

City of Arkansas City

PLANNING COMMISSION MEETING AGENDA

Tuesday, September 14, 2021 at 5:30 PM - 400 W Madison Ave, Arkansas City, KS

GoTo Meeting: https://global.gotomeeting.com/join/642583933 or call +1 (872) 240-3412 **Access Code:** 642 583 933

Call to Order

Roll Call Mary Benton Lloyd Colston Karla Gallegos Paisley Howerton Charles Jennings Ian Kuhn Andy Paton Cody Richardson

Public Comments

Persons who wish to address the Planning Commission regarding items not on the agenda. Speakers will be limited to three (3) minutes. Any presentation is for information purposes only. No action will be taken.

Consent Agenda

1. Meeting Minutes, August 10, 2021 meeting.

Comprehensive Plan

2. Comprehensive Plan discussion on Community Health & Infrastructure

Other Items

Adjournment



City of Arkansas City

PLANNING COMMISSION MINUTES

Tuesday, August 10, 2021 at 5:30 PM - 400 W Madison Ave, Arkansas City, KS

Call to Order

Roll Call

PRESENT: Chair Andy Paton, Mary Benton, Charles Jennings, Paisley Howerton, Ian Kuhn, Lloyd Colston, Cody

Richardson, Joni Curl ABSENT: Karla Gallegos

Staff present at roll call was Principal Planner Josh White and Public Information Officer Andrew Lawson.

Also present at roll call either in person or via GoToMeeting was Harrison Taylor representing the Beautification Advisory Board; Pastor Jack Dickson representing the Arkansas City Ministerial Alliance; Tom Langer representing the City-Cowley County Health Department; Kerri Falletti representing Cowley First and RISE Cowley; Dr. Ron Ballard, Lindsay Wilke and Braden Smith representing USD 470; Landon West representing Arkansas City Recreation Commission; Candace Stephens representing RISE Cowley and First Presbyterian Church; Sarah Johnson representing William Newton Hospital; and Shayla McDonald representing SCK Health.

Public Comments

Persons who wish to address the Planning Commission regarding items not on the agenda. Speakers will be limited to three (3) minutes. Any presentation is for information purposes only. No action will be taken.

There were no comments from the public regarding items not on the agenda.

Consent Agenda

Meeting Minutes, July 13, 2021 meeting.
Motion made by Jennings, Seconded by Colston to approve the meeting minutes as written.
Voting Yea: Chair Paton, Benton, Jennings, Howerton, Kuhn, Colston, Richardson, Curl

Comprehensive Plan

2. Comprehensive Plan discussion on Community Health

White introduced the topic of Community Health. He discussed the content of Chapter 7 from the 2013 Comprehensive Plan including the goals. He invited guests to speak about their respective agencies and how they were working to improve community health in the Arkansas City area. Tom Langer spoke of an ongoing Community Health Needs Assessment which is done every three years. He emphasized that the Health Department's main duty was to promote health in the county. He challenged Planning Commissioners to look at public health in all planning decisions. He volunteered to assist with creating goals and setting metrics to look at. He also noted that the pandemic had the positive that it created new partnerships in the county. Kerri Falletti noted the goals of the organization were active living, healthy eating and tobacco cessation. She spoke about the initiatives the organization is focusing on. Jack Dickson wanted to point out the spiritual component of public health. Churches and religious organizations can sometimes be the first agency somebody in a crisis goes to. These organizations can help with the physical issues including financial needs but can also

help by building better mental health as well. Braden Smith spoke of the partnerships that the school district has developed which have helped greatly in all manner of health situations. He also noted that we are still struggling in our community with child care as well the fact that we don't have enough pediatricians in the area. A major topic of concern for the school district was dealing with teen suicide as well as drug use by students. Landon West noted that the Recreation Commission had been working to get youth active but realized they needed to do more with adult programs. Colston noted that it was important for seniors to stay active and applauded the Silver Sneakers program and the Golden Tigers programs. Jennings stated it was important to celebrate successes something that was lacking in the current plan. Sarah Johnson spoke of their priorities and coordination of care with other healthcare agencies in the county. She also mentioned the Resource Directory that is being created for the county that will help direct people to the resources available all in one place. Candace Stephens spoke of the issues she is seeing in the youth of the community. She spoke of her involvement in RISE Cowley, RESIST, SADD and her work with the Student Resource Officers in the schools and the importance of all of these programs. White thanked all of the guests that spoke for all of their valuable input and the Planning Commissioners echoed that. The notes from this discussion will be compiled and used to start a draft of the new community health chapter. More discussion from some of the absent entities may be discussed at a future meeting including Arkansas City Police and Fire-EMS as well as SCK Health.

Other Items

Lawson asked Planning Commissioners what topics should be the focus of the remaining FlashVote surveys. Planning Commissioners felt that will the ongoing Health Assessment that a Community Health survey would be a waste. They suggested that the next survey should be on Parks and Recreation. Lawson noted that the pool and Wilson Park would probably be separated out but everything else could be a part of that survey. Housing was another topic discussed but it was determined that the Housing Assessment Tool did a pretty good job of gathering community input on housing already. Other potential topics include transportation, infrastructure, economic development and land use and with the exception of economic development, these topics haven't been discussed by the Planning Commission yet.

Adjournment

Motion made by Jennings, Seconded by Colston to adjourn the meeting. Voting Yea: Chair Paton, Benton, Jennings, Howerton, Kuhn, Colston, Richardson, Curl

Meeting adjourned at 7:05 pm.



Planning Commission Agenda Item

Meeting Date: 7/13/21

From: Josh White, Principal Planner

Item: Comprehensive Plan discussion on Community Health &

Infrastructure

Purpose: Comprehensive Plan discussion on Community Health & Infrastructure

Background:

Continue discussion on community health which was Chapter 7 in the 2013 Comprehensive Plan. We have invited representatives of the Arkansas City Fire-EMS Department, the Arkansas City Police Department, the Community Health Center in Cowley County, the Cowley Affinity Project, Cowley College Allied Health, Four County Mental Health and Suicide Prevention of Cowley County. We hope to use this discussion to wrap up this chapter.

After discussion is complete on Community Health, we will switch to Infrastructure. We have invited representatives of AT&T, Cox Communications, the Environmental Services Department, Evergy, Kansas Gas Service, and the Neighborhood Services Division to be a part of this discussion as we plan for the future of communications, electrical, natural gas, stormwater, wastewater, and water infrastructure in Arkansas City and Cowley County.

Action:

Hold discussion, no action required

Attachments:

2013 Comprehensive plan Chapter 6, 2013 Comprehensive plan Chapter 7

Chapter Seven: Community Health

- 7.1 Introduction
- 7.2 Vision
- 7.3 Background
- 7.4 Community Health and Comprehensive Planning
- 7.5 Cowley County Needs Assessment (2012)
- 7.6 Community Health Needs Assessment (2013)
- 7.7 The Importance of the Health Care Sector to the Economy of Cowley County (2010)
- 7.8 Goals and Actions

7.1 INTRODUCTION

Comprehensive planning originated in this country primarily out of a need to protect the health of citizens from such threats as urban congestion, unsafe housing and inadequate sanitation. Eliminating disease, overcrowding and incompatible uses were goals worthy of addressing through planning efforts. As time passed, and comprehensive planning evolved, infrastructure and other issues became its focus and health issues were relegated to public health officials. In recent years, subjects that affect the health of citizens have come full circle with the realization the built environment is critical to good health, as are public policies regarding land use and development. While congestion may not be an issue in Arkansas City, access to health providers, access to parks and open space, transportation, access to groceries, and an opportunity for exercise, are all parts of comprehensive planning that can improve health factors for citizens of Arkansas City.

Health starts where we live, work, learn and play. Our surroundings have a profound impact on our overall health, from exposure to toxins to the ability to safely walk or ride a bicycle. The built environment of our communities and neighborhoods plays an important role in providing opportunities for residents to live long, healthy lives. For example, people who live in walkable neighborhoods tend to get more physical activity, and those who live near supermarkets are more likely to eat healthy foods such as fresh fruits and vegetables.

7.2 VISION

The City will act by influencing the built environment and setting policy regarding City programs and services to enhance the lives and health of Arkansas City residents. Reducing obesity levels, increasing participation in wellness activities, increasing public education of healthy lifestyle choices, reducing dependence on emergency room care

as primary care, and creating good transportation links for walking and biking are recognized means of achieving this vision.

7.3 BACKGROUND

Health Care Services

Arkansas City is home to South Central Kansas Medical Center, which is located at 6401 Patterson Parkway. This new facility was opened in 2011, but the history of the institution dates back to 1905 when it was begun as Mercy Hospital. The facility sits on a large acreage, creating opportunity for expansion and development of a medical campus over time.

The new facility is a single-story building, with over 60,000 square foot of space to meet patient needs for emergency care, with 17 private patient rooms, 5 semi-private rooms, a negative pressure isolation room, and 4 intensive care beds. In addition, there is an obstetrics wing with family birthing suites, with a total of six beds available. There are two operating rooms, two treatment suites for outpatient/inpatient surgery, as well as radiology and laboratory areas. The Center provides a number of vital services for the community from diabetes support and education, physical therapy, to respiratory therapy and more.

The land and buildings of the Medical Center are owned by the Public Building Commission created by the City. Financing for such came via a 10-year 1/2¢ citywide sales tax which commenced in 2009. The land and buildings are leased to the South Central Kansas Health Foundation. The city manager and a city commissioner are ex officio members of the Foundation's board of directors.

Mental Health

Mental health services are provided by the Cowley County Mental Health & Counseling Center, located at Strother Field, 22214 D Street, Winfield. The organization is quasi-governmental, as it is run by a local board of directors, but funded with governmental funds as well as private donations and grants. The Center is licensed and has been providing psychiatric and substance abuse services for nearly forty-five years to Arkansas City residents and the region. Their staff has grown over the years, but now exceeds 90 persons, including licensed clinicians. The location in Strother Field, a mid-point, between Winfield and Arkansas City was selected to efficiently serve the regions clients with a new building that was constructed in 2007, with additional leased space nearby.

Services provided to the children, adults, couples and families include medication services, alcohol and substance abuse evaluation and treatment, emergency and crisis resources and intervention, and a large variety of support services through Children/Adult Community Based Services programs. CCMHCC also offers a day-school, cooperating with six regional school districts for this intensive day-treatment service. The area is also fortunate that the organization is home to the Transitions Foster Home Program, the only remaining foster care program sponsored by a community mental health center in Kansas. The Center also partners with Sumner County for the Children Crisis House in Winfield.

Statement of the City-Cowley County Health Department

Public health practice can be characterized as a multi-disciplinary approach that includes physicians, nurses, epidemiologists, dieticians, health educators and other professionals who assess common health measures to improve community health and the quality of life by providing interventions and promotion of healthy behaviors.

Local health departments provide a broad range of services including: disease surveillance and investigation, immunizations, emergency preparedness, maternal and infant health programs, health promotion and prevention programs, and environmental health services including child care facility inspections.

The 10 essential services of public health are: (1) monitor the health of the community; (2) diagnose and investigate health problems; (3) inform, educate and empower people; (4) mobilize community partnerships; (5) develop policies; (6) enforce laws and regulations; (7) link to and provide health services; (8) assure a competent workforce; (9) evaluate quality; and (10) research for new insights.

In 1946 the Cowley County Board of County Commissioners and the Governing Bodies of the cities of Arkansas City and Winfield created the joint City-Cowley County Health Department governed by a local Board of Health. The Department **vision** is to be a well financed organization capable of implementing its mission on behalf of the communities it serves; that services are delivered by a highly functioning team that serves as a lightning rod or advocate for public health awareness and change through continued assessment and addressing of community health needs; and that the Department is recognized as a valued partner in public health policy development.

The **mission** of the Department is to prevent disease and disability, protect the public health, and promote community health through the teaching of healthy lifestyles. This provision of public health service is focused on population based, community driven interventions. The local health agency provides some individual services as a safety net for those who would not otherwise receive care. The services rendered by the Department are preventative interventions that have been proven to have a direct impact on decreasing the medical costs associated with acute and chronic diseases.

7.4 COMMUNITY HEALTH AND COMPREHENSIVE PLANNING

Introduction. The built environment -- where we live, work, learn, and play -- impacts our health. The following paragraphs summarize the interplay between the subjects of this Plan and community health.

Healthy Food. Eating healthy foods lowers the risk of becoming overweight or obese, key risk factors for chronic diseases such as heart disease, diabetes, and cancer.

Peoples' eating choices are strongly influenced by the food options available to them. For example, living near stores that sell healthy foods influences health. The closer one

lives to a grocery store, the easier it is to obtain fresh fruits and vegetables. Proximity to healthy food is associated with greater consumption of healthy food, and with decreased rates of obesity. Living near sources of unhealthy food can lead to an increased risk for obesity and chronic diseases. When fast food restaurants and convenience stores are more abundant, closer, and cheaper than grocery stores and produce stands, people are less likely and less able to maintain a healthful diet.



Local food production and direct sales increase options for accessing healthy food. Creating new opportunities for farmers markets and produce stands are ways to expand access to healthy food.

Housing. There are three housing-related factors that relate directly to community health. These are housing that is unaffordable, unhealthy, or inadequate.

- <u>Unaffordable Housing</u>. When unaffordable housing is the only choice available, people are forced to make trade-offs that are associated with poor health, obesity and other chronic diseases. When too large a percentage of income goes to cover rent or mortgages, residents may be unable to afford medical care for themselves or their families. Similarly, they may have to rely on inexpensive foods that contribute to obesity, live in over-crowded conditions that may spread infectious diseases, or suffer from poor mental health. Traditionally, housing is considered affordable if the cost of rent and utilities does not exceed 30% of gross household income.
- <u>Inadequate Housing</u>. *Inadequate housing* is housing that is structurally deficient, or having problems such as frayed wiring, lack of plumbing, or narrow stairs without a protective banister.
- <u>Unhealthy Housing</u>. Unhealthy housing is housing of an age or condition that results in problems such as pest-infested carpeting, indoor mold, or flaking lead paint.

Residents need access to affordable housing that offers the benefits of stability and reduced stress, which translate into reduced risk for chronic disease. Housing should not place an undue financial burden on residents that limits or eliminates resources

devoted to self-care and the care of their families. Health is promoted when housing is located near parks, healthy foods, and walkable destinations.

Transportation and Land Use. Creating new opportunities to be active as part of daily life can help in reducing obesity, and "active transportation" such as walking and cycling offers opportunities for exercise. Like all forms of transportation, the ability to benefit from active transportation is intimately tied to the arrangement of land uses in the community and the transportation infrastructure.

Built environments that provide opportunities for physical activity lower the risk of obesity. Neighborhoods with walkable destinations allow residents to get physical

activity as part of their everyday routine. Density and a mix of land uses promote active transportation by bringing destinations closer together. For example, a mix of land uses can result in destinations such as restaurants and retail shops to be within walking distance of residents. Buildings that come right up to the sidewalk with ground-level windows and entrances encourage walking, as do amenities such as street trees, benches, and lighting.



Streets are more comfortable for pedestrians when blocks, buildings, or vegetation provide a sense of enclosure. A well-connected street network makes bicycling and walking easier and safer. Auto-dependent development reinforces sedentary lifestyles, and spending time driving is associated with a higher likelihood of obesity.

The availability of primary care has a role in preserving good health and preventing illnesses and hospitalizations. Health care facility locations that allow people to use active transportation have the added health benefit of promoting physical activity.

Economic Development. Higher incomes are associated with better health. Income is a proven predictor of overall health, and each step up the economic ladder equates to better health. This is indicative not only of better access to health care, but also a greater capacity to engage in healthy behaviors. Employment influences chronic stress and income. Frequent or long-term stress takes a toll on health, and employment is a major influence on stress.

Compact, walkable development that creates vibrant neighborhoods can attract companies and skilled workers than can increase economic opportunity.

Citizens benefit from access to high quality, primary, secondary and higher education and stable employment opportunities that offer living wages. Providing these opportunities requires the community to attract highly skilled workers and create vibrant, attractive places to live, work, and play. A strong local economy helps create opportunities for education and employment.

Parks and Recreation. Being physically active reduces the risk of many diseases and improves wellbeing. Access to parks increases the likelihood of physical activity. The number of parks nearby, their size, and their features or amenities can all influence the amount of physical activity people achieve. People who live close to parks are more likely to use them and be physically active. Multi-use trails help people meet physical activity needs for both recreation and transportation purposes. Physical



activity in parks is affected by park safety and maintenance. Investments in parks are maximized when people feel safe and comfortable using them for exercise.



Contact with nature can also reduce stress and have positive impacts on mental health. Contact with nature can decrease symptoms of attention deficit disorder. Parks and open space are a way for residents to make contact with nature, and also offer a public gathering space to interact with neighbors and others in the community.

Safety and Social Connections. Neighborhoods can undermine a sense of safety if they have characteristics such as narrow sidewalks, dead-end streets and alleys, high speed limits, or the absence of crosswalks. People who perceive their neighborhood as unsafe are less likely to go for walks or use public parks. Adverse health outcomes associated with lack of safety include obesity, chronic stress, heart disease, and poor mental health.

A high degree of social cohesion is a strong predictor of lower rates of violence. Among middle school youth, positive connections to school and social groups is associated with better mental health, less risk of smoking, less risk of marijuana use, and higher graduation rates. In adults, strong social connections can help reduce stress, assist in coping, improve access to material support such as transportation or information, and improve mental health. Social connections are influenced by features of the built environment that provide opportunities for interaction, such as parks, shops, or front porches. The lack of a social network is associated with higher rates of morbidity and mortality, depression, and cognitive decline. Community centers, parks, libraries and other meeting places provide a social space separate from home and work, and play an important role in enhancing social connectedness and a sense of community.

7.5 COWLEY COUNTY COMMUNITY HEALTH NEEDS ASSESSMENT

The Federal Patient Protection and Affordable Care Act requires tax-exempt hospitals to complete a Community Health Needs Assessment every three years. The law requires

the Assessment include input from persons having public health knowledge or expertise along with persons representing the broad interest of the community. The Assessment is to identify community needs and adopt a strategy to address those needs.

Following is an excerpt from the Executive Summary of the "Cowley County Community Health Needs Assessment," published in January 2013. The full report is available at the City-Cowley County Health Department's website:

Priority #1: Promote health, wellness, and chronic disease prevention.

- Emphasize health education from cradle to grave.
- Focus on youth, teaching healthy lifestyle behaviors that can be carried throughout life, *e.g.* hygiene, nutrition, exercise, etc.
- Help adults achieve healthier lifestyle, e.g. weight loss, tobacco cessation, responsible alcohol use.
- Work to prevent cancer and other chronic disease incidence through lifestyle education and modification, and promotion of appropriate screening practices.
- Increase awareness and use of existing local services and providers thereby reducing health spending leakages.
- Work with existing local institutions, e.g. school district, local governments, etc. to collaborate with health and wellness education.

<u>Priority #2</u>: Enhance access to health service providers.

- Health service provider recruitment and retention is a key component.
- Issues of affordability affect access. Direct those eligible and in need toward available resources and assistance.
- Enhance communication and collaboration across health service providers to ensure more complete case management.
- Support options for access to care for the medically underserved.

7.6 COMMUNITY HEALTH NEEDS ASSESSMENT - THE RAY & ASSOCIATES REPORT (2012)

The City-Cowley County Health Department, working in concert with other public and private sector entities and individuals, secured a federal Community Health Center Planning Grant in 2011. That grant was used to conduct an assessment of whether the need for affordable health care in Cowley County justified seeking federal funds for a community health center.

The Assessment produced significant data on many aspects of health care providers and the health care needs, met and unmet, in the County. The full report, published in

August 2012, can be accessed at the City-Cowley County Health Department's website. Brief excerpts follow:

The purpose of this needs assessment is to explore health needs, identify barriers to health care access and determine if there is a community desire for additional primary health services in Cowley County, Kansas. This project was funded by a Community Health Center Planning Grant from the U.S. Health Resources and Services Administration (HRSA) with the goal of supporting the development of community health centers (CHCs). This needs assessment, a component of the planning grant, was sponsored by the Cowley County Access to Health Care Steering Committee.

The Health Care Access initiative began in Cowley County as an interest group with ties to the Health Strategies component of "Vision 20/20," Cowley County's strategic planning document.

The Steering Committee consists of members of medical, educational, governmental and business organizations, as well as representatives from the community. Ray & Associates, LLC, was engaged to conduct a needs assessment to determine whether the need for affordable health care is significant enough to warrant applying for federal funds for a CHC in Cowley County.

The local provider community is comprised as follows:

- Arkansas City
 - ☐ Arkansas City Clinic: six Physicians, three Physician Assistants
 - ☐ Summit Clinic: two Physicians
 - ☐ City-Cowley County Health Department Arkansas City Office
 - ☐ Dentists: seven independent practitioners
 - □ K&D Pharmacy
 - □ Dillons Arkansas City Pharmacy
 - ☐ Graves Drug Arkansas City
 - □ Taylor Drug
 - □ Walgreens
 - □ Wal-Mart Pharmacy

The City-Cowley County Health Department maintains two locations, one in Arkansas City and one in Winfield. The Health Department provides immunizations, HIV/STD counseling, family planning, WIC (Women, Infant and Children) Supplemental Nutrition Program, healthy child assessments and Healthy Start newborn home visits. The Health Department actively promotes car seat fitting, chronic disease reduction and prevention, communicable disease control, tobacco cessation, nutrition education and environmental health.

Summary

An analysis of medical, dental and behavioral health services in Cowley County reveals a provider community working to offer a safety net of services. However, the high rates of uninsured and underinsured residents make it difficult for private providers to meet these healthcare needs, while maintaining financial integrity of their practices. Thus, many individuals are unable to access care. Community health centers (CHCs) are available to individuals who can drive to Wichita, Kansas; however, there is no centralized location for residents of Cowley County to receive affordable health care based on a sliding fee scale.

County residents are clearly interested in the development of a CHC locally. The community effort to investigate the efficacy of a CHC has included individuals within the community who are uninsured or underinsured, as well as providers, hospital administrators and many other community organizations and local businesses.

This needs assessment has documented that Cowley County has higher than average rates of health care needs, particularly for chronic conditions, and lower than average levels of personal resources to manage these conditions, such as income and health insurance. According to residents, major barriers to accessing health care services are primarily related to out-of-pocket costs (*e.g.*, high deductibles, inadequate or no insurance and unpaid bills) and appointment availability (wait times and difficulty taking time off during business hours).

Additionally, community members regard emergency rooms as a source of regular primary health care. Research respondents expressed interest in having more of the following services locally: affordable primary care, dental, vision, obstetrics, pediatrics, health education and assistance finding appropriate services and completing forms. In sum, these findings demonstrate support for a CHC in Cowley County, as there is evidence of unmet health care needs, care access barriers, community desire for affordable services and a willingness to pay for them.

7.7 THE IMPORTANCE OF THE HEALTH CARE SECTOR TO THE ECONOMY OF COWLEY COUNTY

In December 2010 Kansas Rural Health Works published its report on the "Kansas Rural Health Options Project." Following are excerpts from the introduction and summary of that report:

The Economics of Rural Health Care

The organization and delivery of health care services have undergone rapid evolution in recent years. For many Americans, the cost of services and access to care are important issues. This certainly is true in many rural areas where communities have struggled to maintain affordable, quality health care systems. As economic forces and technical advances continue to change health care, it is more important than ever for rural community leaders and health care providers to work together to ensure affordable, sustainable health care systems.

The Economic Contribution of the Health Care Sector In Cowley County, Kansas

The rapidly changing delivery of health services in rural counties has the potential to greatly impact the availability of health care services in the future. These changes include:

- Insufficient Medicare and Medicaid payments to hospitals and providers may force a reduction in the provision of health care services.
- Although Kansas rural health networks are already fairly strong, creation of provider networks may substantially change the delivery of, and access to, local health care services.
- Use of telemedicine could increase access to primary, consultative and specialty health care services at the county level.
- Development of critical access hospitals could help health care services remain in rural counties. Kansas currently has over 80 critical access hospitals.

As a result, the health care sector can have a large impact on the local economy. All of these changes make it imperative that decision makers in Cowley County become proactive in maintaining high quality local health care services.

Health care facilities such as hospitals and nursing homes provide jobs and income to people in the community. As these employees spend their income in the community, a ripple spreads throughout the economy, creating additional jobs and income in other economic sectors.

Summary and Conclusions

The Health Services sector of Cowley County, Kansas, plays a large role in the area's economy. Health Services represents one of the largest employers in the area and also serves as one of the largest contributors to income. Additionally, the health sector has indirect impacts on the local economy, creating additional jobs and income in other sectors. The health sector also contributes substantially to retail sales in the region.

While the estimates of economic impact are themselves substantial, they are only a partial accounting of the benefits to the county. Health care industries in rural counties help to preserve the population base, invigorating the communities and school systems. Similarly, many hospitals and nursing care facilities have active community outreach programs that enhance community services and the quality of life for community residents.

A vigorous and sustainable health care system is essential not only for the health and welfare of community residents, but to enhance economic opportunity as well. Health-related sectors are among the fastest growing in economy. Given demographic trends, this growth is likely to continue. The attraction and retention of new business and retirees also depends on access to adequate health care services.

The strategic health planning process helps local communities identify their health care needs; examine the social, economic, and political realities affecting the local delivery of health care; determine what is wanted and what realistically can be achieved to meet their identified health care needs; and develop and mobilize an action plan based on their analysis and planning.

For the strategic health planning process to be most effective, it must be based in the community and driven by the community. This process is about local people solving local problems. The local hospital and health care providers should have input into the decision-making and should support and trust the outcomes, but the community must provide the energy and commitment.

7.8 GOALS AND ACTIONS

Goal	Support Efforts to Improve Access to Health Services.
Goal	Encourage a Positive View of Mental and Behavioral Health that Will Encourage Citizens to Respond to Their Mental Health Needs.
Goal	Increase the Opportunities for Physical Activities for Citizens of All Ages and Abilities.
Goal	Encourage Easy Access to Healthy Foods.
Goal	Promote Healthy Transportation.
Goal	Continue Working with the City's Partners to Create a Stronger Local Economy.

GOAL SUPPORT EFFORTS TO IMPROVE ACCESS TO HEALTH SERVICES

The City should support the work of the City-Cowley County Health Department and others towards assuring a health care system providing timely, accessible and affordable preventive and primary care services.

Action:

- 1. Improve the public's awareness of available health services.
- 2. Encourage higher rates of utilization of basic preventative care.
- 3. Encourage providers to offer services at times, and days, that allow people to utilize health care services.
- 4. Support the fulfillment of the recommendation of the "Community Health Needs Assessment" for the establishment of a community health center to serve Cowley County.
- 5. Encourage and support Cowley First in its efforts, alongside the South Central Kansas Medical Center and William Newton Memorial Hospital, to study ways to achieve the most cost-effective provision of comprehensive health services to residents of Cowley County.

GOAL: ENCOURAGE A POSITIVE VIEW OF MENTAL AND BEHAVIORAL HEALTH THAT WILL ENCOURAGE CITIZENS TO RESPOND TO THEIR MENTAL HEALTH NEEDS

- 1. Improve the public's awareness of the availability of mental health services.
- 2. Encourage mental health providers and primary care providers to implement programs to reduce the stigma of mental illness.
- 3. Avoid the inappropriate incarceration of persons with mental health issues, and encourage Cowley County to do the same.

GOAL: INCREASE THE OPPORTUNITIES FOR PHYSICAL ACTIVITIES FOR CITIZENS OF ALL AGES AND ABILITIES

Action:

- 1. Maintain and enhance parks and recreation facilities and services consistent with the goals and actions in Chapter 5.
- 2. Increase access to parks, recreation and open space.
- 3. Provide recreation opportunities for residents of all ages, abilities and economic and cultural backgrounds.
- 4. Provide recreation facilities and services needed by various population groups, such as specific age groups or people with special physical requirements.
- 5. Whenever possible, consider the impact of public infrastructure decisions, and private development requiring City approval, upon the ability of citizens to walk or bike to their destinations, including parks.
- 6. Encourage public and private schools, and child care providers, to provide ample opportunities for physical activity.
- 7. Establish areas for physical activity at City offices, and encourage similar actions by other employers.

GOAL: ENCOURAGE EASY ACCESS TO HEALTHY FOODS

Action:

- 1. Encourage the location of food retailers throughout the community
- 2. Support and promote farmers markets, produce stands and community gardens.
- 3. Consider creating a land use category for urban agriculture, distinguishing it from rural agriculture.
- 4. Encourage healthy foods in city-owned facilities and at City-sponsored events.

GOAL: PROMOTE HEALTHY TRANSPORTATION

- 1. Increase the City's walking and bikeway network.
- 2. Increase sidewalk connectivity and safe crossings.

3. Implement traffic calming on neighborhood streets where appropriate.

GOAL: CONTINUE WORKING WITH THE CITY'S PARTNERS TO CREATE A STRONGER LOCAL ECONOMY

- 1. Mitigate the health impacts of poverty by encouraging employment opportunities for those in poverty.
- 2. When recruiting businesses, place significance on businesses that provide living wage jobs.
- 3. Help educational institutions provide students with the support needed for educational success.
- 4. Work with educational institutions and businesses to connect educational achievement with employment opportunities in the community.

Chapter Six: Infrastructure and Transportation

- 6.1 Introduction
- 6.2 Vision
- 6.3 Survey Responses and Comments
- 6.4 Existing Infrastructure and Transportation Systems
- 6.5 Goals and Actions

6.1 INTRODUCTION

The quality and condition of infrastructure and transportation systems affect all communities and are central to the development or redevelopment of neighborhoods, regardless of the particular land use of a neighborhood. Meeting citizen needs for municipal services such as water, sanitary sewer, and transportation of goods and people within the community is a basic function of any city and is critical to maintaining an adequate quality of life for citizens. It is equally important in efforts to secure economic development.

6.2 VISION

The City will be proactive in developing the best, most cost-effective methods of addressing the current shortcomings in its aging street network, aging utility network, and maintaining the flood protection systems, thereby positioning the city for desired growth.

6.3 SURVEY RESPONSES AND COMMENTS

In early 2013, when asked for their input in a community survey conducted for this comprehensive plan, citizens responded they rated the quality of the City's infrastructure system as average, with the highest satisfaction with the sewer system. When asked how willing they were to pay increased taxes or fees for a variety of items, citizens ranked infrastructure improvements third as something they were very willing (24%) to pay for and first among the items they were somewhat willing to pay increased fees or taxes (50%). Further, when asked what three issues were the most important related to property development, the issue identified as most important was existing public water and sewer service, by a wide margin.

When asked about their level of agreement with the following statements, the results were:

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	TOTAL RESPONS ES
A.	The overall street network in the City meets the needs of citizens	5%	14%	24%	49%	8%	687
В.	I support further construction of pathways and sidewalks to promote walking and bicycling in the City	11%	17%	26%	34%	13%	689
C.	The speed at which drivers travel in residential areas is unsafe	7%	22%	27%	30%	15%	689
D.	Obeying stop signs and signals in residential areas is a concern	6%	18%	29%	31%	16%	681
E.	I support a program for sidewalk replacement in residential areas	6%	14%	35%	36%	9%	672
F.	I support the use of public dollars for rail connections for passenger train service between Fort Worth, Oklahoma City, Wichita and Kansas City	11%	9%	23%	28%	29%	744
G.	I support City removal of snow on main arterials but not residential side streets	11%	23%	21%	35%	10%	685
H.	I support modernizing streetlights to reduce energy costs	5%	10%	30%	41%	15%	686
I.	I support reduced mowing and trimming along city streets to save public funds	13%	36%	29%	17%	6%	696
J.	I support planning for the West Bypass connection to Madison	11%	18%	41%	23%	8%	678
K.	The City needs to increase its planning efforts to encourage quality development	2%	7%	38%	41%	12%	685
L.	The City should encourage development within the City by offering incentives for redevelopment of properties	5%	7%	30%	42%	16%	689
M.	I support future expansion of the city limits if developers share in the cost of infrastructure improvements	8%	10%	28%	40%	13%	685
N.	The City is making acceptable progress on ADA/Handicap Accessible Routes	3%	6%	46%	38%	8%	664
O.	I support preservation of brick streets in the historic downtown area	10%	11%	27%	32%	20%	693
P.	I support preservation of all the brick streets in the City	14%	15%	31%	22%	18%	697

The city has begun designing a water treatment plant for the community and as part of the survey, wanted to gauge community support for some aspects of that plant, as follows:

To make the best use of investment in the Water Treatment Plant Project the City should:		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	TOTAL RESPONS ES
A.	Create a wetland for water re-use and educational programs for USD 470, Cowley College and the community	7%	9%	31%	38%	15%	655
В.	Create a wetland for a cleaner environment and to maximize usage of our limited water resources	6%	7%	27%	41%	19%	655
C.	Pursue opportunities to sell water to the casinos and communities south of the City	10%	15%	28%	33%	14%	635
D.	Explore new programs with Cowley College for the training of water treatment plant operators	5%	6%	30%	43%	16%	660
E.	Pursue sustainable building practices when constructing the new plant	2%	2%	26%	47%	22%	673

Given the history of flooding in the City, the management of stormwater is important so survey information was requested on this subject. When asked for their support for regulations that continued to make stormwater management and reduction of flooding a priority, 72% either agreed or strongly agreed. The feeling on other stormwater-related questions was not as strong, though 59% agreed or strongly agreed that working to improve the environment and rivers by having cleaner stormwater should also be action the City should take. Other stormwater survey questions resulted in a majority of neutral answers, so either more education or clarity needs to be had on these issues including requiring reduced runoff, stormwater impact fees, and exempting non-profits from stormwater fees.

6.4 EXISTING INFRASTRUCTURE AND TRANSPORTATION SYSTEMS

The City has been somewhat proactive in studying and investing in water and wastewater infrastructure over the years, but less so with regards to roads and stormwater systems. More work is needed to provide good management and growth of the existing transportation, water and wastewater systems for the future.

Water

A sound water system is crucial to any community and its ability to grow. Water supply, storage and distribution. water flow. must including considered not only for meeting the needs of citizens on a daily basis, but also for firefighting. The City's water sources are from ground water rights to ten well areas that are fed by the Arkansas River in the Ark Alluvium aquifer system. Some of the water rights are vested, but two are not. A



vested right is fixed, unalterable and irrevocable, giving the city the most certainty. The vested combined water rights held by the City provide for 408 million gallons per year at a rate not to exceed 3,100 gallons per minute. Combined with the non-vested rights, the total rate of diversion from all ten wells is 1.264 billion gallons per year, with a not to exceed total of 6,000 per minute. During the drought, summer 2012, a record five million gallons per day was treated. The treatment consists primarily of chlorine and lime, with fluoride and other chemicals added as well.

The city's new water treatment system is expected to solve a number of problems that exist in the current treatment plant, with redundancy of equipment such as the clarifiers, lime system, and other equipment that has outlived its

functionality. The new plant will have pump valves that open gradually, a much better system for the supply system. The plant will provide six million gallons of water a day at capacity. There will be two one-million gallon clear wells constructed as well as better storage of chlorine. New technology will allow monitoring operations from off-site.

A city's water supply must also provide the water storage needed to adequately



fight fires. Average daily demand should be supplemented by at least enough water to fight a four-hour fire. Included in the supply calculations is water stored in water towers. The two elevated storage towers in Arkansas City, one 1,500,000 gallons, one 500,000 gallons, aid in water supply, particularly for fireflow. Other benefits of water storage are meeting peak hourly demand fluctuations and emergency supply due to interruption in source. Bryant Standpipe has a capacity of 1.5 million gallons and is located at 306 W. Bryant Road. Goff Tower has a capacity of 500,000 gallons and is located at

418 Goff Industrial Park Road. A current issue in the water supply system is the need to address flow concerns, through a looped system, east of the Walnut River.

Sanitary Sewer

Essential to the health of citizens in all cities is appropriate sanitary sewer treatment. Timely extension of sewer service lines is critical to development. Such extensions are affected greatly by topography. The most economical system uses topography within drainage basins, allowing gravity to move waste. The costs are more affordable at both installation time and over time, reducing ongoing maintenance. However lift stations are necessary in some locations. Good planning takes into account which areas can be served with gravity and which areas cannot, and future land use classification is one way to show that this factor is understood. Once waste is collected, mechanical and biological processes break it down. The final treatment separates the mixture into water and bio-solids. In Arkansas City, the treated wastewater is returned to the Arkansas River.

The sanitary sewer treatment plant is located at 1701 S. M Street and went online in 1958. There have been some major modifications such as the grit settling basin converted to aeration tank in 1980, along with pump upgrade, recirculation wetwell and pump station construction. Since 2000, the effluent pump station and UV disinfection were constructed, barscreens replaced and clarifier return sludge valves replaced. Also pumps were replaced and a laboratory upgrade made. More recently, in 2009 the final clarifier drive was replaced and in 2011 the primary clarifiers were rebuilt. The capacity of the plant is 2.1 million gallons a day (MGD), average flow, with a maximum of 4.7 MGD,

and an hourly peak of 6.6 MGD. The City's average flow is 1.2 MGD, with peak flows historically in July of 2007 (flooding) of 7.2 MGD. The treatment process is an extended aeration secondary which means the ammonia is removed by nitrification, with two biological processes trickling filters and activated sludge. The sludge handling is an anaerobic digestion dewatered in drying beds, which produces Class A EQ bio-solids. Within the next five years, the City will have to evaluate the life of the Wastewater Treatment Facility to determine if additional upgrades are best or if a new plant will be required to be constructed to meet the community needs.

The sanitary system is comprised of 80 miles of sanitary sewers mains and five lift stations. The system outlet for all lines is the municipal wastewater treatment plant in southeast Arkansas City, at 1701 South M Street.

Other Utilities

Electrical supply is provided by Westar Energy and natural gas is supplied by Kansas Gas Service. Local telephone service is provided by AT&T and cable by Cox Communication.

Stormwater Management

Stormwater volume and flow can limit future development. Areas with a significant propensity to flooding are commonly designated as a 100-year floodplain, hence there is a 1:100 or greater chance that they will flood each year. It is preferable to avoid any urban development in the floodplain; although development regulations recognize a distinction should be made between the floodway and the flood-fringe.

The floodway incorporates the center channel of the waterway and carries a majority of the floodwaters, or in other terms, the center portion of the floodplain which can carry an additional one foot of water after the entire floodplain has been filled.

The flood-fringe is the area between the floodway and the edge of the floodplain. Land within this area can be developed if precautionary measures are taken. These measures include building on enough fill to raise the level of the lowest floor a minimum or one foot above the flood elevation, or sufficiently floodproofing the building itself from hydrostatic and hydrodynamic effects.

A floodplain management program was adopted by the City in the early 1980s, but the most recent regulation was adopted in August of 2010, after a study to determine the flood hazard areas. By having the areas mapped and regulations adopted, owners of property are eligible to purchase flood insurance.

Floodplains include area around both the Arkansas River and the Walnut River. While much of the built area of the community near the rivers is protected by levees, they are still at risk in the event of a levee failure. In Arkansas City, the

length of levee is eleven miles, the longest of any city in the state on a per capita basis.

A map showing the floodplain in and around Arkansas City is included at Appendix I. The map illustrates the potential risk of flood surrounding the community, except to the north and northwest.

The flood of early November 1998 was the most significant flood in recent history with 430 structures damaged by floodwater and 88 destroyed, along with approximately 3000 people evacuated in and around the City. There was eight million dollars in property damage. While the local rainfall was 5.5 inches, the basin received six to ten inches of rain north of the City, worsened by higher than normal precipitation in the month prior. Peak gauge reading was 28.89 feet for the Arkansas River and 32.45 feet for the Walnut. The primary reasons the east side of the community experienced significant flooding were the new levee south of Madison Street was not completed due to some archeological discoveries that delayed levee construction, and a failure of the old levee east of the City's F Street burn pit.

One significant improvement in recent years is the levee/bypass project for U.S. Highway 77, which offers additional protection for the eastern portion of the community from flooding of the Walnut River. This work was completed in 2000. Continuing to enforce stormwater regulations, discouraging development in certain areas, and maintaining the levee system are essential to protecting the City.

The Public Works Department is responsible for stormwater system maintenance and improvements. There are two canal areas that drain water to the Walnut River. These are maintained by the City, "C" Street and the city's "historic" district canal.

Transportation

Existing Road and Highway Network

Arkansas City has excellent access to major transportation systems in Kansas through its connections to U.S. Highway 77 (north-south) and U.S. Highway 166 (east-west). These connections allow for both export and import of goods via truck as well as transporting people for work, tourism, or shopping.



Northbound U.S. Highway 77 carries an average of over 11,200 vehicles per day, with the southbound count lower at just over 9,200. The bypass count ranges from 4,430 to 5,170 according to the Kansas Department of Transportation map published for July 2012. The eastbound traffic on U.S. Highway 166 is just over 4,000 vehicles daily just outside the city limit and westbound is nearly 3,500

vehicles. Highway connections feed the interior road networks to facilitate transportation needs within the community. Primary growth is expected along U.S. Highway 77, north of the community, in keeping with recent trends and because other areas will be difficult to develop due to floodplains.

Standard Street Classification

Due to the need to transport both people and goods within the community as well as to and from the community, transportation systems are intricately woven with economic development and land development. Streets are classified based on a



hierarchical system considering vehicular movement from one area to another, or from home to work, home to shop, goods from one location to another. This system is generally designed with three basic categories of roads: arterial,



collector and local. The arterial are major roadways, designed to carry greater traffic volumes, fed by collector streets, and ideally with only connections from other streets to allow for fewer intersecting points. Collector streets

connect local streets, the lowest classification, to arterial streets, the highest classification. Residents leaving home typically drive from their driveway onto a local street, which is then connected to a collector street serving other residents from a particular area, and then enter an arterial road for through traffic to their destination area, then back to a collector/local to work, shop, and to access services.

It is desirable to protect arterials by controlling street access. Private driveways are discouraged on major arterials and should be limited where possible, to promote safe and efficient traffic flow. Access control guidelines may need to be developed as a goal of the comprehensive plan, if they are not provided elsewhere, particularly for arterials and possibly for collectors. In addition, street widths for all classifications of roadways should be determined as an aid to developers and decisionmakers. As the community grows, considerations for rural roads should also be made for their transition from roadways with ditches to curb and gutter systems.

It is recommended the City forecast which streets are anticipated to become arterials and collectors. Currently, Arkansas City classifies its streets using Kansas Department of Transportation classifications. Map 6-2 identifies these classifications. Ongoing review should occur each year or two to be sure that additional roads are included as development warrants. All other roadways would be classified as local roads.

Air Transportation

Arkansas City has Strother Field for its local air service, located along U.S. Highway 77, approximately five miles north of the City. The field was built in 1942 for the Army Air Force. Deactivation of the field occurred in 1945 and the field was returned to Winfield and Arkansas City. The airport has two lighted, hard-surfaced, pilot controlled runways, one 5500 feet, the other 3150, enabling the accommodation of various aircraft. The terminal building was constructed in 1970 along with a conventional hangar to accommodate the pilots' needs, the needs of the FBO, weather updates, charters, aircraft rental and repair, fuel and flight instruction. The master plan for the airport was completed in 1996 and within the next few years it is anticipated a new plan will be needed. Goals at the airport include rehabilitation to both runways and taxiway B, with reconstruction of the terminal apron and construction of a taxi lane as longer-term goals.

Rail Transportation

Rail service for freight is provided by Burlington Northern Santa Fe, and there are railroad spurs serving businesses in Strother Field that connect to the main lines.

Other Transportation

The City has only limited public or private operated general public transportation. While the 2013 community survey did not pose questions regarding the need for additional transportation services it is believed there may be demand for more bus or van service to Winfield, Wichita and other nearby communities as well as in-city transportation. It is likely that the demand is greatest among elderly citizens who often have limited transportation options and important travel needs, e.g., specialized medical care.

Pedestrian and Bicycle Paths

The City has several recreational opportunities for walking, hiking, and biking, and continues to receive citizen support for more. As stated in Chapter 5 of this Plan, providing a connected series of sidewalks and paths is seen as a positive for the community, and is an alternative means of transportation that merits discussion in this chapter. Consideration should be given to utilizing the canal area, levee areas or former railroad corridors as the backbone for a pedestrian network. Connections with major public facilities such as parks and schools enhance transportation opportunities for youth in the community as well. Furthermore, careful attention to developing sidewalk programs that serve not only adjacent properties but also the community at-large can enhance the community through better health and well-being and also be a point of community pride.

6.5 GOALS AND ACTIONS

Goals represent overall vision and desired outcomes. They describe the community we hope to develop together in the future. The following goals

implement the overall vision for infrastructure and transportation. Their purpose is to focus resources for the improvement of these central components which are critical to the sustainability and growth of Arkansas City. These goals are derived, in large part, from survey responses and other input from private individuals and public officials.

Goal	Establish a General Public Transportation Service, if Community Needs and Support Exists for that Service.
Goal	Maintain and Improve the City's Streets and Sidewalks According to an Adopted Capital Improvements Schedule and Dedicated Funding.
Goal	Identify the Best, Most Cost-Effective Methods of Addressing the Current Shortcomings in the Street Network.
Goal	Preserve Downtown Brick Streets Where Feasible and Brick Streets Outside the Downtown When Neighborhood Support, and Funding, Exist.
Goal	Make Necessary Improvements to the Water Treatment and Distribution Infrastructure.
Goal	Develop a Stewardship Program Emphasizing Water Conservation and Reuse.
Goal	Make the Necessary Improvements to the Wastewater Plant a Matter of High Priority.
Goal	Complete the Inspection of Sanitary Sewer Lines and Replace Lines as Needed.
Goal	Improve the Stormwater Management Capabilities of the City.

GOAL ESTABLISH A GENERAL PUBLIC TRANSPORTATION SERVICE, IF COMMUNITY NEEDS AND SUPPORT EXISTS FOR THAT SERVICE

Action:

The City should create a study committee, comprised of City Commissioners, Planning Commissioners, members of the business community, health care providers, representatives of Cowley College, and members of the public, to measure the level of community interests in and need for a general public transportation carrier to provide both in-city and out-of-city services. If needs and demands sufficient to support such a carrier are identified, the study committee should present to the City Commission the means by which service can best be provided; whether by private business, as a municipal service, or as a public-private partnership.

GOAL MAINTAIN AND IMPROVE THE CITY'S STREETS AND SIDEWALKS ACCORDING TO AN ADOPTED CAPITAL IMPROVEMENTS SCHEDULE AND DEDICATED FUNDING

Action:

The City Commission should annually adopt a rolling 10-year schedule for the maintenance of streets and sidewalks; for the extension of streets and sidewalks into newly developing areas; and for areas of the City lacking the desired level of streets and sidewalks. The adopted schedule should be incorporated into the City's capital improvement plan.

Action:

The City Commission should consider a dedicated source of funding for street and sidewalk maintenance, to help ensure reliable, steady revenues with which to better stay on track with the five-year schedule of work.

GOAL IDENTIFY THE BEST, MOST COST-EFFECTIVE METHODS OF ADDRESSING THE CURRENT SHORTCOMINGS IN THE STREET NETWORK

GOAL PRESERVE BRICK STREETS WHERE ECONOMICALLY FEASIBLE

Action:

1. Achieve a proper balance between recognition that brick streets in the downtown help to define the character of the community and the fact that their maintenance creates a significant public cost.

GOAL MAKE NECESSARY IMPROVEMENTS TO THE WATER TREATMENT AND DISTRIBUTION INFRASTRUCTURE

Action:

- 1. Include within the capital improvement plan the replacement of all water meters as a matter of the highest priority.
- 2. Include within the capital improvement plan a schedule for the replacement of water distribution lines so that by the year 2030 no such lines have been in use exceeding 75 years.
- 3. Proceed with the construction and financing for a new water treatment plant.

GOAL DEVELOP A STEWARDSHIP PROGRAM EMPHASIZING WATER CONSERVATION AND RE-USE

Action:

Encourage water conservation and re-use/recycling at schools, businesses and residences by distribution of educational materials, and provision of rain barrels and other devices to the extent funding is available.

GOAL MAKE THE NECESSARY IMPROVEMENTS TO THE WASTEWATER PLANT A MATTER OF HIGH PRIORITY

Action:

- 1. Identify as a priority need in the capital improvement plan the deficiencies in the wastewater treatment plan identified in the report prepared in 2013.
- 2. Request City staff to prepare a report on steps that can be taken to make wastewater treatment as effective and cost-efficient as possible.
- 3. Address problems with inflow and infiltration as a high priority item in the City's capital improvement program.

GOAL COMPLETE THE INSPECTION OF SANITARY SEWER LINES AND REPLACE LINES AS NEEDED

Action:

- 1. Include within the capital improvement plan a schedule for the video inspection of all sanitary sewer lines by January 1, 2015.
- 2. Prioritize the replacement of defective lines identified in the video inspection.

GOAL IMPROVE THE STORMWATER MANAGEMENT CAPABILITIES OF THE CITY

- 1. Have City staff report to the City Commission whether changes to the requirements for detention/retention structures adequately cover all development impacting stormwater runoff.
- 2. Study the possibility of using stormwater fees to subsidize the cost of retention/detention structures which exceed the minimum requirements of city codes and regulations.
- 3. Consider adoption of soil erosion standards to be applied to new development.
- 4. Increase stormwater fee revenue by applying it to all property, taxable or tax-exempt, and make fees based upon a property's impervious surface area.