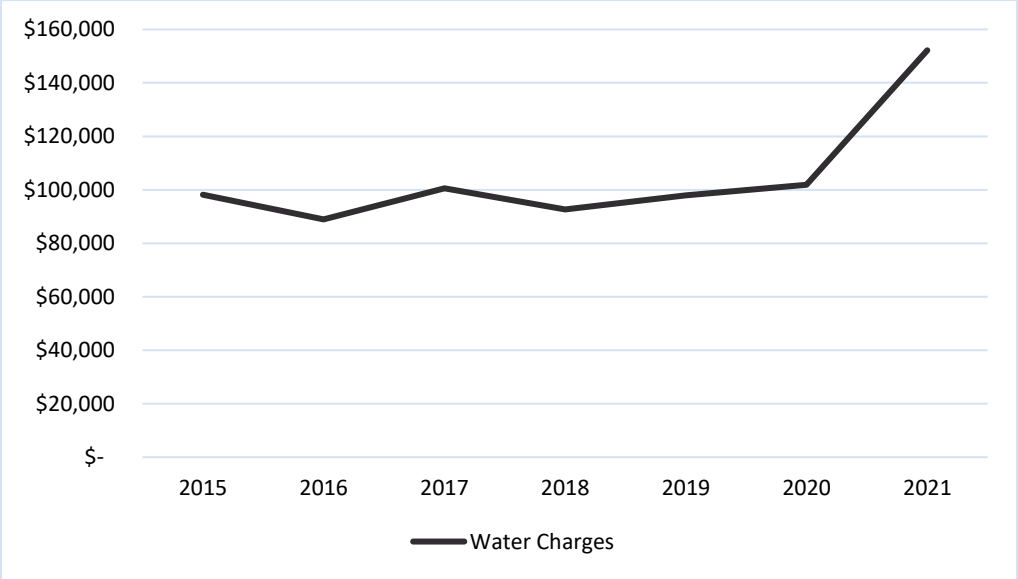
In 2020, the Airport consumed approximately 3.7 million cubic feet of water, an increase from previous years (see **Figure 2-9**). This increase is largely attributed to greater irrigation usage from the new business park. The cost associated with this consumption is also significant—as shown in **Figure 2-10**. Water consumption increased by nearly 55 percent between 2015 and 2021; though some cost increase is more closely related to rate increases. Water conservation measures would not only further regional water reduction efforts but also noticeably impact the Airport's bottom line.

Figure 2-9: Water Consumption Amounts



Source: COS

Figure 2-10: Water Consumption Charges



Source: Colorado Springs Airport

Water Use Reduction

To improve resiliency, the Airport should reduce reliance on large quantities of water provided by CSU. In doing so, the Airport could operate on less during an emergency or, if water becomes restricted/scarce, slow the consumption of water from sources that aren't recharging.

Strategies the Airport could consider include those listed below:

- Complete a water use audit to establish a baseline of water use and potentially add automated metering to better track consumption. It is noted

that the Airport may have the opportunity to participate in an irrigation audit with CSU in the near future.

- Analyze areas that consume the most water and develop a plan for reduction.
- Regularly inspect and fix leaks on all pipes, appliances, and equipment.
- Ensure existing infrastructure is operating at maximum efficiency; keep parts and equipment up-to-date and upgrade systems as needed. Note that the Airport has worked with a CSU water conservation specialist to replace pre-rinse spray valves with more efficient valves.
- Ensure all new development is designed to reduce water consumption. Include specific language in new leases that address water consumption.
- Regularly train existing and new employees on the importance of water use reduction and how they can contribute to the overall effort. Employees should also be adequately trained on all equipment to understand if it is operating efficiently.
- Reuse water for non-potable uses such as dust control, pavement washing, and plant/tree irrigation.
- Replace water-intensive landscape features with xeriscaping landscape.

Of the recommendations given, the most significant element to water conservation is employee, passenger, and administration buy-in and support. Like a recycling plan, successful programs are, generally, those that receive more support; goals and milestones should be celebrated and communicated to help gain and retain support.

Water Resiliency

Water resiliency is an entity's ability to continually provide safe drinking water and properly treated wastewater during and after an emergency. As discussed, water scarcity and potential limitations are a reality for Colorado Springs. The Airport can best be prepared for periods of low availability by considering the following recommendations:

- Develop an emergency response plan in the event water from CSU is unavailable or contaminated. This plan may include on-site storage for both potable and non-potable water.
- Modify water infrastructure in anticipation of frequent severe storms, flooding, and drought, and water scarcity.
- Consider a wastewater treatment plant to reduce consumption from CSU and offer a backup if CSU is unable to provide water to the Airport.
- Monitor and test soils and water for contamination; take immediate action upon positive results to ensure water quality is protected.
- Consider flood risks to existing and future development; utilize pervious surfaces when possible.

Climate Resiliency

Climate resiliency can be defined as the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to the changing climate.[2] As discussed, the climate of our nation, state, and the Colorado Springs area is changing. It is predicted that changes may include more severe storms at increased frequency, a rise in temperature, wide-spread drought, increased wildfire risks, and water scarcity.

Energy and water resiliency are discussed previously; this section provides concluding recommendations on how the Airport can best be prepared for other challenges presented by the changing climate.

General recommendations the Airport may consider to best withstand natural disasters include the following:

- Consider preparing a resilience management plan. This plan supplements the emergency management plan and focusses on advanced preparation for the changing climate.
- Buildings should be equipped with ample shelter-in-place locations for tornados and other natural disasters. Safe locations should be clearly marked, and employees made familiar with their locations. Mass notifications, able to reach all occupants both in and outside the buildings, is extremely important.
- The aggressive decarbonization goals placed on air traffic will lead to the replacement of fossil fuels with cleaner power sources. Infrastructure to support other forms of power should be considered as a demand arises.
- New buildings should be oriented such that regularly occupied areas can be daylit via north-facing glazing or windows to the south shaded against the summer sun. East and west facing glazing should be minimized to avoid heat gain.
- If practical, buildings should be programmed so that unoccupied areas face to the west and protect the occupied portion of the building from the prevailing winter wind. Occupied areas should generally be programmed to the north, east, and south.
- Consider adding emergency plans for wildfires to the Airport Emergency Plan. The existing discussion on fires is relevant to aircraft, fuel, and structural fires. The amount of grassland on and near the Airport increases the risk of fire. Wildfires are not only dangerous to those on the ground, at an airport, the inbound and outbound aircraft are also at increased risk of loss of visibility. This can ultimately hinder firefighting efforts that utilize aircraft.

[2] Center for Climate and Energy Solutions, https://www.c2es.org/content/climate-resilience-overview/, Accessed 2021

In conclusion, we cannot know what the climate will look like in the future. The projections vary and are largely dependent on the reduction of greenhouse gas emissions. The Airport must be proactive in reducing their carbon footprint while preparing for changes in our climate and the impacts to the aviation industry. Acknowledgment and openness, including the brief discussions such as those in this master plan, are a great start.