



SUPPORTING DECENTRALIZED WELL AND SEPTIC USERS

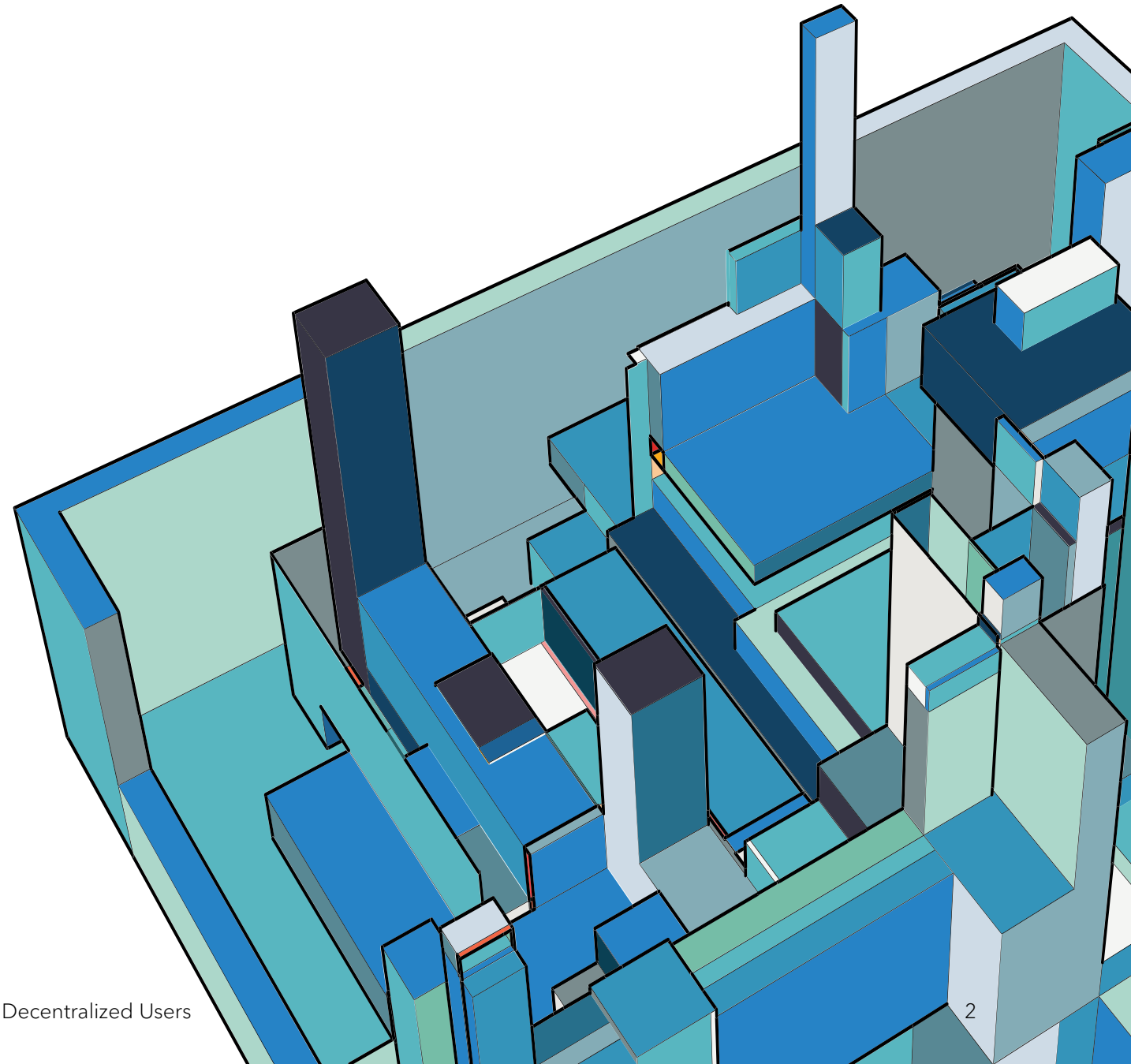
A GUIDEBOOK

The Environmental Finance Center at
University of North Carolina at Chapel Hill
School of Government

ABOUT THE ENVIRONMENTAL FINANCE CENTER

The Environmental Finance Center at the University of North Carolina at Chapel Hill (UNC EFC) is part of a network of university-based centers that work on environmental issues, including water resources, solid waste management, energy, and land conservation. The UNC EFC partners with organizations across the United States to assist communities, provide training and policy analysis services, and disseminate tools and research on a variety of environmental finance and policy topics.

The Environmental Finance Center at the University of North Carolina, Chapel Hill, is dedicated to enhancing the ability of governments to provide environmental programs and services in fair, effective, and financially sustainable ways.



HOW TO USE THIS GUIDEBOOK

This guidebook is intended to give insight into the needs of decentralized well and septic users in North Carolina.

As such, the guidebook synthesizes community stories and a robust body of literature to provide background on these users in the state of North Carolina; reviews historic and ongoing practices of discrimination that create areas lacking centralized water and sewer services; and explains barriers to centralization, including costs of connection. The UNC EFC conducts a spatial analysis to demonstrate the identification of decentralized users in Wake County, describing the methods thoroughly to encourage wider application throughout the state.

The long-term advocacy and scholarship of others support many of the ideas presented here. This book should serve as an entry point to learning more about the issues, stories, and policies that impact decentralized users. Some topics, such as funding streams and specific policy interpretations may change with time. The UNC EFC hopes that this guidebook will serve as a potential resource for those organizations and individuals that aim to support and improve the health and well-being of these decentralized users.

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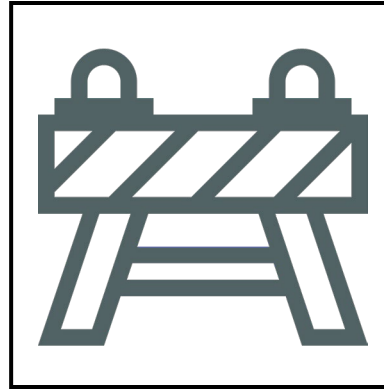
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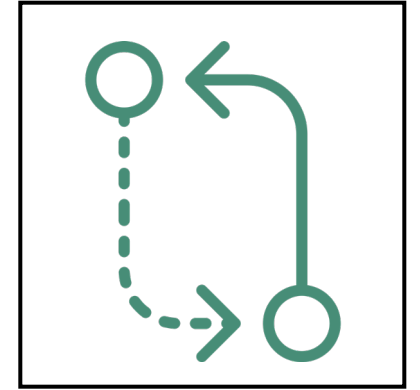
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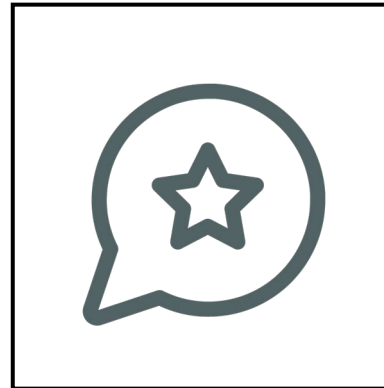
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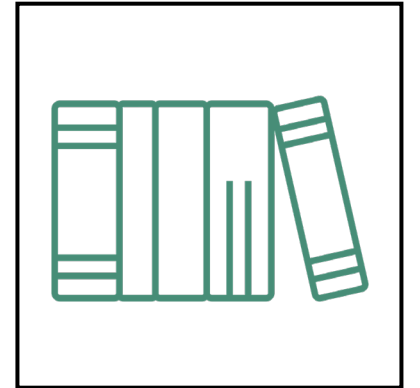
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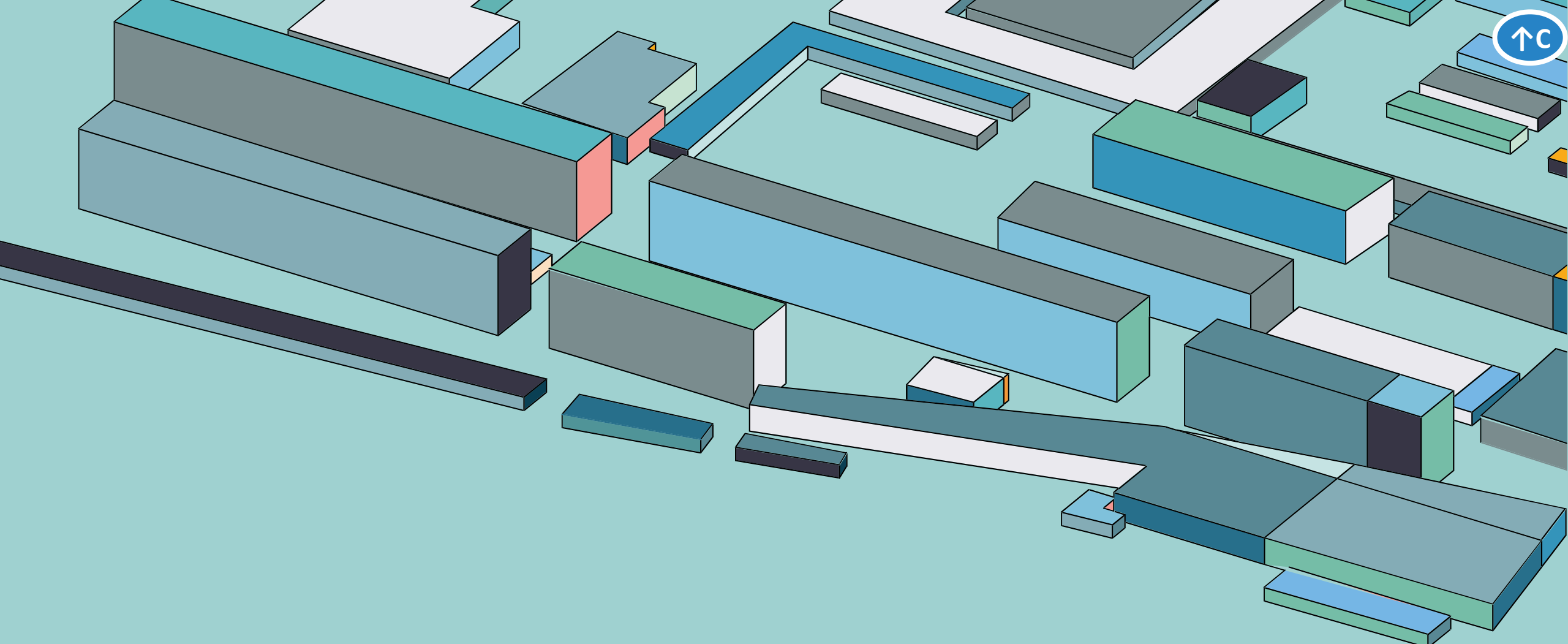
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DEFINITIONS & KEY TERMS

DEFINITIONS

What is a decentralized user?

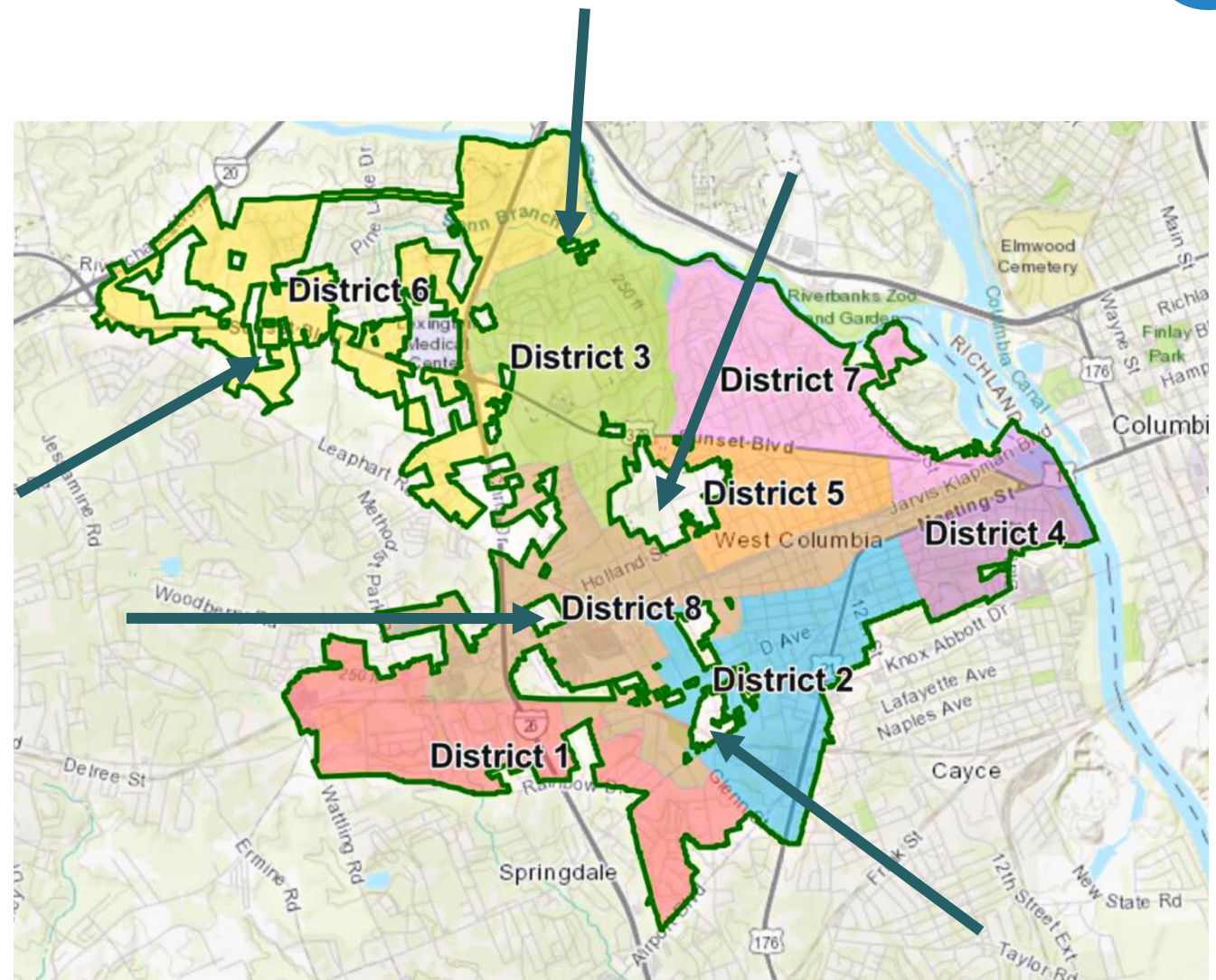
A household connected to a private well or private septic system. They do not pay for monthly service, but they are responsible for the maintenance of these systems. These users are often assumed to only exist in very rural areas, though that is not always the case:

Pocket decentralized user

A decentralized user within municipal bounds and surrounded by centralized utility services (water and/or wastewater); may be colloquially referred to as a 'donut hole'

Underbounded decentralized user

A decentralized user explicitly excluded from nearby utility access by being kept outside of municipal boundaries¹



Examples of municipal pockets in West Columbia, SC²

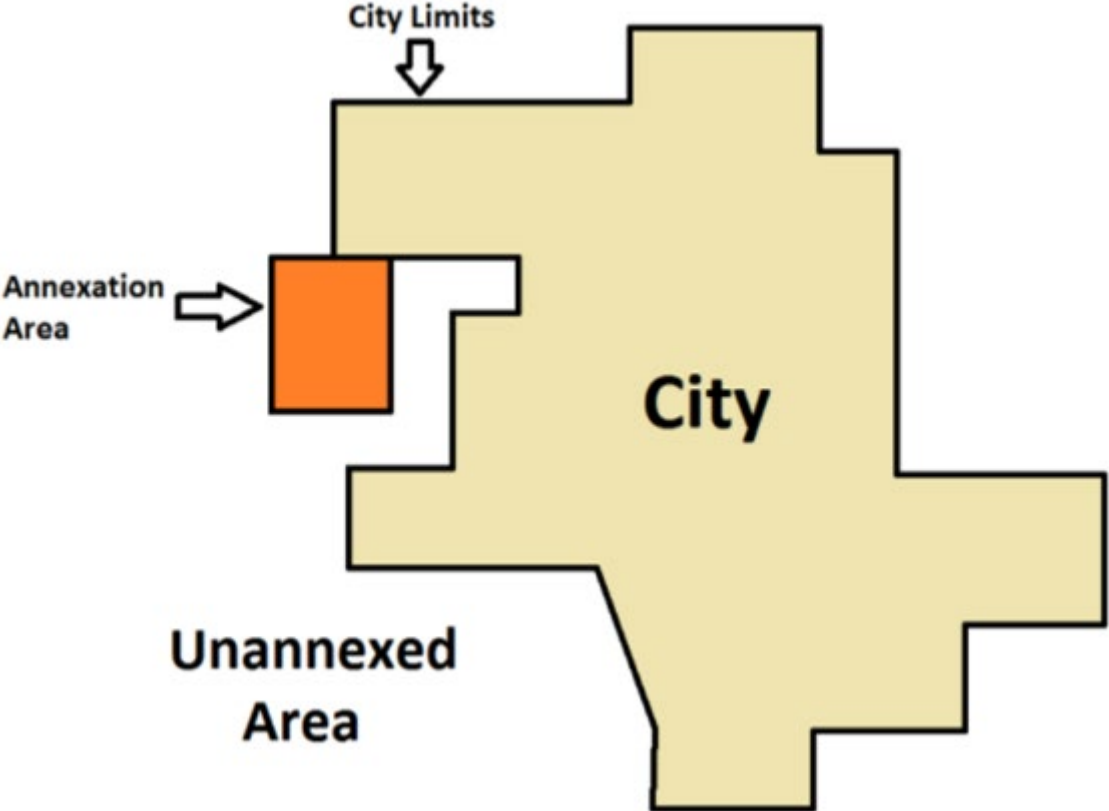
DEFINITIONS

What is annexation?

The incorporation of a property, or multiple properties, into the boundary of an existing municipality

What does it mean for a property to be contiguous?

Property is contiguous to a municipality if it abuts directly on the municipality boundary or is separated by the width of a street, creek/river, railroad right of way, or publicly-owned land.³



Example of a property that is contiguous to the municipal boundary⁴

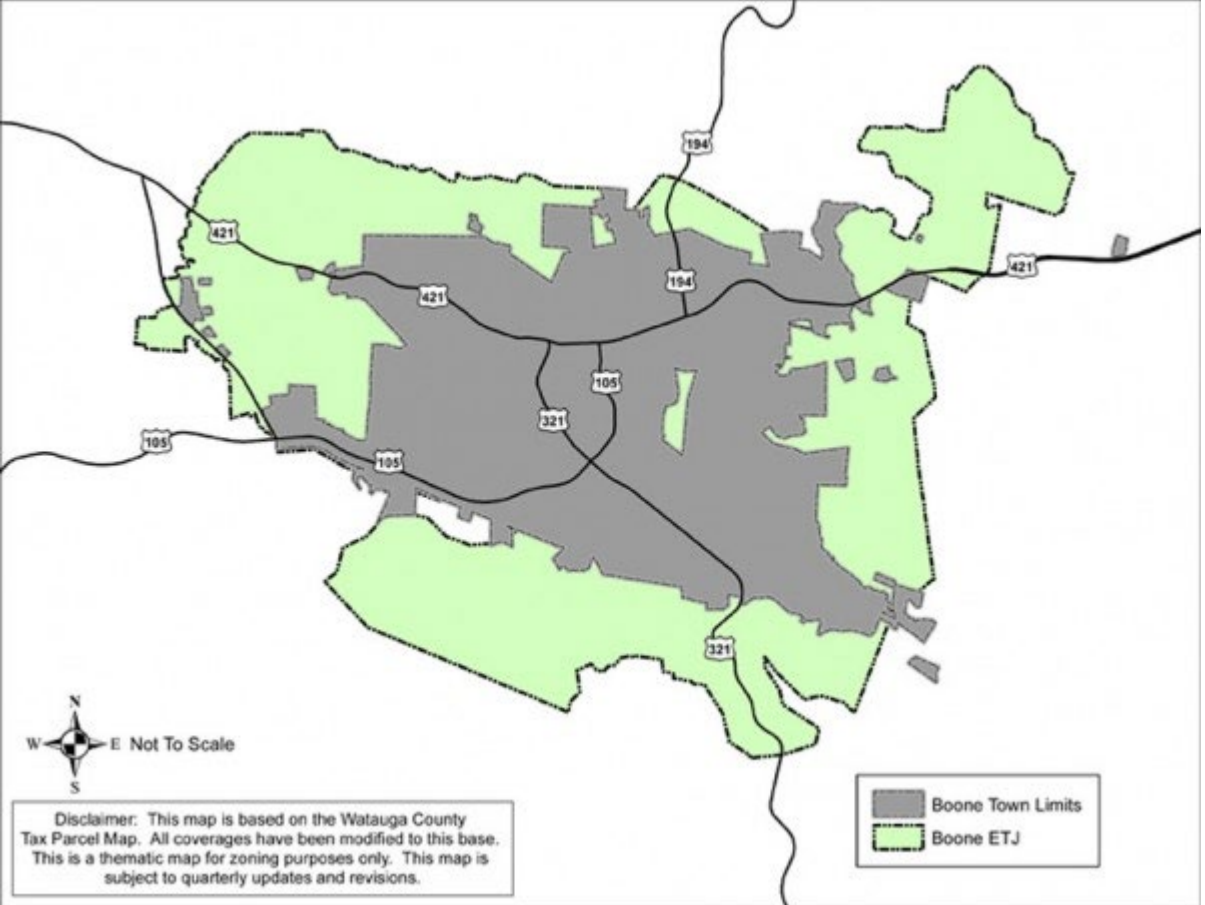
DEFINITIONS

What is an extra-territorial jurisdiction (ETJ)?

ETJ is the geographical area directly outside of a city's municipal bounds that is subject to certain ordinances, including zoning and housing policies.

In North Carolina, municipalities are granted a certain land area outside of their boundaries that is directly related to population. People who live in these areas are not citizens of the municipality, nor are they entitled to certain rights and services, like water and sewer services, city police, and voting in city elections. Municipalities have these areas under their ordinances because the development and activities that happen there have a direct effect on the city.⁵

ETJs often create contention and disagreement across the state. At the time of this guidebook's creation, a bill in the North Carolina Senate proposed the complete elimination of ETJs.⁶



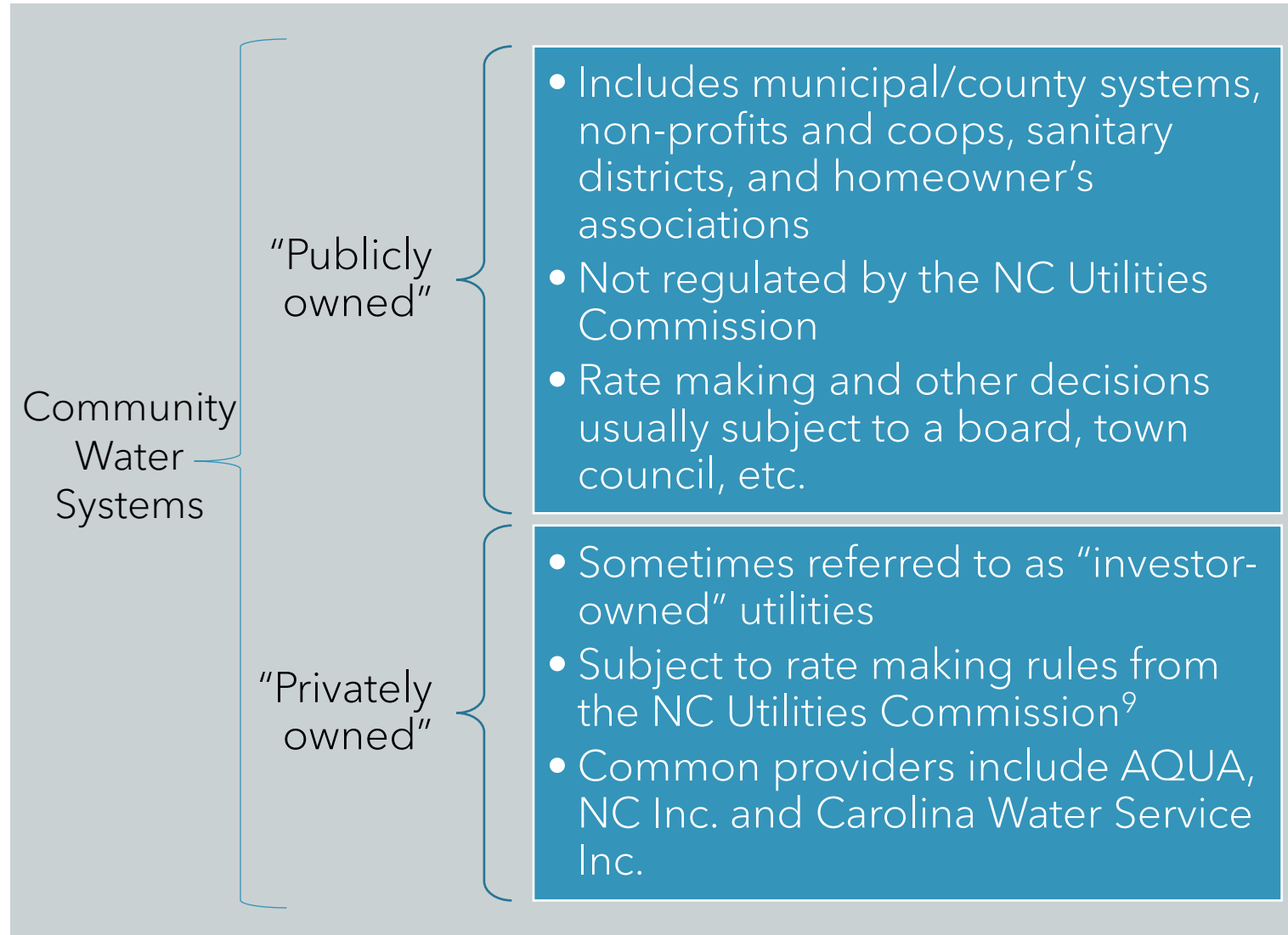
The extraterritorial jurisdiction in Boone, North Carolina was abolished by the NC General Assembly in 2014, a decision that was upheld by the North Carolina Supreme Court in 2016.⁷

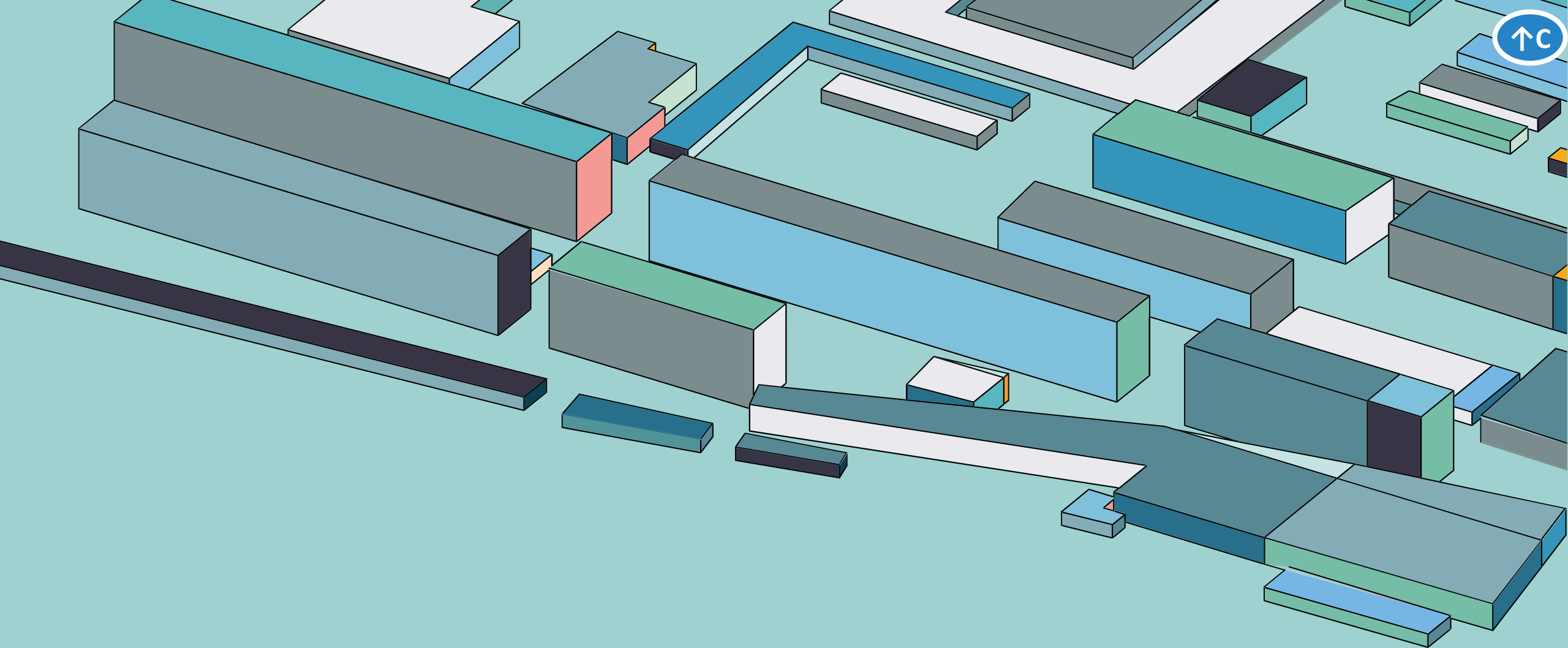
DEFINITIONS – TYPES OF SERVICE

Overlapping language within the water and sewer sector can make discussion of options for North Carolina communities confusing. This guidebook aims for consistent language use, but there may be overlapping applications of certain types of water services depending on location.

When referring to decentralized users, this guide will use “decentralized users”, “well users” or “septic users.” We will not refer to these users as “private users,” though their systems are sometimes referred to as “private” systems in that they primarily only serve a single household.

Community water systems supply water to at least 25 people or 15 residences year-round.⁸ They are subject to water quality regulation via the [Safe Water Drinking Act](#) by the state and federal government. However, there are multiple kinds of community water systems under differing ownership and governance structures. The similarities and differences between these types of systems are not a focus of this guidebook, but awareness of the complexity is helpful to keep in mind. This guidebook will refer to community water systems, regardless of ownership type, as “centralized,” and will focus on access to publicly-owned systems.



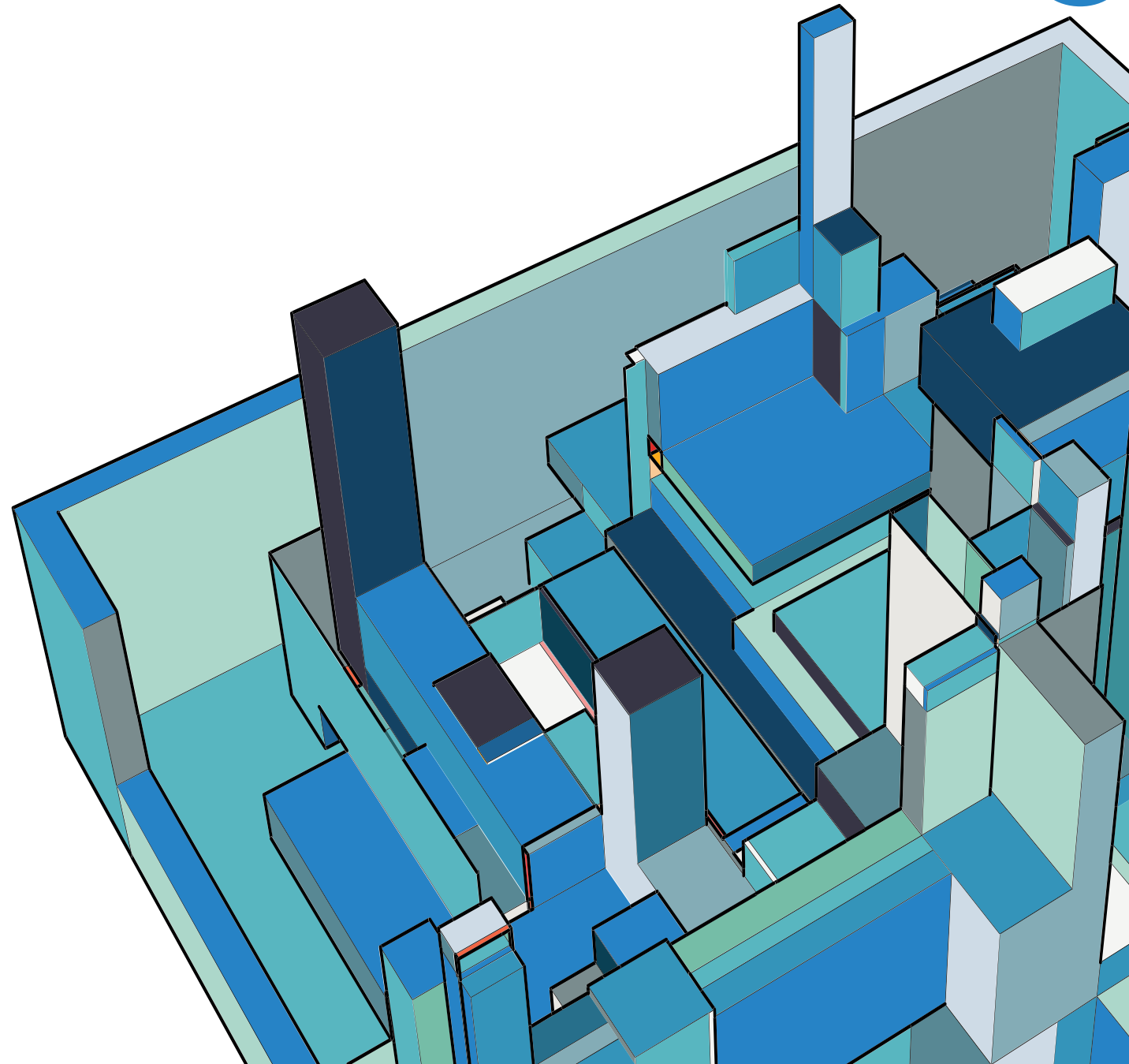


WHY DO DECENTRALIZED USERS EXIST?

BACKGROUND

Decentralized users are common in highly rural areas as maintaining the infrastructure associated with large systems that are widely distributed geographically (for example, miles of pipe, multiple pump stations, water towers, or wells) can become cost-prohibitive for a centralized system.

However, pocket and underbounded decentralized users may remain decentralized even when geographically close to local centralized infrastructure. The history of how these users stayed on wells and septic systems while centralized services were installed can raise environmental justice concerns and highlight ongoing barriers to potential centralization.



HOW CAN POCKETS FORM?

Municipal annexation laws often influence connection to centralized services

Involuntary Annexation

Prior to 2011, North Carolina's annexation laws were much more lenient, allowing municipalities to choose what areas they wanted to annex. Annexation was an attractive way for municipalities to grow and collect additional property tax dollars, especially from high-value properties. Centralized water and sewer service was required to be extended to annexed areas, but annexed areas were required to pick up those connection costs, potentially delaying connection indefinitely.¹⁰

2011 Bill

The Annexation Reform Act of 2011 paused rampant involuntary annexation by municipalities statewide. Homeowners regained some agency, as municipalities were required to foot the bill for extending centralized water and sewer service to areas meeting certain disadvantaged criteria. This bill also allows homeowners to request or deny annexation through a petition process.¹¹

Costs to Connect

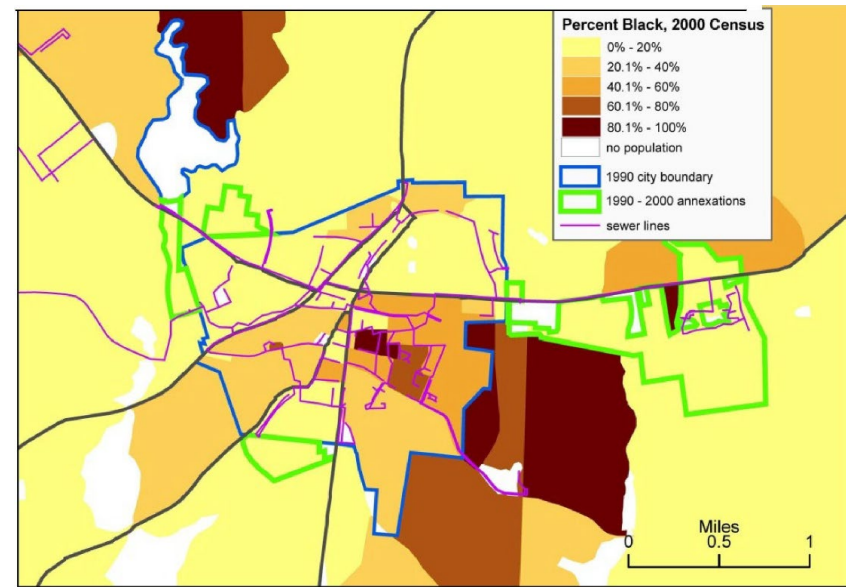
Small municipalities may choose not to annex areas that they would like to provide service to because of the high costs of extending service. If connections are offered, progress may stall unless community members can pay high connection costs. Additionally, small utilities already struggling to keep their system afloat financially may not be able to cover expensive capital costs or apply successfully for funding to support extended infrastructure.¹²

Stay tuned for future resources from the UNC EFC regarding annexation!

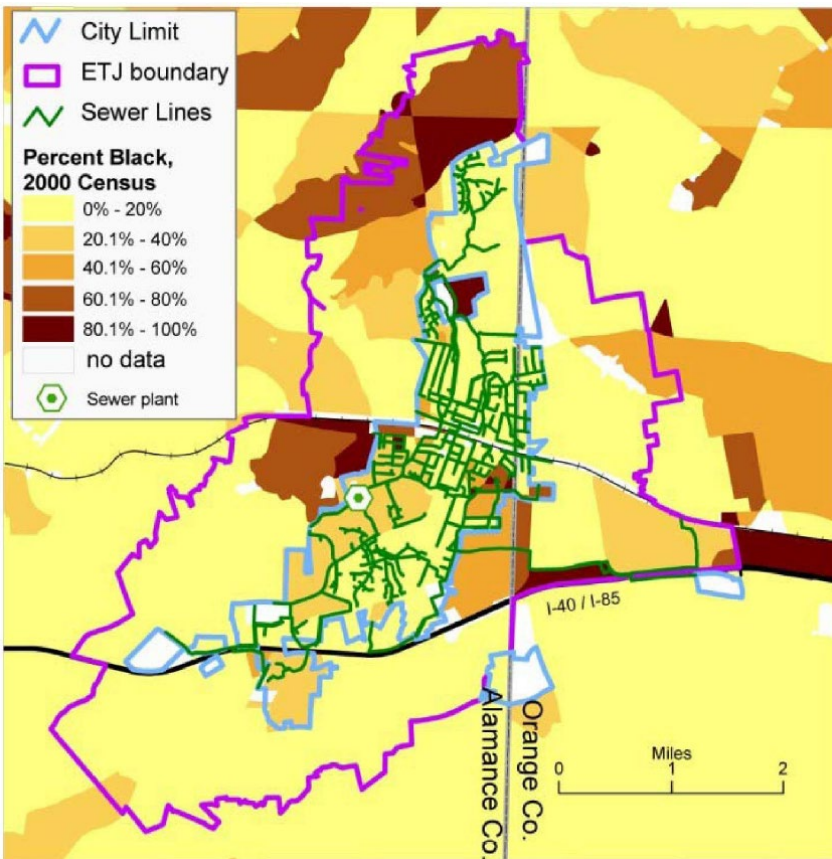
MUNICIPAL UNDERBOUNDING IN NORTH CAROLINA

Before 2011, North Carolina’s annexation laws gave towns the discretion to annex only properties with high tax values, even non-contiguous properties. This resulted in often discontinuous boundaries that neglect poor or Black communities.¹

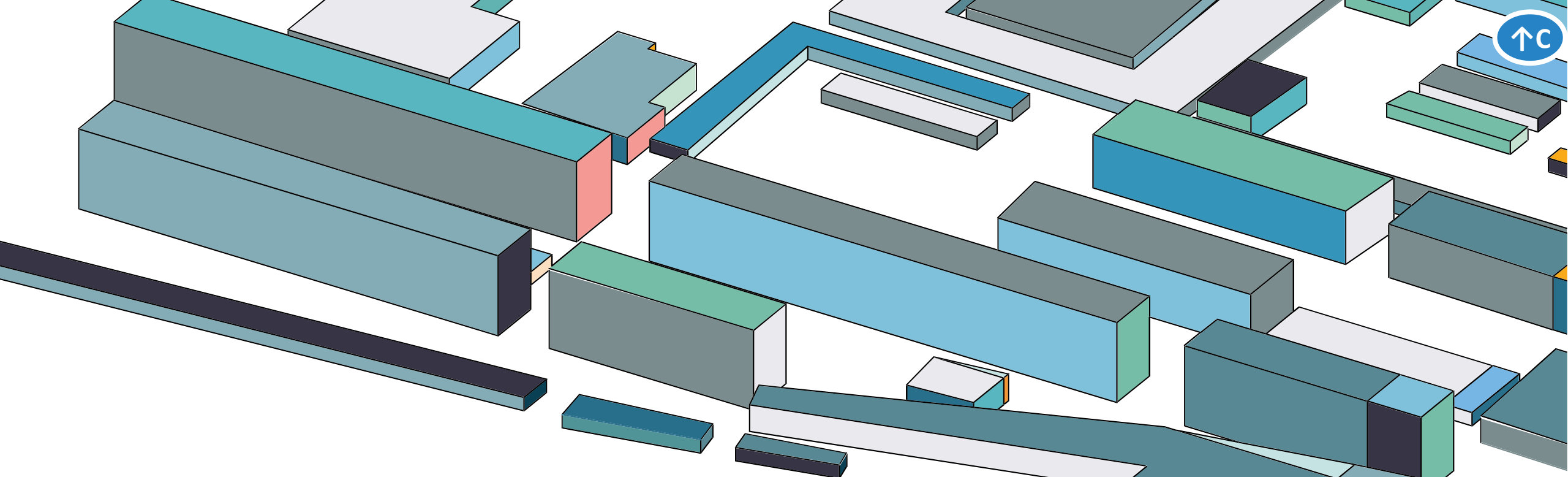
These communities were often restricted to the local ETJ, meaning they remained under municipal land-use, permitting, and zoning control. However, residents in ETJ areas lack elected representatives and are usually excluded from other municipal services - fire, police, solid waste, and of course, water and wastewater services.¹



Underbounding in Creedmoor, NC in 2004¹



Underbounding in Mebane, NC in 2004¹



“Every 10% increase in the African American population proportion within a census block increases the odds of exclusion from municipal water service by 3.8% ($p < .05$).”

(McDonald-Gibson et al., 2014)¹³

ENVIRONMENTAL JUSTICE CONCERNS

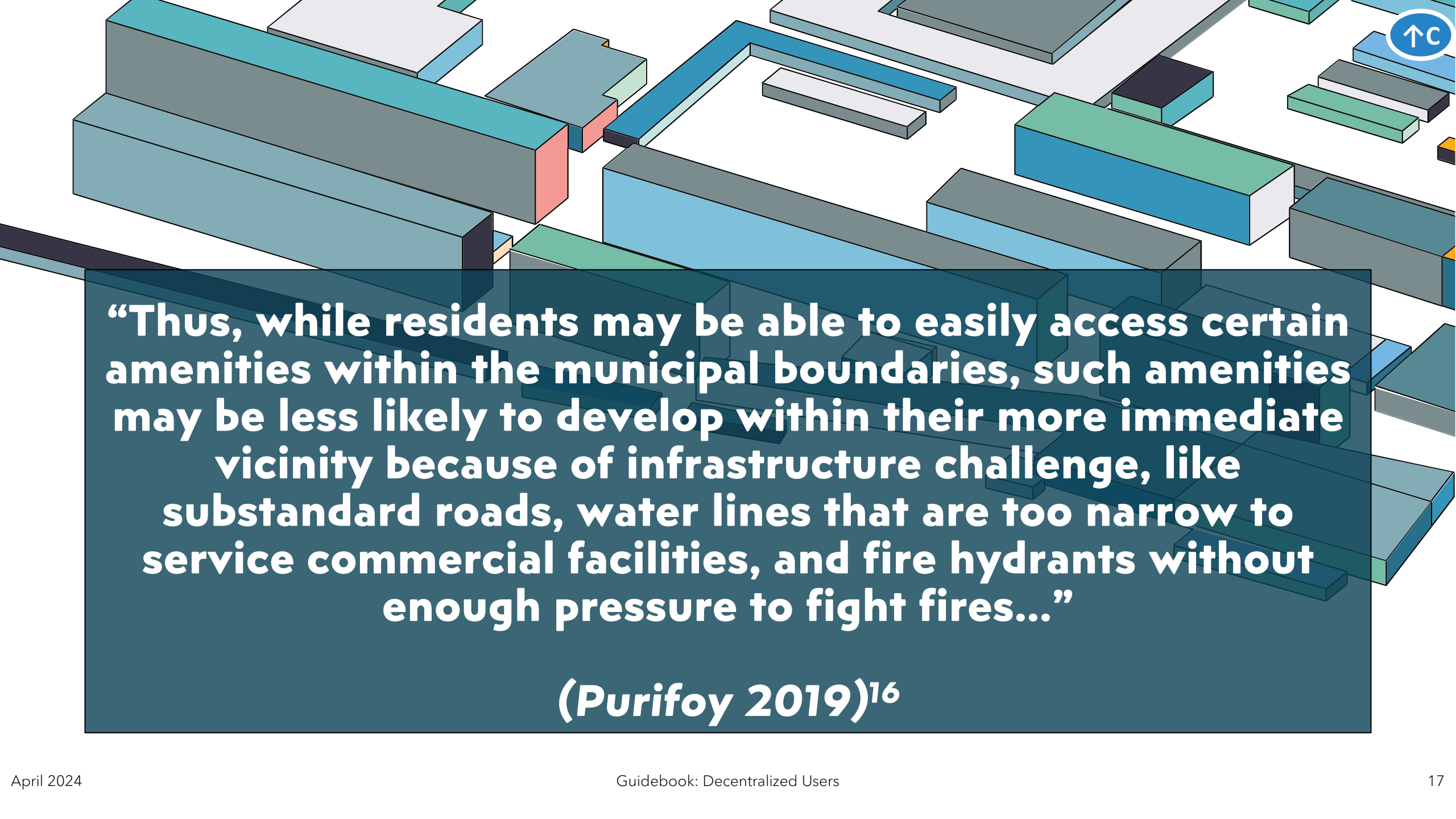
Exclusion from centralized water and sewer services is an [environmental justice](#) issue.

In 2022, the US Water Alliance found that race was the highest predictor of access to safe water and sewer services.¹⁴ Though that figure may include unsafe centralized services, historic municipal underbonding and North Carolina's exclusionary annexation practices up until 2011 contribute to continued reliance on decentralized services by communities of color.

The use of wells and septic can put users at risk of negative health consequences, and the dependence of individuals to maintain their systems themselves, along with high costs of maintenance, can result in potentially unsafe systems persisting for long periods of time.¹⁵

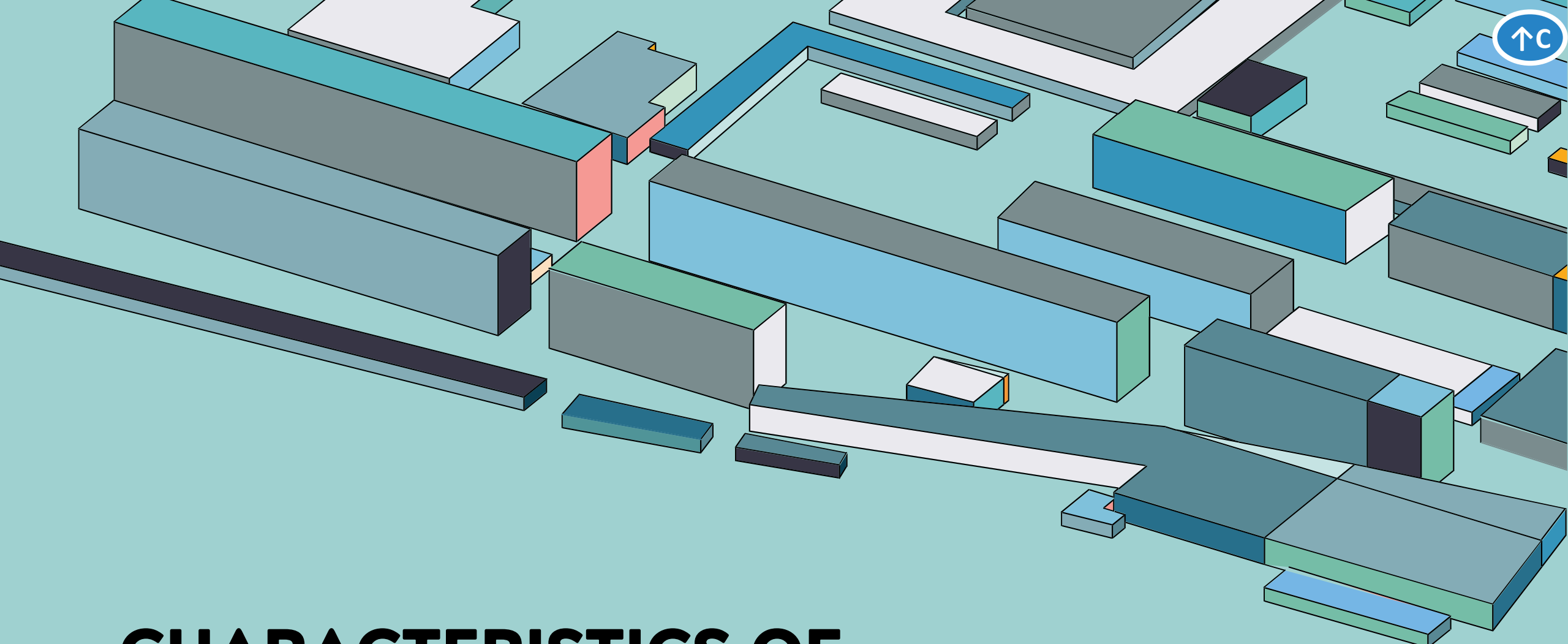
In addition to direct health consequences of failing or contaminated decentralized systems, communities of color excluded by annexation practices may be subjected to industrial pollution and other harmful land uses that are often placed outside municipal boundaries. Other valuable resources for a community, such as grocery stores, health care services, and job opportunities, may be reduced, as these community assets often depend on access to centralized water and sewer.

Even upon annexation and extension of water or sewer service, communities of color may not receive the same benefits of municipal inclusion as their white neighbors, indicating a need for continued efforts toward rectifying environmental injustices.¹⁶

An isometric 3D diagram of a city block layout. Buildings are represented as rectangular blocks in various shades of blue, teal, and grey. A dark blue semi-transparent box is overlaid on the lower portion of the image, containing white text. In the top right corner, there is a small blue circular icon with a white upward-pointing arrow and the letter 'C'.

“Thus, while residents may be able to easily access certain amenities within the municipal boundaries, such amenities may be less likely to develop within their more immediate vicinity because of infrastructure challenge, like substandard roads, water lines that are too narrow to service commercial facilities, and fire hydrants without enough pressure to fight fires...”

(Purifoy 2019)¹⁶



CHARACTERISTICS OF DECENTRALIZED USERS

DECENTRALIZED USERS NATIONWIDE: WATER¹⁷



> 15%

of the United States' population is on private, domestic wells - about 43 million people.

> 20%

of a sample of 2,100 wells sampled by the United States Geological Survey (USGS) were contaminated above levels considered safe for human health.

~ 50%

of the USGS sampled wells had "nuisance" contaminants that negatively impacted smell, taste, and appearance of the water.

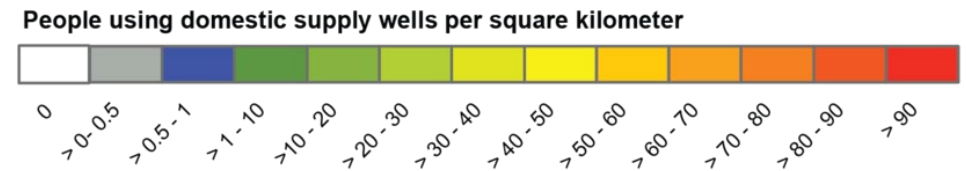
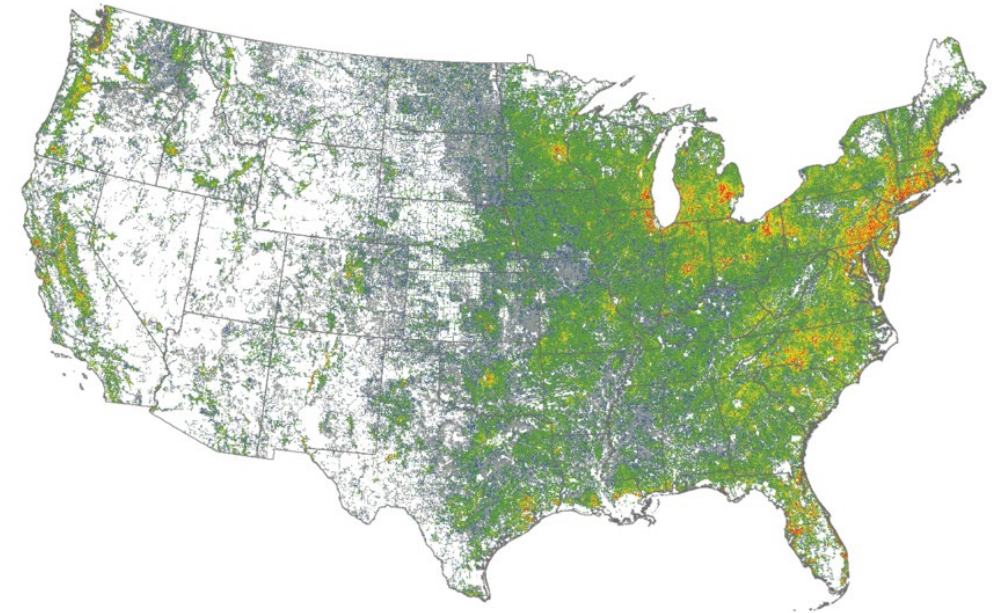


Image credit: [USGS Private Domestic Wells](#)

DECENTRALIZED USERS NATIONWIDE: WASTEWATER¹⁸



~18%

of the United States' population in 2017 had decentralized wastewater systems or lacked wastewater treatment.

~50%

of households without centralized wastewater services are low to moderate income, i.e., earning less than \$61,000 in 2017.

70%

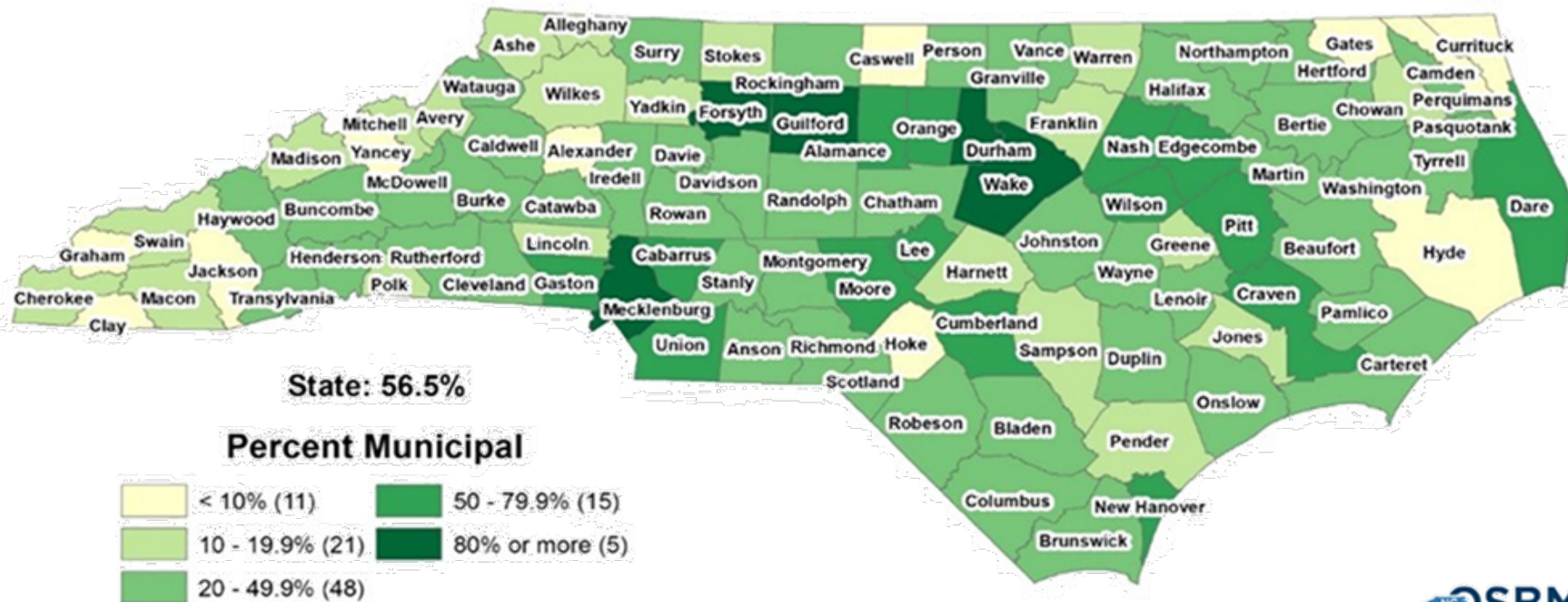
of septic systems included in a 2020 study posed environmental risks due to the age of the infrastructure.¹⁹



Please note: Septic systems vary. Diagram is not to scale.

[This Photo](#) by Unknown Author is licensed under [CC BY-SA-NC](#)

DECENTRALIZED USERS STATEWIDE



Percent of residents living in municipalities by North Carolina county. The darker the green, the higher the percentage of residents within each county living in municipal bounds.²⁰

Only 5 out of 100 counties have 80% or more of their residents living within municipal bounds. As of 2019, roughly 43% of North Carolina's population was living inside of municipal bounds, leaving more than half of North Carolina residents in rural areas without guaranteed connection to centralized service.²⁰

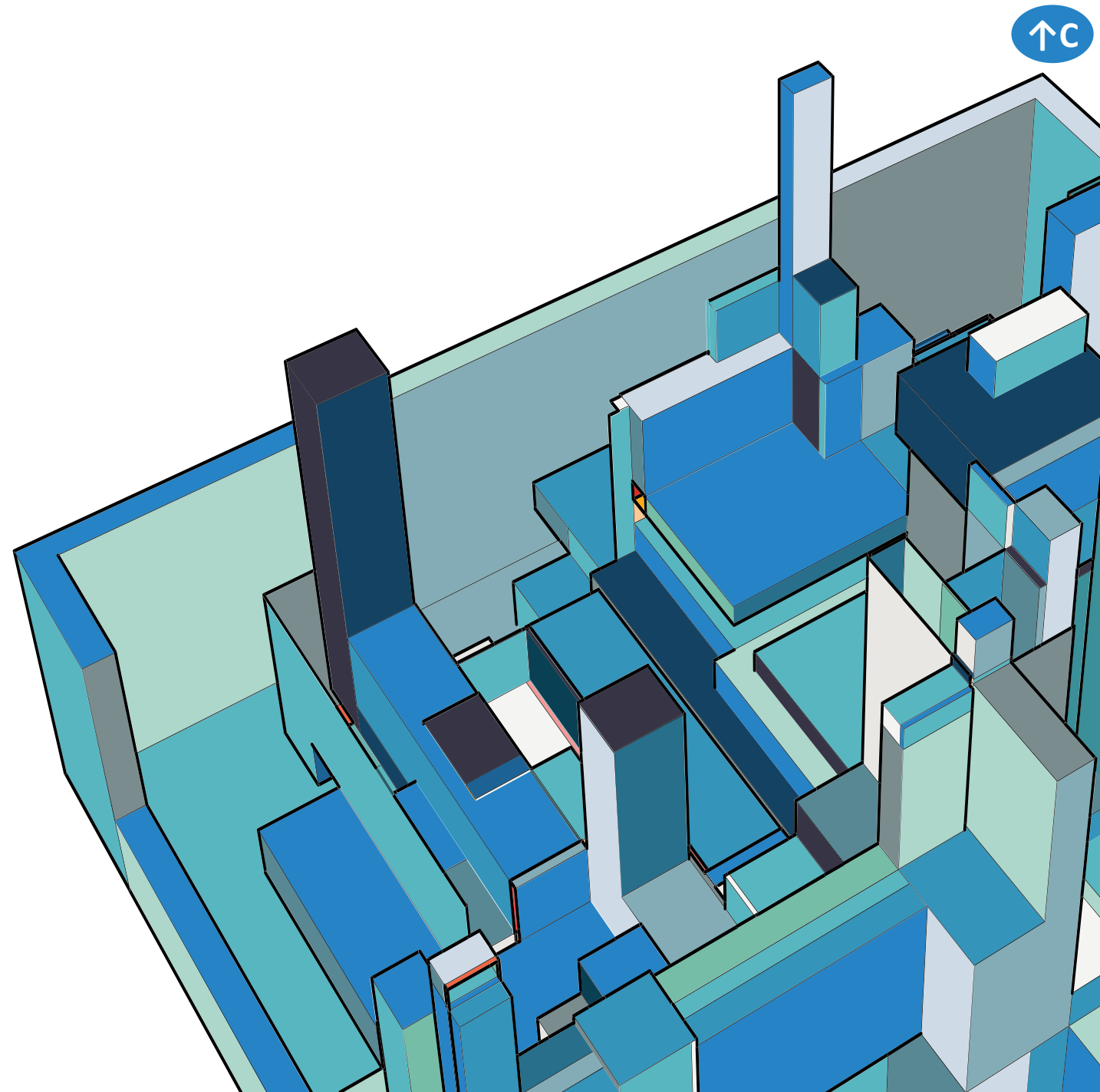


Relatedly, North Carolina is home to:

- 2.4 million well users²¹
- Over 2 million homes on septic systems²²

WELL USER CONSIDERATIONS

North Carolina has the second-highest population and third-highest percentage of residents obtaining drinking water from a private well nationwide.²³ These systems are maintained individually, making the homeowner responsible for testing and repairing systems. However, individuals are not obligated or supported in testing their wells nor in implementing any upgrades, changes, or repairs to their system if they do find issues, including exceedances of EPA-recommended health limits of certain compounds.²³ Commonly found contaminants in private well water include heavy metals such as arsenic, manganese, and lead, which are linked to health issues such as muscle weakness, tremors, and behavioral changes.²⁴⁻²⁶ Bacterial contamination is also a common occurrence in private wells and can lead to gastrointestinal illness.²³

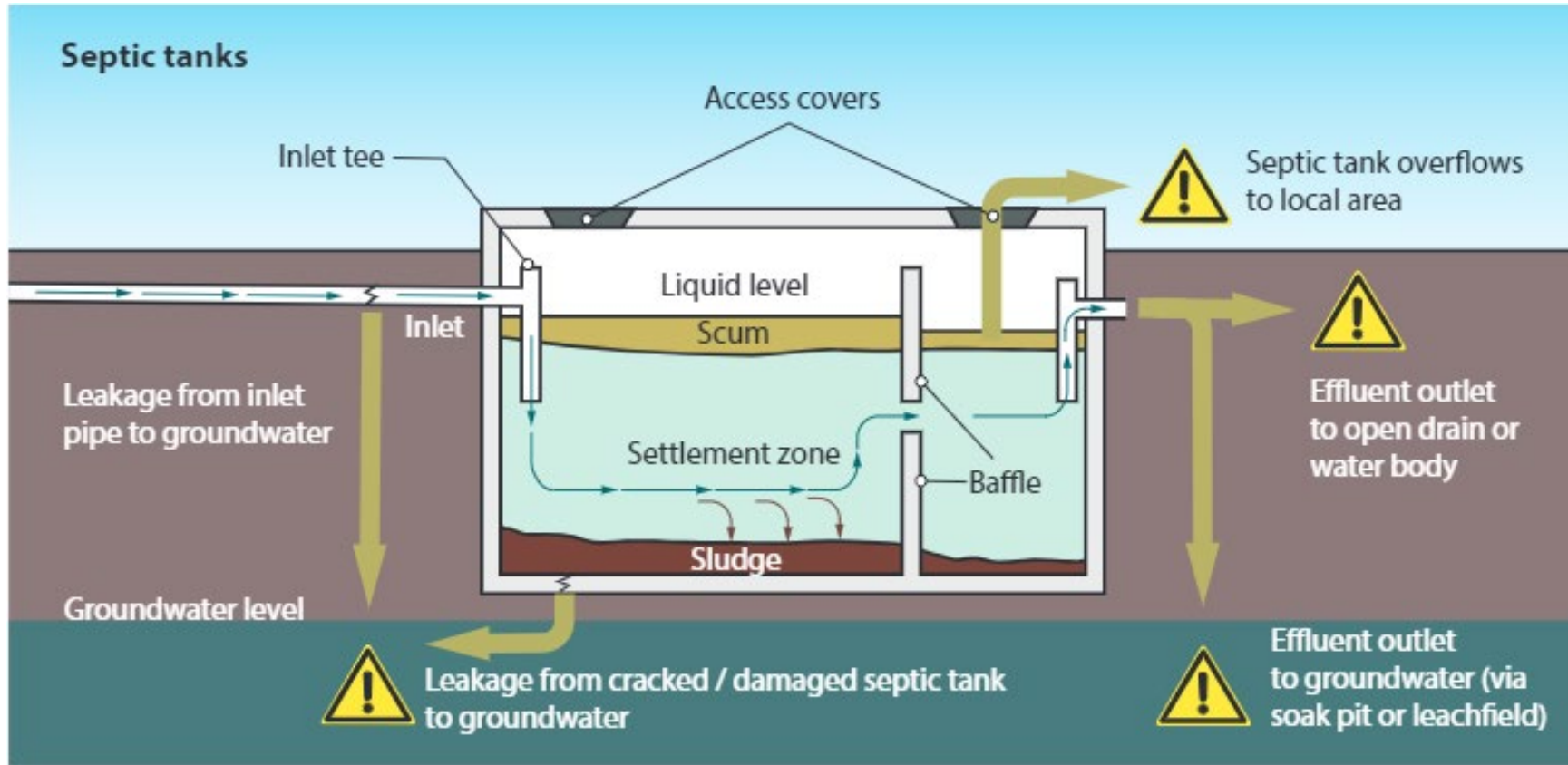


SEPTIC CONSIDERATIONS

Approximately 49% of North Carolina homes rely on septic as their wastewater management system.²² With such a large portion of the state's population using septic, understanding these systems and their potential for failure or substandard operation is imperative to protect public health across the state.

Nonfunctioning septic systems can leach untreated waste and bacteria into surface and ground water.²⁷ This can be especially problematic in areas that rely heavily on private wells as a drinking water supply. Exposure to this untreated waste can result in infection and gastrointestinal disease.²⁸

CONSEQUENCES OF SEPTIC FAILURE



Failure or malfunction of septic systems can leach untreated waste into local surface or groundwater. Contamination of public water supply sources is a concern, but this water is treated and tested by centralized service providers to meet safe drinking water standards. Decentralized users of private wells frequently do not systematically test their water quality, so localized bacterial and fecal contamination may go unmonitored and untreated.

Image credit: [World Health Organization, 2018](#).²⁸

WELL CONTAMINATION STATEWIDE

29,400

or 7.3% of emergency department visits for acute gastrointestinal illness annually were quantified as attributable to poor well quality across the state.²⁹

>25%

of wells in a statewide testing database were contaminated with heavy metals above the maximum contaminant level.³⁰

80%

of tested wells in a Wake County community were contaminated with human fecal material. The research team also detected varying levels of pharmaceuticals, pesticides, and insecticide.³¹

WHY CARE ABOUT DECENTRALIZED USERS?

WATER QUALITY CONCERNS

Private wells are unregulated under the Safe Drinking Water Act, yet over 26% of private wells have documented contaminants that exceed at least one federal drinking water standard.³⁰ Even if a well user tests their water quality, if it results in contamination, they often lack resources to address the issue.²³

UTILITY GOALS

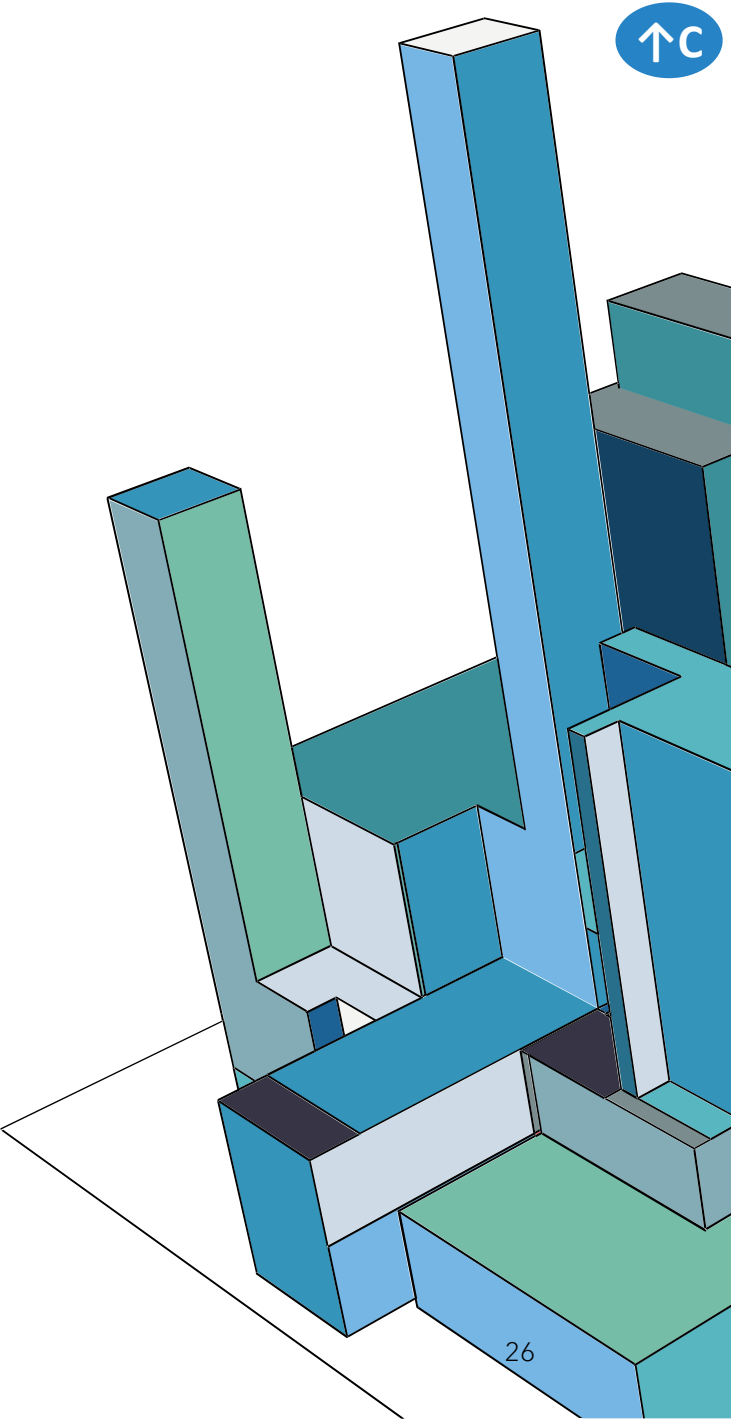
A utility may be interested in supporting users if their mission includes safe water and sewer services for everyone in their community. The inclusion of these residents may also increase the utility's customer base. Extension of services to other areas could incentivize further development and promote local growth.

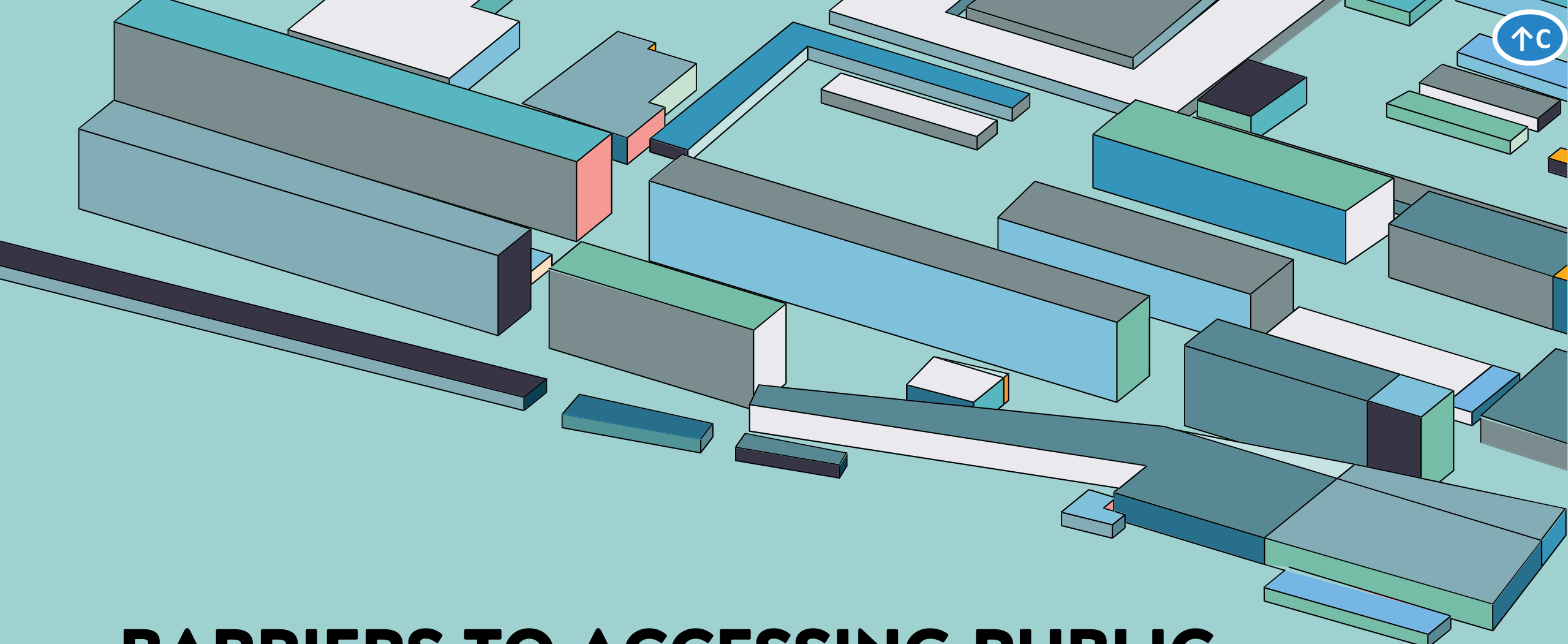
ENVIRONMENTAL CONCERNS

Although a site is inspected when a new septic is under permit review, the upkeep of a septic system is the users' responsibility.³² If not properly maintained, they may release raw sewage into the environment, creating environmental pollution and potential health hazards.³³

INEQUITABLE EXCLUSION

As historic exclusionary practices barred distinct populations, specifically communities of color, from accessing services, increasing access may support local environmental justice initiatives. Identification and inclusion of decentralized users may also increase their access to other services or neighborhood amenities.





BARRIERS TO ACCESSING PUBLIC WATER AND SEWER SERVICE

BARRIERS TO CONNECTION

UTILITY PERSPECTIVE

IDENTIFICATION OF USERS

The locations of decentralized users are not always well-documented. A local government or utility might not know where the location or status of decentralized users.

CONNECTIONS CANNOT BE MANDATED

Utilities cannot mandate connections within their jurisdiction unless under special circumstances, such as a contaminated or failed well. This causes higher uncertainty for utilities as to who may ultimately connect.³⁴

ANNEXATION

If decentralized users are in areas outside of municipal boundaries, annexation or other legal approval may be necessary to extend services depending on local policy.

COST TO CONNECT

The cost of connection for the utility, especially if it is a small utility, can be burdensome.³⁵ Utilities may not have the resources to apply for funding to support infrastructure expansions.

BARRIERS TO CONNECTION

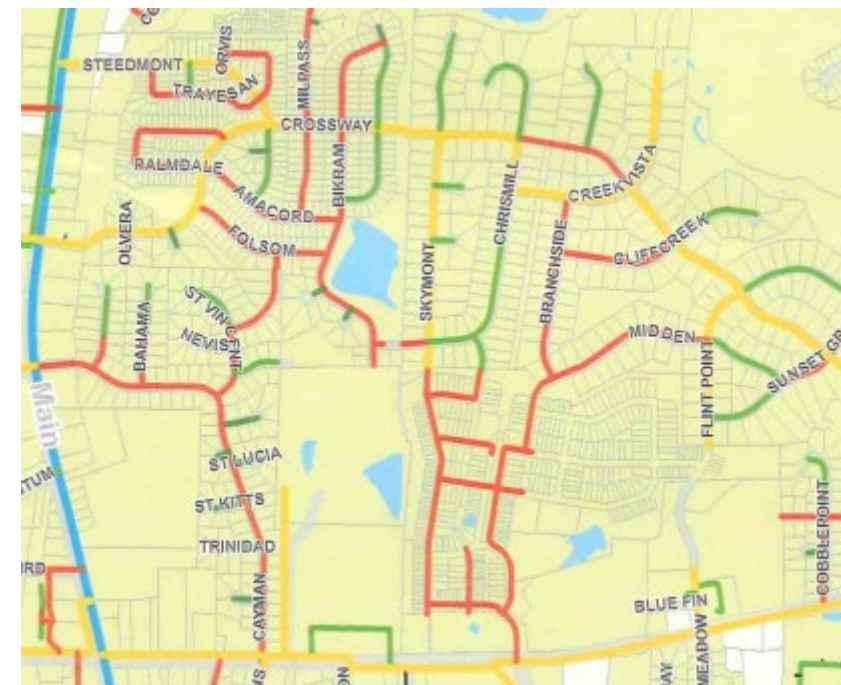
UTILITY – IDENTIFICATION OF USERS

Utilities and local governments are sometimes unfamiliar with decentralized users because they are not their customers. Identifying these users and their potential health risks can be a challenging endeavor. Collaboration with other local stakeholders, such as community groups or county health departments, is helpful in the identification of users and their needs.

Reliable water and sewer connection data may not always be immediately available locally. Consider:

- **Accumulated local knowledge** - Ask around. Residents or local officials may know more than what is digitized.
- **Asset management plans** - Utilities may have developed these plans, which aim to outline existing utility infrastructure.
- **Customer or billing records** - Mapped against parcel information, billing addresses are one way to identify who may not be accessing the utility's services.
- **Localized spatial data** - Some municipalities and utilities may have spatial data regarding connections or the existence of wells/septic systems.

Even if a water/sewer pipeline is along a street, consider that **not all of the properties** may be connected to that line. Additionally, some data sources may be **outdated** or **too new** to include all properties.



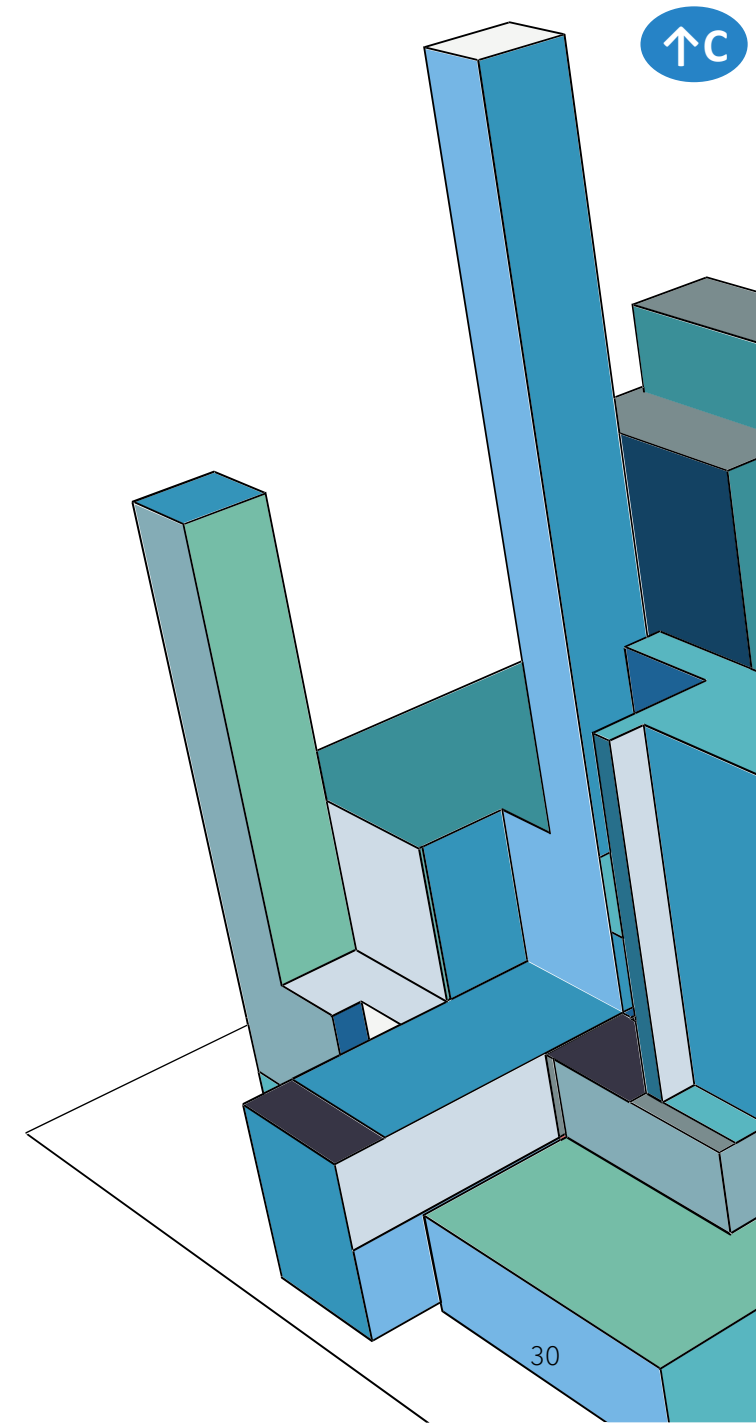
Example of localized water line data. Holly Springs, NC. Colors represented pipe diameter.³⁶

See [the spatial analysis section](#) for detailed methods to identify decentralized users.

BARRIERS TO CONNECTION

UTILITY – COST TO CONNECT

- In 2009, utilities charged customers \$200 – \$3,000 per connection, with the bulk clustered from \$400 – \$1,000. These fees may not cover all of the costs incurred by the utility to make these connections.³⁷ If the utility requires taking on debt to cover new infrastructure, additional costs can accrue, such as interest on the corresponding loan.
- It's estimated that a no-cost-to-consumer connection would cost a utility roughly \$6,500 (accounting for inflation). This amount would vary based on several parameters, such as the number of connections or local housing density.³⁷
- Prior to 2011, a North Carolina pocket-decentralized community was told they would have to pay as much as \$9,565 to connect to the sewer and up to \$8,173 to connect to the main water line of their local utility.³⁸



UTILITY PERSPECTIVE

COMMENTS FROM AN ANONYMOUS MUNICIPAL UTILITY

“There is an assumption that it will just be cheaper to connect to a municipality. Sometimes that's the case when things are right in front of their property.”

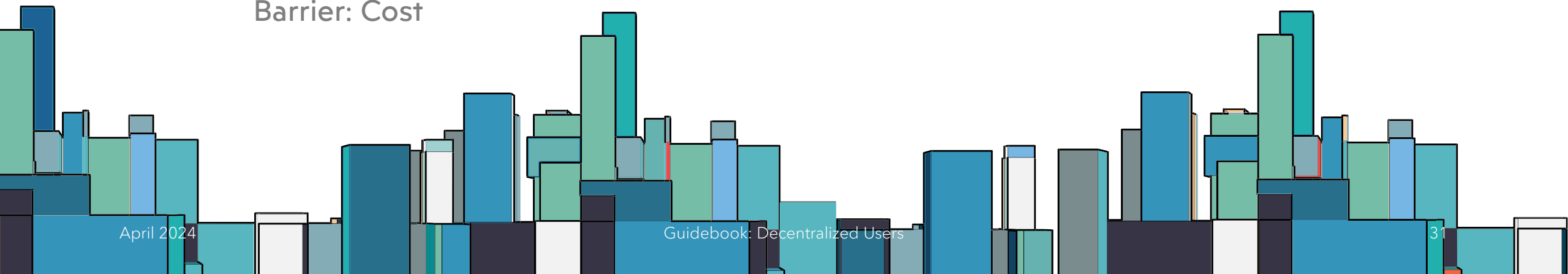
Barrier: Distance to Mains

A property's distance to existing water lines is a huge factor in determining the cost and feasibility of connections for a utility. Some municipalities may implement regulations that make connection easier to implement if a property meets certain criteria, such as distance to existing water lines or in the case of an emergency – such as a failing well. Implementing regulations like this in advance, as the Town of Cary has done, opens the door for potential connections when residents need support.

“Have things changed? Have things gotten cheaper? In most cases, things have just gotten more expensive. Construction costs have gone up 30 or 40%.”

Barrier: Cost

[CLICK HERE TO VIEW CARY'S EMERGENCY CONNECTION ORDINANCE](#)



BARRIERS TO CONNECTION

USERS

AUTONOMY & LACK OF GOVERNMENT TRUST

Users may be interested in maintaining their own water and septic systems, whether due to trust issues with the local government or preference for autonomy.

COST TO CONNECT FOR USER (see [Cost to Users](#))

Decentralized users may be interested in connecting, but likely don't know the cost implications or the procedure to advocate for a connection.

MONTHLY BILLS

Being connected to a utility would result in a monthly utility bill, which users may be wary of. In addition, if a property is annexed, once pipes are installed, property owners become responsible for the maintenance and repairs of lines from the network to their structure.¹¹

BARRIERS TO CONNECTION

USERS – AUTONOMY & EXISTING BELIEFS

DESIRE FOR AUTONOMY

- Some decentralized users may value the independence and autonomy that use of wells and septic systems provide.
- Ongoing maintenance may be more affordable or preferable for certain high-income decentralized users, especially when compared to monthly bills and property taxes. These users can more effectively manage their wells and septic systems, avoiding expensive failures and able to address failures if they occur financially.

EXISTING BELIEFS

- Residents may also believe that their water is clean, safe, and free, and therefore see no need to test or change their water source.³⁹
- Residents have expressed a lack of time, motivation, knowledge, or money to understand what it would take to get connected.⁴⁰
- Wells and septic systems may be an attractive component of a rural or non-municipal lifestyle.

BARRIERS TO CONNECTION

USERS - LACK OF TRUST IN GOVERNMENT

LACK OF GOVERNMENT TRUST

- There are numerous examples of communities being promised municipal services and consistently denied ([see examples](#)). If history has soured the relationship between a community and its local governing body, residents may be disinterested in the process of connecting to centralized services as it relies heavily on working with the local government.
 - For example, in the Rogers-Eubanks neighborhood in Chapel Hill, the municipality built a landfill in the neighborhood and promised municipal services. It took over four decades for any services to be extended to the community.⁴¹

CONCERNS OVER WATER QUALITY

- There is sometimes scrutiny over centralized water quality, with residents experiencing discomfort around fluoridation, local pollution, or the potential presence of poly-fluorinated alkyl substances (PFAS).^{42,43} Aging infrastructure in certain areas may cause local water to be discolored or smelly; lead service lines in some areas may introduce health concerns.
- Distrust of water quality and safety may be more present in communities of color that have been historically excluded from safe centralized services.^{15,44}
- Utilities and municipalities should consider communicating beyond [consumer confidence reports](#) about water quality and rely on local health departments to communicate the differences in health risks between centralized and decentralized options.

BARRIERS TO STAYING DECENTRALIZED

USERS

KNOWLEDGE & COMFORT

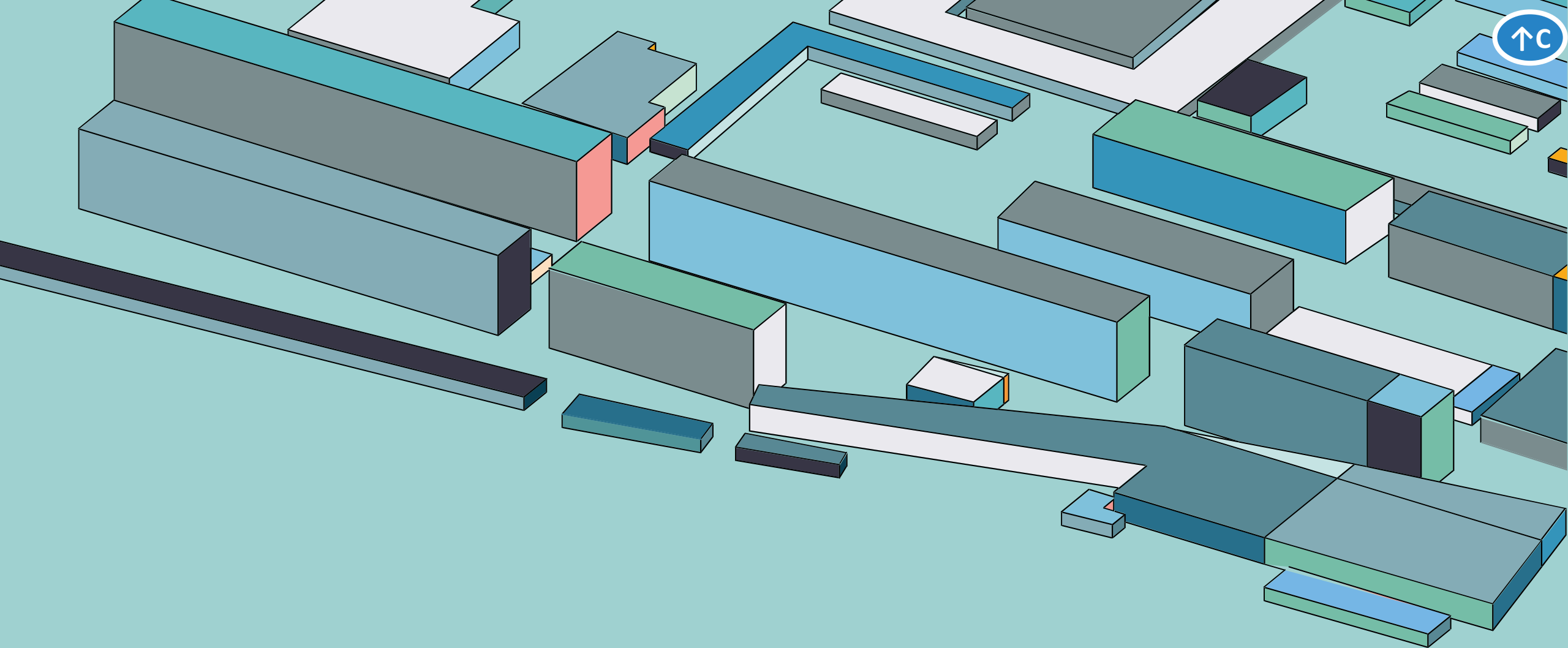
Maintenance of a well or septic system requires familiarity with required procedures, knowledge of local service providers, and time to implement required actions. Residents may need support in learning about effective maintenance practices and other resources.

FEAR OF REGULATION & CONDEMNATION

Residents may be interested in assessing the quality of their system, but may be concerned that failing systems, especially septic systems, will require costly repairs or put properties at risk of condemnation.

COST OF ONGOING MAINTENANCE (see [Cost to Users](#))

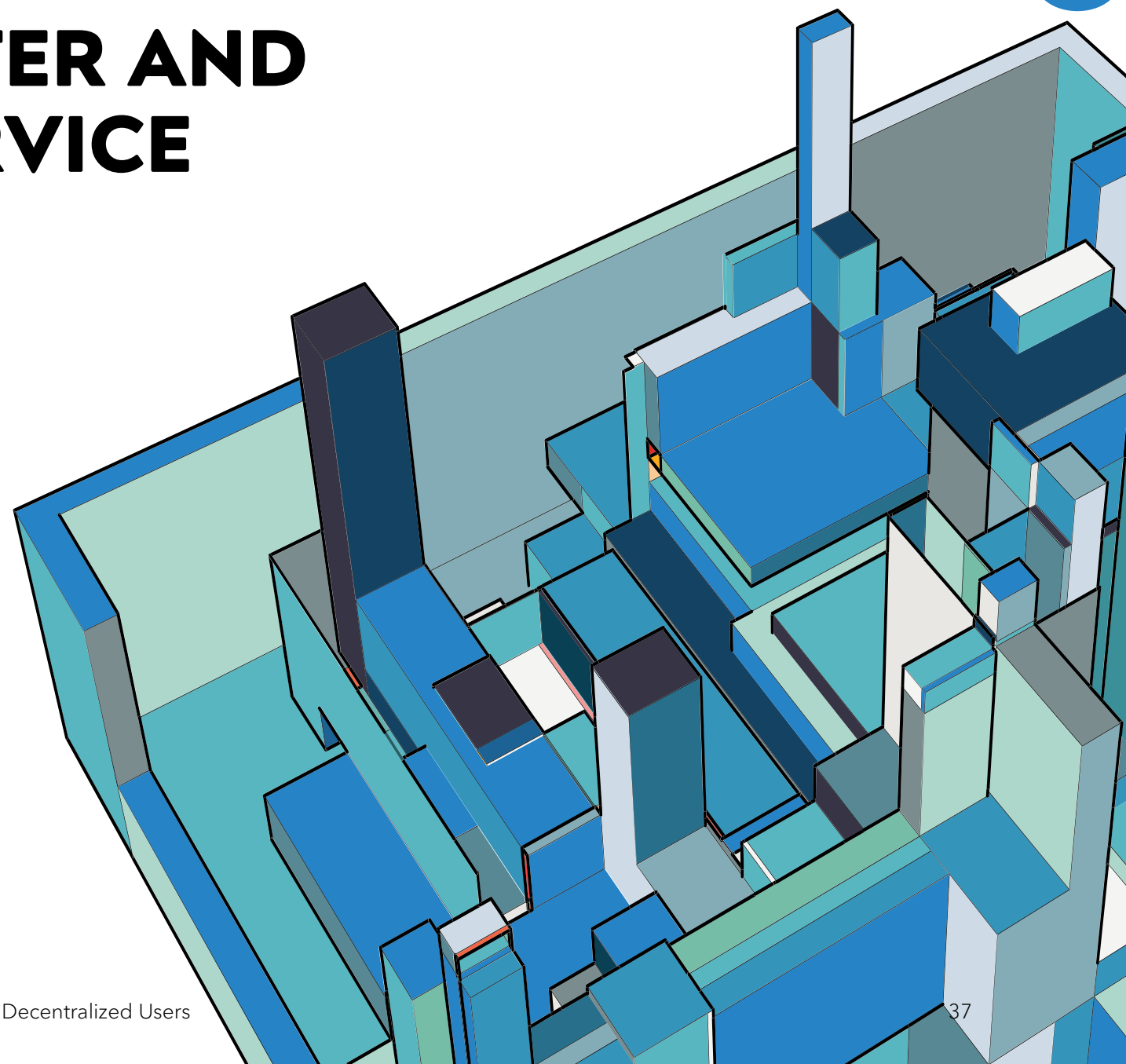
Decentralized systems require ongoing maintenance costs and, in some cases, costs to address emergency failures. Users may not be aware of these costs or be unable to pay for repairs, rehabilitation, or replacement of any failed systems.



COSTS TO USERS

THE COST OF WATER AND WASTEWATER SERVICE

Centralized connection may be the goal for decentralized users with unreliable or unsafe water and wastewater services. Still, the feasibility of centralized connection relies heavily on the location of the closest system. Considering staying decentralized and comparing that to the cost of connection can give individuals a better idea of what they can afford. Understanding the costs and risks associated with maintaining decentralized systems versus connecting to centralized systems helps homeowners understand the full cost of their water service. The amount that decentralized users will pay depends largely on what they can afford, how regularly they maintain their system, and how comfortable they are with the risk of potentially expensive emergency repairs.



COST TO USERS* – STAY DECENTRALIZED

OVERVIEW

- Private wells and septic systems are the financial responsibility of an individual user. Users do not pay for the water flowing into their homes or the wastewater flowing out, but they must pay for **testing and fixing any issues**.
- **Hidden costs** may include health care costs if users' wells are contaminated, and contamination results in negative health consequences.
- Wells drilled since 2008 are required to be tested, but **implementation** for remediation of any contaminants is up to the user. The state provides users with resources, but there is little follow-through.²¹
- In the event of failure, the installation of new systems may require additional costs.

*This does not include installation costs, but rather ongoing costs.

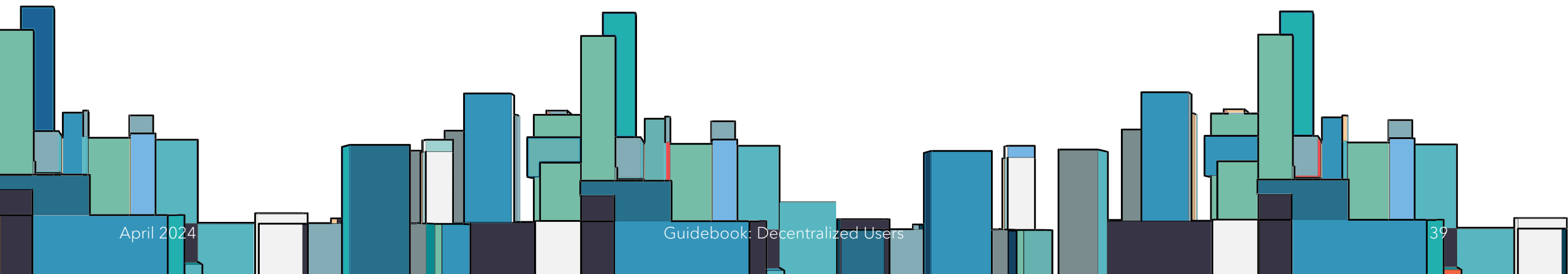
COST TO USERS – STAY DECENTRALIZED

WELL COSTS

- **System-wide treatment** can range from \$200 - \$12,000 in upfront costs, plus up to \$900 per year for maintenance, depending on the system.⁴⁵
- **Point of use treatment** (i.e., one faucet) can range from \$20 to over \$1000, depending on the type of treatment.⁴⁶
- In one North Carolina study, annual **well maintenance fees** can range from \$0 - \$20,000, with an average of \$1,405.⁴⁷
- In some counties, well users must pay a **trip fee** every time an official comes to sample (Wake County's is \$50). This is on top of the cost of the analysis (\$25 - \$175, average \$50).⁴⁸ There may be some opportunities for financial assistance.

SEPTIC COSTS

- **Pumping and cleaning** a septic system can cost several hundred dollars, depending on the size of the tank and the number of users. The EPA recommends inspecting every 1 to 3 years and pumping every 3 to 5 years.⁴⁹
- **Tank replacement** can cost thousands of dollars (national average is \$7,015).⁵⁰
- Although a septic system may last 25-30 years, if the system is **not properly maintained**, the life span can be much shorter.⁵²
- There are associated plumber costs for any minor issues and repairs.



COST TO USERS

CONNECT TO A MUNICIPAL SYSTEM

UNDER ANNEXATION

- Under user-initiated annexation, if the municipality must accept the petition for annexation due to characteristics of the petitioning area, the connection cost is at no fee to the user. However, if it is not deemed to be required but the utility proceeds, the utility may or may not charge a connection fee.
- Once annexed, residents may have other substantial associated costs to bear, such as property taxes.

Stay tuned for future resources from the UNC EFC regarding annexation!

INDEPENDENT OF ANNEXATION

- The cost to connect **varies greatly**.
- A program in Union County charges successful applicants to their water connection program, Short Water Line, \$750 to \$3,000 per connection.⁵¹
- A utility in Orange County charges between \$620 and \$4,295 for a single-family dwelling water connection, depending on the size of the home. The same utility charges between \$1,632 and \$3,466 for a single-family connection to sewer. There are fees to tap into the main line for both connections - \$440 for water and \$530 for sewer.⁵²

MONTHLY BILLS

- Connecting systems will require monthly fees for both water and sewer connections. These fees exist to cover the cost of operating and maintaining the utility. Every utility develops their own rates and rate structure, so the monthly rate will vary based on the utility's needs.
- In North Carolina, monthly water rates range from \$15.73 to \$210.83 per month (median of \$44.60), assuming 6,000 gallons of consumption. Monthly sewer rates range from \$13.32 to \$487.64 per month (median of \$56.23).⁵³

WHAT DOES IT COST TO CONNECT?⁵²

EXAMPLES OF FEES



System Development Fees

Covers a portion of capital costs incurred by utility to provide water service to a property



Water Service and Meter Installation Fees

Covers the cost of physically extending the water lines to a property and installing a meter



Water Main Tapping Fees

Covers the cost of tapping into the water main. These may be combined with installation fees

CONNECTION COST COMPARISON: 3/4" METER ON 2,000 FT² PROPERTY

Connection costs can vary between utilities. Most will charge some type of system development, installation, and tap fees, but utilities may charge additional fees depending on their procedures and services.

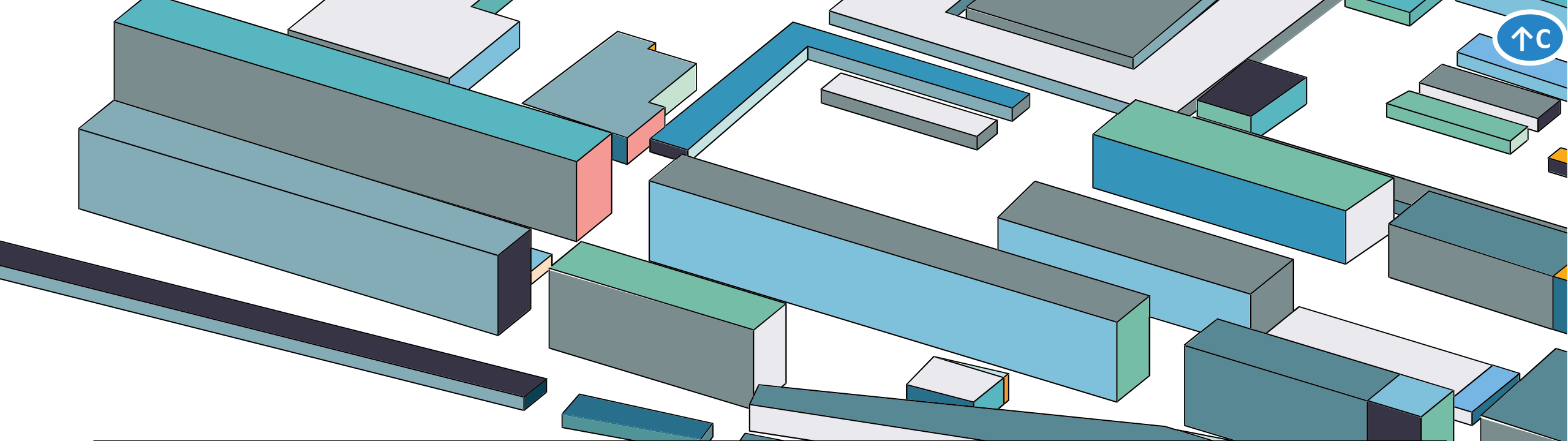
OWASA*⁵²

| | |
|--|----------------|
| (System Development Fee) | \$1,142 |
| (Water Service and Meter Installation Fee) | + \$6,180 |
| (Water Main Tapping Fee) | + \$440 |
| <hr/> | |
| (Total) | \$7,762 |

APEX⁵⁴

| | |
|--|----------------|
| (System Development Fee) | \$1,783 |
| (Water Service and Meter Installation Fee) | + \$1,575 |
| (Water Main Tapping Fee) | + \$2,000 |
| <hr/> | |
| (Total) | \$5,358 |


*Orange Water and Sewer Authority



Connection fees add up quickly for individuals, but they may not cover everything. Importantly, connection cost estimates from a utility do not include the plumbing costs to connect the household to the water line.⁵²

Once a household is connected, they are responsible for their monthly bills. Like connection costs, these can vary widely between utilities.

For example, the monthly bill for 5,000 gallons of residential consumption for water users in Apex, North Carolina, is almost half that for OWASA's customers. Water and sewer rates reflect the plans and priorities of utilities. Rates are affected by many factors, including the cost of ongoing infrastructure projects and the characteristics of their customer population.

OWASA 
\$51.02

APEX 
\$27.25

COST TO USERS – MONTHLY FEE

The UNC EFC updates a [rates dashboard](#) for North Carolina utilities each year. Though intended to assist utility managers and local elected officials, residents can also utilize the dashboard to investigate their potential monthly bill at different consumption points for both water and sewer. Note, the average household in the United States uses **almost 10,000 gallons** of water per month.⁵⁵

Select residential bill and monthly consumption amount

Water Bill Sewer Bill Water + Sewer Bill

5,000 gallons
668 cubic feet →

Monthly Water Bill: \$24.55

Select comparison group: All Utilities

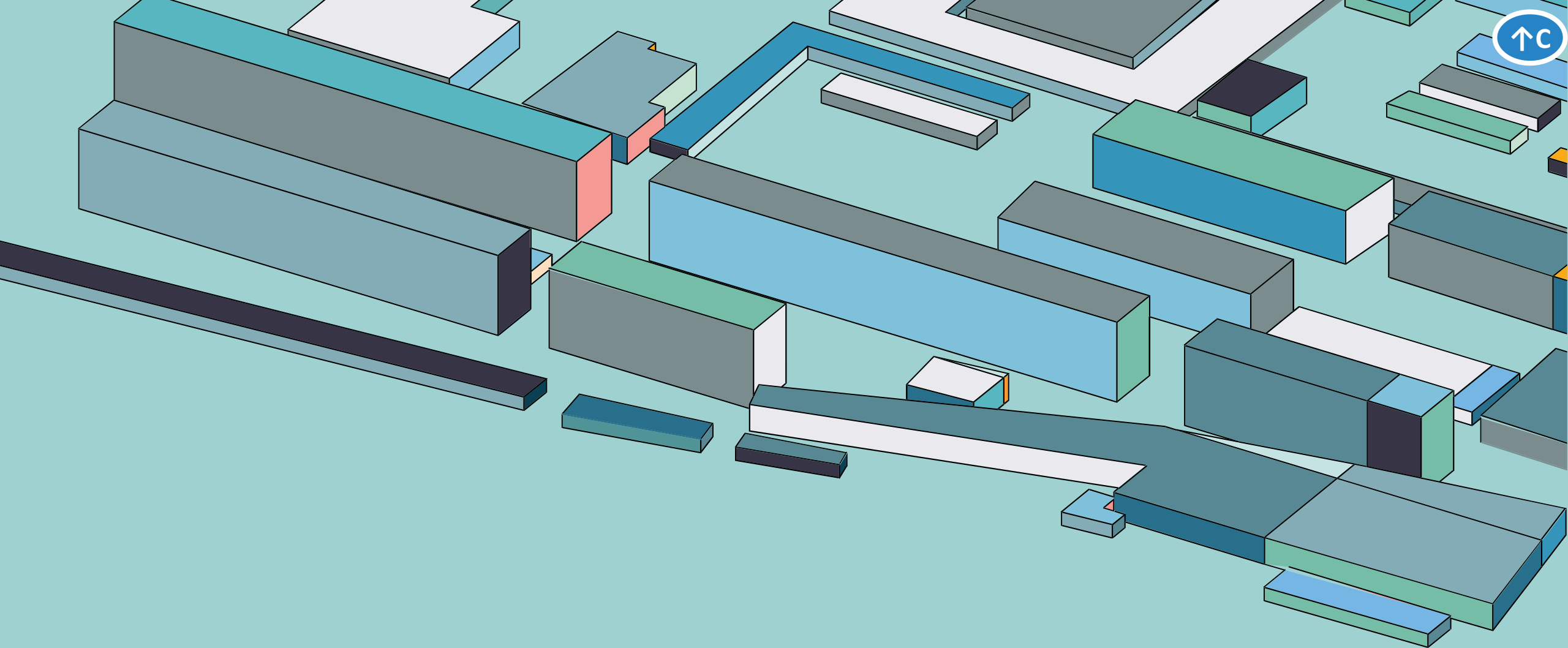
Comparing to **all utilities in survey**

Bill Comparison

Water Bill at 5,000 gallons
Median: \$39.08

Min \$13.27 Max \$206.74

506 rate structures compared

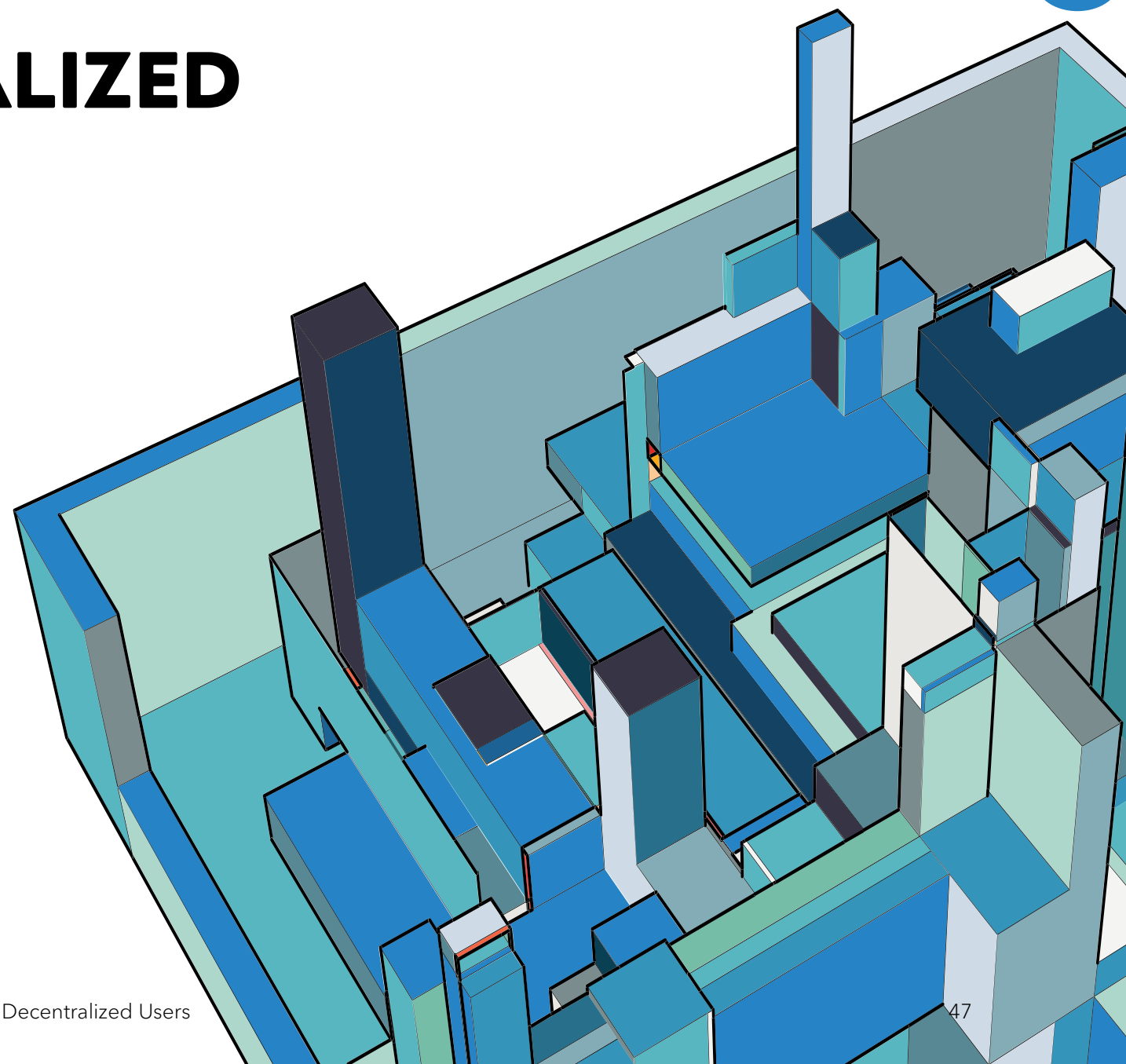


ALTERNATIVES TO CENTRALIZATION

STAYING DECENTRALIZED

Staying decentralized can be significantly cheaper than a centralized connection, especially in cases where extending centralized service is physically impossible or unaffordable for either the homeowner or the utility. In these situations, homeowners retain control over how their system is maintained. However, there is a need for knowledge of proper maintenance and sufficient funds to perform repairs and upkeep.

These solutions vary widely in price and implementation, but they allow homeowners to be flexible and responsive. Some solutions presented may be more appropriate for short-term management of a failed system that poses a health problem while longer-term solutions are identified.



ALTERNATIVE WATER OPTIONS for DECENTRALIZED WELL USERS



BOTTLED WATER

If wells are contaminated, bottled water is an option for select water uses. However, it is more expensive over time than well maintenance or a centralized service, and is difficult to substitute in all contexts, such as bathing.



FILTERS

In-home filters can filter contaminants at the Point-of-Use (POU), such as an individual faucet, or at the Point-of-Entry (POE), where water first enters the home. Both use the similar technologies to filter water but vary in price and placement



ADVANCED TECHNOLOGIES

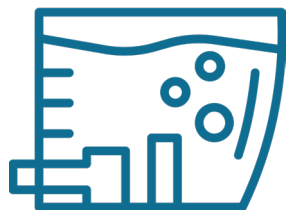
Technologies like membrane filtration, electrochemical processing, advanced oxidation, and disinfection methods remove a range of contaminants, but they have a high energy demand that may not be suitable for small or individual systems.

WHAT'S THE DIFFERENCE BETWEEN POU AND POE?⁴⁵

Point-of-use (POU) and point-of-entry (POE) filters use similar filtration technologies but differ in where in the water is filtered.

POU filters will filter water at one single point of use (e.g., one individual sink), whereas a POE filter will filter all the water that comes into a home. POU filters can be installed either by the homeowner or by a professional depending on how the filter is connected to the faucet, but POE filters must be professionally installed. POU filters are significantly cheaper than POE filters because they are localized and require minimal, if any, plumbing work, whereas POE filters require significant plumbing work. Both types of filters are available for a wide variety of filtration technologies, thus allowing them to address a variety of contaminants.

COMMON TYPES OF POU FILTERS⁴⁵



UNDER SINK

The most common type of POU filter. These filters are connected to the inlet water at one faucet (often, this would be under the sink) and filter everything that comes through the pipes, allowing filtered water to flow from the faucet. They are available for a variety of technologies, and they can often be found in multi-stage models that combine technologies.



PITCHER

The cheapest type of POU filter. These filters often only include only one or two technologies to filter water. Some are pressurized and connected to the inlet water at the faucet, but most are gravity filters, which means the user must manually fill the pitcher with tap water, which will then move through the filter.



FAUCET MOUNTED

The smallest type of POU filter. These are connected to the faucet itself and filter water as it flows through the faucet. They normally have more limited technology options, with granulated activated carbon and redox media being the easiest to find.



REFRIGERATOR

Some refrigerators are designed to dispense filtered water. The filter is mounted in the refrigerator and water passes through it before being dispensed, similar to an under-sink filter. These filters do not have as many technology options and are most often found with granulated activated carbon or activated carbon block.

WHAT TYPE OF FILTER?⁴⁵

Home water filters use various technologies to selectively remove different contaminants from water.

For example, water softeners will remove copper, but they will not remove arsenic. Many filtration methods will work for several different contaminants, so there are options that can tackle multiple at once. Each type of treatment has a different cost as well, which gives the homeowner more flexibility based on their budget.

The table to the right (page 3 of the [Minnesota Department of Health's Home Water Treatment Document⁴⁵](#)) compares various contaminants against common home treatment methods and indicates the level of possible removal.

HOME WATER TREATMENT

Water treatment units and the contaminants they treat

This table shows the most common home water treatment units and the contaminants the units can remove. Learn more about the treatment units and cost estimates on the following pages.

| | Adsorptive media filtration ¹ | Aeration and filtration | Anion exchange ¹ | Carbon filter ¹ | Continuous chlorination and filtration | Distillation | Oxidizing media filtration | Ozonation and filtration | Reverse osmosis | Ultraviolet (UV) disinfection | Water softening |
|---|--|-------------------------|-----------------------------|----------------------------|--|--------------|----------------------------|--------------------------|-----------------|-------------------------------|-----------------|
| Color, taste, or odor issues | ● | ● | | ● | | | | | | | |
| Ammonia | | ● | | | ○ | | | | | | |
| Arsenic ² | ● | ○ | ● | | ● | ● | ● | ● | ● | | |
| Bacteria ³ | | | | | ● | ● | ● | ● | ● | ● | |
| Calcium | | | | | | ● | | | | | ● |
| Chlorine | | ● | | | | | | | ● | | |
| Copper | | | | ● | | | ● | | ● | | ● |
| Fluoride | ● | | ● | | | ● | | | ● | | |
| Hydrogen sulfide | | ● | | ● | ● | | ● | ● | ● | | |
| Iron | | ● | | ● | ● | | ● | ● | ● | | ● |
| Lead | | | | ● | | | | | ● | | |
| Magnesium | | | | | | ● | | | ● | | ● |
| Manganese | | ● | | | ● | ● | ● | ● | ● | | ● |
| Methane | | ● | | | | | | | | | |
| Nitrate | | | ● | | | ● | | | ● | | |
| Nitrite | | ○ | ● | | ● | ● | | ● | ● | | |
| Other dissolved solids (ODS) | | | | | | ● | | | | | |
| Pesticides and other synthetic organic compounds (SOCs) | | | | ● | | ● | | | ● | | |
| Perfluoroalkyl substances (PFAS) | | | | ● | | | | | ● | | |
| Radium | | ○ | | | ○ | ● | ● | | ● | | ● |
| Radon | | ● | | ● | | | | | | | |
| Selenium | ● | | ● | | | ● | | | ● | | |
| Sodium | | | | | | ● | | | ● | | |
| Sulfate | ● | | ● | | | ● | | | ● | | |
| Trichloroethylene (TCE) | | ● | | ● | | | | | ● | | |
| Trihalomethanes (THMs) | | ● | | ● | | | | | ● | | |
| Uranium | ● | | ● | | | ● | | | ● | | |
| Vinyl chloride | | ● | | | | | | | ● | | |
| Viruses ³ | | | | | ● | ● | ● | ● | ● | ● | |
| Volatile organic compounds (VOCs) | | ● | | ● | | | | | ● | | |

¹ The substances that these technologies reduce or remove depends on the filter media or resin.

² There are two types of arsenic in Minnesota groundwater: arsenic(III) and arsenic(V). Pre-oxidation (chlorination, aeration, or ozonation) may be needed before water treatment to make sure the treatment removes the type of arsenic present in your water. Sulfate levels above 100 parts per billion may also affect what type of water treatment will remove arsenic. MDH recommends working with a water treatment professional to make sure your treatment unit/system effectively removes arsenic.

³ If you are using a filter, make sure your filter has the necessary pore size for the bacteria or virus you are trying to remove.

THE COST OF STAYING DECENTRALIZED



BOTTLED WATER⁵⁷

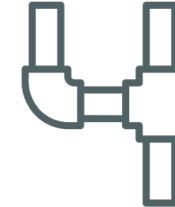
Bottled water can be hundreds to thousands of times more expensive per gallon than centralized water.

Purchasing bottled water is an ongoing cost, and is not applicable to all water uses, such as laundry.



POU FILTERS^{45,56}

POU filters range from just \$10 all the way up to \$1,500 with most under \$400. This estimate does not include additional cost considerations (such as additional energy or water needed to run the filter), or replacement filters and maintenance, which will incur costs every few months and ranges from \$10 to \$500. The range in price depends on the type and technology of the filter.



POE FILTERS⁵⁶

POE filters range from \$200 to \$12,000 depending on the system. This cost estimate does include professional installation costs, but it does not include additional cost considerations (such as additional energy or water needed to run the filter) or replacement filters and maintenance, which will incur costs yearly. Maintenance costs range from \$50 to \$900 and depend on the technology.

ALTERNATIVES TO SEPTIC: USER INTERFACES



Photo: [SuSanA Secretariat](#)



Photo: [Alex Wilson](#)



Photo: [Rene Cortin](#)



Photo: [Incinerating Toilets Inc.](#)

Flush Urine-Diversion Toilets⁵⁸

- Operates with water (minimal amount)
- Divider to divert urine away from feces
- Separate treatment for urine and feces
- **Cost:** \$300 (basic) - \$1,500 (higher end)

Dry Urine-Diversion Toilets⁵⁸

- Operates without water
- Divider to divert urine away from feces
- Drying materials added after defecating (lime, ash, dirt, etc.)
- Separate treatment for urine and feces
- **Cost:** \$300 (basic) - \$1,500 (higher end)

Composting Toilets⁵⁸

- Operates without water
- No division between urine and feces
- Drying materials added after defecating (lime, ash, dirt, etc.)
- One treatment process for urine and feces
- **Cost:** \$50 (basic) - \$2,000 (higher end)

Incinerator Toilets⁵⁹

- Operates without water
- No division between urine and feces
- Heat to burn waste into ash
- Electric and non-electric options available
- **Cost:** \$700 (basic) - \$4,500 (higher end)

Note: The costs estimated here do not include ongoing maintenance. This can vary widely and requires individual expertise and/or education to ensure proper efficacy of these systems.

ALTERNATIVE STORAGE & TREATMENT



Photo: [HomeBioGas](#)

Biodigester/Anaerobic Digester⁶⁰

- Bacteria break down solid waste into methane (a type of fuel), carbon dioxide, and water
- Sealed, insulated system to maintain conditions
- Can be good with high-efficiency/low-water toilets
- Can be combined with kitchen waste
- **Cost:** \$1,000 (small home) - \$2,500 (larger home/farm)

Note: The costs estimated do not include ongoing maintenance. This can vary widely and requires individual expertise and/or education to ensure the proper efficacy of these systems.

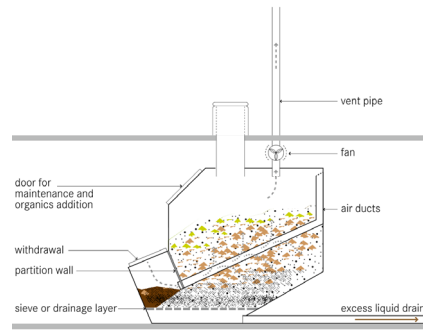


Photo: [Compendium](#)

Composting Chamber⁵⁸

- Heat, moisture, oxygen, and sufficient carbon are required to break down dry waste
- It is difficult to achieve sufficiently stabilized and sanitized outputs
- Waterless - requires the use of a dry toilet
- **Cost:** \$1,500 (small home) - \$13,000 (multi-home)



Photo: [Urban Worm](#)

Vermicomposting⁶¹

- Use of earthworms and/or redworms
- Treatment and decomposition of solid portion of waste (though it can process small amounts of liquid)
- Yields fertilizer (both solid and leachate)
- **Cost:** \$350 (small home) - \$11,500 (high use)

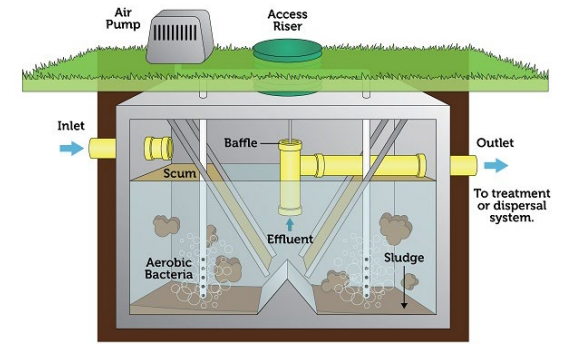


Photo: [EPA](#)

Aerobic Septic System⁶²

- More complex septic system that has multiple chambers
- Resulting effluent can be used for non-consumable irrigation
- They take up less space than a traditional (anaerobic) septic system
- Requires less frequent pumping
- **Cost:** \$1,700 (packaged technology) - \$20,000 (more complex)

ADVANCED SEPTIC-COMPATIBLE SOLUTIONS

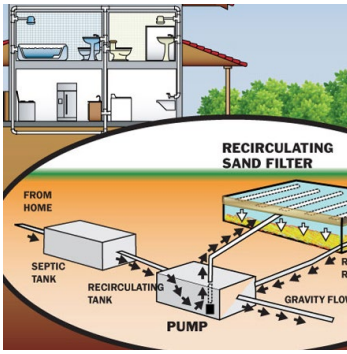


Photo: [Digital Journal](#)

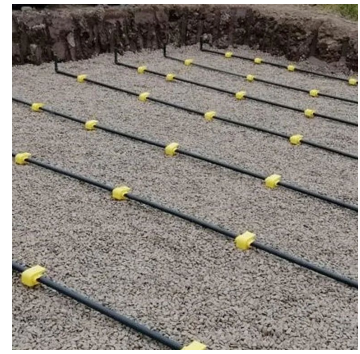


Photo: [Sewage Systems](#)



Photo: [Klamath County](#)

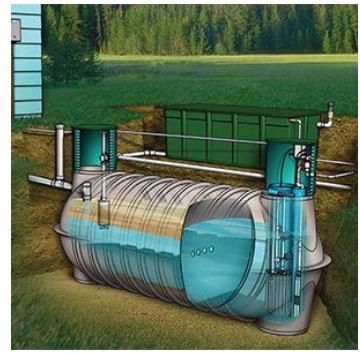


Photo: [Orenco Systems](#)

Recirculating Sand Filter⁶³

- Alternative to a traditional drain field
- Wastewater is mixed treated and released in time-controlled doses through sand
- This process happens several times before being discharged into a drain field
- Works well in areas near water or with a high water table
- **Cost:** \$6,000 - \$11,000

Low-Pressure Pipe System⁶⁴

- Utilizes pressure to distribute water uniformly
- Helps in clayey soil since water is driven into gravel trenches
- Can be difficult to design to meet appropriate pressure
- **Cost:** \$7,000 - \$10,000

Capping Fill (or Mound) System⁶⁵

- Caps a drain field with native, clean soil of the same textural class at a depth of 10-18"
- The bottom of the fill is below the natural soil level
- Allows for better percolation in compact soils or near high water table
- **Cost:** \$8,000 - \$15,000

Advanced Septic System⁶⁵

- Typically comprised of a train of treatment units between a tank and a drain field
- Types of treatment units vary based on site constraints and conditions
- Treatment may include various media filters, aerobic treatment, or ultraviolet light disinfection
- **Cost:** \$20,000 - \$40,000

Note: The costs estimated here do not include ongoing maintenance. This can vary widely and requires individual expertise and/or education to ensure the proper efficacy of these systems.

ALTERNATIVE METHODS OF SUPPORT FOR DECENTRALIZED USERS

There are ways for local governments and other supportive organizations to encourage sustainable decentralized systems. Prioritization of these and similar methods in areas with vulnerable or struggling decentralized users could be a cost-effective way to improve public health without connecting to a water or sewer utility.



WELL CONTAMINATION

Ensure there is guidance on prevention of health impacts if contamination is detected. Provide free or discounted POU filters, and information on filtration options.



COMMUNICATION

Implement creative outreach strategies (text messages, mobile apps, automated phone calls) to remind and motivate users of maintenance needs.



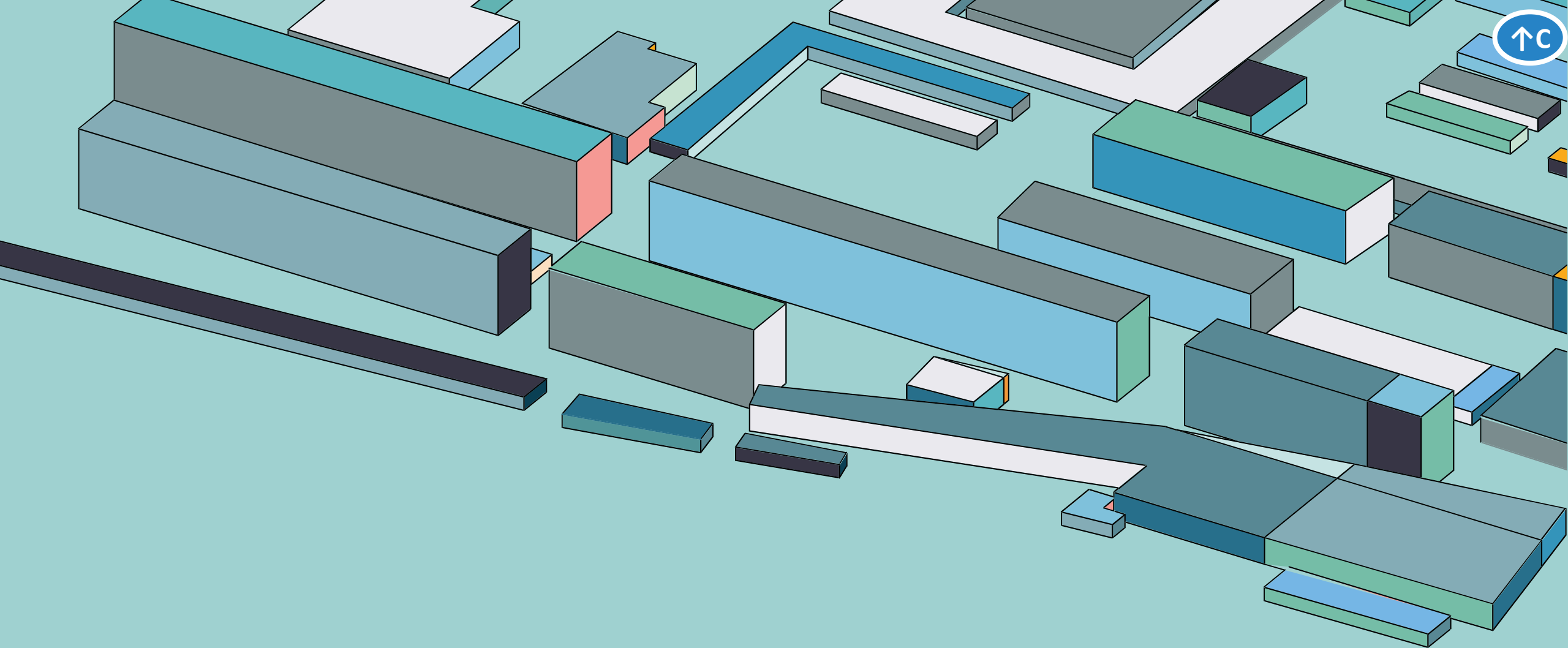
WELL TESTING

Provide free testing services and apply for grants to support testing. Communicate widely about on what needs to be tested, frequency, how to test, and the meaning of test results



SYSTEM REPAIRS

Consider funding and financing programs for larger well and septic repairs, including emergency public health nuisance abatements

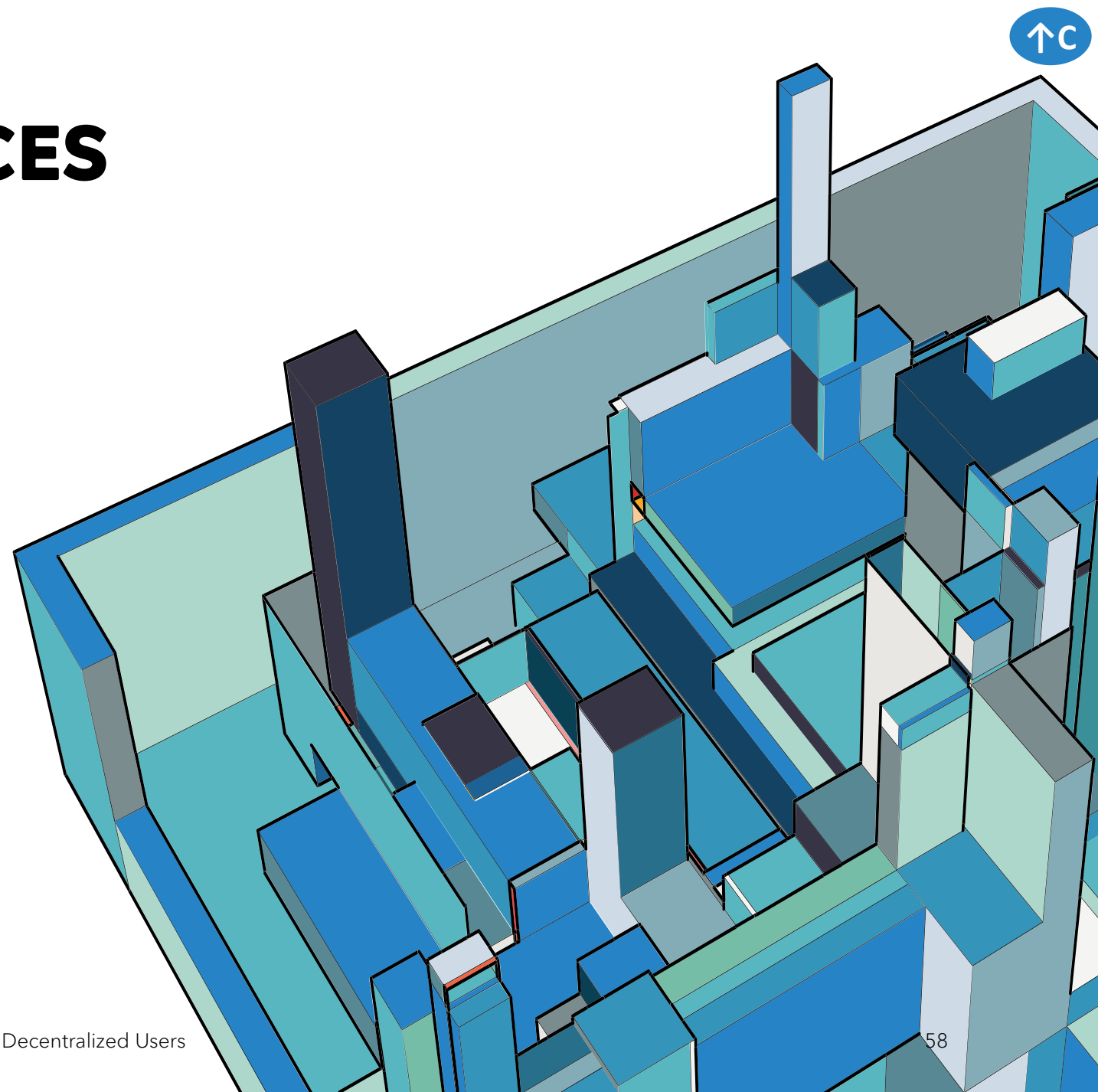


FUNDING OPPORTUNITIES

FUNDING FOR IMPROVED SERVICES

Constructing, repairing, and replacing water and wastewater systems can be financially burdensome, which is why several independently-, state-, and federally-funded offer different types of assistance. Homeowners can find low interest loans and grants to construct, test, replace, and repair individual systems. Municipalities can find technical assistance, training, educational outreach opportunities, funding for infrastructure repairs, and potential opportunities for centralized connection through a wide variety of funding opportunities.

Most often, funding from these sources is provided as fixed, low-interest loans that require the borrower to pay back principal and interest, but there are both residential and municipal opportunities for grant funding. Grants are often available for lower award amounts and is not required to be paid back.



NATIONAL FUNDING for DECENTRALIZED INDIVIDUALS



Individual Household Well and Septic Loan Program⁶⁹

New Well and Septic or Repairs

- Low-interest loans (1%) up to \$15,000
- Residents of rural communities with populations under 50,000
- Dig a new well or repair an existing well
- Install a new standard or alternative septic system



Single Family Housing Repair Loans & Grants^{67,68}

Well Repairs

- Very low-income homeowners
- Loans to repair, improve, or modernize their homes
- Grants for elderly applicants - can be used to remove health and safety hazards
- Can also be used to connect to an existing utility



Individual Household Septic Loan Program⁶⁶

New Wells and Septic or Repairs

- Low-income homeowners
- Loans up to \$15,000 fixed at 1% interest rate
- Focus on areas where centralized connection is not physically or economically feasible
- Rural, unincorporated areas and minority groups

Several programs provide year-round funding for wells and septic on a national level. Individual homeowners are eligible to apply for this funding directly through the organization that provides funding. Many larger projects, like new construction or major repairs, are fixed low-interest loans with a maximum amount, but some programs may provide grants based on income status or age.

LOCAL & STATE FUNDING for DECENTRALIZED INDIVIDUALS



Some municipalities or counties have funding opportunities for local residents. Residents can search on their local municipality or county website for more information about potential programs in their area. These are a few examples of existing programs.



Bernard Allen Emergency Drinking Water Fund⁷²

Emergency Well Support

- Pay for notice to persons whose wells are at risk from groundwater contamination
- Pay for the costs of testing private wells
- Provide an alternate drinking water supply to well owners affected by the contamination



Septic-to-Sewer Project⁷⁰

Sewer Connections

- Ongoing project to connect residents on septic that live in the Northcreek Water Shed to centralized service
- Cost share project that covers system development and connection fees depending on income



Septic System Community Assistance Fund (SSCAF)⁷³

Septic Repairs and Replacement

- Loan terms vary from 3 to 5 years depending on cost
- Interest rate set at 3% for primary residence and 5% for rental properties
- Applicants must attend septic maintenance class



Department of Environmental Services⁷¹

Well or Septic Repairs

- Support lower income, elderly, and disabled residents
- Fix or test well/septic system

TYPES OF PUBLIC APPLICANTS ⁷⁴

Area designations and governance structures will determine what kind of funding a community is eligible to receive

Funding sources may be restricted by what applicants are eligible to apply; federal funding streams are often restricted to public entities. This may include county governments, municipalities (see right), water and sewer districts, and others.

In some cases, the applicant pool may be more restrictive to a subset of these public entities. For example, funding streams may specifically ask for county health departments as applicants or may exclude water and sewer districts if not connected to a local government unit.

MUNICIPALITIES

- Incorporated areas where the NC General Assembly has granted the area a charter to establish a local government
- State legislature grants powers and authorities to municipalities
- Requires that the local government provide certain services, like water and sewer

FUNDING for DECENTRALIZED COMMUNITIES



Facilities Development Grant Program⁷⁷

Infrastructure Grant

- Grant funds for community development projects
- Focused on water and wastewater infrastructure
- Certified by the Community Development Financial Institution

Community Development Loan Program⁷⁷

Infrastructure Loan

- Loans to community entities to develop and/or construct large-scale community projects
- Up to \$250,000, interest rates between 3-7%
- Projects can include building new treatment facility, installing laterals, repairing/replacing a storage tank, etc.

Special Evaluation Assistance for Rural Communities and Households Grant⁷⁶

Feasibility and Design

- Rural, low-income communities (government entities, non-profits, tribes)
- Used for technical assistance, feasibility studies, or preliminary engineering analysis for water and wastewater disposal projects

CDC Private Well Program⁷⁵

Health Dept. Support

- Health departments are applicants
- Investigate a health risk, determine interventions, implement and evaluate
- Training on drinking water
- Wide variety of qualifying activities

FUNDING for PUBLIC ENTITIES



Drinking Water State Revolving Fund (DWSRF)⁸¹

Loans for...

- Extending main service lines to provide water service to existing residents who do not have a safe supply of potable water
- Creating a new community water system that addresses public health issues caused by individual wells (this is only limited to the geographic area of contamination)



Clean Water State Revolving Fund (CWSRF)⁷⁸

Loans for...

- Upgrade, removal, or replacement of decentralized wastewater systems, specifically septic



DWSRF Bipartisan Infrastructure Law (BIL) Emerging Contaminant (EC) Fund⁷⁹

Grant Funding

- Grant funding for any projects eligible under current CWSRF or DWSRF eligibilities that ALSO address an emerging contaminant
- Emerging contaminants can be any contaminant on any CCL⁸⁰, or any PFAS compound
- BIL EC funding *cannot* be used for individual well testing



NRWA
Rural Water Loan Fund⁸²

Small Utility Support

- Low-interest loans to rural water systems
- Small capital projects, short-term repair, or pre-development associated with larger projects
- Cap of \$200,000 and 3% fixed interest

FUNDING for PUBLIC ENTITIES



CDBG Infrastructure^{85,86}

Grant Funding (State)

- Drinking water and wastewater infrastructure projects that benefit areas that meet the CDBG income threshold, which is 80% or less of the current MHI in the county or metropolitan area where the project will occur
- The population benefitting must be at least 51% low- to moderate-income persons
- Projects should mitigate public and environmental health problems

CDBG Neighborhood Revitalization⁸³

Grant Funding (State)

- Neighborhood revitalization through improvements, preservation, or development in a residential area
- Must meet CDBG income threshold or eliminate slums or blight
- Can combine revitalization efforts with connection to centralized service

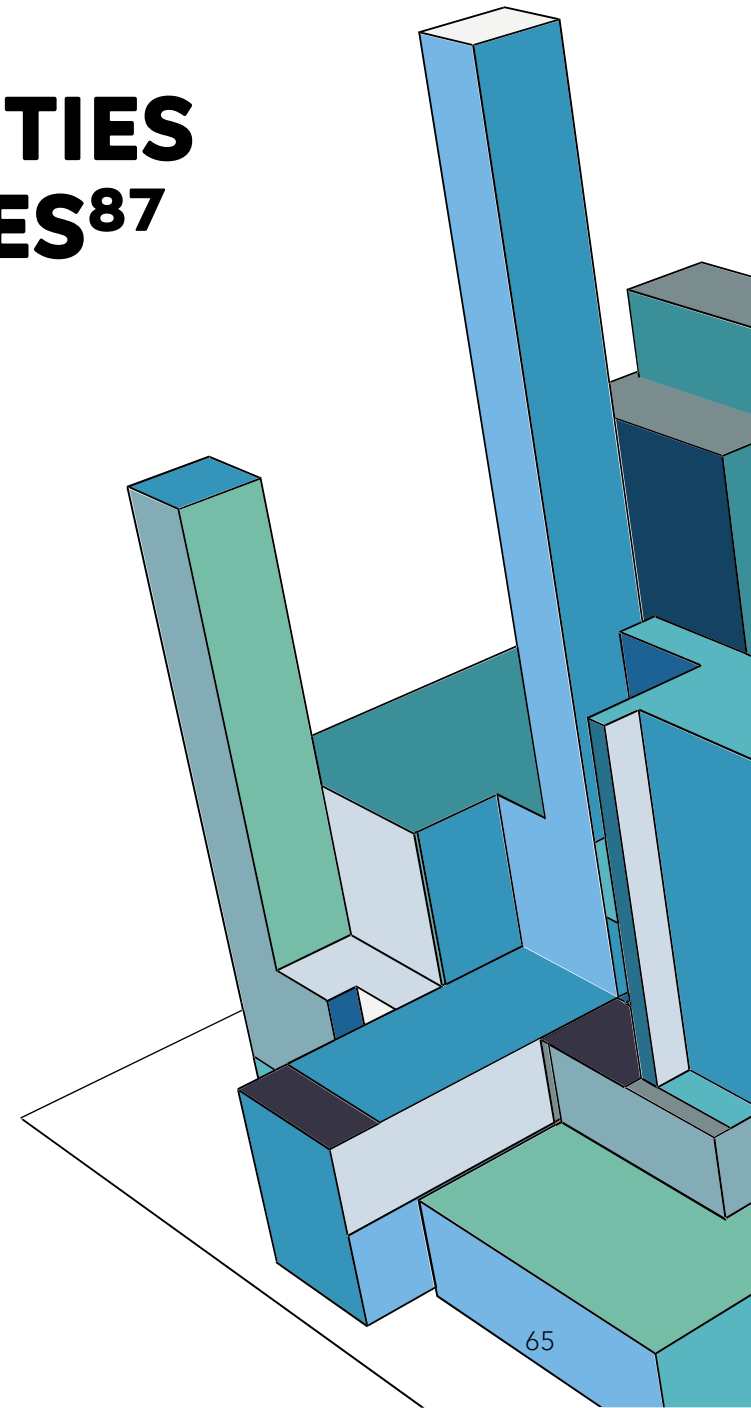
CDBG Entitlement Program⁸⁴

Grant Funding (Federal)

- Grant funding distributed to entitlement communities directly from the Department of Housing and Urban Development (HUD)
- Same project eligibilities as CDBG Infrastructure and Neighborhood Revitalization, funding is allocated yearly, so entitlement communities have more flexibility to carry out larger projects

ADDITIONAL FUNDING OPPORTUNITIES FOR DISADVANTAGED COMMUNITIES⁸⁷

NCDEQ provides additional SRF project options for communities that are identified as disadvantaged. If a public entity undertakes a project that will benefit a disadvantaged community, the project's connection costs may be eligible for reimbursement.



DEFINING DISADVANTAGED COMMUNITY FOR NC SRF FUNDING⁸⁷

NCDEQ uses several metrics to determine if a community qualifies for disadvantaged status.

CURRENT FACTORS

- Affordability of current water and sewer rates relative to the income level of residents in the targeted project area
- Median Household Income (MHI)
- Poverty levels
- Per capita appraised value of property
- Employment rates

ADDITIONAL FACTORS

- Demographic
- Historical
- Cultural
- Linguistic
- Socioeconomic stressors
- Cost-of-Living stressors
- Existing contamination factors

NC SRF DISADVANTAGED COMMUNITY FUNDING OPTIONS⁸⁷

- In North Carolina, connection costs to a public water or wastewater system, or a decentralized system serving a cluster of residences, are eligible SRF project costs under the following conditions:
 - New connections are connecting existing residents.
 - Existing residents must be willing to connect.
 - At least 75% of construction costs are benefitting disadvantaged areas.

DELAWARE CWSRF INDIVIDUAL LOAN PROGRAMS⁸⁸

Delaware is the only state that allows their CWSRF program to make direct loans with individual homeowners. There are two different loan options for borrowers depending on their credit history. The first is the Septic Loan Rehabilitation Program (SLRP) which gives homeowners 20-year loans with a fixed interest rate of 3% or 6% (depending on their income) with monthly payments made to the CWSRF. The Septic Extended Funding Option (SEFO) is designed to provide interest-free loans to borrowers who do not qualify for an SLRP loan. The SEFO program does not require monthly payments, but payment in full is due if the property is sold or if the mortgagee is refinanced within 20 years of the start of the loan. This program is funded through CWSRF administrative set-asides.

EXAMPLE: UNION COUNTY

Location

- Southwestern North Carolina
- Included in Charlotte-Concord-Gastonia Metropolitan Statistical Area⁸⁹
- CDBG Entitlement Community (funding allocated annually)⁸⁴

Competing community concerns

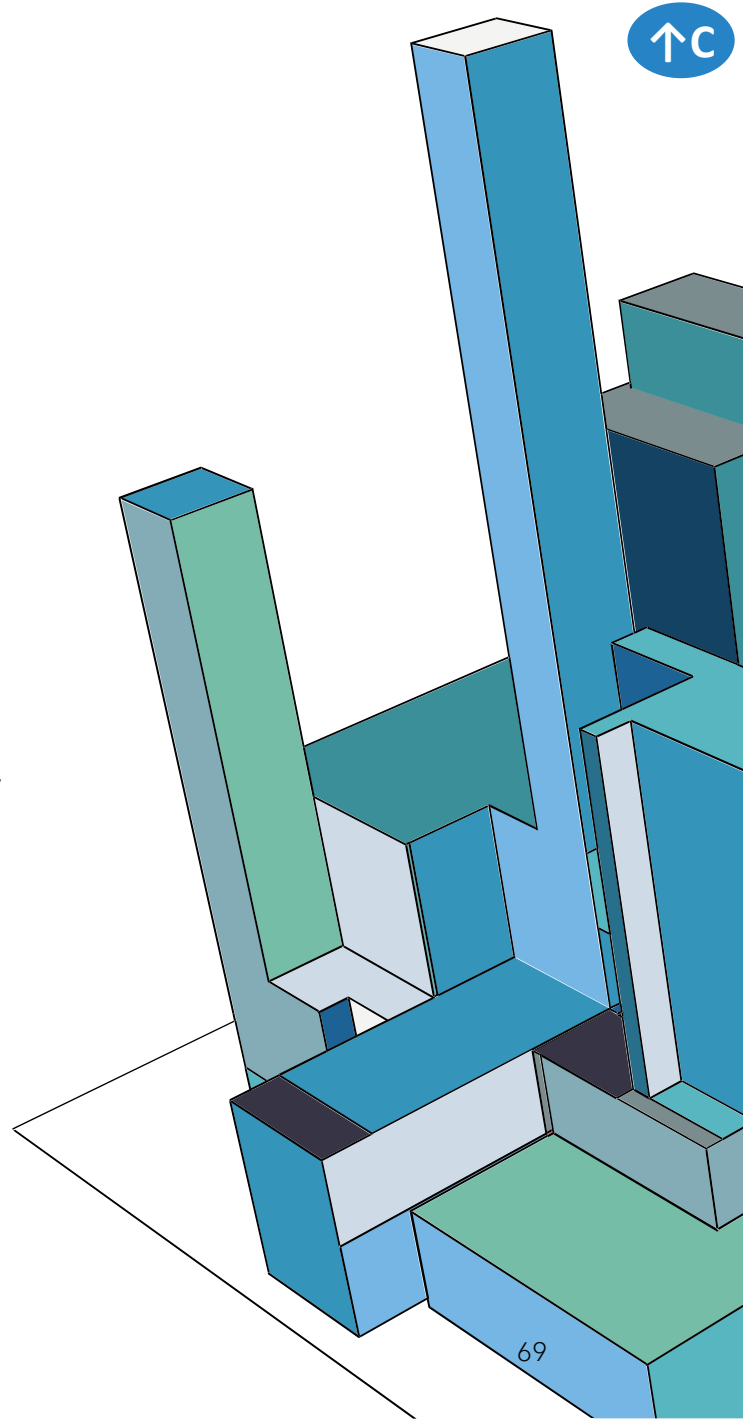
- Consistent problems with low well yields, high arsenic, and muddy water
- County has rural areas that did not have the option to connect to centralized service
- Due to its proximity to Charlotte, Gastonia, and Concord, the community is seeing significant growth

Demographics⁹⁰

- Population: 249,070
- MHI: \$88,465

Short Line Program⁹¹

- Union County established a public water system and allowed individual residential homes to connect through the Short Line Program
- Interested participants are invited to apply to the program, especially in groups
- The county scores applications based on several different criteria and informs successful applicants within a few months
- Participants are required to pay a cost share fee (between \$750-\$3,000) based on their application, as well as a \$360 meter installation fee



EXAMPLE: UNION COUNTY

PROJECT MANAGER: ALINA YOUNG⁹²

“People talking to neighbors that have done the program and reach out to program directors, and the brochures are delivered right to their mailboxes.”



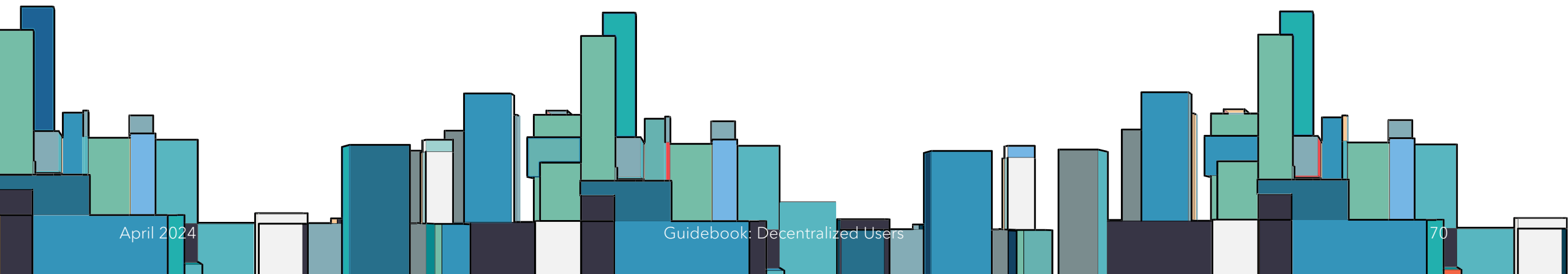
Outreach

“It started out of a need from rural residents of the county who had issues with their wells.”

“People moving into the county see the well tests on their new homes, and they might not be on county water, so they want to get connected.”

Identifying Need

Barrier: Proximity to Water Providers



ADDITIONAL RESOURCES FOR MUNICIPALITIES

Philanthropy and other creative avenues may provide opportunities for additional funding

The Golden LEAF Foundation⁹³

- North Carolina non-profit foundation that partners with municipalities across the state to fund various economic development and infrastructure projects across the state
- The **Bettes Parkway / Peele Road Water / Sewer Extension Project**, funded by the foundation in 2022, extended water and sewer infrastructure. Projects like this one open the possibility for additional centralized service connections for decentralized users⁹⁴
- Non-profit foundations have the flexibility to choose projects that uphold their mission and goals



GAPS IN FUNDING LANDSCAPE

Funding connections

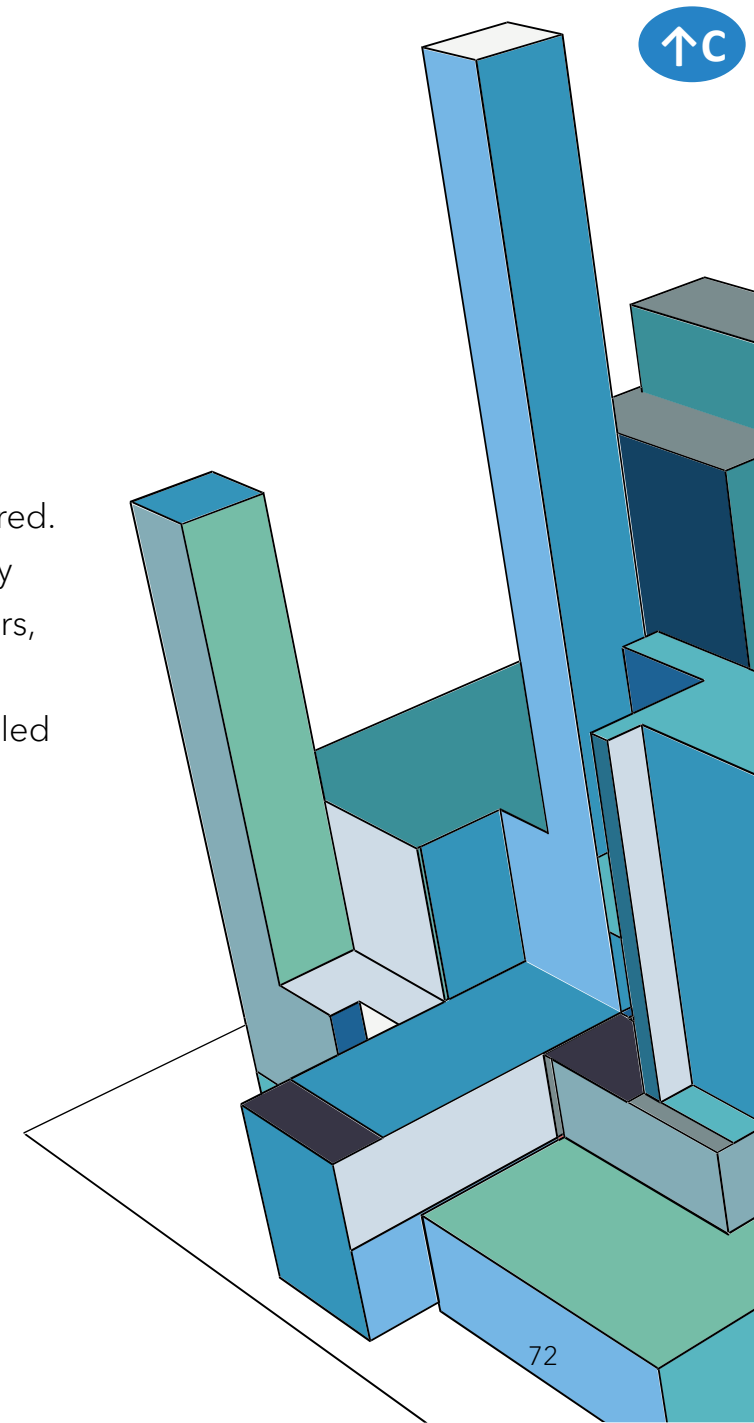
There are limited funding streams available that intentionally fund connections. In some funding programs, connections may be funded as part of a larger effort or to address other service quality issues. However, the variability of needs between decentralized users indicates a need to address funding for connections to centralized systems more directly.

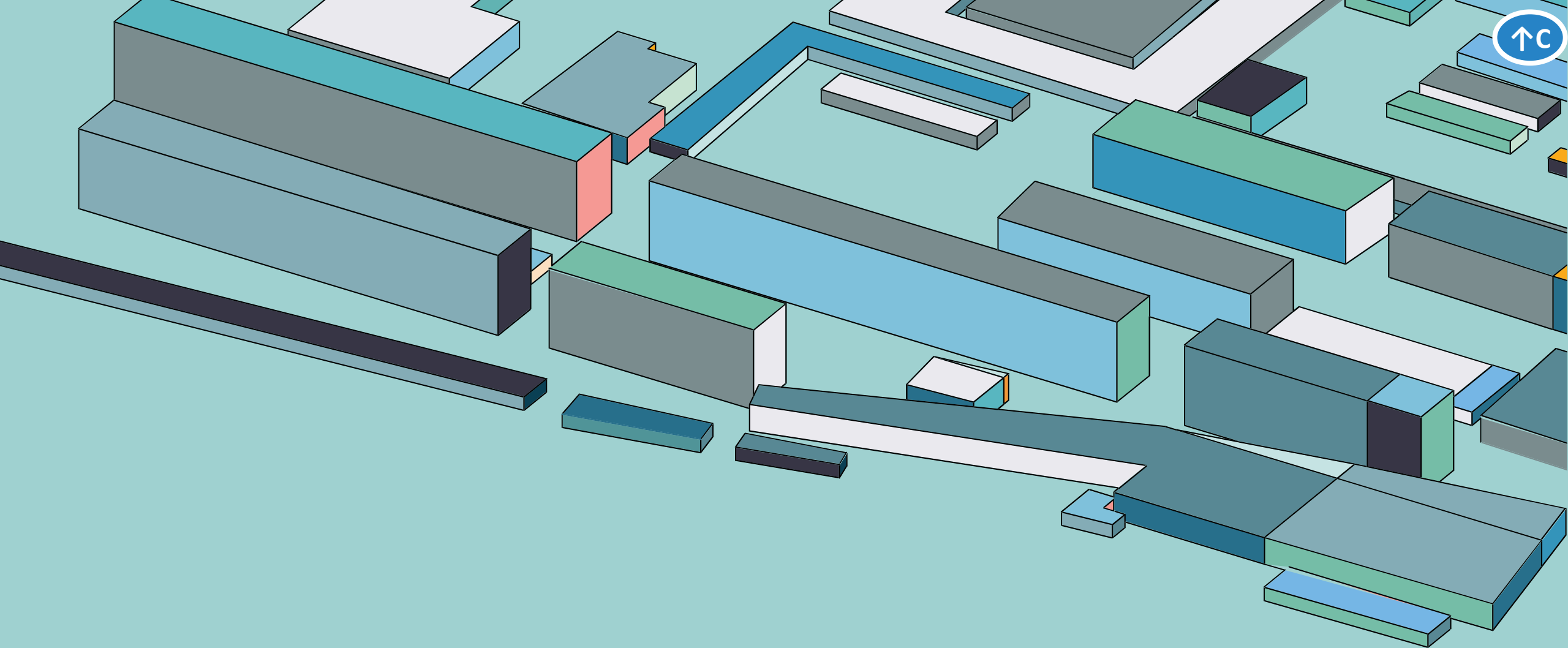
Defining Disadvantaged Users

Funding options may not always be accessible, especially to low-income or minority populations. Each funding program defines disadvantaged users differently, qualifying some homeowners and areas for some programs but not others. This can make navigating the funding landscape confusing because applicants continually need to verify their disadvantaged status. Additionally, those qualifying as disadvantaged may face capacity barriers that affect their ability to learn about and apply toward funding streams.

Staying Decentralized

Staying decentralized requires residents to be responsible for the costs of maintenance for their systems. Some maintenance and repairs may be eligible projects within funding programs, but elements such as routine testing are often not covered. Education and funding for system maintenance may not be readily available or accessible to homeowners, which could cause additional repair costs later. Emergency funding sources to address failing or failed systems also appear to be sparse.



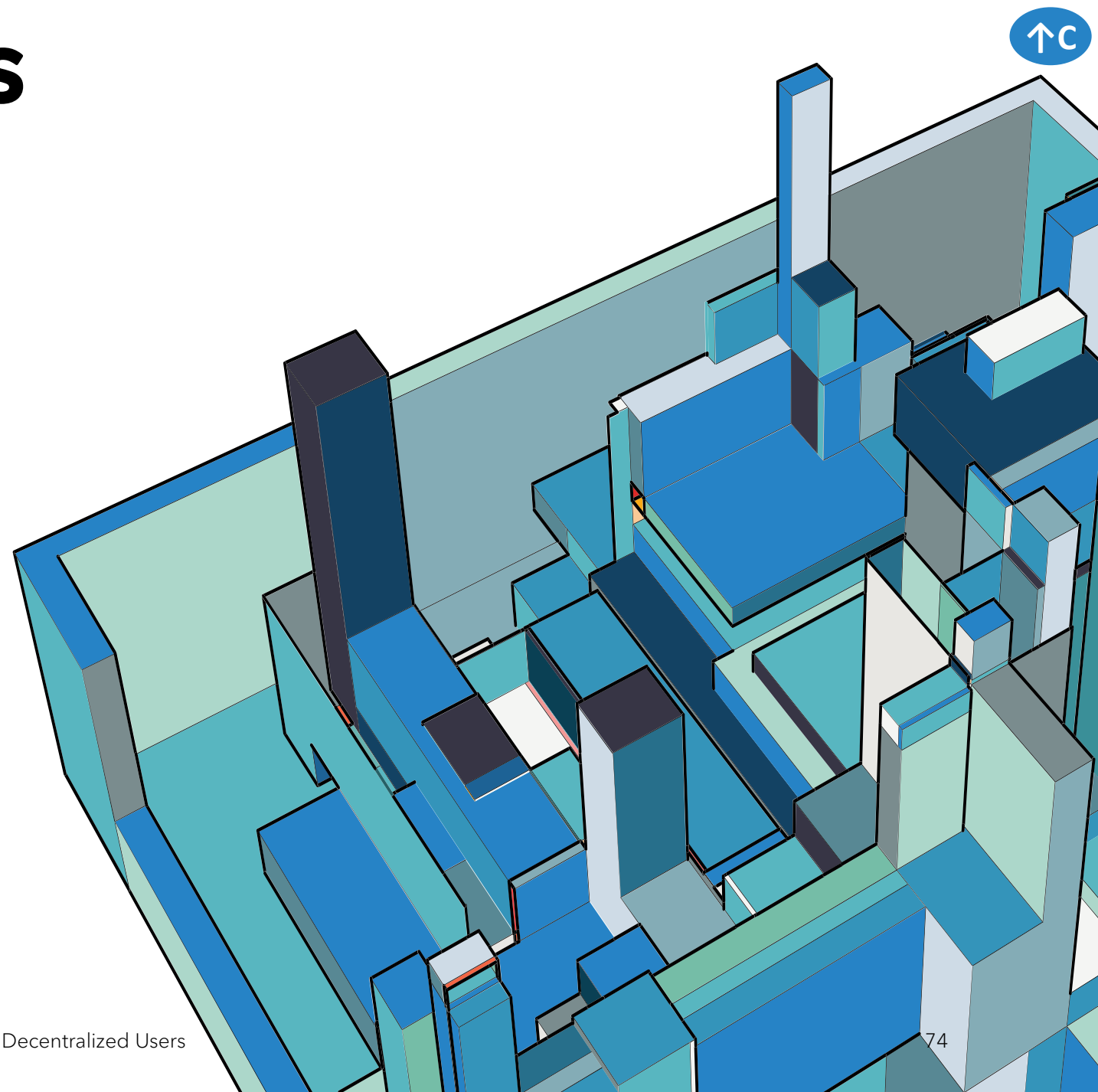


IDENTIFYING DECENTRALIZED USERS: SPATIAL ANALYSIS

SPATIAL ANALYSIS OVERVIEW

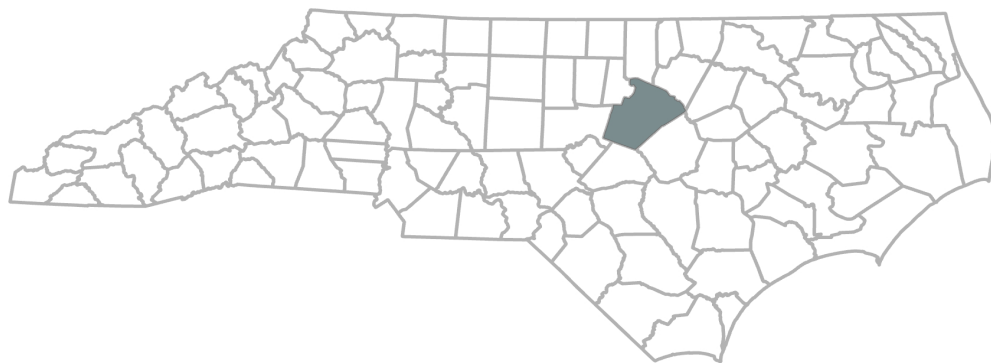
Information regarding the location of decentralized users is lacking. This can be problematic for organizations and individuals hoping to improve water and sewer services for these users. The data may be spotty geographically or over time, depending on when records were initiated and how often they are updated. Additionally, assumptions may be made that ignore the issues described in this guidebook.²³

With this knowledge, the UNC EFC attempted an analysis to consistently identify decentralized users using Geographic Information Systems (GIS) and a variety of data sources within Wake County. The methods and results described here are intended to provide an alternative process for municipalities, utilities, or community groups to use in local identification efforts.



SPATIAL ANALYSIS: WAKE COUNTY

- Highly urban, with some preserved rural character
- 82% living within municipalities⁹⁵
- 25% growth from 2010 to 2020⁹⁶
- 57% white, <10% in poverty⁹⁶
- Five water providers
- Contains Raleigh, the state capital, plus twelve additional municipalities

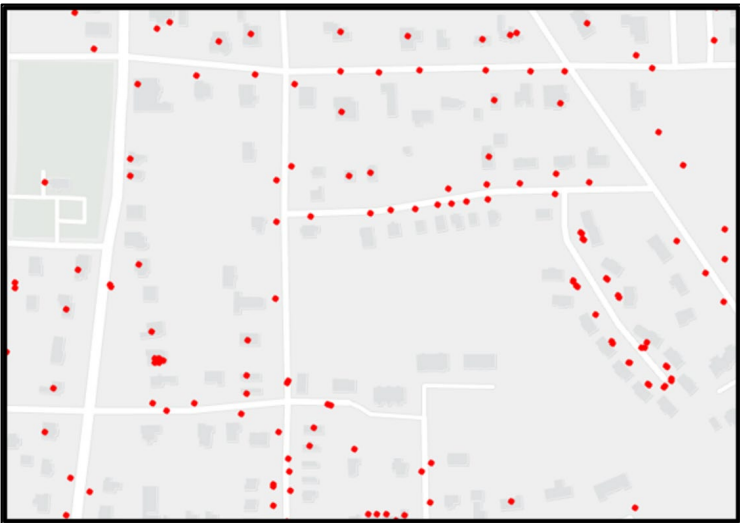


Raleigh's large urbanized presence gives the impression all nearby residents would be connected to centralized water and sewer services.

Image Credit: Dennis Ludlow (Sharkshock), CC BY-SA 4.0 <<https://creativecommons.org/licenses/by-sa/4.0/>>, via Wikimedia Commons

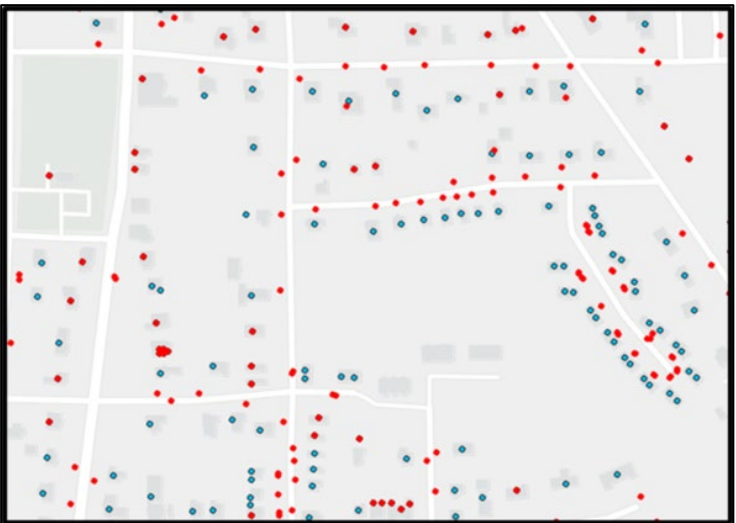
METHOD OVERVIEW

Step 1: Obtain meter locations



● Meter locations

Step 2: Join meter data with address data



● Matched to address points

Step 3: Identify parcels lacking centralized connection



■ Connected to centralized service ■ Pocket-decentralized user parcel

DATA COLLECTION PROCESSES

This analysis focused on the use of water meter location data and assumed that the position of a meter within a residential parcel indicates connection of that parcel to services. This assumption may be incorrect in select cases, but meters were preferred over other data sources as they are pieces of infrastructure that are generally tracked and maintained by the utility. In small or rural utilities, water usage may be unmetered, and the approach described here may be less applicable.

1. **Identify water providers within the county**
 - The UNC EFC rates dashboard can be a helpful starting point⁵³
 - Include publicly and privately owned systems
2. **Locate relevant contact information,**
 - Relevant contacts may include GIS administrators, public works/utility directors, and others
3. **Develop a relationship**
 - Share project goals and plans for data confidentiality**
4. **Obtain and clean data, as necessary**
 - Connect meter locations to parcel data
 - First, connect via address point data; the use of water provider and county addresses may increase accuracy
 - Less intensive if location data is already coded to indicate water access
 - Without the coding, match address data associated with parcels to meter location data
 - Meter locations may be positioned outside of parcel boundaries
 - Supplement with other data sources as necessary
 - Wake County has several subdivisions that are served by privately owned utilities. The lack of inclusion of these systems would create an inaccurate depiction of centralized users within the study area^{97,98}.

**Exclusions: In some cases, water providers may not provide data or may not respond to inquiries

DATA CLEANING METHODS

METER POINT LOCATION DATA

Step 1: Cleaning Meter Point Location Data

- Export the meter dataset into an Excel format (Table to Excel export)
- Convert the address field to the street address only (Text to Column function, remove city, zip, state)
- Add the updated Excel file back into the GIS software

Step 2: Join Meter Data with Address Data

- Add the two address databases into the GIS software
- Using the address fields of the meter point location, join the data to each of the address databases
- In the joined layer, select (by attribute) all the address points with non-null meters
- Create a layer from the selection

Step 3: Select Parcels

- Add the parcel data to the GIS software
- Select parcels that intersect with the first address point layer (select by location)
- Select parcels that intersect with the second address point layer by adding them to the current selection
- Export all selected parcels

Step 4: Merge Data

- Merge the parcels for each water service area into one layer
- Invert the selected parcels to show all parcels that do not have access to water (select by location)
- Export both datasets to represent parcels with and parcels without access to water

DATA CLEANING METHODS

SUBDIVISION (PRIVATELY-OWNED) DATA

Step 1: Connect Available Data

- Bring the public water supply data and the NC OneMap data into GIS^{97,98}
- Join the two datasets using the water system number field
- Select all non-null points (by attribute) to exclude any point unsuccessfully joined to a public system
- Create a new layer and select points with Type "c" (community systems)

Step 2: Select Subdivisions

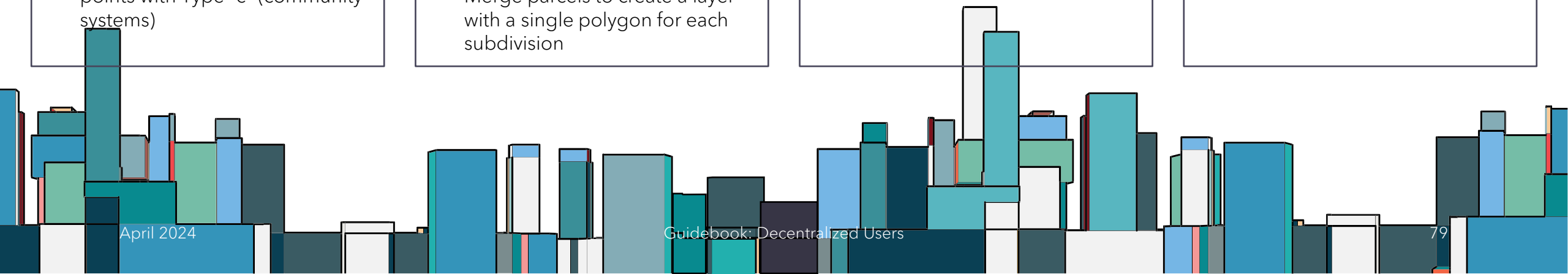
- Add the county subdivision shapefile to the GIS software
- Select any subdivision with a public water source intersecting (select by location) and create a new layer
- If a standalone subdivision file is unavailable, use parcel data to identify parcels with the same subdivision name (field)
- Merge parcels to create a layer with a single polygon for each subdivision

Step 3: Select Parcels

- Use parcel data in the case that a public system does not match a subdivision
- Select parcels that intersect with the public system database (select by location)
- Create a new layer from this selection

Step 4: Merge Data

- Select all parcels within the subdivision layer
- Merge with the selected parcels in Step 3
- Create a layer with all parcels covered by centralized systems



DATA CLEANING METHODS

RESTRICTING TO RESIDENTIAL ONLY

Background

- Ensure parcel layers include only residential properties
- Land classifications are often embedded within parcel data for each county
- Counties use different classification processes, so the process must be tailored to the specific county
- Homeowners Association classifications can be a good resource since they commonly denote communal spaces (parking lots, pools, etc.)
- Historic classifications may also display commercial and residential uses

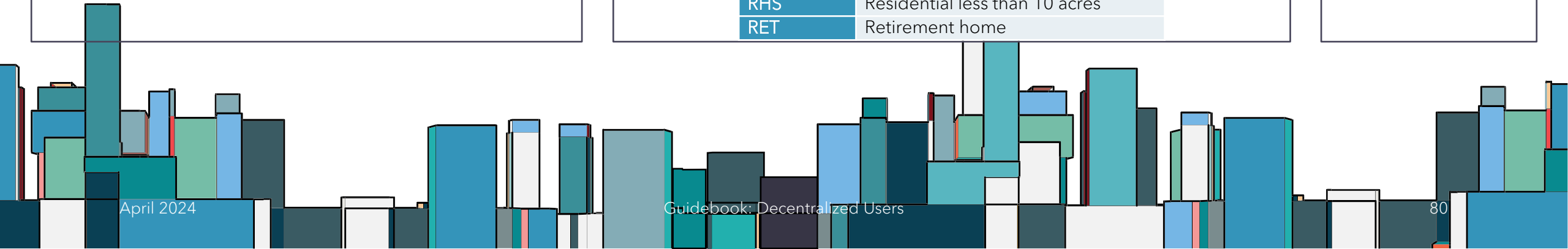
Step 1: Exclude Non-Residential Land

- Use the query function in the GIS software to isolate properties that have residential purposes (this will depend on your data)
- For example, in Wake County these are the following classifications for residential parcels:

| Land_Cla: | Land_Cla_1: |
|-----------|----------------------------------|
| AHS | Acres greater than 10 with house |
| APT | Apartment |
| COX | Condo complex |
| CON | Condominium |
| HIS | Historic |
| MFG | Manufactured Homes |
| MHP | Mobile home park |
| RHS | Residential less than 10 acres |
| RET | Retirement home |

Step 2: Export Queried Layers

- Export the queried layers, creating the final output that shows all residential parcels with and without access to centralized water service



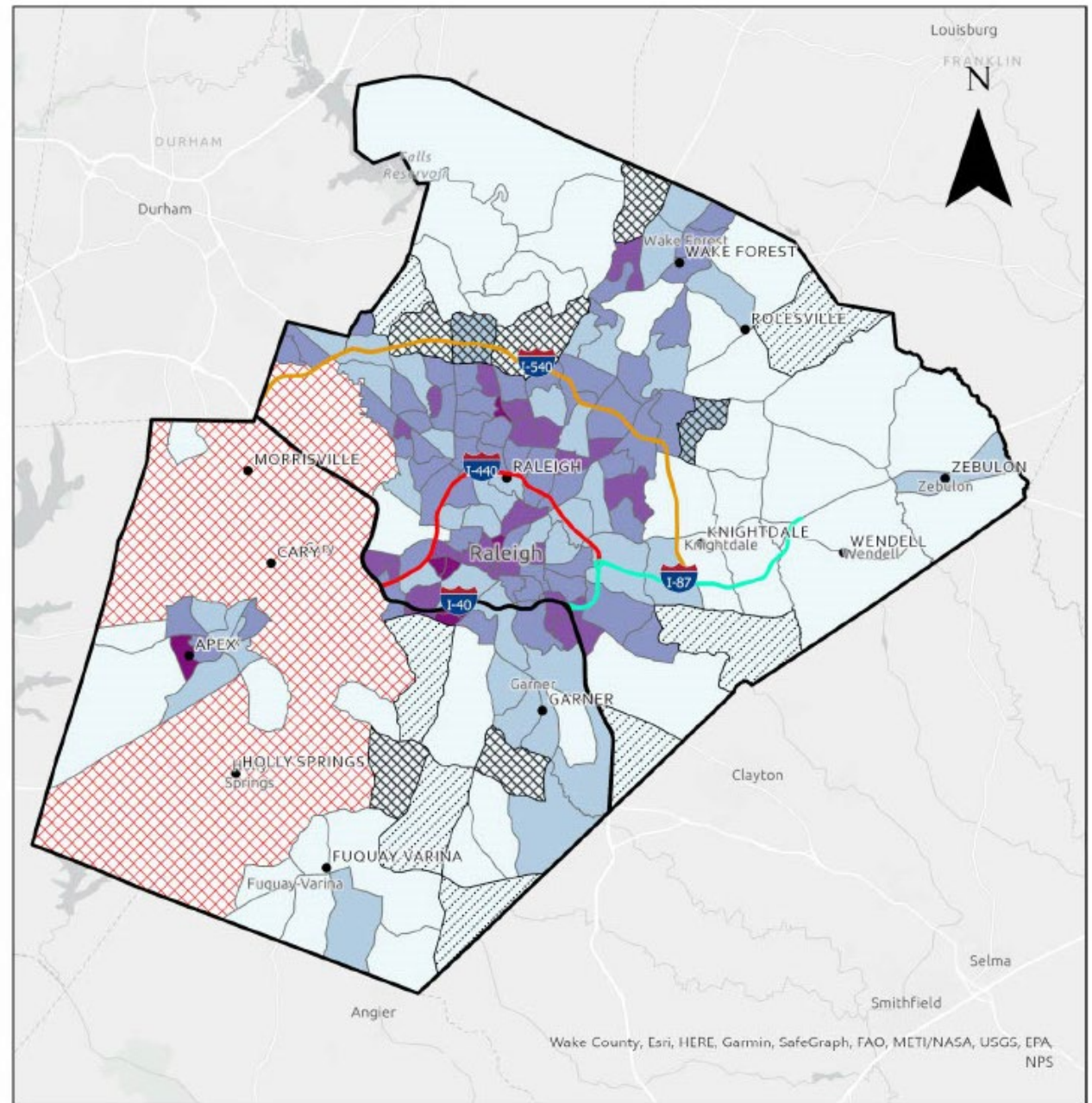
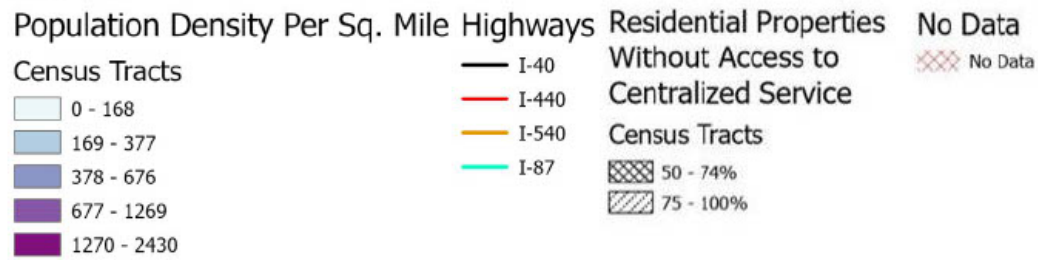
COUNTY RESULTS

Wake

The UNC EFC was able to assess at a parcel-level whether there was connection to centralized water service. The results are presented here in aggregate (i.e., census tract or block level) to preserve privacy.

The most decentralized users (black hatching) exist in the least populous areas of the county (lightest blue shadings).

Data was unavailable from all Wake County municipal providers for this analysis. Lack of data is indicated in red hatching.

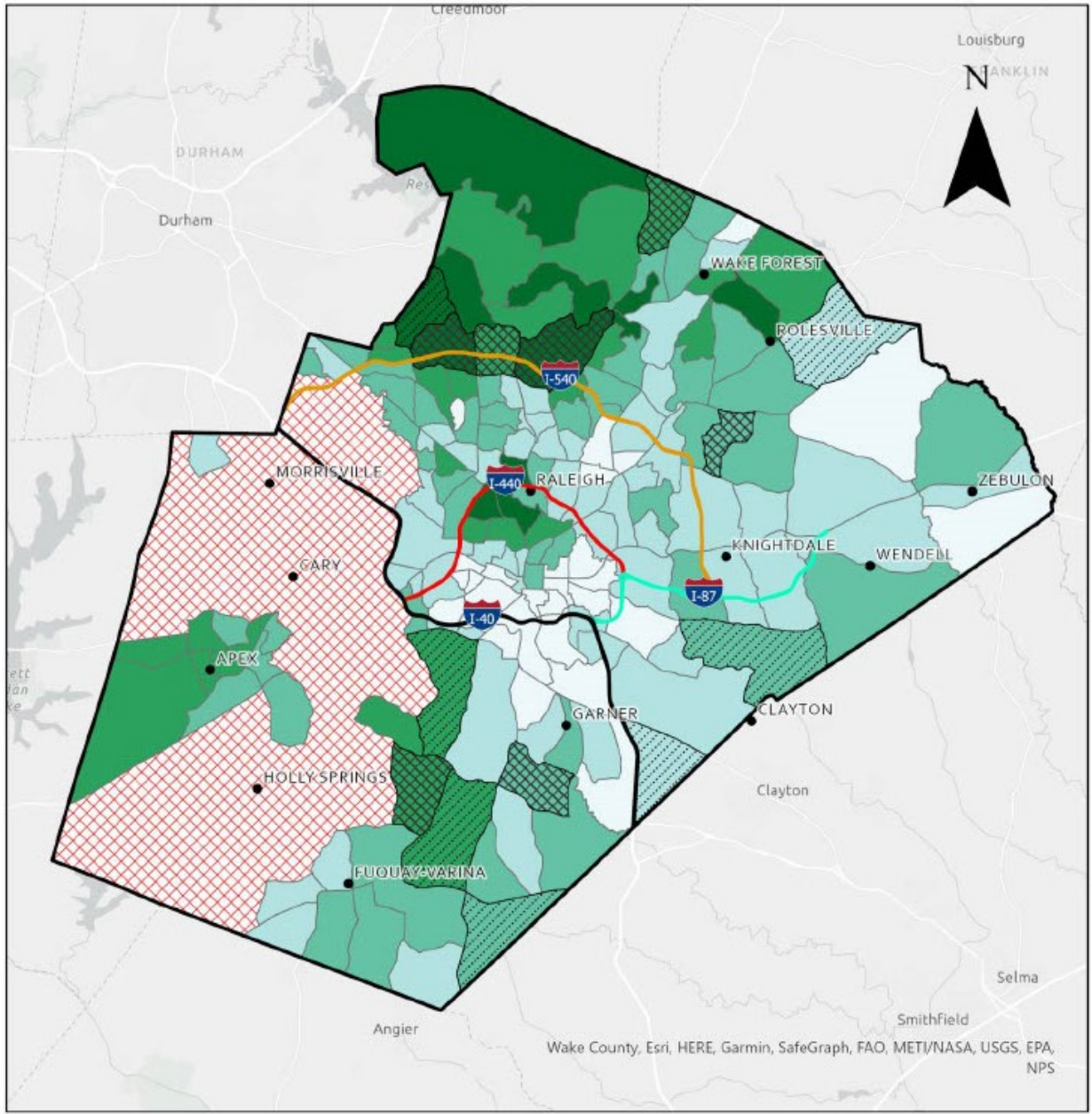


COUNTY RESULTS

Wake

When viewing areas lacking access to centralized service (black hatching) against census tract-level median income (shades of green), there is substantial variability across Wake County. In some of the highest-earning census tracts, 50-74% of residential properties are decentralized.

This is consistent with the pattern of areas actively choosing decentralization for autonomy rather than being excluded or barricaded from connecting to centralized systems. Higher-income users may still need to be educated on appropriate decentralized maintenance and potential local health risks.

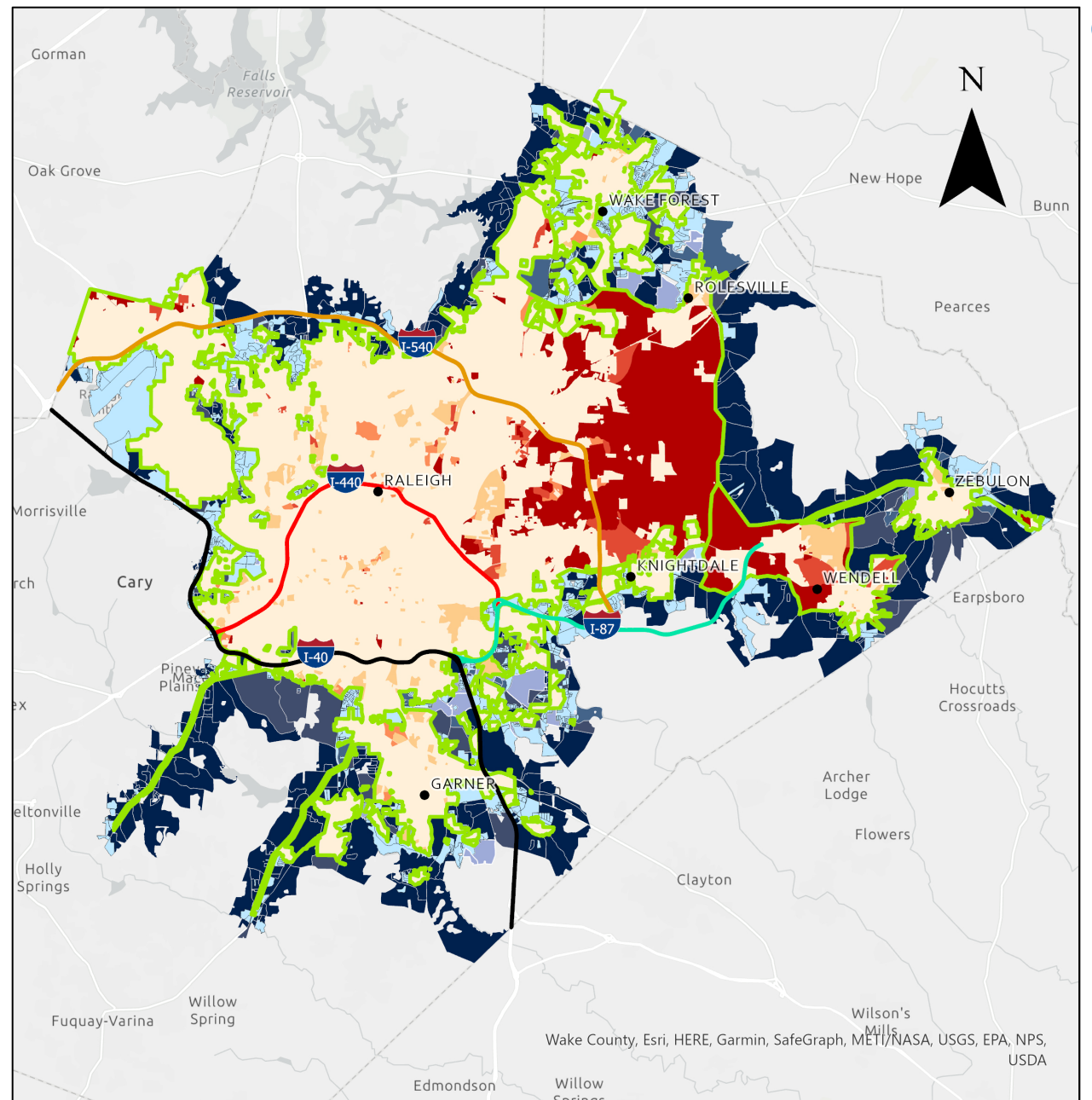
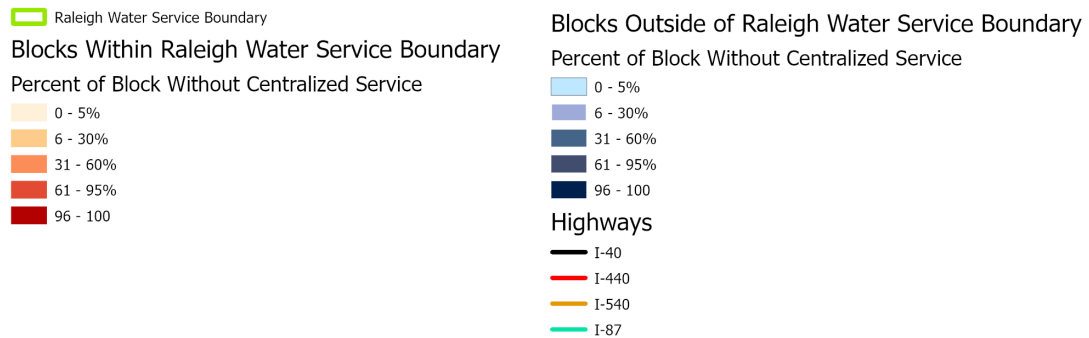


COUNTY RESULTS

Wake

However, there may be users struggling to access centralized services that are “swallowed up” by census tract geographies. Median household income represents the midpoint income of an area; the range of income is not reflected.

Additionally, when looking at the block level (right), it is clear that pocket users (shades of red) and potentially municipally underbounded users (shades of blue) exist within and right outside Raleigh Water’s service area boundary (lime green).

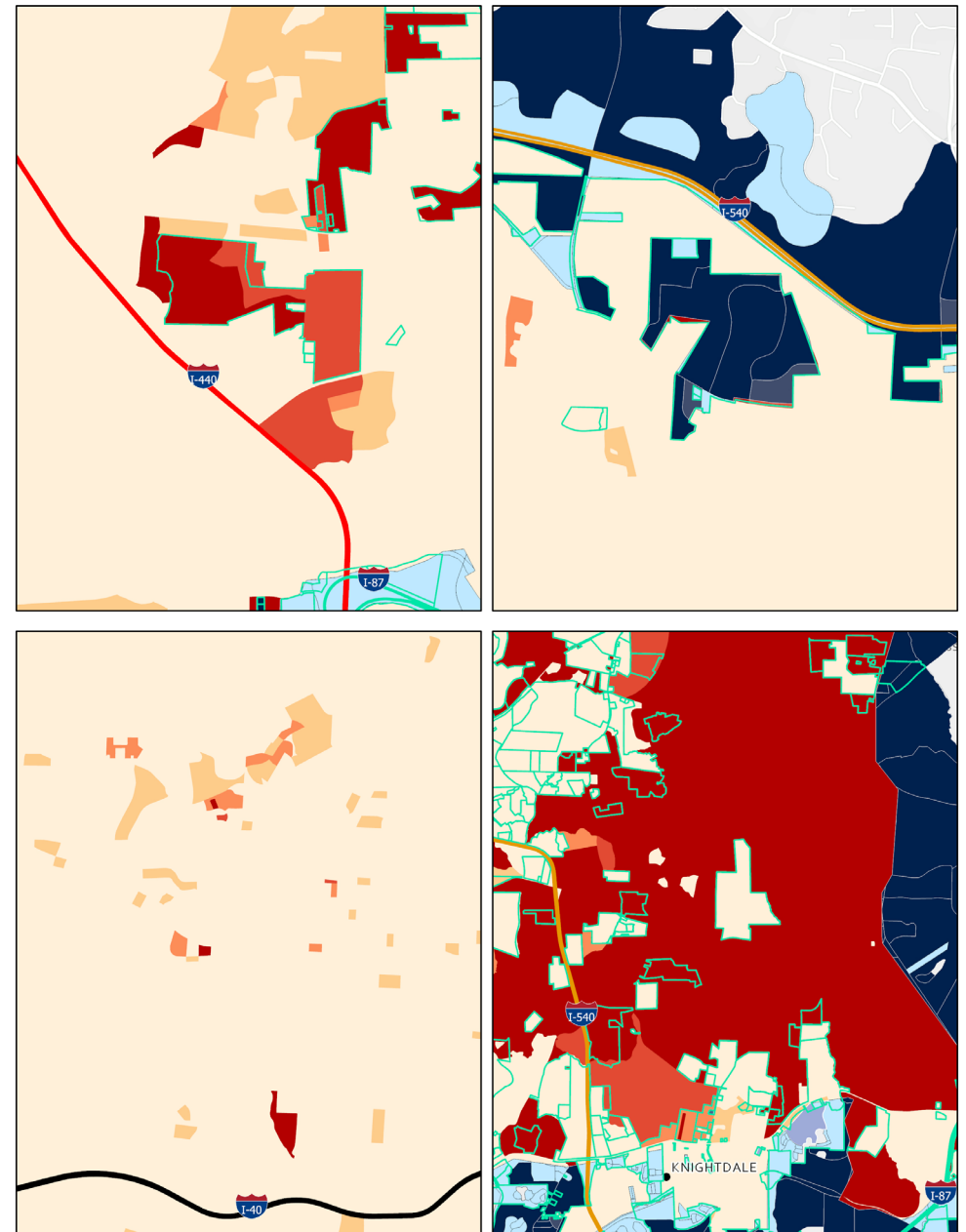
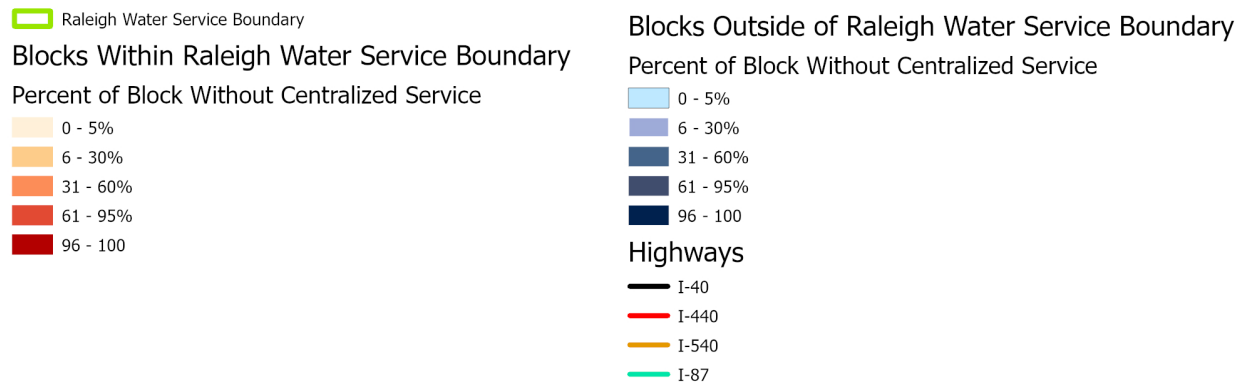


COUNTY RESULTS

Wake

These inset maps highlight variability in access to centralized services, even within or immediately adjacent to municipal boundaries (light green).

Whether due to sporadic and exclusionary annexation, the lack of ability to pay connection fees, or a different reason, each story of continued decentralization represents a different combination of factors that may impede or promote access across the county.

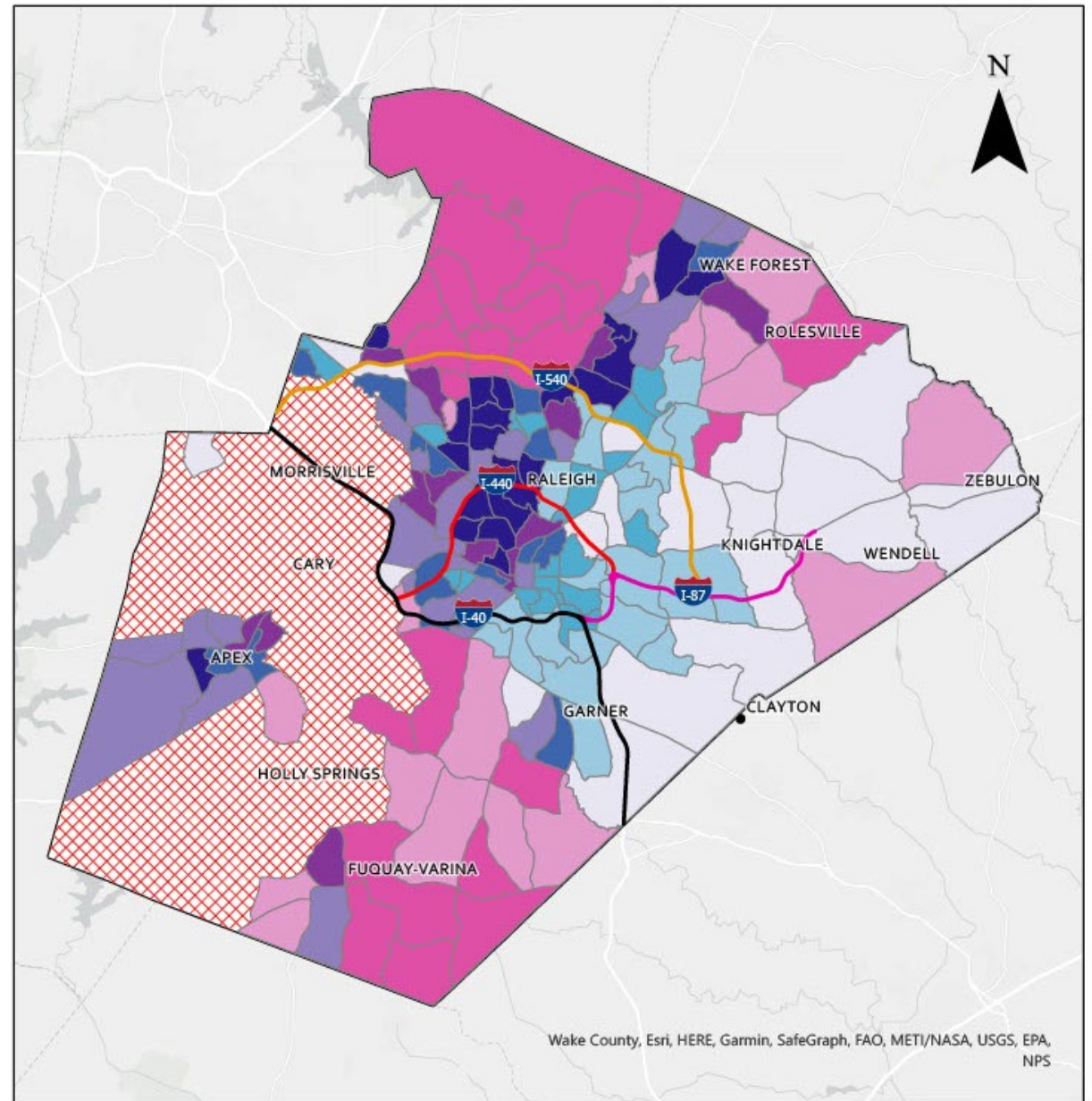
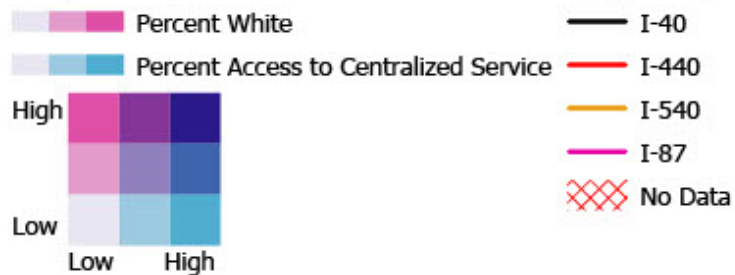


COUNTY RESULTS

Wake

Though census tracts obscure some decentralized users, high-level spatial analysis is still useful. For example, the map to the right shows both access to centralized service (shades of blue) and the white population within a tract (shades of pink).

Areas in the lightest color have the least centralized service (most decentralized users) and the highest non-white population, indicating a higher potential for environmental justice issues in those areas. Again, while there are certainly communities of color that may need assistance within largely white areas, this type of analysis highlights an initial layer of need for a municipality, utility, advocate, or community to consider when considering safe water and sewer options.

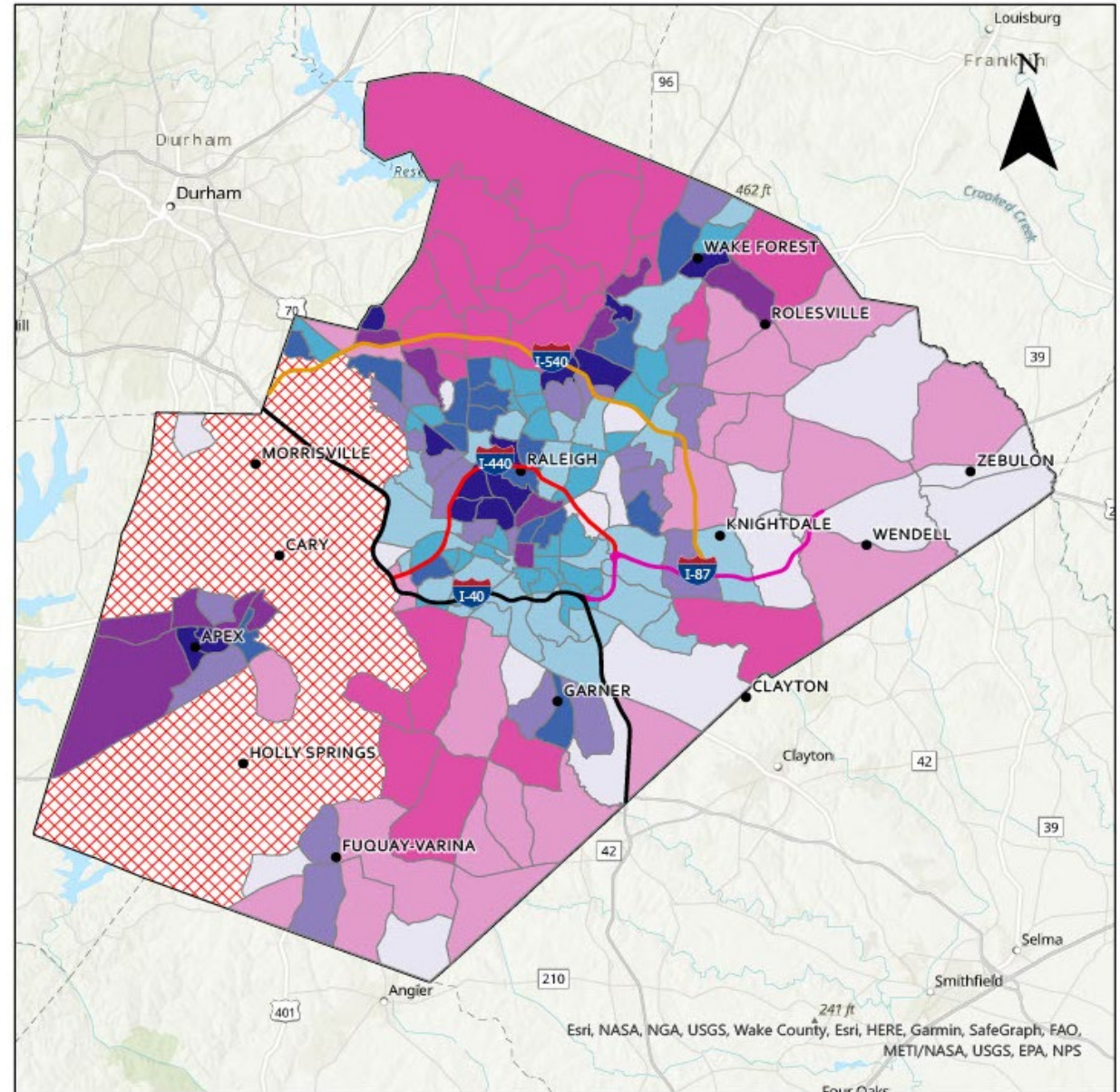
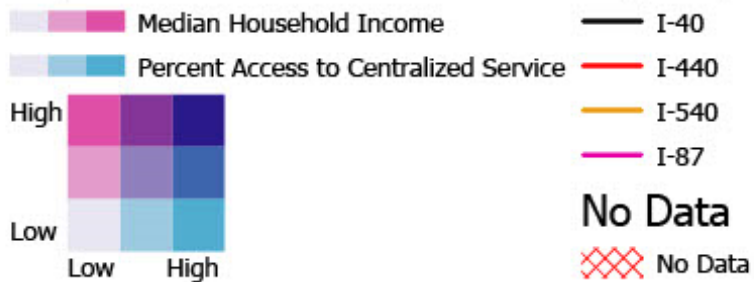


COUNTY RESULTS

Wake

This map uses the same approach as the previous, though the shades of pink now represent median household income.

In this analysis, the lightest shades on the map have the most decentralized users and the lowest incomes. This may indicate that connection costs could be a substantial barrier for users in these areas. Having a plan to address this barrier and being sensitive to the inability to pay these costs is essential to engaging with decentralized users and planning for improved services.



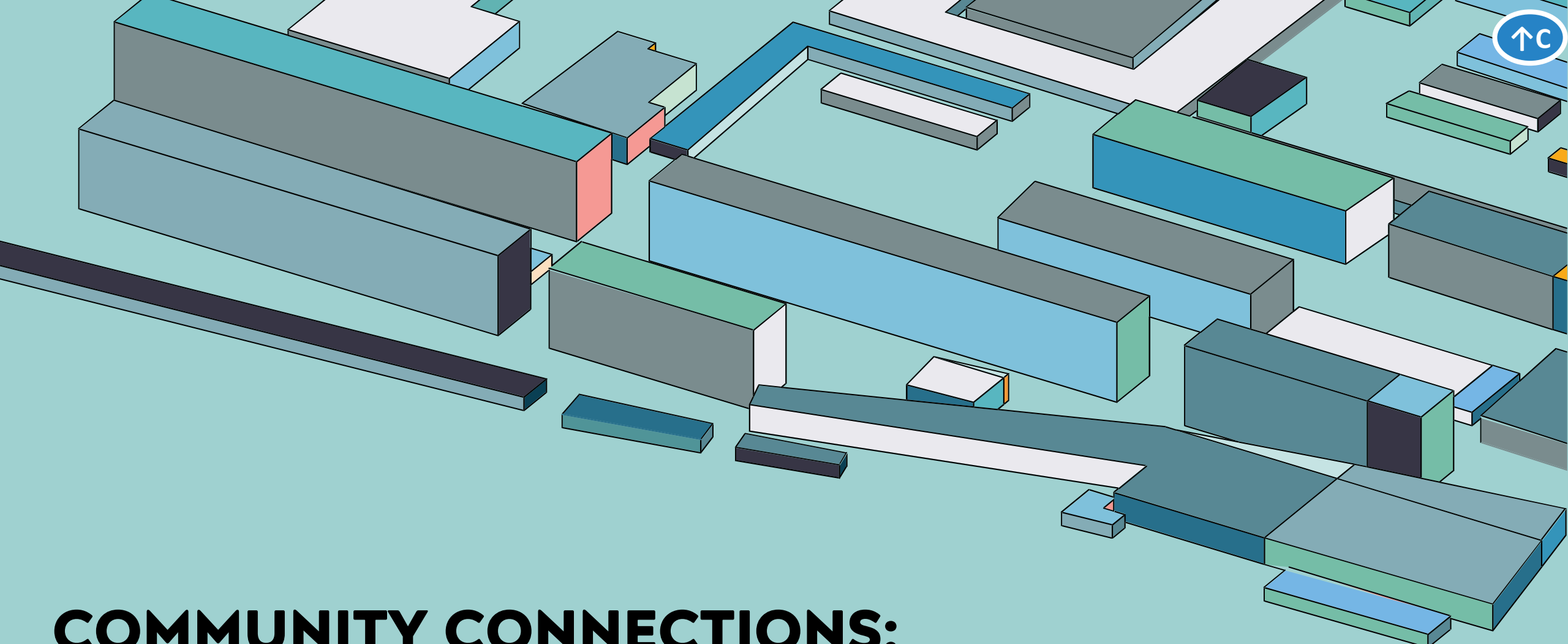
SPATIAL ANALYSIS: LESSONS LEARNED

Best practices

- Use a variety of data when possible (meter location, well contamination, census data, etc.) to accurately and discretely identify decentralized users
- Verify, if possible, using inventory of assets and/or billing records
- “Ground truth” areas of decentralization by proactively engaging community members or local partnering organizations
- In rural/unmetered areas, explore geocoding billing addresses as a proxy for service connections
- Document methods and assumptions

Identifying candidates for connection

- As in this analysis, the location of decentralized users can be compared with demographic information to identify areas that would potentially be appropriate for extended centralized services
- Including detailed asset inventory maps (i.e., location of water lines) in spatial analyses would allow for more productive conversations, as the feasibility and cost of engineering solutions should be well understood before approaching connection as a solution
- Compare outcomes of spatial analysis to criteria of available funding streams
- Create a community engagement plan and prepare how to address barriers to connection, such as the inability to pay connection fees before initiating contact

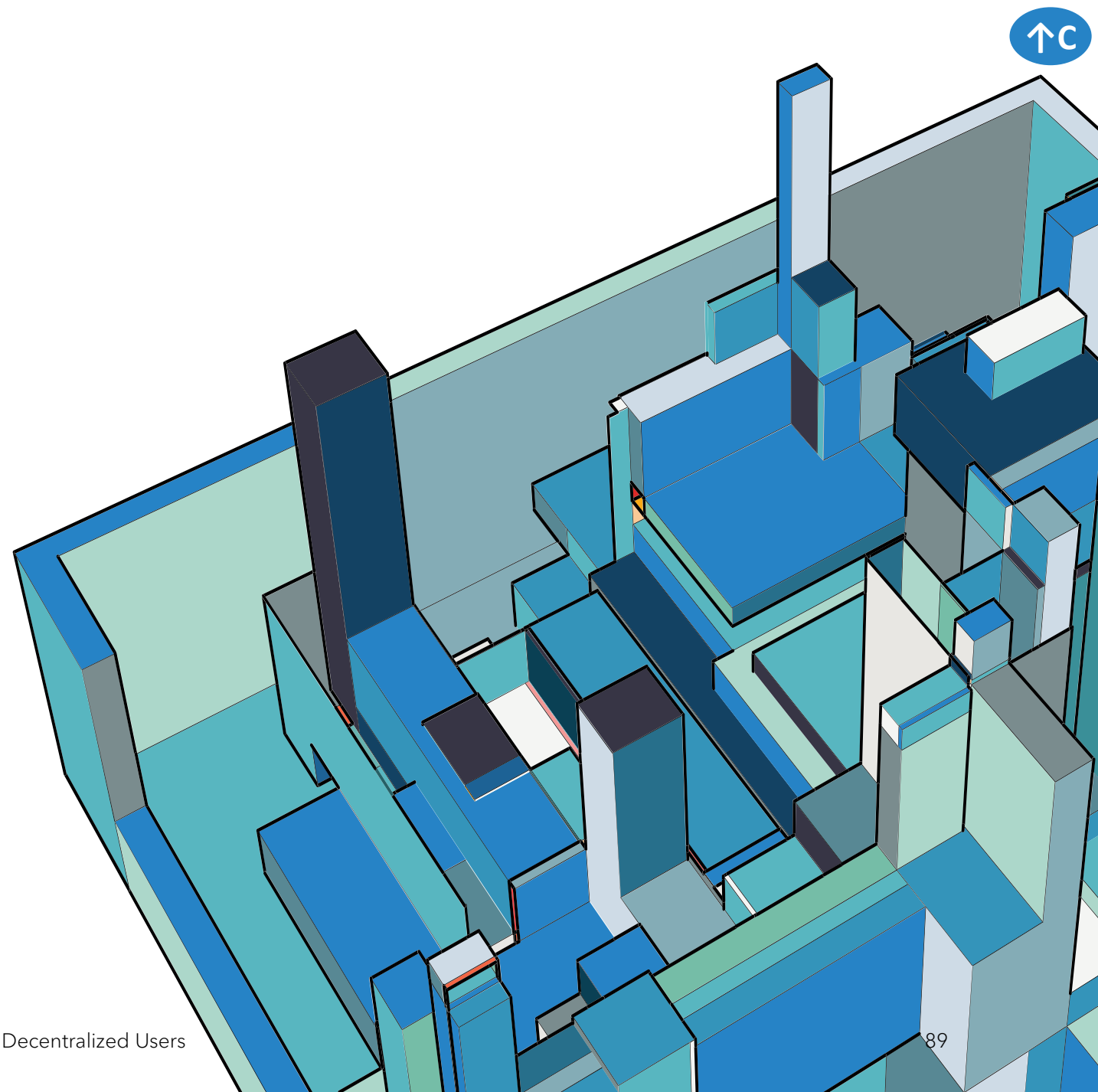


COMMUNITY CONNECTIONS: NAVIGATING PATHS FORWARD FOR DECENTRALIZED USERS IN NORTH CAROLINA

LEARNING FROM COMMUNITIES

Many communities in North Carolina have faced challenges in accessing safe and centralized water and sewer services. Their stories demonstrate how complex and diverse these situations can be, ranging from the extent of race-based municipal exclusion to the severity of health hazards to the depth of collaborative efforts and funding success. Each community has its own “lessons learned” that are invaluable to those moving towards improved services in their area.

These stories are included here as highlights and to show the diversity of problem-solving as well as the wide spectrum of what constitutes success in efforts towards water and sewer services. Some of the information here was collected via interviews, but it is supplemented by articles, websites, and publications. The UNC EFC has included resources to encourage further reading to learn more directly from these expert environmental justice advocates.



SUCCESS FACTORS TO ACHIEVE INCLUSION of DECENTRALIZED USERS

These factors seem to be impactful in the success of increasing water and wastewater access to decentralized users.

Leadership⁹⁹

Persistence and the ability to build collective vision from a leader or a group of leaders.

Social Trust¹⁰⁰

A community's degree of trust or mistrust in governance, often dependent on historical contexts.

Adaptivity⁹⁹

The ability to adapt and change to capitalize on opportunities.

Bridging Agents¹⁰¹

Outside actors that help communities access resources either directly or through connections.



HOFFMAN, NC

Location

- Richmond County
- Roughly halfway between Pinehurst and Rockingham

Failing sanitation^{102,103}

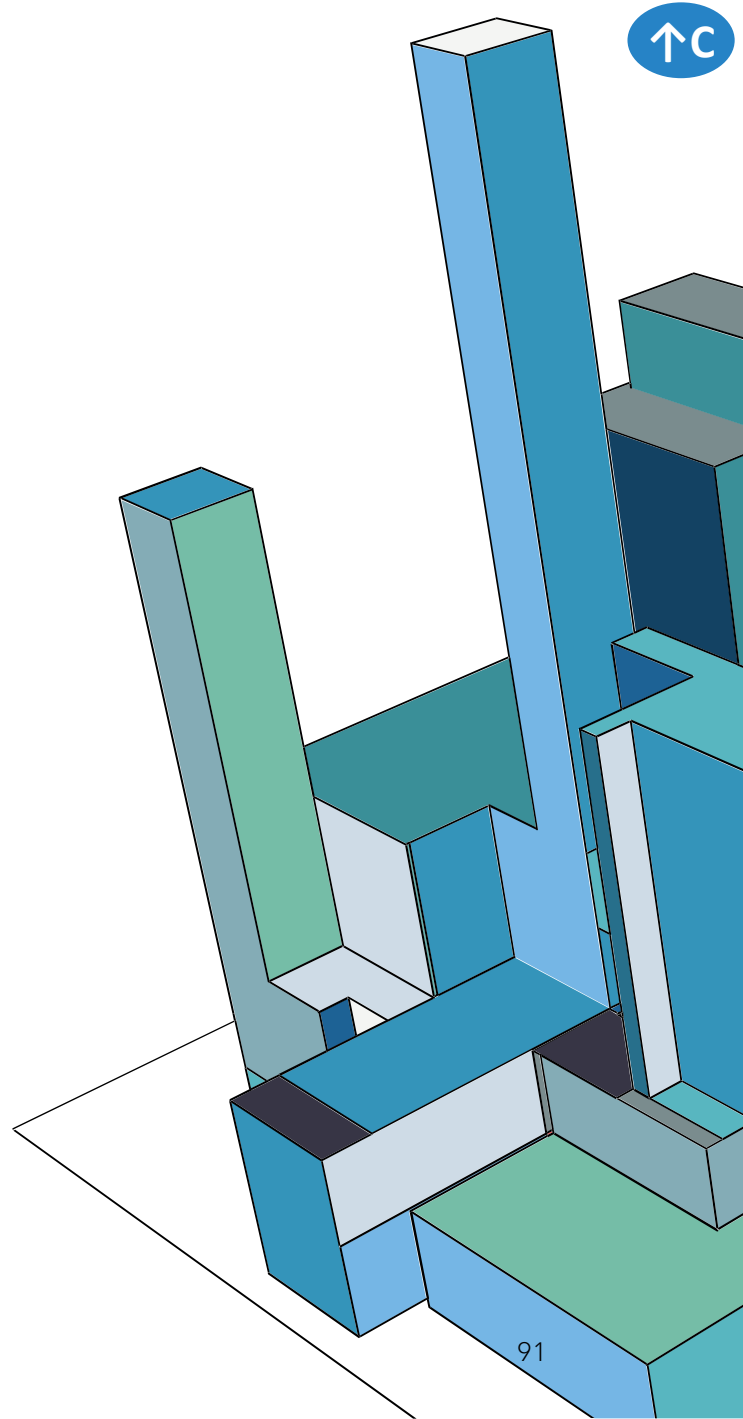
- Failing septic systems and surfacing of untreated wastewater
- Strong odors associated with untreated sewage
- Backups into homes
- Some residents reported having to abandon their homes or resort to straight piping, portable toilets, or latrines

Demographics⁹⁶

- Population: 692
- 65% of population is African-American
- Poverty rate of 35% (2020)

Sewer planning

- Efforts to build a sewer date to the 1990s
- A 2018 report by the N.C. Department of Commerce’s Main Street and Rural Planning Team identified lack of sewer infrastructure as the first item on the “Weaknesses” list in its SWOT analysis.¹⁰⁴
- Sewer system proposal is estimated to cost \$17 million (adjusting for inflation)
- Hoffman is set to receive >\$4 million in funding to begin connecting to centralized services (~50 lower income households)



HOFFMAN, NC

ADVOCATE: HOFFMAN MAYOR, TOMMY HART¹⁰⁵



“Well, I’m not really that hot into being a politician, but I do all I can to help the poor and those you might say have been ‘kicked to the curb,’ I don’t look at it as much as being a politician but more that I serve in my community and try to do the best I can.”

Leadership

“When we got into some of the technical areas, he [the engineer] was there to pick up the slack for us.”

Bridging Agents

“It’s very important to explain to people where we’re going and what we’re trying to do to help them.”

Social Trust

“When everything came through in Raleigh, that’s when we started making a move on it. So, when the doors were open, we went right on in.”

Adaptivity

ROGERS ROAD/EUBANKS¹⁰⁶⁻¹⁰⁸

Location

- Orange County
- In between Carrboro and Chapel Hill as an extra-territorial jurisdiction
- Adjacent to the Orange County Regional Landfill (1972-2013), which resulted in water and air contamination

Competing community concerns

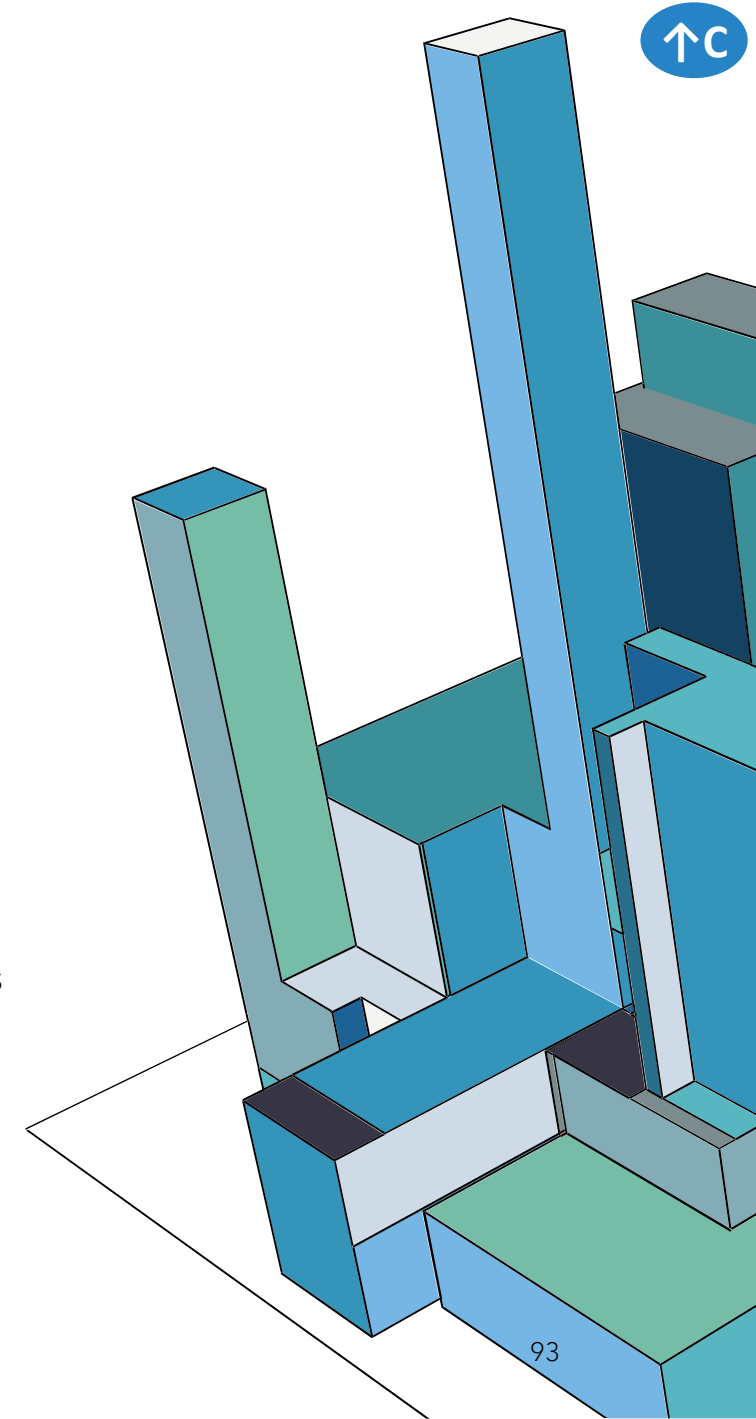
- Gentrification and land loss
- Rising cost of living - property taxes
- Aging population
- Disconnected from community assets (e.g., transportation)
- Failing septic systems

Demographics

- Population: 85 households
- Historically African-American population
- Legacy of broken promises to community and government mistrust

Interlocal agreement

- Agreement with local water/sewer authority
- In 2019/2020, covered 100% of the cost of private service lateral connections to the public sewer system for 65 heritage residences (built before 1980) in the community with household income levels at or below 80% of the area median income.
- 2021/2022, covered 50% of the cost for remaining qualifying households.
- Sewer connections and support still offered in 2023



ROGERS ROAD/EUBANKS

ADVOCATE: REV. ROBERT CAMPBELL¹⁰⁹



“Chapel Hill and Carrboro were running out of places to build a landfill . . . They made promises about the amenities that would be provided if they could place it here that never happened.”

Social Trust

“When the pandemic came, a lot of our people didn’t have access to Zoom, so we couldn’t stay up on all the different meetings.”

Barrier: Technology

“Changing the attitude of morality is the key issue. If you provide clean water, sanitation services, and help people stay in low-income housing then that is a benefit to everybody.”

Barrier: Values

Read more about the [Rogers Road/Eubanks Community](#)

WEST END REVITALIZATION ASSOCIATION (WERA)^{110,111}



Location

- Alamance/Orange County
- Within ETJ of the city of Mebane

Environmental injustices

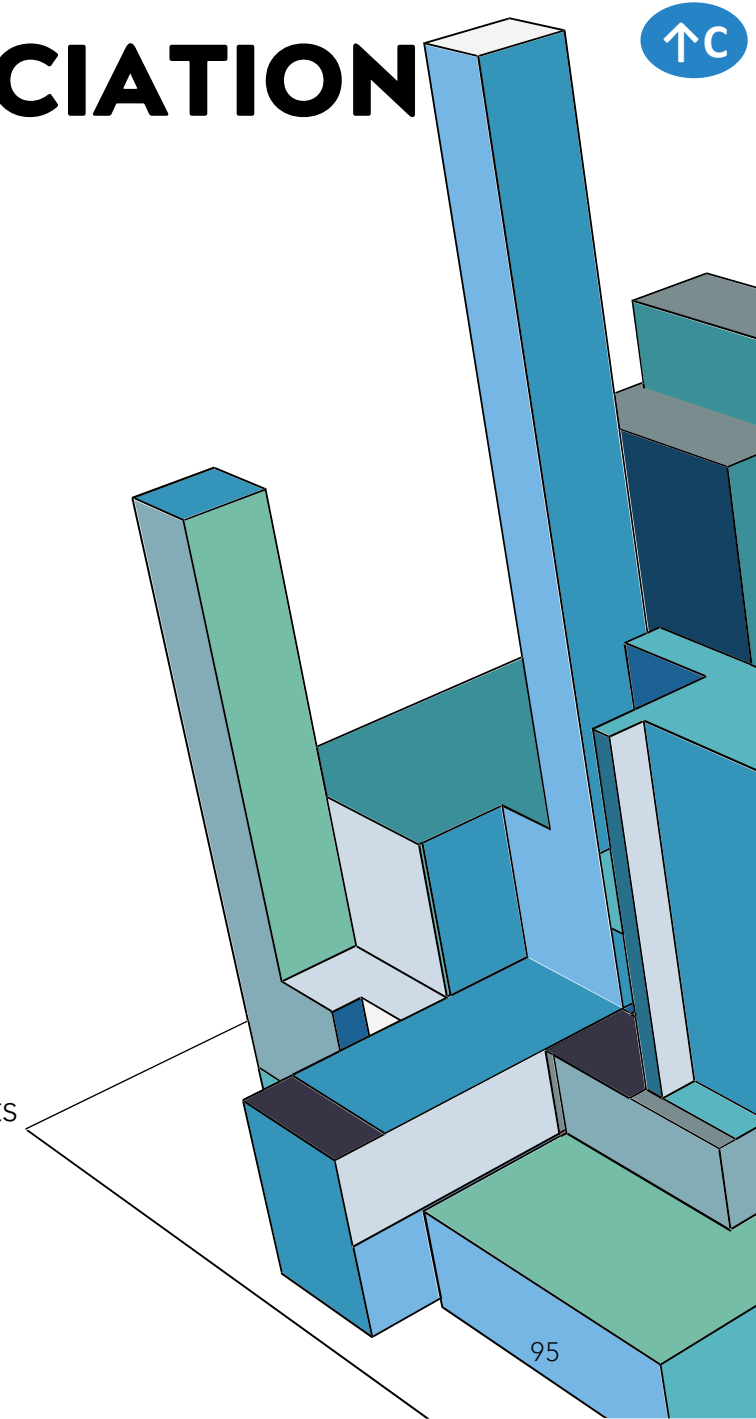
- A highway bypass was planned to go directly through several neighborhoods with no local stakeholder input (1994)
- Septic systems failing, introducing bacterial contamination to well water
- Limited or shoddy access to city water and sewer, though some residents were in close proximity to the treatment plant
- Connection fees posed a major barrier
- The city has selectively annexed white and wealthy areas while ignoring long-term ETJ neighborhoods of color; and rejected funding to connect households because of a planned highway bypass
- Mebane has had a historically dismissive and hostile relationship with WERA

Demographics

- Historic Black & African-American community; some Indigenous and Latinx residents
- Many low-income residents

Actions & advocacy

- In 1999, WERA filed a civil rights complaint with the Department of Justice and the EPA as they lacked basic amenities and services, and as highway bypass had a disproportionate impact on a minority population (Title VI of Civil Rights Act).
- Developed and used “community-owned and managed research” (COMR) to increase participation in advocacy and research, and to share best practices
- CDBG funds leveraged to pave dirt streets and install sewer lines for 1/5 of homeowners
- Activism to improve services is ongoing



WEST END REVITALIZATION ASSOCIATION

OMEGA WILSON, WERA COFOUNDER

INVITED COMMENTARY, NC MEDICAL JOURNAL 2011¹²

"...educate lawmakers, public health professional, and researchers on the legal obligations to support federal environmental policies..."

Social Trust

"It is time to form collaborative problem-solving partnerships that move advocacy to activism and that translate common knowledge about health disparities into effective strategies, to eliminate hazards with measurable outcomes."

Bridging Agents

"WERA civil rights complaints, data collection efforts and collaborative problem-solving partnerships helped leverage millions of dollars in block grants and municipal matching funds for the first-time installation of sewer services..."

Leadership

Read more about [WERA](#)



IVANHOE, NC¹¹³

Location

- Southern Sampson County
- Total county population: 59,036
- County water system serves 6,033 customers

Challenges to centralization

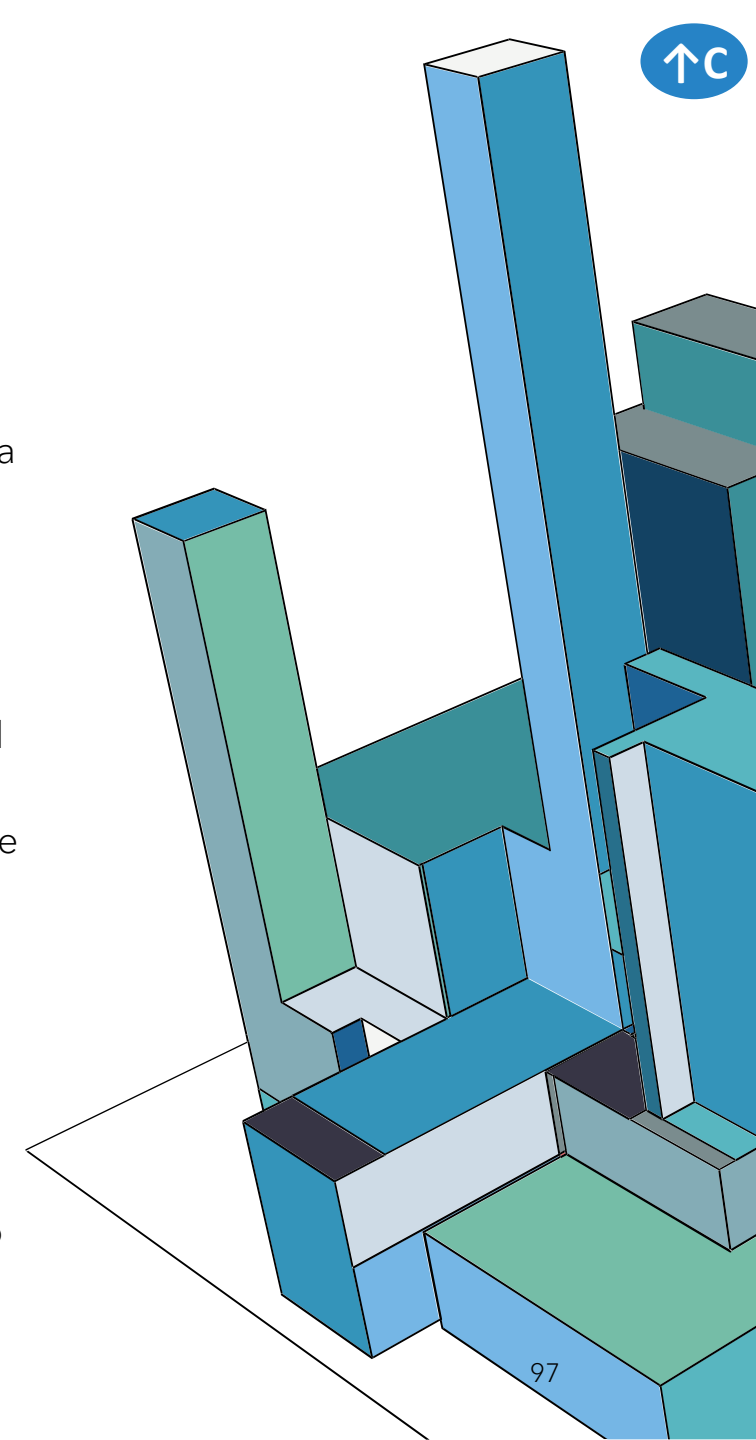
- Long history of underinvestment in the county
- Erosion of trust due to delayed infrastructure projects (e.g., emergency services road) in the past
- Discolored and smelly water staining bathtubs and clothes in wash
- Concern with ability to pay monthly bill

Demographics

- Predominantly Black population
- Low-income and/or fixed-income

Receipt of DEQ Funding

- Community leader Mr. Gilliam learned of funding opportunities in a webinar conducted by NCDEQ, the North Carolina Black Alliance, the Environmental Justice Community Action Network and NC Conservation Network
- Mr. Gilliam connected with the Department of Water infrastructure directly to discuss Ivanhoe's needs as well as application materials
- Ivanhoe residents organized to encourage the county to apply for state funding via multiple county commissioner meetings
- \$13.2 million in grant funds received in the 2022 to connect 350 households in Ivanhoe to the Sampson County water system via 40 miles of new water lines
- Connection fees to the system are covered by the grant funds (i.e., low to no cost to users)



IVANHOE, NC

COMMENTS FROM THE SAMPSON INDEPENDENT 114

“Face-to-face interaction will be needed to get the water flowing into each and every eligible home...No one should be left out because they do not have internet or computer access. True leadership means beating your feet on the street...”

Ivanhoe community leader, Mr. Ed Gillam

Barrier: Technology

“We all worked together to get this done, and we are so grateful that it happened. After 20 years of our goal being to get water in Ivanhoe, we finally made it. And we are so grateful.”

County Commissioner Lethia Lee

Leadership



“DEQ created the funding opportunity, but it was the residents who saw how this grant could change their lives and organized to petition the county to apply”

NCDEQ Secretary Elizabeth Biser

Adaptivity

EXAMPLE: WALNUT TREE, NC¹¹⁵

Location

- Stokes County
- Outside Walnut Cove, NC, a predominantly white town
- Exposed to heavy coal ash pollution from nearby Duke Energy power plant

Historic exclusion

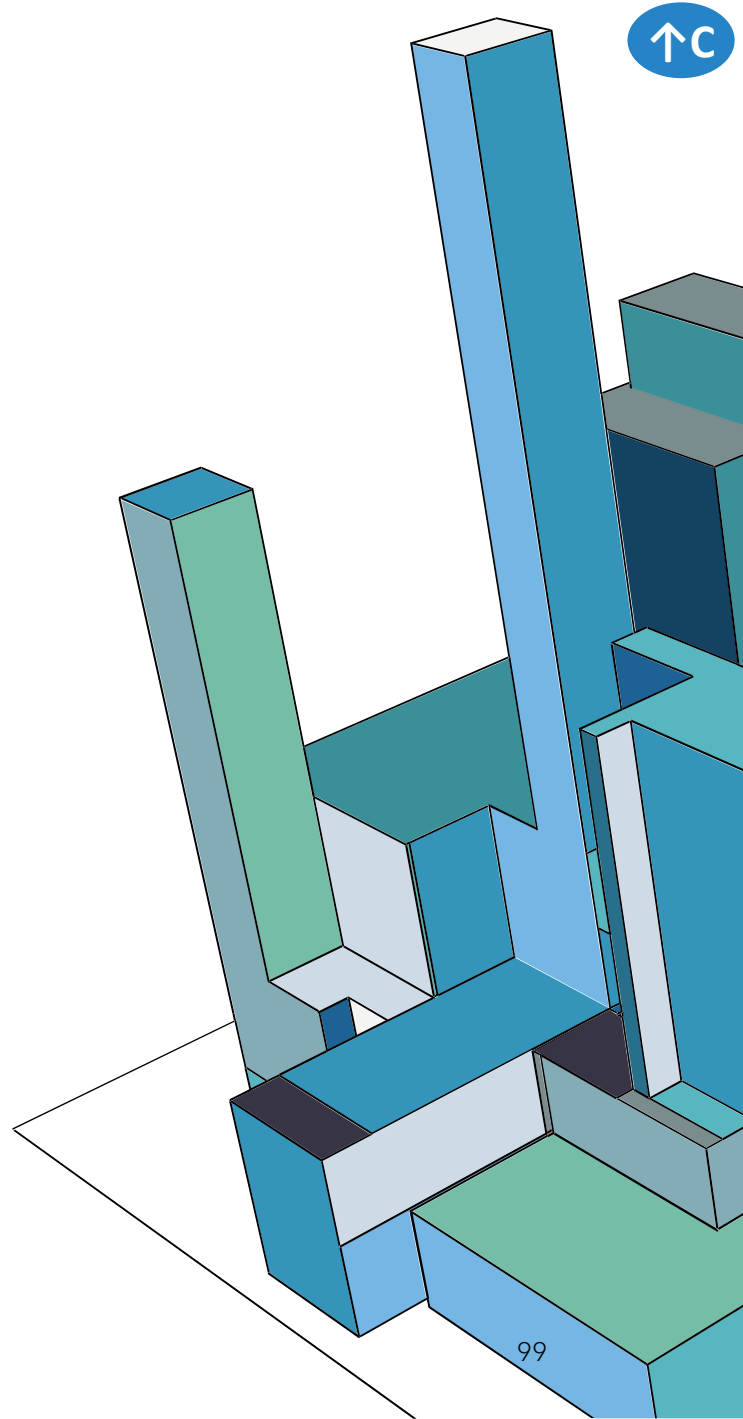
- Homes were originally bought in the early 1970s with expectation of annexation and city services
- Water was smelly and discolored, expensive; Walnut Tree was connected to centralized service but experienced poor water quality compared to Walnut Cove residents
- Interested in annexation to improve water quality and political power as the neighborhood had zero representation in local government
- Petitioned 4 times for annexation, most recently in 2017; all were rejected by town commissioners

Demographics

- Population: 73 households
- Predominantly Black & African-American population

Organizing the neighborhood

- Drilling for natural gas in Walnut Tree (2015) reenergized awareness and advocacy
- After 2017 annexation rejection, citizens and community association partnered with UNC-CH Center for Civil Rights and Raleigh law firm to file civil suit against Walnut Cove
- Walnut Tree residents organized voters in Walnut Cove town limits to support write-in candidates for council and mayor
- New leadership unanimously voted to annex Walnut Tree



EXAMPLE: WALNUT TREE, NC

COMMUNITY ADVOCATES, APPALACHIAN VOICES¹¹⁵

“Back then, we wanted to be annexed so we could have clean water and have the service that was actually promised to us.”

Ada Linster, Walnut Tree community leader

Social Trust

“Even though we were not in the town limits, we participated in the election system that year by going out and bringing people into the polls to vote...”

Ada Linster, Walnut Tree community leader

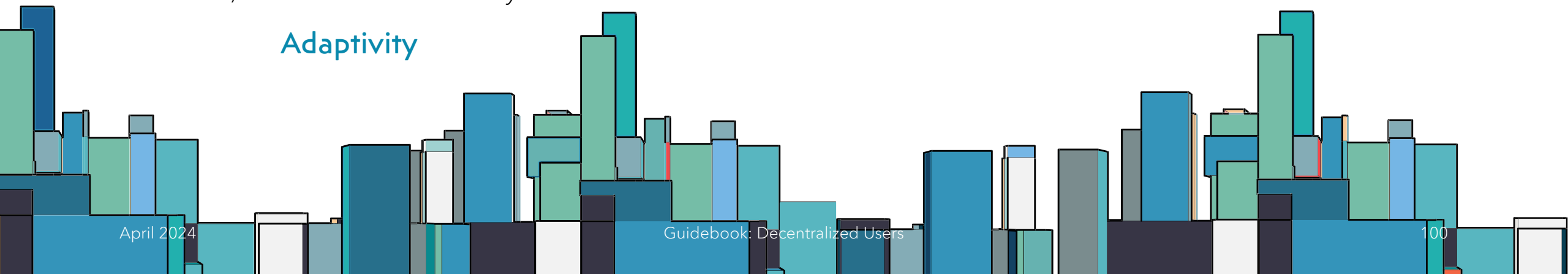
Adaptivity

“Come together. When you come together, and you fight the fight together, and you are determined not to lose, you will win. There will be setbacks, but don’t ever let a setback stop you. Know that as long as you are fighting that fight, eventually you will win.”

David Hairston,

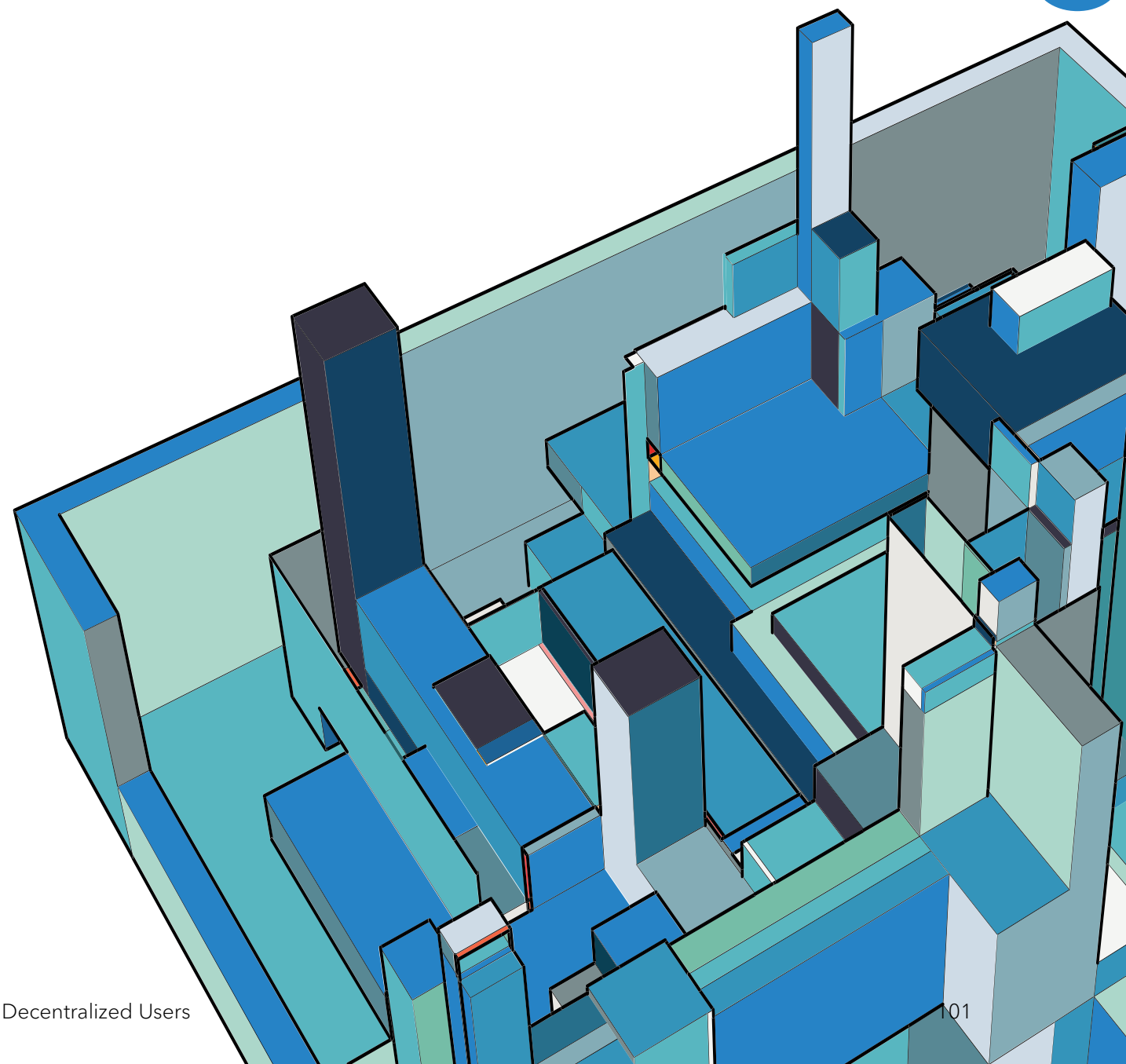
Walnut Tree Community Association president

Leadership



SUCCESSFULLY STAYING DECENTRALIZED

Sometimes the best and most cost-effective way to provide affordable and safe water and wastewater management is to focus on improving decentralized systems. This method may be beneficial in areas where it is difficult or costly to extend service, where there is no existing municipal service, or if the area is outside of municipal bounds. In these situations, municipalities or counties may be able to step in and provide financial support, educational resources, and other effective solutions that can help users find low-cost, safe alternatives to centralized service



EXAMPLE: NAGS HEAD, NC

Location

- Northeastern North Carolina
- Small coastal community
- Popular vacation destination, tourism is major industry

Septic Systems Abound

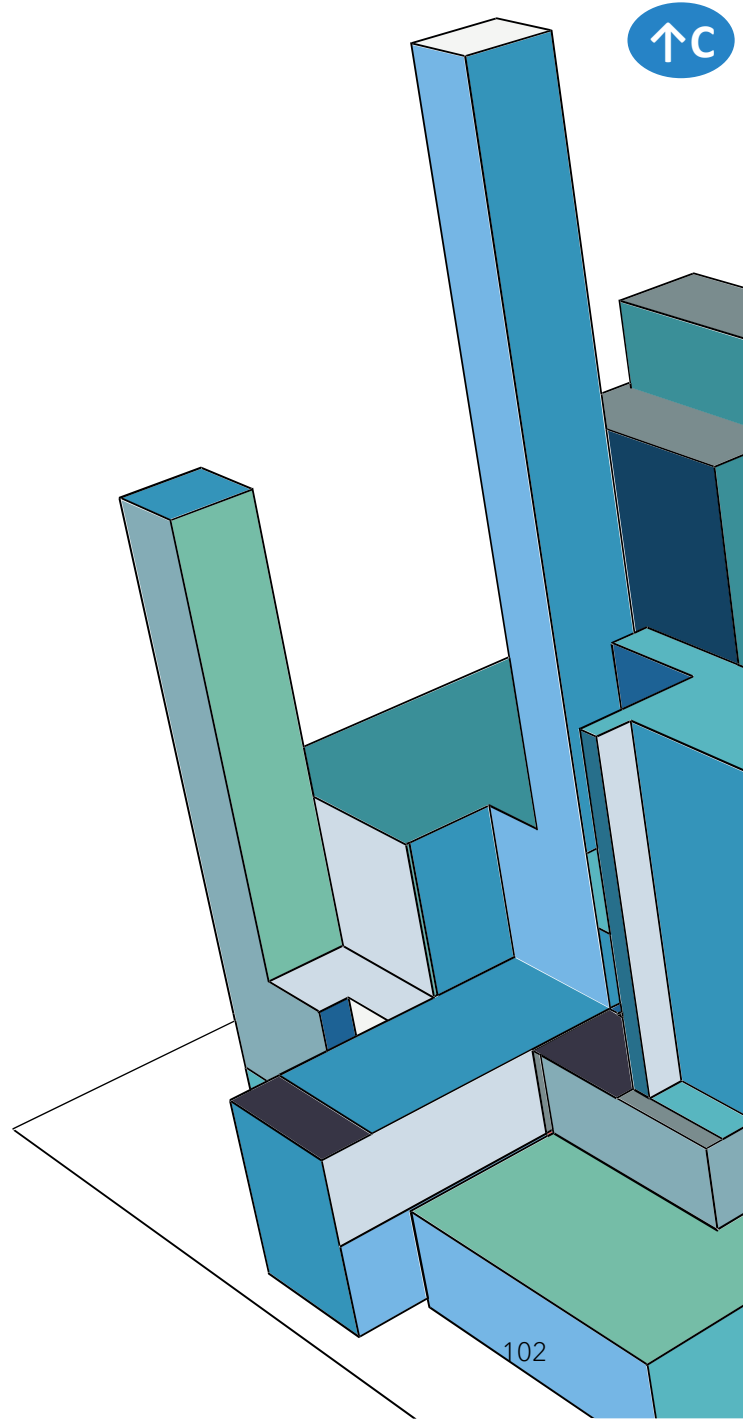
- 80% of the town on septic
- Community saw growth during the pandemic as many second-home owners moved in permanently
- Septic systems require lots of space to function. This keeps the area low-density, which residents and vacationers alike enjoy about the area
- Water quality is top concern due to tourism activity
- Little knowledge of septic function, both in permanent and tourist population
- Limited implementation for septic regulations

Demographics¹¹⁶

- Population: 3,096
- MHI: \$74,526

Septic Relief Program¹¹⁷

- Incentive-based program that provides educational resources and financial incentives for participating
- Resident on septic are eligible for free yearly inspections and a \$150 credit on their water bill every three years when they pump their tanks
- The program also offers low-interest loans for major septic repairs and replacements
- Program administrators offer insight into individual systems and advocate for residents
- Diverse committee monitors and runs the program



EXAMPLE: NAGS HEAD, NC

MUNICIPAL STAFF: CONNOR TWIDDY AND KATE JONES¹¹⁸

“The education is really the biggest part of why this program was created. We have so many people that come down here that are from out of state that are not used to having septic tanks, so it's trying to get them to understand that they have something in their backyard that stores your septic and helps maintain it.”

Barrier: Education

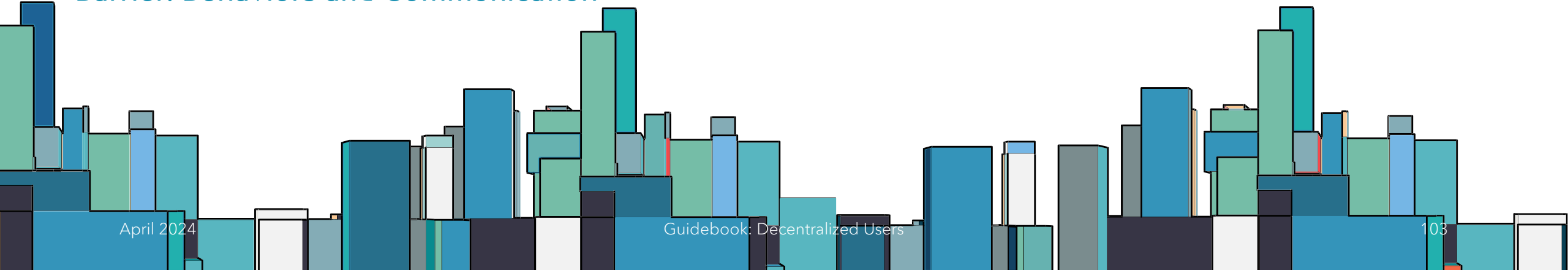
“It's a challenge to reach people who don't live here full time and the visitors. We see an influx of up to 40,000 visitors in the summer, and it's hard to change behaviors sometimes. ”

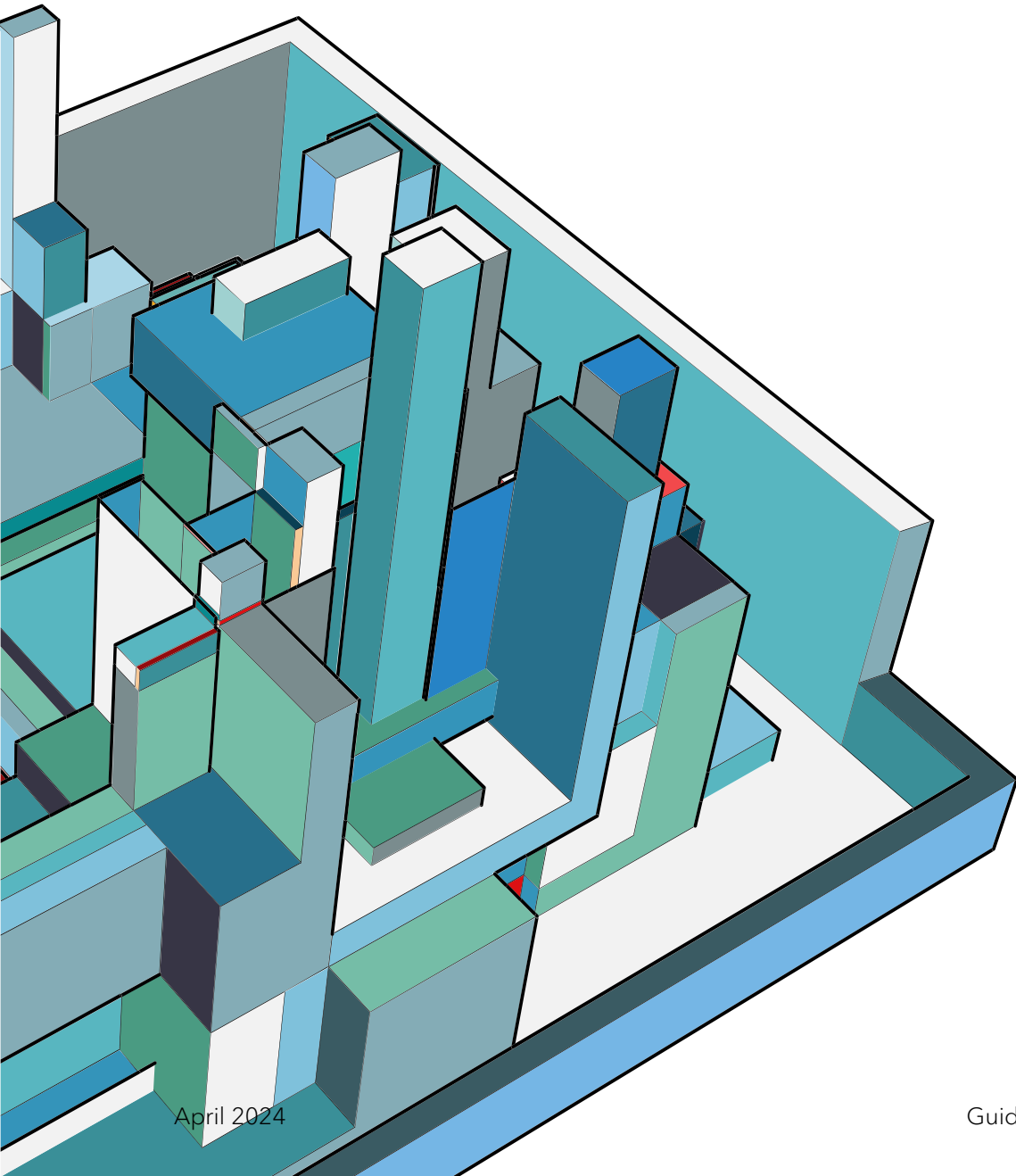
Barrier: Behaviors and Communication

“Once people figure out that they have a septic system and that we offer a free inspection, they are curious. A lot of people think it's nice that we offer them because they can learn what they have, especially the rental houses. They don't know who has been there and what they are flushing down the toilet .”

Education

Read more about the [Septic Health Initiative](#)





APPROACHING THE COMMUNITY

Supporting decentralized users may be intimidating or not feasible financially for local governments and utilities. However, it may still be beneficial to engage with community members to begin to understand their specific challenges on decentralized service and look towards solutions, including applying for supportive funding. The UNC EFC recommends the following practices to increase trust and relationship-building between local governments or utilities and the communities they serve. Additional reading into the examples described in the previous section and connection with community engagement experts are also recommended.

QUICK TIPS FOR COMMUNITY ENGAGEMENT AND OUTREACH

- Approach with options, not promises
- Be transparent in limitations and timelines
- Engage with 3rd party community contacts for facilitation
- Understand and respond to concerns related to health, finances, and more
- Stay curious and respectful
 - Avoid lack of interest or follow through
 - Observe skepticism or lack of trust
 - Hear and internalize community priorities

**Note: to access some funding sources, well contamination must be proved through testing efforts. Some funding streams require specific testing procedures, such as use of an EPA-qualified lab.

Does your drinking water come from a private well?

Adult residents of Orange County are invited to participate in a UNC Chapel Hill study to support access to safe drinking water for communities with private well contamination. After completing this survey, if you live in certain areas of Orange County, you may be selected for a free well test. We will provide 200 well tests. The survey will take less than five minutes to complete.

You may be eligible if you:

- Are 18 years-old or older
- Live in Orange County
- Your drinking water primarily comes from a private well

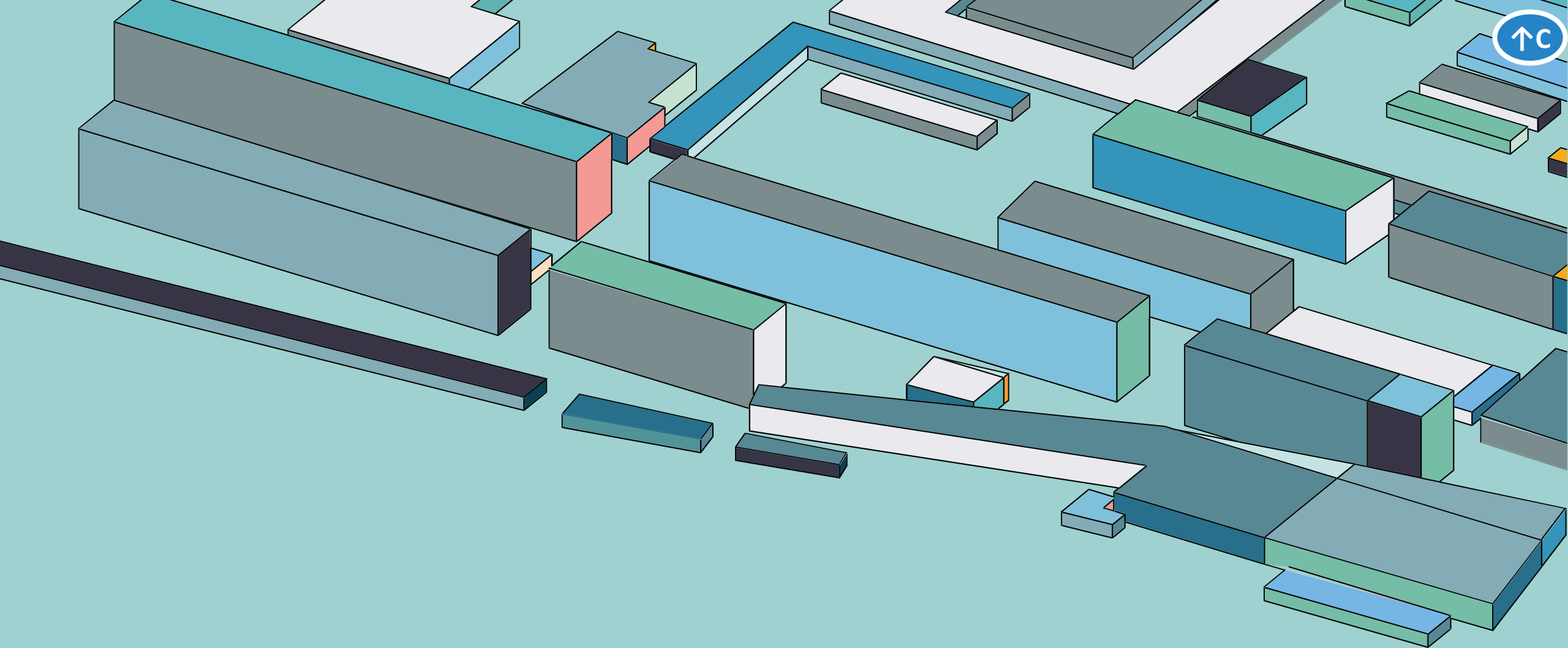
Take the survey:

- Use this QR code: 
- Call: (919) 966-7838
- Link: <https://go.unc.edu/orangewells>

For more information about the survey, contact Andrew George (919) 966-7839 or andrewg@unc.edu. Approved by the UNC Institutional Review Board (IRB) on #####. For more information, contact the UNC Office of Human Research Ethics at 919-966-3113. This study is supported by the Center for Public Engagement with Science (<https://ie.unc.edu/cpes/about/>) funded by the NC Collaboratory (<https://collaboratory.unc.edu/>)



Example outreach flyer from the [Center for Public Engagement with Science](#), University of North Carolina, Chapel Hill.

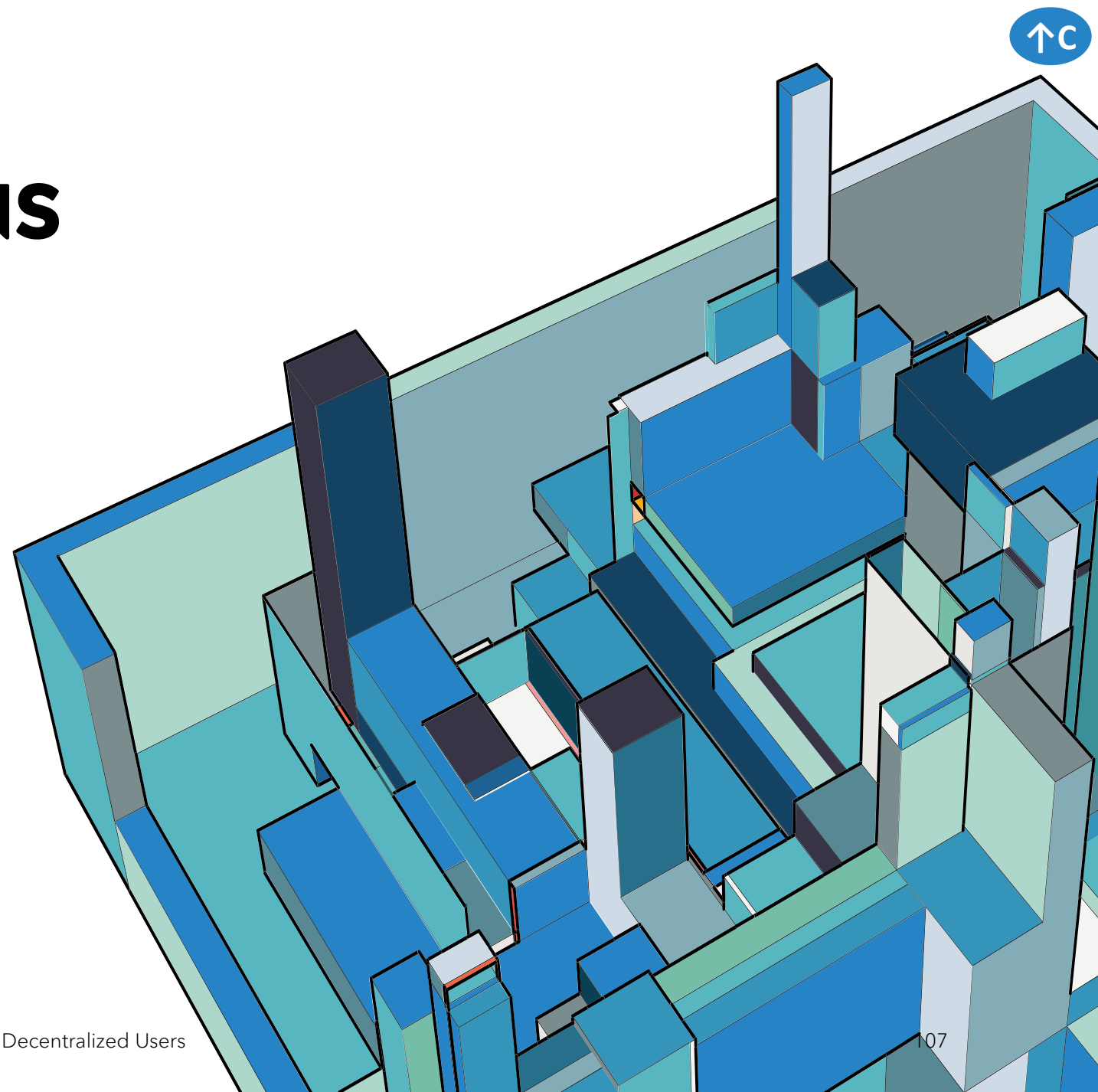


POLICY RECOMMENDATIONS

POLICY RECOMMENDATIONS

Currently, progress towards equitable centralization and sustainable decentralization relies largely on the initiative at the local level. To have movement, then, residents must advocate for themselves (for example, via voluntary annexation), and municipalities must decide to prioritize the support of decentralized users.

As an alternative, utilities and municipalities could work to implement new relationship-building and data-tracking measures. Further, the state of North Carolina can incentivize these measures and proactive management of decentralized users through data creation and novel funding mechanisms.



POLICY RECOMMENDATIONS

Local & County Level

Relationship Building

- Utilities can invest in their relationship with the local health department to be aware of nearby decentralized users and any immediate and severe health risks they face.
- Utilities should consider the value of seeking out connections with local communities and advocacy groups, even if extending services is unaffordable or not an active conversation. Building a working relationship and an understanding of community concerns is the first step towards both entities supporting one another.

Policies and Communications



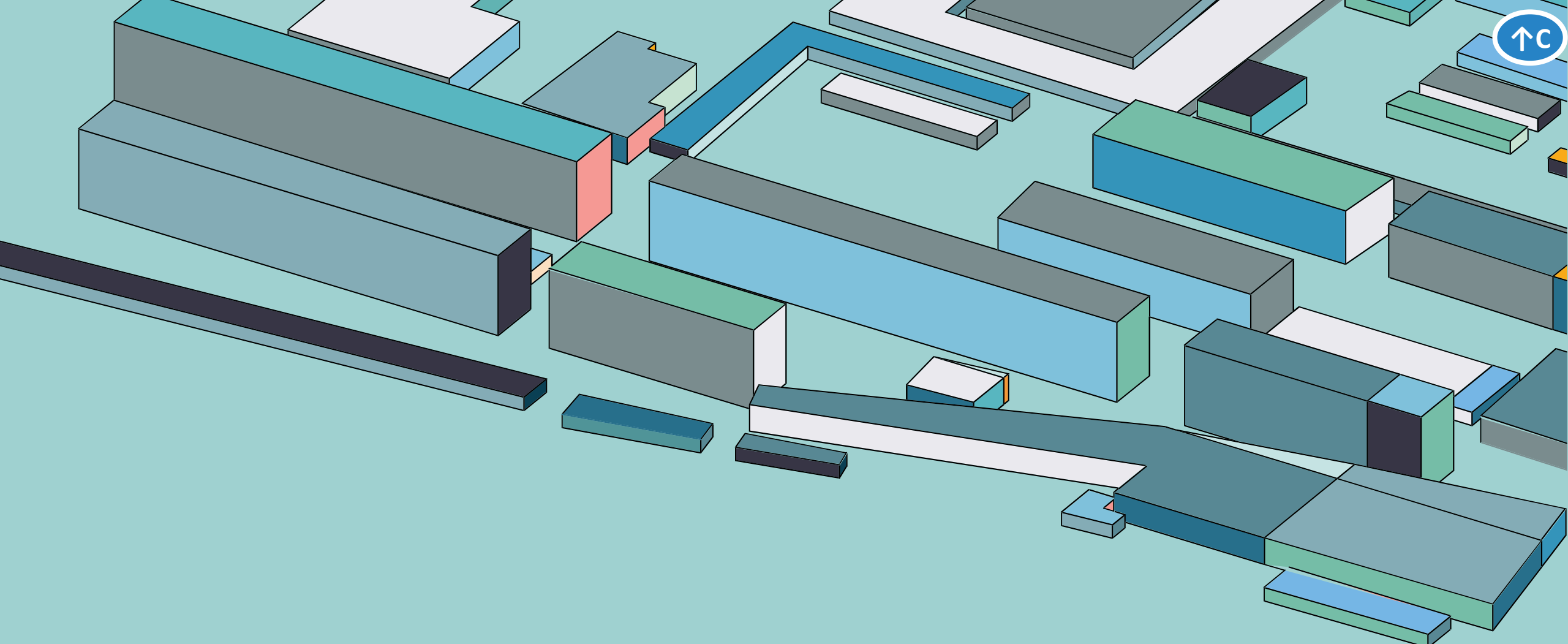
- Utilities should be aware of internal policies for “emergency connections” and increase communications with neighboring utilities to understand the best way to provide services in the event of an emergency.
- Municipalities and counties should consider creating or updating an inventory of decentralized households and providing information and supportive services (i.e., increased well tests, small loans, maintenance reminders) when possible.
- Utilities should consider building trust with local residents and their customer base by being forthcoming about infrastructure limitations, providing clarity about water quality and service rates, and by offering payment plans or other affordability-focused options.

POLICY RECOMMENDATIONS

State Level

Funding & Financing

- The state should consider prioritizing funds toward extending services to decentralized users
- The state may allocate funds for the implementation of a statewide decentralized well and/or septic database
- The state should consider the value of creating a Community Engagement Grant Program for municipalities and other public entities to conduct outreach, well testing, and explore centralization options in partnership with local residents
- The state should consider formalizing support programs for continued decentralized use, including low-interest loans to individuals needing to make repairs or replacements to their systems



RESOURCES

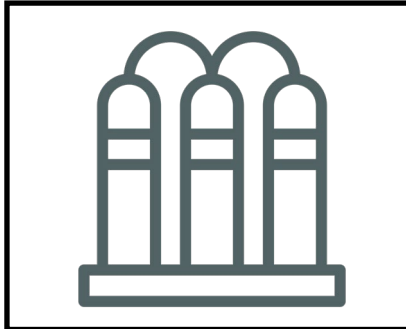
RESOURCES



[State Health Department - Wells](#)
Information regarding potential water contaminants



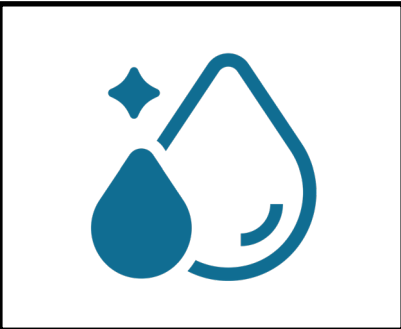
[Environmental Quality Division](#)
Database of wells, potential contaminants



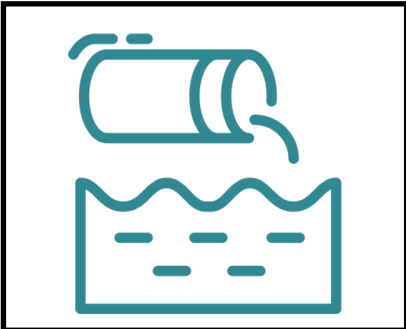
[Department of Water Infrastructure](#)
Funding information for local entities



[Well Care Hotline](#)
Guidance and support for well owners



[State Health Department - Septic](#)
Information and resources about septic for counties and individuals.



[Clean Water for NC](#)
Advocacy and community organizing group



[Environmental Justice Research Clinic](#)
Community-engaged research organization providing technical assistance to individuals.



[Center for Public Engagement with Science](#)
Community-engaged research organization

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