

R.D. Olson Development / WATG Architects

**Sedona Oak Creek Heritage Lodge**  
**MEP Sustainability and Water Conservation Study**  
**Sedona, AZ**

March 10<sup>th</sup>, 2023



## TABLE OF CONTENTS

INTRODUCTION.....	3
1. Background.....	3
2. Project Scope.....	3
3. About A3 Engineering.....	3
EXECUTIVE SUMMARY:.....	3
PROJECT DESCRIPTION:.....	3
1. Sedona Oak Creek Heritage Lodge.....	3
WHAT WE ASSESSED FOR SUSTAINABILITY:.....	4
1. City and State Codes.....	4
2. Local Sustainability Design Requirements and Guidelines.....	4
3. Water Demand Savings Estimate.....	4
THE GOALS FOR SUSTAINABILITY:.....	4
1. LEED Certified.....	4
2. Sedona Climate Action Plan (CAP).....	4
3. Sedona Community Plan.....	6
4. The Coconino County Sustainability Program.....	6
5. Verde Valley Regional Economic Organization (VVREO) Business Sustainability.....	6
6. Schnebly Community Focus Plan (CFA).....	6
SUSTAINABILITY RECOMMENDATIONS:.....	6
WATER DEMAND STUDY:.....	7
1. Assumptions.....	7
2. Findings.....	8
APPENDICES:.....	8
A1. TEAM RESUME / CREDENTIALS.....	8
A2. MEP-RELATED SECTIONS OF SEDONA CLIMATE ACTION PLAN (CAP).....	8
A3. MEP-RELATED SECTIONS OF SEDONA COMMUNITY PLAN.....	8
A4. COCONICO COUNTY SUSTAINABLE BUILDING PROGRAM CHECKLIST.....	8
A5. VERDE VALLEY REGIONAL ECONOMIC ORGANIZATION (VVREO) BUSINESS SUSTAINABILITY ASSESSMENT.....	8
A6. MEP-RELATED SECTIONS OF SCHNEBLY COMMUNITY FOCUS AREA PLAN (CFA).....	8
A7. LEED INDOOR WATER CALCULATOR ESTIMATE FOR 70 GUESTROOM DEVELOPMENT.....	8
A8. VARIABLE REFRIGERANT FLOW (VRF) HVAC EQUIPMENT.....	8

## INTRODUCTION

### 1. Background

R.D. Olson Development and WATG Architects are currently in early design and entitlement stages for the Sedona Oak Creek Heritage Lodge development in Sedona, AZ. The development team requested an evaluation of sustainability goals from a mechanical, electrical, and plumbing (MEP) engineering perspective. A3 Engineering has evaluated the governing community sustainability requirements and guidelines to achieve a sustainable project that will be beneficial to both the Sedona community and the surrounding natural environment.

### 2. Project Scope

A3 Engineering's scope of work included the following:

- Review all governing codes, local codes, and local sustainability documents.
- Determine the collective MEP sustainability requirements needed to support the project.
- Evaluate feasible options to meet and exceed the MEP sustainability requirements.
- Recommend and demonstrate how those options should be implemented to support the goals for sustainability.
- Provide a quantitative estimate of how the recommended goals will meet and exceed code and local requirements.

### 3. About A3 Engineering

A3 Engineering is a licensed Mechanical, Electrical and Plumbing (MEP) engineering consulting firm founded in California. With over 50 years of combined engineering experience, the team at A3 Engineering has acted as the Engineer of Record (EOR) on a multitude of projects, especially including the housing and hospitality markets. A3's experience in these markets include significant design consideration implementation toward sustainability to meet and exceed local codes and sustainable guidelines. Further details about A3 are included in Appendix A1.

## EXECUTIVE SUMMARY:

The City of Sedona is doing all the right things to ensure sustainability is at the forefront of the community's priorities and the sustainability guidelines and certification programs detailed below all align with each other to help achieve those goals. With A3 Engineering's extensive experience, reviewing these requirements and program guidelines is extremely encouraging knowing that this is all very feasible – a sustainable development can be achieved and will be successful if this project carries forward.

The Sedona Oak Creek Heritage Lodge would serve as a beacon and a be a role model for not only future developments, but also inspire change for existing properties to do better. The sections below are general summaries of the poignant documents the City of Sedona has pointed toward as baselines for design and construction. A3 Engineering has reviewed these documents through an MEP lens to evaluate and provided more specific detail of how this all can be accomplished to provide a sustainable development for Sedona.

## PROJECT DESCRIPTION:

### 1. Sedona Oak Creek Heritage Lodge

R.D. Olson Development has acquired approximately 11.5 acres along Oak Creek in Sedona, AZ. The current concept design submittal includes a 70-guestroom lodge with associated site and hospitality amenities, open spaces, meeting spaces, a restaurant, and a wellness center. Sustainability is a of high importance to R.D. Olson and the Sedona community; therefore R.D. Olson is looking to coordinate all sustainability aspects of the project at the earliest stages possible to ensure all requirements are met, the project progress will be efficient, and the completed project will benefit the community while having minimal impact on the surrounding environment.

## WHAT WE ASSESSED FOR SUSTAINABILITY:

### 1. City and State Codes

The starting baseline requirements for any project are current state codes and the local codes and amendments. The State of Arizona the current applicable codes are under the 2018 International Building, Mechanical and Plumbing codes, as well as the NEC 2017 Electrical code. These codes provide a baseline safety and functionality of any modern building construction, but do not address the sustainability goals that Sedona and Coconino County are looking to achieve for this project.

### 2. Local Sustainability Design Requirements and Guidelines

The next step is to look at the local sustainability goals established by the city, county, and state. In communications with the Sustainability Coordinator for the City of Sedona, the guidelines to be reviewed and implemented are as follows:

- LEED Certified
- Sedona Climate Action Plan (CAP)
- Sedona Community Plan
- Coconino County Sustainability Program
- Verde Valley Regional Economic Organization (VVREO) Business Sustainability Certification
- Schnebly Community Focus Area Plan (CFA)

These guidelines drive the framework for meeting the sustainability goals for any new business in Sedona and Coconino County. The following sections of this report directly address these guidelines in what the requirements are and how the MEP teams will implement the sustainable design strategies.

### 3. Water Demand Savings Estimate

Due to the high water demand hospitality developments have, it is important to evaluate and find water saving methods for the site. Using International Plumbing Code 2021 as the baseline for fixture flow rates, a calculation estimate was performed based on LEED v4 Indoor Water Use Reduction Calculator. This calculation demonstrates the potential water savings based on USGBC methodology and how these savings can drastically offset other water usages on the site, such as pools, spas and irrigation.

## THE GOALS FOR SUSTAINABILITY:

### 1. LEED Certified

R.D. Olson has the goal of LEED certification for three (3) public buildings for the Sedona Oak Creek Heritage Lodge development. The public buildings that will be designed to achieve LEED certification are as follows:

- Lobby
- Fitness & Spa
- Restaurant

### 2. Sedona Climate Action Plan (CAP)

The Sedona Climate Action Plan (CAP) clearly communicates the importance of taking care of our environment and minimizing negative impacts on the surrounding community and global climate. The actions listed in the plan are generic in nature and suggest program developments that will help achieve those goals, such as incentives for building energy efficiency, water reduction, and renewable energy.

MEP engineers can support these goals in a multitude of ways. The following are areas that will be achieved in direct response to the CAP's example actions as listed on page 15:

- CAP statement: "Reduce building energy consumption by 15 percent".
  - A3 Engineering has extensive experience applying sustainable codes in various states and jurisdictions where a minimum of 15 percent reduction in energy consumption is required. By applying these codes and standards for mechanical HVAC prescriptive and performance

models, 15 percent reduction will be achieved. Using these codes and standards as a guide, the sustainability goals related to CAP may include the following actions:

- Coordinate with the Architect on building envelope construction and building orientation.
- Use minimum R-19 wall insulation and R-30 roof insulation.
- Use high shading coefficient glazing for glass exteriors.
- Provide shade fins or overhangs, especially on west and south facing windows.
- Optimize outside air ventilation rates to ensure fresh air is delivered to the spaces, but to also avoid unnecessary cooling of hot outside air.
- Utilize economizers to bring in outside air at the most optimal heating and cooling times in lieu of using mechanical heating and cooling methods while meeting indoor air quality and ventilation requirements.
- Design and install ventilation systems conforming to ASHRAE Standard 62.1-2019.
- Provide enhanced thermal comfort design by conforming with ASHRAE Standard 55-2010.
- Utilize variable refrigerant flow (VRF) systems to electrify mechanical systems and reuse heating or cooling from one space to another. VRF systems also utilize low-GWP refrigerants.
- Install occupancy sensors to control mechanical and lighting systems while switching between occupied and empty spaces.
- Install guestroom key card readers to activate lighting and power to the units and to deactivate power after the key card has been removed.
- Operable window switches to shutdown dedicated HVAC equipment to prevent cool air from being wasted to the exterior when windows are opened.
- Provide daylight zone control lighting systems that are low energy consumption and controls to automatically turn off lights when unoccupied.
- CAP statement: "Increase consumption of clean energy in buildings from 27% to 50%. Utilize 60% of suitable rooftop space for solar panels."
  - By using VRF mechanical systems as described above, the mechanical equipment footprint can be minimized, therefore allowing for more space for solar equipment on flat roofs. Maximizing space for solar panels, on flat roofs and sloped roofs that face south, in turn will allow for increased renewable energy capacity to supply building power and lighting, as well as the mechanical equipment themselves and domestic water heaters.
- CAP statement: "Increase EV use to 20% of vehicle miles traveled (VMT)".
  - EV parking requirements will be met to ensure use of EV vehicles is promoted and that the infrastructure is provided. While the MEP design cannot guarantee employees and guests will visit the property via EV's, the property will be doing its part in providing these spaces to all those who visit.
- CAP statement: "Reduce water use".
  - Low flow water fixtures will be provided throughout the property in all types of buildings. Low flow fixtures include water closets, urinals, lavatories, showers, and kitchen sinks. By matching the plumbing fixture flow rates listed in CAP, the water savings will exceed LEED requirements and contribute greater than 15 percent water savings for the buildings and property. Fixture flow rate reductions will be as follows:
    - Water closets: 1.6 gallons per flush (GPF) reduced to 1.28 GPF.
    - Urinals: 1.0 GPF reduced to 0.5 GPF.
    - Lavatories: 1.5 gallons per minute (GPM) reduced to 0.8 GPM.
    - Showers: 2.2 GPM reduced to 1.5 GPM.

### 3. Sedona Community Plan

The Sedona Community Plan, like CAP, lists environmental policies that promote energy efficient buildings (green buildings), water conservation, and renewable energy sources. As described above, following other states and jurisdiction sustainability codes and standards will provide the most stringent energy efficient practices for MEP systems, including HVAC, plumbing, electrical power, and lighting.

The Sedona Community plan states in multiple areas of the document the importance of reducing water consumption and to implement policies to utilize and manage stormwater. The plumbing fixture reductions above are the best way to reduce overall building water consumption and selecting these fixtures will also satisfy this requirement under this plan. The building storm drain systems, designed by the plumbing engineer, will also be coordinated with the civil engineer to ensure that stormwater collected within the building will be diverted to a low-impact development area, which is to say, to collect and discharge water to planters and biological areas, minimizing irrigation water needs.

### 4. The Coconino County Sustainability Program

The Coconino County's Sustainable Building Program (CCSBP) provides a worksheet with a checklist of requirements to meet a bronze, silver, or gold certification level for sustainability. Within the checklist there are six (6) ratings categories, three (3) of which involve MEP-related items. These categories are 'Water Efficiency and Use', 'Energy Efficiency and Use', and 'Indoor Environmental Quality'. To reach the bronze level of sustainability, 25 percent of the total checklist points available must be achieved. There is a high degree of confidence that most of the MEP items can be readily met, which alone would result in more than 25 percent of the total points in the checklist. This checklist is provided in Appendix A4 with points indicated for the MEP items that can be achieved.

As with the other sustainability documents discussed in this report, meeting other states and jurisdiction code requirements will also meet or exceed the requirements listed in the CCSBP checklist.

### 5. Verde Valley Regional Economic Organization (VVREO) Business Sustainability

The Verde Valley Regional Economic Organization (VVREO) has a 'Sustainable Business Certification Program' which is based on the four scientific principles of a sustainable society which are, 1) Reduce non-renewable energy and materials, 2) minimize pollution and waste, 3) protect ecosystems and 4) meet human needs. This certification levels are bronze, silver, gold, and platinum. While many of the certification requirements can be met through MEP design, most of the points are awarded for how the buildings and properties are maintained and operated. The requirements that can be met through design also match those discussed above. Following the requirements of the other documents referenced above will be an easy guide to satisfy the VVREO requirements to certify a sustainable business.

### 6. Schnebly Community Focus Plan (CFA)

The Schnebly Community Focus Plan (CFA) does not have specific MEP-related requirements for sustainability or positive community impacts. However, the MEP engineer can assist the developer, architect, and civil engineer in meeting their requirements under this plan. Examples of where MEP can assist are in the selection of materials, site layouts, utility connections, and providing sustainable design solutions to the types of buildings and amenity spaces to be provided under the CFA. The design solutions would all meet or exceed the guidelines and policies provided under the documents listed in this report.

## SUSTAINABILITY RECOMMENDATIONS:

The following is a list of MEP recommendations in accordance with the sustainability documents addressed in this report. Most of the requirements related to MEP design are consistent and repeated, therefore the following is a comprehensive list across all five (5) documents of the most impactful design strategies:

- A. Coordinate with the Architect on building envelope strategies to meet the minimum 15 percent energy savings contributing by, but not limited to, the following:

- a. Wall and roof insulation and overall construction.
  - b. Building orientation.
  - c. Window glazing.
  - d. Occupancy sensors.
  - e. All electric VRF mechanical equipment, which also use low-GWP refrigerants.
- B. Provide only low flow plumbing fixtures as described in CAP. An approximate LEED indoor water use calculation indicates that approximately 40 percent in water savings is achievable by exceeding the IRC requirements and meeting those listed under CAP. See Appendix A7 for a LEED calculation based on a 70-unit hospitality project.
- C. Utilize solar power systems to increase renewable energy usage and decrease electricity usage from off site.
- D. Provide pre-wired and solar-ready infrastructure for future connections and expansions.
- E. Install heat pump water heaters with gas backup to further promote electrification and help minimize gas water heating. Install solar water heating system to power heat pump water heaters.
- F. Provide EV parking stalls to promote the use of electric vehicles.
- G. Coordinate with the civil engineer for diverting stormwater collected from the buildings to stormwater harvesting tanks and other irrigation or natural low-impact development areas.
- H. Utilize irrigation sensor controls and drip irrigation as well as gutter systems to discharge water where needed for landscaping.
- I. Provide Energy Star certified equipment and appliances only.
- J. Provide lighting systems that are low energy consumption and controls to automatically turn off lights when unoccupied. Comply with the Dark Sky guidelines for exterior property lighting.
- K. Design and install ventilation systems conforming to ASHRAE Standard 62.1-2019.
- L. Provide enhanced thermal comfort design by conforming with ASHRAE Standard 55-2010.
- M. Complete building commissioning to meet ASHRAE Standard 189.1-2020.

## WATER DEMAND STUDY:

The following describes the approach to the water demand study based on the information available at the time this report was written.

### 1. Assumptions

- A. Fixture baseline flow rates are assumed to meet IPC 2021 maximums.
  - a. Baseline flow rates for restroom fixtures were applied per 'Residential Occupancies'.
- B. Hotel operations are assumed to be 24/7 and 365 days per year.
- C. Guest lodge occupancy rate is assumed to be two (2) occupants per guestroom lodge, 140 occupants at maximum capacity.
- D. An average annual lodge occupancy rate is assumed to be 80 percent, or 112 guests per day.
- E. An average of 35 employees on site per day is assumed.
- F. An average of 30 non-guest visitors on site per day is assumed.
- G. Pool size: 1,000 SF, 3.5 feet average depth - 26,180 gallons initial fill.
- H. Spa size: 200 SF, 3 feet deep - 4,488 gallons initial fill.
- I. Pool filters and backwash
  - a. R.D. Olson has similar hospitality developments in operation with similar size pool and spas. The following backwash rates were used based on current operations:
    - i. 1,000 SF Pool with depth listed above
      1. Backwash volume: one percent (1%) of total pool volume = 262 gallons / cycle.
      2. Frequency of backwash: average one (1) time every two (2) weeks (26 times per year).
    - ii. 200 SF Spa with depth listed above
      1. Backwash volume: one percent (1%) of total spa volume = 45 gallons / cycle.
      2. Frequency of backwash: average one (1) time every two (2) weeks (26 times per year).

- b. Pools are rarely completely drained, once every 5 years. The small discharges of water and refills for chemical balancing are also not common and have assumed to not be a factor in this study. For calculation purposes, the average annual fill volume is assumed to be the initial fill volume of the pools and spa divided by 5 years.
  - i. Pool annual fill volume = 26,180 gallons / 5 years = 5,236 gallons per year.
  - ii. Spa annual fill volume = 4,488 / 5 years = 898 gallons per year.
- J. Summer conditions for peak evaporation rate - 95 degrees F, 40% relative humidity
- K. Pool evaporation rate
  - a. Utilizing a hospitality pool consultant's professional experience, the following average evaporation rates is assumed to be 1/4" per day.
  - b. Per 2014 ASHRAE paper titled, "Methods for Calculation of Evaporation from Swimming Pools and Other Water Surfaces", large outdoor pools with similar ambient conditions were measured to have a range evaporation rates from 0.030 to 0.049 lb./hr./ft<sup>2</sup>. For conservative purposes, the highest value was used for summer conditions, which converts to approximate 1/8" per day over a 12-hour day at peak summer conditions. Since these data points were tested for undisturbed pools, this value was doubled to be overly conservative for evaporation losses due to swimmer activity.
- L. For calculation purposes, it is assumed that no other water offset strategies are implemented beyond lowering fixture flow rates.

## 2. Findings

The following table shows the baseline annual hotel water usage based on IPC maximum flow rates, the annual water usage savings by using low flow fixtures as listed in CAP, the annual hotel pool and spa water usage due to filling, backwash cycles, and the estimated annual evaporation volume. The resulting calculation shows that by using low flow fixtures, the property can reduce the water usage by approximately 962,830 gallons per year (42%). The total sum of pool and spa water fill, backwash and evaporation is estimated to be 82,184 gallons per year, or 9% of the total low flow fixture savings, demonstrating that the pool and spa usage can be offset in excess. See Appendix A7 for further calculation details.

Baseline IPC Water Usage (Gallons/Year)	Low Flow Fixtures Water Usage (Gallons/Year)	Pool and Spa Fill (Gallons/Year)	Pool and Spa Backwash (Gallons/Year)	Pool and Spa Evaporation (Gallons/Year)	Total Net Water Savings (Gallons/Year)
1,666,152	962,830	6,134	7,982	68,068	880,846

## APPENDICES:

- A1. TEAM RESUME / CREDENTIALS
- A2. MEP-RELATED SECTIONS OF SEDONA CLIMATE ACTION PLAN (CAP)
- A3. MEP-RELATED SECTIONS OF SEDONA COMMUNITY PLAN
- A4. COCONICO COUNTY SUSTAINABLE BUILDING PROGRAM CHECKLIST
- A5. VERDE VALLEY REGIONAL ECONOMIC ORGANIZATION (VVREO) BUSINESS SUSTAINABILITY ASSESSMENT
- A6. MEP-RELATED SECTIONS OF SCHNEBLY COMMUNITY FOCUS AREA PLAN (CFA)
- A7. LEED INDOOR WATER CALCULATOR ESTIMATE FOR 70 GUESTROOM DEVELOPMENT
- A8. VARIABLE REFRIGERANT FLOW (VRF) HVAC EQUIPMENT



APPENDIX A1  
TEAM RESUME / CREDENTIALS

## OUR PHILOSOPHY



### ACTION

We have a responsibility to utilize design for positive thoughtful action which creates a positive working impact on our internal, external and community peers.



### AWARENESS

Through intentional awareness, we commit to change the AEC industry by establishing a culture of fairness both within our organization and the partners we work with.



### ACCOUNTABILITY

We believe we are accountable for how we treat our internal and external partners and for the impact our designs and actions have within the communities that we serve.

## OUR FIRM

### Important Firm Details

- Mechanical, Electrical, Plumbing (MEP) Design Services
- Small Business (SBE) certification #2028961
- Local Small Business (LSBE) in LA County: #093067
- Professional licenses in:
  - CA, AZ, WA, NV, KS, TX, TN, GA, FL, MI
- PL Insurance Limits \$1M/\$2M - Hartford
- GL Insurance Limits: \$1M/\$2M Hartford (Business Owners Policy)
- 45 years of combined AEC industry experience
- 15+ combined years working together
- Revit and BIM360 expertise

## OUR MARKETS



### HIGHER-ED



### K-12



### HOSPITALITY



### HOUSING



### MIXED-USE



### RETAIL

## OUR PEOPLE



**Austin Allen, PE**  
CEO | Co-Founder



**Andrew Scott, PE**  
CTO | Co-Founder



**Drew Tucker**  
COO | Co-Founder



**Aaron McGee**  
Mechanical Engineer



**Justin Otus**  
Electrical Engineer



**Melissa Partida**  
Office Manager



**Siavosh Asadi**  
Project Manager

## CONTACT INFO

### Location

527 W 7th St. Suite 905  
Los Angeles, CA 90014

### Phone

213.543.3477

### Online

[www.a-3-eng.com](http://www.a-3-eng.com)

### Social

You can find us on LinkedIn and Instagram (IG: @a3\_engineering)

## APPENDIX A2

### MEP-RELATED SECTIONS OF SEDONA CLIMATE ACTION PLAN (CAP)

# SEDONA CLIMATE ACTION PLAN

**(Modified) MEP-Related Sections Only**



JULY 2021

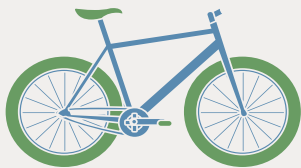
# HOW WE GET THERE

This plan is organized into the following sectors. Each sector presents our strategies and actions for reducing climate pollution and fostering climate resilience in Sedona.



## BUILDINGS & ENERGY

Ensuring long-term access to clean energy while reducing the fiscal and environmental impacts of consumption



## TRANSPORTATION & LAND USE

Reducing transportation emissions and enhancing community mobility



## MATERIALS & CONSUMPTION

Increasing the diversion of waste from the landfill and reducing GHG emissions associated with consumption of goods and services



## WATER & NATURAL SYSTEMS

Conserving community water resources by maximizing water efficiency technologies while ensuring a secure and sustainable water supply in the face of climate change impacts. Managing, restoring, and fostering resilient ecosystems, landscapes, and resources

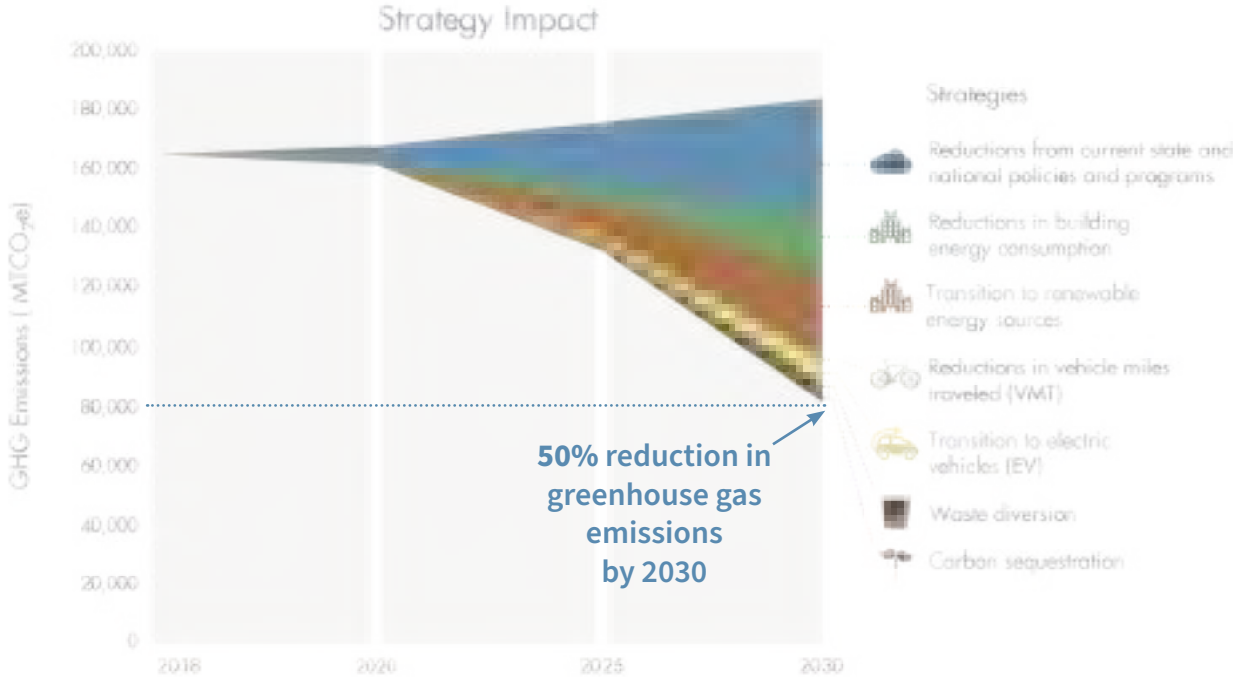


## CLIMATE RESILIENCE

Ensuring Sedona and its residents, businesses, visitors, facilities, and services are prepared for climate impacts, especially those at the highest risk

# WHAT WILL IT TAKE?

To achieve a 50% reduction by 2030, we will need to meet the outcomes below. The actions in the CAP implementation matrix will get the community approximately halfway to our goal. The remaining 25% reduction will rely on new and innovative technologies, additional federal and state action, and regular reevaluation of Sedona’s progress.



# WHAT’S NEEDED?

## EXAMPLE ACTIONS



### Energy efficiency retrofit incentives

- Reduce building energy consumption by 15%



### Rooftop solar incentives; Electrification incentives and contractor training

- Increase consumption of clean energy in buildings from 27% to 50%
- Utilize 60% of suitable rooftop space for solar panels



### Bike, pedestrian, and transit infrastructure; Transit-oriented and mixed-use development

- Reduce community-wide VMT by 10%



### EV infrastructure and incentives; EV-ready code

- Increase EV use to 20% of VMT



### Food waste prevention; Community-wide organics composting program

- Reduce amount of landfilled organic waste by 15%





# BUILDINGS & ENERGY

**GOAL:** Ensure long-term access to clean energy while reducing the fiscal and environmental impacts of consumption

## SUMMARY

Greenhouse gases are released during the combustion of fossil fuels—such as coal, oil, and natural gas—to heat, cool, and power buildings. The generation, transmission, and distribution of electricity and natural gas is the single largest contributor to Sedona’s carbon footprint. State and local action will be needed to transition to cleaner energy sources.

The strategies and actions included in this section will focus on an equitable transition to clean, reliable, and affordable energy. Shifting our building energy sources from fossil fuels to clean electricity sources like wind and solar will be critical in meeting our long-term goals. Making this shift will require that we continue to reduce building energy demand, introduce incentives for building electrification, and expand renewable energy and battery storage infrastructure.

## GREENHOUSE GAS EMISSIONS (2018)



## CO-BENEFIT: COST SAVINGS

Reducing energy consumption saves on energy bills. Solar is now less expensive than other energy sources such as natural gas.

## SEDONA HIGHLIGHT

Sedona was designated as a SolSmart Bronze community for its efforts to make it faster and easier to switch to solar energy.



## STRATEGIES

Reduce building energy demand



Shift to electric heating and power in buildings



Maximize renewable energy generation and storage capacity





# MATERIALS AND CONSUMPTION

**GOAL:** Increase the diversion of waste from the landfill and reduce GHG emissions associated with the consumption of goods and services

## SUMMARY

While the transport and disposal of solid waste only contribute a small portion of Sedona’s carbon footprint, the emissions associated with the manufacture, transport, and use of those disposed materials can be significant. Every phase of a product’s life cycle—from origin, to production and manufacturing, to transportation and distribution, and ultimately to disposal—releases climate pollution.

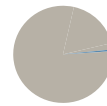
Strategies to reduce emissions from the consumption of goods and services focus on diverting waste from the landfill and encouraging sustainable, climate-friendly consumption.

## STRATEGIES

Enhance sustainable consumption to minimize greenhouse gas emissions



## GREENHOUSE GAS EMISSIONS (2018)



**127 MTCO<sub>2</sub>e**  
 <1% of total emissions

## CO-BENEFIT: ECOSYSTEM HEALTH

A city-wide composting program can improve soil health and sequester carbon.

## SEDONA HIGHLIGHT

In 2019, the City’s first Fix-it Clinic repaired over 200 lbs of household items—fixing more than 80% of items brought in.



Increase waste diversion







# WATER AND NATURAL SYSTEMS

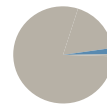
**GOAL:** Conserve community water resources by maximizing water efficiency technologies while ensuring a secure and sustainable water supply in the face of climate change impacts. Manage, restore, and foster resilient ecosystems, landscapes, and resources

## SUMMARY

Climate change paired with increased tourism threaten the ability of Sedona’s natural ecosystems to provide continued water, flooding protection, wildfire resistance, and carbon sequestration services. Although natural systems are not formally captured in our greenhouse gas inventory, proper management of these systems can capture carbon while also enriching recreational opportunities and improving habitat health. Sustainable land management practices like composting, climate-adaptive landscaping, and intentional forest management have been shown to increase the rate of carbon stored in plants and soil.

Along with preserving natural systems, actions in this section include tactics for expanding water reuse and conservation. Although water management only contributes a small portion of our carbon footprint, actions taken to minimize water use, optimize treatment, and improve overall water quality will ensure continued provision of this important resource for future generations.

## GREENHOUSE GAS EMISSIONS (2018)



**3,435 MTCO<sub>2</sub>e**  
2% of total emissions

## CO-BENEFIT: RESILIENCE

Green infrastructure and restoration can provide protection from climate impacts such as flooding and wildfires.

## SEDONA HIGHLIGHT

The City of Sedona participates on the Sustaining Flows Council to partner with the Yavapai-Apache Nation and other Verde Valley stakeholders to ensure long-term water sustainability.

## STRATEGIES

Expand and improve green spaces, including increased ecosystem quality, connectivity, and accessibility



Reduce water use



Expand water reuse and improve water infrastructure



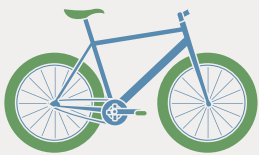
# WHAT YOU CAN DO

While many of the most pressing climate actions will happen at the community level, it is important to be cognizant of our individual emissions and behaviors as well. While there are many steps you can take to reduce your own footprint, here are some idea of how to get started.



## Buildings and Energy

Commit to solar. Visit [www.Sedonaaz.gov/solar](http://www.Sedonaaz.gov/solar) to learn about the process for installing solar on your home or business. Incentives and resources are available to assist with this transition.



## Transportation and Land Use

If you drive to work, consider carpooling, biking or taking the bus one or more days per week, or telecommuting if possible. If that's not possible, consider an electric vehicle next time you are purchasing a car.



## Materials and Consumption

Reduce your meat and dairy consumption. Eating more plant-based foods, such as fruits, grains, and vegetables is one of the most impactful actions you can take.



## Water and Natural Systems

Create a native and drought-tolerant backyard. Attend a Native Plant Workshops to help learn about how to add native plants into your landscape. Careful landscape planning can also reduce your home's wildfire risk.



## Climate Resilience

Talk with family, friends, and neighbors about climate concerns, priorities, and needs. According to the Yale Program on Climate Change Communications, although 63% of Americans are worried about global warming, only 35% of Americans discuss it. By having open conversations, you can help prepare your community for the effects of climate change.

For more information on how to reduce your carbon footprint, visit [sedonaaz.gov/sustainability](http://sedonaaz.gov/sustainability)



# IMPLEMENTATION MATRIX

**Legend:**

<b>Timeframe:</b>	▶ = near-term (0-1 years)	▶▶ = mid-term (2-4 years)	▶▶▶ = long-term (4+ years)
<b>Net Present Value Cost</b> (Through 2030):	💰 = \$0 to \$100,000	💰💰 = \$100,001 to \$1,000,000	💰💰💰 = > \$1,000,000
<b>GHG Impact</b> (Cumulative MTCO <sub>2e</sub> reductions to 2030):	🌿 = 0 to 500	🌿🌿 = 501 to 5,000	🌿🌿🌿 = > 5,000
<b>Action Types:</b>	<b>Vol</b> (Voluntary)	<b>Reg</b> (Regulatory)	<b>SPP</b> (Studies, Plans, Partnerships) <b>CIP</b> (Capital Improvement Project)

Action	Action Type	Action Type	Timeframe	Lead	Potential Partners	GHG Impact	City Cost
<b>Buildings &amp; Energy: Reduce building energy demand</b>							
<b>Community building incentives</b>	Educate and incentivize businesses and residents to reduce energy and water use. Provide resources to help households and businesses conduct energy retrofits and upgrades.	Vol	▶	City of Sedona Sustainability	Sustainability Alliance, Chamber, Northern Arizona Interfaith Council, Northern Arizona Climate Change Alliance	🌿🌿🌿	💰💰
<b>Energy triggers for large buildings</b>	Incentivize large commercial and multifamily buildings to perform energy upgrades achieving deep energy savings by a certain date or at certain trigger events (e.g. time of sale, change of occupancy).	Vol	▶▶	City of Sedona Sustainability, Community Development	Arizona Public Service	🌿🌿	💰💰
<b>Buildings &amp; Energy: Shift to electric heating and power in buildings</b>							
<b>Electric panel updates</b>	Incentivize electrical panel updates (e.g. funding for subsidizing hardware or local electricians to provide reduced cost installations).	Vol	▶▶	City of Sedona Sustainability, Community Development	Yavapai College	🌿	💰💰



Action	Action Type	Action Type	Timeframe	Lead	Potential Partners	GHG Impact	City Cost
<b>Home electrification</b>	Work with Arizona Public Service (APS) to expand programs that incentivize residents to electrify water and space heating.	SPP	▶▶	City of Sedona Sustainability, Community Development	Arizona Public Service	🌿🌿	💰
<b>Contractor training</b>	Develop a contractor training and rebate program for solar water heaters, electric heat-pumps, and converting gas appliances to electric.	Vol	▶	City of Sedona Sustainability, Community Development	Yavapai College	🌿🌿	💰💰💰
<b>New development</b>	Incentivize building electrification in new development and remodels.	Vol	▶▶	City of Sedona Sustainability, Community Development		🌿🌿	💰💰
<b>Buildings &amp; Energy: Maximize renewable energy generation and storage capacity</b>							
<b>Clean energy financing</b>	Explore funding and capital opportunities – such as 0% interest loans – for frontline community organizations and individuals working to own clean energy assets.	SPP	▶	City of Sedona Sustainability		🌿🌿🌿	💰💰
<b>Renewable energy storage</b>	Utilize available state, federal, and private grant funds to promote the expansion of renewable energy storage technologies.	Vol	▶▶	City of Sedona Sustainability	Arizona Public Service	🌿	💰💰
<b>Solar incentives</b>	Ensure rebates or other funding support opportunities – such as solar grants for neighborhoods and cooperative buying – are available for installation of solar on existing buildings.	Vol	▶▶	City of Sedona Sustainability, Community Development	Arizona Public Service	🌿🌿🌿	💰💰



Action	Action Type	Action Type	Timeframe	Lead	Potential Partners	GHG Impact	City Cost
<b>Community choice solar</b>	Advocate for state-level legislation that enables community choice aggregation for community solar.	SPP	▶	City of Sedona Sustainability			
<b>Solar permitting</b>	Waive solar project permitting fees.	Vol	▶	City of Sedona Community Development			
<b>Transportation &amp; Land Use: Develop and maintain a safe, convenient, and effective system for walking, bicyclists, and other active forms of transportation</b>							
<b>Bike/pedestrian Infrastructure</b>	Accelerate the development of the Sedona Trails and Pathways system so that residents and visitors have a safe and healthy alternative to driving. Implement the GO! Sedona Pathways Plan.	CIP	▶	City of Sedona Public Works	Verde Valley Cyclists Coalition, Sedona XYZ, Red Rock Trail Fund, Arizona Department of Transportation		
<b>Mixed-use development</b>	Prioritize and incentivize affordable, transit-oriented and mixed-use development to encourage a walkable community.	Vol	▶▶	City of Sedona Community Development	Sedona XYZ		
<b>Transportation &amp; Land Use: Improve and increase transit ridership</b>							
<b>Public transit investments</b>	Develop a comprehensive, city-wide transit and shuttle system that serves residents, visitors, and employees.	CIP	▶▶▶	City of Sedona Transit	Sedona Chamber, Arizona State Parks, Coconino National Forest, Arizona Department of Transportation		

















Action	Action Type	Action Type	Timeframe	Lead	Potential Partners	GHG Impact	City Cost
<b>Transportation &amp; Land Use: Increase fuel efficiency and clean fuel use</b>							
<b>EV infrastructure plan</b>	Develop and implement an EV infrastructure plan to promote and expand the construction of charging infrastructure and electric-powered mobility.	SPP	▶▶	City of Sedona Sustainability	Arizona Public Service, Sedona Chamber		
<b>Electric vehicle advocacy</b>	Advocate for the expansion of existing incentives and introduce new local incentives to accelerate the adoption of electric vehicles.	Vol	▶▶	City of Sedona Sustainability	Arizona Public Service, Sedona Chamber		
<b>City fleet electrification</b>	Develop a municipal green fleet policy to right size the City fleet, maximize efficiency, and accelerate the transition to electric vehicles.	Reg	▶	City of Sedona Sustainability			
<b>EV-ready code</b>	Require EV-ready parking spaces in new commercial and multifamily developments.	Reg	▶	City of Sedona Sustainability, Community Development			
<b>Materials &amp; Consumption: Enhance sustainable production and consumption to minimize greenhouse gas emissions</b>							
<b>Municipal Sustainable Procurement Policy</b>	Ensure implementation of a sustainable procurement policy. Prioritize the purchasing decisions that yield the highest emissions reduction impact within each department. Explore climate-friendly food catering, alternative vehicle and fuel purchases, and low-carbon concrete.	Reg	▶	City of Sedona Sustainability, Finance			



Action	Action Type	Action Type	Timeframe	Lead	Potential Partners	GHG Impact	City Cost
<b>Food waste education</b>	Launch an outreach campaign that educates the community about preventing wasted food and sustainable consumption.	Vol	▶▶	City of Sedona Sustainability	Healthy World Sedona, Sustainability Alliance, Northern Arizona Climate Change Alliance		
<b>Materials &amp; Consumption: Increase waste diversion</b>							
<b>Food recovery program</b>	Establish a robust food recovery program to support community members and protect against disruptions, including working with food rescue organizations, schools, and commercial kitchens.	Vol	▶▶	City of Sedona Sustainability	Sedona Oak Creek Unified School District, Chamber, Sedona Food Bank, Cornucopia Community Advocates		
<b>Community organics diversion</b>	Implement a city-wide community organic waste program to compost food waste and yard waste.	Reg	▶▶	City of Sedona Public Works			
<b>Refrigerant disposal</b>	Identify strategies to improve recovery and reuse of refrigerant chemicals.	SPP	▶▶	City of Sedona Sustainability	Yavapai County, Arizona Department of Environmental Quality		
<b>Water &amp; Natural Systems: Expand and improve green spaces, including increased ecosystem quality, connectivity, and accessibility</b>							
<b>Native planting in municipal projects</b>	Prioritize native plantings with deep roots on public properties to maximize carbon sequestration and resilience. This includes the grounds of municipal buildings, parks, and schools.	Vol	▶	City of Sedona Sustainability, Public Works	Friends of the Verde River, Sedona Oak Creek Unified School District, Keep Sedona Beautiful		



Action	Action Type	Action Type	Timeframe	Lead	Potential Partners	GHG Impact	City Cost
<b>Prepare recreation services for climate change</b>	Maintain cooperation with Arizona State Parks and U.S. Forest Service recreation programs to plan for and respond to increased visitation and use of recreational services and open spaces.	SPP	(Ongoing)	City of Sedona Sustainability	Coconino National Forest, Arizona Department of Environmental Quality, Arizona State Parks, Oak Creek Watershed Council, Verde Front, Red Rock Trail Fund, Sedona Chamber		
<b>Green infrastructure codes for commercial buildings</b>	Adopt a green infrastructure code that applies to new construction projects and the remodeling of commercial buildings.	Reg		City of Sedona Community Development	Friends of the Verde River		
<b>Climate adaptive landscaping</b>	Require native and climate appropriate plants in the landscaping of public and private projects.	Reg		City of Sedona Community Development	Friends of the Verde River, Sedona Chamber, Yavapai County Cooperative Extension, Keep Sedona Beautiful		
<b>Creek restoration</b>	Expand protection and restoration efforts throughout the Oak Creek watershed. Reduce flood risk by supporting the natural capacity of creeks to retain water.	CIP		City of Sedona Sustainability	Northern Arizona University Friends of the Verde River, Coconino National Forest, Oak Creek Watershed Council		
<b>Forest health</b>	Identify opportunities for the City to support forest health improvements. Reduce wildfire risk and protect other ecosystem services such as water quality, wildlife habitat, and soil health.	SPP		City of Sedona Sustainability	Coconino National Forest, Northern Arizona University, Sedona Fire District		





Action	Action Type	Action Type	Timeframe	Lead	Potential Partners	GHG Impact	City Cost
<b>Low-impact business development</b>	Focus business development efforts on businesses that have lower impacts on natural resources and improve resident quality of life.	Vol	▶▶	City of Sedona Economic Development	Sedona Chamber, Small Business Development Center, Local First Arizona		
<b>Carbon sequestration</b>	Research and develop regional opportunities to improve the natural sequestration of carbon in plants and soils.	SPP	▶▶	City of Sedona Sustainability	Northern Arizona University, Coconino National Forest, Northern Arizona Climate Change Alliance, Friends of the Verde River, Yavapai County Cooperative Extension		
<b>Water &amp; Natural Systems: Expand and improve green spaces, including increased ecosystem quality, connectivity and accessibility</b>							
<b>Water retrofits</b>	Update and advertise incentives and direct install programs that retrofit inefficient water fixtures and support low water landscaping.	Vol	▶▶	City of Sedona Sustainability	Arizona Water Company, Oak Creek Water Company, Friends of the Verde River, Keep Sedona Beautiful		
<b>Water harvesting ordinance</b>	Adopt a rainwater harvesting ordinance for new development.	Reg	▶▶	City of Sedona Community Development	Friends of the Verde River		
<b>Water Resource Management Plan</b>	Create an integrated water resource management plan that ensures a long-term sustainable supply of water when faced with climate-related hazards.	SPP	▶▶	City of Sedona Sustainability, Wastewater	Friends of the Verde River, The Nature Conservancy, Sustaining Flows Council, Yavapai-Apache Nation, Salt River Project, Coconino Plateau Water Advisory Council		



## APPENDIX A3

### MEP-RELATED SECTIONS OF SEDONA COMMUNITY PLAN

## 5. ENVIRONMENT

### Goals

- Preserve and protect the natural environment.
- Ensure a sufficient supply of quality water for the future.
- Protect Oak Creek and its riparian habitat.
- Reduce the impacts of flooding and erosion on the community and environment.
- Promote environmentally responsible building and design.

### Environment Chapter:

- Water Resources
- Resource Conservation
- Policies
- Action Plan

**What Changed Since 2002?**

- New studies on water supply and projected demand for the Verde Valley Region.
- Educational programs on water conservation.
- Ordinance adopted that prohibits wood-burning stoves and fireplaces.
- Adopted covered loads ordinance.
- Native, drought tolerant plants ordinance adopted.
- *Stormwater Master Plan* adopted.
- The Sedona Wetlands Preserve constructed at the City's Wastewater Treatment Plant.

**What's New in This Plan?**

- Recommendation to develop a green building program.
- Recommendation to develop an action plan that would focus on methods to improve energy efficiency and conservation and reduce harmful emissions.
- Recommendation to use low impact development and green infrastructure to manage stormwater.

Protection of the environment is the community's top priority, and sustainability is a fundamental goal of the Plan. This chapter addresses our impacts to the environment, locally and globally, from conserving non-renewable resources to protecting the health of the ecosystem. While some of these issues may not seem to be a problem today, if the current rates of consumption and impacts continue, the long-term results will be a significant decline in the health of the environment, the availability of vital resources, and the community's quality of life.



## WATER RESOURCES

Water is a vital resource for the health of the community, the environment, and the economy. Oak Creek was the main attraction for early settlement of Sedona and is now a draw for recreational activities by those wanting to escape the heat of summer. Oak Creek flows to the Verde River and is part of the Verde Watershed, which is relied upon by growing communities, including Cottonwood and Camp Verde. An ample supply of clean water for future generations is critical to the future of Sedona and the region.

### Water Supply and Demand

Surface water includes Oak Creek and other streams, springs, lakes, ponds, and reservoirs. Appropriated water rights to surface water in the Verde Watershed currently exceed the available supply of water. Flood and stormwater can also be a source of water, yet require collection, storage, appropriate use, and treatment that is difficult with an intermittent and unreliable source. Wastewater effluent is another potential water source (see wastewater discussion below).

Groundwater is found in underground aquifers that are recharged by water seeping into the pores and cracks in soil and rocks. Aquifers are connected and can be influenced by recharge and withdrawals occurring far beyond the immediate area, and they will be impacted by the cumulative effects of what occurs throughout a region.

Groundwater is the primary source of domestic water for most communities, including Sedona. There are several private water providers in the City that supply potable water, including the Arizona Water Company and Oak Creek Water Company. Both draw on groundwater wells to supply residential and business needs. While groundwater is a currently available supply of water, there is an overdraft in the Verde Valley. Overdraft occurs when the amount of water being used exceeds the amount being recharged.

There have been several studies concerned with the future of our regional water supply, such as the *Central Yavapai Highlands Water Resource Management Study*, a partnership of the Yavapai County Water Advisory Committee, the U.S. Bureau of Reclamation, and the Arizona Department of Water Resources; and the findings of the U.S. Geological Survey's regional groundwater flow model. The predictions are that based on water supply and population estimates, demand will exceed the supply of water in the Verde Watershed by 2050.

The City partners with multiple organizations concerned with the sustainability of the region's water supply, including the Yavapai County Water Advisory Committee, the Verde River Basin Partnership, the Coconino Plateau Water Advisory Council, and the Northern Arizona Municipal Water Users Association.

### Key Issues

- Projections that the long-term supply of water in the Verde Watershed will be inadequate.
- Oak Creek's water quality has exceeded standards for E. Coli bacteria.
- The water supply for City residents is managed by private entities.
- Flooding has resulted in property damage and other impacts.
- Flooding and erosion have impacted property, habitat, and the water quality of Oak Creek.

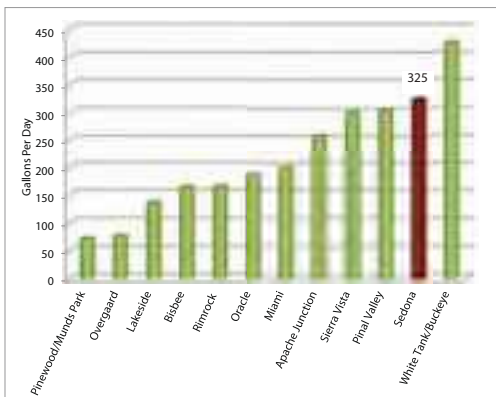
### Water Conservation

The City and local water companies have provided education and outreach programs that encourage the public to reduce water use. However, Sedona residents have higher rates of water use than most Arizona communities (see table below). Commercial businesses and non-residential users rank as the 2nd highest in water use compared to the other communities listed below. Much of the water use in Sedona goes to landscaping, which could be reduced by using more efficient irrigation and landscaping techniques that require less water.

### Water Quality

One of Sedona's greatest assets is Oak Creek, which is also a major attraction for tourists to Oak Creek Canyon. Unfortunately, the creek has suffered from poor water quality since at least 1973. The levels of *E.Coli* bacteria have often exceeded water quality standards, resulting in health warnings and restrictions. Contaminants enter the water supply from multiple sources, and can impact both groundwater and surface water. The causes of contamination include waste from wildlife, humans, dogs, livestock, septic systems, recreation, and agriculture. Stormwater can carry

### 2012 Average Water Use of Sedona Residential Water Users



Source: Arizona Water Company

pollutants such as pesticides and oil, as well as trash and other debris. Efforts are underway, led by the Oak Creek Watershed Council, to counteract these impacts through education and outreach, and through projects such as installing more public toilets, trash receptacles, and dog waste stations.

### **Wastewater Management**

The City incorporated in 1988, and most of the City's infrastructure was originally developed under the jurisdiction of either Coconino or Yavapai Counties. The City established its sewer system in 1993 and has since converted 60 percent of City homes and businesses off of septic systems. Reducing the number of septic systems by converting to the City sewer system is removing one of the threats to Oak Creek's water quality.

Treated wastewater is a form of effluent that is considered an available supply of water if it is claimed at the time of discharge. Typically it is impounded, evaporated, or stored underground. The City's Wastewater Treatment Plant produces treated effluent that is currently stored in reservoirs or disposed of in ponds or with spray irrigation. Effluent can be reused for a variety of purposes when treated to appropriate levels. The challenge to reusing effluent from the City's Wastewater Treatment Plant is in distributing the water, especially since the treatment plant is four miles beyond the city limits.



### Stormwater Management

The City's 2005 *Stormwater Facilities Master Plan* proposes drainage improvements where there are significant flooding concerns. Projects are prioritized based on criteria such as the threat to life or property, the frequency of flooding, and the potential to coordinate with other projects. The City continues to implement these projects annually as part of the City's Capital Improvement Plan. The City's storm drain system consists of culverts, roadside drainage ditches, and natural washes. Besides the potential for flood damage, stormwater can also carry pollutants. One key aspect of the City's stormwater management program is public education and outreach to citizens and businesses about protecting water quality by preventing pollutants from entering the stormwater system.

The City's *Stormwater Management Plan* addresses measures to maintain and improve the quality of stormwater being discharged into Oak Creek and its tributary drainages. The plan focuses on reducing the discharge of pollutants into

Oak Creek, increasing public awareness of water quality issues, promoting regional programs, and satisfying the water quality requirements of the Clean Water Act. Stormwater can be managed with the use of more natural features that accommodate the water rather than funneling it across paved surfaces to enter drainages, referred to as low impact development. The intent is to increase infiltration rather than runoff. Increased infiltration can reduce the impacts of flooding downstream and ultimately contribute to groundwater recharge. Just as in nature, plants can slow the movement of water, discourage erosion, and naturally irrigate landscaping, while increasing wildlife habitat and improving property appearance. This may be as simple as adding a curb cut that allows water to collect in a median or strip of landscaping between a street and sidewalk. Other methods include using permeable or porous pavers and pavements, creating depressions or bioswales that act as retention basins, or simply preserving more natural open space within developments.

**Low Impact Development:**  
A stormwater management approach that preserves or mimics natural drainage systems for infiltration and the reuse of stormwater.





## RESOURCE CONSERVATION

The environment that surrounds us is made up of resources that we all depend on, and with the goal of sustainability in mind, these resources must be conserved for future generations.

### Energy Conservation and Air Quality

Conserving energy will reduce costs while decreasing the use of fossil fuels and resulting pollution. Improving the efficiency of buildings can reduce the need for heating and cooling and result in lower utility bills. Solar power is already in use by many homes and businesses, and there is the potential for expanding the use of solar energy throughout the community.

Air quality is affected by vehicle exhaust, fireplaces, wood burning stoves, prescribed burns, and dust from off-highway vehicles. Less manageable air quality impacts are primarily from wildfires and excessive winds carrying dust and particulates. Improving energy efficiency and reducing vehicle use and traffic congestion are ways of reducing air pollution and thus improving air quality.

### Habitat Conservation

A healthy natural environment is reliant on maintaining the natural functions of the ecosystem, on which plants and animals depend. The idea that the built environment is in harmony with the natural environment means that the natural landscape should be preserved wherever possible and replicated in landscaping and restoration. While preserving the landscape in its natural state is preferred, landscaping with native plants can reduce water consumption while providing wildlife habitat.

### Green Building

Green building and low impact development are environmentally friendly design and construction practices. Integrating these methods into new and existing projects will have multiple benefits, such as improving energy efficiency, reducing air pollution, conserving water, and providing wildlife habitat.

### Key Issues

- The impacts to environmental quality from increasing traffic and vehicle use.
- Environmental impacts of increasing numbers of people recreating on public land.
- Habitat loss and degradation from development, erosion, and recreation.
- The potential for increasing the use of solar and other renewable energy.

Green Building:  
Design, construction, and operational practices that use resources responsibly and efficiently.

## ENVIRONMENT POLICIES

1. Participate in and contribute to regional and statewide water planning efforts.
2. Investigate and implement appropriate methods to reuse treated wastewater and to recharge groundwater.
3. Improve and maintain the water quality of Oak Creek.
4. Implement incentives or regulations for existing and new development to incorporate water conservation measures and energy efficient site design and building features.
5. Incorporate water conservation, energy efficiency, the use of renewable energy sources, and sustainable practices into new and existing City facilities and programs.
6. Establish standards for the use of low impact development practices to manage stormwater.
7. Work with Coconino County to relocate structures out of floodways during redevelopment efforts.
8. Reduce harmful emissions.
9. Support community efforts to be dark sky compliant.
10. Preserve and restore natural drainages and open space areas with native plants to provide wildlife habitat, reduce erosion, and improve stormwater retention.
11. Control the spread of invasive exotic plant species through education, removal, and prevention.
12. Implement a green building program that includes education, standards, and incentives.
13. Support recycling and other waste stream reduction efforts.

## ENVIRONMENT ACTION PLAN

Action	Lead	Partners
<b>Priority 1 (0-5 years):</b>		
1 Ensure that a City representative participates in regional water advisory organizations.	Community Development, Public Works	Yavapai County, Verde Valley municipalities and regional organizations
2 Collaborate with private water companies to reduce water consumption.	Community Development, Public Works	Private water companies
3 Reevaluate and update the dark sky ordinance.	Community Development	Planning and Zoning Commission, City Council
4 Investigate existing weed management efforts and implement appropriate actions, which may include a partnership weed management plan.	Public Works	Community Development, Forest Service
5 Develop a City green building code and associated incentives for all development.	Community Development	Planning and Zoning Commission, City Council, citizens, building community
<b>Priority 2 (6-10 years):</b>		
6 Conduct an inventory and audit of water conservation and energy efficiency of City facilities and operations and implement appropriate measures.	Public Works	Private water companies, Community Development
7 Develop an action plan that would focus on methods to improve energy efficiency and conservation and reduce harmful emissions.	Community Development	Public Works, City Manager's Office, Planning and Zoning Commission
8 Investigate the acquisition of private water companies.	City Manager's Office	Public Works, City Attorney, Community Development, water companies

APPENDIX A4

COCONICO COUNTY SUSTAINABLE BUILDING PROGRAM CHECKLIST



“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” -World Commission

[www.coconino.az.gov/sustainablebuilding](http://www.coconino.az.gov/sustainablebuilding)

Use this rating worksheet as a guide to sustainable building and/or for tabulating points to certify projects for the Coconino County’s Sustainable Building Program (CCSBP). Please contact the Sustainable Building Program at 928-679-8882 or [nschmidt@coconino.az.gov](mailto:nschmidt@coconino.az.gov) with questions or for any additional information.

## 2022 Sustainable Building Program Commercial Project Guidelines and Rating Worksheet

Submittal Date: \_\_\_\_\_ Final Date: \_\_\_\_\_

Point Rating: \_\_\_\_\_ Point Rating: \_\_\_\_\_

Owner:		Phone:	
Project Name:		Project #	
Site Address:		Parcel #	
City, St.:		BD#	
Builder:		Phone:	
Arch/Designer:		Phone:	

<b><u>Bronze Level</u></b>	<b><u>Silver Level</u></b>	<b><u>Gold Level</u></b>
By qualifying at the entry level you will be meeting the CCSBP’s baseline for sustainably responsible building.	The intermediate level is designed to achieve a higher level of environmental building performance.	At the advanced level, the building demonstrates exceptional environmental commitment.
Accumulate a total of <u>25% of applicable points</u> from the checklist.	Accumulate a total of <u>35% of applicable points</u> from the checklist.	Accumulate a total of <u>50% of applicable points</u> from the checklist.

A project which qualifies for any level of certification may earn a Net Zero Energy Distinction if the project meets the Net Zero Energy requirements. This distinction will appear on the project plaque received upon completion of the program. Please see the Net Zero requirements on page 5. Projects must meet all prerequisites to achieve any level of certification.

<b><u>Summary of Rating Categories</u></b>	
1 Community and Site	4 Materials and Resource Use
2 Water Efficiency and Use	5 Indoor Environmental Quality
3 Energy Efficiency and Use	6 Innovation and Education

## Worksheet Items for Credit

**Potential  
Points**

**Project  
Points**

### 1-Community and Site

Community Connectivity & Transportation	1.01	Project is located within ¼ mile of urban trail.	4	4
	1.02	Project provides access to public transportation.	2	
	1.03	Project supports high density development and community connectivity through diverse uses of neighborhood.	3	
	1.04	Building is placed on previously developed land or high priority site, e.g. brownfields and infill in a historic district.	3	
	1.05	Development considers neighboring land uses in design.	4	
	1.06	Bike racks are installed on site.	2	2
	1.07	Infrastructure for green vehicles is provided.	5	5
Community Resilience	1.08	Firewise construction practices are implemented.	3	
	1.09	Site demonstrates Firewise practices.	3	
	1.10	Health and wellness area for employees.	1	
	1.11	Dedicated space for community gathering.	1	
Site	1.12	Erosion control plan, including topsoil preservation, is implemented.	2	
	1.13	Maximizes open and natural space by minimizing the disturbed area on site. Have a "no-disturbance zone" marked on drawings. "No-disturbance zone" to be protected flagged and protected during construction.	2	
	1.14	Building is placed/constructed on-site to minimize negative impact on natural vegetation, site topography, and natural drainage ways.	2	
	1.15	Low Impact Development (LID) strategies implemented to keep stormwater on site.	6	
	1.16	Exterior lighting compliant with Dark Skies regulation (light pollution reduction).	1	
	1.17	No chemical herbicides or pesticides are used on site, or non-toxic versions are used (including for termite pretreatment).	2	
	1.18	Appropriate amount of outdoor space is included.	2	
	1.19	Roof system minimizes heat island effect.	1	

	1.20	Landscape minimizes heat island effect.	<b>2</b>	
	1.21	Protection and/or restoration of wildlife habitat (including pollinator habitat).	<b>1</b>	
		<i>Total for Community &amp; Site (1)</i>	<b>52</b>	<b>11</b>

<b>2-Water Use and Efficiency</b>				
Appliances/ Fixtures	2.01	Automatic faucet installed in bathroom sinks (battery IR or motion sensors).	<b>4</b>	
	2.02	Faucets are low flow at 0.8 gallons per minute or less at 20 psi and 1.5 gpm at 60 psi.	<b>10</b>	10
	2.03	Tanked toilets are 1.28 gallons per flush or less, flushometer-valve toilets are 1.6 gpf or less or dual flush.	<b>15</b>	15
	2.04	Urinals are 0.5 gallons per flush or less, 3 points Waterless urinals, 6 points	<b>15</b>	3
	2.05	Water bottle filling stations are installed.	<b>4</b>	4
	2.06	Washing machines are Energy Star certified	<b>4</b>	4
	2.07	Dishwashers are Energy Star certified.	<b>4</b>	4
Rainwater Harvesting	2.08	Rainwater collection and storage system is installed for use on site. (No distribution system installed)	<b>8</b>	8
	2.09	Rainwater collection system with on-site distribution to vegetation is installed (i.e. e. gutters, scuppers, downspouts, retention areas, irrigation lines, swales, berms, etc.). Credit awarded is in addition to 2.10.	<b>8</b>	
Graywater Reuse	2.11	Two-pipe drain system for future gray water recovery system is installed.	<b>2</b>	
	2.12	Complete gray water irrigation system is installed.	<b>10</b>	
Exterior Strategies	2.13	Landscape is Xeriscaping (100% of landscaped areas) excluding vegetable/fruit gardens. Hydroseed grasses are native/low water, as are trees and shrubs, no turf. (Points for 2.13 or 2.14)	<b>10</b>	
	2.14	Landscape requires no irrigation (other than gray water, stored rainwater, reclaimed water and/or natural precipitation). (Points for 2.13 or 2.14)	<b>10</b>	
	2.15	Irrigation controller has a rain sensor shut off.	<b>2</b>	
	2.16	Irrigation system has soil moisture sensor.	<b>2</b>	
	2.18	Turf (lawn) area is minimized and irrigated with reclaimed water. For turf areas greater than 400 sf that are not irrigated with reclaimed water, a deduction of 1 point per 100 sf of turf.	<b>0</b>	
		<i>Total for Water Use &amp; Efficiency (2)</i>	<b>108</b>	<b>48</b>

<b>3-Energy Use and Efficiency</b>				
Passive Solar Design	3.01	Building is oriented on the lot so the longest axial dimension faces within 20 degrees of true south.	<b>5</b>	
	3.02	Windows on south side.	<b>2</b>	
	3.03	Thermal mass is included in the design.	<b>2</b>	
	3.04	South glass has proper overhang or other shading feature to afford both summer shading and winter sun.	<b>3</b>	
	3.05	Exterior shading devices, screens, or landscaping for windows on the west side of the building, or no west windows installed.	<b>1</b>	
	3.06	Air lock vestibule is used to minimize heat loss at main entrance(s).	<b>2</b>	
	3.07	Building is designed for passive solar winter heating using solar heat gain analysis: 4-points for 50% heating demand, 9-points for 75% heating demand, 12-points for 100% heating demand.	<b>12</b>	
Renewable Energy	3.08	Clean renewable energy system installed: solar electric (photovoltaic) power system and/or a wind power system. Points are awarded based on percentage of the project's energy needs met: 2 points for every 10% of energy needs met; a maximum of 20 points is awarded for 100%.	<b>20</b>	
	3.10	Solar water heating system is installed. (4 points for meeting 50% of annual hot water needs, 7 points for meeting 80%)	<b>7</b>	
	3.11	Pre-wiring (Solar ready) or plumbing to allow for easy installation of future renewable energy systems. Wiring for PV-3 points, Plumbing for solar thermal- 3 points; 6 points accumulative	<b>6</b>	<b>3</b>
Appliances	3.12	Appliances are Energy Star certified.	<b>2</b>	<b>2</b>
Lighting	3.14	Occupant sensor controls are provided.	<b>5</b>	<b>5</b>
		High efficacy lighting constitutes	<b>15</b>	<b>15</b>
Building Envelope	3.15	Floors, slabs, walls and ceilings exceed the requirements of Tables C402.1.4 and C402.4 by at least 5%	<b>5</b>	
	3.22	Fenestration U-factors are reduced by at least 5%	<b>3</b>	<b>3</b>
	3.23	Energy Performance Analysis completed	<b>4</b>	



Performance	3.25	Diagnostic Blower Door Test results show 0.35 ACH or less (0.35 CFM at 50 Pascal's pressure per sf or less).	5	
	3.26	Duct blaster test is performed and results show that total duct leakage $\leq$ 6 cfm/sf to outdoors per 100 sq ft of conditioned floor area.	5	
	3.27	Whole building commissioning to meet ASHRAE Standard 189.1-2020	10	10
Mechanical Systems	3.28	HVAC	10	
	3.29	Water heaters are Energy Star certified	3	3
Certifications	3.30	Project is also participating in another energy/sustainable building certification program.	1	
Atmosphere	3.31	Mechanical systems and appliances utilize low GWP refrigerants.	5	5
		<i>Total for Energy Use &amp; Efficiency (3)</i>	116	46

4-Materials and Resource Use				
Design	4.01	Credit will be awarded for designs with extra consideration for durability and resilience to weather damage from these elements: freeze-thaw cycles, moisture, temperature extremes, and UV radiation exposure.	2	
	4.02	Use of Optimal Value Engineering (OVE) or advanced framing techniques. Must include examples on drawings.	2	
Construction Waste	4.03	Removed trees, stumps and tree limbs are donated or ground for mulch.	2	
	4.04	Construction waste reduction / reuse plan written and followed (e.g. recycle wood, cardboard, drywall, foam, metal, concrete, masonry, asphalt).	6	
	4.05	Donate excess materials to a non-profit building organization. (Restore, etc.)	2	
Materials	4.06	Use of durable finishes (i.e. warranty or life expectancy of 40+ years) The finish must comprise 90% of total finish used in each category: roofing (2 pts), siding (4 pts), and flooring (4 pts).	6	
	4.07	Regional materials: materials used are extracted and/or manufactured within 500 miles of site.	6	
	4.08	Recycled, salvaged, and/or rapidly renewable materials are used.	6	
	4.09	Certified sustainably harvested wood products are used.	6	
	4.10	Redevelopment of existing building. 5 points per 20%	25	
	4.11	Provide life cycle analysis results showing environmental impact reduction	6	

	4.12	Recycling bins provided throughout building	<b>2</b>	
	4.13	Compost collection and/or composting facilities on-site	<b>1</b>	
		<i>Total for Materials &amp; Resource Use (4)</i>	<b>72</b>	

<b>5- Environmental Quality</b>				
Ventilation	5.01	Ventilation strategy is implemented to ensure healthy outside air exchange. Building is designed and constructed for ventilation conforming to ASHRAE Standard 62.1-2019.	<b>8</b>	
	5.02	Passive radon ventilation system is installed per EPA guidelines.	<b>6</b>	
Materials	5.03	Low-VOC materials are used: floor coverings, adhesives, sealants, paints and finishes. (3-points for each type used, max 15-points)	<b>6</b>	
	5.04	Zero VOC materials are used: flooring, adhesives, sealants, paints and finishes. (4-points for each type used, max 20-points)	<b>6</b>	
	5.05	Provide enhanced thermal comfort design by conforming with ASHRAE Standard 55-2010.	<b>2</b>	<b>2</b>
	5.06	Acoustic performance. Consideration given and design features implemented to address potential noise issues.	<b>2</b>	
	5.07	Added air filtration. MERV rating >11	<b>2</b>	<b>2</b>
		<i>Total for Indoor Environment Quality (5)</i>	<b>32</b>	<b>4</b>

<b>6-Aesthetics, Education and Innovation</b>				
Aesthetics	6.01	Public art that enhances community character, historical understanding and cohesion.	<b>10</b>	
Education	6.02	Educational aspects are integrated throughout the construction (eg construction blog, tours, speaking at local schools about project)	<b>5</b>	
Innovation	6.03	Innovative Features:	<b>5</b>	
		<i>Total for Innovation and Education</i>	<b>20</b>	

### Total Points for all Categories

	1	2	3	4	5	6	Total
<b>Total</b>	52	108	116	72	32	20	400
<b>Submitted</b>							
<b>Final</b>							

## APPENDIX A5

# VERDE VALLEY REGIONAL ECONOMIC ORGANIZATION (VVREO) BUSINESS SUSTAINABILITY ASSESSMENT

Save

Done

More

Exit

Bronze

Silver

Gold

Platinum

## Bronze

### REDUCE Non-renewable Energy and Resources *(Need 2)* ▲

#### ENERGY CONSERVATION

Conserve energy with equipment, appliances, and heating/cooling systems.

##### EXAMPLES:

- Use equipment efficiently (unplug appliances, control thermostats, etc).
- Repair or purchase used equipment.
- Ensure new equipment is more efficient than norm (e.g. Energy Star).
- Other.

#### CLIMATE

Understand and take steps to reduce your greenhouse gas impacts.

##### EXAMPLES:

- Buy 50% green power.
- Maintain refrigeration equipment and replace outdated refrigerants.
- Identify sources of greenhouse gas in the business and 2-3 actions to reduce.
- Identify climate-related risks to your business and 2-3 actions to mitigate.
- Other.

#### TRANSPORTATION

Reduce miles traveled or fuel used by employees and the business.

##### EXAMPLES:

- Encourage alternative commute modes (carpool, public transit, cycle, walk).
- Consolidate shipments for deliveries.
- Choose lower-footprint delivery options.
- Enable remote work.
- Other.

#### EXTRACTED MATERIALS

Reduce your need for non-renewable materials from mines, quarries, mineral deposits, etc. EXAMPLES:

- Delay upgrading metal-containing products (electronics, appliances, vehicles, etc) until you need additional capabilities AND recycle properly.
- Minimize or find alternatives for non-renewable materials (rock, gravel, sand, concrete, tile, glass, metal, etc).
- Reuse metals and other non-renewable resources from your own operations.
- Other.

### MINIMIZE Pollution & Toxics *(Need 2)* ▲

#### CHEMICALS

Use nontoxic products for the majority of your cleaning. EXAMPLES:

- Use certified green cleaning products (Green Seal, EcoLogo, Safer Choice, Environmental Working Group).
- Make your own green cleaning products from ingredients such as lemon juice, baking soda, and vinegar.
- Minimize the need for harsh solvents by choosing products and materials easily cleaned with water and nontoxic ingredients.
- Other.

#### AIR QUALITY

Maintain adequate ventilation and fire prevention, both indoor and outdoor.

##### EXAMPLES:

What are you doing?

What are you doing?

What are you doing?

What are you doing?

What are you doing?

What are you doing?

Save

Done

More

Exit

Bronze

Silver

Gold

Platinum

 **WASTE****Reduce waste and recycle common materials. EXAMPLES:**

Separate and recycle at least 25% of waste with a service that demonstrates minimum 80% recovery rate.

Reduce the waste you generate by at least 25%.

Plan 3-5 steps to increase diversion from landfill within the next two years.

Other.

What are you doing?

 **MATERIALS EFFICIENCY****Reduce materials and packaging in your business. EXAMPLES:**

Favor durable, reusable, and repairable items, avoiding single-use products and excessive packaging.

Reduce packaging for items you produce or sell.

Buy key materials and supplies in bulk.

Other.

What are you doing?

**PROTECT Ecosystems (Need 2) ▲** **FOOD SYSTEMS****Reduce food-related waste. EXAMPLES:**

Identify 2-4 opportunities to prevent food waste.

Reduce serving sizes.

Reduce the footprint of your food packaging.

Other.

What are you doing?

 **WATER****Assess indoor and outdoor water use and take basic steps to conserve. EXAMPLES:**

Install low flow water fixtures.

Ensure all water-using appliances are high-efficiency.

Encourage water-saving behaviors; test for and eliminate leaks.

Ensure irrigation systems are efficient (e.g., drip irrigation, timers).

Other.

What are you doing?

 **BUILDING****Assess building(s) against current codes and set priorities for improvement. EXAMPLES:**

Comply with Dark Sky guidelines AND at least one of the following:

Ensure buildings comply with current codes OR older buildings at least meet safety codes with plans to improve.

Occupy and preserve a historic building.

Commit to current codes for remodels planned in the next two years.

Other.

What are you doing?

 **OTHER NATURAL RESOURCES****Assess your use of natural resources and make plans to improve. EXAMPLES:**

Give preference to local and/or certified sustainable products.

Identify your main natural resource uses and make plans to mitigate risks.

Assess the impact of your waste streams to air, water, and soil.

Identify habitat impacts of your business emissions.

Other.

What are you doing?

**MEET Human Needs (Need 2) ▲** **SAFETY NET****Provide basic benefits for employees. (Check if self-employed, with health**

What are you doing?

Save

Done

More

Exit

Bronze

Silver

Gold

Platinum

Provide paid vacation for employees working 20+ hrs/week.

Provide paid vacation and personal time for employees working 29+ hrs/week.

Offer family leave with a commitment to continued employment upon return.

Other.

**INCLUSION**

**Establish goals and plans for a diverse and inclusive workforce.**

**EXAMPLES:**

Define a vision for inclusion in your business and make plans to achieve.

Assess the diversity of your employee base relative to the community and set goals to improve.

Understand labeling that protects workers and communities in your supply chain (e.g., Fair Trade) and choose certified products.

Other.

**EMPLOYEE DEVELOPMENT**

**Design jobs for employee satisfaction and growth. (Check if self-employed with no employees.) EXAMPLES:**

Provide reliable work shifts, task variety, flexibility AND hold supervisors accountable for these elements.

Establish practices (e.g., surveys) to identify and address areas of concern.

Regularly recognize employees in ways that are meaningful to them.

Other.

**STAKEHOLDER ENGAGEMENT**

**Build collaborative relationships with customers, community, and other external stakeholders. EXAMPLES:**

Attend public meetings to understand community needs (e.g., City Council, Rotary, nonprofit presentations).

Participate in community development activities (e.g., city commissions, nonprofit boards).

Encourage customers to make more sustainable choices with your products or services (e.g., packaging, linen reuse, water stations).

Actively participate in local disaster preparedness efforts.

Other.

**MANAGE for Sustainability (Need 2) ▲**

**MISSION**

**Communicate the business case for sustainability to managers and staff.**

**EXAMPLES:**

Develop a vision and business case for sustainability in your organization.

Share the organization's sustainability commitment with all employees.

Train employees on sustainability frameworks and practices.

Other.

**IMPLEMENTATION & INTEGRATION**

**Make sustainability a formal initiative. EXAMPLES:**

Designate someone in your organization to lead sustainability efforts.

Engage managers and staff to identify sustainability projects.

Implement at least one project and evaluate results and lessons learned.

Identify a sustainability issue in the community and engage in philanthropy around it (time, money, or in-kind).

Other.

**MEASUREMENT & REPORTING**

**Gather sustainability data to guide major projects. EXAMPLES:**

Identify 1-5 relevant sustainability metrics and gather baseline data.

What are you doing?

What are you doing?

What are you doing?

What are you doing?

What are you doing?

What are you doing?

Bronze	Silver	Gold	Platinum
--------	--------	------	----------

Next

Save
Done
More
Exit



APPENDIX A6  
MEP-RELATED SECTIONS OF  
SCHNEBLY COMMUNITY FOCUS AREA PLAN (CFA)



# Schnebly Community Focus Area Plan

## CFA Vision

This CFA is located within the Heart of Sedona, a pedestrian-friendly area focused on Oak Creek and Sedona's heritage. Future development and redevelopment is a mix of uses that preserves the Oak Creek riparian corridor, with natural hillsides, open fields, and a variety of modestly scaled buildings, thus sustaining the distinct historic context and character.



## INTRODUCTION

This Community Focus Area (CFA) Plan is an addendum to the Sedona Community Plan and serves as a guide for future development of this area. The intent is to address issues that are specific to this geographic area in more detail than the City-wide Sedona Community Plan. This unique Sedona neighborhood is located across Oak Creek from the bustling tourist district of Uptown. Driving up Schnebly Hill Road from State Route 179, the shops and galleries are quickly left behind as you pass through a sparsely developed area that soon transitions to the National Forest. There are only 41 houses within this 91 acre area, most of which are hidden in the hills or set back from the road. Sedona's only RV Park is here, hidden in the trees along Oak Creek, with 84 camping sites. Visible above the trees is the glass spire of the Creative Life Center, a draw for visitors and residents to its seminars and programs.

This area is bound to see significant growth and change in the future as only 56% of the lots in this area have been developed. The area is currently zoned single-family residential, and future growth would result in far more houses than today, changing the area from its open, rural character to a typical residential area. The intent of this CFA Plan is to guide future growth in a manner that will retain the unique character of the area.

### Community Expectations

The Sedona Community Plan listed the following expectations for this CFA:

- *“Retain large parcels and rural character.*
- *Support agriculture as a key character element.*
- *Support non-residential uses (e.g., bed and breakfast, neighborhood cafe) if tied to the preservation of large land areas and generates less traffic than medium-density residential.*
- *Retain similarly affordable housing currently provided in existing mobile home/RV park.*
- *Protect riparian environment along Oak Creek.*
- *Evaluate potential for environmentally sensitive public creek access.*
- *Preserve historic resources (Gassaway House).”*

- Sedona Community Plan p. 45

### Existing Conditions

CFA Planning Area: 91 acres

Current Land Use:

- 75 lots, 44% of the lots are undeveloped
- 41 houses on 30 acres
- 1 office building, 1 religious institution, and 1 RV Park (84 sites)

Zoning:

- The majority of the CFA is either zoned RS-10b (40 acres) or RS-18b (44 acres):
  - RS-10b permits Single Family Residential with a minimum lot size of 10,000 square feet and a maximum of 4 dwelling units per acre
  - RS-18b permits Single Family Residential with a minimum lot size of 18,000 square feet and a maximum of 2 dwelling units per acre
- Other Zoning: Commercial (C-1): 2 lots; Transitional (T-12): 1 lot; Planned Residential Development (PRD): Red Rock Creek subdivision

Subdivisions:

- Red Rock Creek subdivision on Gassaway Place (The Gassaway House Historic Landmark and 9 undeveloped lots)
- The Gem subdivision on Quail Ridge Lane (8 lots, 1 undeveloped)

Streets:

- 1 public street (Schnebly Hill Road) maintained by the City of Sedona
- 4 private streets

Natural Resources:

- Oak Creek and its riparian area of large sycamore trees separates this area from Uptown
- Bear Wallow Canyon drains into Oak Creek, starting at the Mogollon Rim and running parallel to Schnebly Hill Road until entering Oak Creek next to the RV Park
- The north and east side of the CFA is characterized by steep hillsides and canyons

## RECOMMENDATIONS

The Recommendations section of this CFA Plan includes goals, objectives, and strategies. The Sedona Community Plan is the guiding document for the CFA Plan, with the goals of this plan taken from the Community Plan. The CFA objectives are statements describing the desired future of the area. The strategies (listed on the following pages) describe methods that will lead to achieving the goals and objectives. Two chapters of the Community Plan are not listed below ("Parks, Recreation, and Open Space" and "Economic Development") however those topics are covered by the other categories as shown in the summary below.

ENVIRONMENT	LAND USE	COMMUNITY	CIRCULATION
<p><b>Community Plan Goals</b></p> <ul style="list-style-type: none"> <li>• Protect Oak Creek and its riparian habitat.</li> <li>• Reduce the impacts of flooding and erosion on the community and environment.</li> <li>• Protect and preserve natural open space.</li> </ul>	<p><b>Community Plan Goals</b></p> <ul style="list-style-type: none"> <li>• Reflect a unique sense of place in architecture and design.</li> <li>• Ensure harmony between the built and natural environments.</li> <li>• Create mixed use, walkable districts.</li> </ul>	<p><b>Community Plan Goals</b></p> <ul style="list-style-type: none"> <li>• Preserve and celebrate the community's history.</li> </ul>	<p><b>Community Plan Goals</b></p> <ul style="list-style-type: none"> <li>• Reduce dependency on single-occupancy vehicles.</li> <li>• Create a more walkable and bike-able community.</li> </ul>
<p><b>CFA Objectives</b></p> <ul style="list-style-type: none"> <li>• Oak Creek is permanently protected in its natural state as a vital resource for the natural environment, community, and region.</li> <li>• Open space is a defining feature of the area, and preserved for its natural resource and scenic values.</li> </ul> <p>➤ See page 13-15</p>	<p><b>CFA Objective</b></p> <ul style="list-style-type: none"> <li>• A distinct identity unique to the area which reflects its rural, agricultural, and historical qualities.</li> </ul> <p>➤ See page 16-19</p>	<p><b>CFA Objective</b></p> <ul style="list-style-type: none"> <li>• The historic values that contribute to the character of the area are protected and interpreted.</li> </ul> <p>➤ See page 20</p>	<p><b>CFA Objective</b></p> <ul style="list-style-type: none"> <li>• A system of trails that connects residents and visitors to destinations within the neighborhood and to Uptown that is safe and convenient for walking and bicycling.</li> </ul> <p>➤ See page 21-23</p>

## IMPLEMENTATION

This CFA Plan is an addendum to the Sedona Community Plan which provides the overarching vision for future development of the City. The CFA Plan provides a more specific vision and strategies for this area and is an important tool in the City's development review process that evaluates new construction, redevelopment, and renovations, including residential, commercial, and lodging development. This plan will be used by City staff, the City's Planning and Zoning Commission, and City Council when reviewing and evaluating proposed projects.

The CFA Plan is also a tool that can be used by property owners, developers, and residents preparing a development proposal. By using this plan as a guide when putting together a development proposal, the applicant will understand the community's vision for the area.

This plan provides policy direction to guide development, whereas the Land Development Code sets forth the requirements. To make some of these strategies possible, the City of Sedona may need to amend existing regulations and processes, such as elements of the Land Development Code. The City may also consider providing incentives to encourage the participation of private developers in implementing the CFA Plan's recommendations.

Implementation of the plan is likely to occur incrementally over time with property redevelopment, new development projects, and public infrastructure improvements. Whether it is a private developer, property owner, or a City of Sedona Capital Improvement Project, projects should be designed in alignment with the plan's recommendations.

To realize the vision set forth in this plan, contributions and participation from both public, private, and non-profit entities will be necessary. The public-private partnerships to be developed might include the provision of public benefits, or financial participation which could include, but not be limited to, assisting in the offset of costs associated with development plan elements,

capital improvements, or purchase of property for a specific community benefit. These community improvements or benefits might include, but are not limited to:

- permanent protection of the Oak Creek corridor,
- trails, parks, and open space, and
- preservation of historic resources.

### **Proposed Oak Creek Heritage District**

To better enable new development projects to meet the objectives of this CFA Plan, a new zoning district is recommended. The Oak Creek Heritage District will offer options for multiple compatible land uses that may be more suitable to the area's unique features than residential zoning. The new district will encourage creative site design that will preserve the area's natural and cultural resources while strengthening the sense of place.

The new district will be an important tool in the implementation of this plan, and to facilitate the plan's implementation the City will initiate the rezoning process at the request of the landowner following adoption of the CFA Plan. The CFA Plan and the new district regulations (in the Land Development Code) will both apply to development projects under the new district.

Rezoning to the Oak Creek Heritage District will provide property owners with more flexibility by expanding their land use options. Property owners may also consider partnering with neighboring landowners to further expand the development potential of their property. This is particularly important when a community resource such as Oak Creek or pedestrian paths cross property lines. Coordination and cooperation among neighboring landowners and the City will be key to realizing the vision for this CFA.

## Proposed Oak Creek Heritage District

The Oak Creek Heritage District is a new zoning designation that provides the means for a land use that exemplifies the distinctive natural and cultural values of this area. Those features that set it apart, such as Oak Creek, the hillsides, and the historic sites are all valuable assets that should be considered a highlight rather than a hindrance for property owners. Under this district, property can be developed in a manner that maintains the historic character, scenic views, and natural resources that are the defining features of this unique setting.

One objective of this district is to encourage development that will best protect Oak Creek and the surrounding riparian habitat. Coordinated and consolidated development allows for designs that can cluster buildings and preserve larger areas of connected open space. The alternative is small, individual building lots with more driveways and more fences that will fragment wildlife habitat and eliminate the scenic characteristics of the area.

This district would also diversify the City's lodging options by offering a variety of unique alternatives that are not the typical hotel experience. This is an ideal location for low intensity lodging where visitors can easily walk to the Uptown restaurants and shops and not contribute to traffic congestion.

Landowners with property in the CFA may voluntarily choose to rezone their property to the Oak Creek Heritage District to take advantage of this opportunity once the new zone district regulations are adopted. The City will assist landowners by facilitating the rezoning application process.

The new zoning district is being proposed as an option available only at the request of a landowner.

### Permitted Uses

#### Lodging:

- Lodging Density: not to exceed double the established residential zoning density of the property.
- For example, if the property was zoned RS-10 which is a maximum of 4 houses per acre, the new zone would allow for a maximum of 8 units of lodging per acre.
- Lodging will be limited to no more than half the acreage of the CFA to ensure a mix of land uses.
- Lodging styles supported include small designer hotels, bed and breakfast inns, cottages, bungalows, and alternative lodging types, including cabins and other similar permanent structures, but not including RV's and tents or tentlike structures.
- Lodging may have associated amenities and accessory uses as listed below.

#### RV Parks:

- RV Park Density: 8 sites/acre
- An RV Park is an outdoor facility designed for accommodation in RV's for recreation, education, naturalist, or vacation purposes. An RV is a mobile structure designed as temporary living quarters for recreation, vacation, camping or travel use, which is either self-propelled or is mounted on or drawn by another vehicle. Examples include, but are not limited to, a travel trailer, camping trailer, fifth-wheel trailer, truck camper, motor home or camper van.
- RV Parks are limited to the location of the established RV park as it existed at the adoption of the CFA Plan, covering 10.8 acres.

#### Agricultural uses:

- Gardens, nurseries, vineyards, orchards, and incidental operations.

#### Park and Recreation Amenities:

- Park amenities such as picnic tables, benches, etc.
- Trails
- Amenities may be publicly accessible or for customer use only

**Proposed Oak Creek Heritage District, continued**

**Commercial:**

- To limit traffic impacts, commercial development should be located on Schnebly Hill Road within 750 feet of the roundabout.
- Appropriate businesses may include restaurants, markets, offices, galleries, studios, and retail shops.

**Single-Family Residential:**

- Density: not to exceed the established residential zoning density of the property
- The housing must be clustered in order to preserve areas of open space.

**Multi-family Residential:**

- Density: not to exceed established zoning density
- Increased density may be considered on a case by case basis when associated with community benefits, such as affordable housing, creek access, or agricultural uses.
- Multi-family housing may include duplexes, apartments, patio homes, courtyard bungalows, condos, or townhouses.
- The housing must be clustered in order to preserve areas of open space.

**Accessory Uses:**

- Employee, caretaker, or owner-occupied housing
- Spa, fitness, yoga, or other wellness studio
- Outfitter and guide services
- Outdoor recreation equipment supplies and rentals
  - Excluding motorized vehicle rentals
- Retail shop (gifts, gear, and supplies)
- Produce stand
- Café, bar, or restaurant

**Examples of lodging accommodations:**



### Proposed Oak Creek Heritage District, continued

#### Development Guidelines:

The CFA Development and Design Guidelines (pages 17-19) and all other CFA strategies are applicable to this district, in addition to the following.

- Oak Creek Floodway: All structures are to be located outside of the floodway. This will preserve the Creek's natural habitat, maintain the stormwater functions, and minimize flood damage.
- Open Space Viewshed:
  - A continuous corridor of open space along Schnebly Hill Road will preserve the viewshed from the road which is one of the defining features of the district.
  - Development may need to be clustered in order to preserve open space, including hillsides.
- Habitat Preservation:
  - Site design shall retain large native trees and as much of the natural vegetation as possible.
  - Open space should be uninterrupted and contiguous with open space and natural areas on adjacent properties.
- Historic Features: historic buildings and other historic resources should be preserved, adapted for reuse, and integrated with new development.
- Trails and pathways that connect across other properties are encouraged and will be publicly accessible, including the proposed Oak Creek creekwalk. Internal paths do not need to be publicly accessible.
- Limit the number of driveways off of Schnebly Hill Road by using existing driveways or private roads or sharing driveways wherever possible.
- Existing land uses would continue as non-conforming uses.



## APPENDIX A7

### LEED INDOOR WATER CALCULATOR ESTIMATE FOR 70 GUESTROOM DEVELOPMENT

# Sedona Oak Creek Heritage Lodge

## Water Usage Data and Calculations

***\*\*See LEED Indoor Water Use Calculation for details on baseline and daily water usage.***

	QTY
Total Number of Guest Lodges	70
Estimated Max # of Guests ( 2 per Lodge)	140
Average Annual Guest Lodge Occupancy Rate	80%
Average Daily Guests On Site	112
Average Daily Employees On Site	35
Estimated Daily Non-Guest Visitors	30
Total Daily Baseline Water Usage (gallons/day) **	4,565
Total Design Daily Water Usage (gallons / day) **	2,638
Operating Days per Year	365
Average pool fill per year (gallons)	5,236
Average spa fill per year (gallons)	898
Gallons per backwash (Pool)	262
Gallons per backwash (Spa)	45
Weeks per Year	52
Backwashes per week	0.5
Evaporation (in/day)	0.25
Evaporation (gallons/day)	187
<hr/>	
<i>Total Pool and Spa Fill (gallons / year)</i>	<i>6134</i>
<i>Total Pool and Spa Backwash (gallons / year)</i>	<i>7,982</i>
<i>Total Pool and Spa Evaporation (gallons / year)</i>	<i>68,068</i>
<b>Total Baseline Flow (gallons / year) **</b>	<b>1,666,152</b>
<b>Total Design Flow (gallons / year) **</b>	<b>962,830</b>
<b>Total Pool and Spa Water Consumption (gallons / year)</b>	<b>82,184</b>
<b>Total Net Water Savings (gallons / year)</b>	<b>880,646</b>

## Summary for Design and Construction Rating Systems

Note: All information on this tab is READ-ONLY. To edit, see the previous tab(s).

Group Name	Baseline Case (gallons/year)			Design Case (gallons/year)		
	Annual Flush Volume	Annual Flow Volume	Annual Consumption	Annual Flush Volume	Annual Flow Volume	Annual Consumption
Sedona Oak Creek Lodge	387,922.00	1,278,230.00	1,666,152.00	299,989.85	662,840.00	962,829.85

Annual baseline water consumption (gallons/year)	1,666,152.00
Annual design water consumption (gallons/year)	962,829.85
Percent water use reduction (%)	<b>42.21%</b>

Group name:

**Table: Project Information**

Enter project occupancy information. This information should be consistent with occupancy numbers used in other LEED credits.

**D Non-default gender mix**

The default gender mix is half male and half female. If necessary, modify the Male and Female occupant type columns for non-default gender mix if the project is specifically designed for an alternative gender ratio or the project is expected to have alternative gender usage rates for the life of the building.

**L The project includes ADA and/or gender-neutral restrooms**

If the project includes separate gender neutral and/or ADA restrooms without urinals, the LEED default assumption is that 5% of male occupants and 5% of female occupants use these restrooms. Enter 5% into the percent of males expected to use restrooms with urinals below. Alternatively, the project team can estimate this percentage based on the project's restroom layout/anticipated usage patterns or weighted feature counts.

Occupancy Type	Employees (FTE)	Visitors	Retail Customers	Students (K-12)	Residential	Other (specify)	Gender Ratio (%)
Total	36	36	0	0	112	0	50%
Male	18	18	0	0	56	0	50%
Female	17	18	0	0	56	0	50%

Determine the percent of males expected to use urinals (enter 100% if all male restrooms have urinals, 0% if the project contains no urinals, etc.)

Percent of males expected to use restrooms with urinals:

Enter the number of days the project is accessible to employees or FTE.

Annual days of operation:

**For projects with dual/flush toilets**

Enter the resulting flush rate into the design case flush rate section below.

Low-flush (gpf)	
Full-flush (gpf)	
LEED weighted average flush rate (gpf)	0.00

**Table: Flush Features**

1. Include the **Feature ID** that matches the information provided in the plumbing schedule.
2. Select the **Feature Family** and **Feature Type** installed on the project.
3. Enter the **Design Flush Rate** identified by the manufacturer. For dual flush toilets, use 100% to determine average flush rate.
4. Enter **Percent of Occupants** with access to the feature. If the feature is installed in all restrooms, use 100%.
5. If necessary, modify the **Total Uses per Day** column for non-default uses.

Feature Information			Flush Rate		Percent of Occupants (%)	Uses per Day					Total Daily Uses		Total Daily Water Use	
Feature ID	Feature Family	Feature Type	Baseline Flush Rate (gpf)	Design Flush Rate (gpf)		Employees (FTE)	Visitors	Retail Customers	Students (K-12)	Residential	Other	Default	Non-default (Optional)	Baseline (gallons)
WC	Toilet (male)	Low-Flow Water Closet	1.60	1.20	100	1.0	0.0	0.0	0.0	0.0	299.5		474.20	360.34
WC	Toilet (female)	Low-Flow Water Closet	1.60	1.20	100	3.0	0.0	0.0	0.0	0.0	338.5		541.60	430.28
UR	Urinal	Low-Flow Urinal	1.60	0.100	100	0.0	0.0	0.0	0.0	0.0	42.0		43.50	5.25
						0.0	0.0	0.0	0.0	0.0	0.0		0.00	0
						0.0	0.0	0.0	0.0	0.0	0.0		0.00	0
Baseline case annual flush volume (gallons/year)											387,822.00			
Design case annual flush volume (gallons/year)											269,880.00			

**Table: Flow Features**

1. Include the **Feature ID** that matches the information provided in the plumbing schedule.
2. Select the **Feature Type** installed on the project.
3. If necessary, modify the **Duration** column for non-default values.
4. Enter the **Design Flow Rate** identified by the manufacturer.
5. Enter **Percent of Occupants** with access to the feature. If the feature is installed in all restrooms, use 100%.
6. If necessary, modify the **Total Uses per Day** column for non-default uses.

Feature Information			Duration (sec)	Flow Rate		Percent of Occupants (%)	Uses per Day					Total Daily Uses		Total Daily Water Use	
Feature ID	Feature Type	Default (sec)		Baseline Flow Rate (gpm)	Design Flow Rate (gpm)		Employees (FTE)	Visitors	Retail Customers	Students (K-12)	Residential	Other	Default	Non-default (Optional)	Baseline (gallons)
	Private (residential) laundry (load)		60	2.20	0.0	100	0.0	0.0	0.0	0.0	0.0			1,222.00	498.00
SH	Residential showerhead		60	2.50	1.5	100	0.0	0.0	0.0	0.0	1.0	112.0		2,240.00	1,344.00
	Public laundry (residential) (load)		30	0.80	0.0	100	0.0	0.0	0.0	0.0	0.0			30.00	30.00
							0.0	0.0	0.0	0.0	0.0			0.0	0.0
							0.0	0.0	0.0	0.0	0.0			0.0	0.0
Baseline case annual flow volume (gallons/year)											1,273,264.00				
Design case annual flow volume (gallons/year)											842,840.00				

## APPENDIX A8

### VARIABLE REFRIGERANT FLOW (VRF) HVAC EQUIPMENT

## OPPORTUNITY

How much energy is used for heating, ventilation and air conditioning (HVAC) in U.S. office buildings?

**34%**  
**OF ENERGY**  
GOES TO HVAC<sup>1</sup>

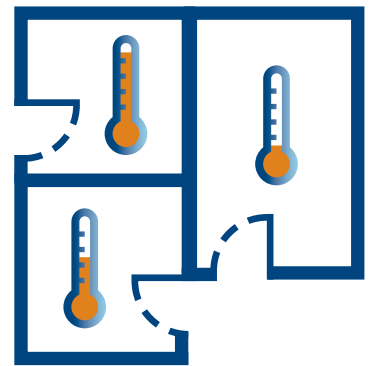
**3%**  
**OF U.S. OFFICE BUILDINGS RELY ON VRF<sup>2</sup>**  
PRIMARY HVAC SYSTEM IN EUROPE,  
JAPAN AND CHINA<sup>3</sup>

## TECHNOLOGY

How does VRF work?

**PROVIDES INDEPENDENT TEMPERATURE CONTROL**  
TO ROOMS THROUGHOUT BUILDING

**USES REFRIGERANT**  
AS COOLING/HEATING MEDIUM;  
SUBSTITUTING THIN PIPES FOR  
DUCTWORK



## M&V

Where did Measurement and Verification occur?

**PACIFIC NORTHWEST NATIONAL LABORATORY** drew from a wide variety of sources to evaluate the performance of VRF for GSA buildings

## RESULTS

How did VRF perform in M&V?

**34%**  
**ENERGY SAVINGS**  
PROJECTED  
RELATIVE TO  
CODE-COMPLIANT  
HVAC<sup>4</sup>

**THIN PROFILE**  
ADVANTAGEOUS IN  
HISTORIC BUILDINGS  
WITH LIMITED ROOM  
FOR DUCTWORK<sup>5</sup>

**COST-EFFECTIVE**  
WHEN THE PREMIUM  
IS < \$4/SQ.FT.  
COMPARED TO CODE-  
COMPLIANT HVAC<sup>6</sup>

## Projected Payback for VRF vs VAV

Reasonable paybacks achievable (shown in white)

### VRF vs VAV with Gas Reheat or Cav

34% Projected Energy Cost Savings

		Energy Cost Savings, \$/ft <sup>2</sup>							
		\$ .10	\$ .14	*\$ .18	\$ .22	\$ .26	\$ .30	\$ .34	\$ .38
Added Cost \$/ft <sup>2</sup>	\$1	10	7	6	5	4	3	3	3
	\$2	20	14	11	9	8	7	6	5
	\$3	30	21	17	14	12	10	9	8
	**\$4	40	29	22	18	15	13	12	11
	\$5	50	36	28	23	19	17	15	13
	\$6	60	43	33	27	23	20	18	16

### VRF vs VAV with Electric Reheat

45% Projected Energy Cost Savings

		Energy Cost Savings, \$/ft <sup>2</sup>							
		\$ .13	\$ .19	*\$ .24	\$ .29	\$ .34	\$ .40	\$ .45	\$ .50
Added Cost \$/ft <sup>2</sup>	\$1	8	5	4	3	3	3	2	2
	\$2	15	11	8	7	6	5	4	4
	\$3	23	16	13	10	9	8	7	6
	**\$4	30	22	17	14	12	10	9	8
	\$5	38	27	21	17	15	13	11	10
	\$6	45	32	25	21	17	15	13	12

\* Average GSA Portfolio Energy Cost Savings (based on GSA average usage of 60.7 kBtu/ft<sup>2</sup>, GSA average cost of \$0.89/therm, and EIA average cost of \$0.10/kWh)

\*\* Average Added Cost

## DEPLOYMENT

Where does M&V recommend deploying VRF?

## PILOT PROJECTS

Research on field performance is limited

<sup>1</sup>Variable Refrigerant Flow Systems. Brian Thornton, Anne Wagner (PNNL), December 2012, p.4 <sup>2</sup>Ibid, p.11 <sup>3</sup>Ibid, p.4 <sup>4</sup>Ibid, p.13 <sup>5</sup>Ibid, p.24 <sup>6</sup>Ibid, p.46