CITY OF HENDERSONVILLE
ENVIRONMENTAL SUSTAINABILITY BOARD

City Hall Chambers | 160 6th Ave E. | Hendersonville NC 28792
Thursday, September 21, 2023 – 3:30 PM

AGENDA

1. **CALL TO ORDER**

   A. Call To Order; Kelly Pahle, Chairperson

2. **APPROVAL OF AGENDA**

   A. Approval of agenda

3. **APPROVAL OF MINUTES**

   A. Meeting Minutes; Environmental Sustainability Board meeting August 17, 2023

4. **PUBLIC COMMENT**

5. **PRESENTERS**

   A. Crystal Cauley, Bird Sanctuary at Brooklyn Creek and Wildlife Habitat Certification - 10 minutes

6. **STAFF LIAISON UPDATE**

   A. Litter Sweep Weeks - Caitlyn Gendusa, Sustainability Manager

   B. Brooklyn Creek Community Garden - Caitlyn Gendusa, Sustainability Manager

   C. Building efficiency projects (energy audit and policy) - Caitlyn Gendusa, Sustainability Manager

7. **CITY COUNCIL UPDATE**

   A. Mayor Pro-tem, Lyndsey Simpson

   - Plastic bag and styrofoam regulation discussion with MountainTrue and request for E.S.B. member to keep up to speed on progress/next-steps

   - Neighbors for More Neighbors Case for Support

8. **BOARD MEMBER UPDATES**

   A. Mayor's Monarch Pledge: Marcia Shaffer, board member

   B. Waste Reduction: Virginia Tegel, board member

9. **SUBCOMMITTEE UPDATES**

   A. Hendo Earth Fest - Ann Twiggs and Frank Stewart, chair members

10. **NEW BUSINESS**

   A. Sustainability Strategic Plan energy section review, Caitlyn Gendusa - staff liaison

11. **ADJOURNMENT**

The City of Hendersonville is committed to providing accessible facilities, programs and services for all people in compliance with the Americans with Disabilities Act (ADA). Should you need assistance or an accommodation for this meeting please contact the City Clerk no later than 24 hours prior to the meeting at 697-3005.

CITY OF HENDERSONVILLE
ENVIRONMENTAL SUSTAINABILITY BOARD

City Hall Chambers | 160 6th Ave E. | Hendersonville NC 28792
Thursday, August 17, 2023 – 3:30 PM

MINUTES

1. **CALL TO ORDER**

   A. Call To Order- Kelly Phale, Chairperson at 3:30pm
   Virginia absent

2. **APPROVAL OF AGENDA**
   Grady motioned to approve first; Ann second

3. **APPROVAL OF MINUTES**

   A. Meeting Minutes; Environmental Sustainability Board; July 20, 2023
   Jill motioned to approve first; Mary Ellen second

4. **STAFF LIAISON UPDATE**

   A. Caitlyn Gendusa, staff liaison

   - Update on Sustainability Strategic Plan
   - Reminder of board appreciation dinner
   - Comprehensive Plan

5. **NEW BUSINESS**

   A. FountainWorks retreat recap; Kelly Pahle, Chairwoman
   Board in agreement to focus on policy work while continuing Hendo Earth Fest, facilitating Mayor's Monarch Pledge, and Sustainability Hero Award. Each meeting moving forward will devote a large portion of the meeting to focus on one of the focus area topics such as energy. Caitlyn will send out report to board prior to meeting to give an overview of that particular focus area.

   B. Composting discussion; Kelly Pahle and Jill Carter, Chairwomen
   Board decided to focus on other priorities identified in the FountainWorks retreat. There is also a desire to have a survey component first to identify who in the community would be interested in a compost program. Most likely the on-site subpod or something similar would require a paid service to pick up the material (as the case for Buncombe County model) and add it to a secondary composting site where there would be enough food scraps. Board also would like to hear an update on the success of the program once it gets further along.

AGENDA

C. Hendo Earth Fest Sub-committee; Caitlyn Gendusa, staff liaison
Frank and Ann have decided to co-chair the subcommittee

6. CITY COUNCIL UPDATE

A. Mayor Pro-tem, Lyndsey Simpson
No update except to take the Comprehensive Plan survey

7. ADJOURNMENT

Kelly adjourns meeting at 4:37pm

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BROOKLYN CREEK BIRD SANCTUARY

- 4 BIRDHOUSES INSTALLED AT SULLIVAN PARK WITH ESB FUNDS & DONATION FROM WILD BIRDS UNLIMITED
- BIRD FEEDING STATION DONATED BY WILD BIRDS UNLIMITED
- FB PAGE: BROOKLYN CREEK BIRD SANCTUARY

CAREY AND LUTRELLE O'CAIN, WILD BIRDS UNLIMITED AT THE LEFT

SEPTEMBER 16TH-30TH

LITTER SWEEP DAYS

Participate in Litter Sweep and have the chance to be recognized at a future City Council or County Commissioners meeting.

Follow along on social media during Litter Sweep for tips and tricks to help reduce your waste at home!

Be a Litter Sweep Warrior! Join the City of Hendersonville & Henderson County for this Fall's Litter Sweep initiative. Participants can volunteer to pick up trash during NCDOT's Fall Litter Sweep. Participants should coordinate with NCDOT for litter pick up supplies, location, and trash pick up. Visit *ncdot.gov/littersweep* for more information.

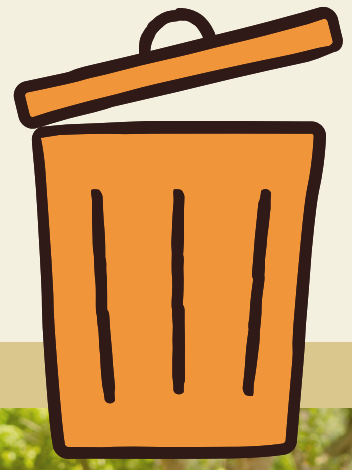
After participating in the litter sweep, fill out this participation survey to report yourself or group: *https://www.surveymonkey.com/r/QLKJQMS* The individual or group that picks up the most bags of trash will be recognized at a future City Council or Board of Commissioners meeting, depending on the location of the pick up.

Throughout the two weeks, we will also be posting tips to reduce your own waste throughout your home. Interested in getting involved? City residents, please reach out to Sustainability Manager, Caitlyn Gendusa at cgendusa@hvlnc.gov; County residents please reach out to Environmental Programs Coordinator, Amy Schmitte at aschmitte@hendersoncountync.gov

#LitterSweepNC #Wastereductiontips #LitterSweepWarrior

LITTER CLEAN UP EVENT

SUNDAY, SEPTEMBER 24TH
2-4PM



Location:
Berkley Road (Register for parking location)

Help us beautify our community by cleaning up litter from our roadways!

Follow along on social media during Litter Sweep for tips and tricks to help reduce your waste at home!

Interested in attending?
Contact 828-694-6524 or aschmitte@hendersoncountync.gov for more information.

Henderson County and the City of Hendersonville are teaming up for a clean up event on Sunday, September 24th from 2-4pm along Berkley Road (location provided upon registration). Registration is required to attend the event. Contact Environmental Programs Coordinator, Amy Schmitte at 828-694-6524 or aschmitte@hendersoncountync.gov to sign up for the clean up event. Details will be provided upon registration. All clean up supplies and safety gear will be provided for volunteers.

Can't join our event but still interested in participating in Litter Sweep? You can organize your own litter clean up event with friends, family, or local community organization. Participants can volunteer to pick up trash during NCDOT's Fall Litter Sweep. Participants should coordinate with NCDOT for litter pick up supplies, location, and trash pick up. Visit ncdot.gov/littersweep for more information.

Follow along for more tips and tricks to reduce your own waste throughout your home. Questions about waste reduction? City residents, please reach out to Sustainability Manager, Caitlyn Gendusa at cgendusa@hvlnc.gov; County residents please reach out to Environmental Programs Coordinator, Amy Schmitte at aschmitte@hendersoncountync.gov

#LitterSweepNC #Wastereductiontips #LitterSweepWarrior

WASTE REDUCTION TIP 1:

LITTER SWEEP DAYS

Know your resources! Refresh your memory by reading the County and City recycling brochures for what is and isn't acceptable.

Additional waste reduction programs and information can be found by visiting: hendersonvillenc.gov/sustainability and hcrecycles.org

Follow along on social media during Litter Sweep for tips and tricks to help reduce your waste at hom

Henderson County and the City of Hendersonville offer a wealth of information on waste reduction and recycling. You can find out more information by checking out resources provided by the City and County at hendersonvillenc.gov/sustainability/waste-management and hendersoncountync.gov/environmental-programs. Print copies can be mailed upon request.

Follow along for more tips and tricks to reduce your own waste throughout your home. Questions about waste reduction? City residents, please reach out to Sustainability Manager, Caitlyn Gendusa at cgendusa@hvlnc.gov; County residents please reach out to Environmental Programs Coordinator, Amy Schmitte at aschmitte@hendersoncountync.gov

#LitterSweepNC #Wastereductiontips

WASTE REDUCTION TIP 2:

LITTER SWEEP DAYS

Reducing your waste in the laundry room can be done by making some simple changes. Swap out your single use dryer sheets for reusable wool dryer balls!

Follow along on social media during Litter Sweep for tips and tricks to help reduce your waste at hom

Our laundry rooms are a great place to start when looking at ways to reduce waste. Natural fiber, wool dryer balls can easily replace your single use dryer sheets. Not only are they easy to use, they also last for years and can be used over and over again. Worried about not having that fresh laundry scent? Add some essential oils to the dryer balls before drying your laundry.

Liquid laundry detergents typically come in large plastic jugs that not are only bulky but take up a lot of space too. Swap out your liquid laundry detergent for bulk laundry powder or opt for a concentrate laundry detergent. For concentrates, search for brands with sustainable packaging options that allow you to send back or refill the container to reduce single use packaging.

Follow along for more tips and tricks to reduce your own waste throughout your home. Questions about waste reduction? City residents, please reach out to Sustainability Manager, Caitlyn Gendusa at cgendusa@hvlnc.gov; County residents please reach out to Environmental Programs Coordinator, Amy Schmitte at aschmitte@hendersoncountync.gov

#LitterSweepNC #Wastereductiontips

WASTE REDUCTION TIP 3:

LITTER SWEEP DAYS

One of the biggest ways to reduce your waste is to compost. Multiple systems are available to meet your needs and Henderson County also offers discounted compost bins certain times of the year.

Follow along on social media during Litter Sweep for tips and tricks to help reduce your waste at hom

Reducing your food waste can come in many forms. Start by reducing how much food waste you have by creating shopping lists, meal prepping, using the first in first out system in your refrigerator or pantry, or reorganizing produce to keep it fresh longer. You'll likely still have some food waste left over from preparation and you can compost these remaining food scraps. Backyard composting is a great option for fruit and vegetable scraps. Don't have the space to backyard compost? Henderson County has a food waste drop off at the Convenience Center for all residents.

Follow along for more tips and tricks to reduce your own waste throughout your home. Questions about waste reduction? City residents, please reach out to Sustainability Manager, Caitlyn Gendusa at cgendusa@hvlnc.gov; County residents please reach out to Environmental Programs Coordinator, Amy Schmitte at aschmitte@hendersoncountync.gov

#LitterSweepNC #Wastereductiontips

WASTE REDUCTION TIP 4:

LITTER SWEEP DAYS

Shopping in bulk is a great way to reduce food packaging and is oftentimes less expensive. Simply bring your own reusable cloth bags or jars, have the cashier take the weight and refill. At check-out, the cashier will deduct the initial container weight from your total cost. Easy!

Follow along on social media during Litter Sweep for tips and tricks to help reduce your waste at hom

Shopping in bulk, especially with your own reusable containers, is a great way to reduce waste. Most grocery stores offer bulk sections which allow you to purchase only the amount that you need and reduce packaging waste. Check with the store beforehand to make sure they allow outside containers in the bulk section.

The best reusable container is the one you already have! Glass jars from sauces, soups, oils, pickles, etc. make great reusable containers once they're cleaned out. Simply bring your container and ask a cashier to take the weight for you. Refill your container and check out. It is that easy!

Follow along for more tips and tricks to reduce your own waste throughout your home. Questions about waste reduction? City residents, please reach out to Sustainability Manager, Caitlyn Gendusa at cgendusa@hvlnc.gov; County residents please reach out to Environmental Programs Coordinator, Amy Schmitte at aschmitte@hendersoncountync.gov

#LitterSweepNC #Wastereductiontips

WASTE REDUCTION TIP 5:

LITTER SWEEP DAYS

Dining on the go can often go hand in hand with a lot of unnecessary waste. Limit your waste when dining out by refusing plastic utensils, straws, napkins, and bags. Eating out at your favorite restaurant and know you'll have leftovers? Plan ahead and bring your own container for leftovers.

Follow along on social media during Litter Sweep for tips and tricks to help reduce your waste at hom

When dining on the go, you can help reduce your waste by refusing unneeded items like plastic utensils, straws, napkins, bags, and more. Instead opt for packing your own reusable items like cloth napkins, metal straws, metal or bamboo utensils, reusable water bottles, reusable coffee mugs, and canvas tote bags. Take an extra step when dining out and bring your own container for leftovers. Not only will this save some waste from the landfill but it will make heating up leftovers easier!

Follow along for more tips and tricks to reduce your own waste throughout your home. Questions about waste reduction? City residents, please reach out to Sustainability Manager, Caitlyn Gendusa at cgendusa@hvlnc.gov; County residents please reach out to Environmental Programs Coordinator, Amy Schmitte at aschmitte@hendersoncountync.gov

#LitterSweepNC #Wastereductiontips

WASTE REDUCTION TIP 6:

LITTER SWEEP DAYS

Keeping up with changing fashion trends can often lead to wasted clothing that you cycle through quickly. Instead of ordering new clothing, try your luck at one of our many thrift stores. Do you have clothes that you have outgrown? Instead of tossing them, donate them.

Follow along on social media during Litter Sweep for tips and tricks to help reduce your waste at hom

Henderson County is home to many great thrift stores. These can be great options for revamping your wardrobe or donating clothing you have outgrown or no longer wear. A plethora of online second hand stores are also available. Not only does this help to decrease the amount of wasted clothes that end up in our landfills but it may also save you some money!

Follow along for more tips and tricks to reduce your own waste throughout your home. Questions about waste reduction? City residents, please reach out to Sustainability Manager, Caitlyn Gendusa at cgendusa@hvlnc.gov; County residents please reach out to Environmental Programs Coordinator, Amy Schmitte at aschmitte@hendersoncountync.gov

#LitterSweepNC #Wastereductiontips

WASTE REDUCTION TIP 7:

LITTER SWEEP DAYS

Bathrooms are notorious for single use plastics! Make some simple swaps to lessen your plastic foot print like switching out your liquid shampoo and conditioner for solid shampoo and conditioner bars. Not only are they great products with no plastic, they also are great for travelling. No spills!

Follow along on social media during Litter Sweep for tips and tricks to help reduce your waste at hom

Looking to reduce waste in your bathroom? Single use plastics in your bathrooms may be taking over but there are some simple swaps you can make to reduce your waste. Swap plastic toothbrushes for bamboo toothbrushes, body wash for bar soap, bottled hair products for a shampoo or conditioner bar, toothpaste for toothpaste tablets, shaving cream for shave bars, plastic razors for metal razors, deodorant in plastic for deodorant in cardboard. The list goes on and on! Not ready to switch to shampoo and conditioner bars? Try out concentrates instead! Find a container to use (preferably repurposing one you already have), add the concentrate, add water, mix, and voila! Liquid shampoo and conditioner without the plastic packaging.

Follow along for more tips and tricks to reduce your own waste throughout your home. Questions about waste reduction? City residents, please reach out to Sustainability Manager, Caitlyn Gendusa at cgendusa@hvlnc.gov; County residents please reach out to Environmental Programs Coordinator, Amy Schmitte at aschmitte@hendersoncountync.gov

#LitterSweepNC #Wastereductiontips

7th Avenue

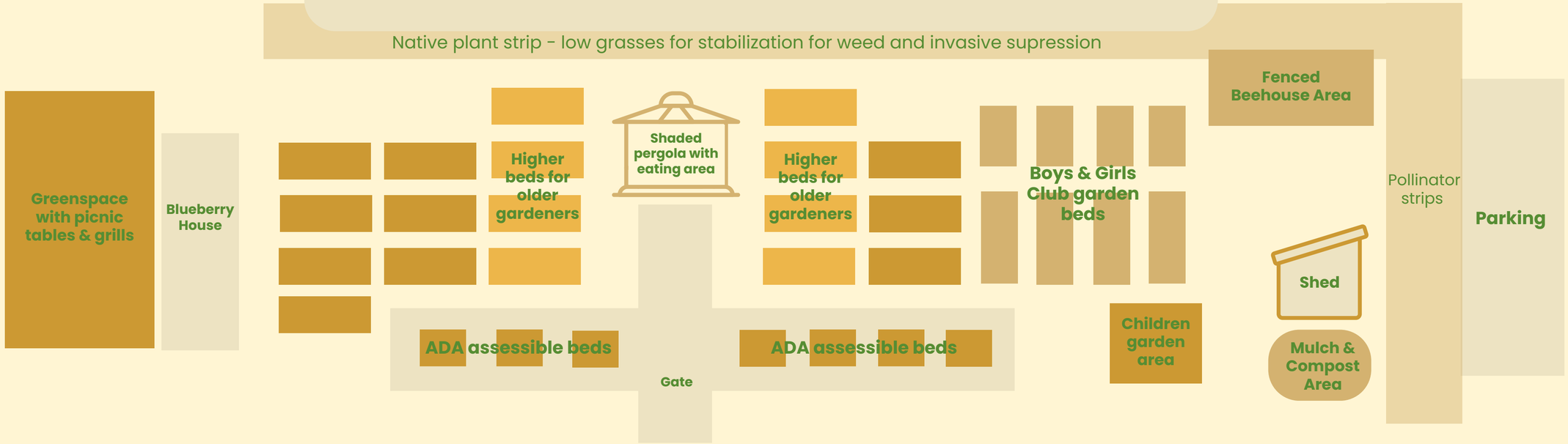
BROOKLYN COMMUNITY GARDEN

HISTORY

Located adjacent to Sullivan Park in the historic 7th Avenue district, this community garden was started in 2011 with a partnership between the City of Hendersonville and a few dedicated community members to use City land for a community garden in the Green Meadows community.

Brooklyn is a historic Black neighborhood established in the late 19th century that grew into a thriving community being the center of Black life and culture. In the 1960's the community was renamed as Green Meadows as part of an urban renewal project. To preserve and honor the legacy of the original community, this garden is named the Brooklyn Community Garden.

REVITALIZATION & EXPANSION PLAN



PARTNERS

Black History Research Group

Healthy Babies Bright Futures

Caregivers of Mother Earth

NC STATE Extension Master Gardener

BOYS & GIRLS CLUB OF HENDERSON COUNTY

North Carolina COMMUNITY GARDEN PARTNERS

BEE CITY USA HENDERSONVILLE, NC

A Place To Go
Healing, Connecting, and Community

Forever caring. Forever giving.
Community Foundation of Henderson County

SECURED FUNDING

Grant funds are vital for making this project possible. To date, the City of Hendersonville and community members have come together and secured $50,000+ in funds dedicated for the garden. These funders include:

$5,000
City of Hendersonville Bee City USA program

$25,000
Healthy Babies Bright Futures

$2,550
The Seed Money Challenge & N.C. Community Garden Partners

$25,000
Community Foundation of Henderson County

POLICY ON BUILDING EFFICIENCY STANDARD REQUIREMENTS FOR ALL NEW MUNICIPAL CITY CONSTRUCTION AND RENOVATIONS

Introduction and Purpose

- Incorporate green building standards into all facilities constructed and owned by the City of Hendersonville to demonstrate the City's commitment to sustainable building design in its own building practices and policies;
- Reduce energy costs by maintaining energy efficiency standards; and
- Take advantage of federal tax credits and utility rebates available for energy efficient buildings.

Requirements

Exterior Design and Construction

- Associated parking lots shall be constructed to be electric vehicle supply equipment (EVSE) capable. This includes:
    - Electric panel capacity, dedicated branch circuit that is not less than 40-ampere and 208/240-volt, and continuous raceway both underground and surface mounted to enable the future installation of electric vehicle supply equipment.
    - Building and associated area shall be designed as solar PV ready. This includes:
    - Adequate electrical conduit from the roof, ground, or parking lot to the electrical room to accommodate roof, ground mounted, and/or parking lot solar;
    - Designate space in electrical panel for future solar interconnection;
    - Designate space outside or in electrical room for PV system equipment such as inverters and transformers; and
    - Design roof to accommodate additional load requirement for PV system.

- At least two bike racks are required per building.

- The solar reflex index, SRI for the roof must have a minimum SRI value of 82 for a low-sloped roof (less than or equal to 2:12 slope) or SRI value of 39 for a steep-sloped roof (greater than 2:12 slope) to reduce the heat island effect and reduce energy use.

- Design landscaping in a way that reduces water use, manages stormwater, and enhances biodiversity which may include but is not limited to:
    - Native and drought-tolerant plants;
    - Utilize smart irrigation instead of spray;
    - Source trees with larger canopy to increase wildlife habitat potential; or
    - Minimize sod/turf to decrease water and maintenance.

Interior Design and Construction

- Lighting
  - All interior and exterior lighting is LED
  - /*requently visited communal area.

- Heating & Cooling
  - HVAC
    - Units shall have a minimum 16 SEER rating.
    - Procurement process shall prioritize efficient electric equipment such as conventional heat pumps and mini split heat pumps.
    - Units shall have low-impact refrigerants or no refrigerants where possible.
  - Where economically feasible, boilers shall not be used with a preference for solar hot water heaters and on demand water heaters where practical.
  - Smart thermostats are required in areas that enable personal preferences in temperature control.
  - Prior to procurement, a 5 year cost analysis shall be completed to consider the overall cost savings and environmental impacts either by the contractor or Sustainability Manager.

- Windows shall have a minimum U factor of ≤ 0.30

- Insulation shall have a minimum R-value which includes:
  - Attics: R38 to R60
  - Walls: 2x4: R13 to R15 or 2x6: R19 to R21
  - Floors: R25 to R30
  - Crawlspaces: R25 to R30

- Plumbing
  - Plumbing fixtures shall not exceed the following flow rates:
    - Water closets = 4.8 L / flush
    - Urinals = 0.5 L / flush
    - Lavatory faucets = 1.9 L / min
    - Kitchen faucets = 5.7 L / min
    - Showers = 5.7 L / min.

- Ambient and indoor air quality
  - Paint shall not exceed 50 g/l of volatile organic compounds, VOC's. Industrial maintenance safety coatings shall not exceed 480 g/l of VOCs.

Note: Standards were derived from best practices stated in Leadership in Energy and Environmental Design, LEED and U.S. Department of Energy: Energy Efficiency and Renewable Energy.

mountaintrue.
Protecting the Places We Share.

Case for Support

Neighbors for More Neighbors

Our vision for cities and towns across the Southern Blue Ridge Mountains is for residents to have a wider range of housing options and to discourage sprawl and the destruction it can bring to our natural environment. The more we can build housing in convenient, walkable communities with a variety of safe and easily accessible modes of transportation like transit and bike paths, the less carbon footprint we will generate in our day to day activities.

Standing in the way are regulatory barriers, a fear of change to existing neighborhoods, and persistent opposition to development. These challenges make it difficult to build on land where infrastructure and amenities already exist. Our historical preference for detached single family homes requires more land, new roads, and increased travel times for regular activities.

Neighbors for More Neighbors WNC will inspire communities by demonstrating the benefits of diverse housing types and walkable neighborhoods. Through our advocacy, residents will see the prospect of new homes being built in our own neighborhoods as an opportunity rather than a threat. To achieve this, we will analyze existing regulations and advocate for changes that will lead to healthy, diverse, and thriving communities. We will host community forums, publish opinion pieces in local newspapers, run social media campaigns, host education programs, share articles and stories in our newsletters and blog posts, and work with trusted community partners to spread this vision beyond our existing audience. By growing a grassroots base of support for walkable communities with a healthy mix of housing types, we can support elected leaders and local government staff as they make difficult decisions to benefit both existing and future residents.

Our partner organizations include Asheville Area Habitat for Humanity, Thrive Asheville, Asheville on Bikes, and Mountain Housing Opportunities. We have also been accepted as a member of the Welcoming Neighbors Network, a national network of local organizations working to fix the US housing shortage. These groups share our vision and are ready to work alongside us to make it a reality. In year one, we will expand our partnerships and grow a strong volunteer network. We anticipate building a regional network across communities in and around Boone, Brevard, Bryson City, and Hayesville.

A successful Neighbors for More Neighbors WNC program will cost $80,000 to implement and will demand a committed volunteer base of supporters. **Where do you see yourself fitting in to make this vision a reality for our mountain region?**

VISIT: moreneighborswnc.org

City of Hendersonville, NC
Mayors' Monarch Pledge - 2023 FINAL REPORT

Mayor Barbara Volk
Hendersonville, NC

Pledge Summary

Hendersonville is a small city in western North Carolina with a population of roughly 16,000. Nestled by the Blue Ridge Mountains, it is home to the beautiful Oklawaha Greenway, a 3.5-mile trail winding through wetlands, meadows, and forests connecting four public parks. The heart of Hendersonville's downtown area sports a two-story pollinator mural complete with illustrations of the Monarch Butterfly's life cycle above a demonstration pollinator garden. A few blocks away, artists transformed a city sidewalk into a honey-combed yellow brick road which pedestrians can meander through an illustrative border garden of native plants and pollinators. The City of Hendersonville is committed to saving the monarch butterfly and other pollinators with the annual signing of the Mayors' Monarch Pledge and will continue to engage residents in building more pollinator habitat throughout the city.

Action Items Committed for 2023

Communications and Convening

1. Issue a Proclamation to raise awareness about the decline of the monarch butterfly and the species' need for habitat.

Program and Demonstration Gardens

2. Host or support a native seed or plant sale, giveaway or swap.

3. Plant or maintain a monarch and pollinator-friendly demonstration garden at City Hall or another prominent or culturally significant community location.

Past Pledge Archive

Mayor Name Program Year Pledge Date Achievement
2022 Mayor of Hendersonville Barbara Volk 3/17/2022

Selected Action Items

1. Issue a Proclamation to raise awareness about the decline of the monarch butterfly and the species' need for habitat.

Date of Proclamation: 4/12/2023 by Mayor of Hendersonville Barbara Volk
Title of Proclamation (i.e. – Monarch Day or Pollinator Week): Pollinator Month

2. Host or support a native seed or plant sale, giveaway or swap.

IN PROCESS:

Plans for a native plant giveaway have begun by providing milkweed seeds to the horticulture department of Blue Ridge Community College. As part of the department's curriculum, students will plant the seeds in the campus greenhouse and manage the care of the seedlings until Spring 2024. At that time, a portion of the plants will be ready and available for the City of Hendersonville's use as part of a native plant giveaway at the Brooklyn Community Garden, a local pollinator garden currently being refurbished with help by the City of Hendersonville.

What community organizations, groups, or leaders (if any) did you partner with or engage to host the event?

Blue Ridge Community College, Bee City USA, Caregivers of Mother Earth, Henderson County Master Gardens, residents of the adjacent Green Meadow housing community, and the City of Hendersonville will be partnering for the event next year.

3. Plant or maintain a monarch and pollinator-friendly demonstration garden at City Hall or another prominent or culturally significant community location.

Where is the demonstration garden located and how does this location relate to the cultural significance of the monarch (if relevant)? (Please provide an address or coordinates, if possible)

An agreement with the North Carolina Department of Transportation allowed the City to create a large native plant garden alongside northbound Four Seasons Highway (NC Hwy. 64), which is the primary entrance to the city from Interstate 26. The site also fronts an access road to Seventh Avenue West in front of a popular Aldi's grocery store. The garden is visible by multiple lanes of traffic on the highway as well as slower traffic on the access road. Landscaped on about a quarter of an acre of amended/enriched soil, the pollinator garden is protected on the west side by a berm of well-established trees. This provides a beneficial location for the 6 medium-height pollinator-friendly trees, 43 flowering shrubs, a number of tall grasses and hundreds of plugs of perennial flowers to flourish. Local landscape designer Bruce Lowe selected a variety of pollinator-friendly plants, trees and shrubs to also reflect the name of the street – Four Seasons Boulevard. The garden has an on-site water source due to the efforts of the city Public Works Department. A city Welcome sign is adjacent for passersby to note the City's efforts to support and commitment to pollinator sustainability. (See attachments)

What community organizations, groups, or leaders (if any) did you partner or engage with to complete this effort?

Hendersonville Tree Board, Bee City USA and Henderson County Master Gardeners, along with the cooperation of the NC Department of Transportation.

What is the size of the demonstration garden (in acres)? Please limit your answer to only the number of acres in the answer field below (e.g., 0.5 acres). For reference, 1 acre = 43,560 square feet and is about the size of a football field without the end zones.

Approximately 0.25 acre or 10,900 square feet.

Addition Actions Items Completed or Continuing Into 2024:

COMPLETED: Symbolic Monarch Migration through the Environmental Education Alliance - *A Communication and Convening Action Item*

This educational program is organized by Kim Bailey, a local educator and farmer/owner of Milkweed Meadows Farm in Fruitland, NC, and Estela Romero, monarch educator and journalist who works in monarch overwintering sanctuaries near Angangueo, Michoacán, Mexico. Local teachers in both countries are provided educational materials and hands-on props to present up-close and personal views of the monarch butterfly's remarkable life cycle and epic annual migration.
https://journeynorth.org/symbolic-migration/resources/teaching/about-symbolic-migration

Financial support was provided for 12 participating classrooms in City schools, involving approximately 360 students.

1. Hendersonville Middle School - 7th Grade
2. Hendersonville Middle School - 7th Grade
3. Immaculata Catholic School STEM Lab - 4th Grade
4. The Mountain Community School - 2nd Grade
5. Hendersonville Elementary School - 2nd Grade
6. Bruce Drysdale Elementary - 1st Grade
7. Bruce Drysdale Elementary - 1st Grade
8. Bruce Drysdale Elementary - 3rd Grade
9. Bruce Drysdale Elementary - Segundo Grado, Dual Language
10. Bruce Drysdale Elementary - Segundo Grado, Dual Language
11. Hands On Children's Museum
12. Bullington Gardens - Exceptional Children - 1 High School Class (city)

Community partners included Bee City USA, Milkweed Meadows Farm and Bullington Gardens.

IN PROCESS: Integration of monarch butterfly conservation into the city's Sustainability Plan - *A Systems Change Action Item*

Community outreach has begun with the promotion of "Gen H" - - the city's marketing title for the process of gaining vital public input via in-person meetings as well as an anonymous questionnaire (online and printed versions) for full-time and part-time residents, tax payers, and visitors. This gathering of feedback will provide guidance in prioritizing goals as the Sustainability Plan is drafted. The plan is expected to be finalized and approved by the City Council in 2024.

ONGOING: Brooklyn Community Garden
Engage with Gardening Leaders and Partners

Brooklyn Community Garden, located adjacent to Sullivan Park in the historic 7th Avenue district, was started in 2011 with a partnership between the City of Hendersonville and dedicated community members. The City has provided land for a community garden in the Green Meadows low-income community. The current refurbishment plans include reconfiguring an expanded garden layout, constructing new raised beds with amended soil, new plantings, educational signage, walking paths, and new street signage. Ongoing work days began Summer 2023 with City workers and local volunteers from a number of organizations including Bee City USA - Hendersonville, Caregivers of Mother Earth, Sullivan Community Garden, Community Foundation, Master Gardeners - Henderson County, and the City of Hendersonville.

Action Items

In total, how many individuals have been reached through the Mayors' Monarch Pledge in your community this year (Jan-Dec)? Please limit your answer to only the number of individuals reached in the answer field below (e.g., 50).

_____

Of these individuals reached, how many are youth (ages 0-18) and how many are adults? Please limit your answer to only the number of adults and youths engaged in the answer field (e.g., 500 youth and 600 adults).

_____Young _____Adults

In total, how many acres of monarch habitat have been created in your city in the last 12 months? Please limit your answer to only the number of acres in the answer field below (e.g., 3).

Approximately .04 acres between two new gardens

Where is your habitat being created? This may include residences (yards, containers, balconies, etc.), schools, places of worship, rights-of-way, roadsides, community gardens, culturally-significant locations, shared public spaces and common areas or parks.

Community garden, roadside, public greenway

How are you leveraging the Mayors' Monarch Pledge program to engage marginalized communities, such as low-income communities or communities of color?

The Brooklyn Community Garden is a collaboration of effort by multiple entities including residents of the adjoining Green Meadow housing community, Henderson County Black History Research Group, Caregivers of Mother Earth, Boys & Girls Club of Henderson County, NC State Extension Master Gardeners, A Place To Go, and the City of Hendersonville. Funding has been secured from the Henderson County Community Foundation, Healthy Babies Bright Futures, Bee City USA - Hendersonville and N.C. Community Garden Partners.

What was your community's motivation for taking and continuing to work on the Mayors' Monarch Pledge?

This is the city's second year of participation in Mayors' Monarch Pledge. Due to the city's locale, climate and abundant natural resources, residents have demonstrated a long-time interest in conservation and environmental care. The city government has now recognized the need to lead by example in promoting environmental sustainability through the Mayors Monarch Pledge, Tree City Bee City USA commitments.

What resources have been most helpful to you thus far and what new resources would you like to see to help meet your goals? What resources would be useful to help expand equitable engagement in community processes and access to high quality, usable nature?

Collaboration among the many conservation and environmental partners already in action within the city as well as surrounding communities and counties has created a strong knowledgeable and supportive base of partners to successfully realize the city's efforts.

What else should we know about your monarch butterfly conservation efforts over the last year?

The city's hiring of a full-time Sustainability Manager this Spring has been instrumental in keeping the energy, focus and organization of the city's sustainability goals in clear focus.

Food Waste Solutions

City of Asheville and Buncombe County

quarterly networking event — Wednesday, Sept. 13, 2023
Stephens Lee Recreation Center


EAST END
VALLEY
STREET
COMMUNITY GARDEN
ASHEVILLE
Parks & Recreation


LET'S MAKE COMPOST!
YES!
YES!
MATERIALS CAN BE COLLECTED LOOSE AND FREE!
NO OTHER TYPE OF BAGS WILL BE ACCEPTED.
NO!


PLEASE FILL BINS BACK TO
FRONT, IT REALLY HELPS
WITH CLEANLINESS &
SERVICE
THANK YOU!


FOOD SCRAPS
DROP-OFF
• LET'S MAKE COMPOST! •
INSTRUCTIONS
• Remove all produce stickers, rubber bands, wrappers, ties, bags, and plastics
• Empty food scraps and compostable waste into the cart
• Close lid and secure doors when finished
• Do not overfill!
More info? www.ashevillenc.gov/compost or scan QR code
See an issue? Contact sanitation@ashevillenc.gov
THE CITY OF ASHEVILLE
BUNCOMBE COUNTY
TO OPEN:
ENTER CODE,
PUSH LOCK UP,
THEN PULL DOWN!


WANT TO DROP YOUR FOOD SCRAPS HERE?
- Sign up today, it's free and easy!
Scan this QR code or visit
www.ashevillenc.gov/compost
SAVE the FOOD AVL
WNCFOODWASTE.ORG


DON'T FORGET
THERE ARE LOTS OF WAYS TO PREVENT FOOD WASTE BEFORE MAKING COMPOST FROM SCRAPS
1. Plan meals and use leftovers creatively
2. Date labels can be tricky and don't necessarily mean food is no good; use your nose and eyes before tossing
3. Freeze food! Butter, bread, leftovers, and more can go right in the freezer and be reheated when you're ready!
THE CITY OF ASHEVILLE
SAVE the FOOD AVL
BUNCOMBE COUNTY


TRASH ONLY


UPDATE:
EMPTY PIZZA BOXES
PLACE IN THE BIN NEXT TO THE SHED
PLEASE DO NOT PLACE PIZZA BOXES IN THE COMPOST SHED


COMMUNITY GARDEN
EAST END VALLEY STREET


THE CITY OF
ASHEVILLE

HOME FOOD WASTE AUDIT

Nearly 40% of the food supply in the US is wasted. Most of the food wasted from households and restaurants ends up in a landfill. **Food that is thrown away also wastes all of the land, water, and energy that it takes to grow, store, and transport it.** We all need healthy food to live and grow and this audit will investigate how to waste less food and live more sustainably.

Food:Waste SOLUTIONS WNC
WNCFOODWASTE.ORG

THE CITY OF ASHEVILLE

SAVE the FOOD AVL

SHARE WITH US @WNCFOODWASTE

Let's collect and analyze some home food data. Starting with a look at where we purchase food can help us think from the very beginning about how we can reduce food waste (and food-related waste like packaging!). Buying food that has less packaging and only buying the foods we will use before they go bad can help reduce waste.

WHERE DO YOU GET FOOD DURING THE WEEK?

(CIRCLE ALL THAT APPLY)

GROCERY STORE Y N

Tip: Shop the outside aisles of the grocery store for the freshest foods that usually have less packaging.

FARMERS MARKET Y N

Tip: If you visit, ask a farmer what fruits and vegetables are in season and growing in WNC right now.

RESTAURANTS/ FAST FOOD Y N

Tip: Try not to order more than you will eat. Leftovers are one of the biggest sources of food waste at home.

HOME OR COMMUNITY GARDEN Y N

Tip: Gardens provide fresh food without any packaging. Extra food can be donated or preserved by freezing or canning it.

GAS STATION/CONVENIENCE STORE Y N

Tip: Think about how you can recycle the packaging of whatever you buy.

NEXT UP, COMPOST.

Composting is nature's way of recycling food and yard waste. It is a natural process that happens when organic materials decompose and return to the soil. By composting at home, you help keep food waste out of landfills where they take up space and release methane, a greenhouse gas.

1. DOES YOUR HOUSEHOLD COMPOST FOOD SCRAPS? (CIRCLE ONE)

YES, WE COMPOST EVERY DAY.

YES, WE COMPOST SOMETIMES.

NO, WE AREN'T COMPOSTING RIGHT NOW.

I'M NOT SURE IF WE COMPOST.

2. IF YOU ANSWERED YES, CAN YOU TELL US WHERE? (CIRCLE ALL THAT APPLY)

MY BACKYARD

COMMUNITY GARDEN

COMPOSTING SERVICE (SUCH AS COMPOSTNOW)

OTHER_____

3. IF YOU ANSWERED NO CAN YOU TELL US WHY? (CIRCLE ALL THAT APPLY)

NO SPACE

I DON'T KNOW HOW

OTHER_____

If there was a free place to drop off your food scraps for composting, would you use it? YES NO MAYBE

HOME FOOD WASTE AUDIT

WEEK #____ worksheet

Food Waste SOLUTIONS WNC

THE CITY OF ASHEVILLE

SAVE the FOOD AVL

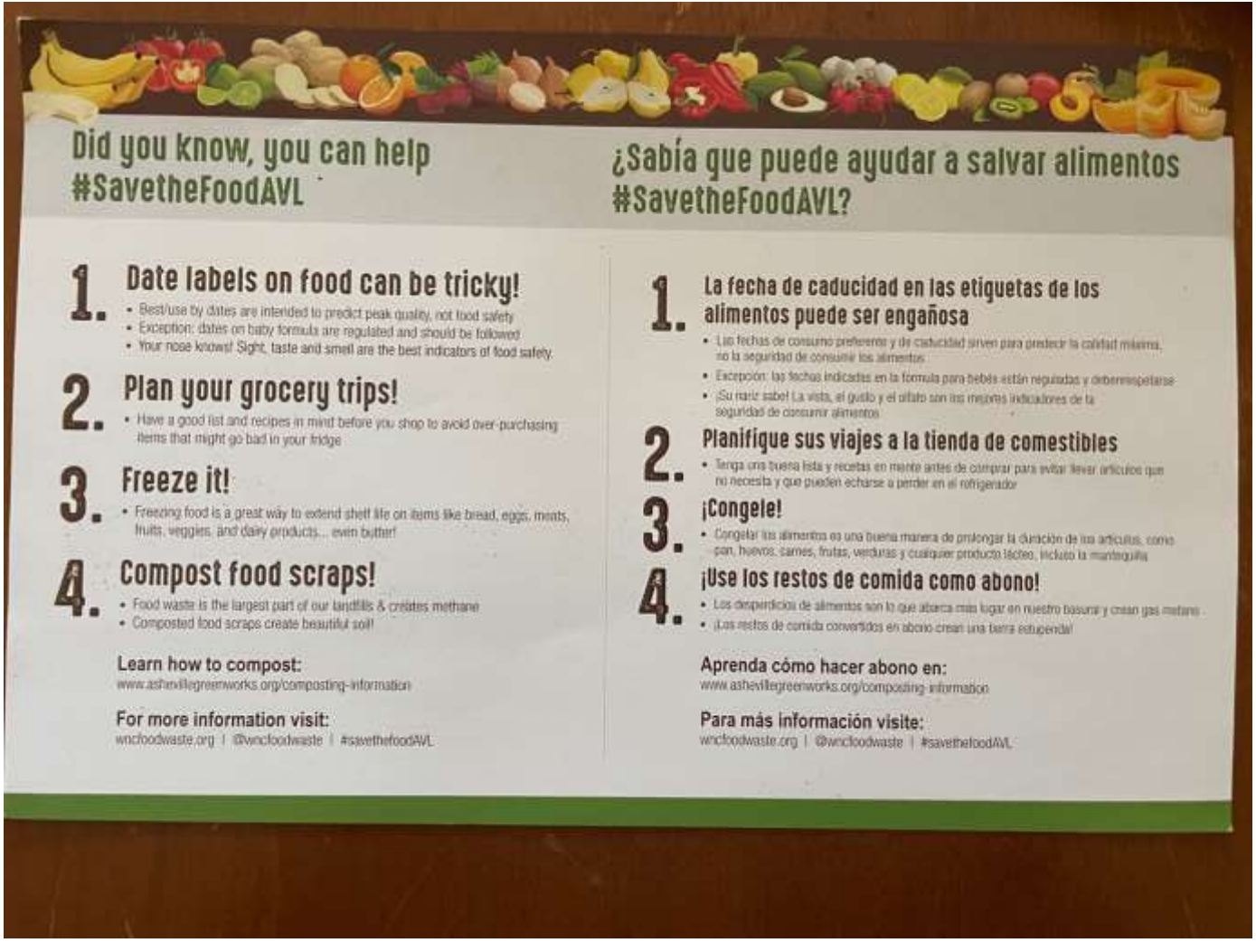
Investigating Your Kitchen

This week, pay attention to the food that is wasted every time you eat. Fill out the chart below by noting any foods that are thrown away, the quantity and reason it was uneaten, estimated monetary value, and if the waste was composted (or donated, etc).

NOTES: _____

	Food(s) Thrown Out	How Much? (1/2 cup, cup, etc)	Reason for Tossing	Estimated Value ($)	Composted? (Yes/No/Other)
S					
M					
T					
W					
Th					
F					
S					


Знаете ли вы, что вы можете помочь
#SavetheFoodAVL
SAVE the FOOD AVL
THE CITY OF ASHEVILLE
1. Этикетки с датами на упаковке могут быть обманчивы!
• Срок годности обычно означает период наивысшего качества продукта, а не годность к употреблению
• Исключение: даты на смесях детского питания регулируются законом, и их обязательно нужно учитывать
• Доверьтесь носу! Вид, вкус и запах - это лучшие показатели безопасности еды!
2. Составляйте план похода за продуктами
• Перед походом в магазин подготовьте мысленный план покупок и рецептов, чтобы лишние продукты не портились в холодильнике
3. Помните про заморозку!
• Хранение еды в морозильной камере — это отличный способ продлить срок годности хлеба, яиц, мяса, фруктов, овощей, молочных продуктов... и даже сливочного масла!
4. ¡Use los restos de comida como abono!
• Самая большая часть мусорных свалок приходится на пищевые отходы, создающие метан
• Компост используется для создания плодородной почвы!
Узнайте о том, как делать компост:
www.ashevillegreenworks.org/composting-information
Для получения дополнительной информации посетите:
wncfoodwaste.org | @wncfoodwaste | #savethefoodAVL
For more information visit:
wncfoodwaste.org @wncfoodwaste #savethefoodAVL
Para obtener más información:
wncfoodwaste.org @wncfoodwaste #savethefoodAVL
Чтобы узнать больше, см:
wncfoodwaste.org @wncfoodwaste #savethefoodAVL
SAVE the FOOD AVL
WNCFOODWASTE.ORG
THE CITY OF ASHEVILLE



Did you know, you can help #SavetheFoodAVL

1. Date labels on food can be tricky!

- Best/use by dates are intended to predict peak quality, not food safety
- Exception: dates on baby formula are regulated and should be followed
- Your nose knows! Sight, taste and smell are the best indicators of food safety.

2. Plan your grocery trips!

- Have a good list and recipes in mind before you shop to avoid over-purchasing items that might go bad in your fridge

3. Freeze it!

- Freezing food is a great way to extend shelf life on items like bread, eggs, meats, fruits, veggies, and dairy products... even butter!

4. Compost food scraps!

- Food waste is the largest part of our landfills & creates methane
- Composted food scraps create beautiful soil!

Learn how to compost:
www.ashevillegreenworks.org/composting-information

For more information visit:
wncfoodwaste.org | @wncfoodwaste | #savethefoodAVL

¿Sabía que puede ayudar a salvar alimentos #SavetheFoodAVL?

1. La fecha de caducidad en las etiquetas de los alimentos puede ser engañosa

- Las fechas de consumo preferente y de caducidad sirven para predecir la calidad máxima, no la seguridad de consumir los alimentos
- Excepción: las fechas indicadas en la fórmula para bebés están reguladas y deberíanrespetarse
- ¡Su nariz sabe! La vista, el gusto y el olfato son los mejores indicadores de la seguridad de consumir alimentos

2. Planifique sus viajes a la tienda de comestibles

- Tenga una buena lista y recetas en mente antes de comprar para evitar llevar artículos que no necesita y que pueden echarse a perder en el refrigerador

3. ¡Congele!

- Congelar los alimentos es una buena manera de prolongar la duración de los artículos, como pan, huevos, carnes, frutas, verduras y cualquier producto lácteo, incluso la mantequilla

4. ¡Use los restos de comida como abono!

- Los desperdicios de alimentos son lo que abarca más lugar en nuestro basural y crean gas metano
- ¡Los restos de comida convertidos en abono crean una tierra estupenda!

Aprenda cómo hacer abono en:
www.ashevillegreenworks.org/composting-information

Para más información visite:
wncfoodwaste.org | @wncfoodwaste | #savethefoodAVL

WANT TO COMPOST?

Start your own backyard compost or use Food Scraps Drop-Off locations.

WHAT'S THE DIFFERENCE?

You can take dairy, bones, meats, etc. to Food Scraps Drop-Off locations. Commercial compost has better chemistry and higher temperatures! However, dairy, bones and meat can't be composted in your backyard because they won't break down.

TIGHT LID, IN THE FRIDGE!

Afraid of smells or bugs? Your compost won't be any smellier or buggier than your trash! Same stuff, different bin! Keep a tight lid to avoid any issues or store it in the fridge/freezer, especially if you have meat, bones and fish. After dumping your compost out, rinse your indoor bin!

SAVE THE FOOD AVL!

While composting is a great option for those bones, peels, and shells, reducing food waste is the best first step! Try to shop with a list, organize your fridge, and use leftovers creatively.

SAVE the FOOD AVL

Check out www.foodwastewnc.org for more tips!

WHAT PAPER GOES WHERE?

COMPOST
Dirty or thin paper, like paper towels, napkins and tissue

RECYCLING CART
Clean paper, cardboard and cartons.

TRASH CART
Plastic-lined receipts, plates, and to-go containers.

FOOD SCRAPS DROP-OFF

REGISTER AND FIND A LOCATION NEAR YOU!

Scan QR code or visit ashevillenc.gov/compost for a list of food scraps drop-off locations!

LET'S MAKE COMPOST!

YES! All kinds of raw, cooked, scraps and plant trimmings

Leave produce bags/stickers OUT of your collection

Paper products (no plastic lining) and other certified compostable products

NO!

Plastic bags and wrappers

Plastic-coated (shiny) take-out boxes and plates

To-go hot and cold drink cups

MATERIALS CAN BE COLLECTED LOOSE AND FREE!

If you choose to bag your food scraps, use only paper bags or certified BPI compostable "bio bags."

NO OTHER TYPE OF BAGS WILL BE ACCEPTED.

THE CITY OF ASHEVILLE

NC

ASHEVILLE COMPOSTS!

SAVE the FOOD AVL

WNCFOODWASTE.ORG

LEARN MORE ABOUT COMPOSTING

in your backyard or at Food Scraps Drop-Off locations

ASHEVILLENC.GOV/COMPOST

BACKYARD COMPOSTING 101

FRESH GREENS

NITROGEN-RICH


Grass and plant trimmings


Fruits and vegetables


Egg shells


Bread


Rice and legumes


Tea leaves and coffee grounds

Leave produce bags/stickers OUT of your compost!

DRY BROWNS

CARBON-RICH


Dead leaves, straw and hay


Broken up sticks and wood chips


Coffee filters


Shredded paper


Compostable paper products
(No plastic lining; tear up)


Paper towels and napkins

⊘ KEEP THESE OUT! ⊘


Meat, fish and bones*


Food cooked with grease


Dairy products

Snack wrappers


Certified compostable


Plastic-coated (shiny)


To-go hot and cold


Plastic-coated

1 DECIDE ON A LOCATION THAT HAS:

- Easy access for your convenience
- Bare soil for microorganisms to enter the compost from beneath
- Flat ground for good drainage

2 ORGANIZE INDOORS:

- Collect food scraps in the kitchen in a container with a tight lid to keep fruit flies away / minimize odor – or store in your fridge / freezer
- Chop up larger items like watermelon and pumpkins

3 ADD YOUR INGREDIENTS:

- Empty your kitchen container into your compost bin regularly
- Stir in your new material to the top layer
- Cover your food scraps with a three-inch layer of browns

4 HARVEST:

- Wait six to twelve months and let nature do its work, or aerate with a shovel and add water as needed to speed up the process. It's ready when the compost is dark brown and earth-like!

Want to learn more or get free bin materials? The City of Asheville partners with Asheville GreenWorks on workshops and bin giveaways. Check out ashevillegreenworks.org for more info!

* Meat, fish, bones, and compostable products like hot and cold cups, cutlery, and to-go containers are


Food Waste SOLUTIONS WNC
LEARN MORE ABOUT FOOD WASTE SOLUTIONS WNC!
HOW TO GET INVOLVED
FOOD WASTE RESOURCES
FOOD SCRAPS RECIPES
HOW TO DO A HOME FOOD WASTE AUDIT
Scan the QR code to access these resources and more!
@wncfoodwaste
wncfoodwaste.org
SAVE the FOOD AVL
THE CITY OF ASHEVILLE


WANT TO DROP YOUR FOOD SCRAPS HERE?
SAVE the FOOD AVL

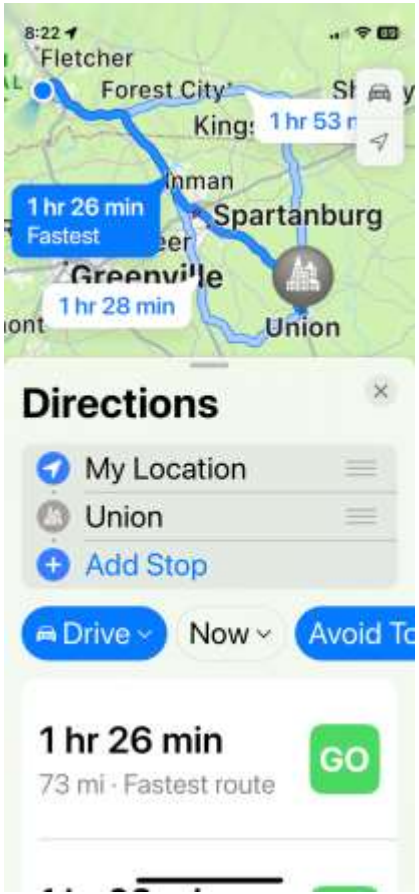
2 tons compost

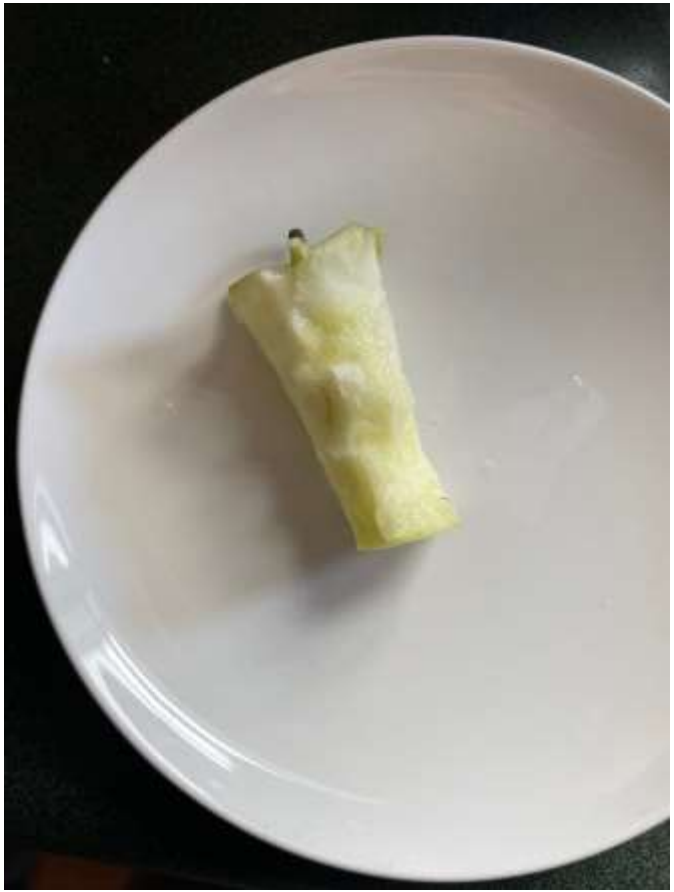
4000 tons landfill

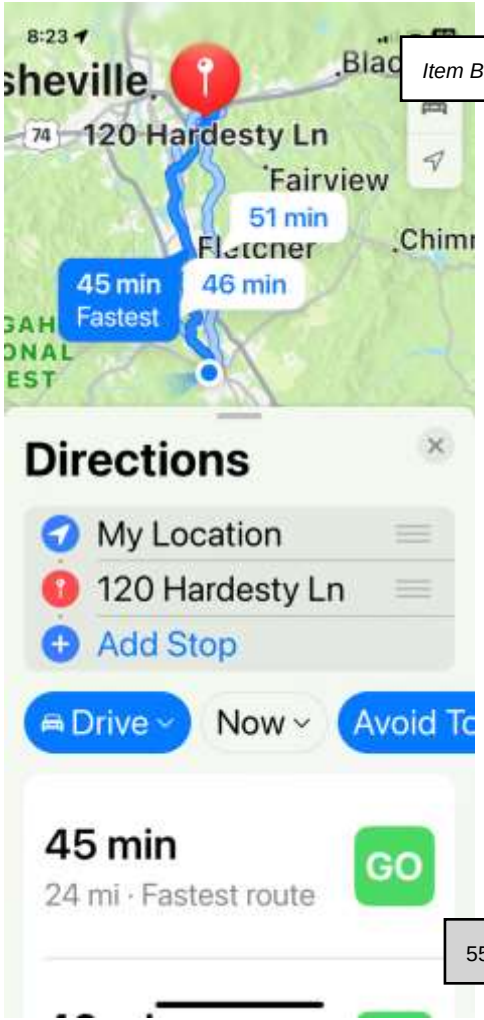
=

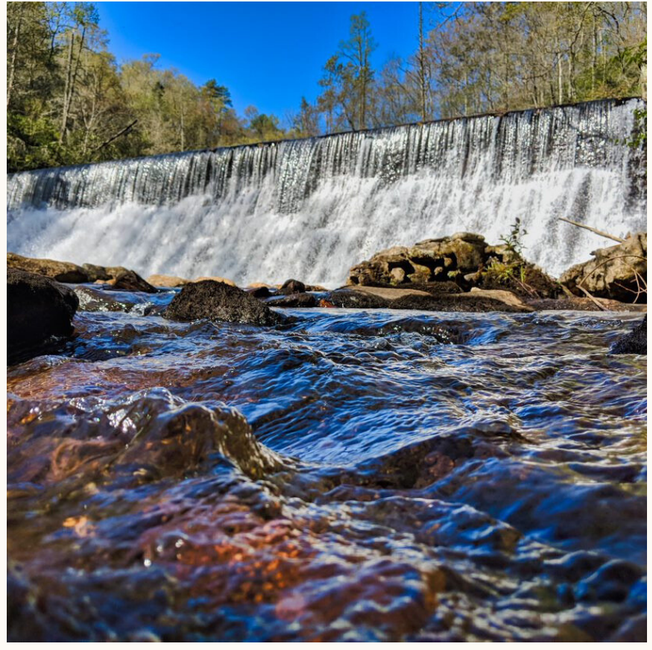
0.0005% per week

http://www.citizen-times.com/story/news/local/2014/12/08/turning-asheville-food-waste-problem-profits/20102273/









CITY OF HENDERSONVILLE

Sustainability Strategic Plan 2024

City of Hendersonville Sustainability Strategic Plan

The City of Hendersonville's City Council recognizes the following core values and beliefs related to sustainability that should be upheld as stated in Resolution R-21-53:

- The City will evaluate the environmental sustainability of all projects and programs while maintaining a solid relationship with residential and business development;
- The City believes that it is our responsibility to protect all our natural resources and the environment through the implementation of sustainable and responsible projects;
- The City must lead by example by evaluating all city operations to ensure they protect or repair the natural environment and are environmentally sustainable; and
- The City will prioritize the protection of existing tree canopy and the development of greenspaces and parks.

In order to implement these values and beliefs, the City has created this Sustainability Strategic Plan which outlines measurable goals and actions to reduce our overall impact on the environment while strengthening our communities, especially those underserved to ensure we have a prosperous future now, and for generations to come. This plan addresses challenges with a path forward on actionable and measurable opportunities to reduce the City's municipal greenhouse gas emissions, GHG.

Community members provided input at two public meetings to inform and prioritize what actions the Plan should include.

The five main focus areas for this plan include:

- Energy
- Transportation
- Waste Management
- Land Management
- Water

Within each of these focus areas are specific recommended actions designed to help reach our strategic goal of 30% reduction in greenhouse gases, GHG by 2030. This plan will be updated every 5 years to ensure our actions are ambitious yet achievable.

A Challenge & Opportunity

The principles of sustainability integrate environmental, social, and economical values into solutions to some of the world's biggest challenges: social inequity, environmental health, air pollution, increasing operational costs and more.

For the City of Hendersonville, our community character and way of life is strongly rooted in the natural environment of the Appalachian mountains. As population rates increase, we must look for opportunities to reduce our impact on the environment through integrating sustainability within city planning and operations.

The primary purpose of this Plan is to reduce the overall greenhouse gas emissions for City operations while preserving our environment. While some actions relate more to the community level such as increased bikeability and walkability infrastructure or recycling, This Plan focuses specifically on sustainability goals and actions at the municipal operational level with recommendations for residents, businesses, and community members.

What Does "Sustainability" Mean?

The meaning can vary across different fields and disciplines with three constant principals: economic viability, environmental protection, and social equity. For the City of Hendersonville, we must have smart growth that is both economically sound while respecting our environment for the collective community.

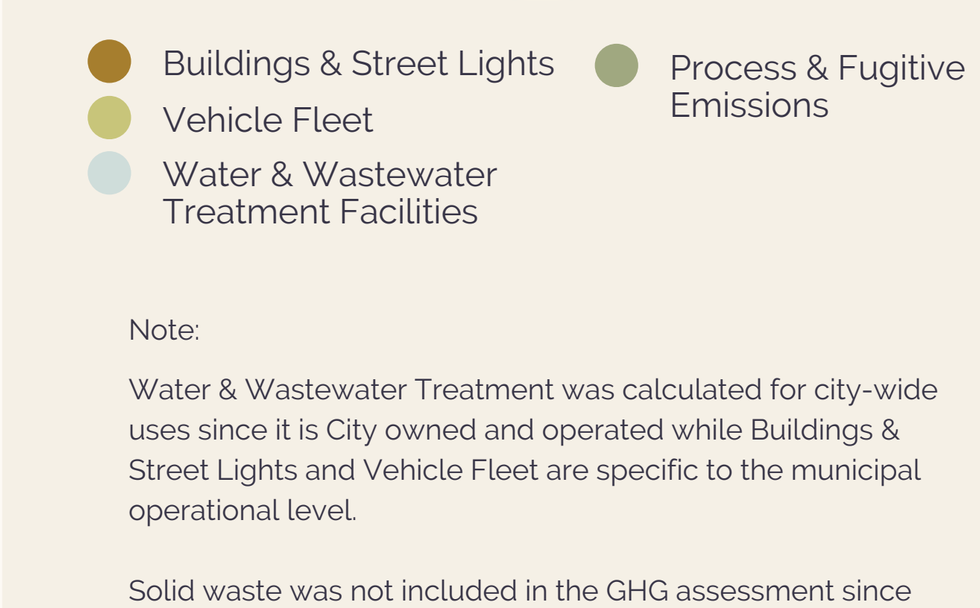
Source:
* 2030 Hendersonville Comprehensive Plan

Greenhouse Gas Assessment

In order to ensure this Plan has measurable results, a greenhouse gas assessment was completed to identify the largest sources of emissions. Assessments like these are commonly used in municipal sustainability planning to provide a benchmark of our starting point and how we would like to improve as we look to the future.

Greenhouse gas emission reduction is a necessary step in ensuring a resilient economy, environment, and community.

GHGs are gases in the earth's atmosphere that trap heat and keep our planet warm enough to sustain life. GHGs include carbon dioxide, methane, nitrous oxide, and fluorinated gases. Since the 1900's, Human activity such as burning fossil fuels has caused a dramatic increase in these gases and the trend has rapidly accelerated in recent years. When too much heat is trapped, overall temperature rises. This results in destructive weather patterns that include flooding, drought, and other natural disasters.



Note:

Water & Wastewater Treatment was calculated for city-wide uses since it is City owned and operated while Buildings & Street Lights and Vehicle Fleet are specific to the municipal operational level.

Solid waste was not included in the GHG assessment since the City does not have tracking on what is produced only for municipal operations. Furthermore, the City does not own or operate the waste transfer station or landfill. Municipal solid waste is also expected to be very small. For informational purposes, the total CO2e for City-wide solid waste is 2,208 MT CO2e.

This Sustainability Plan will help the City mitigate these challenges while realizing cost savings and improved quality of life.

For this assessment, 2021 City emissions were used as a benchmark to measure our progress and goals. 2021 is the most recent year where emission factor sets are available for measuring.

What process was used to create the GHG Assessment?

This assessment was completed through ICLEI: Local Governments for Sustainability, which is a global network of more than 2,500 local and regional governments committed to sustainable urban development. ICLEI's ClearPath model was used to complete a local government operations protocol for the quantification and reporting of greenhouse gas emissions inventories.

What was included in our GHG Assessment?

Buildings & Streets

This sector includes the emissions from energy used to operate City owned buildings, streets, lights (owned and leased), and traffic signals.

Fleet

Included are the emissions from on-road and off-road vehicles used for municipal operations ranging from garbage trucks to administrative vehicles for staff. The specific types of fuel and miles are tracked as well as the vehicle size.

Wastewater & Water Treatment

This sector accounts for the emissions from the wastewater treatment process, from pumping water to treating wastewater and drinking water,

Process & Fugitive Emissions

These emissions calculate the amount of methane that is leaking out of pipes during distribution of natural gas.

Solid waste is an important aspect of sustainable practices even though it is not included in the City's GHG assessment based on the reasons found on page 7. As a result, proposed waste reduction actions are included within this strategic plan to ensure we are making strides in reducing the City's solid waste consumption.

How do you measure GHGs?

Greenhouse gases are measured in carbon dioxide equivalent otherwise known as CO2e. Various greenhouse gases ranging from carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbons, and more. These gases are then converted to the amount of carbon dioxide in metric tons that would cause the same amount of atmospheric warming.

Energy

Overview

Energy is a necessity to power City operations. However, how we go about using energy and what sources of energy is an opportunity for not only reducing emissions but realizing financial savings in the long run.

While the City has limited authority to alter where our energy comes from, ensuring adequate building efficiency and reduced energy costs should be a top priority. In addition, we must look for opportunities to produce the City's own renewable energy where feasible such as solar energy installations on new and renovated municipal buildings while being an advocate for increased renewable energy supply from our utility providers.

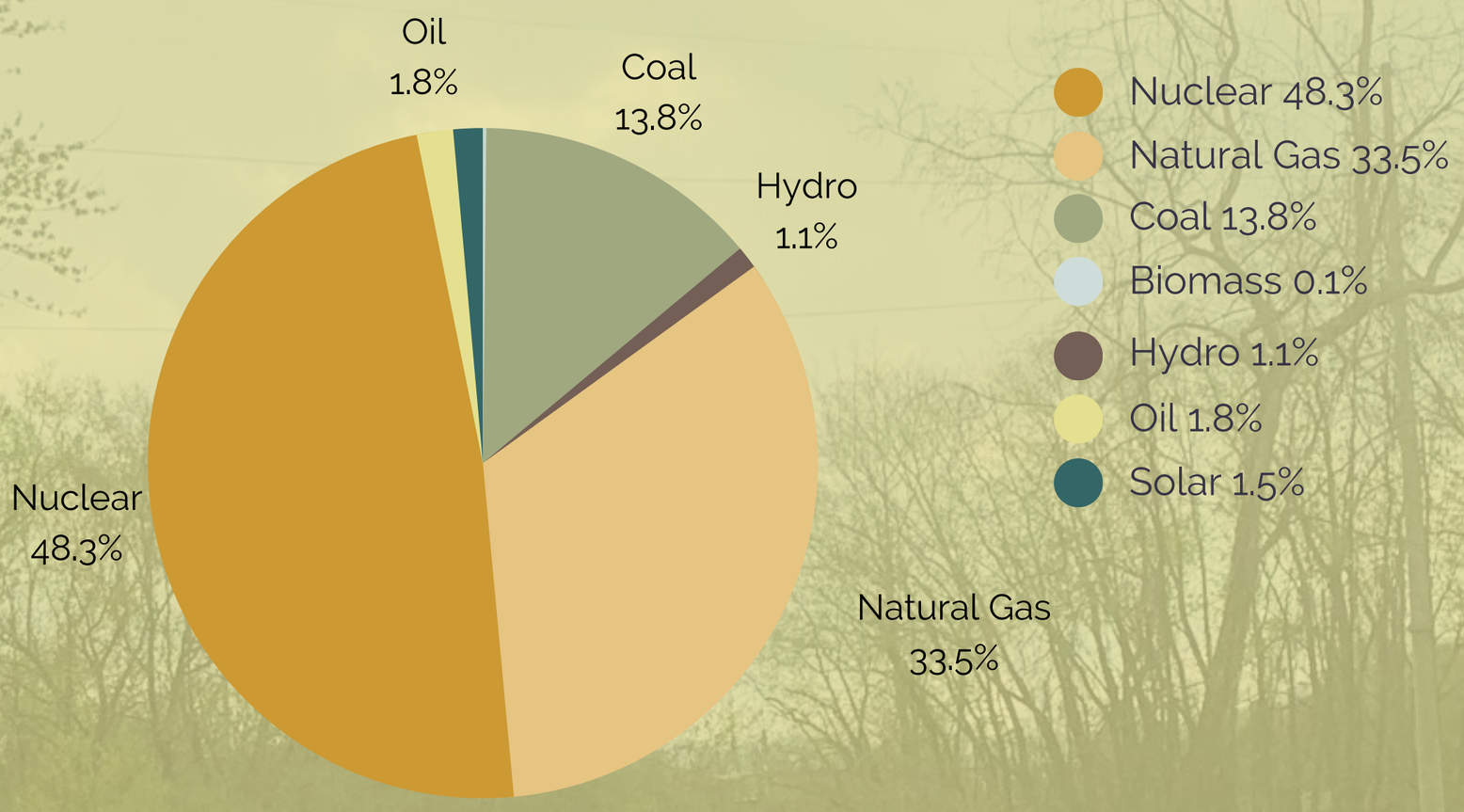
Goal

Reduce energy demand from municipal buildings & increase amount of renewable energy utilized

Actions

- ☐ Achieve 10% Renewable Energy
- ☐ Achieve 15% Energy Savings from Efficiency Upgrades
- ☐ Establish sustainable building policy

The City's current energy utility providers are Duke Energy and Dominion Energy both of which have a goal of being carbon neutral by 2050



2022 Utility Power Consumption Breakdown, MWh

Action

Achieve 10% Renewable Energy

Investing in renewable energy sources such as on-site and off-site solar will greatly reduce GHGs while increasing energy independency. As of 2022, Duke Energy sources 2.7% of solar energy with the majority of energy production from nuclear, natural gas, and coal. In order to reach the City's solar energy goal, off-site as well as on-site opportunities should be considered to ensure we bring about a cleaner, more resilient City.

Strategies to reach this action:

- Explore Duke Energy's Shared Solar Program (pending approval) and advocate for and collaborate with Duke Energy to develop more utility-scale renewable projects in our area.
- Assess current City buildings for roof mount solar, parking lots for solar carports, and park property for ground mount solar to see what is feasible and implement a policy to require all new buildings be constructed to accommodate solar panels in the future.
- Leverage Duke's goal of 70% carbon reduction by 2030 in North Carolina to achieve strategic goal while exploring on site-solar and other renewable energy options.

Off-site solar:

A few options exist to increase solar energy including Duke Energy's Shared Solar Program, which is awaiting approval and renewable energy credits, RECs which are readily available. RECs are a certified way to offset energy produced from fossil fuels by purchasing a credit from a renewable energy source which represents one megawatt-hour (MWh) of electricity generated and delivered to the electricity grid from a renewable energy resource. The Shared Solar Program would enable the City to pay for the development and operation of solar facilities (as well as program administration expenses) and in return, receive bill credits for their share of the solar energy generation

On-site solar:

On-site solar options include ground mount, rooftop, canopy, and carport. There is also a requirement with Duke Energy that the maximum power generation at any time for solar cannot exceed the peak demand of the building. Therefore, a building can not be entirely operated by on-site solar.

Estimated costs to implement

Ground mount: $1-$2/watt
Roof mount: $2.50-$3/watt
Canopy: $3-$4/watt
Carport: $3.50-$3.70/watt

Payback period for City Hall and City Operations Center for example is 18-28 years with $7,600-$11,800 in savings per building each year.

RECs (as of 2021) $6.60/MWh
Shared Solar: TBD

New Solar Installation While the City doesn't currently have any on-site solar, the new FIrestation No. 1 has multiple sustainability features such as heat island reduction with a white roof that reduces the amount of heat absorbed, light pollution reduction by using down-lighting and cut-off fixtures, as well as optimized energy performance. Also included is a 4,000 KWH per month solar voltaic system.

Sources:

* 2022 Solar Feasibility Study by RN&M Engineers
* ICLEI USA ClearPath
* Environmental America Clean Energy Pathways
* Collaborative Solar price quote

Action

Achieve 15% Energy Savings from Efficiency Upgrades

Ensuring energy efficiency begins with assessing the City's current buildings to see what opportunities are available for upgrading or retrofitting to decrease energy usage and associated emissions. Many municipal buildings within Hendersonville are several decades old and are now built to outdated energy and water standards. This is a tremendous opportunity to not only reduce emissions but also to realize financial savings from upgrades.

Strategies to reach this action:

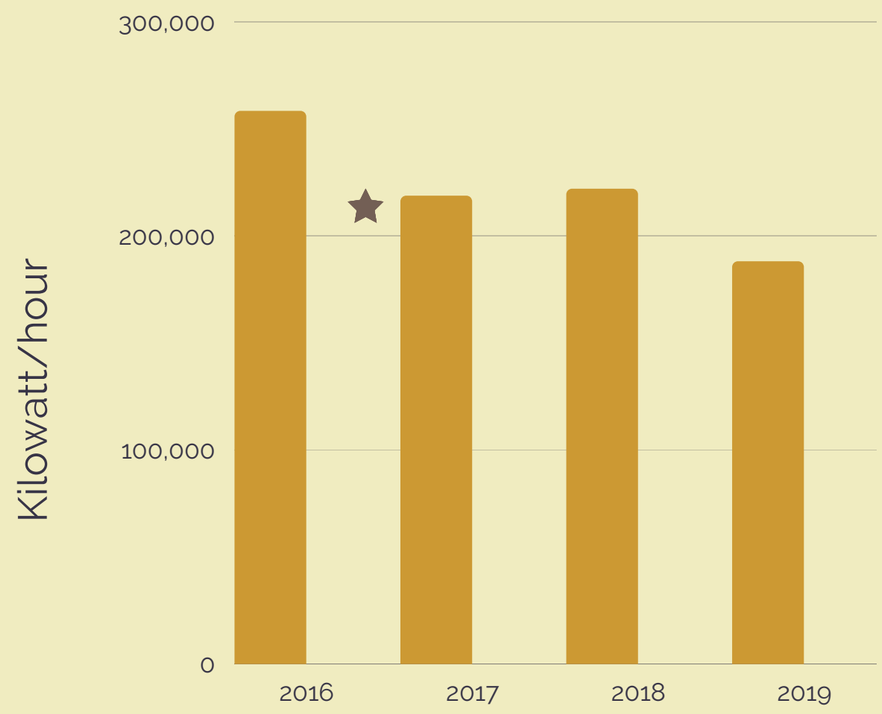
- Partner with organizations that complete energy audits such as Waste Reduction Partners and Duke Energy's Virtual Energy Assessment to see what opportunities for upgrades exist
- Prioritize upgrades that yield the most cost savings and fastest return on investment
- Complete audits at least every five years and consider tracking Energy Use Intensity (EUI) every year.
- Prioritize upgrades for Water & Wastewater Treatment facilities which account for 62.6% of the City's greenhouse gases

Energy efficiency wasn't taken into consideration for North Carolina's building code until 1978. Buildings constructed prior did not include energy standards.

Estimated costs:

At City Hall alone, estimated costs for implementing energy and water efficiency recommendations were $28,700 with $3,800 in cost savings per year and a 0.1-5.4 year payback period. This represents one example of the energy and cost savings by upgrading existing municipal buildings. In this example, lighting upgrades were free of charge due to Duke Energy's rebate program. While majority of upgrades will not be free, there is oftentimes a minimal payback period when looking at the biggest energy saving upgrades. A key outlier is Water and Wastewater Treatment facilities which can have significantly higher price points.

Case Study - LED lighting upgrades at City Operations Center, 2017



In the first year after converting all lighting in the City's Operations Center to LED, an $2,727.08 was saved in 2017.

★ After conversion

Sources:

* U.S. Office of Energy Efficiency & Renewable Energy Building Energy Codes Program * 2018 Waste Reduction Partners Energy Audits
* ICLEI USA ClearPath

Action

Establish Sustainable Building Policy

Throughout this Sustainability Strategic Plan, policy implementation will be essential to ensure our goals are efficiently met. Standard policies also provide a clear understanding of what minimum requirements must be met for municipal buildings and other sustainability practices to minimize emissions.

Often called “green building design,” many features like orientation of the building, roof material, appliances and fixtures chosen, as well as other design and construction plans determine how the building will affect the environment. By making more environmentally friendly choices for our municipal buildings, we can minimize negative environmental impacts while saving money in the long term.

Currently, there is no City policy specifying minimum sustainability or green building measures that all buildings must include. Establishing and implementing a policy with these standards will provide a multitude of emission reduction and cost saving benefits.

Strategies to reach this action:

- Consult best practices from Leadership in Energy and Environmental Design (LEED) and Energy Star standards
- Policy requirements should be rigorous but not cost prohibitive with long term cost analysis planning in mind.
- Ensure policy is updated at least every 5 years to meet new technology improvements.

Estimated costs to implement:

There are no associated costs. Policies should be updated at least every five years to ensure they are up to date with new technology and improvements.

Community Level

Adequate biking and walking infrastructure enables residents, business owners, and our community to reduce their reliance on driving internal combustion engines, thus reducing the overall emissions from the transportation sector. According to the City’s 2018 Bicycle Plan, only 0.1% of Hendersonville’s working population bikes to work. In addition, 6% of City residents do not have access to a vehicle to drive. When considering the economical benefits, increased biking and walking infrastructure has been shown to increase property value and create businesses in Western North Carolina as outdoor recreation and tourism are integral in our community’s way of life. Increasing the City’s bikeability and walkability will bring about numerous benefits including increased quality of life, equity, economical, and environmental impacts.

WILL BE COMPLETED AFTER SURVEY INPUT RECIEVED

City of Hendersonville

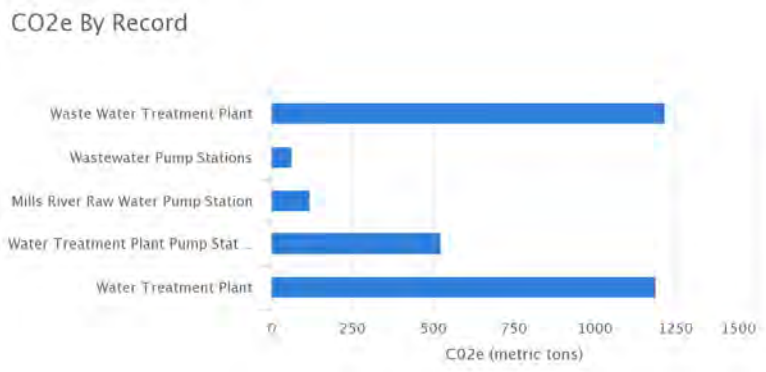
Environmental Sustainability Board

2021 Energy Overview

Current energy utility providers:

Duke Energy (all other energy used for building, streetlights, and traffic signals)

- Total energy consumption:
  - 12,350 MWh/year
  - 3,602 MT CO2e
- Dominion Energy (natural gas for heating)
  - 83,230 therms
  - 442.67 MT CO2e
- **NOTE: 77% of the total energy consumption for the City is derived from water and wastewater treatment, pumps, and facilities. Keep in mind water and wastewater treatment services municipal operations, city residents, county residents, and any other customers. Since the City owns and operates this utility (unlike solid waste), it is the City's responsibility to account for this total energy use in a greenhouse gas assessment.**
  - Breakdown:



Notes:

- CO2e is calculated by summing the three gases, CO2, CH4, and N2O and applies the global warming potential values to CH4 and N2O to express records in terms of CO2 equivalent.
- Energy audits are in the works for the Water Treatment Plant and City Operations Center
- In terms of available grants, the only ones I have seen are for low income and/or residential community solar or are only available for larger municipalities. Keep that in

mind with proposals to council; funding would likely have to come from the City and not reliant on grant funds.

Attachments:

- Greenhouse gas assessment overview
- Duke Energy 2022 breakdown (note, this document wasn't available for 2021 numbers but can be used to get an idea of Duke's energy breakdown and trends).
- 2022 Solar feasibility study
- 2018 energy audit for City Hall
- Water & Sewer sustainability initiatives (many projects relating to energy)

Considerations for proposed policy from Caitlyn/staff liaison:

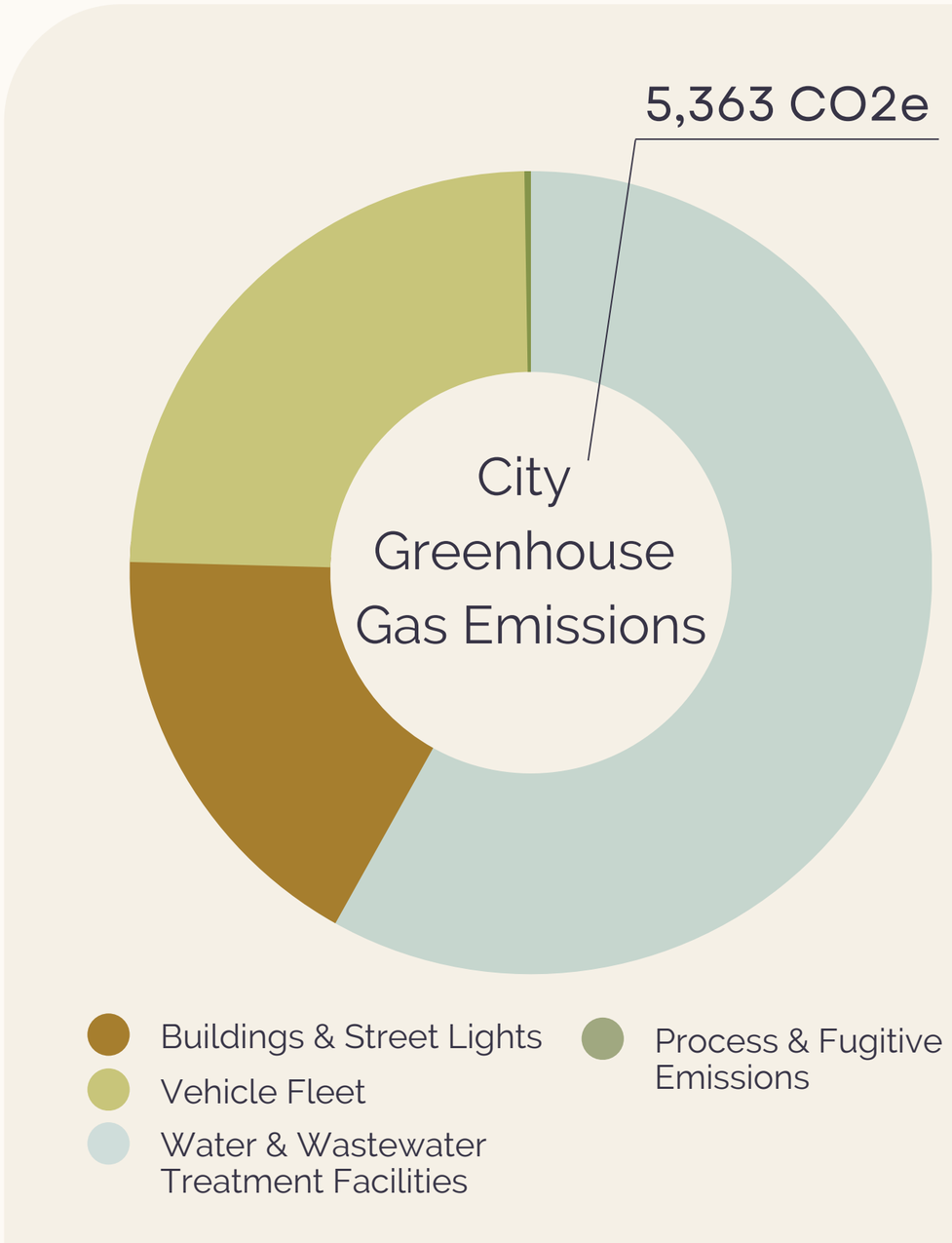
- Minimum energy efficient standards for municipal buildings (this is something that is on my to-do list that I would like to work on but I am more than happy to have ESB take the lead. Thus far this would just be for municipal buildings but if the board would like to focus on the commercial and residential sectors, that could be how we break up the responsibilities with me working on the municipal side).

Greenhouse Gas Assessment

In order to ensure this Plan has measurable results, a greenhouse gas assessment was completed to identify the largest sources of emissions. Assessments like these are commonly used in municipal sustainability planning to provide a benchmark of our starting point and how we would like to improve as we look to the future.

Greenhouse gas emission reduction is a necessary step in ensuring a resilient economy, environment, and community.

GHGs are gases in the earth's atmosphere that trap heat and keep our planet warm enough to sustain life. GHGs include carbon dioxide, methane, nitrous oxide, and fluorinated gases. Since the 1900's, Human activity such as burning fossil fuels has caused a dramatic increase in these gases and the trend has rapidly accelerated in recent years. When too much heat is trapped, overall temperature rises. This results in destructive weather patterns that include flooding, drought, and other natural disasters.



Note:

Water & Wastewater Treatment was calculated for city-wide uses since it is City owned and operated while Buildings & Street Lights and Vehicle Fleet are specific to the municipal operational level.

Solid waste was not included in the GHG assessment since the City does not have tracking on what is produced only for municipal operations. Furthermore, the City does not own or operate the waste transfer station or landfill. Municipal solid waste is also expected to be very small. For informational purposes, the total CO2e for City-wide solid waste is 2,208 MT CO2e.

This Sustainability Plan will help the City mitigate these challenges while realizing cost savings and improved quality of life.

For this assessment, 2021 City emissions were used as a benchmark to measure our progress and goals. 2021 is the most recent year where emission factor sets are available for measuring.

What process was used to create the GHG Assessment?

This assessment was completed through ICLEI: Local Governments for Sustainability, which is a global network of more than 2,500 local and regional governments committed to sustainable urban development. ICLEI's ClearPath model was used to complete a local government operations protocol for the quantification and reporting of greenhouse gas emissions inventories.

What was included in our GHG Assessment?

Buildings & Streets

This sector includes the emissions from energy used to operate City owned buildings, streets, and traffic signals.

Fleet

Included are the emissions from on-road and off-road vehicles used for municipal operations ranging from garbage trucks to administrative vehicles for staff. The specific types of fuel and miles are tracked as well as the vehicle size.

Wastewater & Water Treatment

This sector accounts for the emissions from the wastewater treatment process, from pumping water to treating wastewater and drinking water,

Process & Fugitive Emissions

These emissions calculate the amount of methane that is leaking out of pipes during distribution of natural gas.

Solid waste is an important aspect of sustainable practices even though it is not included in the City's GHG assessment based on the reasons found on page 7. As a result, proposed waste reduction actions are included within this strategic plan to ensure we are making strides in reducing the City's solid waste consumption.

How do you measure GHGs?

Greenhouse gases are measured in carbon dioxide equivalent otherwise known as CO2e. Various greenhouse gases ranging from carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbons, and more. These gases are then converted to the amount of carbon dioxide in metric tons that would cause the same amount of atmospheric warming.

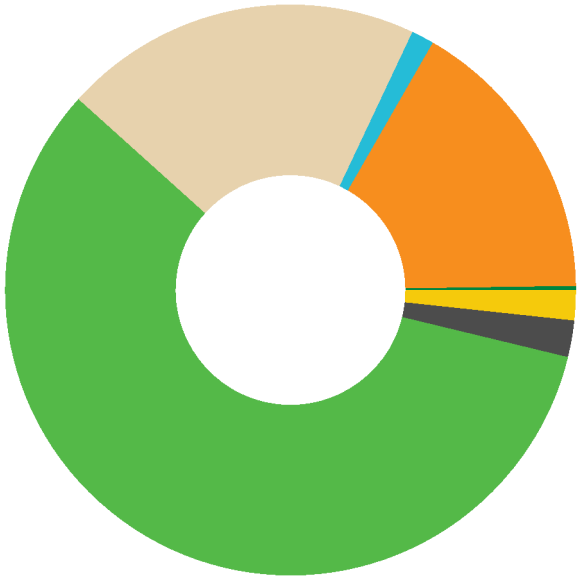
CITY OF HENDERSONVILLE - CUSTOMER

Duke Energy Carolinas

Generation Mix

YOUR 2022 TOTAL USAGE: **12,345** MWh

- 0.2% (Biomass)*
- 16.5% (Coal)
- 1.3% (Hydro)*
- 20.4% (Natural Gas)
- 57.9% (Nuclear)*
- 2.1% (Fuel/Oil)
- 1.7% (Solar)*



** Carbon-free sources*

2022 Carbon Intensity

584

lbs CO_2/MWh

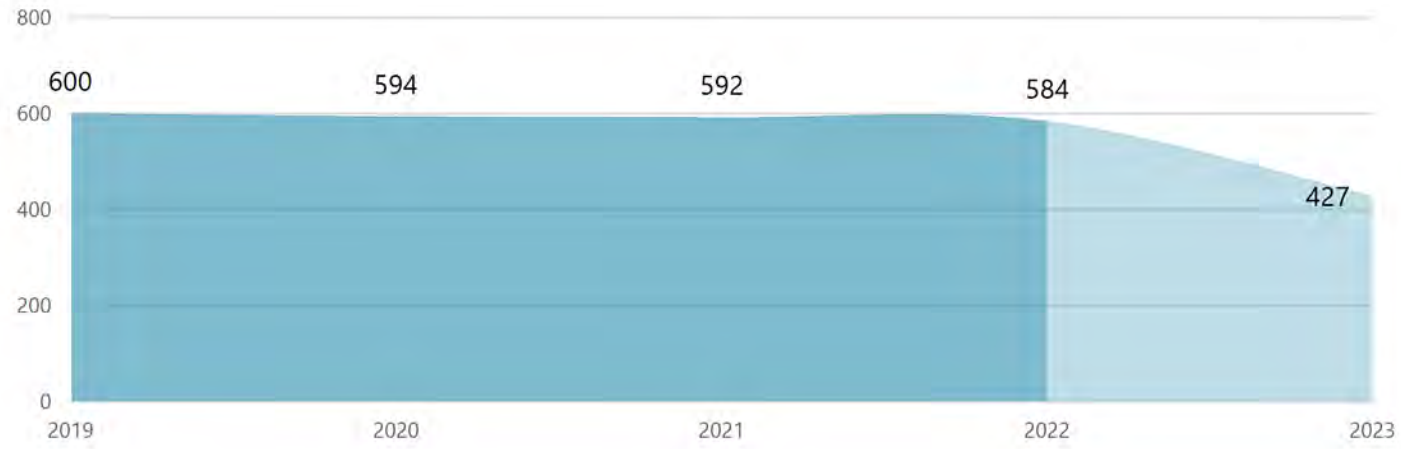
Forecast Model: Forecasting models for 2023 Carbon Intensity based on Duke Energy's Integrated Resource Plan.

Usage Data & Generation Mix: Usage data and generation mix are based on the selected calendar year. Actual usage from billing data and generation mix are used when available, otherwise projections are used to provide this reasonable snapshot.

Based on your usage and Duke Energy's carbon intensity, your 2022 carbon emissions are **7,209,199** lbs CO2

Carbon Intensity

(lbs CO_2/MWh)



Historical | Projected

Duke Energy CO_2 Emissions Reduction Goals | **By 2030** cut CO_2 emissions by at least 50% | **By 2050** attain net-zero CO_2 emissions

For options how to further impact your carbon emissions, just ask your Large Account Manager!
Report Generated By: Russo, Matt | Matt.Russo@duke-energy.com

Want to learn more about Duke Energy's Sustainability efforts? See it online: https://p-micro.duke-energy.com/esg/esg-resources. Generation mix and CO2 emissions data is based on customer's actual consumptions patterns, including time of consumption. Forward-looking statements are based on management's beliefs and assumptions. Actual results could differ materially from such forward-looking statements.

Reece, Noland & McElrath, Inc.
390 Main Street, Canton, NC 28716
Phone: 828-492-0677
MAIL@RNM-ENGINEERS.COM

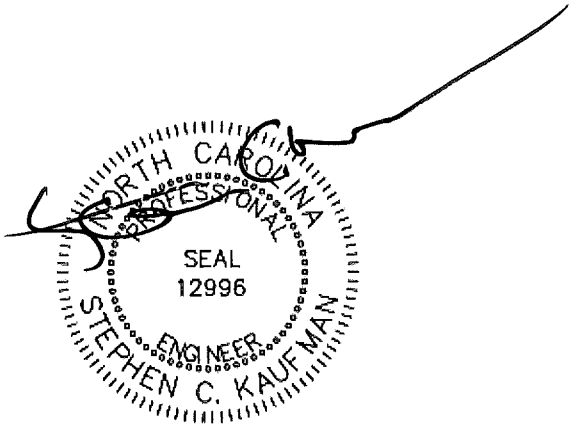
PHOTOVOLTAIC SYSTEMS FEASIBILITY STUDY

FOR

THE CITY OF HENDERSONVILLE, NORTH CAROLINA

CITY HALL AND OPERATIONS CENTER FACILITIES

OCTOBER 26, 2022



Hendersonville City Hall/Operations Center PV study

According to PVWatts Calculator (nrel.gov), the following solar characteristics can be used to estimate solar panel power production in this region:

- Average efficiency for Hendersonville's zip code: 14%
- Solar radiation available for PV panels: 1kW/sq. meter

Therefore, estimated solar power production is: 140 W/sq. meter of panels installed.

City Hall

Site info: Area of parking spaces (est.): 352 sq. meters

The solar calculator estimated the following monthly power production:

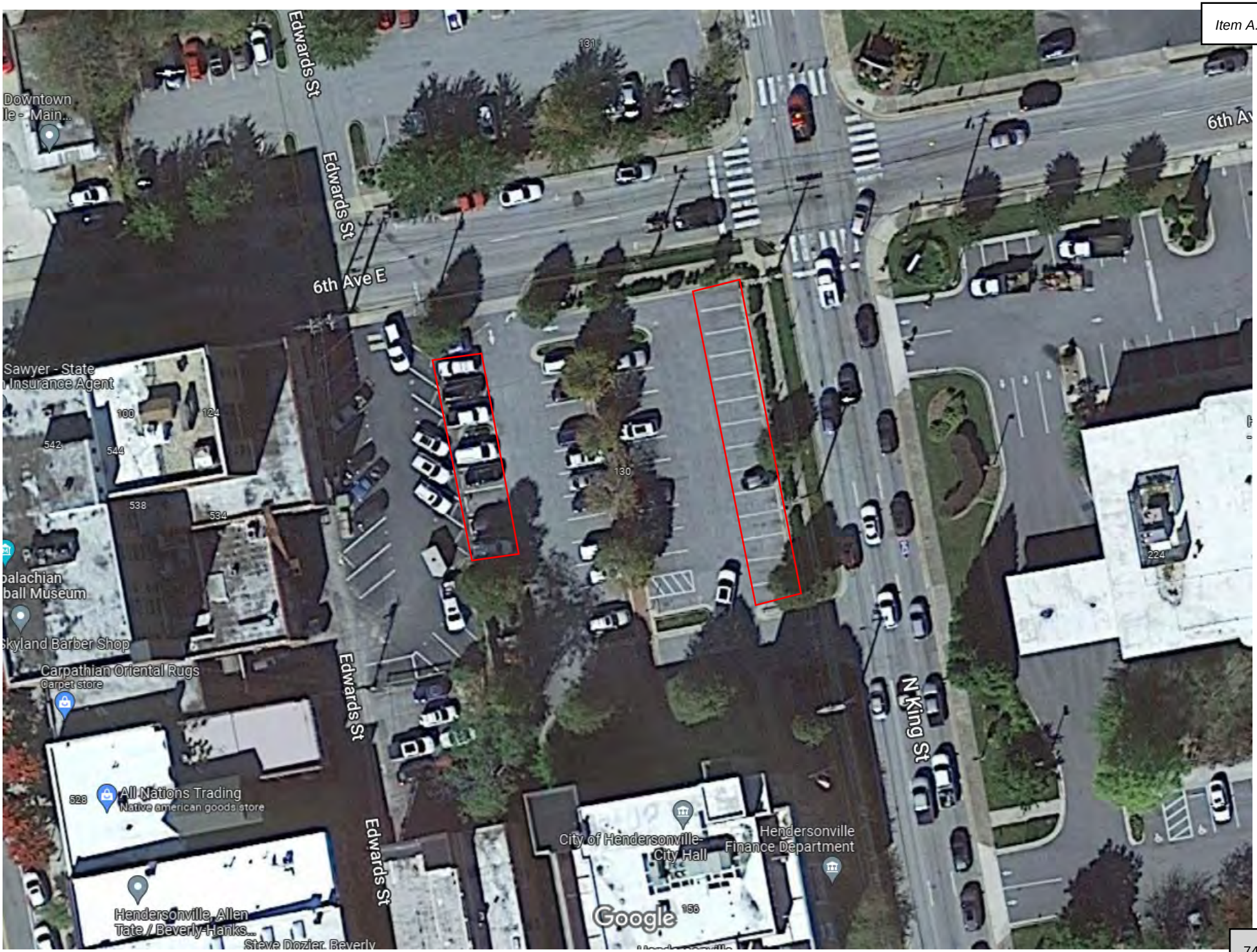
year	month	est. Solar output (kWh)
2021	9	6,532.82
2021	10	5,645.70
2021	11	4,702.40
2021	12	3,690.43
2022	1	4,031.16
2022	2	4,545.95
2022	3	6,072.57
2022	4	6,894.44
2022	5	7,426.04
2022	6	7,489.45
2022	7	7,506.63
2022	8	7,223.87
	Total (kWh)	**71,761.46**

To estimate new power demand and payment, the estimated solar output above was subtracted from the past year's power consumption for both city hall and parking ops. The same rates were used for the residual demand. This would best demonstrate monthly power cost if solar panels were installed and functioning as expected:

year	month	Existing power bill	new power bill
2021	9	$ 3,013.48	$ 2,315.65
2021	10	$ 2,069.50	$ 1,559.86
2021	11	$ 1,552.55	$ 1,149.04
2021	12	$ 1,587.06	$ 1,233.00
2022	1	$ 1,454.01	$ 1,103.95
2022	2	$ 1,805.85	$ 1,166.65
2022	3	$ 1,835.61	$ 1,129.09
2022	4	$ 1,827.51	$ 1,066.03
2022	5	$ 1,923.45	$ 1,306.24
2022	6	$ 2,919.51	$ 1,990.32
2022	7	$ 2,895.66	$ 1,954.49
2022	8	$ 2,766.50	$ 2,036.83
Total		**$ 25,650.69**	**$ 18,011.14**

Total estimated savings over the year: $7,639.55

Reference area layout for panels:


Edwards St
6th Ave E
N King St
Downtown
Sawyer - State
Insurance Agent
Carpathian Oriental Rugs
Carpet store
All Nations Trading
Native american goods store
Hendersonville, Allen
Tate / Beverly-Hanks...
City of Hendersonville-
City Hall
Hendersonville
Finance Department
Google
100
124
542
544
538
534
130
224
528
156

Operations Center

Current site info: Area of parking spaces (est.): 395 sq. meters

The solar calculator estimated the following monthly power production:

year	month	est. Solar output (kWh)
2021	9	7,192.77
2021	10	7,064.73
2021	11	5,917.94
2021	12	5,034.75
2022	1	5,873.99
2022	2	5,945.44
2022	3	7,649.42
2022	4	7,555.21
2022	5	8,364.17
2022	6	8,041.70
2022	7	7,713.88
2022	8	7,798.38
	Total (kWh)	**84,152.37**

To estimate new power demand and payment, the estimated solar output above was subtracted from the past year's power consumption for both city hall and parking ops. The same rates were used for the residual demand. This would best demonstrate monthly power cost if solar panels were installed and functioning as expected:

year	month	Previous power bill	new power bill
2021	9	$ 1,654.93	$ 1,013.47
2021	10	$ 1,341.74	$ 716.99
2021	11	$ 1,096.29	$ 580.36
2021	12	$ 1,082.38	$ 625.78
2022	1	$ 1,123.66	$ 620.88
2022	2	$ 1,142.06	$ 636.44
2022	3	$ 1,188.94	$ 561.11
2022	4	$ 1,119.76	$ 464.99
2022	5	$ 1,320.06	$ 601.31
2022	6	$ 1,924.96	$ 1,226.18
2022	7	$ 2,048.34	$ 1,379.91
2022	8	$ 1,914.26	$ 1,242.11
Total		**$ 16,957.38**	**$ 5,145.27**

Total estimated savings over the year: $11,812.11

Reference area layout for panels:


Williams St
122
Williams St
5
City Operation Center
Williams St
Hendersonville Engineering
451
Williams St
Google
Catherine Gillet

Operations Center- Future lot PV study

In order to be in compliance with Duke Energy, there are certain criteria that have to be taken into consideration. Their requirements for solar power production are such as the maximum power generation at any time cannot exceed the peak demand of the building. Due to the yearly fluctuation of solar power production, any additional solar in the future lot could risk exceeding maximum demand in its peak production season. Therefore, it is our recommendation that solar canopies are not installed in this lot.

Cost estimations:

Canopy solar pricing appears to be quite limited in this area. Therefore, we utilized online estimates. These are not an actual indication of the true cost of construction and installation. Prices may vary.

Reference: How Much do Solar Canopies Cost? | EnergyLink (goenergylink.com)

Estimated price per watt: $3.45 to 3.99$

Cost with this estimate:

- City hall (53kW): $182,850-211,470
- Operations Center (59.2 kW): $204,240-295,408

Reference: Solar Carport Cost 2022 | Avg Price Per Watt - AE, LLC (powersolarphoenix.com)

Estimated price per watt: $3.72

Cost with this estimate:

- City hall (53kW): $197,160
- Operations Center (59.2 kW): $220,224

Reference: Solar Carports: What They Are And Benefits (greenlancer.com)

Estimated price per watt: $3.45

Cost with this estimate:

- City hall (53kW): $182,850
- Operations Center (59.2 kW): $204,240

Based on these estimates, the initial cost range of these arrays are:

City Hall: $182,850-211,470

Operations center: $204,240-295,408

Simple Payback period

With these estimations, the payback period range is:

City hall: 18-25 years

Operations Center: 24-28 years

Business Partner Id: 1102498263

From Date: 10/01/2021 to Date: 09/30/2022

Charge Bill Year	Charge Bill Month	Contract Account Name	Premise Street Address	Premise State	Total Dollars	Total KWH	Cost Per KWH
2021	9	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,654.93	20,869.88	$0.0741
2021	10	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,341.74	16,511.24	$0.0759
2021	11	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,096.29	13,645.76	$0.0751
2021	12	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,082.38	13,204.20	$0.0766
2022	1	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,123.66	14,379.24	$0.0730
2022	2	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,142.06	14,736.00	$0.0724
2022	3	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,188.94	15,453.40	$0.0719
2022	4	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,119.76	13,601.88	$0.0769
2022	5	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,320.06	16,483.08	$0.0748
2022	6	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,924.96	25,239.16	$0.0713
2022	7	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$2,048.34	27,597.32	$0.0694
2022	8	CITY OF HENDERSONVILLE	305 WILLIAMS ST	NC	$1,914.26	25,492.20	$0.0702
2021	9	CITY HALL	160 6TH AVE E	NC	$3,013.48	36,684.48	$0.0768
2021	10	CITY HALL	160 6TH AVE E	NC	$2,069.50	29,172.96	$0.0663
2021	11	CITY HALL	160 6TH AVE E	NC	$1,552.55	22,544.56	$0.0644
2021	12	CITY HALL	160 6TH AVE E	NC	$1,587.06	21,849.52	$0.0679
2022	1	CITY HALL	160 6TH AVE E	NC	$1,454.01	21,526.40	$0.0631
2022	2	CITY HALL	160 6TH AVE E	NC	$1,805.85	21,024.00	$0.0708
2022	3	CITY HALL	160 6TH AVE E	NC	$1,835.61	23,604.96	$0.0644
2022	4	CITY HALL	160 6TH AVE E	NC	$1,827.51	23,370.96	$0.0647
2022	5	CITY HALL	160 6TH AVE E	NC	$1,923.45	27,187.60	$0.0661
2022	6	CITY HALL	160 6TH AVE E	NC	$2,919.51	33,574.96	$0.0763
2022	7	CITY HALL	160 6TH AVE E	NC	$2,895.66	32,628.64	$0.0778
2022	8	CITY HALL	160 6TH AVE E	NC	$2,766.50	34,059.52	$0.0759

Waste Reduction Partners

ENERGY ASSESSMENT

City of Hendersonville
City Hall

CONFIDENTIAL REPORT PREPARED BY:

Waste Reduction Partners

ASSESSMENT TEAM:

Tom Wooten, Hendersonville Public Works Director
Larry Reeves, Hendersonville Building Maintenance Supervisor
Terry Smith, Hendersonville Building Maintenance Technician
Jean Young, Hendersonville Accounts Payable
George Tregay, Waste Reduction Partners
Barry Hanak, Waste Reduction Partners

SPONSORED BY:

NC Department of Environmental Quality
Division of Environmental Assistance
and Customer Service

EPA

EPA United States Environmental Protection Agency

DATES:

Survey: May 23, 2018

Report: June 26, 2018

Disclaimer

This report is intended to convey information and guidance for identifying opportunities and options for organizational improvements, energy reduction and cost savings. Neither any WRP team member, the Land of Sky Regional Council (LOSRC), nor any funding agency shall be held liable for any statements, written or oral, included in this report, nor be held liable for any damages resulting from the assessment reported herein. Compliance with environmental and occupational safety and health laws is the sole responsibility of each business. All legal and regulatory references within this document are intended only for informational purposes and are not to be taken as reliable sources of legal reference. Clients should contact the appropriate legal and regulatory authorities for current regulatory requirements as well as for interpretation and implementation. All references and vendor materials (when available) mentioned in the report are included in this disclaimer. Mention of a vendor, brand name, or manufacturer does not represent an endorsement by LOSRC, the WRP program, nor any funding agency. Neither the LOSRC, WRP personnel, nor the authors of this report are responsible for practices or procedures implemented by individual firms. Recommendations are given as options only and are to be implemented by the firm at its discretion.

The value of any assessment is dependent upon the number of recommendations implemented. Waste Reduction Partners provides its services at no or reduced cost to the customer and is funded by grants and donations from various governmental and industry constituents. All clients are encouraged to evaluate the value of this service and consider supporting Waste Reduction Partners to continue providing this valuable service to other NC organizations. Tax-deductible donations can be made to the "Land of Sky Regional Council" to support the work of Waste Reduction Partners.

This report was prepared for:
Tom Wooten, Hendersonville Public Works Director
305 William Street, Hendersonville, NC 28792
828/697-3084

This report was prepared by:
Waste Reduction Partners
www.wastereductionpartners.org

Land of Sky Regional Council
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Asheville, NC 28806
828-251-6622

Author(s):
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Barry Hanak, bhanak@wrpnc.org

TABLE OF CONTENTS

Assessment - Executive Summary

Introduction

The City Hall for Hendersonville is located on 5th Avenue East. Tom Wooten, Director of Public Works, requested that Waste Reduction Partners conduct an energy and water assessment of the City Hall. Larry Reeves, Building Maintenance Supervisor, and Terry Smith, Building Maintenance Technician, escorted George Tregay and Barry Hanak of Waste Reduction Partners (WRP) on a walk through assessment of the building on May 23, 2018. Jean Young, Accounts Payable, provided information on the electric billing.

Facility Description

The City Hall was built in 1928, but has been remodeled extensively with many aspects dating from 2000 or more recent. The building area was estimated to be 30,895 sq. ft. on four floors. The first floor is accessed from the parking lot and is used by the customer service department and the police (24/7). The second floor has the original entrance on 5th Avenue, a large lobby, City Council Chambers, and administrative functions. The third floor has offices for city departments. The fourth floor was originally the jail, but has been completely remodeled for Police Department offices.

Occupancy of the building is about 20 staff in Administration, Finance and Human Resource departments, present about 50 hours per week. The Police Department has a staff of about 55 with operations 24/7 from the City Hall. Police officers are working outside the building a portion of the time. To gage building the building usage, it was assumed that there was an average occupancy of 8 police staff for 168 hours per week.

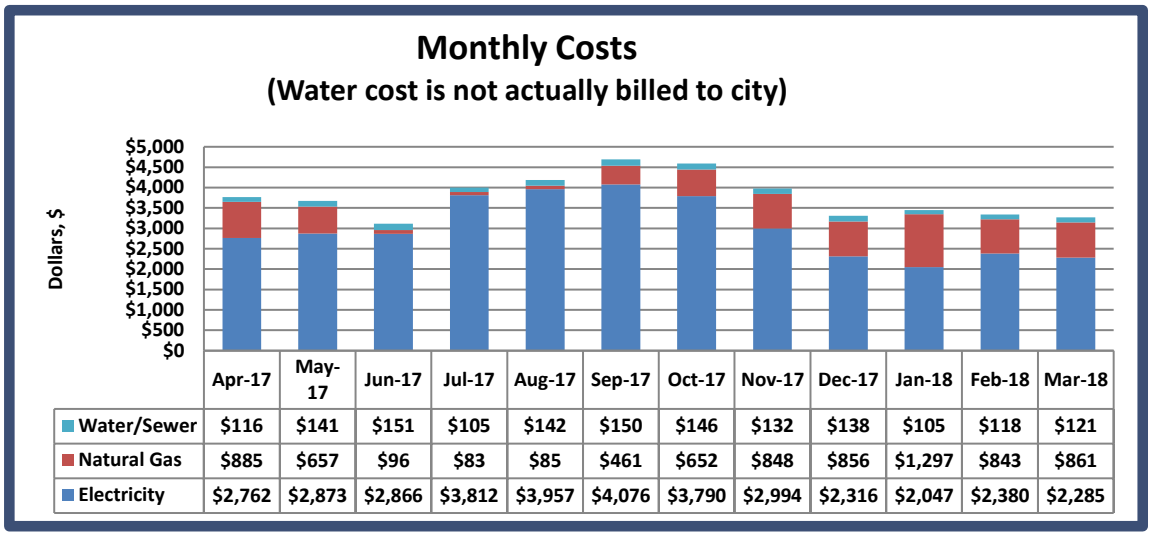
Summary of Energy Benchmarks

The average energy consumption per square foot (Energy Index) of heated and cooled space is about 83 thousand Btu/sq.ft./year. That value is similar to that for an office building. Considering the 24/7 operation of the police department, the assessors judge the overall efficiency to be very good.

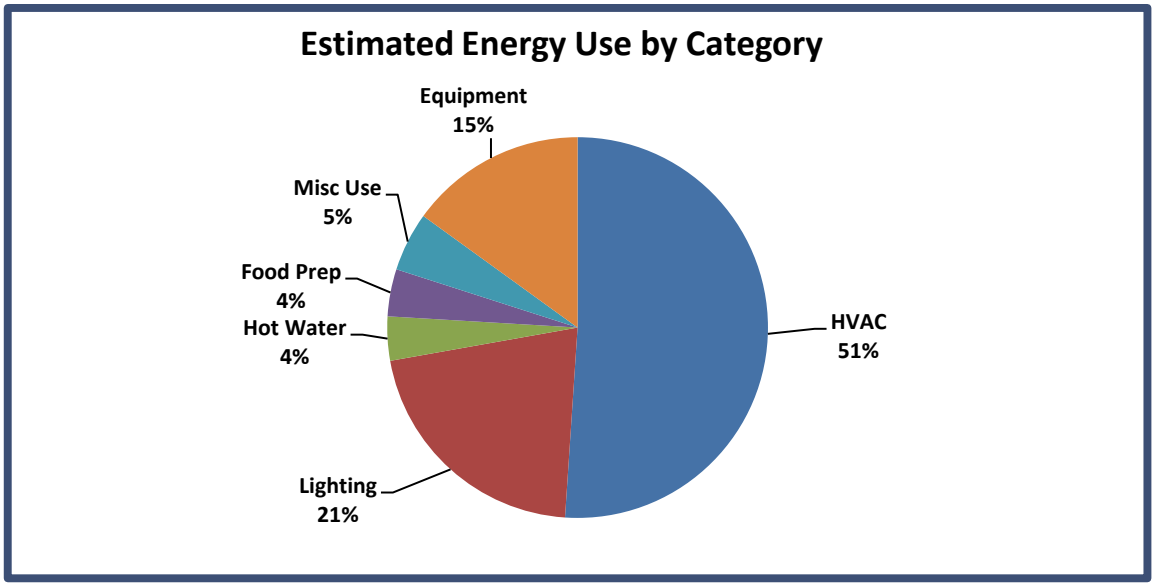
Hendersonville does not charge itself for water and sewer. For this report, however, these costs were calculated to give a value to the effective benefits of water efficiency measures.

The monthly costs are shown below and the estimated distribution of energy usage illustrated in the pie chart.

Summary of Energy Benchmarks		
Total Energy Consumed:	2,572	Million Btu / yr
Total Energy Index:	83	kBtu / sq ft / yr
Total Energy Cost:	43,784	$ / yr
Total Energy Cost Index:	1.42	$ / sq ft / yr



	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
Water/Sewer	$116	$141	$151	$105	$142	$150	$146	$132	$138	$105	$118	$121
Natural Gas	$885	$657	$96	$83	$85	$461	$652	$848	$856	$1,297	$843	$861
Electricity	$2,762	$2,873	$2,866	$3,812	$3,957	$4,076	$3,790	$2,994	$2,316	$2,047	$2,380	$2,285



Summary of Findings and Recommendations

Estimated Annual Cost & Energy Savings			
Energy Cost Savings, $ / Year	$3,369	Electricity Savings, kWh/yr.	44,800
Water Cost Savings, $ / Year	$472	Natural Gas Savings, Therms/yr.	77
Total Cost Savings, $ / Year	$3,840	Fuel Oil Savings, Gallons/yr.	0
Energy Savings, MMBTU / Year	161	Propane Savings, Gallons/yr.	0
		Water Savings, Gallons / Year	55,163

Estimated Annual Emissions Reductions	
Carbon Equivalent, (CO_2e) - Greenhouse Gases, Pounds/Year	49,272
Nitrogen Oxides, (NO_X) - Precursor to Ozone, Pounds/year	37
Sulfur Oxides, (SO_X) - Contributes to Acid Rain, Pounds/Yr	91

Summary of Recommendation Measures

Energy Efficiency Recommendations	Cost Savings / yr.	Investment Cost	Payback Period (yr)	mmBtu Saved
Upgrade recessed can lights from CFL to LED	$193	$992	5.2	9
Upgrade 4 ft. fluorescent fixtures to LED	$3,176	$17,220	5.4	144

Water Efficiency Recommendations	Water Saved (gal/yr)	Cost Savings per Year	Investment Cost	Payback Period (years)	mmBtu Saved/yr
Replace the aerators in the 19 bathroom sinks with 0.5 gpm aerators.	12,906	$151	$95	0.6	7
Replace the two showers with 2.0 gpm units.	1,825	$21	$20	0.9	1
Replace the current 1.6 gpf toilets with 1.28HE gpf toilets.	7,008	$52	$7,650	TBD	0
Replace the current one gpf urinals with 0.125 gpf urinals.	28,744	$213	$2,700	TBD	0
Reduce flowrate in kitchen sink to 1.5 gpm	4,680	$35	$5	0.1	0
Totals for Energy		**$3,369**	**$18,212**		**153**
Totals for Water	**55,163**	**$472**	**$10,470**		**8**
GRAND TOTALS FOR ALL RECOMMENDED EFFICIENCY MEASURES		**$3,840**	**$28,682**		**161**

Optional Measures and Future Choices

City Hall has received multiple upgrades and has a high level of energy efficiency. HVAC upgrades are already planned and not included in this report. The T8 fluorescent and CFL lighting is reasonably efficient, however, LED technology has made tremendous advances and should be considered for further energy use reductions.

The City has already converted to LED fixtures at the Operations Center and Fire Station. The assessors recommend a follow up evaluation of lessons learned before starting on the City Hall. For example, did the LED fixtures cause any areas to become overlit? A review of before and after electric usage for Operations Center and Fire Station is encouraged. How well do the reductions at Operations and Fire Station correlate with expectations of the LED upgrade? This information will allow a more informed evaluation of proposed LED upgrades to City Hall.

Assessment Report

Background

The City of Hendersonville has a population of 14,000 with the City Hall located on 5th Avenue East. Tom Wooten, Director of Public Works, requested that Waste Reduction Partners conduct an energy and water assessment of the City Hall. Larry Reeves, Building Maintenance Supervisor, and Terry Smith, Building Maintenance Technician, escorted George Tregay and Barry Hanak of Waste Reduction Partners (WRP) on a walk through assessment of the building on May 23, 2018. Jean Young, Accounts Payable, provided information on the electric billing.

Facility Description

The City Hall was built in 1928 but has been remodeled extensively with many aspects dating from 2000 or more recent. The area was estimated to be 30,895 sq. ft. on four floors. The first floor is accessed from the parking lot and is used by Customer Service Department and the Police Department (24/7). The second floor has the original entrance of 5th Avenue, a large lobby, City Council Chambers, and administrative functions. The third floor has offices for city departments. The fourth floor was originally the jail, but has been completely remodeled for Police Department offices.

Occupancy of the building is about 20 staff in Administration, Finance and Human Resource departments and they would be present about 50 hours per week. The Police Department has a staff of about 55 with operations 24/7 from the City Hall. Police officers are working outside the building a portion of the time. To gage building the building usage, it was assumed that there was an average occupancy of eight police staff for 168 hours per week.

Energy Efficiency Recommendations

Utility Use Analysis

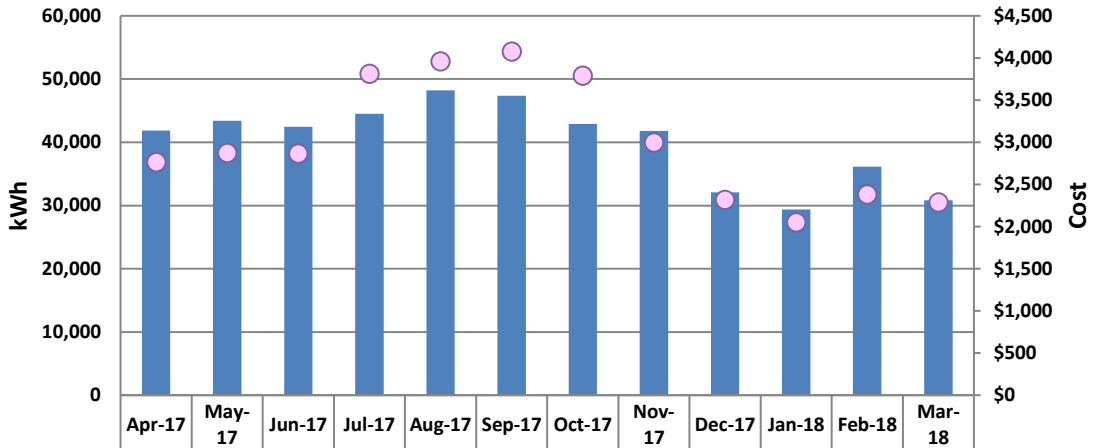
Electricity accounts for 64% of the energy usage and is purchased from Duke Energy Carolinas under the OPT-V Time-Of-Use Secondary General Service schedule. A total of 480,860 kWh was used from April 2017 to March 2018 at a cost of $36,159. The billing is broken down into the following categories:

Basic Facilites charge	$32.17	
Demand Charge per kW	$16.6190	June 1 – September 30 (Summer)
	$9.0765	October 1 – May 31 (Winter)
Energy Charge per kWh	$0.06284	On-Peak Mon/Fri (1 to 9 PM Summer), (6 AM to 1 PM Winter)
	$0.03386	Off-Peak All other weekday hours, Saturday, Sunday, and holidays
Renewable energy rider and 7% sales tax		

During the winter, the effective rate is about $.07 per kWh; however, the high demand rate in the summer raises the effective rate to about $0.085 per kWh. Air conditioning causes the highest usage and is charged at the higher rate. Thus, upgrading air conditioning (planned) will have the largest impact on electric cost.

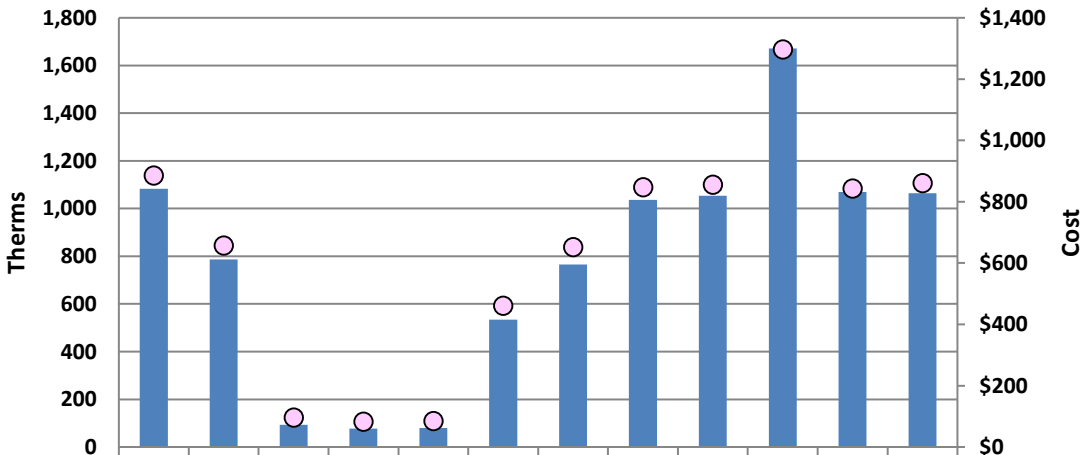
Natural gas accounts for 36% of the energy usage and is purchased from PSNC. A total of 9,313 therms were consumed in the last year at a cost of $7,625. The usage is primarily for heating as illustrated in the figure below.

Electricity Usage and Cost



	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
kWh	41,833	43,413	42,449	44,498	48,218	47,369	42,889	41,808	32,061	29,374	36,124	30,824
Cost	$2,762	$2,873	$2,866	$3,812	$3,957	$4,076	$3,790	$2,994	$2,316	$2,047	$2,380	$2,285

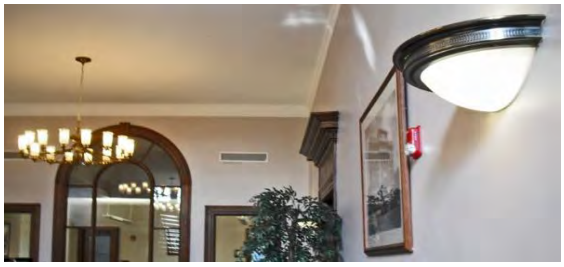
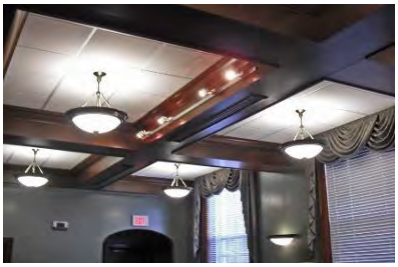
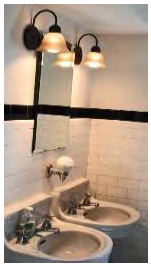
Natural Gas Usage and Cost



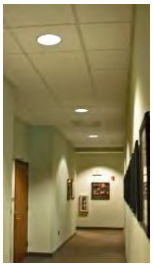
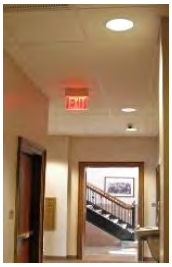
	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
Therms	1,083	787	93	77	80	534	765	1,036	1,054	1,671	1,069	1,064
Cost	$885	$657	$96	$83	$85	$461	$652	$848	$856	$1,29	$843	$861

CFL Lighting Details - Upgraded to LED

The building has a wide variety of architectural light fixtures that use CFL bulbs. These are best addressed by identifying an LED replacement and installing when the CFL bulb burns out.

There are an estimated 32 can fixtures in the hallways. If these are upgraded as a group with a LED upgrade kit, then rebates can be utilized.

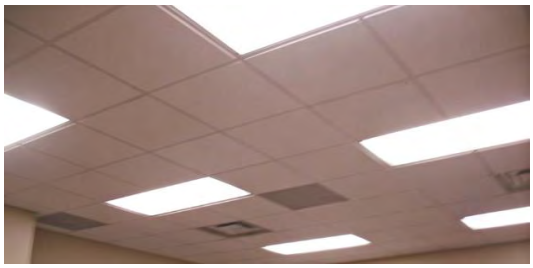
Details of Recommendations - Incandescent Lighting Upgraded to LED

Upgrade for Incandescent Lighting to LED			Energy Savings				Cost Comparison						Payback
							Investment Cost			Annual Savings			
Location Key	Before	After	Watt Red'n Per Lamp	Est. Hours ON per Year	No. of Lamps to be Repl'd	KWH Saved Per Year	Material	Labor	Total	Energy	Maintenance	Total	Years
	CFL can	LED kit	16.0	5,000	32	2,560	$672	$320	$992	$193	$0	$193	5.2
				TOTAL	**32**	**2,560**	**$672**	**$320**	**$992**	**$193**	**$0**	**$193**	**5.2**

Contact a lighting supplier for recommendations and pricing on a LED kit that would provide an acceptable light level. There is a huge variety of products available with widely varying pricing. The values listed above are an example assuming replacing 32 26 W CFL bulbs with a 10W LED kit costing $25 with $10 labor and a $4 rebate. The 5,000 hours per year is a guess assuming some hallways are lit all the time and some are shut off at night. The Duke rebate assumes the kit is on the Design Lights Consortium list or Energy Star list (may be listed under fixtures-recessed lighting).

Fluorescent Lighting Details - Upgraded to LED

The majority of the fixtures are for 4 ft. fluorescent tubes. These are in troffer fixtures in suspented ceiling or hanging in strip type fixtures.



LED kits have been developed that reduce four 32 W lamp fluorescent fixture (128 W) to less the 32 W total. Installation can take less than ten minutes. This type of upgrade is recommended for the troffer fixtures.

It was estimated that there are approximately 80 additional 4 ft. fluorescent tubes in a variety of fixtures (strip, stairwell, bathroom). These can be upgraded on a tube for tube basis with an energy reduction of about 50%. There are two types of LED tubes on the market: those that use a ballast compatible with the fluorescent tube and a "ballast bypass" version where the LED is wired directly to line voltage. The ballast bypass is not recommended because of the safety issue if a fluorescent tube is installed in a fixture without a ballast.

A further caution is verify that the fixture wiring (series/ parallel, shunted/nonshunted) is compatible with the LED tube. In addition, the ballast needs to be on the LED manufacturers approved list to validate the warranty.

Details of Recommendations - Fluorescent Lighting Upgraded to LED

Upgrade for Fluorescent Lighting to LED			Energy Savings				Cost Comparison						Payback
							Investment Cost			Annual Savings			
Location Key	Before	After	Watt Red'n Per Lamp	Est. Hours ON per Year	No. to be Repl'd	KWH Saved Per Year	Material	Labor	Total	Energy	Maintenance	Total	Years
	Troffer	LED kit	68.0	3,200	180	39,168	$12,420	$3,600	$16,020	$2,945	$0	$2,945	5.4
	Strip	LED tube	16.0	2,400	80	3,072	$1,200	$0	$1,200	$231	$0	$231	5.2
TOTAL					**260**	**42,240**	**$13,620**	**$3,600**	**$17,220**	**$3,176**	**$0**	**$3,176**	**5.4**

Vendor quotes are needed to obtain quantities and costs. The upgrades were roughly estimated with the following assumptions.

For each troffer, the fluorescent tubes and ballasts would be replaced by a $105 LED kit with $20 labor and $36 Duke rebate. The 68 W reduction assumes a 50/50 mix of two and four tube fluorescent fixtures are replaced an average of 28 W LED kit. The 3,200 hours reflect the mixed use of the rooms the troffers are located in.

LED tubes for the various types of strip fixtures can be purchased for less than $10. This report, however, uses a conservative estimate of $18 per tube to allow for the possible need to replace the ballast. Labor was assumed to be with City staff. The Duke rebate is $3 per tube.

HVAC Details

There are already plans for a major upgrade to HVAC equipment so this assessment did not address this area. The Fulton boiler is 14 years old and is in good working order.

Water Heating Details

There is a single gas Lochinvar water heater. No recommendations; however, be sure to evaluate higher efficiency models when replacement is needed.

Envelope Details

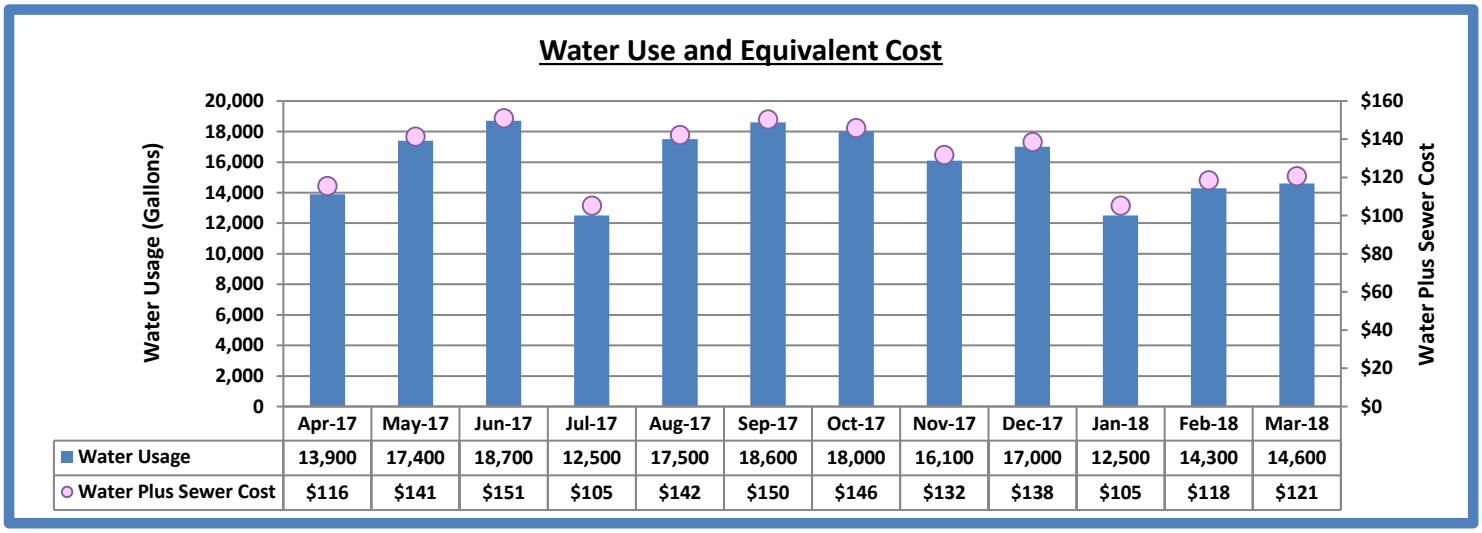
Doors and windows are relatively new and in good condition. No recommendations for this area.

Water Use Recommendations

Water Usage and Cost

Water usage was provided in 100 gallons units and converted to gallons for the figure below.

Hendersonville does not charge itself for water and sewer. This report calculates an effective cost based on $.0074 per gallon to illustrate the benefit of water savings.



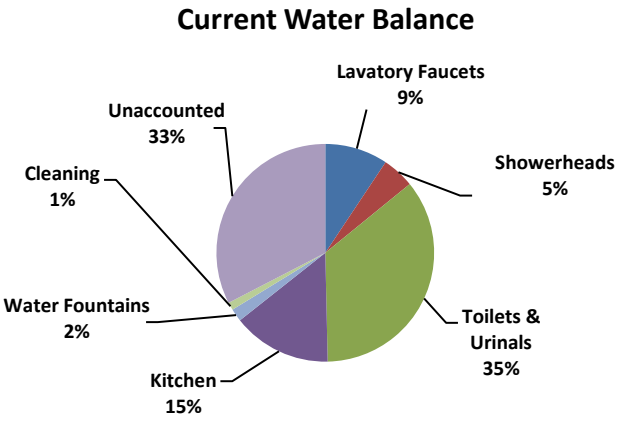
	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
Water Usage	13,900	17,400	18,700	12,500	17,500	18,600	18,000	16,100	17,000	12,500	14,300	14,600
Water Plus Sewer Cost	$116	$141	$151	$105	$142	$150	$146	$132	$138	$105	$118	$121

Water Use Analysis

The water use at City Hall is dominated by bathrooms used by staff and visitors. Estimates for water use were made for each of the categories shown in the following table and pie chart. Conservative estimates were made for bathroom use, however, these still left a third of the water use unaccounted for. If the bathroom use is actually higher than the estimates, then projected water saving will be proportionately larger.

Estimated Current and Future Water Use

Category	Current Use (Gallons/Year)	Future Use (Gallons/Year)
Lavatory Faucets	17,870	4,964
Showerheads	9,125	7,300
Toilets & Urinals	67,890	32,138
Kitchen	28,080	23,400
Laundry	0	0
HVAC	0	0
Water Fountains	3,650	3,650
Irrigation	0	0
Cleaning	2,196	2,196
Unaccounted	62,289	62,289
TOTAL	191,100	135,937



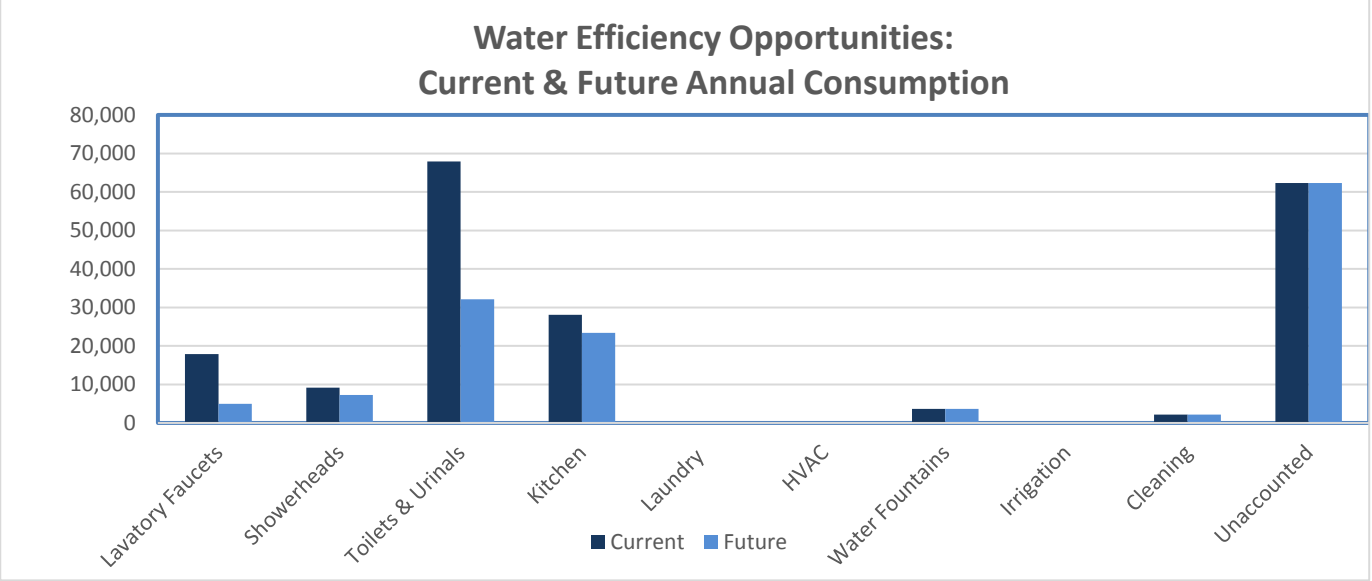
The facilities at City Hall have already reached a good level of water efficiency. There is, however, room for improvement.

Upgrades to faucets by changing the aerators would have a payback of only a few months.

Converting urinals to extremely low flow would have a payback of several years. Upgrading toilets from 1.6 to 1.28 gallons per flush is a modest reduction with a long payback. Incorporating a toilet change as part of a remodeling project should be considered.

There are only two showerheads, but the estimated flowrate is greater than needed. Installing 2.0 gpm shower heads will have an impact on reducing water use and the payback is nearly immediate.

The water savings illustrated in the chart look modest; however, the estimated annual reduction is approximately 55,000 gallons per year. The cost saving would be over $400 if the city charged itself for water. Details of these recommendations are described below.



Summary of Water Use Recommendations

Water is provided by the Hendersonville Sanitary Water & Sewer District. Areas of potential water savings were identified and listed in the following table. The City Hall is already doing a good job with water conservation and the projected savings in consumption is documented. Specifics of each individual recommendation is described in the Details Section below.

Summary of Recommendation Details

Upgrade Option	Water, Sewer, Energy Savings per Year						Upgrade Cost and Payback				
Fixture	Current Use (gallons/yr)	Percent Saved	Water Savings (gallons)	W/S Cost Savings	Energy Cost Savings	Total Cost Savings	No. of Units	Equip. Cost per Unit	Labor Cost per Unit	Total Cost	Payback yrs
0.5 Lav Faucets	17,870	72%	12,906	$ 96	$ 55	$ 151	19	$ 5	$ -	$ 95	0.6
2.0 Showerheads	9,125	20%	1,825	$ 14	$ 8	$ 21	2	$ 10	$ -	$ 20	0.9
1.28 HE Toilets	35,040	20%	7,008	$ 52	$ -	$ 52	17	$ 350	$ 100	$ 7,650	147.3
Urinals	32,850	88%	28,744	$ 213	$ -	$ 213	6	$ 350	$ 100	$ 2,700	12.7
aerator	28,080	17%	4,680	$ 35	$ -	$ 35	1	$ 5	$ -	$ 5	0.1
Total	122,965	45%	55,163	$ 409	$ 63	$ 472	0	$ 720	$ 200	$ 10,470	

Discussion of Water Efficiency Recommendations

Change the aerators on bathroom faucets from 1.5 gpm to 0.5 gpm. Cost should be less than $5 each with almost immediate payback.

Upgrade Option	Water, Sewer, Energy Savings per Year						Upgrade Cost and Payback				
Fixture	Current Use (gallons/yr)	% saved	Water Savings (gallons)	Water & Sewer Cost Savings	Energy Cost Savings	Total Cost Savings	No. of Units	Equip. Cost per Unit	Labor Cost per Unit	Total Cost	Payback yrs
0.5 Lav Faucets	17,870	72%	12,906	$96	$55	$151	19	$5	$0	$95	0.6

Install 2.0 gpm showerheads. New 2.0 shower heads can be purchased for as low as $10 each. Niagara Power Shower Heads are a good example at $10 each.

Upgrade Option	Water, Sewer, Energy Savings per Year						Upgrade Cost and Payback				
Fixture	Current Use (gallons/yr)	% saved	Water Savings (gallons)	Water & Sewer Cost Savings	Energy Cost Savings	Total Cost Savings	No. of Units	Equip. Cost per Unit	Labor Cost per Unit	Total Cost	Payback yrs
2.0 Showerheads	9,125	20%	1,825	$14	$8	$21	2	$10	$0	$20	0.9

The current toilets are 1.6 gallons per flush (code standard back in 1995); the codes for 1.6 gpf have changed since 1995. Savings could be obtained by upgrading to High Efficiency Toilets (HET) using 1.28 gallons per flush. The estimated cost saving does not warrant an immediate investment; however, the upgrade could be incorporated into the future remodeling.

Upgrade Option	Water, Sewer, Energy Savings per Year						Upgrade Cost and Payback				
Fixture	Current Use (gallons/yr)	% saved	Water Savings (gallons)	Water & Sewer Cost Savings	Energy Cost Savings	Total Cost Savings	No. of Units	Equip. Cost per Unit	Labor Cost per Unit	Total Cost	Payback yrs
1.28 HE Toilets	35,040	20%	7,008	$52	$0	$52	17	$350	$100	$7,650	147.3

Best in class water-saving urinals use only 1/8 the amount of water used by the current urinals (1 gpf). Upgrading the urinals is projected to save 28,000 gallons of water per year.

Upgrade Option		Water, Sewer, Energy Savings per Year					Upgrade Cost and Payback				
Fixture	Current Use (gallons/yr)	% saved	Water Savings (gallons)	Water & Sewer Cost Savings	Energy Cost Savings	Total Cost Savings	No. of Units	Equip. Cost per Unit	Labor Cost per Unit	Total Cost	Payback yrs
Urinals	32,850	88%	28,744	$213	$0	$213	6	$350	$100	$2,700	12.7

The kitchen sink water flow should be restricted to 1.5 gpm with and aerator. If the current flow is 1.8 gpm and the faucest is used for 60 minutes per day, then over 4,600 gallons could be saved with a simple change.

Upgrade Option		Water, Sewer, Energy Savings per Year					Upgrade Cost and Payback				
Fixture	Current Use (gallons/yr)	% saved	Water Savings (gallons)	Water & Sewer Cost Savings	Energy Cost Savings	Total Cost Savings	No. of Units	Equip. Cost per Unit	Labor Cost per Unit	Total Cost	Payback yrs
Kitchen sink aerator	28,080	17%	4,680	$35	$0	$35	1	$5	$0	$5	0.1

Appendices

A. Facility Statistics

Square Footage	Year Constructed	Hours Occupied per Week	# of Occupants
30,895	1928	Est. 20 staff 50 hr/wk and average of 8 police 168 hr/wk	

B. Utility History

Mo / Yr	Elect-All Usage KWH	Electric Cost	Nat Gas Usage Therms	Nat Gas Cost	Oil Usage Gallons	Oil Cost	Propane Usage Gallons	Propane Cost	Water Usage Gallons	Water / Sewage Cost *
17-Apr	41,833	$2,762	$1,083	$885	0	$0	0	$0	13,900	$116
17-May	43,413	$2,873	$787	$657	0	$0	0	$0	17,400	$141
17-Jun	42,449	$2,866	$93	$96	0	$0	0	$0	18,700	$151
17-Jul	44,498	$3,812	$77	$83	0	$0	0	$0	12,500	$105
17-Aug	48,218	$3,957	$80	$85	0	$0	0	$0	17,500	$142
17-Sep	47,369	$4,076	$534	$461	0	$0	0	$0	18,600	$150
17-Oct	42,889	$3,790	$765	$652	0	$0	0	$0	18,000	$146
17-Nov	41,808	$2,994	$1,036	$848	0	$0	0	$0	16,100	$132
17-Dec	32,061	$2,316	$1,054	$856	0	$0	0	$0	17,000	$138
18-Jan	29,374	$2,047	$1,671	$1,297	0	$0	0	$0	12,500	$105
18-Feb	36,124	$2,380	$1,069	$843	0	$0	0	$0	14,300	$118
18-Mar	30,824	$2,285	$1,064	$861	0	$0	0	$0	14,600	$121
Total	**480,860**	**$36,159**	**9,313**	**$7,625**	**0**	**$0**	**0**	**$0**	**191,100**	**$1,566**

* The amount Water / Sewer would cost if City of Hendersonville billed itself for this service.

Utility	Utility Totals		Conversion to BTU Equivalents			Total Units	
Electricity	480,860	X	3,413	Btu/kWh	=	1641	Million Btu's
Natural Gas	9,313	X	100,000	Btu/Therm	=	931	Million Btu's

Total Energy Use	=	2572.475 MMBtu's
Total Sq. Ft.	=	30895.000 FT^2
Total Energy Index	=	83.265 kBtu's /sq ft
TOTAL COST INDEX	=	**1.417 $ / SQ FT**

C. Resources and Fact Sheets

Financial Incentives for Energy Projects

Duke Energy Business Incentives - Duke Progress Energy's Smart Saver Program and Small Business Energy Saver Program offer incentives for many energy efficiency upgrades, including lighting upgrades. These incentives will reduce investment cost and shorten payback periods for the upgrades. For more information, please visit:

https://www.duke-energy.com/business/savings

Waste Reduction Partners Technical Publications

Waste Reduction Partners has created a number of technical publications to help you pursue your utility cost-saving and environmental goals. Click on the link below to open the document.

http://wastereductionpartners.org/resources/fact-sheets-2

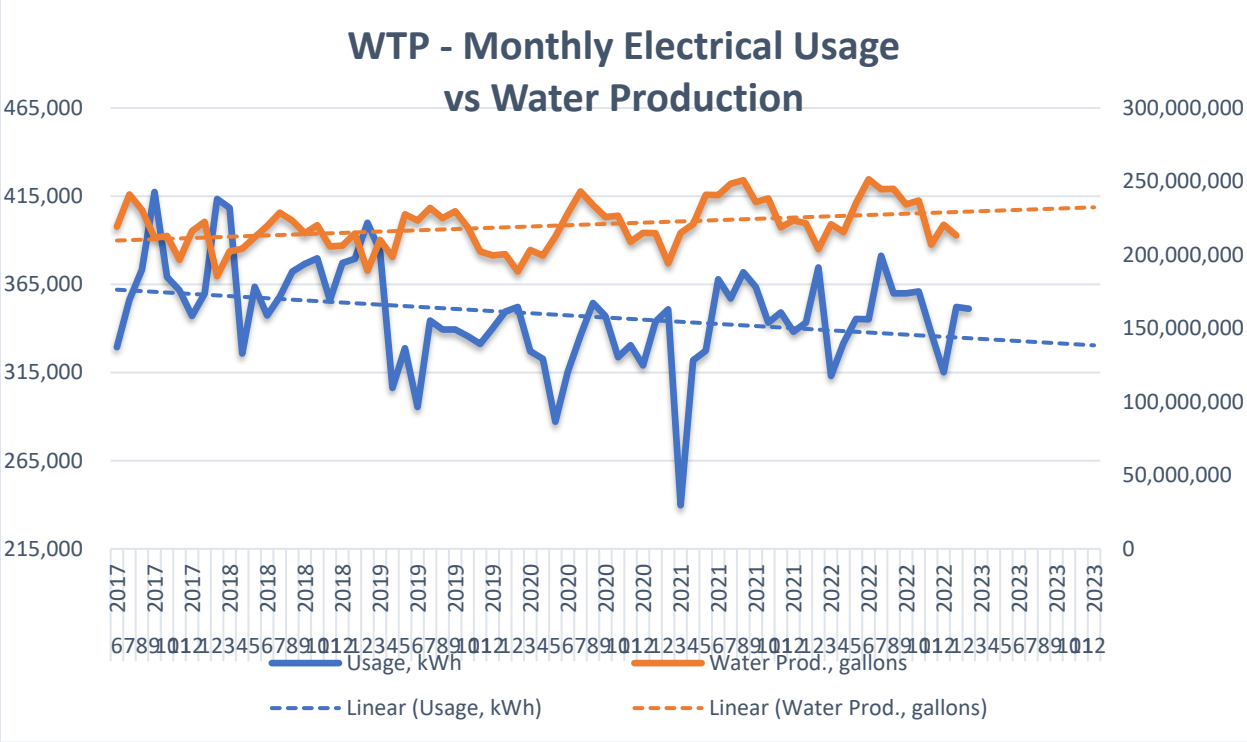
D. Follow-up Evaluation

Waste Reduction Partners provides energy, solid waste, water, and pollution prevention assessments to institutional and business entities throughout North Carolina. These assessments are confidential, non-regulatory, and provided at no or reduced cost to the client. A follow-up contact will be made with clients 6-12 months after this assessment report has been delivered to discuss the value of the assessment. The purpose of the follow-up is to evaluate the effectiveness of our reports and consultation and to determine if report recommendations were found to be worthy of implementation. You are encouraged to take the few minutes required to complete the follow-up in order to help Waste Reduction Partners continually improve its services.

Sustainability Efforts

- Inline Hydrokinetic Energy Recovery Turbine Generators – We have investigated this possibility at our water treatment facility a couple of different times and have determined that we do not have a large enough raw water pipeline to make this project affordable and cost-effective. Minimum pipe diameter is 24-inches while our pipe is only 16-inches in diameter.

- Replace High-Service Pumps and Motors with High-Efficiency Motors with Variable Frequency Drives (VFDs) at Water Treatment Facility – This project was completed in May 2019 at a cost of $2,207,623 which included engineering, equipment purchase and contractor for installation. We have reduced our monthly power consumption by 8% or 377,145 kWh annually, on average, while our water production has increased 2.49% or 64,094,000 gallons annually, on average.



- Replace Existing Ultraviolent (UV) Disinfection System at Wastewater Treatment Facility with High-Efficiency UV System – Project is currently in the construction phase. The estimated ROI on the equipment cost is ~7-years and it is forecasted to reduce electrical costs by up to 40%. Total cost for this project, including engineering, equipment purchase, pipe purchase and contractor for installation is $3,759,219 while the cost for the equipment-only is $565,000. The $3.759M cost includes construction of a new channel, new piping to feed both channels and a new effluent metering system.

- Replace Existing 250-hp Centrifugal Blowers (3) with New Turbo Blowers with Variable Frequency Drives (VFDs) – This project is described in our 2022 WWTP Master Plan prepared by McKim & Creed. The 3-existing blowers are one-speed and can not be controlled with VFDs. So, when we only need 1.5-blowers we turn on 2-blowers thus using more energy than is truly necessary. With these new blowers, we will have the ability to control the output of each blower thus reducing our overall energy consumption.

- WWTF Biosolids Thermal Drying System – Currently, we are dewatering our biosolids produced at our WWTF to about 18% solids, or ~82% water, and then transporting this material to Haywood County to a privately owned and maintained MSD landfill. We also dewater our WTF residuals at the WTF and transport them to the WWTF with the same final destination. Over the past couple of years, the cost to do this has almost doubled in cost for both treatment facilities. With the new biosolids thermal drying system, we will have the ability to increase the solids content from ~18% to ~85 to 90% thus reducing the amount of water that we are paying to landfill. The second part of this project is to generate a much more sustainable final product that no longer needs to go to a landfill but can instead be used as a soil amendment in both residential and commercial applications. This project is slated to begin engineering design and permitting in FY2024 with construction beginning some time in FY2025 at a cost of ~$12,500,000.

- WTF Residual Management – The third part of this solids management effort is the residuals from the water treatment process. These residuals will be dewatered on-site by a contractor and then disposed of as a soil amendment rather than going to a landfill, resulting in a much more environmentally sustainable process. For this project, we will need to construct a residuals storage facility on the WTP property in Mills River and then select a contractor to dewater, store and dispose of this material. This project is slated to begin engineering design and permitting in FY2023 with construction beginning some time in FY2024 at a cost of ~$1,500,000.

- Advanced Metering Infrastructure (AMI) – In April 2012, the City contracted with Energy Systems Group (ESG) to design and have constructed this new metering system across the City's water system. This project included the replacement of ~26,000 older mechanical meters with meters with much greater accuracy equipped with two-way communications required to transmit meter reading data to 13-towers placed in strategic locations across the City's water system. This allows City staff to read meters daily, if necessary, and eliminated the need for manual meter reading on a monthly basis with 4-meter readers. This greatly reduced the City's carbon footprint and provided a way for staff and our customers to identify demand-side leaks before they became a problem. This tool allows the City to reduce the unnecessary loss of a valuable resource…..water. The cost for this project was ~$11,700,000 and was financed over a 15-year period.

- AquaHawk Alerting – This is an app that our customers can place on their phone or computer and can take their water usage, either by cost or volume of usage. This allows our customers to set thresholds for their usage and will alert them when these thresholds are exceeded or when water usage is continuous, thus signaling to the customer that they may have a leak. City staff can also monitor this program for demand-side leaks and can notify our customers of these potential leaks on a daily basis. This service is provided to our customers at no charge.

- Water Loss Reduction Program – Both the AMI system and AquaHawk Alerting are active components of this program. In addition to these, the City Council and City management approved our department to create a new position, referred to as a leak detection technician, in 2014 and was dedicated to monitoring our vast water distribution system for water loss. Along with this individual position, we were afforded the opportunity to hire and equip a crew focused on repairing water leaks identified by our technician. This has allowed us to greatly decrease our water losses, or non-revenue water (NRW), over the past 9 years.

- Inflow and Infiltration Reduction Program – Inflow is generally defined as either storm water or surface water entering the sewer collection system while infiltration is groundwater infiltrating the sewer collection pipe network through cracks and voids in the pipes. Like the water loss reduction program, we began an inflow and infiltration reduction program in 2014 with the hiring of an inflow infiltration technician. The crew referenced above was also focused on repairing issues in the sewer collection identified by this technician. With this program, we have seen a noticeable reduction in the flows entering our wastewater treatment facility on a daily basis over the past 9 years.

- Long John Mountain Water System Improvements – The City provides water to customers along Long John Mountain off of U.S. Highway 64W (Brevard Rd.) and NC Highway 191 (Haywood Rd.). The water system in these areas was installed mostly by developers over the last several decades. Because of the piecemeal nature of this water system development, there are ~12 pumping stations and 2 tanks. The construction of a new booster pumping station and water storage tank on Long John Mountain that would be at an elevation that will result in the elimination of at 10 of the 12 aforementioned pump stations and both existing water tanks. The project would boost water pressure and available fire flow for many area customers. The abandonment of the near dozen pump stations would also result in a significant reduction in energy consumption and operation and maintenance burdens.

- 2016 Multi-Area Streambank Restoration – Stream restoration project where the integrity of existing sanitary sewer infrastructure was threatened by nearby streams at 12-different locations. These streams, impacted by development and redevelopment over the years have significant bank erosion and degradation of riparian zones, are encroaching on sewer pipes and/or manholes. The goal of this project was to protect the existing sanitary sewer infrastructure through a combination of live plantings and bioengineering and enhance the overall health of the stream. The total cost for this project was ~$2,900,000.

- 2021 Streambank Restoration – As with the previous streambank restoration project, the integrity of existing sanitary sewer infrastructure has been threatened by nearby streams at several different locations. These streams, also impacted by development and redevelopment over the years have significant bank erosion and degradation of riparian zones, are encroaching on sewer pipes and/or manholes. The goal of this project, like the other, is to protect the existing sanitary sewer infrastructure through a combination of live plantings and bioengineering and enhance the overall health of the stream. The estimated cost of this project is currently ~$600,000.

- Elimination of Pump Stations – We have a standing objective to eliminate sewer pump stations with gravity sewer (Jackson Park gravity sewer eliminated our largest sewer pumping station in 2014) and eliminate smaller water pump stations with single, larger stations pumping to storage tanks at higher elevations (i.e., Long John Mountain Water Improvements project). Over the past 18 years, we have eliminated 8 sewer pump stations and 6 water pump stations. As previously mentioned, the Long John Mountain project will eliminate 9 hydro pump stations, 2 booster pump stations and 2 water storage tanks. All of these stations and tanks will be replaced with one more efficient larger pump station and one storage tank at a higher elevation.

- Solar Power Generating Panels – We have explored the use of these panels on several of our facilities and have always determined those not to be cost effective. We are considering the use of these panels with our thermal

biosolids drying system project to be placed on top of the building used to store the finished project. We are also investigating the use of these on our new residuals storage building at the water treatment plant, as well.

Rendering of Biosolids Drying Building