AKRON-CANTON AIRPORT

SUSTAINABLE MASTER PLAN

Prepared as Part of the 2014 Airport Master Plan Update

Akron-Canton Airport (CAK) | North Canton, OH





February 2016

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INTRODUCTION

1 INTRODUCTION

The Akron-Canton Airport Authority (The "Authority) is taking a holistic approach to the management of its assets and resources. This is being done to ensure the Airport's operational viability and service to the traveling public well into the future. To that end, the Authority has developed this Sustainable Master Plan to incorporate the principles of sustainability into the everyday operation and long-term planning of the Airport.

1.1 WHAT IS SUSTAINABILITY?

The global sustainability movement has emerged in response to concerns about the unintended social, environmental, and economic consequences of rapid population growth, economic growth and consumption of natural resources. There may be as many interpretations of "sustainability" and "sustainable development" as there are groups trying to define it. However all definitions are founded on the overarching principal of sustainability as identified by the United Nations' Brundtland Commission in the early 1980s (Report of the World Commission on Environment and Development: Our Common Future, **http://www.un-documents.net/our-common-future.pdf**).

> *… development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

3 | Pillars of Sustainability

People • Planet • Prosperity

From this, the concept of sustainability has progressed and many organizations have adopted management philosophies that go beyond the traditional measures of financial performance and integrate the environmental and social dimensions of Economic Growth, Social Responsibility and Environmental Stewardship. These are also commonly referred to as the three pillars of sustainability, or **People**, **Planet**, and **Prosperity**.

From an organizational management perspective, implementing sustainability encompasses a wide variety of practices that are aimed at:

- Promoting "social progress" and ensuring organizational goals are achieved in a way that's consistent with the needs and values of the local community – **People**
- Protecting of the environment by reducing impacts and conserving natural resources – **Planet**
- Maintaining high and stable levels of economic growth and employment – **Prosperity**

"Social progress" is the capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential.

–SocialProgressImperative.org

1.2 SUSTAINABILITY AT AIRPORTS

Previously, government agencies acted primarily as environmental watchdogs, striving to ensure that industries met legal requirements to control pollution. Today, these agencies are developing tools, theories and practices to move from controlling pollution to preventing it. These efforts draw on advances in science and technology to protect human health and the environment, and promote innovative green business practices. To that end, the U.S. Federal Government enacted the following regulations:

- Executive Order 13423: *"Strengthening Federal Environmental, Energy, and Transportation Management"* of 2007 set policy and specific goals for federal agencies to "conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner."
- Executive Order 13693, "*Planning for Federal Sustainability in the Next Decade.*"

Even prior to these initiatives, airports that receive funding from the Federal Aviation Administration (FAA) have been responsible for developing their facilities in accordance with the National Environmental Policy Act (NEPA). In addition to upholding the regulatory requirements of NEPA, the FAA previously initiated, and currently maintains, several sustainability oriented environmental programs. These include the "Part 150" Noise Compatibility Planning Program (started in 1984) and the Voluntary Airport Low Emissions Program (VALE) (started in 2004). In response to the more recent federal directives, the

FAA embarked on an Environmental Management System program (in 2007) and a Sustainability Master Plan Pilot Program (in 2010).

The **Sustainable Master Plan** Pilot Program began with the purpose of making sustainability a core planning and management objective and not a secondary activity. Since the introduction of the program, the FAA has funded sustainability studies at numerous airports across the United States. As part of the pilot program, the Akron-Canton Airport Authority received a grant from the FAA to develop a Sustainable Master Plan as a component of its ***2014 Airport Master Plan Update.***

1.3 SUSTAINABILITY PLANNING PROCESS

Over a 12-month period, the Authority prepared this **Sustainable Master Plan** with the following objectives in mind:

- Identify achievable actions that will have the greatest return on investment to the People, Planet and Prosperity
- Engage the various stakeholders and tenants to build awareness of, and commitment to, sustainability of the Airport
- Develop a sustainability program that is easy to implement and that provides mechanisms for monitoring performance and opportunities for continued improvement
- Develop a culture of sustainability within the Airport organization

The process began with an assessment of its existing airport facilities and operations, and working with a group of stakeholders to identify current sustainable (or "green") activities being performed at the Airport and within the neighboring communities. This information was used to identify important resources, potential issues, and opportunities for improvement. From those findings, the strategic ***focus areas*** to be addressed in the plan were identified. ***Objectives*** for each of the focus areas were established and baseline assessments were performed. This included an Energy Efficiency Assessment (or Energy Audit) of the 6 airport buildings owned and directly maintained by the Authority. There are numerous other buildings located on airport property that are leased to a variety of tenants; however, they were not evaluated as part of this study. The study also included an inventory of GHG emissions related to automobile and aircraft activity as well as the equipment used to service the airlines and maintain the airfield. ***Actions*** that would support achieving the objectives and overarching sustainability goals were identified and prioritized based on their total benefit, investment payback period, and ease of implementation. This resulted in an ***action plan*** and performance targets being established for each of the focus areas. Finally, a process for monitoring and reporting plan performance was established. This overall programmatic process is depicted in the following schematic and will be periodically revisited to ensure that the Airport's **Sustainable Master Plan** remains relevant and effective, and that the Authority is continually improving its programs and processes.

1.4 INTEGRATION WITH AIRPORT MASTER PLAN INITIATIVES

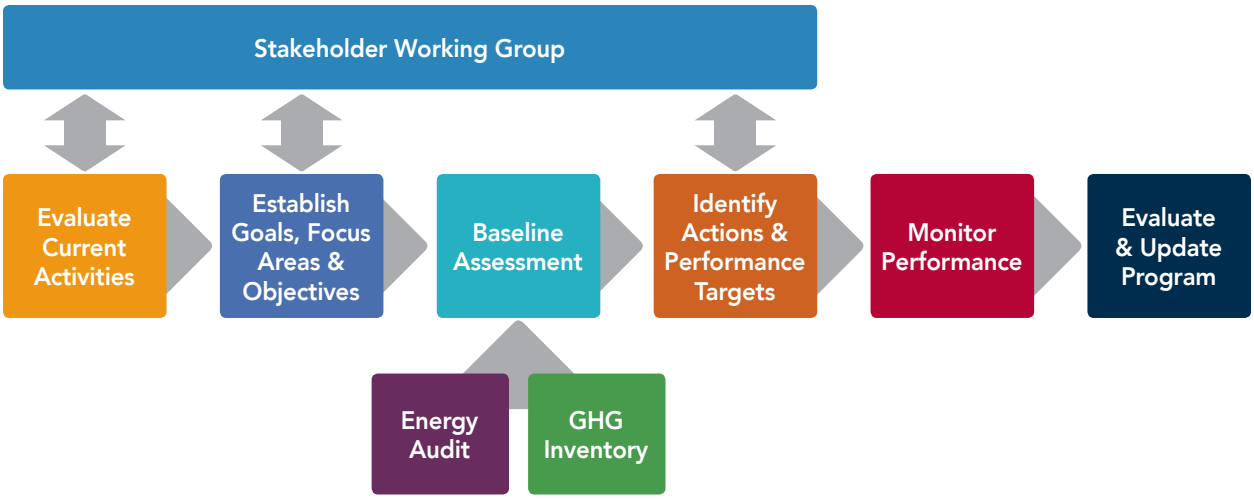

Figure 1-1: Sustainability Planning Process

As mentioned previously, this **Sustainable Master Plan** was prepared as a component of the Airport's ***2014 Master Plan Update***. The Master Plan is a comprehensive evaluation of the airside and landside facilities needed to meet public air travel demand over a ±20-year planning horizon. Concurrent with the development of those studies, the Authority also prepared an update to their Part 150 Noise Compatibility Program. The Part 150 program is a detailed study of potential aircraft-related noise exposure and land use compatibility in the Airport environs. These three (3) strategic planning studies are distinctly interrelated—sharing information and building upon each other's findings. Each study also had a stakeholder involvement program that shared several members, thereby adding to program continuity and fuller community integration. Cumulatively these studies have created a long-term development vision for the Airport that provides flexibility to adapt to changing market conditions and reflects the operational, social, economic and environmental factors that will lead to a sustainable future.

Section 2

ABOUT THE AKRON-CANTON AIRPORT

2 ABOUT THE AKRON-CANTON AIRPORT

The history of the Airport dates back to World War II when the United States' primary concern was air defense. Development of an airport in the Akron-Canton area was initially proposed in 1942 for the purpose of military pilot training. Due to changing priorities with the war effort, development of the new airport was delayed, however planning, site selection and construction continued and following the end of the war, the Akron-Canton Airport (CAK) was opened in October 1946. Public air-travel demands grew, United and American Airlines began providing service in 1948, and the Airport facilities have been incrementally developed to meet the growing passenger needs.

2.1 EXISTING CONDITIONS

Today, the Airport encompasses approximately 2,400 acres of property within Summit County and Stark County, Ohio. The Airport provides facilities and services capable of accommodating numerous aircraft operators, including private piston-engine aircraft, corporate jets, commercial airlines and military aircraft. The airfield includes two (2) active runways and an extensive taxiway system. Runway 5/23 is 8,204 feet long and has the highest utilization rate, and Runway 1/19 is 7,601 feet long. The current passenger terminal was originally built in 1961 and the latest expansion occurred in 2006 with the construction of an elevated concourse, additional gates and expanded passenger amenities.

The Airport connects the region to the global transportation network and plays a significant role in the nation's air travel system. The Airport predominately draws customers from within a 90-minute drive time, including the counties of Summit,

Medina, Wayne, Stark, Portage, Carroll, Geauga, Cuyahoga, Lorain, Huron, Ashland, Holmes, Tuscarawas, Coshocton, and Guernsey. Passenger traffic grew significantly between 2007 and 2012, outpacing many similar-sized airports throughout the country. In 2012, the Airport enplaned approximately 940,000 passengers and accommodated approximately 84,000 aircraft operations. Despite a temporary downturn in 2013 due to mergers and route changes within the airline industry, further growth in passenger and aircraft activity is projected over the 20-year planning horizon.

In addition to being an invaluable transportation asset, the Airport has always been a vital economic engine in the region. In 2012 the Airport supported over 3,086 local jobs, resulting in more than $150.2 million in payroll, and adding over $502 million annually in total economic impact to the community.

To meet the needs of the travelers, and maintain the highest levels of safety and cost effectiveness, the 2014 airport master planning process identified several recommended facility improvements. The improvements focus on enhancing customer service and operational efficiency by:

- Replacing the aging and undersized concourse with new gates on a second-level concourse
- Expanding the baggage screening, ticketing, and baggage claim areas of the terminal
- Providing additional, conveniently located auto parking
- Improving taxiway circulation and providing access to an expanded west side general aviation area
- Promoting compatible land use both on and off airport property

2.2 VISION, MISSION AND CORE VALUES

The Authority's management philosophy for the Airport is built around the needs of its customers. Offering the traveling public low fares, exceptional convenience, easy access, and relaxing amenities are the cornerstones of this philosophy. To guide the Authority's decision making process, and the staff's day-to-day operation of the Airport, the vision and mission for CAK can be succinctly stated as:

VISION To be Northeast Ohio's preferred airport

MISSION Saving air travelers money and time so they can enjoy the journey more

PROMISE *a better way to go.®*

In support of this philosophy, the following core values define what matters most to the Authority and staff, and what they believe in. By staying firmly rooted in these core values, the Airport will continue to drive economic development and air travel success in Northeast Ohio.

- **Respect** – is given to all customers, employees, partners, communities, facilities and the natural environment
- **Family** – is how customers, coworkers and business partners are treated
- **Simplicity** – is the theme for developing and operating the facilities and for communication
- **Value** – in the services, fares, and amenities provided
- **Quality** – in the facilities, airline network, services and amenities provided
- **Sustainability** – doing what's good for the **People**, the **Planet** and everyone's **Prosperity**

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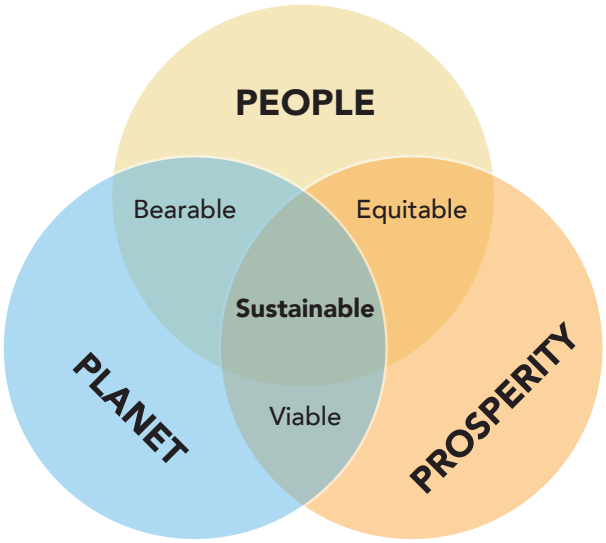
Section 3

MANAGING SUSTAINABILITY AT THE AKRON-CANTON AIRPORT

3 MANAGING SUSTAINABILITY AT THE AKRON-CANTON AIRPORT

Sustainable development is achieved when the Economic Growth, Social Responsibility and Environmental Stewardship components of sustainability are in balance. The Authority views this Sustainable Master Plan as a strategic endeavor to leverage the Airports full potential and benefit to the community. The effort is also necessary to safeguard and enhance the public's investment in the Airport.



The Authority's vision, mission and core values form the foundation of this plan. To anchor the fundamentals of sustainability into the Airport's management structure, the Authority has made a commitment to implementing sustainable practices and has identified several overarching programmatic goals.

3.1 COMMITMENT TO SUSTAINABILITY

The Authority is committed to promoting and implementing environmentally and socially responsible business practices throughout CAK; balancing social,

environmental and economic needs for the well-being of the community and its employees. From an airport management perspective, the Authority's sustainability program will focus on actions that support the following goals:

- Promote social progress
- Enhance the customer experience
- Protect and conserve natural resources
- Reduce the Airport's carbon footprint
- Increase efficiency and reduce operational and maintenance costs
- Promote local and regional economic growth

3.2 SUSTAINABILITY WORKING GROUP

In the preparation of this Sustainable Master Plan, a stakeholder working group was assembled to help guide the study and identify internal and external factors that could influence the Airport's ability to become more sustainable. The group included members of the Authority, airport staff, airlines, various tenants, the FAA, and representatives from local town and county governments.

At the outset of the study, the working group participated in an evaluation of the Airport's strengths, weaknesses, opportunities and threats relative to the efficient and long-term operational sustainability of the facilities (i.e. S.W.O.T. analysis). Sustainable (or green) activities taking place at the Airport and in the surrounding communities were identified and the group provided insight as to what the Airport was doing well, what topics of concern there may be, and what could be improved upon to enhance overall efficiency and customer experience at the Airport. The group acknowledged the Authority's strengths in providing a high level of customer service and traveler convenience. They also acknowledged the Authority's dedication to fiscal responsibility by maintaining low operational and maintenance costs and providing value priced commercial airfares. While a variety of other programs and issues were discussed, several topics emerged as common priorities for all stakeholders. These included alternative energy, solid waste and recycling management, energy efficiency, and public outreach.

3.3 STRATEGIC FOCUS AREAS AND OBJECTIVES

Information gathered from the working group, combined with guidance from the FAA and industry best practices, was used to identify the most relevant sustainability topics, or "focus areas" that this Plan should address. Objectives aimed at supporting the overarching sustainability goals were also identified for each of the focus areas. The focus areas, associated objectives, and how those objectives support the sustainability goals are identified in the following table.

FOCUS AREA GOALS AND OBJECTIVES

Focus Areas	Objectives	Social Progress	Customer Experience	Protect and Conserve Natural Resources	Reduce Carbon Footprint	Reduce O and M Cost	Economic Growth
ADMINISTRATION	» Integrate sustainable approaches and practices into the internal policies, business processes, written agreements, day-today operation, and long-term planning of the Airport	✈	✈	✈	✈	✈	✈
	» Provide opportunities and incentives to improve the health and well-being of the employees	✈				✈	
	» Develop the CAK workforce through proper recruitment, training, retention and diversity	✈	✈			✈	✈
ENERGY MANAGEMENT	» Maximize energy efficiency and minimize energy consumption within buildings and airport property			✈	✈	✈	
	» Evaluate and implement alternative energy procurement programs and renewable source generation			✈	✈	✈	✈
WASTE MANAGEMENT AND RECYCLING	» Minimize the amount of solid waste generated and disposed of in local landfills			✈	✈	✈	
	» Maximize collection and re-use of recyclable materials			✈	✈	✈	
	» Ensure that hazardous materials are properly stored and handled and do not pose a threat to the environment or human health	✈		✈	✈		
WATER RESOURCE MANAGEMENT	» Maximize water conservation and minimize potable water use within Airport facilities			✈	✈	✈	
	» Protect regional water quality through effective stormwater management and pollution prevention initiatives	✈		✈	✈		
AIR QUALITY	» Minimize greenhouse gas emissions associated with airport activities	✈		✈			
	» Develop and operate airport facilities in accordance with federal NEPA provisions for criteria air pollutants			✈	✈		
GREEN CONSTRUCTION	» Integrate sustainable approaches and practices into the design and construction of facilities on the Airport property			✈	✈	✈	
COMMUNITY CONNECTION	» Promote compatible on- and off-airport land uses that support continued airport operations and minimize impacts to the surrounding communities	✈		✈			✈
	» Strengthen partnerships with local government and community organizations						✈
	» Engage the public through dedicated outreach, education, and involvement in the long-term planning for the Airport	✈	✈				✈
	» Foster intermodal transportation options to and from the Airport	✈	✈	✈	✈		
ECONOMIC VITALITY	» Develop and maintain robust product and service offerings (air service, concessions, general aviation) and customer friendly facilities	✈	✈				✈
	» Promote on- and off-airport business development, revenue generation, and job growth/retention	✈					✈
	» Strengthen partnerships with the business community, universities, and promote business diversity	✈					✈
	» Make prudent financial decisions and employ full life-cycle cost evaluations					✈	✈

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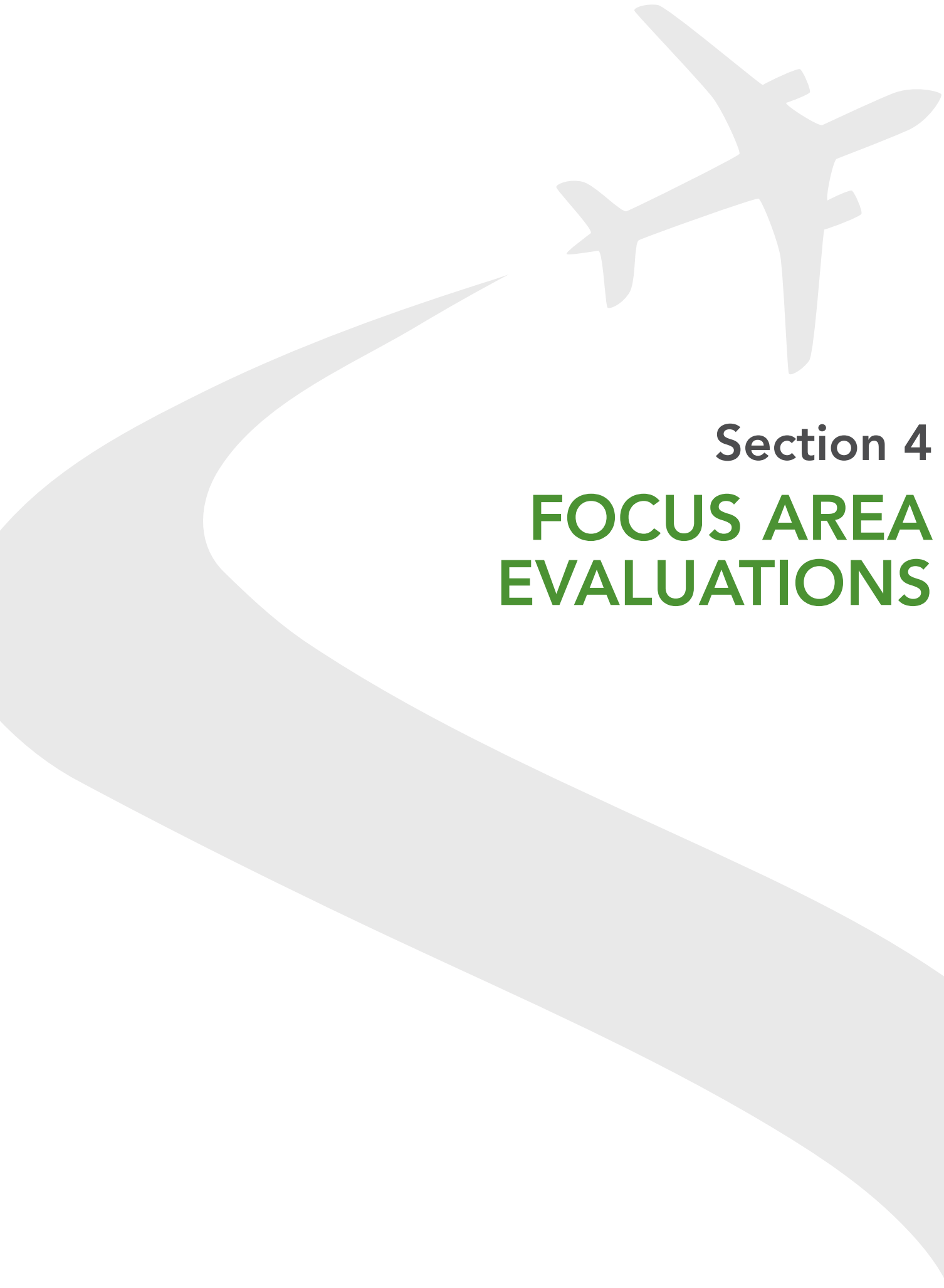


Section 4

FOCUS AREA EVALUATIONS

4 FOCUS AREA EVALUATIONS

For each of the focus areas, an assessment of the existing conditions and opportunities for sustainable enhancement was performed. The working group and airport staff provided valuable input to these evaluations. Due to the expansiveness of sustainability issues, only the topics deemed most relevant to the continued operation of the Airport were addressed at this time.

4.1 ADMINISTRATION

The success of any program, including this **Sustainable Master Plan**, depends on the strength of its organizational structure and the commitment of its participants. The Authority has committed to implementing environmentally and socially responsible business practices throughout the Airport. Effective oversight of this program, however, will require a focused effort by key airport staff members. Implementation will rely on the cooperative efforts of all staff, tenants and several of the stakeholders.

Sustainability objectives related to the administration of the Airport are:

- Integrate sustainable approaches and practices into the internal policies, business processes, written agreements, day-today operation, and long-term planning of the Airport.
- Provide opportunities and incentives to improve the health and well-being of the employees

- Develop the CAK workforce through proper recruitment, training, retention and diversity

The following addresses several administrative items that relate to the ongoing management of the Airport and identifies opportunities for advancing the sustainability initiative and garnering the greatest benefit to the People, Planet and Prosperity.

4.1.1 Sustainability Committee

As of early 2014, day-to-day management and operation of the Airport is conducted by an approximate 45-member team of Authority employees. This team is led by the President and Chief Executive Officer who is responsible for managing the Airport's annual operating budget, strategic planning, and Capital Improvement Program (CIP). The President also functions as the Director of Aviation. The executive staff includes the Chief Operating Officer, Facility Manager and Senior Vice President of Marketing and Communication. The remaining employees are distributed amongst the seven departments and provide a variety of services, including administration and marketing, operations management, building maintenance, custodial duties, field maintenance, Airport Rescue and Fire Fighting (ARFF), and information services.

The **Sustainable Master Plan** is intended to be a living program that is easy to implement. It is not envisioned to be burdensome to the staff members charged with its oversight. To effectively manage this program along all levels of the organization and within all day-to-day operations, it is recommended that the Authority establish a Sustainability Oversight Committee. This group would act as the Airport's sustainability champions and seek opportunities to integrate sustainable solutions and practices at CAK. They would be responsible for reviewing current policies, procedures and programs, and for making recommendations to the executive staff on ways to become more sustainable. They would also be responsible for coordinating any needed improvements and for monitoring and reporting on the program's performance as described in **Sections 5** and **6**.

To build partnership between the Authority and the various airport tenants, involvement in the Sustainability Team could be expanded to include a subgroup of tenants and service providers. This would offer the Sustainability Oversight Committee a broader perspective on sustainability issues and ease the implementation of green policies and procedures.

In conjunction with this, commitment from the tenant community could be strengthened by individual tenants becoming signatory to a "green airport pledge" thereby acknowledging acceptance of the principles of sustainability in their business dealings and daily operations. While this approach would be considered a voluntary commitment, participation could be elevated through the lease agreements by requiring tenants to establish their own corporate sustainability policy.

4.1.2 Awareness and Education Campaign

To build a culture of sustainability for the Airport, the Authority and its staff will need to disseminate program information or "spread the word" about sustainability. An effective communication program will reach internal and external audiences and provide both education and awareness of sustainability issues and the intended benefits. Multiple channels of communication, many of which are already in place at CAK, could be utilized to reach the diverse group of airport stakeholders and garner the needed acceptance. A common theme within these communications should be identifying what individuals can do to contribute to the sustainability of the Airport and surrounding communities.

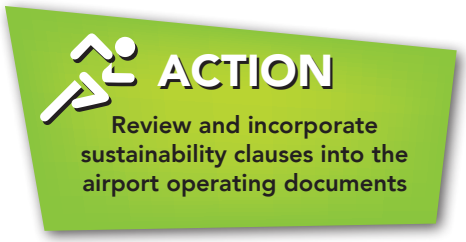
Some specific considerations when developing and implementing the awareness and educational campaign include:

- **Staff Training** – Include sustainability education and staff expectations in the employee initiation process and any employee handbooks or manuals. Hold recurrent sustainability training events. Distribute a periodic sustainability oriented newsletter to staff (and possibly tenants).
- **Staff Incentives** – Include a sustainability or "green" metric in the staff performance evaluation process. Spur staff adoption and creativity by recognizing, or incentivizing, personnel that bring implementable recommendations to the Sustainability Oversight Committee. Personnel could also be recognized for any outstanding contributions they provide to the overarching sustainability goals for the Airport. An award program could be developed on either a contest or nomination basis.
- **Tenant Outreach** – Build awareness of sustainability matters with the various tenant groups and identify how they can contribute to the sustainability objectives and what benefits they could expect from their participation. This could be achieved through regularly scheduled tenant meetings and/or newsletters similar to those items described for the staff training program. Incentivizing tenant participation through an awards or recognition program could also increase tenant acceptance and participation.
- **Best Sustainability Practices** – The Authority already has several programs in place that guide day-to-day activities and support the principles of sustainability. Examples include a recycling program, maintaining a non-smoking facility, a Stormwater Pollution Prevention Plan (SWPPP), a Spill Prevention, Containment and Countermeasures Plan (SPCC), and a voluntary FAA Part 150 noise study compatibility program. On many fronts, airport staff and tenants are already performing sustainable actions. The challenge is in knowing what to do and how it relates to sustainability. In conjunction with the education and awareness campaign, each department could develop a list of best sustainability practices relative to their operational functions and area of responsibility. While these could evolve into more strict standard operating procedures or policies in the future, gradual implementation may ease acceptance. Items that could be included range from establishing default double sided printing and going "paperless", to increased use of web-based video conferencing, to landscape procedures that avoid fertilizers and identifying no-mow zones (that do not create a wildlife hazard). Examples of numerous

other practices can be found on the Sustainable Aviation Guidance Alliance (SAGA) database (**http://www.airportsustainability.org/database**). SAGA is broad volunteer coalition of aviation interests formed in 2008 to assist airport operators of all sizes in planning, implementing, and maintaining a sustainability program. The database is an extensive, searchable resource of sustainability practices that can be tailored to the unique requirements of individual airports of all sizes and in different climates/regions in the United States.

- **Public Outreach** – Promote sustainability awareness to the general public through the various information channels already used by the Authority. This can include the Airport's website, social media (Facebook, Twitter, etc.), signage and other publications. In addition to garnering local support, these channels can be used to acknowledge the Airport's sustainable achievements and report on the program's overall performance.

4.1.3 Operating Documents



An airport is a diverse collection of systems and tenants, providing an array of facilities and services to varied groups of users. In order to maintain the highest level of safety and quality of service to those users, the Authority has implemented several mechanisms to help govern tenant and user activities. These mechanisms also protect the interests of the Authority and ensure consistent and fair treatment of all tenants. These mechanisms are in the form of primary operating documents which include tenant leases, contracts, Minimum Standards, Airport Development Standards, policies, and other standard operating procedures. As described below, integrating sustainability concerns into these operating documents will help support the long-term viability of the Airport.

- **Lease Agreement**s – The Authority maintains a variety of leases including terminal building and office space, airline space, food and retail concessions, rental car facilities, developed and undeveloped ground leases, and hangar and apron space. Landlord and tenants must work together to develop high-performance buildings and maintain healthy, productive work environments. Historically, property owners and tenants have had difficulty integrating sustainability into the lease process due to differences over responsibilities and cost-sharing arrangements. The lease plays an important role by laying the groundwork and ensuring a win-win outcome with the tenants.

  The Authority is encouraged to build clauses into new, modified or renewed lease agreements that improve sustainability on many fronts, such as, reducing external environmental impact and resource consumption while improving the indoor environment, health and productivity of the occupants. Examples include: requiring the establishment of a corporate sustainability policy, allowing cost-sharing for energy-saving improvements, ensuring tenants build offices to green standards, sharing access to energy use information, and encouraging cooperation on airport environmental programs (e.g. Sustainability Team, recycling program). It must be acknowledged that many of the existing leases are long-term agreements, and it will likely take several years for sustainability clauses to be integrated into all of them.

The commercial real estate industry has prepared substantial amounts of guidance, based on case studies and lessons learned, regarding the implementation of sustainable practices into the development, leasing, and maintenance of commercial properties. Industry resources with guidance on preparing "green leases" include; the Institute for Market Transformation (**http://www.greenleaselibrary.com/winners.html**), the U.S. Green Business Council "Green Office Guide" (**www.gcbi.org)**, and Core Net Global (**http://sustainability.corenetglobal.org**). The Airport Cooperative Research Program (ACRP) also provides airport specific lease and contract guidance in their Synthesis 42 report *Integrating Environmental Sustainability into Airport Contracts* (**http://www.trb.org/Publications/Blurbs/169023.aspx**).

- **Contracts** – The Authority procures a variety of services including professional consulting, engineering design, construction, parking management, maintenance and janitorial. While the current contracts may broadly encourage compliance with any local, state and federal environmental requirements, there is opportunity to integrate language that will help drive sustainability both at the Airport and within the community. Two (2) resources providing guidance and examples of integrating sustainability clauses into standard contracts include:

  - ACRP's *Integrating Environmental Sustainability into Airport Contracts* (**http://www.trb.org/Publications/Blurbs/169023.aspx**)
  - *American Institute of Architects (AIA) Sustainable Projects Contract Documents* (**http://www.aia.org/contractdocs/aiab093903**).

- **Minimum Standards** – The 2004 *Minimum Standards for Aeronautical Services or Activities* identifies the basic requirements for any person or entity desiring to provide aeronautical services to the public at the CAK. In accordance with FAA requirements, these standards are intended to be reasonable, non-discriminatory, and ensure that no operator is afforded an exclusive right of activity. Adherence to these minimum standards is a condition of the lease agreement between the Authority and service provider.

  The standards include several provisions that the service providers meet all safety and environmental requirements as mandated by the local, state and federal agencies. These provisions apply most directly to fueling and deicing operations, aircraft maintenance and repair, vehicle and equipment washing, and the handling of hazardous or volatile materials. While these provisions are intended to protect the health and safety of people and the environment, as well as promote fair competition and economic sustainability, there is opportunity to more solidly incorporate and advance the sustainability initiative.

- **Airport Development Guidelines** – The 2000 *Development Guidelines (Architectural, Engineering and Aesthetic Control)* apply to all tenants on leased airport property and are intended to ensure reasonable coordination and control of physical development at the Airport. While these are guidelines, and not a rigid code, any proposed deviation from the guidelines must be approved by the Authority. The guidelines and project review process include consideration of FAA standards, airspace protection, compatible land use, stormwater management, utility connections, environmental protection, aesthetics, and safety. Within this document there is opportunity to more directly incorporate sustainability considerations.

4.1.4 Green Procurement

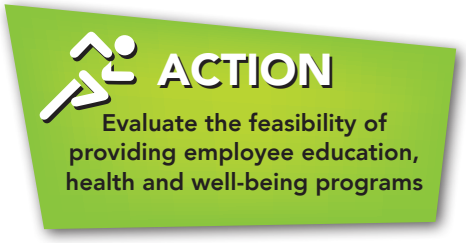
"Green procurement" is a method where environmental and social considerations are given equal weight to the price, availability, and performance criteria used to make purchasing decisions. Also known as "environmentally preferred purchasing", particularly within US federal government agencies, green procurement is intended to minimize negative environmental and social effects through the use of environmentally friendly products and by purchasing goods and services from manufacturers and vendors who share a commitment to the environment. By adopting a "Green Procurement" policy, Authority staff would strive to:

- Minimize the consumption of non-replaceable natural resources by specifying durable, long lasting materials and finishes to extend material life, and reduce maintenance requirements (i.e. avoid products that require frequent replacement or regular maintenance).
- Seek alternatives to products and processes that are detrimental to the environment by using more "environmentally friendly" products and processes (e.g. cleaning supplies, bleach-free paper products)
- Minimize waste, including: any packaging, waste produced by the product (or service) in questions, and waste generated by the eventual disposal of the product
- Maximize the reuse and recycling of materials
- Stimulate demand for "environmentally friendly" products by letting manufacturers and suppliers know the environmental performance expected in products

Generally speaking, the preference would be, to the greatest extent practicable, recycle content products and environmentally preferable products, and services unless such products do not perform satisfactorily and/or are unreasonably expensive. Guidance on identifying and evaluating environmentally preferred products and services include the U.S. EPA's Environmentally Preferable Purchasing Program (**http://www.epa.gov/oppt/epp/**), and the Green Seal non-profit organization (**http://www.greenseal.org**).

4.1.5 Employee Health and Well Being

As of 2014, the Authority's human resources function is managed by the Director of Aviation. Many of the employees perform multiple duties, the field, and operations personnel are cross-trained in airport rescue and firefighting. This lean staffing philosophy affords opportunity for strong team building and increased responsibility. At this time, due primarily to number and composition of part-time versus full-time staff, there are no official employee education benefits or health and well-being programs established. As the staff grows, and as the budget allows, the ability to provide additional employee programs should be evaluated.



4.1.6 Green Business Certification

Being a leader in airport sustainability takes commitment, creativity, time, and effort. There are numerous environmental, community and aviation industry resources available for guidance on developing and maintaining a sustainability program. Many of these resources are governmental agencies, non-profit organizations, or a joint partnership between the two. Collectively, these resources provide a community of knowledge and support. The Authority's involvement with these types of organizations could provide the Sustainability Oversight Committee with the most current issues, best practices and data relevant to the ongoing operation and maintenance of the Airport. Many of these organizations also have programs to motivate and acknowledge sustainability achievements through various "green" certifications or accreditations. While there are several readily acknowledged green certifications related to energy efficient buildings (refer to **Section 4.3**), the following are a couple organizations that could be applicable to the Airport and may be worth further consideration. Some form of "green business certification" could also be leveraged by the Authority in its ongoing outreach, marketing, and community connection campaigns.

- **Green Plus** – is recognized as a university backed third-party certification of an organizational process (as compared to a product or building certification). Green Plus also provides member businesses with education and networking resources to help improve their bottom line through sustainability initiatives. The certification process begins with a self-administered diagnostic survey and costs less than $600. In Ohio, Green Plus has partnered with the Council for Smaller Enterprises (Greater Cleveland Chamber of Commerce) to help organizations develop the skills and tools to become more competitive, more successful, and more sustainable. (**http://gogreenplus.org/sustainable-busines-certification/**)

- **Green America** – is a not-for-profit membership organization founded in 1982 (previously "Co-op America" until 2009). They certify businesses that are committed to the principles of social justice and environmental sustainability. This includes evaluating the way businesses source and market their products, take care of their employees and customers, and strive to continually improve their sustainability performance. (**http://www.greenamerica.org/greenbusiness/certification.cfm**)

- **Living Green** – is a City of Green (OH) program that encourages businesses, homeowners and local communities to adopt sustainable practices and "operate through the lens of good stewardship for our people, our planet and for the prosperity both today and into the future." By becoming a member of "Team Green", the Authority would be expected to uphold and promote the principles of sustainability. They would also receive recognition for their efforts and achievements through the City's own community outreach and awareness activities. This program is free of charge and the implementation of this Sustainable Master Plan would provide the information needed for the Team Green application. (**http://www.cityofgreen.org/living-green-at-work**)

4.2 ENERGY MANAGEMENT

Electricity and natural gas are two (2) of the larger operating expenditures at the Airport; therefore, any conservation initiatives that can be undertaken economically will have a positive effect on the environment and the Airport's operating budget. The following addresses the current usage of these energy sources and identifies opportunities for reducing their rate of consumption and/or reducing the costs associated with their procurement. The feasibility of developing alternative or renewable energy sources for the Airport is also addressed.

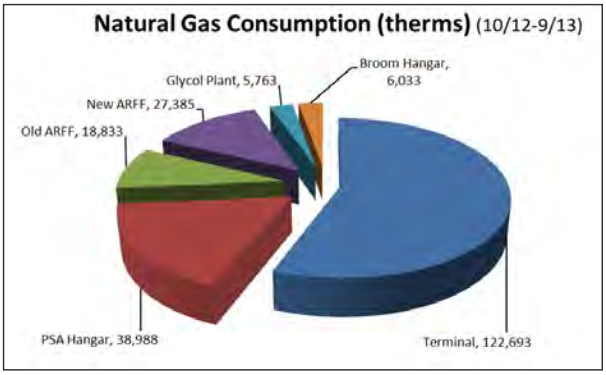
Sustainability objectives related to energy management at the Airport are:

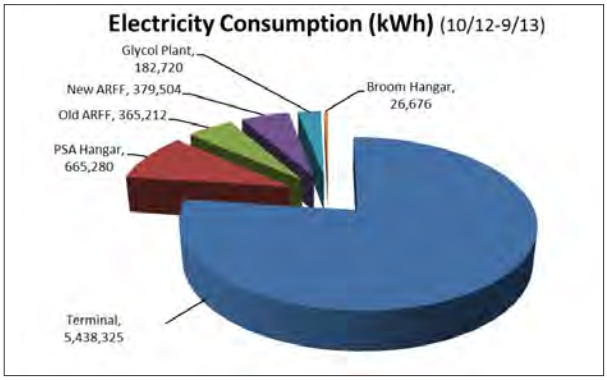
- Maximize energy efficiency and minimize energy consumption within buildings and airport property
- Evaluate and implement alternative energy procurement programs and renewable source generation

4.2.1 Electricity and Natural Gas Consumption

Of the 60 or so buildings on airport property, the Authority owns and maintains six (6) of them. These include the passenger terminal, the old ARFF building, the PSA hangar, the broom hangar, the new ARFF building and the glycol treatment plant. The other buildings are owned and maintained by their respective tenants, with ground leases provided by the Authority. In early 2014, an *Energy Efficiency Assessment*, or energy "audit", was performed for the six (6) Authority buildings. This report was done under separate cover and is available from the Airport upon request.

For the 12-month period of October 2012 through September 2013, the six (6) buildings used 7.36 million kilowatt-hours (kWh) of electricity at a cost of $519,000. It should be noted that the airfield lighting is routed through the terminal's main electrical vault and is included in these figures. The buildings also used 219,700 therms of natural gas at a cost of $137,800. The passenger terminal (including airfield lighting) is by far the largest energy consumer representing 74% of the total electricity used and 56% of the natural gas consumed. Over the same period of time, the Airport enplaned 887,663 commercial passengers . As a comparative metric, this equates to 8.29 total kWh and 0.25 therms per enplanement.





During recent terminal improvement projects, the Authority began to improve its energy performance by installing high efficiency boilers and HVAC units, using fritted glass that allows natural daylight but reduces heat transmission,

and installing LED and other high efficiency lighting fixtures (both on the airfield and in the terminal).

The efficiency assessment identified several potential Energy Conservations Measures (ECMs) that could be employed to further reduce energy consumption in the six (6) Authority maintained buildings. Recommendations on which ECMs to implement were based on simple payback periods of less than 15 years and include improvements to the HVAC equipment and controls, lighting and appliance control systems, and building insulation. **Table 4-1** summarizes the estimated investment and energy saving for each of the six buildings. These recommendations do not include improvements to the airfield lighting systems.

Table 4-1: Estimated Investment and Energy Savings for the Six Buildings

Summary of All Recommended Energy Conservation Measures						
Building	ECMs	Estimated Cost	Annual Utility Savings			Payback Period
		($)	kWh	Therms	$	(years)
Terminal	HVAC, Controls, Kitchen Controls, Lighting	620,000	992,811	4,067	73,900	0.4-14.9
Old ARFF	Lighting Controls	45,000	67,299	0	5,700	7.9
PSA Hangar	HVAC. Controls, Lighting	82,200	236,159	3,860	25,700	0.9-11.1
Broom Hangar	Insulation, Lighting	28,000	25,151	1,508	4,600	5.9-6.0
New ARFF	Vending Controls	400	2,891	0	300	1.3
Glycol Treatment	HVAC, Lighting	23,000	25,114	0	4,000	5.9-9.4
	Totals	**798,600**	**1,349,425**	**9,435**	**114,200**	**7.0**

Table 4-2: Short Term Energy Conservation Measures

Short Term Energy Conservation Measures					
ECMs	Estimated Cost	Annual Utility Savings			Payback Period
	($)	kWh	Therms	$	(years)
Terminal					
H3 - Install Synchronous Belt Drives on Air Handling Units	2,000	34,629		2,400	.09
H6 - Install High-Efficiency HVAC Motors	4,000	81,224		5,900	.07
C1 - Implement Night Setback Temp Control	4,000	145,040	2,454	11,500	.04
K3 - Install Vending Miser Control	1,600	11,563		800	2.0
Subtotal	**11,600**	**272,456**	**2,454**	**20,600**	
PSA Hangar					
H6 - Install High-Efficiency HVAC Motors	1,000	12,817		1,200	0.9
K3 - Install Vending Miser Control	200	1,927		200	1.0
Subtotal	**1,200**	**14,744**	**0**	**1,400**	

Short Term Energy Conservation Measures					
ECMs	Estimated Cost	Annual Utility Savings			Payback Period
	($)	kWh	Therms	$	(years)
New ARFF					
K3 - Install Vending Miser Control	400	2,891		300	1.3
Total	**13,200**	**290,091**	**2,454**	**22,300**	**0.6**

Refer to Energy Efficiency Assessment report under separate cover for details.
Costs and savings based on 2013 rates

Based on this assessment, if all the recommended ECMs were implemented, electricity use could be reduced by approximately 18% and natural gas use by about 4%. The energy bill could also be reduced on the order of 17%. The nearly $800, 000 investment to obtain these savings will likely take several years and several individual projects to achieve. By focusing on the largest energy consumers and shortest payback periods, improvement projects in the terminal, PSA hangar and new ARFF building with less than a 2 year return on investment should be prioritized. Those recommended ECMs are summarized in the following table and would result in a 4% annual reduction in electrical use and a 1% reduction in natural gas use.

4.2.2 Alternative and Renewable Energy Sources

Developing or incorporating alternative sources of energy generation, as a means of reducing a facility's utility costs and carbon footprint, is of interest to many airport sponsors. To date, there have been varying degrees of implementation at airports, ranging from small scale wind and solar installations to campus wide solar farms and geothermal programs. For most commercial service airports, the largest electricity demand is related to the terminal building. Depending on the size and leasing structure of the terminal, it appears that the larger airports are more capable of structuring an alternative energy program that achieves financial payback in a reasonable timeframe. Often, these energy development programs are multi-stakeholder partnerships and capitalize on third-party incentives or grants.

Airports also have rather unique operational and safety concerns and not all "green energy" technologies are currently considered appropriate for use on or near an active airfield. Spurred by positive business models and increased acceptance, the energy industry is rapidly advancing technological innovation and market development. The FAA and various aviation organizations, including the ACRP, are continuing their evaluation of how to implement and capitalize on these burgeoning technologies. It is anticipated that these advancements will allow for greater incorporation of alternative energy sources at airport facilities.

While the use of alternative energy is an environmentally responsible pursuit, the business case for doing so must be balanced with financial practicality. The CAK *Energy Efficiency Assessment* (**complete under separate cover**) includes a preliminary feasibility evaluation of several alternative energy

technologies for the Airport. Due in part to the facility size and utility demand characteristics, not all of these were deemed practical for implementation at the Airport. The ones that provide some level of plausibility are summarized in the following paragraphs:

- **Solar Photovoltaic Array** – The amount of space available to construct an array determines how much electricity can be generated. There are multiple locations within CAK property that a solar array could technically be developed. These include undeveloped mixed-use/business park areas to the west of the airfield, open areas along Lauby Road to the northeast of the airfield, and on the top of existing buildings in the terminal area. Ongoing facility planning for the Airport also indicates the potential of a future parking garage being developed in the main parking lot adjacent to the terminal building. Solar panels could be installed on the upper deck of this parking garage which would have the added benefit of providing another level of "covered" parking. Based on the garage concepts presented in the 2014 Master Plan Study, the footprint of the garage would be approximately 359,000 square feet. A solar array of this size would cost approximately $9.1 million to construct generating roughly 2,280 kW or 2,739,313 million kwh per year. This would offset approximately 50% of the annual electricity used by the terminal building and airfield lighting. Based on 2014 rates, this could result in an annual savings of approximately $189,000. At this rate, the payback on investment would take over 48 years. Unless additional third-party or grant funding becomes available, development of a solar array at CAK may not be financially prudent.

  Indianapolis International Airport
  Source: CleanEnergyAuthority.com

  One concern with developing solar arrays near an airport is the potential effect of "glare" on pilots and air traffic controllers. Beginning in about 2010, the FAA has been issuing guidance on evaluating, measuring and mitigating any adverse effects of glare to aircraft operations. The FAA now requires a quantitative glare analysis including an evaluation of potential visual impacts, prior to approving any new solar installations on-Airport property. The energy industry is responding to this concern by developing improved glare reducing materials.

- **Solar Thermal Hot Water** – Solar hot water systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. Solar collectors are usually placed on the roof of a building, and the sun's energy is then used to generate hot water. Hot water at the Airport is currently produced by gas-fired water heaters therefore this type of system could offer a natural gas utility savings. Incorporation of solar hot water systems into future building renovation or development projects warrants further consideration by the Authority.

- **Wind Power** – The common vision of a wind turbine is a three-bladed rotor, connected to a generator, mounted atop a monopole. The size of the turbine, and the amount of wind experienced at the installation site, determine the amount of energy produced. On a scale of 1 (the lowest) to 7 (the highest), Class 3 and above wind speeds (13 mph or greater) are generally considered a "good wind resource". According to National Renewable Energy Laboratory (NREL), average wind conditions in the Akron-Canton area are classified as Class 2 (at 50 m height) meaning the site would not likely be a good candidate for commercial scale wind power.

East Midlands Airport, UK
Source: airport-int.com.com

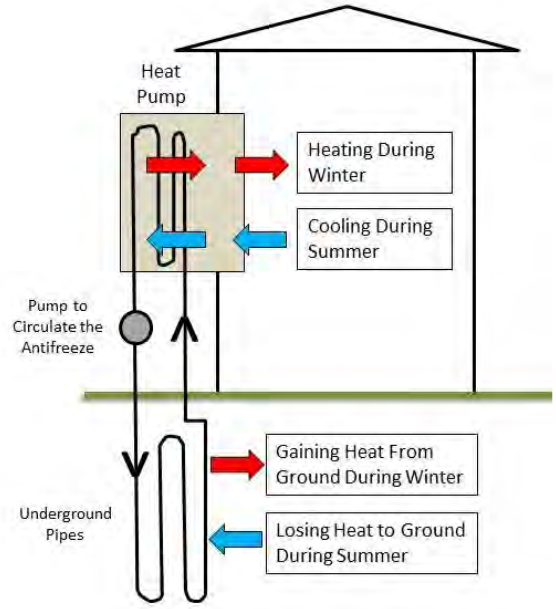
Boston Logan International Airport
Source: New York Times, 9/3/2008

There are also several concerns with the installation of commercial type wind turbines on or near an airport. Considering that the largest commercial turbines can have diameters greater than 300 feet and heights near 500 feet, physical penetrations of navigable airspace, including Part 77 and TERPs protective surfaces, can become an issue. Large turbines can also cause turbulence to downstream air and can cause radar interference if located near transmitter/receiver equipment. These issues are the topics of ongoing agency evaluation.

While large scale wind energy generation for the Airport may not be practical, the opportunity does exist for smaller, architectural type systems could be incorporated into building renovation or new construction. These smaller systems that could be used to augment traditional purchased electricity and could power specific systems within the buildings. The generation capability of these small-scale systems is growing and pending further study could result in a positive business case for the Airport. Small turbine systems have been installed at several airports including Boston Logan International Airport, Detroit Metro Airport, Honolulu International Airport, and Midway Airport.

- **Geothermal Heat Pumps** – A geothermal heat pump (or ground source heat pump) is a central heating and/or cooling system that uses the relatively constant ground temperature to transfer a building's heating and cooling loads. The earth is used as a heat source in the winter and a heat sink in the summer. These systems are very energy efficient and emit fewer pollutants than most other heating/cooling systems as there is no combustion process or associated heat transfer losses. Pumps are used to circulate water (or more commonly glycol) from an in-ground "bore" field to the building's heat pump loop. The size of the bore field is determined by the peak heating and cooling loads of the building and the heat transfer properties of the ground. The

depths of the bores (wells) are determined based on the economics of drilling and the available land, but typically range in the 300-400 foot depth for shale which is prevalent in the CAK area. To heat and cool the existing terminal building, an estimated 226 bores at 400 foot depth would be needed.



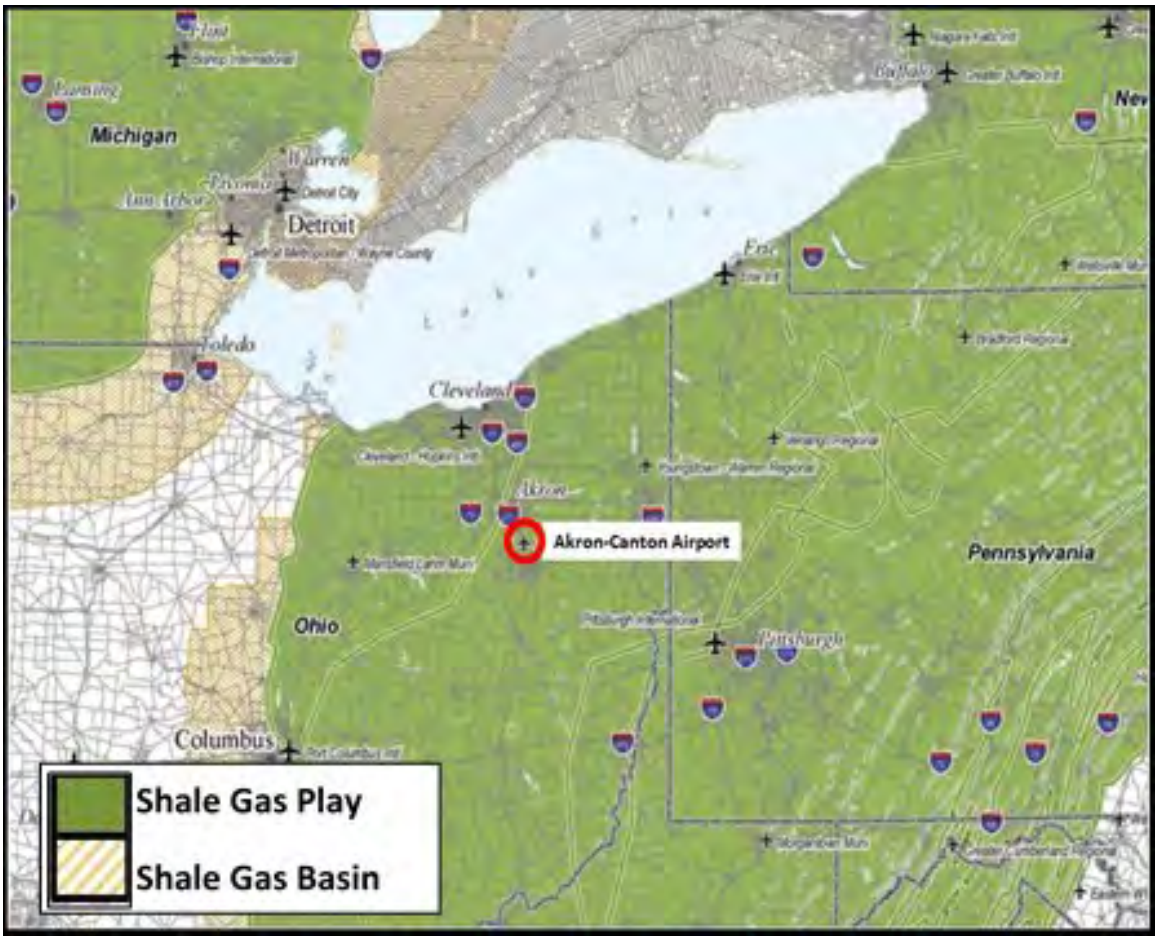
Geothermal systems tend to have relatively high first costs, especially for retro-fit applications due to the need for drilling multiple bores, installation of underground piping, installation of ceiling mounted heat pumps and associated ducting, piping and electrical work. A system for the existing terminal is estimated to cost $3.0M and could save 116,700 kWh of electricity and 104,000 therms of natural gas per year. This represents a small 2% reduction in electricity usage, but a significant 85%-90% reduction in natural gas demand. Based on 2014 rates, this could result in an annual savings of approximately $72,000, but the payback on investment would take over 42 years. Additional site evaluation and pursuit of third-party or grant funding would be needed to confirm the feasibility of developing this type of system at the Airport.

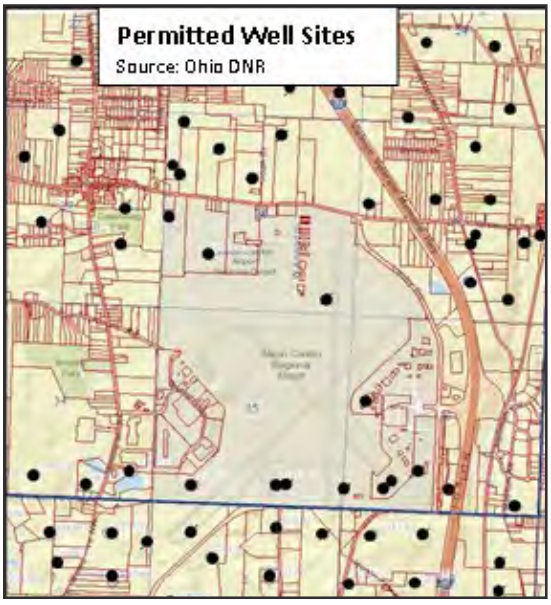
- **Oil and Gas Drilling** – Over the past decade, advances in oil and gas extraction methods have led to increased production and new well sites being developed throughout the nation's shale gas basins. The first advancement is *horizontal directional drilling* where the drill bit can be extended into the narrow gas reservoirs that lie parallel to the above-ground surface. The second advancement is *hydraulic fracturing* ("fracking") where water, sand and chemicals are pumped underground to break apart the rock and release the gas.

  As depicted in the following **Figures 4-1 and 4-2**, CAK is located within the Marcellus Shale Gas Play[1]. A "Play" is the part of a shale gas basin where active gas exploration is occurring. According to the Ohio Department of Natural Resources (DNR) Oil and Gas Well Database[2], there are several permitted wells near CAK in various states of activity. Some are exploratory, some have not been drilled, others have been closed, and a few may be active. There are even a couple of well sites on airport property. There are no substantial extraction operations occurring near the Airport at this time. The majority of activity appears to be further east and in Pennsylvania.

1 http://www.eia.gov/state/maps.cfm?v=Natural Gas
2 http://oilandgas.ohiodnr.gov/well-information/oil-gas-well-locator

Figures 4-1 and 4-2: Location of CAK in the Marcellus Shale Gas Play



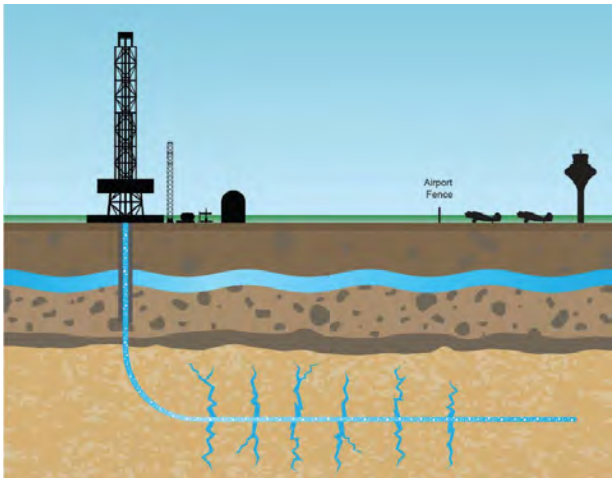


The opportunity for the Authority lies in the ability to sell extraction rights to a natural gas company and/or utilized any gas mined from the property to power airport facilities. This could create an additional revenue stream or lower the utility costs. There is one (1) airport in Ohio known to have oil and gas drilling activities; Jefferson County Airpark in Steubenville, OH approximately 90 miles southeast of CAK[3]. Twenty miles south of Steubenville, just across the Ohio-West Virginia border, the Wheeling Ohio County Airport also has drilling activities.

The potential issues with natural gas extraction on or near an airport include airspace protection, FAA obligated land use, and

3 ACRP Report 108, Guidebook for Energy Facilities Compatibility with Airports and Airspace, 2014

environmental concerns related to hydraulic fracturing. The physical equipment for well sites can include drill rigs, communication towers and storage tanks which all have the potential to penetrate protected airspace. These issues can be addressed during site design and agency coordination as with any other vertical development project near an airport. The FAA is also keenly interested in ensuring that any mining revenue collected and spent by the Airport sponsor is done so in accordance with the "Revenue Use Policy" and with the AIP Grant Assurances 24 and 25. These requirements apply to projects located on the surface of airport property (e.g. ground leases) and to projects that extend into subsurface grounds below airport property (e.g. directional drilling). The issue of "fracking" has divided many in the energy, environmental and scientific communities due to concerns related to the chemicals used in the mining process, the potential for ground water contamination, and seismic concerns. With these financial, regulatory and environmental issues in mind, the Authority should continue to evaluate opportunities as they arise.



Source: ACRP Report 108

- **Glycol Treatment Plant** – The Airport has a state-of-the-art facility for the collection and treatment of glycol-based aircraft deicing fluids. There is the potential of converting the natural gas byproducts from the treatment process to an alternative heat or energy source for use in other airport buildings. This in turn could reduce the Authority's utility expenses and the Airport's carbon footprint. Refer to **Section 4.5** for more details.

- **Leasing Space for Others to Develop "Green" Systems** – Airport sponsors are always looking for opportunities for increased revenue to support their operations and improve their financial position. According to the *2014 CAK Master Plan*, there is approximately 370 acres of airport property available for non-aviation uses. Leasing additional land to commercial tenants for the development of their own renewable energy systems may also be an opportunity for the Authority. Not only would this provide financial benefits, but the net energy use and carbon footprint of the Airport campus would be reduced.

The ability of the Authority to implement an alternative energy program at the Airport is influenced by regulatory, environmental and financial concerns. The energy demand characteristics of the Airport may not facilitate a positive business case for a large scale solar or geothermal project without third-party investment or grant assistance. Continued evaluation of the technical and financial feasibility of developing such an energy source at the Airport would be needed. The evaluation should include appropriate agency coordination and seek third-party partnerships to help perform the evaluation and fund the installation costs. The

ACTION

Evaluate the technical and financial feasibility of developing a solar and/or geothermal energy source at the Airport

aviation related concerns of these energy technologies would also apply to any of the tenants pursuing development of their own alternative energy systems. Refer also to **Section 5** for a discussion of potential energy procurement and funding programs as well as **Section 4.6.1** for a description of the "Green Energy Ohio" program.

ACTION

Evaluate the technical and financial feasibility of developing a solar and/or geothermal energy source at the Airport

There may be opportunities to install solar hot water heaters and/or smaller architectural type wind turbines into future building renovation or new construction projects. Due to the unique aviation concerns associated with these technologies, coordination with the FAA during the design process would be needed.

While the natural gas production market is active in Ohio, and people in the Akron-Canton area are benefitting from the newer extraction methods, there appears to be little opportunity for the Authority to capitalize on this trend at this time. The Authority should continue monitoring local market conditions and FAA guidance regarding oil and gas extraction opportunities on or near the Airport. Should the opportunity for mining/gas extraction on or near the Airport materialize, property and deed research performed during the 2014 Master Plan Study will help the Authority address any "Revenue Use" issues with the FAA.

ACTION

Monitor opportunities for oil/gas extraction at the Airport

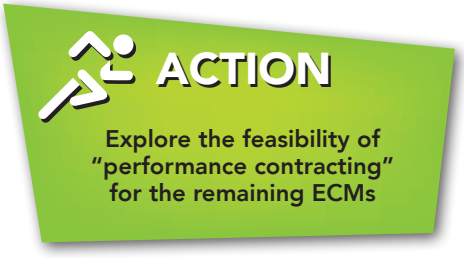
4.2.3 Energy Procurement and Funding Methods

With the increased volume of sustainability actions and energy conservation measures, additional assistance to provide a funding source for these actions may be necessary. As such, there are numerous funding opportunities available via the FAA, Local organizations, negotiating energy procurement, etc. The following list outlines several of these options in greater detail.

- **Energy Procurement** – Many utility companies across the nation are deregulated which enables building owners to choose a different third party electric and/or natural gas supplier while retaining their current local utility provider. Many times the local provider has the best price per kilowatt-hour or therms, but there are instances where the rates fluctuate greatly with the weather conditions and purchasing from a third party supplier is less expensive on an annual basis. For CAK, the electric utility provider is the Ohio Edison Company and the natural gas provider is Dominion East Ohio. There are hundreds of third party utility providers nationally and typically several available in each utilities' service area (refer to Appendix X for a listing of alternative suppliers in the CAK service area). The building owner must continue to pay the transportation charge portion of their utility bill which covers the maintenance and expansion costs for wiring and piping infrastructure. The supplier portion is billed independently, typically on a monthly basis. If an owner opts to participate in an energy procurement plan, they should monitor the supplier's rates frequently as they can change from month to month and most third party contracts include an escalation clause.
- **Power Purchase Agreement (PPA)** – These are a popular method of funding capital intensive alternative energy projects such as solar photovoltaic systems and wind turbines. These

technologies have a relatively high first cost of ownership and are heavily subsidized with state and federal grants and tax incentives. There are several variations of PPAs but the concept is similar for all. A contractor provides the owner with a fully operational system on their property which is typically leased by the owner for 15 years. The contractor owns and maintains the equipment for the term of the lease, after which, the contract is either terminated or renewed. If renewed, the old equipment is removed and upgraded with new technology. The owner is still connected to the utility power grid and continues to pay for electric transportation charges. During the term of the lease agreement, the owner pays the contractor a fixed monthly fee for electricity and the contractor/system provides the electrical needs for the building at a rate which would be lower than what the utility provider would charge. Any surplus electricity that is returned to the power grid is net metered and paid back to the contractor by the utility provider. Typically the tax benefits and available rebates are paid directly to the contractor. The benefits of this model are that the building owner gets renewable energy at little or no upfront cost, does not have maintain the equipment and gets less expensive fixed price electricity.

- **Energy Performance Contracting (EPC)** – Otherwise known as Energy Services Contractor (ESCO), EPC is a procurement model that uses the anticipated dollars saved from proposed energy savings measures (ECMs) to fund the implementation costs of the ECMs (and other improvements). By leveraging the time value of money, every dollar of energy saved today will increase in value each year due to interest and the inflation rate of the cost of the energy. This annual savings basically creates a funding source that allows a performance contractor to finance the project, typically for 15-18 years. Most performance contracts include a guaranteed savings clause that protects the owner from savings shortfalls should they occur as well as other clauses that account for increased energy consumption penalties due to building expansions or changes in use. The money saved each year from the energy improvements can actually create a surplus of cash each year that can be used for other non-energy related operations and maintenance projects. This could be an attractive method of funding desired improvements when little up-front capital is available. The drawback to a performance contract is that the energy savings are not only used to fund the project, but are also used to pay the performance contractor for their services and guaranty, which ultimately reduces the benefits of the energy savings verses an owner funded project.



Performance contractors tend to be subsidiaries to HVAC and temperature control vendors such as Siemens, Johnson Controls, Honeywell, Trane, etc. and most performance contracts have some temperature control components. Solicitations for performance contracting for projects considering using this model are typically performance based as well, requiring each contractor to prepare a proposal based on their estimate of maximum project savings based on a walkthrough of the facility.

- **VALE** – Under the VALE program, airport sponsors can use Airport Improvement Program (AIP) funds and Passenger Facility Charges (PFCs) to finance for cleaner technology projects that the FAA deems cost effective. Projects can range from the purchase of low-emission vehicles to major

infrastructure improvements. Examples of eligible projects include: preconditioned air units, chargers for electric ground support equipment like bag tugs and belt loaders; natural gas refueling stations for airport buses and shuttles; photo-voltaic solar arrays, and electric gates at the terminal. VALE projects also receive emission reduction credits from State governments, which the Airports can use to meet future environmental obligations under the Clean Air Act.

4.3 WASTE MANAGEMENT AND RECYCLING

Waste generated at the Akron-Canton Airport comes from a variety of sources including the airlines, airport operations and maintenance, passengers, tenants, and the restaurant/retail concessionaires. The volume of waste generated is most directly related to the number of passengers and the amount of aircraft activity. As described in the *2014 Master Plan Study*, continued growth in both passenger enplanements and aircraft operations is anticipated. This will result in greater volumes of airport waste that will need to be collected, stored and disposed.

Recycling is probably the most tangible means of reducing the operational costs and environmental impacts associated with traditional waste disposal. This has become a focal point for many airport operators, and the FAA Modernization and Reform Act of 2012 (FMRA) included expanded Airport Improvement Program (AIP) funding eligibility for "developing a plan for recycling and minimizing the generation of airport solid waste, consistent with applicable State and local recycling laws, including the cost of a waste audit." The FAA is developing additional guidance on this topic, including Program Guidance Letter 12-08 (9/14/12).

Sustainability objectives associated with the management of waste materials at the Airport include:

- Minimize the amount of solid waste generated and disposed of in local landfills
- Maximize collection and re-use of recyclable materials
- Ensure that hazardous materials are properly stored and handled and do not pose a threat to the environment or human health

From a program management perspective, there are several actions that the Authority and sustainability team can pursue to increase the effectiveness of the current waste management and recycling activities. These include but are not limited to:

- **Recycling Policy and Procedures** – As described in **Section 4.1**, administrative actions could include:
  - Incorporating recycling topics into the staff and tenant awareness and education campaign

- Establishing policies, incentives, and/or standard operating procedures for staff that promote waste reduction
- Incorporating recycling requirements in the Airport operating documents (e.g. leases, minimum standards). The Authority could also provide incentives or inspection to encourage tenants and concessionaires to use alternate means of waste disposal.
- Including consideration for low-waste, or limited-packaging products in a "green procurement policy"
- Incorporate the use of reusable oil filters for airport vehicles
- Partnering with local or community based sustainability outreach and awareness programs such as the City of Green's "Living Green" initiative

- **Waste Stream Analysis** – To optimize the level of waste reduction and recycling, this detailed type of assessment would help characterize and quantify the solid materials, recycling, and hazardous waste streams at the Airport. An in-depth understanding of who, what, where and how the waste is generated would allow the Authority to target the practices that have the greatest potential for enhancement. It would also help establish more quantifiable targets and metrics for monitoring recycling performance. Such an analysis could be performed early in the development of a waste management program, to establish a baseline, or performed at a later point in time to maximize the program's effectiveness. A comprehensive waste stream analysis would require an investment of both time and money, and would best be performed by a specialty waste management consultant.

The following describes the Airport's current solid waste, recycling, and hazardous material programs and identifies reasonable opportunities for enhancement.

4.3.1 Solid Waste

In general, trash from the Airport is removed by a local waste company that utilizes landfills for disposal. As of 2014, the Authority has a contract with the Kimble Company which maintains 21 eight-cubic yard (CY) dumpsters distributed around airport property. The Authority is charged a flat $2,500 monthly fee which includes daily/weekly collection of all dumpsters, as well as additional collection if needed due to higher than normal volume. Five (5) of the dumpsters are paid for by the Authority and the others are proportionately paid for by the tenants through a flat, fixed quarterly fee as part of their lease agreements. In 2013, the Airport generated approximately 200-250 CYs of trash per week, with the terminal building (which includes waste from the airline flights) contributing the largest volume.

Waste from international flights is however treated differently. Per the US Customs and Border Protection service, certain protocols must be followed when dealing with the waste from those flights. At CAK, after an aircraft clears customs, any remaining on-board waste is discarded in one 8-cubic yard container that remains separated from the regular solid waste stream. The Authority contracts with Stericycle, Inc. who collects the isolated waste material on an as needed basis. In accordance with US Customs, the international waste must be disposed of with 72 hours of the disposal date. After Stericycle, Inc. collects the waste, it is taken to a treatment facility in Youngstown, OH where it is incinerated. The cost associated with international waste disposal and incineration were $486 for 2013.

The Authority recognizes the importance of recycling and in 2008 partnered with the Stark-Tuscawaras-Wayne Joint Solid Waste Management District ("STW District") for the collection and removal of recyclable materials from terminal building. As part of this program, the recycling bins and pick-up and disposal of the recycling material are provided free of charge by the STW District. Currently, there are four sets of containers strategically placed around the terminal that provide separate bins to dispose of paper, plastic, and glass. The bins are designed with placards to segregate the recyclables and to improve their noticeability.

The airlines and other tenants within the terminal participate in recycling to varying degrees. Some have specific operational requirements for all employees and activities, others have general recommendations, and others may have negligible contributions. Some airlines rely on third party contractors to clean aircraft interiors after each flight, with waste disposal of both passenger trash and cleaning supplies being the responsibility of the contractor.

Recycling waste collected from terminal activities is transferred to four large industrial sized (6-8 CY) dumpsters that are also segregated by material type. For tenant and staff convenience, two of the dumpsters are located on the north side of the terminal and two are located on the south side. The STW District empties the dumpsters once a week unless the Authority requests additional pickups due to an unusually high volume. The remainders of the tenants on the airfield recycle on an individual basis and the prominence of recycling in those areas appears significantly less than the terminal building.

Even with a recycling program in place, there is undoubtedly some level of recyclable material being discarded with the regular trash. This presents the Authority with opportunities to potentially reduce the amount of material disposed of in the local landfills. By increasing the amount of recycling and effectively reducing the amount of trash generated, there is also the opportunity to renegotiate the waste removal contracts, reduce the number of trash dumpsters and lower the operating expenses for both the Authority and tenants. In addition to the waste stream assessment and general administrative actions, other activities aimed at increasing the collection of recyclable materials could include:

ACTION

Expand the solid waste recycling program throughout the Airport

- **Additional Terminal Recycling Bins** – Placing additional recycling bins in the terminal could help reduce the amount of recyclable materials discarded as trash. Additionally, by locating the recycling bins next to every regular trash bin, passengers and employees would have a higher propensity to properly discard waste material simply out of convenience.
- **Airport-Wide Recycling Program** – The Authority's current recycling program is focused on the terminal building and does not include the other buildings or tenants on airport property.

While the terminal is the largest trash generator, and some of the tenants/businesses may have their own recycling programs, there may be an opportunity to expand the cost-free, STW District recycling program to more areas of the Airport. Initially, additional recycling bins and dumpsters could be placed around the Airport property and with other major tenants. Ideally, the additional recycling dumpsters could be located adjacent to the existing trash dumpsters to streamline the segregation and collection of recyclables. At some point, however, it may become desirable to develop a centralized recycling facility for use by all tenants, to manage the increased amount of collected material. Opening such a "recycling center" to the local public, even on a periodic basis, would expand the Airport's positive environmental effect further into the local community.

New eco-friendly water bottle refill stations installed within the terminal building

- **Summit ReWorks** – This is a program spearheaded by the Summit/Akron Solid Waste Management Authority, with the purpose of reducing the region's reliance on landfills and increasing solid waste reuse, recycling, and waste minimization. The program's mission is to "provide solutions and leadership to empower our community, institutions, and businesses to develop and utilize environmentally sound, cost-effective recycling and waste management strategies". Similar to the STW District, the Authority could partner with ReWorks which provides several resources and recycling opportunities such as free recycling collection, promotional and educational materials, and waste stream consulting services. ReWorks provides both business and residential services. (**http://www.summitreworks.com/**)

- **Surplus Food Donation** – Currently, surplus prepared and stored food waste from the Airport (restaurant and airlines) is disposed of through the traditional solid waste stream. This creates an opportunity to reduce the amount of food being discarded as trash by donating surplus food to a local charitable organization. The restaurant vendors at CAK (MSE Branded Foods) currently donate surplus food items to Haven of Rest approximately once a month. The Haven of Rest and Refuge of Hope are both rescue mission programs that feed both shelters and the community six days a week. This is done by the restaurant as the deliver the surplus food to the location. To add to this donation, The Akron-Canton Regional Food Bank (ACRFB) will collect non-perishable donations and distributes food and other essential items to member agencies in eight Northeast Ohio counties including Stark and Summit counties (**www.akroncantonfoodbank.org**). These agencies take perishable, non-perishable, and previously prepared goods to provide sustenance for homeless individuals in the area (**www.refugeofhope.org**). Collaborating with these organizations could help support the local community by providing relief to those in need.

- **Non-Disposable or Reusable Restaurant Wares** – the restaurant concessionaire currently uses prepackaged, disposable flatware for both in-restaurant and take-away service. The "greenness" of reusable metal or eco-friendly biodegradable flatware as compared to disposable plastic flatware is dependent on many variables including the manufacturing process, packaging,

shipping, and dishwashing equipment. Reusable flatware must be washed which consumes water and energy. Plastic and biodegradable cutlery must be trucked away to a landfill in the regular solid waste stream. Once there, traditional plastics will never decay, bio-plastics will break down over an extremely long period, and wood products will breakdown rather quickly. The wood and bio-plastic materials will create some amount of carbon dioxide and methane gas during their decay process. Costs of the various types of flatware are estimated to range from: plastic 3-12 cents per set, bio-plastic 15-30 cents, wood 16-50 cents, and metal 60 cents to $1.00. The restaurant does utilize and wash glass and reusable plastic beverage containers and food baskets. While this presents an environmental stewardship opportunity for the daily operation of the restaurant, the decision to incorporate reusable or biodegradable service ware may be more of a "green statement" decision rather than an economic or measurable benefit decision.

4.3.2 Hazardous Waste Oils and Petroleum Products

The storage, use and disposal of hazardous materials are necessary and inevitable components of the Airport's daily operation. There are several types of hazardous material waste products generated at CAK including: waste oil from aircraft and machinery; waste or contaminated fuel (automobile gasoline, diesel, AVGAS, jet fuel); hydraulic fluids; and used cooking oil from the restaurants and food vendors.

The Authority operates multiple shops that generate waste material from the maintenance and repair of service vehicles and ground support equipment (e.g. aircraft deicing trucks, snow removal equipment, ARFF vehicles, etc.). This includes airline/flight-line support activities, as well as aircraft maintenance activities, that take place in the Authority owned "PSA Hangar". To support these activities, the Authority maintains a 350 gallon container that stores the comingled, liquid waste products. As of 2014, the James Sunland Oil Recovery company is contracted by the Authority to empty and dispose of/recycle the contents. Pick-up typically occurs twice a year unless needed in the event of excess activity. As part of this contract, the disposal contractor pays the Authority approximately 25 cents per gallon for the collected waste material. On average, this amounts to $150-$175 of revenue per year.

The two main Fixed Base Operators (FBOs) on the airfield, McKinley Air and Ultimate Jet Charters, also collect, store and dispose of hazardous waste materials. Typical materials generated from their servicing and maintenance of aircraft and equipment include used or contaminated Jet A/100LL fuel, motor oil, lubricants, and hydraulic fluid. Ultimate Jet maintains one 350 gallon tank for the storage of waste fuels and a separate 55 gallon drum for waste oils. The Akron-Canton Waste Oil Company is contracted to empty and dispose of the contents of these containers. Ultimate Jet Charters is charged approximately $50 for each collection, which occurs approximately every 6-8 weeks depending on the amount. This equates to an annual fee of $325-$430 for disposal of the containers. If included in the authority's oil recycling program, this could result in an additional $650-$860 in revenue (at 25 cents per gallon).

To protect the environment, and for human health and safety, the Authority maintains a SPCC plan (last updated in 2012 by Gresham, Smith & Partners). The SPCC plan addresses the containers, oil-filled operational equipment, facilities, and associated infrastructure regulated or required under Title 40

Code of Federal Regulations (CFR) Part 112 "Oil Pollution Prevention". The Authority's SPCC plan covers the equipment and activities exclusively operated by the Authority. As required by those regulations, other tenants on airport property may maintain their own SPCC plans. The Authority has a contract with the Clean Harbors, Inc. to treat all of the Airport related oil and fuel spills, the materials associated with those spills (i.e., the oil-dry material used to soak up the spill), and the removal of the waste. This service is on-call and the amount charged is dependent on the size of the spill.

The food and restaurant concessionaires at the Airport dispose of their grease and used cooking oil in one 8-cubic yard container located in the waste area of the Airport. The concessionaire contracts directly with the Waste Management Company to collect and dispose of the waste oil. Collection typically occurs once every month and the concessionaire pays a sum depending on the weight of the waste oil. Once the cooking oil has come to the end of its life, it can be made into biodiesel, which is considered to be a safe and environmentally friendly alternative to petrochemical based diesel fuel.

As airport activity increases over time, there will be higher volumes of waste oil/fuel generated at the Airport. Since the collection and disposal of most of these waste products are regulated in some form, the opportunities for sustainable enhancement revolve around efficiency of collection and maximizing revenue generated from the recycling of those materials. The Authority receives revenue from its collected waste oils, and the FBOs and restaurant concessionaires pay for the disposal of their hazardous waste products. Renegotiating the waste collection agreements, and/or developing a centralized hazardous material storage facility maintained by the Authority could benefit everyone on the airfield. These actions could result in streamlining the collection of waste oil/fuel, reducing tenant operating expenses, and increasing Authority revenue. Initially, the Authority could take on the responsibility of the existing waste oil containers, and should maintenance or volume demands warrant, a centralized facility could be pursued in the future.

4.3.3 Glycol Waste, Storage and Reuse

Proper de-icing and/or anti-icing of aircraft (hereafter collectively referred to as "deicing"') is critical to ensuring safe flight operations during winter weather. Prior to take-off, liquid deicing agents are sprayed onto aircraft while at the terminal gates, on the apron, or on designated deicing pads. The application can be performed by either fixed-fluid applicators (i.e. stationary de-icing equipment) or more commonly by glycol trucks with high-pressure spray booms. The spent deicing fluid from overspray and runoff from the aircraft is then collected, stored, disposed or recycled. Most airports store the collected glycol and stormwater runoff in tanks until third-party contractors transfer the waste runoff to recovery and recycling plants or waste water treatment facilities.

The main component of aircraft deicing fluid is propylene glycol or ethylene glycol, which are manufactured organic compounds that function as antifreeze by lowering the freezing point of water.

Typical aircraft deicing fluids are a mixture of 60% glycol and 40% water along with some other ingredients such as thickening agents, surfactants (wetting agents), corrosion inhibitors, and colored, UV-sensitive dye. Glycols are considered a potentially hazardous material due to the toxic effect they may have on people and animals, and the harmful effects it can have on water quality. The largest environmental concern with the use of glycol-based deicing agents is that of contaminated stormwater runoff (i.e., excess precipitation or snow melt that does not soak into the ground or evaporate creating pooled or flooded water potentially carrying contaminants from the surface). Glycols have a high level of biochemical oxygen demand (BOD) as they breakdown in the surface waters. In other words, large quantities of dissolved oxygen in the water column are consumed when naturally occurring microbial populations decompose the glycol. This process can adversely affect aquatic life by consuming oxygen needed by aquatic organisms for survival.

On May 16, 2012, the US EPA issued the final rule for *Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category*. The US EPA's Effluent Guidelines for Airport Deicing Discharges are national regulations that control the discharge of pollutants to surface waters and to publicly owned treatment plants. These guidelines are based on performance of treatment and control technologies. The final rule requirements state that existing and new primary airports with 1,000 or more annual jet departures that generate waste water associated with pavement de-icing should use: 1) non-urea fluid to de-ice pavement; or 2) meet effluent limitations for ammonia per their NPDES Industrial permit. Currently, CAK does not use urea-based fluid to de-ice airfield pavement and meets existing effluent limitations for ammonia. Only new airports with 10,000 annual departures located in certain cold climate zones will be required to install collection facilities. In existing facilities, the NPDES permitting process for industrial storm water will continue to be the primary means to control discharges on a site-specific basis. Given CAK's existing collection system and Anaerobic Fluidized Bed Reactor (AFBR), the US EPA's final ruling should not impact the Airport's current de-icing operations or infrastructure.

Source: Gresham, Smith & Partners (www.greshamsmith.com)

With the priority of safe public travel, the FAA has implemented strict standards for the performance characteristics of the deicing products and for their application. To minimize the effect of these glycol-based materials on the environment, the Environmental Protection Agency (EPA) has classified them as a regulated "industrial process" wastewater under the NPDES 40 CFR Part 122 "National Pollutant Discharge Elimination System" (i.e. NPDES permitting program). As a result, disposal of spent aircraft deicing fluid has become both an environmental and economic liability to airport sponsors.

While most airports pay to have the glycol waste disposed of off-site, CAK is home to one of three (as of 2014) state-of-the-art airport deicer collection, storage and treatment facilities operating worldwide. Constructed in 2006, this system includes two deicing pads, a vehicle wash bay, in-pavement drainage collection system with underground diversion valves, two 750,000 gallon concrete storage tanks, and a Glycol Digestion Facility with AFBR. The spent deicing fluid and stormwater mix flows from the deicing pads to the facility where the glycol is consumed by microscopic organisms inside the treatment system.

During the breakdown process, methane gas is produced which is then used to heat the reactors within the treatment system and the facility itself. The balance of the methane gas is burned off to atmosphere through a flare stack located outside of the treatment plant.

The amount of glycol collection, storage, and facility run-time is solely dependent on the weather during the winter season. The facility at CAK is typically operational between four and six months of the year, depending on precipitation. Before the facility becomes operational, the storage tanks must collect between 100,000 and 200,000 gallons of storm water and glycol mix. The final decision to begin operation at the facility is based on the concentration of the mix within the storage tanks (i.e., if only storm water has been collected up to a certain point, there is no glycol to be digested). Over the past four winter seasons (2010-2013), an average of 119,500 gallons of storm water/glycol mix was collected and an average of 29,500 Standard Cubic Feet (SCF) of methane gas was produced per year. The associated costs for running the facility have averaged approximately $159,000 per year, which includes materials, supplies, utilities, and payroll.

Currently, excess methane gas generated by the Glycol Digestion Facility is burned off. While methane is a greenhouse gas, the emissions from its combustion are significantly cleaner than from other fossil fuels[4]. This provides an opportunity for the Authority to collect, store and convert that gas to heat or energy for other uses. This could reduce the Authority's utility expenses and the Airport's carbon footprint. The ability to store and recover the energy from the excess "bio-gas" will need further evaluation, including chemical composition, energy potential, system requirements, preliminary engineering and cost/benefit.

It is likely that planning, design and construction of a bio-gas to energy conversion project could be pursued under the FAA's VALE funding program. The VALE program allows airport sponsors to be proactive in improving air quality at their facilities and is available to commercial service airports located in compromised air quality areas of the country. As designated by the EPA, CAK is located in an area classified as "maintenance" for particulate matter and ozone so is eligible for the VALE program[5].

ACTION

Seek opportunities to generate heat/energy from byproducts of glycol digestion facility

The Authority anticipates constructing a new salt/sand storage facility in 2015/2016 which could capitalize on this opportunity as the building would need to be heated during the same periods of time that the glycol facility would typically be operating. As operations and airport activity increase over time, the demand for aircraft deicing would also increase, which in turn will create more glycol collection and digestion, and ultimately more opportunities for alternative energy production. With a 1.5 million gallon storage volume, the glycol facility has the capacity to accommodate increased operations for years to come.

4 EIA – Natural Gas Issues and Trends 1998
5 Akron-Canton Airport Master Plan Study, CHA Consulting, Inc., 2014

4.4 WATER RESOURCE MANAGEMENT

Water is an essential natural resource that is vital to ecosystem health and human well-being. According to the U.S. Geological Survey (USGS), only 2.5 percent of the Earth's total water supply is fresh water and less than 1 percent of that is directly available for human use. This includes the surface water found in rivers, lakes, and reservoirs and underground aquifers that are shallow enough to be tapped at reasonable cost. While these sources are renewed by rain and snowfall, and are therefore available on a sustainable basis, they are somewhat finite in nature. Over the years, population and development pressures have stressed the natural water systems, resulting in increased federal regulation of both potable water and stormwater runoff.

Water use at the Airport touches almost every aspect of daily activities including drinking water, food preparation, cleaning and maintenance, aircraft deicing, irrigation and sewage. Consistent with the environmental stewardship goals of protecting and conserving natural resources, the Authority has identified the following water resource management objectives:

- Maximize water conservation and minimize potable water use within Airport facilities
- Protect regional water quality through effective storm water management and pollution prevention initiatives

4.4.1 Potable Water Conservation

Water conservation is about reducing the amount of potable water consumed for daily activities. This in turn reduces the draw on natural freshwater resources. In addition to the environmental benefits of reduced water use, financial benefits can also be garnered. Each drop of potable water has to be moved, treated, stored and often heated. Each of these processes requires energy and infrastructure maintenance. By reducing the demand for treated water, both the end user and the supplier can save money. The associated reduction in energy use can result in further environmental benefit, particularly in areas where fossil fuels are used to generate energy. According to the U.S. Energy Information Administration (**www.eia.gov**), in 2013 approximately 67 percent of the energy generated in the United States was fossil fuel based and 19 percent was nuclear.

Potable water is provided to the Airport through the City of North Canton's public water supply system. The Authority has installed a sub-metering network to accurately gauge the amount of potable water consumed. This includes water used in the terminal building, the parking lot toll booths, the dump station, the glycol treatment plant, the new ARFF building and the old ARFF building (now the general aviation Customs and Border Protection building). According to CAK records, these facilities consumed ±10.6 million gallons of water in 2012 and ±13.8 million gallons in 2013. The vast difference between 2012 and 2013 is the result of a broken underground pipe that had been leaking for several months. From January through August 2014, the Airport had used ±5.424 million gallons of water at an expense of $48,404 which equates to an average price of $0.0089 per gallon. Over that same period of time, the Airport enplaned 525,932 passengers which equates to 10.3 gallons of water used per enplanement.

To promote water conservation at the Airport, the Authority has installed low-flow, or high-efficiency toilets, urinals, and faucets (e.g., variable flush, pressure-assisted aerators), and occupancy sensors on

many of the fixtures within the terminal building restrooms. These improvements were made as part of larger facility renovation projects; however, several outdated and lower efficiency fixtures still remain. The new ARFF facility, which opened in May 2013, includes high-efficiency fixtures. Operations and maintenance staff also use low-volume high-pressure nozzles on hoses used for vehicles washing.

An opportunity exists for the Authority to reduce its potable water draw even further by replacing the remaining outdated low-efficiency water fixtures within the terminal. The current water efficiency standards, according to the EPA and WaterSense Program, for commercial toilets and urinals are 1.6 and 1.0 gallons per flush (gpf) or less, respectively. Additionally, for commercial faucets, the current standard maximum flow is 2.2 gallons per minute (gpm) or 0.25 gal per cycle. Comparatively, high-efficiency toilets use between 0.5-1.0 gpf and waterless urinals obviously don't use any water. High-efficiency faucets typically utilize occupancy sensors and higher pressure systems to use less water per cycle (0.15 gallons per cycle). Based on these factors, an evaluation of potential water and expense savings was performing using the following data, methodology and assumptions:

Data and Assumptions:

- Number of total fixtures
  - Faucets – 40 Public, 8 Private
  - Urinals – 35 Public
  - Toilets – 50 Female, 25 Male, 8 Private
- Estimated use per fixture per day based on traffic volume and EPA Water Sense data:
  - Urinals – 75 Flushes per day per urinal
  - Toilets
    - Female – 100 Flushes per toilet per day
    - Male – 50 Flushes per toilet per day
  - Faucet use was calculated by the number of total flushes (one use per passenger/flush)
- Upgrade costs including labor and materials for higher efficiency restroom fixtures (all estimates derived using RS Means Green Building Construction Cost Data)
  - $600 per Low-Flow Occupancy Sensor Faucet Fixture
  - $700 per Waterless Urinal
  - $800 per Low-Flow Toilet (Men's and Women's)
  - Average cost per gallon based on Airport records ($0.0089 gal.)

Methodology:

- Current annual total restroom water use calculated by applying the total annual operational days with the average daily flushes per fixture and then multiplying by the EPA standard

- Estimated annual total cost calculated by applying total water use (faucet, urinal, toilet) with the average per gallon water expense for the Airport ($0.0089 gal.)
- The total use and annual water expense cost for replacement fixtures were calculated similar to the current water use; however, the high-efficiency standards per individual unit were applied.
  - Faucets – 0.15 gal per cycle
  - Urinals – 0 gpf (waterless)
  - Toilets – 0.75 gpf (average of 0.5-1.0 gpf)
- Water and operational cost savings derived from calculating the difference between the new and the old water use and expenses
- Return on investment (ROI) calculated by dividing the cost to replace each unit by annual savings

The results of this analysis are provided in the following table and indicate that the Authority could potentially reduce potable water use by three million gallons per year, and reduce annual water expense by over $28,000. Based on those savings, and the cost to replace the fixtures in the restrooms, the Authority may begin to see a significant ROI in just over four years. It is recommended that any outdated, lower-efficiency fixtures be replaced with high-efficiency, low-flow, and waterless units as a proactive project. **Table 4-3** shows the previously mentioned data in table format.

Table 4-3: Annual Water Use

Annual Water Use within Terminal Restrooms										
		Current EPA Standards		High-Efficiency Standards						
Fixture	# of Units	Water Use	Annual Cost	Water Use	Annual Cost	Water Savings	Expense Savings	Upgrade Cost Per Unit	Total Upgrade Cost	ROI (Yrs.)
Faucet	48	819,425	$7,293	491,655	$4,376	327,770	$2,917	$600	$28,800	10
Urinals	35	958,125	$8,527	0	$0	958,125	$8,527	$700	$24,500	3
Toilets	83	3,650,000	$32,485	1,710,938	$15,227	1,939,063	$17,258	$800	$66,400	4
Total	**166**	**5,427,550**	**$48,305**	**2,202,593**	**$19,603**	**3,224,958**	**$28,702**		**$119,700**	**4**

The installation of "tank-less" or "point-of-use" water heaters was also evaluated in terms of water conservation for restrooms and other facilities at the Airport. As mentioned in the Energy Efficiency Assessment, there are two 215-gallon gas-fired water heaters that serve the majority of restrooms in the terminal building. The other outlying, or remote, restrooms are served by smaller gas-fired "tank" style

water heaters or point-of-use electric water heater. The restaurant utilizes several small electric tank-style water heaters for food preparation. Based on current traffic levels, it was determined that replacing the existing tank-style hot water heaters with tank-less units would not be reasonable or cost effective enough to constitute meaningful energy or water savings. However, in the future, during renovation projects or when the existing water heaters reach the end of their usable life, replacing the tank-style heaters with tank-less units is still a recommended action.

ACTION

Replace smaller tank style water heater units with tankless units, when opportunities arise

4.4.2 Water Recycling and Reuse

Additional means of reducing the draw from a public water supply include rain water harvesting and gray water systems. These are two methods of water recycling that could potentially be used as supplemental, non-potable water sources for use in toilets and urinals, vehicle washing, or landscape irrigation at the Airport.

"IWS - watercache.com"; 5600 gallon commercial rainwater collection system for LEED Gold rated fire station in Denton, Texas

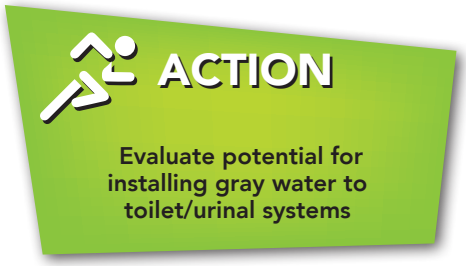
Harvesting is the collection of rainwater from roof tops, large concrete areas, or other impervious surfaces and storing that water in cisterns for non-potable use. Cisterns can be placed above or below ground, and the collected water is pumped or gravity-fed into the appropriate plumbing system. CAK has no landscaping that requires irrigation, so the restrooms within the terminal building would be the most likely candidate for such a system. Washing of rental cars is another potential use of captured rainwater.

One potential means of water collection would be to capitalize on the existing deicing pad infrastructure. By installing a 5,000-10,000 gallon underground cistern and retrofitting the collection drains and bypass valves to divert collected rainwater to the cistern during non-operation months, the Airport could collect an average of 225,000 gallons of rain water per month from March through July (based on apron area and the average monthly rainfall according to US Climate Data). This could reduce the Authority's public water demand by almost a third during the five-month rainy season and reduce the annual water cost by $10,000 (based on $0.0089/gallon).

The difficulty and high cost of retrofitting the terminal's existing plumbing with a secondary rainwater system does make such a venture largely infeasible as the return on investment would likely be decades. However, during any future terminal renovations or expansions (such as the concourse expansion programmed for 2016/2017), the integration of a rain water cistern system should be considered, as the costs for new construction would be reasonable as part of a larger project.

ACTION

Consider the implementation of a rain water cistern during future terminal expansion or renovation



Gray water systems refer to the reuse of water drained from showers, faucets, sinks, dishwashers, wash bays, and other potable to waste water systems (excluding toilets and kitchen sinks). Gray water is of lesser quality than common tap water and is only recommended for use in toilets and urinals, car washes, and possibly irrigation. Because gray water systems vary from low-cost systems (e.g. one sink to one toilet) to higher complexity systems, additional research would be needed to evaluate the feasibility of retrofitting the existing restrooms to use gray water as a supplement to the primary water supply. Though not as robust as a rainwater system, there is potential to reduce public water demand and operational expenses by converting the system for each individual restroom.

4.4.3 Protecting Water Quality

Airport activities have the potential to effect local water quality. The transportation and storage of fuels, de-icing of aircraft and pavement, and general indirect pollution can lower the quality of watersheds and water bodies near an airport. For this reason, the management of stormwater runoff (i.e., precipitation in the form of rainwater or snow melt that "runs off" over the land instead of seeping into the ground) is highly regulated through the National Pollution Discharge Elimination System (NPDES) permit program, created in Section 402 of the 1972 Clean Water Act (CWA). The NPDES permit program is designed to prevent stormwater runoff from washing harmful pollutants and excess silt into local surface waters such as streams, rivers, lakes or coastal waters.

The Airport requires permit coverage for stormwater discharges from its daily "industrial" operations and construction activities. Industrial activities, including deicing operations, are monitored under individual NPDES permit number 3IN00157*BD which expires October 31, 2018. Individual permits are to be renewed every 5 years. Most of CAK's construction activities are monitored under the General Permit for Storm Water Discharges from Small and Large Construction Activities. The current General Construction Permit is No. OHC000004 expiring April 20, 2018. The Ohio EPA has been renewing it every 5 years. The General Permit covers discharges that will have a minimal effect on the environment. The Ohio EPA has, however, required that certain airport construction projects, such as the ARFF building and parking lot expansions performed between 2010 and 2014, obtain an individual construction permit. Additionally, in accordance with the requirements of these permits, CAK maintains a SWPPP which identifies the people, processes and practices that airport staff must follow to prevent and mitigate stormwater pollution.

Stormwater management is a major element of the Authority's commitment to sustainability and environmental stewardship. Airport staff executes stormwater management and water quality protection efforts at a high level. Stormwater quantity has been well controlled on airport property since 1997, when CAK implemented the recommendations of a comprehensive Drainage Study[6] to ensure post-development runoff volumes remained equal to or below the volumes calculated for the pre-development conditions at the Airport. During the winter months, the Glycol Treatment Facility collects excess glycol from aircraft deicing operations along with stormwater from much of the apron and grassy areas immediately adjacent to the deicing pads treating the collected glycol and water runoff simultaneously.

6 Akron-County Regional Airport Stormwater Drainage Study, prepared by Environmental Design Group, April 1997

As part of the Authority's ongoing environmental planning efforts, the *2014 Master Plan Study* identified the stormwater management controls in place at the Airport (sand basins, ponds, glycol recovery plant, etc.) as well as future recommended controls to accommodate anticipated facility growth. As the various areas of the Airport are planned and developed, the Authority will need to comply with the NPDES permit requirements at that time and implement the latest strategies and practices available as stormwater management technologies continue to evolve.

ACTION

As airport development occurs, update and expand the current stormwater controls and SWPPP accordingly

The EPA describes Low Impact Development (LID) a[7]s:

> ***An approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product. There are many practices that have been used to adhere to these principles such as bio retention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. LID has been characterized as a sustainable stormwater practice by the Water Environment Research Foundation and others.***

ACTION

Incorporate LID strategies into the Airport's "Development Guidelines"

To proactively reduce the ecological effects of continued airport development, while meeting the needs of the traveling public and local communities, LID strategies should be employed throughout airport property where applicable and feasible. This can be promoted by integrating LID concepts into the Authority's *Development Guidelines (Architectural, Engineering and Aesthetic Control)* which apply to all tenants on leased airport property. An extensive list of LID resources can be found on the EPA website at **http://water.epa.gov/polwaste/green/**.

4.5 AIR QUALITY

The EPA, under the influence of the Clean Air Act, has set National Ambient Air Quality Standards (NAAQS) for pollutants considered to be harmful for public health and the environment. The NAAQS identifies

7 U.S. EPA, http://water.epa.gov/polwaste/green/

six principal pollutants, known as 'criteria' pollutants, which include carbon monoxide (CO), sulfur oxides (SO_X) lead (P_b), nitrogen dioxide (NO_2), ozone (O_3), and particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). Under the CAA, each state is responsible for classifying areas with respect to compliance or degree of noncompliance with the NAAQS. These designations include "attainment", "non-attainment" and "maintenance". An area with air quality better than the NAAQS is designated as attainment, while one with air quality worse than the NAAQS is designated as non-attainment. Non-attainment areas are further classified as extreme, severe, serious, moderate, and marginal. A maintenance area is one previously designated non-attainment but re-designated as a maintenance area because air pollution levels have improved above levels that would place the area in non-attainment status. According to the Ohio Environmental Protection Agency (OEPA), Summit County is designated as a marginal nonattainment area for ozone and both Stark County and Summit County are within a maintenance area for $PM_{2.5}$.

Another class of air pollutants that has been receiving increased attention in recent years are greenhouse gases (GHG). GHG is the general term for a number of gases that are instrumental in controlling the temperature of the earth. The most common GHGs include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N2O), and ozone, but there are many others. Excess amounts of these GHGs can lead to increases in the earth's near-surface temperature, which is part of the debate on world climate change. GHGs are generated both by natural and man-made sources, including stationary and mobile sources. Relative to airports, the GHG of primary importance is the CO_2 generated from the burning of fuels.

On April 17, 2009, EPA's Administrator signed an Endangerment Finding, which found that the current and projected concentrations of the six key GHGs in the atmosphere have an effect on the planet. The GHG emissions generated directly and indirectly by an entity such as a federal agency can be classified into "scopes," based on the source of the emissions:

- **Scope 1** emissions are direct emissions from sources that are owned or controlled by the reporting entity. For an airport, these emissions are those associated with ground vehicles owned and operated by the Airport and stationary sources.
- **Scope 2** emissions are indirect emissions from the generation of purchased electricity consumed by the Airport.
- **Scope 3** are also indirect emissions from sources not owned or directly controlled by the entity but related to the entity's activities. Scope 3 are typically the largest quantity of emissions at an airport, as they include aircraft-related emissions, emissions from all tenant-related activities, as well as the public's travel to and from the Airport.

Sustainability objectives associated with Air Quality at the Airport include:

- Reducing the carbon footprint of the Airport
- Decrease the amount of emissions generated associated with CAK both on- and off-Airport
- Improve the air quality of the surrounding region

4.5.1 Baseline Assessment

An inventory of GHG emissions was completed for the Airport in March, 2014 utilizing guidance provided in the Airport Cooperative Research Program Report 11 – Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories (ACRP, 2009) (see **Appendix A**). As such, the baseline assessment was prepared to identify the emissions of the six principal greenhouse gases, which are carbon dioxide (CO2), nitrous oxide (N_2O), methane (CH_4), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFC), and perfluorocarbons (PFC). The basis of the inventory assessment was to identify quantifiable emissions generated at CAK and categorize those emissions to recognize opportunities and practices that can be implemented to reduce the total emissions for the Airport. Typically, emissions that are associated with an airport occur from the following activities:

- Aircraft operations
- Ground Support Equipment (GSE)
- Ground access vehicles (GAV)
- Stationary sources (i.e., natural gas uses in buildings on airport property and emergency generators)
- Electricity use

The majority of emissions and particulate pollution generated at airports is primarily from aircraft operations. The emissions from aircraft include Landing and Take-Off (LTO) and Cruise operations. These categories encompass the various phases of operations on the Airport (run-up, taxi, take-off queue, etc.) and within the vicinity of the Airport (LTO operation is defined as all activities taking place below 3,000 feet). Emissions data from these operations were based on fuel consumption factors from the FAA's Emissions and Dispersion Modeling System (EDMS) modal (FAA, 2009). These factors were then applied to base year total operations at the Airport which calculated total emissions. The base year used in this assessment was 2013.

After aircraft operations, the largest contributors to airport emissions are daily GAV operations that operate in the vicinity of the Airport. (i.e., vehicles used to transport people/goods to and from the Airport). These are considered to be aircraft owners/operators (FBOs, employees, etc.), the general public (passengers, pickup/drop-off, rental car, etc.), and public transit systems that serve CAK (parking shuttle, shuttle buses, bus line, taxi, etc.) For the purposes of this assessment an average trip distance of 30 miles was assumed along with daily passenger car traffic estimates at 2,800 trips to and from the Airport.

Although the remaining sources do generate emissions, they are at a rate much less than the previous two sources. These include the GSE on the airfield, electricity use (terminal, FBO, tenant, etc.), and stationary sources (boilers, furnaces, water heaters, generators, etc.). These sources were measured based on the size of their engines in the equipment and by the amount of energy (electricity, natural gas, etc.) needed to power the equipment. The total number of hours were taken for GSE and applied to the EDMS similar to operations and the total energy use for electricity and stationary sources was derived from the Energy Efficiency Assessment.

Table 4-4 details the total emissions (in metric tons) for the various sources of GHG emissions. As noted in the table, the total GHG emissions (CO_2-equivalent) for CAK are estimated to be 91,750 metric tons per year.

Table 4-4: Estimated 2012 Greenhouse Gas Emissions (metric tons)

2012 Baseline Green House Gas Emissions (Metric Tons)			
Activity	**CO2**	**CH4**	**N20**
Aircraft Operations (Total)	59,871	3.00	0.28
Aircraft Operations (LTO)	18,663	0.78	0.08
Aircraft Operations (Cruise/APU)	41,208	2.22	0.21
Ground Support Equipment	2,056	0.12	0.004
Ground Access Vehicles	23,034	0.92	0.14
Stationary Sources (Total)	1,247	0.12	0.002
Natural Gas Use	1,208	0.12	0.001
Emergency Generators	39	0.002	0.001
Electricity Use	4,865	0.06	0.02
Total Emissions	**91,072**	**4.21**	**0.45**
Total Emissions (CO2-equivalent)		**91,750**	

4.5.2 Airport Operations

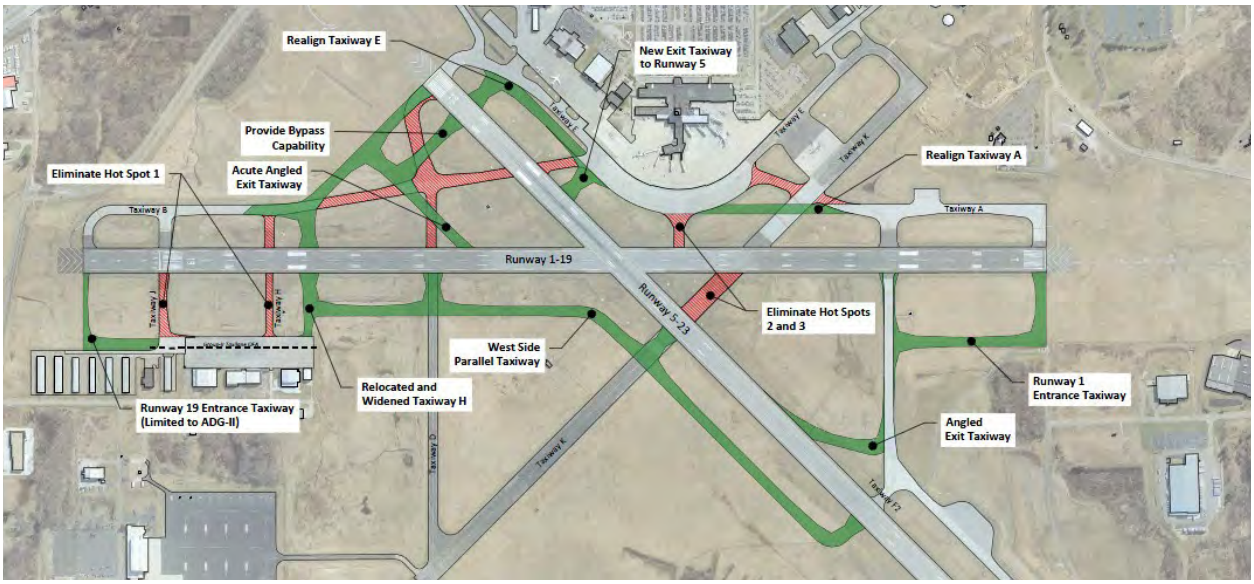
As expected, the most significant source of emissions associated with CAK is attributed to fuel combustion from aircraft operations. Of the total 91,750 metric tons of CO_{2e} emissions, approximately 65% are from aircraft fuel combustion. It is very common for airports to accumulate delays, both on the ground and in the air. These delays are the result of several factors (carrier delays, departure congestion, airborne operations causing ground delays, etc.) that cause extended periods in which the Airport generates excess emissions. This includes extended taxiing times, delayed aircraft gate push-back/run-up, increased departure queue times (aircraft sitting idle waiting to take-off), and other extended engine run times. Taxiing procedures are typically categorized as taxi-out and taxi-in (i.e., from the gate to the runway and vice versa).

Based on the level of activity at CAK and the relatively low peak hour events, airfield congestion is not a concern. However, the Master Plan does predict a 20.8% growth in overall operations during the next 20 years so congestion could become an issue in the near future. Therefore, it is recommended that the Airport implement new sustainable airfield practices and procedures during peak operational windows (see *2014 Airport Master Plan: Chapter 2 Forecasts of Aviation Demand for peaking characteristics at CAK*).

CAK has begun to implement several sustainable procedures to mitigate current and future emissions associated with aircraft engine run. The *2014 Airport Master Plan* identified options for more efficient

aircraft taxi procedures, which the Airport plans to implement in daily aircraft operations. Specifically, the Master Plan recommends new future taxiway construction on the west side of the airfield for more efficient access to the GA area of the Airport. In addition to the development of the west side taxiways, other taxiway development on the airfield will contribute to the reduction of taxi times (taxiing distance to point of departure/arrival) including the development of taxiways on the end of Runway 7, Runway 23, and Runway 19. **Figure 4-3** depicts the future taxiway improvements around the airfield.

Figure 4-3: 2014 Master Plan Taxiway Improvements



The new taxiway construction and taxiing procedures will alleviate a large amount of any future congestion associated with increased operations. The following are additional opportunities the Airport may consider for future implementation.

- **Single Engine Taxi** – Taxiing on reduced engines (one engine on two engine aircraft, two engines on four engine aircraft, etc.)
- **Aircraft Tow-outs** – Towing the aircraft (also referred to as dispatch towing) from the gate to position for departure near the runway
- **Queue Management** – Procedure to limit the accumulation and congestions on the airfield associated with arrivals and departures through coordination and collaborative airfield planning airfield

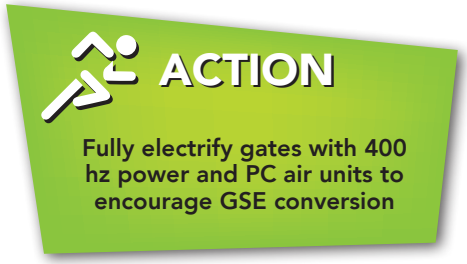
ACTION

Consider adopting specific practices to taxiing procedures to minimize unnecessary emissions

4.5.3 Ground Support Equipment

Ground Support Equipment (GSE) activity also contributes to airport emissions, albeit in a much lower capacity then aircraft operations. GSE equipment at CAK is owned and operated by various sources including individual airlines (Southwest, US Airways, Delta, etc.), FBO (McKinley Air, Ultimate Jets, etc.), and the Airport (Airport vehicles). Various types of GSE operated by the airlines include aircraft tugs,

baggage equipment, fuel and de-icing trucks, and other airport vehicles. In addition to airline operated equipment, the FBOs on the Airport also have GSE vehicles equipped with gas/diesel powered engines. Additionally, these vehicles and support equipment can either be powered by diesel engines or hybrid and fully electric motors.

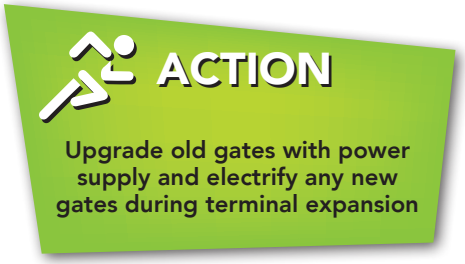


In an effort to reduce pollution and promote environmental awareness, airlines have begun to convert their equipment from diesel and gas powered engines to electric powered motors. At CAK, US Airways (including PSA) and Southwest Airlines are taking part in this effort. Although the Airport has no ownership of these GSE, the Airport has an opportunity to assist the airlines by supporting their conversion in other ways, including terminal upgrades providing electrical power, retrofitting terminal gates, and working with the FBOs to convert the non-airline owned equipment to electric power.

In addition to the terminal upgrades and providing additional power supply for GSE from the terminal, the Airport has an opportunity to reduce emissions further by terminal gate electrification. Typically, as an aircraft begins its run-up procedures and the boarding of passengers at the terminal gate, it is necessary for the aircraft to utilize the Auxiliary Power Unit (APU) of the aircraft. The APU is an engine power unit on the aircraft used to provide electrical power functionality for the aircraft on the ground (electrical systems, conditioned or forced air, lighting systems, etc.) while the engines are not in use. As such, the APU uses fuel for power and creates emissions when utilized.

Electrification of the terminal gates essentially outfits the gate with additional electrical power to support aviation activity at the gate. This includes reconstruction of old gates without passenger loading bridges or electrification with centralized pre-conditioned air for the aircraft, charging stations for electrical ground equipment, and the installation of additional electrical ports for stationary charging (charging while equipment is not in use).

CAK currently has three of its 11 gates (Gates 8, 9 and 10) categorized as fully electrified which include PC air units for heating and cooling and power (400Hz) sources at each bridge. However the remaining eight gates either have only ground power unit sources (Gates 4, 5, and 11), no electrification advantages, or are without passenger loading bridges (Gates 1, 2, and 3). The Master Plan identifies future terminal expansion which includes upgrading existing ground level gates to second floor boarding impacting three of these gates (Gates 1 through 3). The Airport has had preliminary discussion as to the evaluation of the feasibility of adding passenger loading bridges to Gates 1 and 2. Additionally, the current terminal expansion plan includes complete reconstruction of Gates 3 through 7 which would include fully electrified gates with passenger loading bridges, pre-conditioned air, ground power, charging stations, and electrical ports. These future terminal upgrades provide CAK with an opportunity to electrify any new or upgraded gates.



4.5.4 Ground Access Vehicles

The second largest contributor, approximately 25% of the total airport emissions generated at the Airport, are Ground Access Vehicles (GAV). GAV includes passenger vehicles (including pick-up and drop-off), airport shuttles, limos, taxis, buses, and other means or transportation to and from the Airport.

In a general sense, the mitigation of emissions generated from GAVs is a challenge for airports from the standpoint that aviation growth leads to an increase in passengers which as a result increases the amount of vehicle activity to and from the Airport. However, there are several strategies and opportunities to mitigate the relative amount of emissions by implementing environmentally responsible policies and procedures.

One of these improvements, identified in the Master Plan, is the reconfiguration of access roadways to the terminal building, which would mitigate congestion occurring along the terminal curbside. Improvements to the access roadways will increase efficiency of roadway traffic, improve way-finding, and result in shorter vehicle run times and reducing emissions. In addition to the proposed roadway improvements, the Master Plan also recommended the Airport adopt and implement new traffic management policies to encourage shorter wait times, increase in cell phone lot use, and other traffic management monitoring and procedures.

In preliminary discussions with local municipalities, the Airport has discussed a joint venture to donate a portion of land to develop a CNG station on Airport property. As such, this station would be accessible to not only the Airport but local and community consumers (city bus lines, university and local community school buses, long-haul transport vehicles, etc.). This would provide a public-use CNG station between the cities of Akron and Canton where there currently are CNG stations. Additionally, this would provide the Airport with the means and opportunity to increase revenue generation on-Airport by supporting the CNG station as an owner/operator or through a land lease operation.

The Airport has also begun talks of converting its parking shuttle service fleet from diesel powered engines to alternative fuel sources. As of this study, the Airport's ultimate goal is to completely convert all of its equipment and vehicles to alternative fuel, mainly Compressed Natural Gas (CNG). The Airport has discussed a partnership program with local municipalities and environmental groups to convert the diesel powered shuttle bus engines to compressed natural gas. The Airport is also discussing proposals to convert/retrofit the authority fleet to alternative fuels and hybrid vehicles. However, in order for the conversion of fleet vehicles to be feasible, the previously discussed CNG station would also be recommended as these actions are together associated.

4.5.5 Stationary Sources

A secondary source for emissions at Airports comes in the form of stationary sources. These sources can include everything from gas powered water heaters to emergency and non-emergency generators, furnaces and other gas powered utilities within the terminal and other airport facilities.

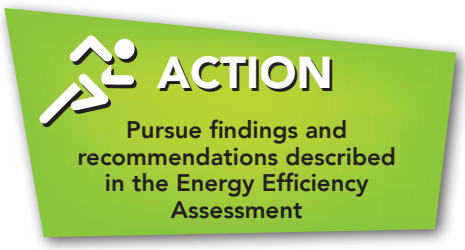
Although these sources are classified as Scope 1, or controlled by the Airport, the generation of stationary source emissions is much lower than other contributors. However; the Airport still has an opportunity to reduce or eliminate emissions associated with these sources. As mentioned in Section **4.2 Energy Management** and **Section 4.4 Water Resource Management**, the Airport can replace or convert gas powered utilities to alternative fuel (CNG) or fully electric powered equipment.

Because of the relatively low emissions output from these sources, the comparative outcome in emissions reduction will nevertheless be negligible and a benefit costs analysis should be completed before considering further action.

4.5.6 Electricity Use

The quantity of electrical energy consumed at the Airport is directly related to the level of passenger activity. As such, when the level of passenger activity increases, as projected in the *2014 Airport Master Plan*, the aggregate sum of electricity spent will also rise. Additionally, as the Airport expands the terminal building more electrical power will be necessary to power the new portion of the building.

Electrical emissions are, generally speaking, not equivalent to fuel powered emissions as they are considered to be Non-Point Source (NPS) emissions. NPS emissions are defined as pollutant source that are diffuse and do not have a point of origin or are not introduced to the environment from a standard outlet. Electricity is derived from a power source off-Airport and provided for the region. Thus, decreasing energy use on the Airport will reduce the draw from regional energy use, reduces reliance on off-site power generation and fossil fuels, and improves the regional air quality.



As mentioned in **Section 4.2** and described within the **Energy Efficiency Assessment (provided under separate cover)**, there are several opportunities to minimize the relative use of electrical energy with the largest opportunity within the terminal building. As such, it is recommended the Airport consider pursuing recommendations identified in energy efficiency assessment.

4.6 GREEN CONSTRUCTION

The Airport encompasses 2,400 acres of land that is home to numerous commercial, government and private tenants. While some tenants represent Fortune 500 companies, others represent small-business or personal interests. The facilities for these tenants vary greatly in size and complexity and include both aeronautical uses that require airside access, and non-aeronautical uses that do not need direct access to the airfield. As of 2014, approximately 240 acres of the property was developed with non-

aeronautical uses. The *2014 Airport Master Plan* identified approximately 300 additional acres of airport property available for general commercial/industrial development and another 90-100 acres available for aeronautical development.

Of the 60 or so buildings on airport property, the Authority owns and maintains six of them, including the Passenger Terminal, Old ARFF Building, PSA Hangar, Broom Hangar, New ARFF Building and the Glycol Treatment Plant. The terminal was expanded in 2006, with an upper level concourse consisting of four gates, concessions and other public amenities. The TSA passenger screening checkpoint and the pre-security food court were reconfigured and renovated in 2011. These improvements included the use of terrazzo floors in lieu of carpet, and low energy transmission glass (i.e. fritted glass) which allows natural daylight while reducing heat transmission. The New ARFF Building was constructed in 2013 and incorporated new sustainable technology including a new state-of-the-art Building Management System that controls the heating and cooling of the building to operate at a higher efficiency and updated lighting fixtures to high-efficiency lighting. Other ongoing renovation/upgrade projects include the installation of high efficiency boilers and HVAC equipment and LED/high efficiency lighting fixtures both within the terminal and on airfield. To promote indoor air quality and public health, the terminal is a non-smoking facility, with smoking prohibited near the entrances.

In addition to the likely growth in tenant facilities, the *2014 Airport Master Plan* also identified a near-term development program and long-term vision for the Airport facilities needed to meet the growing public air-travel demands. Future infrastructure improvements are anticipated to include rehabilitation and expansion of the passenger terminal, access road and parking lot reconfiguration including a structured garage, additional and reconfigured taxiways, apron expansions, and new maintenance and equipment storage buildings. All development and facility expansion on the Airport, including the airfield and Authority and tenant assets, are undertaken in concurrence with FAA approved Airport Layout Plans (ALPs). All tenant development is performed in accordance with the Authority's *Development Guidelines (Architectural, Engineering and Aesthetic Control)* that are intended to ensure reasonable coordination and control of physical development with consideration of FAA standards, airspace protection, compatible land use, stormwater management, utility connections, environmental protection, aesthetics, and safety. As described in **Section 4.1**, there is opportunity within that document to more directly incorporate sustainability considerations.

With the goal of making new construction and facility rehabilitation at the Airport as "green" as practical, the current Development Guidelines could be expanded into "Sustainable Design and Construction Guidelines." These revised guidelines could provide a list of recommended practices to ensure that development projects are executed in a sustainable or environmentally friendly manner. The list or menu of items could be developed from the SAGA Database (**http://www.airportsustainability.org/database**) or the LEED "Credit Library" (**http://www.usgbc.org/credits**). The developer could be directed to these resources, or the Authority's sustainability team could identify the specific practices that are most appropriate for facilities at the Airport. Sustainable practices could be identified for several areas of facility design and construction including

- **Engineering and Architecture Staff** – Promote the use of LEED-accredited professionals on project design teams.
- **Stormwater Management** – Provide strategies or Best Management Practices (BMPs) that promote infiltration and address stormwater rate and quantity, treatment, pollution prevention, and erosion and sediment control during construction.
- **Low Impact Development** – Refer to **Section 4.4.3**
- **Water Efficiency** – Reduce potable water usage through high efficiency fixtures, graywater reuse, or rainwater collection and use.
- **Energy Performance** – Promote energy efficient design, systems and processes to reduce energy use related to lighting, HVAC, insulation, and system controls. This could include maximizing the use of natural light and Energy Star rated appliances and equipment.
- **Renewable or Alternative Energy** – Promote the use green energy where appropriate including solar, geothermal, and wind. This could also address the use of alternative fuel vehicles (electric, compressed natural gas) and associated fueling/charging facilities.
- **Landscaping** – Promote the use of vegetation that is indigenous, low maintenance, drought resistant and non-wildlife attracting. Also address community screening and aesthetics.
- **Heat Island Reduction** – Incorporate reflective materials for pavements, roadways, parking lots, sidewalks, plazas and roofs to reduce potential "heat island" effects. Heat islands are built up areas that are hotter than nearby rural, vegetated or undeveloped areas. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness, and water quality.

Coastal Treated Products Company

- **Pavement Design and Construction** – Where appropriate, use warm mix asphalt which allows lower temperatures at which the material is mixed and placed. This temperature reduction has the benefit of cutting fuel consumption and decreasing the production of greenhouse gases. Additional engineering benefits include better compaction, the ability to haul paving mix for longer distances, and extending the paving season by being able to pave at lower temperatures.
- **Construction Materials** – Maximize the use of low maintenance and high recycled content materials and products. Where appropriate, promote the "deconstruction" of facilities, as opposed to "demolition" and the development of *construction waste management plans* that sort and reuse construction wastes including concrete, asphalt and other building materials. Forest Stewardship Council (FSC) certified wood products could also be promoted. The FSC certification indicates that the wood products come from a forest is managed responsibly, including protecting fragile ecosystems, respecting native cultures and economies, restricting clear cutting and pesticide use, and preventing illegal logging.

  — Reuse or repurpose existing buildings where feasible.

- **Indoor Air Quality** – Enhance public and employee health through ventilation design and easily cleanable ductwork, and the use of low-VOC emitting materials, products and finishes within the occupied spaces.

- **Clean Construction Equipment** – Promote the use of well maintained, low emission construction equipment and vehicles consistent with the U.S. EPA's latest non-road diesel emission standards. Include consideration for the use of recycled oils and lubricants and provide effective dust control within the construction sites.

- **Topsoil Management** – Topsoil is that uppermost layer of soil capable of supporting vegetation. The nutrient- and organic matter-rich topsoil has become a commodity that contractors often strip and sell if it is not needed to stabilize the final project site. Over-manipulation and compaction of the topsoil can alter its vegetation growth capabilities. If there is not sufficient or viable topsoil at the project site, it must be trucked in from other locations, which can increase a project's construction budget. The use of native topsoil, or that from the same general site, is also known to have better resistance to invasive species growth. According to the AASHTO Center for Environmental Excellence (**http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/4_11.aspx**), general environmental stewardship practices for earthwork and soil management include:

  - Minimize the extent of disturbance and impact to soil outside the project's construction limits.

  - Mitigate construction-related soil compaction in vegetation restoration areas by ripping the soil to loosen its structure.

  - Stockpile and reuse native soils where practical.

  - Minimize erosion potential and weed species invasion by establishing a healthy plant cover.

  - When stockpiling topsoil, mound soil no higher than 1.3 m (4 feet) high for less than one year and preferably less than 6 months. Cover to prevent soil erosion and contamination by weeds.

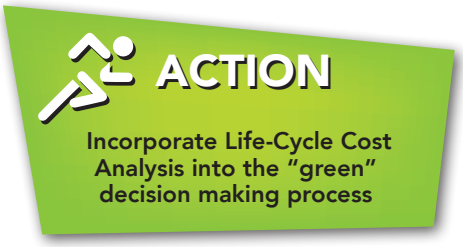
  - Avoid walking, operating equipment or driving vehicles on planting areas after soil preparation is complete.

- **Bids and Contracts** – Provide sample bid and contract language, or templates, for construction projects based on the provisions of the "Sustainable Design and Construction Guidelines.

These expanded sustainability guidelines could be implemented as either "requirements" or "recommendations" depending on the level of flexibility and/or control desired by the Authority. The Authority could provide detailed technical specifications for sustainability items, or they could designate a specific achievement level, performance standard, or target goal that any development must or should attain. Such standards could be set for individual items, such as "tenant must achieve a 50% recycling rate"; which states a level of performance, but how the tenant achieves it—is for them to determine. A broader standard could also be set such as "the highest LEED® level practical", regardless of whether or not LEED certification is actually pursued. These types of "performance based" requirements tend to leverage market innovation to reduce development costs.

Application of the guidelines could also be "tiered" where they are a "standard" for any Authority owned and maintained buildings and "encouraged" for privately developed facilities. Many organizations, including some airports within the United States, have set LEED "Silver" as the design goal/standard. Out of a total 69 LEED points available for new construction projects, Silver status is achieved with 33-38 points as compared to "Certified" with 26-32, "Gold" with 39-51 and "Platinum"' with 52-69. The larger the building or facility, the more financially prudent opportunities there are to implement sustainable features. For that reason, some organizations will set a threshold, such as 7,500 square feet, for the "standards" to apply.

For relatively small, inexpensive, or simple projects, calculating the "simple payback" may be sufficient to make a sound decision. Particularly effective for projects that reduce energy or resource usage, simple payback is how long it will take for the cumulative savings (as compared to standard or non-green actions) and other benefits to equal or "payback" the initial investment. For projects that are more costly or complicated in nature, a full "life-cycle cost analysis" (LCCA) may be needed to make a well-informed decision. An LCCA measures the "total cost of ownership" over the lifetime of the project. When comparing development alternatives, the LCCA measures the opportunity cost of one investment vs. another alternative and provides data as to which might provide a more significant ROI. Compared to a simple payback analysis, an LCCA includes the initial cost of a project, as well as the anticipated maintenance, operation, financing, useful life and any ultimate salvage value that the project may have.



In determining whether a simple payback analysis or a more in depth LCCA should be used, a developer/investor would typically start with a simple payback analysis. Considering that investors want the quickest return possible, if that analysis indicates the project would require, for example, more than five years to produce a return, an LCCA may needed. At this point, particular attention must be paid to the anticipated lifespan of the finished project. For many organizations, a ten or fifteen year payback period is considered the threshold. As previously described, the Energy Efficiency Assessment used a simple payback ROI of fifteen years.

A source of information on LCCA and the pros cons, when to apply can be found on the Northwest Energy Efficiency Alliance "Better Bricks" program website at: **http://www.betterbricks.com/graphics/assets/documents/BB_CostAnalysis_WWW.pdf**.

And the U.S. Green Building Council's LEED website at: **http://www.green-buildings.com/content/78446-leed-life-cycle-cost-analysis**.

4.6.1 Industry Certifications and Accreditations

Similar to the "green business" certifications described previously, there are several readily acknowledged green certification programs related to energy efficient buildings. The organizations listed below can provide a wealth of information related to the planning, development, and maintenance of high-performance green buildings that support the principles of sustainability. Whether striving for actual certification, or incorporating their best practices into the Authority's

Development Guidelines or specific facility improvement project, participation in these organizations could be considered. Their resources and/or certifications would be expected to optimize energy efficiency, reduce operating costs, and help solidify the Authority's position as leader in airport sustainability.

- **US Green Building Council/Leadership in Energy & Environmental Design (LEED)** – is a fee-based, green building certification program that recognizes best-in-class building strategies and practices. Buildings are evaluated on topics such as process, materials, access, energy, water efficiency, air quality and innovation. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification (e.g. certified, silver, gold, platinum). There are five rating programs, for different project types, including :
  - New building construction or major renovation
  - Interior "fit-out"
  - Existing building operations and maintenance
  - Neighborhood development
  - Single, or multi-family residential homes

- **Green Globes** – is a fee-based, online green building rating and certification tool, similar to LEED and many other systems around the world. It has modules for both new construction and continual improvement of existing buildings. Green Globes is structured as a self-assessment to be done in-house using a project manager. Following a satisfactory self-assessment, third-party verification is performed by assessors with expertise in green building design, engineering, construction, and facility operations. Buildings that successfully complete a third-party assessment are assigned a rating of one to four Green Globes. **(http://www.greenglobes.com/home.asp#)**

ACTION

Incorporate LEED or GreenGlobes principles into a set of *Airport Development Guidelines*

- **ENERGY STAR** – is a US EPA program that certifies appliances, electronics, buildings and industrial plants that meet strict energy performance standards set by the EPA. ENERGY STAR certified buildings use less energy, are less expensive to operate, and cause fewer greenhouse gas emissions than their peers. To be eligible for ENERGY STAR certification, a building must earn a score of 75 or higher on the EPA's free "Portfolio Manager" online tool for measuring and tracking energy use, water use, and greenhouse gas emissions. This score indicates that the building performs better than at least 75 percent of similar buildings nationwide. Information submitted in the certification application must be verified by a licensed Professional Engineer (PE) or Registered Architect (RA) to be eligible for approval. Certification is given on an annual basis, so a building must maintain its high performance to be certified year to year. Even if

ACTION

Use Energy Star program to monitor energy performance and seek certification for the terminal

certification is not sought, Portfolio Manager can be used to monitor and benchmark a building's environmental performance. (**http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification**)

- **Green Energy Ohio** – is a non-profit organization that assists in developing environmentally and economically sustainable energy policies and practices throughout the state of Ohio. The organization is also Ohio's chapter of American Solar Energy Society (ASES) and helps to promote renewable energy (e.g., solar, wind, biomass, hydro, etc.). They provide education materials and guides to green energy financing, incentives and procurement programs, and energy conservation. Partnering with, or using Green Energy Ohio as a resource, could help advance the Authorities evaluation of developing an alternative energy source at the Airport. (**http://www.greenenergyohio.org/**)

4.7 COMMUNITY CONNECTION

If sustainability is about balancing the environmental, financial and social needs of a community, a symbiotic relationship between an airport and the various groups it interacts with must be established. Airport sponsors need to educate and keep the public informed as to the importance and benefits of their airport. Community input and "buy-in" is needed for the Airports to be successful. The success and growth of those airports, in turn, support economic health and quality of life within the community. Three key components of the Authority's efforts to be an integral part of the community are promoting land use compatibility, outreach and engagement, and the donation of time and resources.

4.7.1 Compatible Land Use

The long-term viability of any airport is dependent upon effective land use planning, both on airport property and in the surrounding communities. With compatible land use plans in place, airports can ensure safe and efficient aircraft operations and are better able to meet future needs of the communities they serve. Alternatively, the encroachment of non-compatible land uses can limit economic development, reduce quality of life for airport neighbors and increase safety risks to aircraft and persons on the ground.

Through the years, the Authority has worked closely with the City of Green and Jackson Township to ensure that land uses surrounding the Airport are compatibly planned for in their respective Comprehensive Land Use Plans and Zoning Ordinances. The areas surrounding the Airport include a mix of commercial, industrial, recreational, public and residential uses. Although residential uses are not typically considered compatible with airports, the residential areas nearest to CAK are generally separated by commercial/industrial land uses or roadway buffers and are not directly under the "close-in" aircraft approach or departure paths.

ACTION

Address vegetation concerns identified in the Master Plan as part of the Authority's ongoing airspace protection program

The FAA's primary concerns regarding development near an airport include: preventing obstacles to navigable airspace (i.e., C.F.R. Title 14, Part 77); minimizing and mitigating wildlife

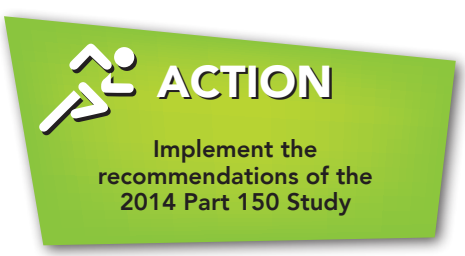
hazards (e.g., birds, deer) and their attractants (e.g., food sources, landfills, open water); and avoiding or mitigating uses that could cause visual and electronic interference to aircraft operators. In addition, Runway Protection Zones (RPZ) should be kept free of flammable/explosive material and uses that draw public assembly (e.g., community/religious centers, schools, etc.).

At CAK, there are no cell towers, wind turbines or buildings that are known to be a hazard to air navigation and no land uses that currently cause visual obstructions from the production of smoke, dust, steam or sun glare. There are a few areas of concern related to vegetative obstructions (i.e. tree growth) and the Airport's Part 77 Airspace Protection Surfaces. As of late 2014 the FAA has not determined these to be a hazard to air navigation, however, the *2014 Master Plan Update* has proactively recommended a mitigation program to remedy these concerns.

The Master Plan also identified 19 acres of off-airport property that lies within the Runway 23 RPZ that should be acquired by the Authority to provide positive control and prevent any potential future incompatibilities. While the Authority does not currently own these parcels, which is the FAA's preference, they do maintain "avigation easements" over most of them. The easements provide for airspace compliance and mitigate any concerns related to noise and vibration related to aircraft operations. The Authority also maintains aviation easements on parcels beneath the approaches to Runway 5 and Runway 1, and the developable area by the Hilton Garden Inn located east of Lauby Road.

Aircraft noise is generally one of the largest airport related land use concerns – particularly for neighboring residents. The Authority is committed to being the best neighbor possible, which includes minimizing noise exposure within the surrounding community. The most formal way that airport sponsors can identify and address potential noise-related issues is through the FAA's voluntary Part 150 program (codified under 14 C.F.R. Part 150). The Part 150 program sets forth a process for airport sponsors to develop FAA-approved programs to reduce or eliminate incompatibilities between aircraft noise and surrounding land uses. The Authority performed Part 150 noise studies in 1989 and 1997. Based on those studies, the Authority and local jurisdictions have taken numerous steps to minimize and prevent noise impacts including property acquisitions, rezoning and establishing the Airport Commerce zoning district in the City of Green. More recently, the Authority performed its third Part 150 study in 2014. The study had substantial community involvement, including multiple public workshops and a diverse advisory committee comprised of airport stakeholders, tenants, community residents, local businesses and surrounding municipalities.

Airports today are generally quieter than they were in the past due to improved aircraft and engine technologies, and advanced navigation procedures. Such is the case at CAK. Using the latest FAA-approved noise modeling software, validated with multi-day community noise measurements, the 2014 Part 150 study determined that the noise exposure footprint of the Airport has shrunken compared to the previous studies. While the 2014 study determined that the surrounding land uses are generally compatible with current and projected airport activity, there were several resulting recommendations that could help



further reduce "perceived" community noise impacts, or those that are below regulatory thresholds but may still be perceived as an annoyance by neighboring residents. Many of these recommendations are refinements of earlier Part 150 Study recommendations and some are more voluntary in nature and are at the operational discretion of the pilot or air traffic control.

A significant recommendation of both the *2014 Master Plan Update* and the *2014 Part 150 Study* is the establishment of a multi-jurisdictional Airport Overlay Zone (AOZ). The AOZ would supplement local zoning ordinances by defining an area in which the local jurisdictions would notify the Authority of potential changes in land use, subdivision, zoning or other planning and development-related actions. The Authority and local jurisdictions would then work together to review the proposals for potential incompatibility concerns on a case-by-case basis. The review would acknowledge the unique operational, regulatory and land use issues of the Airport, including noise, airspace protection and navigational interference. This will ensure that local land use boards and officials, as well as landowners and developers, make the most well-informed and sustainable development decisions possible. The limits of the AOZ were coordinated with the seven local jurisdictions that the zone would affect – Summit County, Stark County, City of Green, Jackson Township, Lake Township, City of North Canton, and Plain Township. The recommend configuration of the AOZ takes into consideration the current and future noise contours, the FAR Part 77 airspace protection surfaces, transportation corridors and logical neighborhood boundaries.

ACTION

Work with the local municipalities to implement an Airport Overlay Zone

4.7.2 Outreach and Engagement

Going beyond the necessary "marketing" of the Airport and its services, the Authority dedicates a significant amount of its resources to public outreach and community involvement. Connection points with the Airport users, stakeholders and various community interests include:

- Regularly updated, interactive and informative website (**www.akroncantonairport.com**)
- Extensive social media including Facebook, Twitter, Pinterest, YouTube, Vine, Instagram, Flickr, blogs and email newsletters
- Monthly, live, interactive, "Prez Says" conversations with the Airport Director through Facebook
- Stakeholder, user and community working group participation in major airport planning studies such as the *2014 Master Plan Update*, the *Part 150 Noise Compatibility Study*, and this **Sustainable Master Plan**
- Civic and industry speaking events by airport leadership
- Senior leadership participation on several advisory boards within the community, including the Akron and Canton Chambers of Commerce, the Akron/Summit Convention and Visitors Bureau, Leadership Akron, and the Development Finance Authority of Summit County
- Engagement of local, state and federal elected officials via hosted "Coffee Talks" several times a year and an annual visit to the congressional delegations in Washington, D.C.

- Open and proactive media relations to inform the public at large of significant airport events, activities or issues

The Airport is viewed as an industry leader in community outreach and engagement. Airport staff have shared their experiences and best practices with others in the Airport industry at numerous conferences and through trade related publications.

ACTION

Continue refining outreach program consistent with emerging trends and technologies

4.7.3 Giving Back

The Authority, and airport staff, also "give back" to the community through the donation of time, money and other resources, including:

- Support of the "Honor Flight Network" which transports America's veterans to Washington, D.C. to visit the memorials dedicated to honor their service and sacrifices. (**http://www.honorflight.org/**)
- Guest speaking at the local universities and colleges and providing internship opportunities for their students. This has also helped establish an employment resource pool for the Airport and recent graduates.
- Charitable giving to programs such as United Way (**www.unitedway.org**)
- Sponsorship of the Pro Football Hall of Fame in Canton, OH (**www.profootballhallof.com**)
- Sponsorship of the World Golf Championships, currently the "Bridgestone Invitational" in Akron, OH in early August. The World Golf Championships organization, in conjunction with Northern Ohio Golf Charities annually donates approximately $1 million to charities throughout Northeast Ohio. Through professional golf at Firestone Country Club, more than $21,000,000 has been given to organizations seeking to improve the quality of life in region. (**www.worldgolfchampionships.com**)

ACTION

Expand relationships and internship programs with local universities/colleges

While incredibly active on these fronts, there are still more organizations and activities that Airport staff would like to participate in. Balancing these activities with the manpower needed to maintain the core facilities and operational activities of the Airport becomes a limiting factor. This is particularly true with the lean and efficient staffing structure the Authority maintains – *"there are only so many hours in the day"*. Airport staff will continue to pursue these outreach and community connection opportunities as time and manpower allow. Two potential opportunities to enhance the connection with the local communities include expanding internship

ACTION

Support/empower employee charitable giving and volunteer programs

programs with the universities/colleges and supporting employees volunteering and/or charitable giving efforts.

4.8 ECONOMIC VITALITY

Commercial service airports are significant generators of economic activity. They accommodate the needs of business and leisure travelers throughout the U.S. and beyond. They are also integral to the shipping of time-critical and high-value cargo. Airports create employment and provide payroll and tax revenue for the communities they serve.

According to a recent study commissioned by the Authority[8] , the total economic impact of the CAK in 2012 was $502.3 million (including direct, indirect and induced dollars). This represents a 26 percent increase over 2008. Within that total dollar impact, the Airport generated $50.7 million in local, state, federal, sales and excise tax revenues of which nearly $32.9 million was directly from the Airport and its tenants. These taxes are used in the local economy to support schools, infrastructure improvements, further economic development, and to support many other programs that aim to improve the quality of life in the community.

The Airport and its tenants directly employed 1,821 persons in 2012, which is 27 percent more than in 2008. The total number of airport-related jobs in the six-county study area (Stark, Summit, Medina, Carroll, Portage, and Wayne) was 3,086. The direct income generated by the Airport was $104.6 million. Combining direct, indirect, and induced income, CAK produced a total of $150.2 million in payroll in 2012. The average annual salary of the jobs created by the Airport was $57,400.

The growth experienced between 2008 and 2012 can be attributed to several factors including a rebounding national economy, strong regional economic development initiatives, effectively developing and maintaining airport facilities to meet traveler needs, expanding airline services and routes, and the availability of airport property for commercial development. By adhering to the Vision, Mission and Core Values described in **Section 2.1**, the economic output of the Airport should continue to grow. Four (4) business facets that are primary to the economic health of the Airport and region include *revenue generation, market expansion, expense control*, and *small business access*.

4.8.1 Revenue Generation

Growth of the Authority's revenue sources will help fund the facility improvements needed to meet growing traveler demands and help offset the associated increase in operating expense related to those improvements. The following describes several of the revenue and income sources that are, or could be, available to the Airport.

- **Facility and Ground Leases** - Approximately 78 percent of the Authority's operating revenue comes from non-airline sources including leasing of terminal space and both aeronautical and non-aeronautical ground leases of airport property. New tenants and additional ground leases will increase the Authority's operational revenue. As mentioned previously, approximately 240

8 CAK Website, http://www.akroncantonairport.com/about/economic-impact, accessed 9/29/14

acres of airport property is developed with non-aeronautical uses (i.e. those that do not require airside access). The 2014 Airport Master Plan identified approximately 300 additional acres of airport property available for commercial/industrial development and another 90-100 acres available for aeronautical development. Much of the undeveloped commercial-use property is within a Foreign Trade Zone (FTZ) that includes the Port Green Industrial Park. Port Green is being developed through partnership of the City of Green, the State of Ohio, the Airport, Summit County, Aqua Ohio, the Development Finance Authority of Summit County, and SB Equities. The latest 140 acre phase of this project opened in July 2014 with the extension of Global Gateway Road, through the park, to Greensburg Road.

In addition to the import tariff and tax benefits of the FTZ, attracting tenants to the developable airport property can also be incentivized through Ohio's Community Reinvestment Area program and the City of Green's Enterprise Zone Tax Incentive Program. Both of these programs offer tax relief for commercial development and business growth.

- **User Fees** – Airport development, maintenance and operation is largely supported by fees and taxes paid by users of the national airspace system including passengers, airlines, and aircraft owners and operators. As passenger activity levels increase, income to the Airport will also increase. The following describes the primary sources of user generated funds and revenue available to the Airport.

- The FAA's Airport Improvement Program is funded from the Airport and Airway Trust Fund, which is derived from taxes on passenger tickets, airline flight segments, international arrivals and departures, air cargo waybills, aviation fuels, and frequent flier awards. The AIP provides funds to NPIAS airports for eligible planning, design, and construction projects that support safe and efficient public air travel. The amount of AIP "entitlement" funds available to CAK is dependent, in large part, to the number of annual passenger enplanements. As passenger activity increases, the amount of annual AIP entitlement funds will also increase.

  — The FAA's PFC program allows commercial service airports to collect a fee (included in the ticket price) from every passenger boarded at their airport. Subject to federal program rules, these funds can be used for the development of eligible public use aviation facilities. Currently the maximum allowable PFC that can be collected is $4.50 per enplanement. Many airports and industry organizations are urging Congress to eliminate this federal cap, which would provide the Airports additional local financial resources to develop needed infrastructure in a time when traditional federal funds are becoming increasingly scarce. The proposed 2014 federal budget included provisions for increasing the maximum allowable PFC to $8.00. The debate is ongoing and many airlines oppose this increase as it would affect their ticket pricing structure.

— Similar to the PFC program, many commercial service airports have implemented a Customer Facility Charge (CFC) program which collects a user fee from each rental car transaction. Collected funds are then able to be used for infrastructure projects that benefit rental car operations such as access road and parking lot improvements, consolidated rental car facilities, parking garages, and other customer amenities. Currently, the Airport does not have a CFC program, but the Authority has begun pursuing this opportunity with the rental car providers. Such a program could help fund development of a structured parking garage as identified in the *2014 Airport Master Plan Update*.

— According to the *2014 Airport Master Plan Update*, over 45 percent of the Authority's operating revenue comes from automobile parking fees. Maximizing the revenue potential of the parking facilities involves optimizing the types of parking offered (e.g. short term, long term, premium) and the associated rate structure. While the current shuttle buses provide excellent customer service getting passengers to the terminal, there is no covered, or premium, pubic parking. Providing covered parking, or a structured parking garage, near the terminal building would provide an additional class of parking commanding a higher parking rate, thus resulting in increased revenue. The *2014 Airport Master Plan Update* identified a site and financial plan that would support development of a parking garage in the 10-year planning horizon.

— The fees paid by the airlines, to the Authority for use of Airport facilities, includes leasing space in the terminal and commercial apron as well as per-aircraft landing fees. Currently, these "Rates and Charges" are fixed in the airline agreements with the Authority for a period of five years. The rates do include an estimated escalation clause. There is an opportunity to make the rate structure more formulaic based on the Airport's actual annual operating budget. This would allow the Rates and Charges to adjust more directly with experienced operating costs and fluctuation in utility rates. It would also align the airline fees with the ongoing facility improvements such as the planned terminal expansion in 2016/2017.

4.8.2 Diversification

Along with increasing the revenue generation of the Airport, diversification of the Airports assets will further assist in revenue generation outside of typical Airport operations. These new ventures are directly related to the Airport, however are not dependent upon airport operations. The following describes previously mentioned revenue generating avenues that are, or could be, available to CAK.

- **CNG Fuel Station** – Developing and constructing a public use CNG station on Airport property will help to reduce the operating costs of current Airport owned vehicles and create an additional revenue stream by providing a public use facility to the local community. Additionally, this action would proactively push the Airport to convert Airport owned vehicles to alternative power sources as well as regional/city public transportation buses which would have a readily accessible station for fuel. This station could be owned and maintained by the authority as a service or profit center that retails CNG or could be an additional ground lease by a third party that the authority uses to power their shuttles.
- **Mineral Rights/Extraction** – Consult with FAA to investigate the possibility to sell extraction rights to a natural gas company and/or utilize any gas mined from the property to power airport facilities. This opportunity could include a land lease agreement for a percentage of the profits, a mineral rights agreement for the use of the natural gas extracted from Airport property, and wholesale ownership and operation of the extraction activities. This could create an additional revenue stream or lower the utility costs.

4.8.3 Equal Access and Fair Competition

Growth in airport activity and growth in the local business community are inextricably linked. This is not only true for the numerous Fortune 500 companies in the local area, but also the many smaller supporting and specialized service companies. Title 49, Subtitle A, Part 26 of the Code of Federal Regulations requires airport sponsors to promote the participation of Small and Disadvantaged Business Enterprises (DBEs) on federally funded contracts. To that end, the Airport Authority has established an annual DBE participation goal of 12 percent of federally funded projects for fiscal years 2012-2014. Actual participation over that period was 9.6, 10.8 and 11.1 percent respectively. Based on those participation levels and current federal guidance, a goal of 11 percent has been established for 2015 through 2017.

ACTION

Maintain DBE program and seek opportunities to expand outreach to local DBE entities

In October 2014, the Authority received a Diversity Advocacy Award from Black Pages Ohio and Summit Magazine. Black Pages Ohio is one of the largest minority-business listing and resource guides for Ohio communities. (**www.blackpagesohio.com**)

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Section 5

ACTION PLAN, IMPLEMENTATION AND FUNDING SOURCES

5 ACTION PLAN, IMPLEMENTATION AND FUNDING SOURCES

As part of this Sustainability Management Plan, it is important for CAK to adopt a plan which implements and monitors the goals discussed and identified throughout this document. This section describes the steps for implementing and tracking the performance metrics relative to each goal and objective. However, it is also essential to recognize how this plan will fit contextually with other financial and project plans (PFC Programs, ACIP, etc.) the Airport is obligated to.

This section provides CAK with a general timeline of various sustainable actions and objectives accompanied with information necessary to determine, at the Airport's discretion, the timing and scope of each action. Essentially, the implementation plan is a menu list of items/actions, formatted such that the Airport can choose from a range of items in short (0-5 years), mid (5-10 years), and long-term (10-20 years) programs. The implementation and monitoring plan outlines the eight "focus areas" presented in previous sections. Each focus area has an implementation schedule, measurables for the short-, mid-, and long term, and a monitor plan to record progress.

The short-term sustainable objectives were compiled using the "low-capital" objectives. These actions and recommendations have very little initial cost, but provide a range of return on investment from short- to long-range returns. Some of the sustainable objectives do not have any financial return on investment because they are not driven by potential cost savings, rather there initiatives are driven by environmental or social benefits and were given equal consideration. By implementing a plan with low capital/quick investment return objectives in the short-term allows CAK the flexibility to apply the cost savings towards high-capital/high-return objectives in the mid- and long-term time periods.

Some initiatives identified in this study could be incorporated into future AIP eligible projects already identified in the Airport's Master Plan. The FAA has recently expressed a willingness to include sustainable components in AIP-eligible projects. They have acknowledged that if an AIP-eligible project includes certain sustainability components, those are also eligible for funding.

The data and assumptions used to determine a recommended implementation schedule for this plan may change over time and/or become obsolete. Therefore, a sustainability initiative that requires a review of the plan annually is recommended. It is recognized and understood that it may not be feasible that every action will be implemented according to the recommended schedule.

5.1 IMPLEMENTATION PLAN

The following tables provides a summary of recommended objectives for CAK to consider for the short term (0-5 years), mid-term (6-10 years), and the long-term (10+ years) implementation at the Airport. The tables also show what sustainability goals (people, planet, prosperity) each objective contributes to.

Additionally, the Overarching Sustainability Goals (detailed in Section 3.3) that the implementation initiatives for each focus area are based on are also provided for reference.

5.1.1 Administration Implementation Plan

Overarching Administration Sustainability Goals

- ✓ Integrate sustainable approaches and practices into the internal policies, business processes, written agreements, day-today operation, and long-term planning of the Airport
- ✓ Provide opportunities and incentives to improve the health and well-being of the employees
- ✓ Develop the CAK workforce through proper recruitment, training, retention and diversity

ADMINISTRATION	Social Progress	Customer Experience	Protect and Conserve Natural Resources	Reduce Carbon Footprint	Reduce O and M Cost	Economic Growth
Short Term Objectives						
» Establish an interdepartmental sustainability committee	✈		✈	✈		
» Develop an airport tenant sustainability working group	✈		✈			
» Publish an annual sustainable summary report	✈	✈	✈			
» Develop detailed technical specs and standards to assist implementing sustainability measures	✈		✈			
» Obtain tenant commitment to sustainability	✈		✈			
» Review and incorporate sustainability clauses into the airport operating documents	✈	✈	✈	✈	✈	✈
» Define and require sustainable design goals in future RFQs, RFPs, and bid review criteria	✈	✈				
» Update Sustainability Plan Implementation schedule	✈	✈	✈	✈	✈	✈
Mid Term Objectives						
» Incorporate sustainable practice requirements in standard land lease contract language	✈					
» Develop a multi-channel, sustainability and education campaign that reaches staff, tenants and the general public	✈	✈				
» Provide sustainability awareness training for employees, consultants and contractors	✈	✈				
» Evaluate the feasibility of providing employee education, health and well-being programs	✈	✈				
» Explore methods to provide additional education and internship opportunities	✈	✈				
Long Term Objectives						
» Develop and implement an environmental management program	✈	✈	✈			
» Participate in "green" certified programs	✈	✈	✈			
» Develop and implement green procurement policy	✈	✈	✈			

5.1.2 Energy Management Implementation Plan

Overarching Energy Management Sustainability Goals

- ✓ Integrate sustainable approaches and practices into the internal Maximize energy efficiency and minimize energy consumption within buildings and airport property
- ✓ Evaluate and implement alternative energy procurement programs and renewable source generation

ENERGY MANAGEMENT	Social Progress	Customer Experience	Protect and Conserve Natural Resources	Reduce Carbon Footprint	Reduce O and M Cost	Economic Growth
Short Term Objectives						
» Implement Short-Term Energy Conservation Measures, energy efficiency improvements in the terminal, PSA hangar, and the new ARFF building defined in Short-Term ECM table in **Section 4.3.1**	✈	✈	✈	✈	✈	✈
» Incorporate LEED or GreenGlobes principles into a set of *Airport Development Guidelines*	✈	✈	✈	✈	✈	✈
Mid Term Objectives						
» Implement Mid-Term Energy Conservation Measures (5-10 year ROI) defined in ECM table in **Section 4.3.1** for energy efficiency improvements for all on-airport buildings	✈	✈	✈	✈	✈	✈
» Monitor/Investigate opportunities for oil/gas extraction at the Airport			✈	✈	✈	✈
Long Term Objectives						
» Use Energy Star Program to monitor energy performance and seek certification for the terminal	✈		✈	✈	✈	✈
» Implement Long-Term Energy Conservation Measures (10-15 year ROI) defined in ECM table in Section **4.3.1** for energy efficiency improvements for all on-airport buildings	✈	✈	✈	✈	✈	✈
» Pursue public-private partnerships to evaluate and/or develop solar energy systems			✈	✈	✈	✈
» Evaluate the technical and financial feasibility of developing a solar and/or geothermal energy source at the Airport			✈	✈	✈	✈
» Consider installing solar hot water heaters and/or small wind turbines into future building renovation or new construction projects			✈	✈	✈	✈

5.1.3 Waste Management and Recycling Implementation Plan

Overarching Waste Management and Recycling Sustainability Goals

- ✓ Minimize the amount of solid waste generated and disposed of in local landfills
- ✓ Maximize collection and re-use of recyclable materials
- ✓ Ensure that hazardous materials are properly stored and handled and do not pose a threat to the environment or human health

WASTE MANAGEMENT AND RECYCLING

	Social Progress	Customer Experience	Protect and Conserve Natural Resources	Reduce Carbon Footprint	Reduce O and M Cost	Economic Growth
Short Term Objectives						
» Conduct a waste and recycling audit				✈	✈	
» Derive a baseline for the total solid waste generated per year to monitor and track reduction to meet goals			✈	✈		
» Develop a Terminal Solid Waste Management and Recycling Program	✈	✈	✈	✈	✈	✈
» Increase the amount of strategically located recycling receptacles next to trash receptacles		✈	✈	✈		
» Conduct awareness training for the janitorial staff to ensure that recyclables stay segregated from waste	✈	✈	✈			
» Expand the solid waste recycling program throughout the Airport			✈	✈		
» Implement solid waste reduction initiatives and incentives for airport employees, tenants, and vendors	✈				✈	✈
» Minimize the use of office printing materials			✈	✈	✈	✈
Mid Term Objectives						
» Renegotiate or consolidate waste disposal contracts					✈	✈
» Evaluate the use of environmentally friendly restaurant wares	✈	✈	✈	✈	✈	✈
» Require concessionaires to utilizes reusable products	✈		✈	✈	✈	✈
» Identify free, or revenue generating means of used cooking oil disposal or recycling			✈	✈	✈	✈
» Join or initiate local programs that raise awareness (i.e., begin social networking programs, poster initiatives, recycling events)	✈	✈	✈			
» Seek opportunities to generate heat/energy from byproducts of glycol digestion facility			✈	✈	✈	✈
Long Term Objectives						
» Develop a centralized solid waste/recycling and hazardous waste facility	✈	✈	✈	✈	✈	✈
» Consider sponsoring community food drive events	✈	✈				

5.1.4 Water Resource Management Implementation Plan

Overarching Water Resource Management Sustainability Goals

- ✓ Maximize water conservation and minimize potable water use within Airport facilities
- ✓ Protect regional water quality through effective stormwater management and pollution prevention initiatives

WATER RESOURCE MANAGEMENT	Social Progress	Customer Experience	Protect and Conserve Natural Resources	Reduce Carbon Footprint	Reduce O and M Cost	Economic Growth
Short Term Objectives						
» Incorporate LID strategies into the Airport's "Development Guidelines"			✈	✈	✈	✈
» Use low-volume, high pressure sprayer nozzles on water hoses used for vehicle washing, clean-up, regular use			✈	✈	✈	
Mid Term Objectives						
» Replace outdated terminal restroom fixtures and toilets with innovative high-efficiency units	✈	✈	✈	✈	✈	✈
— Install waterless urinals			✈	✈	✈	✈
— Install variable flush or pressure assisted toilet units			✈	✈	✈	✈
» Install low flow faucets			✈	✈	✈	✈
— Install automatic sensors or occupancy sensors on faucets, urinals, and toilets			✈	✈	✈	✈
» Replace smaller tank style water heater unites with tankless units			✈	✈	✈	✈
» As airport development occurs, update and expand the current stormwater controls and SWPPP accordingly			✈	✈		
Long Term Objectives						
» Evaluate potential for installing grey water to toilet/urinal systems	✈	✈	✈	✈	✈	✈
» Consider the implementation of a rain water cistern during future terminal expansion or renovation	✈		✈	✈	✈	✈

5.1.5 Air Quality Implementation Plan

Overarching Air Quality Sustainability Goals

- ✓ Minimize greenhouse gas emissions associated with airport activities
- ✓ Develop and operate airport facilities in accordance with federal NEPA provisions for criteria air pollutants

AIR QUALITY	Social Progress	Customer Experience	Protect and Conserve Natural Resources	Reduce Carbon Footprint	Reduce O and M Cost	Economic Growth
Short Term Objectives						
» Develop new airfield practices and procedures to reduce engine run times	✈		✈	✈		
» Consider adopting specific practices to taxiing procedures to minimize unnecessary emissions	✈		✈	✈		
» Consider adopting specific practices to minimize unnecessary emissions pertaining to Airport owned vehicles			✈	✈		
» Pursue VALE Grant to assist with gate equipment acquisition					✈	✈
» Adopt pedestrian traffic management policies, improve way-finding, and encourage cell lot use	✈	✈	✈	✈		
» Consider development of CNG station on or new Airport property	✈	✈	✈	✈	✈	✈
Mid Term Objectives						
» Fully electrify gates with 400hz power and PC air units to encourage GSE conversion	✈	✈	✈	✈	✈	
» Upgrade old gates with power supply and electrify any new gates during terminal expansion		✈	✈	✈	✈	
» Convert/retrofit Airport owned vehicles (parking shuttle buses, airport vehicles) to CNG			✈	✈	✈	✈
» Purchase additional alternative energy powered GSE units (baggage conveyors, electric tugs, baggage carts, etc.)			✈	✈		
Long Term Objectives						
» Convert/retro fit Airport owned vehicles to alternative energy sources (Electric/Hybrid)			✈	✈	✈	✈

5.1.6 Green Construction Implementation Plan

Overarching Green Construction Sustainability Goals

✓ Integrate sustainable approaches and practices into the design and construction of facilities on the Airport property

GREEN CONSTRUCTION	Social Progress	Customer Experience	Protect and Conserve Natural Resources	Reduce Carbon Footprint	Reduce O and M Cost	Economic Growth
Short Term Objectives						
» Develop "green" standards or guidelines for all new construction and facility rehabilitation	✈		✈	✈	✈	✈
» Incorporate Life-Cycle Cost Analysis into the "green" decision making process			✈	✈	✈	✈
» Consider the use of warm mix asphalt for surface lot rehabilitation			✈	✈		
» Implement LID principles in future design and construction projects	✈	✈	✈	✈	✈	✈
Mid Term Objectives						
» Incorporate LEED guidelines and standards in terminal design and construction	✈	✈	✈	✈		
» Explore opportunities to repurpose building materials related to the terminal expansion			✈	✈	✈	✈
Long Term Objectives						
» Incorporate Energy Star and GreenGlobes principles in all future construction policies	✈	✈	✈	✈		

5.1.7 Community Connection Implementation Plan

Overarching Community Connection Sustainability Goals

- ✓ Promote compatible on- and off-airport land uses that support continued airport operations and minimize impacts to the surrounding communities
- ✓ Strengthen partnerships with local government and community organizations
- ✓ Engage the public through dedicated outreach, education, and involvement in the long-term planning for the Airport
- ✓ Foster intermodal transportation options to and from the Airport

COMMUNITY CONNECTION	Social Progress	Customer Experience	Protect and Conserve Natural Resources	Reduce Carbon Footprint	Reduce O and M Cost	Economic Growth
Short Term Objectives						
» Address vegetation concerns identified in the Master Plan as part of the Authority's ongoing airspace protection program	✈	✈			✈	
» Fee-simple acquisition of property within the Runway 23 Runway Protection Zone						
» Expand social media/connection platform (Twitter, Facebook, Social Networking)	✈	✈			✈	✈
Mid Term Objectives						
» Implement recommendations of the 2014 Part 150 Study	✈	✈	✈	✈		
» Work with the local municipalities to implement an Airport Overlay Zone	✈	✈				
» Expand relationships and internship programs with local universities/colleges	✈	✈			✈	✈
» Support/empower employee charitable giving and volunteer programs	✈	✈			✈	✈
» Continue refining the outreach and engagement programs with the local community to include programs and community involvement with the Airport	✈	✈			✈	✈
Long Term Objectives						
» Develop community Airport awareness programs (poster programs)	✈	✈				
» Develop land use planning program that incorporates local community programs	✈	✈	✈	✈	✈	✈

5.1.8 Economic Vitality Implementation Plan

Overarching Economic Vitality Sustainability Goals

- ✓ Develop and maintain robust product and service offerings (air service, concessions, general aviation) and customer friendly facilities
- ✓ Promote on- and off-airport business development, revenue generation, and job growth/retention
- ✓ Strengthen partnerships with the business community, universities, and promote business diversity
- ✓ Make prudent financial decisions and employ full life-cycle cost evaluations

ECONOMIC VITALITY	Social Progress	Customer Experience	Protect and Conserve Natural Resources	Reduce Carbon Footprint	Reduce O and M Cost	Economic Growth
Short Term Objectives						
» Continue partnerships and promoting on-airport commercial development	✈	✈			✈	✈
» Develop formulaic approach to setting airline rates and charges on an annual budget basis	✈	✈				✈
» Maintain DBE program and seek opportunities to expand outreach to local DBE entities	✈	✈			✈	✈
Mid Term Objectives						
» Support a legislative increase to the maximum allowable PFC					✈	✈
» Continue pursuing implementation of a CFC program					✈	✈
Long Term Objectives						
» Consider the development of a parking garage structure at the Airport	✈	✈			✈	✈
» Develop a parking rate structure based on associated premium or plus service parking to optimize the types of parking offered	✈	✈			✈	✈

5.2 MONITORING PLAN

Tracking the performance of sustainability initiatives over time is a key component to implementing sustainability at CAK. Recording what progress has been made, and revising goals and objectives as CAK deems necessary. Defining performance initiatives and recording progress will allow the Airport to determine what objectives are working and what objectives need modified. The following tables contain a monitoring report card and, when appropriate, a quantitative-based measurable. These tables will be used to monitor the progress of the objectives identified in the previous section. It is important to note that not all of the focus areas have measurable tables as not every area has a tangible measurement of success, such as baseline levels of quantity related to the focus area.

5.2.1 Administration Monitoring Plan

ADMINISTRATIVE IMPLEMENTATION PLAN AND MONITORING REPORT

Focus Year	Achievement	Monitoring Initiative
2016	Yes / No	Establish an interdepartmental sustainability committee
2016	Yes / No	Develop an airport tenant sustainability working group
2016	Yes / No	Publish an annual sustainable summary report
2017	Yes / No	Develop detailed technical specs and standards to assist implementing sustainability measures
2017	Yes / No	Obtain tenant commitment to sustainability
2017	Yes / No	Review and incorporate sustainability clauses into the airport operating documents
2018	Yes / No	Define and require sustainable design goals in future RFQs, RFPs, and bid review criteria
2021	Yes / No	Update Sustainability Plan Implementation schedule (2021)

5.2.2 Energy Management Monitoring Plan

Focus Year	Measurable	Baseline Year	Current Year
2021	Reduce Airport electrical (kwh) energy use 10% by 2021	7.36 mil kwh	
2026	Reduce Airport Natural Gas (therms) use 20% by 2026	219,700 therms	
2031	Reduce total Airport energy (kwh/therms) use 25% by 2031	7.36 mil/ 219,000 therms	
Focus Year	**Measurable**	**Baseline Year**	**Current Year**
2016	Install Synchronous Belt Drives on Air Handling Units		
2016	Install High-Efficiency HVAC Motors		
2017	Implement Night Setback Temp Control		
2017	Install Vending Miser Control		
2018	Install Lighting Controls (Occupancy Sensors)		
2019	Install Walk-In Cooler Controls		
Focus Year	**Measurable**	**Baseline Year**	**Current Year**
2016	Install Synchronous Belt Drives on Air Handling Units		
2016	Install High-Efficiency HVAC Motors		
2017	Implement Night Setback Temp Control		
2017	Install Vending Miser Control		
Focus Year	**Measurable**	**Baseline Year**	**Current Year**
2016	Install Synchronous Belt Drives on Air Handling Units		

5.2.3 Waste Management and Recycling Monitoring Plan

Focus Year	Measurable	Baseline Year	Current Year
2021	Reduce solid waste stream ratio by 50% by 2021	81/19	
2021	Reduce solid waste volume by 25% from baseline	10,000 - 13,000 CY	
2021	Expand recycling program to include paper, plastic, glass, and metal materials	Paper	

WASTE MANAGEMENT AND RECYCLING MONITORING REPORT

Focus Year	Achievement	Monitoring Initiative
2016	Yes / No	Conduct a waste & recycling audit
2016	Yes / No	Derive a baseline for the total solid waste generated per year to monitor and track reduction to meet goals
2016	Yes / No	Develop a Terminal Solid Waste Management and Recycling Program
2016	Yes / No	Increase the amount of strategically located recycling receptacles next to trash receptacles
2016	Yes / No	Conduct awareness training for the janitorial staff to ensure that recyclables stay segregated from waste
2017	Yes / No	Expand the solid waste recycling program throughout the Airport
2017	Yes / No	Implement solid waste reduction initiatives and incentives for airport employees, tenants, and vendors
2018	Yes / No	Minimize the use of office printing materials

5.2.4 Water Resource Management Monitoring Plan

Focus Year	Measurable	Baseline Year	Current Year
2021	Reduce water consumption on the Airport by 5%	10,600,000 gal	
2026	Reduce water consumption in the Terminal by 50%	10,600,000 gal	
2031	Reduce total water use on the Airport by 50%	10,600,000 gal	

WATER RESOURCE MANAGEMENT MONITORING REPORT

Focus Year	Achievement	Monitoring Initiative
2016	Yes / No	Incorporate LID strategies into the Airport's "Development Guidelines"
2016	Yes / No	Use low-volume, high pressure sprayer nozzles on water hoses used for vehicle washing, clean-up, regular use
2016	Yes / No	Replace outdated terminal restroom fixtures and toilets with innovative high-efficiency units • Install waterless urinals • Install variable flush or pressure assisted toilet units • Install low flow faucets
2016	Yes / No	Install automatic sensors or occupancy sensors on faucets, urinals, and toilets
2016	Yes / No	Replace smaller tank style water heater unites with tankless units

5.2.5 Air Quality Monitoring Plan

Focus Year	Measurable	Baseline Year	Current Year
2021	Decrease total airport GHG emissions 10% from baseline levels	91,750 MT	
2031	Decrease total airport GHG emissions 25% from baseline levels	21,489 MT	
2050	Decrease total airport GHG emissions 80%	21,489 MT	

AIR QUALITY MONITORING REPORT

Focus Year	Achievement	Monitoring Initiative
2016	Yes / No	Develop new airfield practices and procedures to reduce engine run times
2016	Yes / No	Consider adopting specific practices to taxiing procedures to minimize unnecessary emissions
2016	Yes / No	Consider adopting specific practices to minimize unnecessary emissions pertaining to Airport owned vehicles
2017	Yes / No	Pursue VALE Grant to assist with gate equipment acquisition
2019	Yes / No	Adopt pedestrian traffic management policies, improve way-finding, and encourage cell lot use
2021	Yes / No	Consider development of CNG station on or new Airport property

5.2.6 Green Construction Monitoring Plan

GREEN CONSTRUCTION MONITORING REPORT

Focus Year	Achievement	Monitoring Initiative
2017	Yes / No	Develop "green" standards or guidelines for all new construction and facility rehabilitation
2018	Yes / No	Incorporate Life-Cycle Cost Analysis into the "green" decision making process
2019	Yes / No	Consider the use of warm mix asphalt for surface lot rehabilitation
2019	Yes / No	Implement LID principles in future design and construction projects

5.2.7 Community Connection Monitoring Plan

COMMUNITY CONNECTION MONITORING REPORT

Focus Year	Achievement	Monitoring Initiative
2017	Yes / No	Address vegetation concerns identified in the Master Plan as part of the Authority's ongoing airspace protection program
2017	Yes / No	Fee-simple acquisition of property within the Runway 23 Runway Protection Zone
2021	Yes / No	Expand social media/connection platform (Twitter, Facebook, Social Networking)

5.2.8 Economic Vitality Monitoring Plan

ECONOMIC VITALITY MONITORING REPORT

Focus Year	Achievement	Monitoring Initiative
2021	Yes / No	Continue partnerships and promoting on-airport commercial development
2021	Yes / No	Develop formulaic approach to setting airline rates and charges on an annual budget basis
2021	Yes / No	Maintain DBE program and seek opportunities to expand outreach to local DBE entities

Appendix A
GREEN HOUSE GAS EMISSIONS INVENTORY

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APPENDICES

1.0 Background

The main purpose of this inventory is to provide a baseline assessment of greenhouse gas emissions associated with airport operations. Emissions associated with the airport occur as a result of the following activities:

- Aircraft operations
- Ground support equipment operations
- Ground access vehicles (e.g. people driving to the airport)
- Stationary sources (e.g. combustion, refrigerants, fire suppressants)
- Electricity use

This inventory has been prepared for the six principal greenhouse gases (GHG): carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFC), and perfluorocarbons (PFC).

2.0 Greenhouse Gas Inventory and Forecast Procedures

The greenhouse gas inventory was prepared using the guidance in the Airport Cooperative Research Program Report 11 – Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories (ACRP, 2009). Calendar year 2012 was identified as the baseline year for the inventory.

The ACRP guidance states that airport GHG inventories should be categorized and allocated by ownership/control of the emission source. The Authority owns the airport land and many of the buildings and other facilities (e.g. fuel tanks). However, many facilities are operated by tenants and the Authority's role is limited to management activities. As a result, the Authority is responsible for a small portion of the emissions from building heating and electricity use and maintenance/support vehicles. It should be noted, however, that specific use data for Authority-controlled spaces was not available.

2.1 Aircraft Operations

Greenhouse gas emissions result from the combustion of fuel during aircraft operations. In order to simplify the inventory process, emissions from aircraft are assigned to an airport based on fuel sales at that airport, regardless of where the fuel is consumed. To provide an estimate of GHG emissions that occur in the vicinity of the airport, aircraft emissions are divided into the cruise and landing/takeoff (LTO) modes of operation. LTO operation is defined as all activities taking place below 3,000 feet. LTO emissions were based on fuel consumption factors from the FAA's Emissions and Dispersion Modeling System (EDMS) model (FAA, 2013). Taxi-in and taxi-out times were set to 5 minutes and 3 minutes, respectively. The glide slope was set to 3 degrees, which is the angle specified by the glide slope indicators for Runways 1-19 and 5-23.

Data on flight operations was provided by aircraft model for the 2011 calendar year and input into the EDMS. For aircraft with multiple engine selections within the EDMS, the default engine was used whenever possible. For models with no default engine, an engine was selected based on a review of engines historically supplied with the aircraft.

Although flight school operations are present at the airport, no flight operations were assumed to be touch-and-go maneuvers, where a plane lands and immediately takes off.

The detailed calculations for the emissions from aircraft operations are provided in Appendix A. The EDMS model parameters are provided in Appendix B.

2.2 Ground Support Equipment

Emissions resulting from the operation of ground support equipment (GSE) operations also contribute to the total GHG emissions at the Airport. There is various GSE located at CAK, including fuel trucks, baggage carts, aircraft tugs, deicing equipment, and ground power units. The amount of gasoline and diesel fuel used at the airport was used to estimate GSE emissions. Emission factors for CO_2 from gasoline and diesel combustion were obtained from the ACRP guidance. Factors from the Climate Registry's General Reporting Protocol (GRP) were used for CH_4 and N_2O (TCR, 2014).

The detailed calculations for emissions from GSE are provided in Appendix A.

2.3 Ground Access Vehicles

One of the largest contributors of GHG emissions at CAK is operations from ground access vehicles (vehicles used to transport people/goods to and from the airport). These may be considered to be aircraft owners/operators, tenants, the general public (passengers, pickup/drop-off, etc), or the two public transit systems serving the airport. Data was not available to determine each group's share of the total ground access vehicle emissions. The daily passenger car traffic to the airport was estimated at 2,800 trips. Approximately 75,000 rental cars were leased at the airport in 2012 and are included as passenger cars.

For the purposes of this inventory, an average trip distance of 30 miles was assumed. Additionally, the national average for vehicle fuel economy, 23.3 miles per gallon (BTS, 2014), was used as the assumption. It was assumed that all GAV used gasoline. Emissions related to GAV air conditioning were not included in the inventory as these emissions are not substantially related to access of the airport by vehicles.

Two public transit bus routes serve the airport. The Stark Area Regional Transit Authority (SARTA) Route 81 bus serves the airport with 30 stops per day, six days per week. Route 81 runs between Canton and Akron along Interstate 77. The airport is located just off of Interstate 77. As a result, only a two mile portion of the bus route is considered to be influenced by the airport. It was assumed that half of the trips were buses fueled by compressed natural gas (CNG), and the remaining were diesel-fueled buses. Detailed information about SARTA's bus fleet was not available.

The Akron Metropolitan Regional Transit Authority (METRO RTA) Route 110 serves the airport

with five stops per day, on weekdays only. The portion of the bus route considered to be influenced by the airport is the 13 mile section between Akron Fulton International Airport and CAK. Detailed information about METRO RTA's bus fleet was not available. All trips were assumed to be diesel-fueled buses.

Access to the long-term and economy parking lots is provided by a jitney shuttle bus. The shuttle bus route was estimated to be 2.25 miles per loop. The shuttle bus was assumed to make 4 loops per hour. Although the shuttle bus operates 24 hours a day, there are typically no scheduled arrivals or departures between midnight and five am. As a result, the shuttle bus was assumed to operate 19 hours each day.

Emission factors for CO_2 from GAV were obtained from the ACRP guidance. Factors from the GRP were used for CH_4 and N_2O (TCR, 2014). The detailed calculations for the emissions from GAV are provided in Appendix A.

2.4 Stationary Sources

Greenhouse gas emissions also result from the combustion of fuel in stationary sources such as boilers, furnaces, water heaters, and generators. Emissions may also result from operation and maintenance of air conditioning and fire-fighting systems.

Fuel use in boilers and water heaters was obtained from utility records. In some cases, complete utility records for 2012 were not available. Missing data was estimated based on usage patterns from complete records. There are 2 emergency generators located at CAK. Generators were assumed to be 750 HP, and each generator was assumed to operate 50 hours per year. Emission factors for stationary sources were obtained from EPA's AP-42 Compilation of Air Pollutant Emission Factors, the GRP, and the ACRP guidance (EPA, 1995).

Finally, it should be noted that there was not sufficient data to estimate emissions from air conditioning and fire-fighting systems.

The detailed calculations for emissions from stationary sources are provided in Appendix A.

2.5 Electricity Use

The generation of electricity for the Airport also contributes to the total emissions count. The total electricity use was obtained from utility records. In some cases, complete utility records for 2012 were not available. Missing data was estimated based on usage patterns from complete records. The EPA's eGRID database was used to obtain greenhouse gas emission factors for the Ohio power grid (EPA, 2014).

The detailed calculations for emissions from electricity use are provided in Appendix A.

2.6 Global Warming Potentials

Different greenhouse gases emitted from human and natural sources have different impacts on climate. For example, one ton of CO_2 has a different effect on the climate than one ton of methane.

Using results from complex computer simulations, scientists have developed equivalency methods for estimating the relative impacts on climate change of different chemicals. The most commonly-used equivalency method is the Global Warming Potential (GWP). The GWP for a chemical is a ratio of the chemical's warming potential to the warming potential of CO_2. Applying these GWPs to all of the estimated GHGs allows for the summation of emissions on a "CO_2-equivalent" basis.

GWPs were obtained from the ACRP guidance. The detailed calculations for CO_2-equivalent emissions are provided in Appendix A.

2.7 2020 Forecast

Forecasts of airport traffic in 2019 have been included in the Sustainable Airport Master Plan. The ratio of 2019 forecast traffic and 2011 actual traffic was used to estimate fuel use, GSE use, GAV traffic levels, natural gas use, and electricity use for 2020.

The National Highway Traffic Safety Administration (NHTSA) has proposed a Corporate Average Fuel Economy (CAFE) for passenger cars in 2020 of 44.7 miles per gallon, well above the current standard of 32.7 miles per gallon (NHTSA, 2011). The fuel economy target under the CAFE standards is not indicative of real-world fuel economy and applies only to individual model years. In order to estimate actual fuel economy for all passenger cars in 2020, the ratio of passenger car CAFE fuel economy in 2012 to passenger car CAFE fuel economy in 2020 was applied to the 2012 average fuel economy of 23.3 miles per gallon for all passenger cars. The resulting estimated fuel economy for GAV in 2020 is 31.9 miles per gallon. A similar increase in fuel economy for buses is expected, but a detailed proposal has not yet been issued. As a result, the emission factors for emissions from buses were not revised.

While emissions from aircraft, GSE, stationary sources and electricity use are expected to decrease, there was not sufficient data to revise the emission factors for these sources.

The detailed calculations for the 2020 GHG forecast are provided in Appendix A.

3.0 Summary of Results

The estimated greenhouse gas emissions associated with operations at Akron-Canton Airport in 2012 are provided in Table 1 below. The 2020 greenhouse gas emission forecast is provided in Table 2.

Table 1 – Estimated Greenhouse Gas Emissions (metric tons)
Akron-Canton Airport
Baseline (2012)

Activity	**CO_2**	**CH_4**	**N_2O**
Aircraft Operations (Total)	59,871	3.00	1.30
Aircraft Operations (LTO)	18,663	0.78	0.41
Aircraft Operations (Cruise/APU)	41,208	2.22	0.89
Ground Support Equipment	2,056	0.12	0.05
Ground Access Vehicles	23,034	0.92	0.49
Stationary Sources (Total)	1,247	0.12	0.003
Natural Gas Use	1,208	0.12	0.002
Emergency Generators	39	0.002	0.001
Electricity Use	4,865	0.06	0.08
Total Emissions	**91,072**	**4.21**	**1.92**
Total Emissions (CO_2-equivalent)		**91,750**	

Table 2 – Estimated Greenhouse Gas Emissions (metric tons) Akron-Canton Airport 2020 Forecast			
Activity	**CO_2**	**CH_4**	**N_2O**
Aircraft Operations (Total)	63,312	3.17	1.37
Aircraft Operations (LTO)	23,197	0.91	0.51
Aircraft Operations (Cruise/APU)	40,115	2.26	0.87
Ground Support Equipment	2,175	0.12	0.06
Ground Access Vehicles	18,203	0.97	0.51
Stationary Sources (Total)	1,316	0.13	0.004
Natural Gas Use	1,277	0.13	0.003
Emergency Generators	39	0.002	0.001
Electricity Use	5,145	0.06	0.08
Forecast Emissions	**90,152**	**4.45**	**2.03**
Forecast Emissions (CO_2-equivalent)		**90,869**	
% Difference to 2012 Emissions (CO_2e)		**-0.96**	

References

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Appendix A

Emission Estimate Spreadsheet

Akron-Canton Regional Airport
Greenhouse Gas Inventory
Baseline Year 2012

The greenhouse gas inventory was prepared using the guidance in the Airport Cooperative Research Program Report 11 – Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories (ACRP, 2009). The inventory has been prepared for the six principal greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFC), and perfluorocarbons (PFC). No sources of SF_6 were identified at the airport. In addition, there was insufficient data to estimate emissions of HFC and PFC.

Aircraft Operations

Sample Calculation

$$Emissions\,(metric\,tons) = Fuel\,Use\,(gal) * Emission\,Factor\left(\frac{lb}{gal}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Emission Factors

	Jet A (lb/gal)	Avgas (lb/gal)	Source
CO_2	21.095	18.355	ACRP, 2009
CH_4	5.95E-04	0.016	ACRP, 2009
N_2O	4.63E-04	2.43E-04	ACRP, 2009

2012 Total Fuel Use

Total fuel use for passenger and general operations is based on the total fuel dispensed at the airport in 2012. Fuel use for military operations has been estimated. Fuel use in the LTO cycle for military operations was estimated using EDMS, and the LTO fuel use was assumed to represent 20% of total military fuel use at the airport.

Jet A (gal):	6,090,000
Avgas (gal):	192,000

Total Emissions - Aircraft Operations

CO_2	59,871	metric tons
CH_4	3.00	metric tons
N_2O	1.30	metric tons

Akron-Canton Regional Airport
Greenhouse Gas Inventory
Baseline Year 2012

Landing-Takeoff Operation (LTO) Fuel Use

LTO fuel use is based on fuel consumption data from FAA's EDMS model.

Jet A (gal):	1,918,369
Avgas (gal):	36,840

Landing-Takeoff Operation (LTO) Emissions

CO_2	18,663	metric tons
CH_4	0.78	metric tons
N_2O	0.41	metric tons

Cruise/APU Emissions (Total Emissions - LTO Emissions)

APU-specific fuel consumption data is not available. As a result, the emission estimation method includes APU emissions as part of cruise emissions. As discussed in Section 3.2 of the Guidebook, this is a known limitation of the method. Future versions of EDMS are expected to include APU fuel consumption factors so that APU emissions can be broken out and included with the LTO cycle emissions.

CO_2	41,208	metric tons
CH_4	2.22	metric tons
N_2O	0.89	metric tons

Ground Support Equipment

Sample Calculation

$$Emissions\,(metric\,tons) = Fuel\,Use\,(gal) * Emission\,Factor\left(\frac{lb}{gal}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Emission Factors

	Diesel fuel (lb/gal)	Gasoline (lb/gal)	Source
CO_2	22.384	19.564	ACRP, 2009
CH_4	1.28E-03	1.10E-03	TCR, 2014 (Table 13.7)
N_2O	5.73E-04	4.85E-04	TCR, 2014 (Table 13.7)

Akron-Canton Regional Airport
Greenhouse Gas Inventory
Baseline Year 2012

Estimated 2012 Fuel Consumption

Diesel:	192,000	gallons
Gasoline:	12,000	gallons

Total Emissions - Ground Support Equipment

CO_2	2,055.90	metric tons
CH_4	0.1174	metric tons
N_2O	0.0526	metric tons

Ground Access Vehicles

Sample Calculation

$$Emissions\,(metric\,tons) = Mileage(mi) * Emission\,Factor\left(\frac{lb}{mi}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Emission Factors

	Gasoline (lb/mi)	Diesel Bus (lb/mi)	Natural Gas Bus (lb/mi)	Source
CO_2	0.82	3.11	4.91	ACRP, 2009 (lb/gal) and average fuel economy (BTS, 2014 and NREL, 2010)
CH_4	3.24E-05	1.12E-05	4.33E-03	TCR, 2014 (Tables 13.4 and 13.6)
N_2O	1.74E-05	1.06E-05	3.86E-04	TCR, 2014 (Tables 13.4 and 13.6)

Estimate Passenger Car Mileage

Average daily trips to airport:	2,000	
verage trip distance (one-way, assumed):	30	miles
annual passenger car (gasoline) mileage:	43,800,000	miles

Akron-Canton Regional Airport
Greenhouse Gas Inventory
Baseline Year 2012

Estimate Transit Bus Mileage

SARTA Route 81 weekly trips:	180	
Trip distance influenced by airport:	2	miles
% of trips by diesel bus:	50%	
% of trips by CNG bus:	50%	
METRO RTA Route 110 weekly trips:	50	
Trip distance influenced by airport:	13	miles
% of trips by diesel bus:	100%	
Total diesel bus mileage:	43,160	miles
Total CNG bus mileage:	9,360	miles

Estimate Parking Shuttle Mileage

Daily parking lot loops:	76	
Loop distance:	2.25	miles
Total parking shuttle (diesel) mileage:	62,415	miles

Total Mileage

Total gasoline mileage:	43,800,000	miles
Total diesel mileage:	105,575	miles
Total CNG mileage:	9,360	miles

Total Emissions - Ground Access Vehicles

CO_2	16,501.00	metric tons
CH_4	0.6628	metric tons
N_2O	0.3482	metric tons

Akron-Canton Regional Airport
Greenhouse Gas Inventory
Baseline Year 2012

Stationary Sources

Emergency Generators - Sample Calculation

$$Emissions\,(metric\,tons) = Hours\,(hrs) * Horsepower\,(HP) * Emission\,factor\left(\frac{lb}{hp-hr}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Emergency Generators - Emission Factors

	Generators (lb/hp-hr)	Source
CO_2	1.15	EPA, 1995
CH_4	6.53E-05	TCR, 2014 (Table 13.7, converted based on 7,000 btu/hp-hr and 137,000 btu/gal)
N_2O	2.93E-05	TCR, 2014 (Table 13.7, converted based on 7,000 btu/hp-hr and 137,000 btu/gal)

2012 Emergency Generator Use

Total generator hours:	150	hours (assumed, 50 hr per unit)
Generator horsepower:	750	HP (assumed)

Total generator use: 112,500 hp-hr

Total Emissions - Emergency Generators

CO_2	58.68	metric tons
CH_4	0.0033	metric tons
N_2O	0.0015	metric tons

Natural Gas - Sample Calculation

$$Emissions\,(metric\,tons) = Gas\,Usage\,(mscf) * Emission\,Factor\left(\frac{lb}{mscf}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Natural Gas - Emission Factors

	Natural Gas (lb/mscf)	Source
CO_2	120.59	ACRP, 2009
CH_4	1.19E-02	ACRP, 2009
N_2O	2.37E-04	ACRP, 2009

Akron-Canton Regional Airport
Greenhouse Gas Inventory
Baseline Year 2012

2012 Total Natural Gas Use

10,000.0	mscf

Total Emissions - Natural Gas

CO_2	547.00	metric tons
CH_4	0.0538	metric tons
N_2O	0.0011	metric tons

Total Emissions - Stationary Sources

CO_2	605.68	metric tons
CH_4	0.0571	metric tons
N_2O	0.0026	metric tons

Electricity Use

Sample Calculation

$$Emissions\,(metric\ tons) = Electricity\ Usage\ (MWh) * Emission\ Factor\ \left(\frac{lb}{MWh}\right) * 0.00045359\ \left(\frac{metric\ tons}{lb}\right)$$

Emission Factors

	Electricity (lb/MWh)	Source
CO_2	1503.47	EPA, 2014
CH_4	1.82E-02	EPA, 2014
N_2O	2.48E-02	EPA, 2014

2012 Total Electricity Use

2,000.0	MWh

Akron-Canton Regional Airport
Greenhouse Gas Inventory
Baseline Year 2012

Total Emissions - Electricity Use

CO_2	1,363.92	metric tons
CH_4	0.0165	metric tons
N_2O	0.0225	metric tons

Total Emissions & CO_2 Equivalences

Total Emissions

CO_2	80,397.35	metric tons
CH_4	3.8497	metric tons
N_2O	1.7257	metric tons

Sample Calculation

$$CO_2e\ (metric\ tons) = \sum Pollutant\ Emissions\ (metric\ tons) * Global\ Warming\ Potential$$

Global Warming Potentials (GWP)

	GWP	Source
CO_2	1	ACRP, 2009
CH_4	25	ACRP, 2009
N_2O	298	ACRP, 2009

Total Emissions - CO_2e

CO_2e	81,007.86	metric tons

References

ACRP, 2009. Guidebook on Preparing Greenhouse Gas Emissions Inventories. Available from the Airports Council International – North America web site - http://aci-na.org/static/entransit/acrp_guidebook_on_greenhouse_gases_april09.pdf, 2009.
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Akron-Canton Regional Airport
Greenhouse Gas Inventory
2020 Projection

The greenhouse gas estimate was prepared using the guidance in the Airport Cooperative Research Program Report 11 – Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories (ACRP, 2009). The inventory has been prepared for the six principal greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFC), and perfluorocarbons (PFC). No sources of SF_6 were identified at the airport. In addition, there was insufficient data to estimate emissions of HFC and PFC.

Aircraft Operations

Sample Calculation

$$Emissions\,(metric\,tons) = Fuel\,Use\,(gal) * Emission\,Factor\left(\frac{lb}{gal}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Emission Factors

	Jet A (lb/gal)	Avgas (lb/gal)	Source
CO_2	21.095	18.355	ACRP, 2009
CH_4	5.95E-04	0.016	ACRP, 2009
N_2O	4.63E-04	2.43E-04	ACRP, 2009

2020 Estimated Fuel Use

Estimated fuel use for passenger and general operations is based on the total fuel dispensed at the airport in 2012, multiplied by the ratio of 2019 operations to 2011 operations. Fuel use for military operations has been estimated. Fuel use in the LTO cycle for military operations was estimated using EDMS, and the LTO fuel use was assumed to represent 20% of total military fuel use at the airport.

Jet A (gal):	6,440,000
Avgas (gal):	203,074

Total Emissions - Aircraft Operations

CO_2	63,312	metric tons
CH_4	3.17	metric tons
N_2O	1.37	metric tons

Akron-Canton Regional Airport
Greenhouse Gas Inventory
2020 Projection

Landing-Takeoff Operation (LTO) Fuel Use

LTO fuel use is based on fuel consumption data from FAA's EDMS model.

Jet A (gal):	2,392,053
Avgas (gal):	37,051

Landing-Takeoff Operation (LTO) Emissions

CO_2	23,197	metric tons
CH_4	0.91	metric tons
N_2O	0.51	metric tons

Cruise/APU Emissions (Total Emissions - LTO Emissions)

APU-specific fuel consumption data is not available. As a result, the emission estimation method includes APU emissions as part of cruise emissions. As discussed in Section 3.2 of the Guidebook, this is a known limitation of the method. Future versions of EDMS are expected to include APU fuel consumption factors so that APU emissions can be broken out and included with the LTO cycle emissions.

CO_2	40,115	metric tons
CH_4	2.26	metric tons
N_2O	0.87	metric tons

Ground Support Equipment

Sample Calculation

$$Emissions\,(metric\,tons) = Fuel\,Use\,(gal) * Emission\,Factor\left(\frac{lb}{gal}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Emission Factors

	Diesel fuel (lb/gal)	Gasoline (lb/gal)	Source
CO_2	22.384	19.564	ACRP, 2009
CH_4	1.28E-03	1.10E-03	TCR, 2014 (Table 13.7)
N_2O	5.73E-04	4.85E-04	TCR, 2014 (Table 13.7)

Akron-Canton Regional Airport
Greenhouse Gas Inventory
2020 Projection

Estimated 2020 Fuel Consumption

Diesel:	203,100	gallons
Gasoline:	12,700	gallons

Total Emissions - Ground Support Equipment

CO_2	2,174.82	metric tons
CH_4	0.1241	metric tons
N_2O	0.0556	metric tons

Ground Access Vehicles

Sample Calculation

$$Emissions\,(metric\,tons) = Mileage(mi) * Emission\,Factor\left(\frac{lb}{mi}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Emission Factors

	Gasoline (lb/mi)	Diesel Bus (lb/mi)	Natural Gas Bus (lb/mi)	Source
CO_2	0.61	3.11	4.91	ACRP, 2009 (lb/gal) and proposed fuel economy (NHTSA, 2011 and NREL, 2010)
CH_4	3.24E-05	1.12E-05	4.33E-03	TCR, 2014 (Tables 13.4 and 13.6)
N_2O	1.74E-05	1.06E-05	3.86E-04	TCR, 2014 (Tables 13.4 and 13.6)

Estimate Passenger Car Mileage

Average daily trips to airport:	2,115	
verage trip distance (one-way, assumed):	30	miles
annual passenger car (gasoline) mileage:	46,326,147	miles

Akron-Canton Regional Airport
Greenhouse Gas Inventory
2020 Projection

Estimate Transit Bus Mileage

SARTA Route 81 weekly trips:	180	
Trip distance influenced by airport:	2	miles
% of trips by diesel bus:	50%	
% of trips by CNG bus:	50%	
METRO RTA Route 110 weekly trips:	50	
Trip distance influenced by airport:	13	miles
% of trips by diesel bus:	100%	
Total diesel bus mileage:	43,160	miles
Total CNG bus mileage:	9,360	miles

Estimate Parking Shuttle Mileage

Daily parking lot loops:	76	
Loop distance:	2.25	miles
Total parking shuttle (diesel) mileage:	62,415	miles

Total Mileage

Total gasoline mileage:	46,326,147	miles
Total diesel mileage:	105,575	miles
Total CNG mileage:	9,360	miles

Total Emissions - Ground Access Vehicles

CO_2	13,056.92	metric tons
CH_4	0.6999	metric tons
N_2O	0.3681	metric tons

Akron-Canton Regional Airport
Greenhouse Gas Inventory
2020 Projection

Stationary Sources

Emergency Generators - Sample Calculation

$$Emissions\,(metric\,tons) = Hours\,(hrs) * Horsepower\,(HP) * Emission\,factor\left(\frac{lb}{hp-hr}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Emergency Generators - Emission Factors

	Generators (lb/hp-hr)	Source
CO_2	1.15	EPA, 1995
CH_4	6.53E-05	TCR, 2014 (Table 13.7, converted based on 7,000 btu/hp-hr and 137,000 btu/gal)
N_2O	2.93E-05	TCR, 2014 (Table 13.7, converted based on 7,000 btu/hp-hr and 137,000 btu/gal)

2020 Estimated Emergency Generator Use

Total generator hours:	150	hours (assumed, 50 hr per unit)
Generator horsepower:	750	HP (assumed)

Total generator use: 112,500 hp-hr

Total Emissions - Emergency Generators

CO_2	58.68	metric tons
CH_4	0.0033	metric tons
N_2O	0.0015	metric tons

Natural Gas - Sample Calculation

$$Emissions\,(metric\,tons) = Gas\,Usage\,(mscf) * Emission\,Factor\left(\frac{lb}{mscf}\right) * 0.00045359\,(\frac{metric\,tons}{lb})$$

Natural Gas - Emission Factors

	Natural Gas (lb/mscf)	Source
CO_2	120.59	ACRP, 2009
CH_4	1.19E-02	ACRP, 2009
N_2O	2.37E-04	ACRP, 2009

Akron-Canton Regional Airport
Greenhouse Gas Inventory
2020 Projection

2020 Estimated Natural Gas Use

10,576.7	mscf

Total Emissions - Natural Gas

CO_2	578.55	metric tons
CH_4	0.0569	metric tons
N_2O	0.0011	metric tons

Total Emissions - Stationary Sources

CO_2	637.23	metric tons
CH_4	0.0602	metric tons
N_2O	0.0026	metric tons

Electricity Use

Sample Calculation

$$Emissions\,(metric\ tons) = Electricity\ Usage\ (MWh) * Emission\ Factor\ \left(\frac{lb}{MWh}\right) * 0.00045359\ \left(\frac{metric\ tons}{lb}\right)$$

Emission Factors

	Electricity (lb/MWh)	Source
CO_2	1503.47	EPA, 2014
CH_4	1.82E-02	EPA, 2014
N_2O	2.48E-02	EPA, 2014

2020 Estimated Electricity Use

2,115.3	MWh

Akron-Canton Regional Airport
Greenhouse Gas Inventory
2020 Projection

Total Emissions - Electricity Use

CO_2	1,442.59	metric tons
CH_4	0.0175	metric tons
N_2O	0.0237	metric tons

Total Emissions & CO_2 Equivalences

Total Emissions

CO_2	80,623.57	metric tons
CH_4	4.0702	metric tons
N_2O	1.8248	metric tons

Sample Calculation

$$CO_2e\ (metric\ tons) = \sum Pollutant\ Emissions\ (metric\ tons) * Global\ Warming\ Potential$$

Global Warming Potentials (GWP)

	GWP	Source
CO_2	1	ACRP, 2009
CH_4	25	ACRP, 2009
N_2O	298	ACRP, 2009

Total Emissions - CO_2e

CO_2e	81,269.12	metric tons

References

ACRP, 2009. Guidebook on Preparing Greenhouse Gas Emissions Inventories. Available from the Airports Council International – North America web site - http://aci-na.org/static/entransit/acrp_guidebook_on_greenhouse_gases_april09.pdf, 2009.

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