Village of Antioch Water Sustainability Project Plan

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Problem Statement

The Village of Antioch uses a local well system as its source of water for village residents. Over time, concerns have been raised about the well water infrastructure's sustainability and the quality of the village's drinking water. These issues have led the mayor and village staff to investigate what it would take to transition the village's water source to Lake Michigan water. This has been an idea that has been explored in the past, and using past data and research, the village leadership would like an update of options for the community. Due to expected population increases and an aging infrastructure, local officials are concerned about the current water system's sustainability. Past village leadership had considered a transition to Lake Michigan water, but for various reasons, decided to forego executing that transition.

As the population of the village has grown, so have concerns over the long-term viability of the existing system to meet demand. Additionally, EPA standards have intensified, adding to the costs of addressing water quality issues. Recently, one of the village's 10 wells was taken offline due to a failure in the EPA's level of approved iron in the water supply.

Transitioning to Lake Michigan water could be a viable solution but requires a significant capital investment. Plus, there are also regulatory hurdles and the struggle to gain widespread community support. Timing is also a factor, with costs associated with both infrastructure reinvestment and investing in Lake Michigan water infrastructure projected to rise if implementation is delayed.

This capstone research paper assesses the viability of a possible transition to Lake Michigan water, providing an analysis of the current water system, community opinions, financial

implications, and strategic recommendations to ensure long-term water sustainability and quality for the Village of Antioch.[1]

Analysis of the Problem & Alternatives

The Village of Antioch delivers its community water through a system of shallow and deep-water wells to its residents. The system is adequate in size for the current population but is not currently designed to accommodate population growth and address other concerns. According to 2022 Census data, the Antioch population was reported at 14,700 people but a 2025 World Population Review reveals their population has grown to 14,979. Estimates from engineers and consultants believe that Antioch's population was to be approximately 30,594 by the year 2030 when a study was completed in 2015 (Village of Antioch, 2017). According to Interim Village Administrator, Geoff Guttschow, growth population was slowed and stagnant in ten-year period since the HR Green report. The expected population growth, if it does grow over the next 5 years, would place serious stress on the current water system and probably deliver undesirable nutrients to residents from over-pumping the aquifers to meet the daily demands. Current water system pumping of water to meet the demands are at 1.44 million gallons of water per day. The 2030 expectation with future growth anticipation would increase to 2.8 million gallons per day (Applied Technologies, Inc., 2007). Antioch has applied for a Lake Michigan water allotment and was approved for an allotment for 1.157 million gallons per day in 2025 with small incremental increases each year through 2050. Appendix 1 confirms the Lake Michigan water allotment for the Village of Antioch. The allotment for 2030 is 1.2 million gallons per day so the 2.8 million

[1] Our team had interviewed several local government officials and external stakeholders: Antioch Interim Village Administrator Geoffrey Guttschow, contract engineer Tim Hartnett of HR Green, Village of Lake Zurich Director of Public Works, Mike Brown, and CLCJAWA Executive Director William Soucie were interviewed February and March 2025.

gallons per day anticipated amount for 2030 will still require 1.6 million gallons per day of local water storage if the growth in population demand increases in the future (Illinois Department of Natural Resources, 2024). A water system capacity problem indeed.

Antioch also has serious issues with water quality from studies conducted in the past twenty years along with Illinois Department of Public Health requisite testing of wells. A press release from the Village of Antioch categorized their own water quality in the current water system as "poor" back in 2017. A commissioned report in 2015 for the Village of Antioch identifies the water as moderately hard with lead contaminants present along with arsenic contaminants present at almost one-half the alarm level for maximum concentration (HR Green, Inc., 2015). Antioch has a water treatment process for radium removal that was installed in 2005 and the test sampling records indicate the process is working with very low, if any, levels of radium detected. Antioch was notified by state officials in 2009 the water system needed additional testing for harmful groundwater contaminants lower than the Illinois Groundwater Standard (Illinois Department of Public Health, 2009).

Additional notifications from the state have also happened over the last twenty years when contaminant alarms near maximum allowable concentrations in the water sampling. Additional testing from these requests did not invoke any modifications or require additional actions. According to a press release from the Village of Antioch in May of 2017, local officials acknowledged significant depletion of the shallow well aquifers is causing serious water supply issues. The demand for water has resulted in over-pumping of several aquifers creating low water levels and poor water quality. As a result, Antioch may need to spend additional millions of dollars on the construction of new shallow and deep wells or find another permanent water source. The

press release further identified Lake Michigan water as the most cost-effective and reliable permanent water supply solution (Village of Antioch, 2017).

Background to the Problem

Analysis of short-term and long-term local well water system

According to the Village of Antioch website, the strategic plan is 5 years out of date. The three-year strategic plan in 2017 (Appendix 2), identifies maintaining infrastructure systems for future demand with strategic initiatives. Those strategic initiatives included developing capital asset strategy for growth, creating community education programs for Lake Michigan water, establishing a water main replacement programs, and developing capital facilities plan. The strategic plan report also identifies the infrastructure deterioration as one of the most challenging issues facing the Village and as the highest priority over the next 3-5 years.

Cost comparison of immediate action versus delayed implementation in Lake Zurich transition to Lake Michigan have moved costs from $50 million initially to $150 million now according to Public Works Director, Mike Brown, from the Village of Lake Zurich. The water project in Lake Zurich began in 2011. Lake Zurich officials report that the village will begin receiving Lake Michigan water in 2028. The time period from beginning to end or seventeen years was due to opposition of the community to support the transition to Lake Michigan water and also the construction improvements necessary to receive the water. The Village of Antioch has similar concerns that Lake Zurich has experienced over the last 20 years. The concerns of shallow well depletion reported back in 2017 put the community on thin ice for how long the Village of Antioch could expect the current water system to support the community. The window of opportunity for

Antioch to transition can't be delayed any longer with these concerns and the length of time it could take to deliver clean, drinkable water to Antioch residents.

With Antioch delaying their decisions to move forward to transition to Lake Michigan water, costs were $20-25 million range back 10 or 20 years ago but have now increased to around $40-50 million. Additional delays in implementation could further creep those costs to $75-100 million range and limit water providers available. The allotment that Central Lake County Joint Action Water Agency (CLC JAWA) was going to deliver to Antioch back in 2017 is now going to Lake Zurich. Antioch's hesitancy to move forward has ultimately eliminated one of four potential providers from consideration. The CLC JAWA is now at capacity and is no longer an option for any municipalities still seeking Lake Michigan water. If Antioch would further delay transition to Lake Michigan water, they may only have one provider for that water service in Waukegan if other communities sign on to Lake County Public Water District. Waukegan Water Plant could then further leverage additional fees since they would become the Village of Antioch's only available provider.

Stakeholder Analysis

The village of Antioch incorporated and unincorporated residents make up the large population of the stakeholders influenced and impacted by Antioch's water supply, service, and resources. Most homes are supported through the village well water system; additionally, local businesses and village departments/organizations also depend on the village water service system. Neighboring villages may also bear burdens or fruit based on the success, developments, and growth of Antioch.

Literature Review

In *With the People an Introduction to an Idea,* David Matthews identifies that the public's dissatisfaction with its governing institutions isn't a short-term problem. Noting that "frustration and anger have turned into sharp bitterness" in the political environment (Matthews, 2020, 3). Additionally, representatives in governing institutions are also demonstrating little confidence in the public. En lieu of this reciprocated distrust an additional barrier outside of financial encumbrance faces infrastructure and project planning developments.

Drinking-water contaminants in groundwater are widespread, simultaneously resources for protecting or treating groundwater sources of drinking water are limited (Eberts, 2014). Water is a vital resource and the source for public consumption should take precedence. America is one of the top five users of water and the average person use over 300 liters a day (Wouters, 2010). Water resources are one of the important natural resources that protect people's livelihood and promote social and economic development (Zhang et al., 2022). For a community to thrive sustainable resources should be established. This enhances a community's ability to achieve growth and development. "Dissatisfaction with service delivery results not only from inadequate provision of services but also the quality provided" (Masiya et al., 2019, 34).

As stated in *Water Insecurity and Conflict Risk*s "Modern society depends on adequate water supplies for agriculture and industry, to generate power, ensure public health, and maintain essential ecosystems. Yet growing populations, soaring demand, unsustainable management practices, and mounting environmental challenges are imposing increasing burdens on the world's critical freshwater resources" (Michael, 2020, 3). Michael also states that the global population is

expected to grow from 7.7 to 9.7 billion in 2050. Though we do not have the direct focus on global population growth we can articulate the population of Antioch will increase and water needs will increase in tandem with population and economic growth (Michael, 2020).

In the most recent Village of Antioch's Strategic Plan (2017-2020) economic development is listed as one of five top priorities. Specifically stated, "Provide strategic, targeted incentives for development and redevelopment toward the goal of expanding the Village's tax base and achieving desired quality of life" (Village of Antioch, 2016, 8). Quality of life and economic development are established goals of the Antioch community. Having a higher quality and more sustainable water system established supports the vision of the village. When it comes to water only 3% of water on the planet is fresh water, most of which is unevenly distributed and subject to great variability which can affect social and economic development (Wouters, 2010). For the Village of Antioch to continue to achieve village goals implementing an alternative water service will not only bolster economic goals but it will modernize the village system and increase sustainability. "Investment in water infrastructure protects public health and quality of life and promotes innovative technologies that help the United States stay competitive. The link between water infrastructure investment and a healthy economy is strong." (Strauss, 2013, 8).

A pertinent question will continuously be based on cost to the public. Gauging willingness to pay for and support these developmental improvements can be assessed with tools such as surveys similar to what was utilized in this project plan data collection. A study conducted by Whittington and colleagues published in Economic Development and Cultural Change found that valuation surveys are feasible methods for estimating individuals' willingness to pay for improved water services. Their research concluded that surveys provided a viable method for willingness to

pay for a wide range of public infrastructure projects and public services (Whittington et al., 1990). Research such as this supports the survey incorporation for relevant data collection for the purpose of this project. Though on our initial survey public participation was limited a study on *Public Support for Participation in Local Development* shows that despite obstacles, awareness of the costs of participation and low levels of trust in government, people want to be involved (Hofer et al., 2024).

In *Drinking Water in the United States: Are We Planning for a Sustainable Future* Derrington advises that "increasing understanding about short-term and long-term human health impacts of declining water quality should be sufficient to provoke public support" (Derrington, 2011, 80). This references quality, sustainability, and water protection. The village has an obligation to the public health, but effective implementation does require public support, by increasing the publics education on the short-term and long-term we can enhance not only public acceptance but support for the water project plan.

Data Collection & Analysis

A community survey was conducted by the Capstone group to gather Antioch area residents' opinions and input on their current satisfaction with their water system. The survey data was analyzed to identify key trends. Results are broken out by residents who live in the 60002 zip code (Antioch) and village stakeholders that do not reside in the 60002 zip code. This is inclusive of village employees and business operators.

The survey achieved a less-than-desired response rate. The Capstone group attributes a significant reason for the poor response rate to the local election that took place during the two-

week response period in addition to the limited timeframe that could be allotted for survey distribution. The survey gathered input from residents of Antioch and the surrounding area stakeholders regarding the current well water system and the potential transition to Lake Michigan water. With 76 total responses, primarily from long-term residents of the incorporated Village of Antioch, the survey was still able to show meaningful insights into public perspective surrounding water quality, sustainability, and infrastructure investment.

Results are displayed for residents living specifically in the Antioch 60002 zip code and coalesced with all stakeholder respondents. The survey had a total of 72 respondents, primarily residents of incorporated areas, with the largest demographic groups aged 46-55 (39%) and over 55 (31%). The survey also saw a substantial proportion having household incomes above $150,000 (43%). Survey responses were solicited across the northwestern Lake County area, with most respondents living in the Village of Antioch. Data was collected from residents and non-residents to compare trends. Responses were generally consistent across demographics, although residents from Antioch specifically showed slightly higher levels of concern about drinking water safety (40%) compared to the general respondent pool (37%).

The results reveal strong concern about the quality and sustainability of Antioch's well water system. Residents rated water taste, odor, and color with "average" scores. Nearly 40% of respondents expressed concern about drinking water safety, and only half currently drink their own tap water. Positively, most residents, nearly three-quarters, reported overall satisfaction with water service, the dissatisfaction stems largely from water quality and limited communication from their water provider. Only 12% of respondents expressed satisfaction.

Despite the overall satisfaction with the current water service, there is strong community interest in upgrading the system. A total of 67% of respondents support water service rate increases to fund improvements, with most willing to pay an additional $1–$20 per month. A vast majority of respondents, 83%, say it is either "extremely" or "very" important to have safe, reliable drinking water, and 79% support infrastructure investment to promote community growth.

An area that is important for any movement toward Lake Michigan water would be public education and outreach. Almost one-third of respondents say they are dissatisfied with their current water provider's communication. Community engagement will be critical in building trust, securing support, and ensuring a transparent decision-making process as the Village considers this significant infrastructure upgrade. The full community survey with the results is available in Appendix 3 (Antioch Water Service Survey).

Impacts

Political Impacts

There will likely be several political impacts in Antioch related to the exploring and transitioning to Lake Michigan water. At the local level in Antioch, the transition will require active involvement and leadership from the Village Board, the Mayor's office, and other stakeholders. These village leaders will need to lead community conversations surrounding water supply, funding, and community support. Based on community feedback, there will need to be significant education on the value of making the massive investment into the water infrastructure. There is a perception among community residents that taxes are already too high, and some feel there is not a need for this expense.

One of the primary political challenges will be related to the funding needed for this project. Having a well-defined plan to fund the infrastructure that will be needed to connect to Lake Michigan water, and a description of the long-term impacts of the project on residents' water bills will need to be a clear part of the community education initiative. The Village will need to address the concerns of residents who may be opposed to the transition to Lake Michigan water, requiring effective leadership and communication from local politicians. Residents of the Antioch community have only recently begun to embrace referendums that ask for more spending. A November 2020 referendum by the Antioch Library District asking to borrow roughly $9.6 million showed how split the community is on tax increases, passing by only eight votes. A 2022 referendum by the Antioch First Fire Protection District passed by less than 300 votes, after failing several times over the previous 15 years.

Working toward Lake Michigan water for the community will also raise important policy discussions about water pricing, sustainability, and equity. The water charges for Antioch residents could become a contentious issue, with the likelihood of higher water rates for residents. Local officials will need to find a way to balance the financial costs of the transition with the need to maintain affordable access to clean water. A strong education campaign will help build a stronger case for higher rates.

Societal Impacts

The impact of transitioning to Lake Michigan water will affect not only the current residents of Antioch but also generations of future residents. One of the most immediate impacts would be the affordability of water, especially for low-income households. While the transition

would deliver higher-quality water, the costs associated with the implementation of new infrastructure would likely lead to higher water rates for residents. It would be important for the Village to take into consideration the need for a sustainable water supply with the potential financial burden on residents. The community already feels "overtaxed".

Additionally, residents will need to adjust to changes in water quality and access. The move to Lake Michigan water will provide a more consistent and cleaner water supply, reducing concerns related to taste, odor, and contamination. However, there will likely be initial resistance to change, as some residents may prefer the local well water system they are familiar with. Community outreach and education will be an important part of alleviating concerns of the new water source.

Other positive impacts would be higher home values and stronger economic development activity. Poor drinking water can decrease a home's value by at least 3-6%, possibly more (Kaur & Janmaat, 2023). Investing in the infrastructure of the Antioch drinking water supply could lead to more residential, commercial, and industrial development, which would also drive higher property values, which would have an overall positive impact on the village's property tax revenue.

Environmental Impact

The Village of Antioch decision on water sustainability and quality is important due to the impact from population increases and water consumption in the community population. Water scarcity and its consequences should also be considered as a reason to implement a strategy that addresses a short-term and more importantly a long-term solutions. The consideration to expand

their current water system or transition to Lake Michigan water should help mitigate the environmental impact to the Antioch community.

Economic Impact

The economic impact of improving the water sustainability and quality in the Village of Antioch are significant capital costs at $50 million to the local government and its residents. The improvements achieved would include improving public health, elimination of undesirable minerals in drinking water, increased quality of life, increased desirability in business growth and residential growth while avoiding water scarcity. The impact of these improvements would be beneficial immediately and positively in the future.

Why should the waters of Lake Michigan be brought to Antioch?

Clean drinking water is one of our most precious natural resources. Many countries in the world have trouble finding clean and sustainable drinking water for their people. The constraints on water quantity and water quality are becoming increasingly tight, as key regions of the world experience exponential rates of population growth, expanding consumption patterns, deteriorating water sources, and the uncertain impacts of climate change. These global challenges are causing some countries to experience water stress (Habiba, Abedin and Shaw, 2014). Water shortage occurs before water stress. The two ways to avoid water shortage are to (1) increase available water or (2) limit population (Kummu, 2016).

The Great Lakes are the largest freshwater supply of clean drinking water than any other place on Earth and represent one-fifth of the world's freshwater in surface water supply. Lake Michigan water is provided to Chicago, Milwaukee, and more than 150 Illinois communities.

More than 10 million people in Illinois rely on Lake Michigan for their drinking water. What makes Lake Michigan water so special, and why does Antioch need Lake Michigan water? Lake Michigan would provide water sustainability with the increased population and the quality of water for the community now and in the future.

Without Lake Michigan water, sustainability would be very difficult for the Village of Antioch to maintain its own water system. The waters of the Great Lakes continue to be a source of high-quality drinking water (Environmental Protection Agency, 2022). The treatment for water from Lake Michigan needs disinfection and minimal treatment to drink and use daily for residents and businesses. The water plants disinfection process brings water from Lake Michigan into the plant and passes it through an ozone, ultraviolet light and filtration process that disinfects the water then preparing it to be shipped to communities. Water treatments from underground water such as those from aquifers need specific treatments for minerals present which makes the water treatment process more expensive.

Alternatives Considered

Option #1 Village of Antioch decides to wait to consider all its options

The Village of Antioch could consider waiting to see if their water system continues to provide adequate water for their community and hope the increased but slowed population will be sufficient in the future. The option of waiting to see if other options become available or if interstate agreements could become an option.

If options # 2 or 3 are implemented, the current water system in Antioch would need necessary upgrades to the current water infrastructure if the decision to transition to Lake Michigan

water or implementation of their own water treatment plant options. An engineering firm, Smith Engineering, identified a list of improvements that should have been made in 2007 but have only completed some of the items on this necessary upgrade list. The list of improvements includes adding water mains to Deep Lake Road and Route 173, adding pressure valves, demolishing a booster station and a storage tank, adding a 500,000 gallon elevated storage tank, and replacing various water mains to improve flow. The total cost for these improvements in 2015 was $5.44 million. The total cost of those improvements has gone up in the ten years since that proposal was determined by a conservative inflationary rate of 2% per year to a total cost now of $7 million. The items completed over the last 10 years include the improvement of watermains on Route 173, demolish tank #1, installing 5 new pressure relief valves, and replacing various water mains within the system to boost flow. The improvements of the water system completed to date are estimated to be $3 million so the remaining improvements based on the study schedule is approximately **$4 million**. The work needed to be completed still includes the installation of the elevated storage tank, water main replacement on Deep Lake Road and State Line Road, replacement water mains for further flow improvement.

Option #2 Village of Antioch decides to transition to Lake Michigan water with one of four providers

Waukegan Water Plant (Proposal #1)

The options for the Village of Antioch for water outside of Antioch to be considered include Lake Michigan water from several providers. The first proposal to be considered is the water provided from the Waukegan Water Plant (WWP). Waukegan is the only city in Lake County that

the plant delivers water from the Great Lake. This option would be to lay 50,000 feet of 18" water mains or 9.5 miles of pipe from Waukegan's water system at Yorkhouse Road and Delaney Road. The route of installing water mains would continue from Waukegan west on Yorkhouse Road to north on Chicago Avenue, west on Wadsworth Road, north on Hunt Club Road to west on Route 173 to the connection of Antioch water system at Crawford Road. The route which the pipeline must be run is on county roads which makes this engineering very complex due to unknowns or mysteries of crossing other county roads with buried utilities and private systems. The 18" water main requires a wide placement to be placed separate from other utilities. The route also must pass under two interstate highways which makes it more complex and unusual. Waukegan's proposal has plenty of capacity to provide Antioch with its allotment of Lake Michigan water.

The WWP proposal includes a booster pump station, due to the length of the water pipe from Waukegan to Antioch, twenty (20) system valves, and aforementioned water mains for a 2015 proposal of $24 million. The inflationary cost of that proposal in 2025 is estimated to be approximately $5 million bringing the total cost of $29 million in 2025 plus the necessary infrastructure upgrades of $4 million for a total capital cost of $33 million. We would also anticipate issues of additional costs and fees added to this estimate due to the additional engineering and equipment fees that would be necessary due to the route of water mains on county and private roads. If the Village of Antioch chooses water from Lake Michigan with Waukegan, the Village of Antioch may be required to pay for future plant expansion which could be anywhere from $15-30 million. A contract or agreement with WWP should clearly negotiate these cost considerations in the final agreement.

Lake County Public Water District (Proposal #2)

The second proposal to be considered is from the Lake County Public Water District (LCPWD) located in Zion on Route 173. The water district currently delivers water to Zion and Winthrop Harbor only. This proposal is the most logical since it is a straight delivery on Route 173 to Antioch and would require the least amount of engineering costs. The most complicated part of the route is crossing under two interstate highways for Route 41 and Interstate I-94. Similar to the proposal from Waukegan, the proposal has 54,900 feet or 10.4 miles of 18" water mains, a booster pump station, twenty-two (22) system valves for a 2015 cost of $25 million. The 2025 inflationary cost would move the total cost closer to $30 million. This option has the lowest cost of water out of all of the Lake Michigan water delivery options but has a significant capital investment into the Zion water treatment plant of $13 million in 2015 and closer to $16 million today. Adding this capital cost with piping brings this proposal to $46 million. The LCPWD option would require a capital investment into their water plant since the facility is near capacity for what they can deliver. The capital investment would expand their capacity to provide Antioch with their allotment.

Central Lake County Joint Action Water Agency (Proposal #3)

The third option for delivery of Lake Michigan water is the Central Lake County Joint Action Water Agency (CLC JAWA) a facility that delivers Lake Michigan water to several communities in Lake County. The facility is located in Lake Bluff or nearer the southern portion of Lake County and delivers water to the communities of Lake Forest, Libertyville, Gurnee, Grayslake, Lake Villa, Lake Zurich, Mundelein, Round Lake and Wauconda. The plant has

reached full capacity of 56 million gallons per day to the communities listed above with no plans for future expansion. The costs of water delivery were similar to the previous two options but since 2015, the facility has reached capacity when the Village of Lake Zurich reached agreement with CLC JAWA for its remaining capacity. This proposal was an option back in 2015 but is no longer an option to the Village of Antioch today.

Kenosha Water Utility (Proposal #4)

The fourth and final proposal for Lake Michigan water to consider is the Kenosha, Wisconsin water plant. "The Kenosha Water Utility (KWU) is not an option for Antioch to consider since it would "take an act of god to get approval or mitigate the red tape complications of delivering water from one state to another." (Hartnett, 2025) HR Green does not recommend Antioch obtaining water through any community in Wisconsin due to the high research costs and lengthy application process makes this option unrealistic. In theory, the KWU would deliver water from Bristol, Wisconsin down to Deep Lake Road at Route 173 to connect to Antioch's water system. The water mains to connect the two water systems together is 38,980 feet or 7.4 miles of pipeline or in the neighborhood of $20-30 million. The cost of bringing water through this route might be the least expensive route but this option should not be considered given the application process and red tape that would need to be realized.

Option #3 The Village of Antioch builds their own water treatment plant and infrastructure to support future growth while providing clean, quality water to its community.

The Antioch community water system as it sits today with a combination of deep and shallow wells would need to receive several upgrades that were identified in the previous analysis.

The water system would need to add five (5) additional wells, one deep well and four shallow wells, and another 500,000 gallon above ground water storage tank. The cost of those additional modifications were $9.245 million in 2015. The inflationary cost of that today would be $11.1 million in 2025.

The cost of converting Antioch's water system to produce Lake Michigan quality-water is significant and the most expensive of all proposals to be considered. In this proposal, the Village of Antioch would build a water treatment facility while adding 3 deep well aquifers, adding a one-million-gallon above-ground storage tank, and add/replace 30,000 feet of new 12" water mains to the water system infrastructure. The water treatment facility would include iron filtration, reverse osmosis membranes, chemical feed pumps, high-service pumps, and a treatment building. The capital investment in this proposal is $38.183 million in 2015. The inflationary cost of that today is $48 million in capital costs and the remaining system upgrades of $4 million to a total captial cost of $52 million. The annual operation costs of the water treatment facility is approximately $5 million. Combining the capital costs and operating costs of this proposal is $57 million to provide Lake Michigan quality-water without bringing Lake Michigan water to Antioch. It is important to note that $57 million may be on the conservative side and the actual costs could be closer to $65-70 million with annual recurring fees for treatment and maintenance and state regulatory inspections and monitoring.

The Village of Antioch would also have to consider the state and federal regulations that would be required with building their own water treatment facility. A concern to this proposal is the current state of the shallow well aquifers. Reports as far back as 2007 indicate that shallow wells have been nearly depleted and the quality of the water being produced are sometimes fair at

best. Shallow wells in Antioch should be considered questionable if the shallow wells are near depletion or producing water that is not of sufficient quality.

Recommendations

The recommendation of this panel is to transition to Lake Michigan water (proposal #2) from the Lake County Public Water District (LCPWD). The proposal has the lowest cost of water despite a large capital investment to expand the water plant to deliver the required capacity to Antioch. The route for pipelines is also a straight shot on Route 173 from Zion to Antioch which also make it a logical solution. The water infrastructure would also need to be upgraded to accept Lake Michigan water for $4 million. With proposal number 3 and 4 not being realistic options, the recommended LCPWD proposal and proposal #1 (Waukegan) are the only options available for the Village of Antioch to consider. The LCPWD proposal has a significant capital investment in order to increase LCPWD discharge capacity to send water to Antioch, otherwise the LCPWD is operating at full capacity of their plant. The capital investment for LCPWD is $16 million to expand their water plant, the investment in piping and equipment from Zion to Antioch is $30 million and additionally the $4 million left in Antioch water system upgrades to a total investment of $50 million. The cost of water is less expensive from LCPWD over the long-term of 20-40 years compared to the cost of water from Waukegan for the same time frame. The Waukegan proposal is less expensive on the front end of the proposal but more expensive over time.

Challenges to Implementation

I. Data Availability: Communication with current Village of Antioch stakeholders.

II. Regulatory Uncertainty.

III. Cost Fluctuations: Unknown inflation outlook and impact.

IV. Community Concerns / Political Support.

Timeline for Implementation

Timing is of the essence with this project for the Village of Antioch. Historical data combined with our cost projections show that the longer the implementation of the transition to Lake Michigan water, the more expensive the project. Additionally, costs related to the current infrastructure and the sustainability of the current well source provide for a finite timeline that should be followed. As is the case with other communities, such as the Village of Lake Zurich, a smooth transition to Lake Michigan water will only happen when a well-structured timeline is developed and followed. This proposed timeline outlines the milestones needed to complete the project successfully.

I. Initial Planning (Year 1):

i. Update the village's comprehensive feasibility study from HR Green to assess the complete technical, financial, and environmental aspects of transitioning to Lake Michigan water. From the feasibility study, develop a detailed project plan.

ii. Identify potential funding sources and secure initial funding for the project.

iii. Begin public engagement, public awareness campaign.

II. Community Engagement and Education (Year 1-8):

i. Launch a community engagement campaign to inform residents about the project and its benefits.

ii. Conduct public meetings, workshops, and informational sessions to address community concerns and gather feedback.

iii. Develop educational materials to help residents understand the transition process and the importance of Lake Michigan water.

III. Regulatory Approvals and Permits (Year 2-3):

i. Submit applications for necessary regulatory approvals and permits to state and federal agencies.

ii. Conduct environmental impact assessments and address any concerns raised by regulatory bodies.

iii. Obtain all required permits and approvals to proceed with the project.

IV. Detailed Design and Engineering (Year 4):

i. Develop detailed engineering designs for the new water infrastructure, including treatment facilities and transmission mains.

ii. Conduct site surveys and geotechnical investigations to inform the design process.

iii. Finalize the design and prepare construction bid documents.

V. Construction (Year 5-7):

i. Begin construction of the new water treatment facilities and transmission mains.

ii. Monitor construction progress and ensure adherence to project timelines and quality standards.

iii. Address any construction challenges and make necessary adjustments to the project plan.

VI. Testing and Commissioning (Year 6-8):

i. Conduct thorough testing of the new water infrastructure to ensure it meets all regulatory and quality standards.

ii. Commission the new water treatment facilities and transmission mains.

iii. Address any issues identified during testing and make necessary adjustments.

VII. Transition and Integration (Year 8):

i. Gradually transition the village's water supply from the well system to Lake Michigan water.

ii. Monitor the integration process and address any operational challenges.

VIII. Ongoing Monitoring and Maintenance (Year 9 and Beyond):

i. Implement a long-term monitoring and maintenance plan to ensure the continued reliability and quality of the new water system.

ii. Conduct regular inspections and maintenance of the water infrastructure.

iii. Address any issues promptly to maintain the integrity of the water supply.

Conclusion

By developing a strategic timeline, the Village of Antioch can have a clear path to successfully transition to Lake Michigan water. This is not only viable but necessary for Antioch to maintain economic prosperity and growth. For the village to evolve services must as well. Antiquated services are a disservice to the community but also can impose a greater detriment to the village in its entirety on outlook analysis. Investment and implementation of a high-quality sustainable water system supplied through Lake Michigan is the only direction that leads Antioch forward. A sustainable water system doesn't just sustain a service... it sustains a village.

References

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Northern Illinois University

Appendix

Appendix 1: Antioch DNR permit for Lake Michigan water

State of Illinois
Department of Natural Resources
Office of Water Resources

Lake Michigan Allocation Permit No. 2024-003

The Illinois Department of Natural Resources Hereby Grants

City of Antioch

an allocation of water from Lake Michigan in the amounts set below for the accounting years indicated, subject to the conditions contained in this Permit (see reverse side):

Water Year	Allocation (mgd)	Water Year	Allocation (mgd)
2025	1.157	2038	1.288
2026	1.166	2039	1.300
2027	1.175	2040	1.312
2028	1.184	2041	1.320
2029	1.192	2042	1.329
2030	1.201	2043	1.337
2031	1.211	2044	1.346
2032	1.222	2045	1.355
2033	1.232	2046	1.358
2034	1.242	2047	1.361
2035	1.252	2048	1.364
2036	1.264	2049	1.367
2037	1.276	2050	1.370

All amounts listed in million gallons per day (mgd).

Date of issuance: October 1, 2024

Natalie Finnie by Jan A. Wolter

Natalie Phelps Finnie, Director
Illinois Department of Natural Resources

Appendix 2: Antioch Strategic Plan Summary

Village of Antioch-Strategic Plan Summary 2017-20

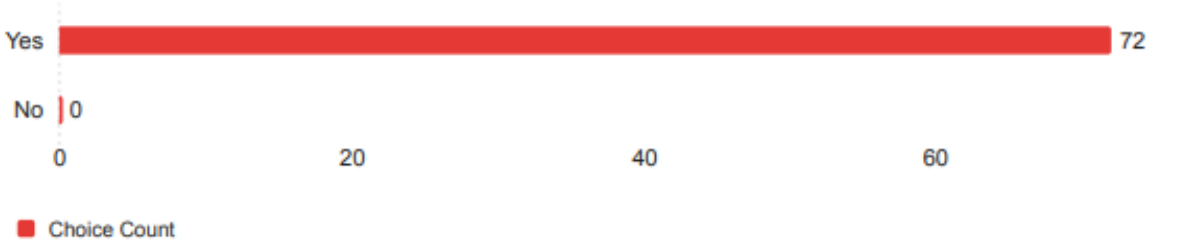
Strategic Priority	Desired Outcome	Key Outcome Indicator (KOI's)	Target	Strategic Initiatives
Financial Strength	Clear picture of short term (3 yr.) financial operations	3 year: -Revenue, expenses, debt, reserves	Increase accuracy of financial projections	a) Develop 3-yr. financial plan b) Create comprehensive capital inventory c) Develop capital funding strategy d) Conduct operating revenue/expense analysis
	Buffer against econ downturn/ increase bond rating	All fund balances	-40% General Fund -25% water/sewer -AA rating	
	Adequate funding for capital needs	Defined funding sources	-Full funding of capital needs	
Economic Development	Increased tax base	-EAV _Sales tax	-EAV and sales tax growth meet operating	a) Conduct retail marketing analysis b) Implement 2016 Economic Development Plan c) Develop new Comp Plan d) Market Antioch brand e) Develop feedback mechanisms f) Create beautification program
	Balanced development	--Results—development distribution -National/regional standards	__% Change from current to VOA adopted policy/standard	
	Recognized "destination"	Survey, feedback results	Businesses, visitors, real estate brokers indicate that Antioch is a recognized destination	
Maintain Infrastructure Systems	Have the right facilities for future demand	-Efficiency measures -Benchmark standards	Decisions made consistent w/ benchmark standards & community demand	a) Establish community benchmarks b) Develop capital asset strategy for growth c) Create community education program re: Lake Michigan water d) Conduct infrastructure standards review-all systems e) Establish watermain replacement program f) Complete I&I studies g) Develop capital facilities plan
	Compliant infrastructure systems	Infrastructure category standards	Meet standards-every system	
	Reliable, quality water system	_#_ breaks _water quality measurement results	__% Reduction-watermain breaks __% Improved quality	
Workforce Development	Staffing levels meet Village needs	Staffing analysis reports	100% of department targets met by 2021	a) Conduct staffing study b) Update Perf. Eval process c) Conduct comprehensive employee feedback process d) Complete compensation study e) Implement trng. program
	Competent staff	Results-performance evaluations, tests	100% of employees met job expectations	
	Be an employer of choice	- Survey results-employees - Survey results-applicants	100% say Antioch is a desirable place to work	
Organizational Effectiveness	Leadership (Bd.-staff) cohesiveness	Self-assessment results	_% meetings/interactions conform to est. norms & standards	a) Establish Bd-Staff relationship review process b) Update Info mgmt. system c) Develop Village App d) Conduct technologies assess. e) Dev/implement Community survey f) Determine service level stand. g) Board/staff standards policy
	Service levels & delivery aligned w/ community expectations	Community feedback results	__% satisfaction w/ levels __% satisfaction w/ delivery	
	Technology enhanced staff effectiveness	Staff & operational efficiency measurement results	efficiency improvement in 2 target areas	

5

Appendix 3: Antioch Water Service Survey

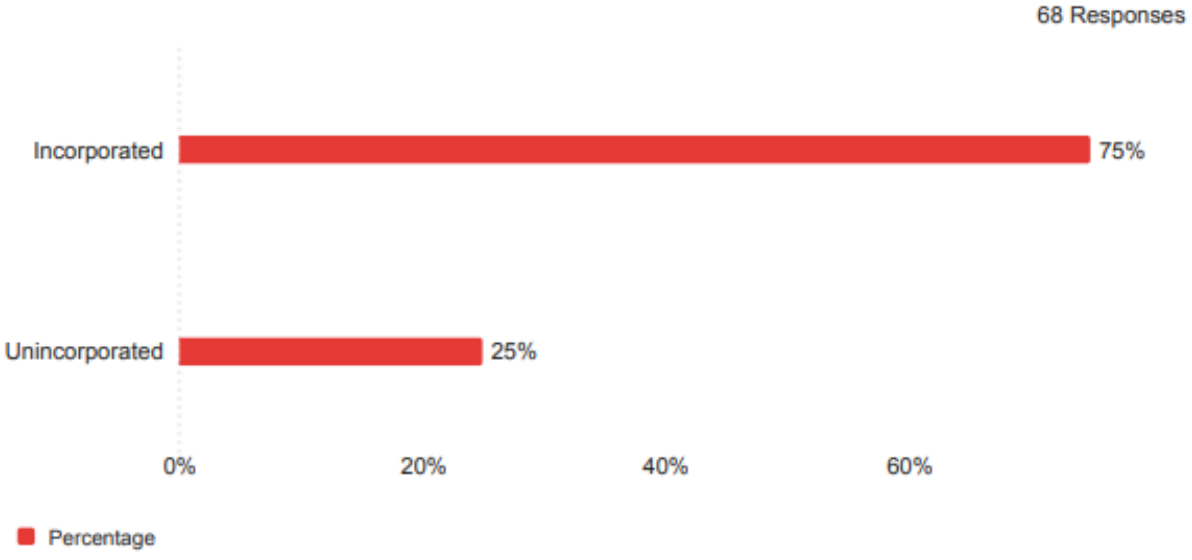
Welcome! - Thank you for taking part in the Community Water Survey! The voluntary survey takes 5-10 minutes, and your responses are anonymous. For any questions, please contact James Moran at z1978319@students.niu.edu. Thank you for your time! I consent to taking part in this survey. I verify that I acknowledge that the information I provide will be collected anonymously and may be used as part of a capstone project for a group of students at Northern Illinois University.

72 Responses



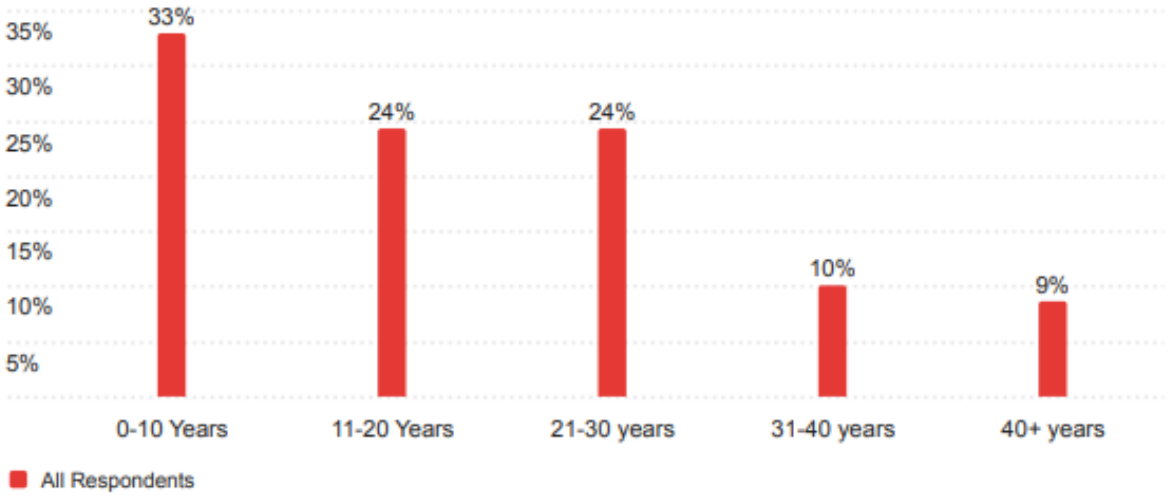
Demographic 2 - Do you reside in an incorporated or unincorporated community? - Selected Choice

68 Responses



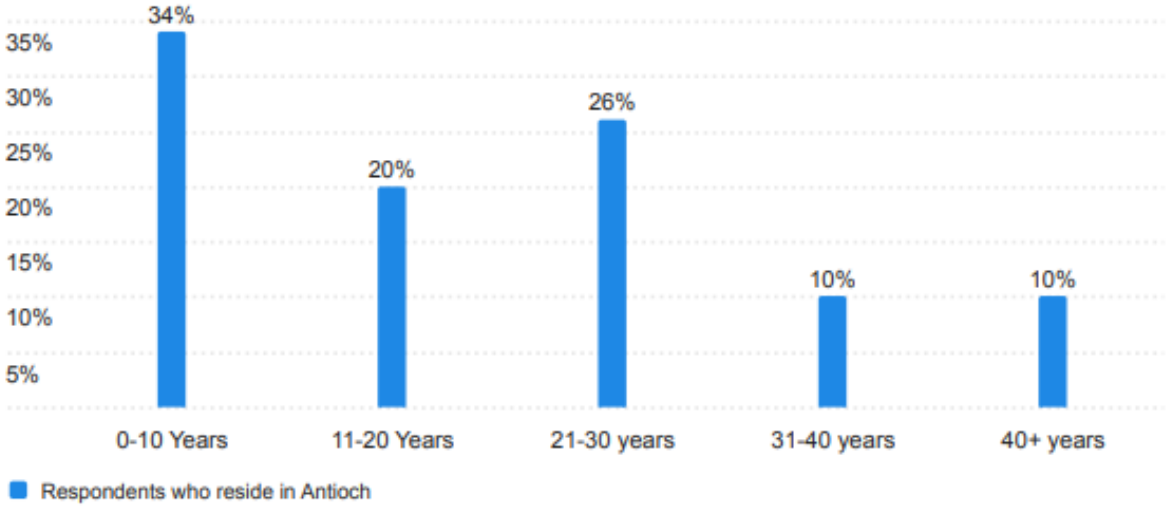
Demographic 3 - How long have you been a resident of your current community?

70 Responses

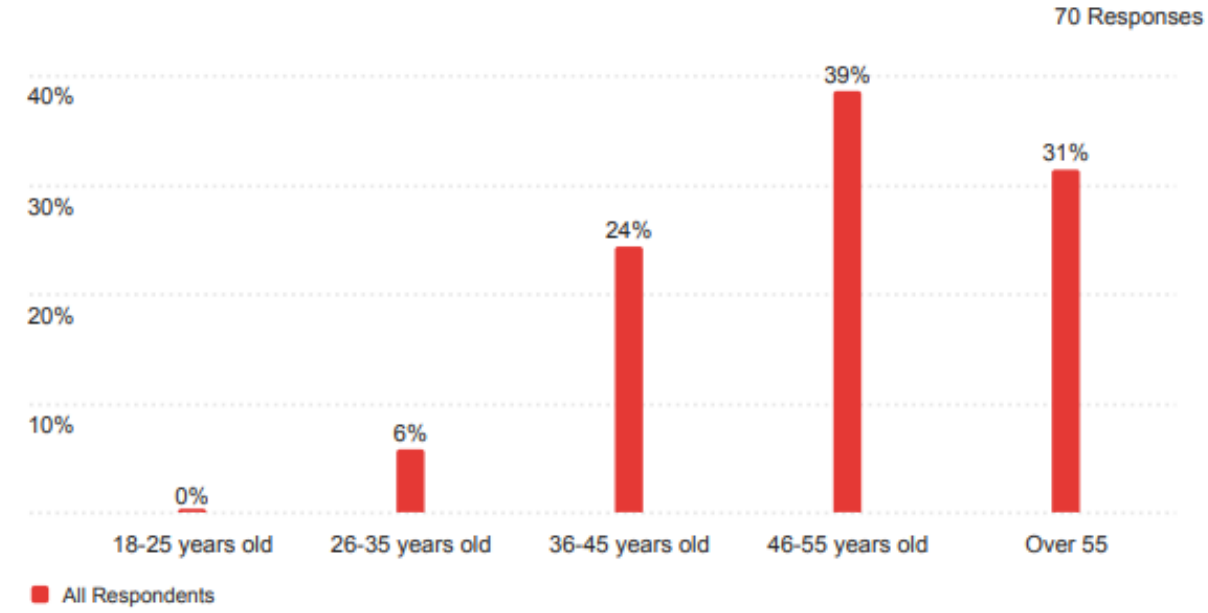


Demographic 3 - How long have you been a resident of your current community?

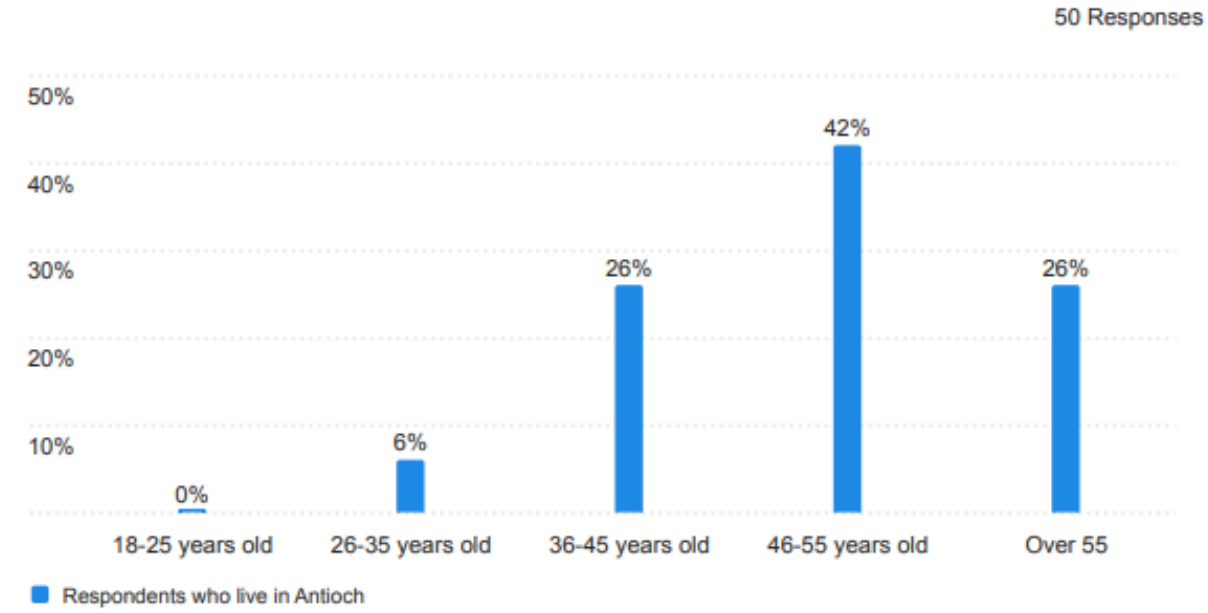
50 Responses



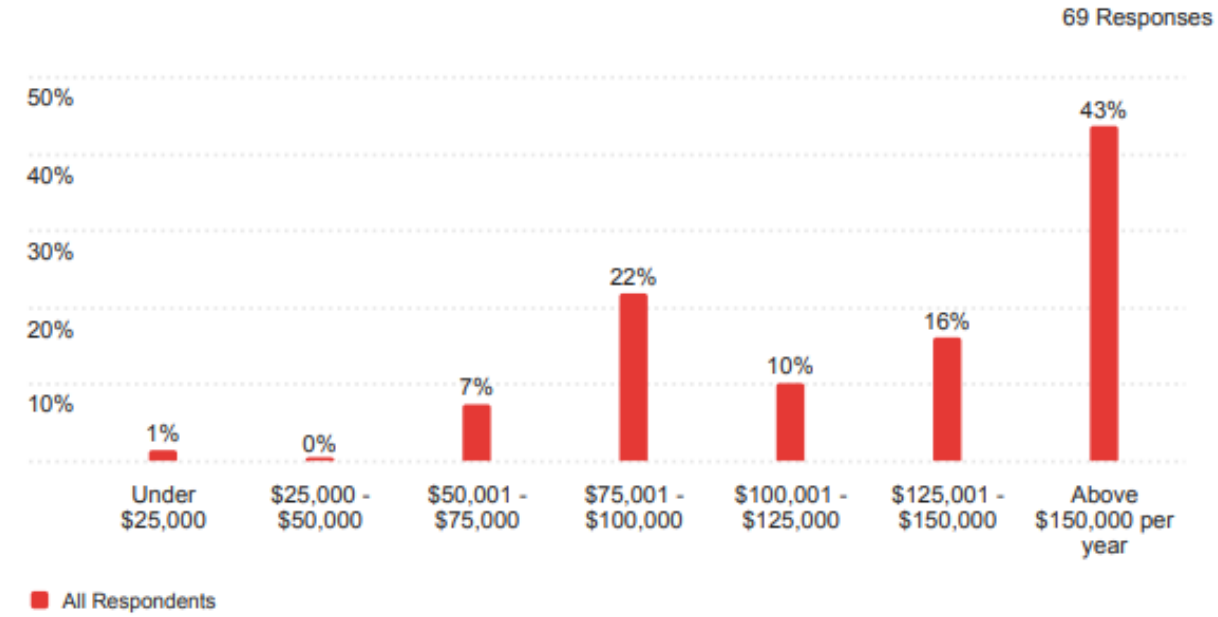
Demographic 4 - What is your age?



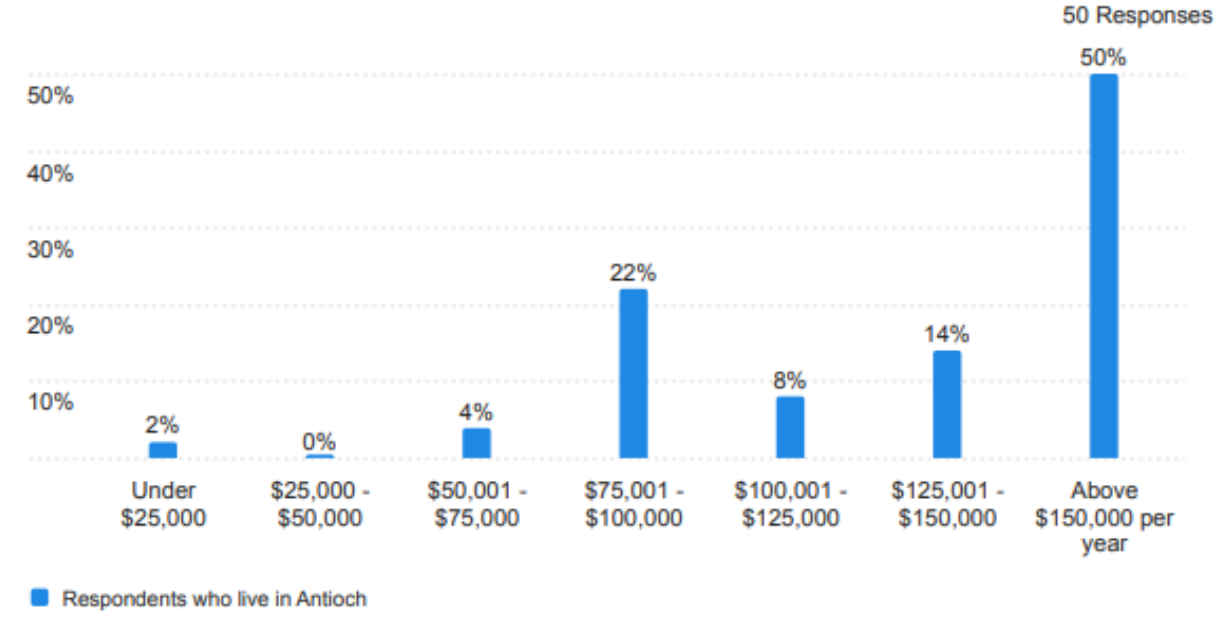
Demographic 4 - What is your age?

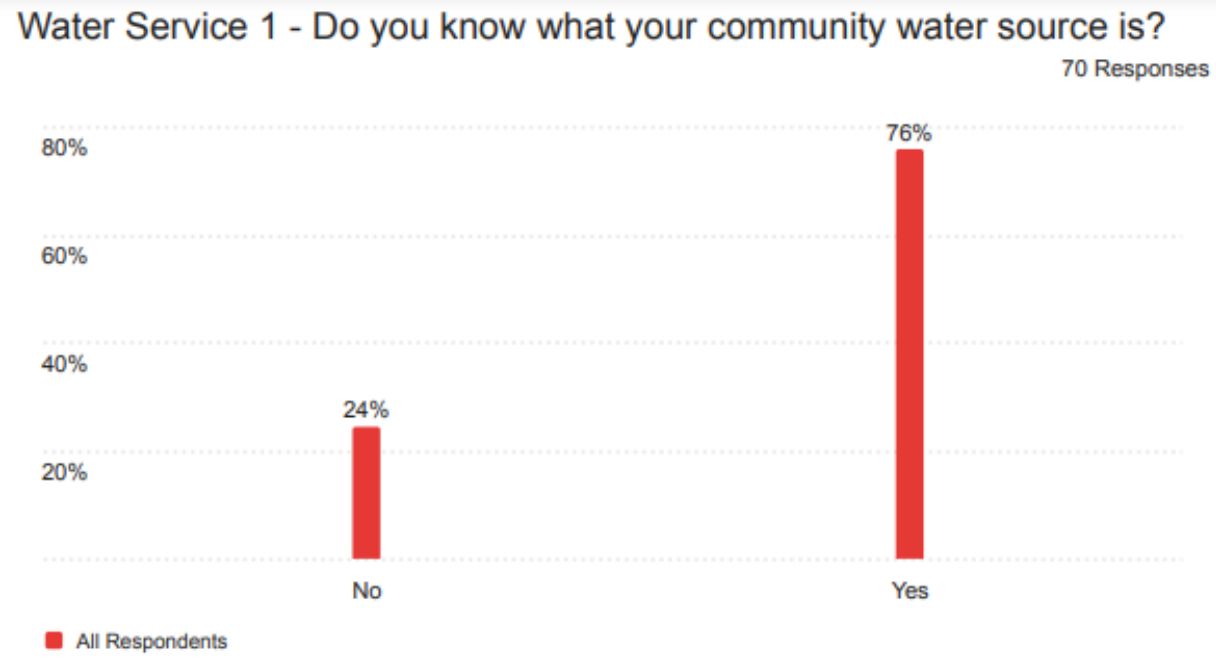


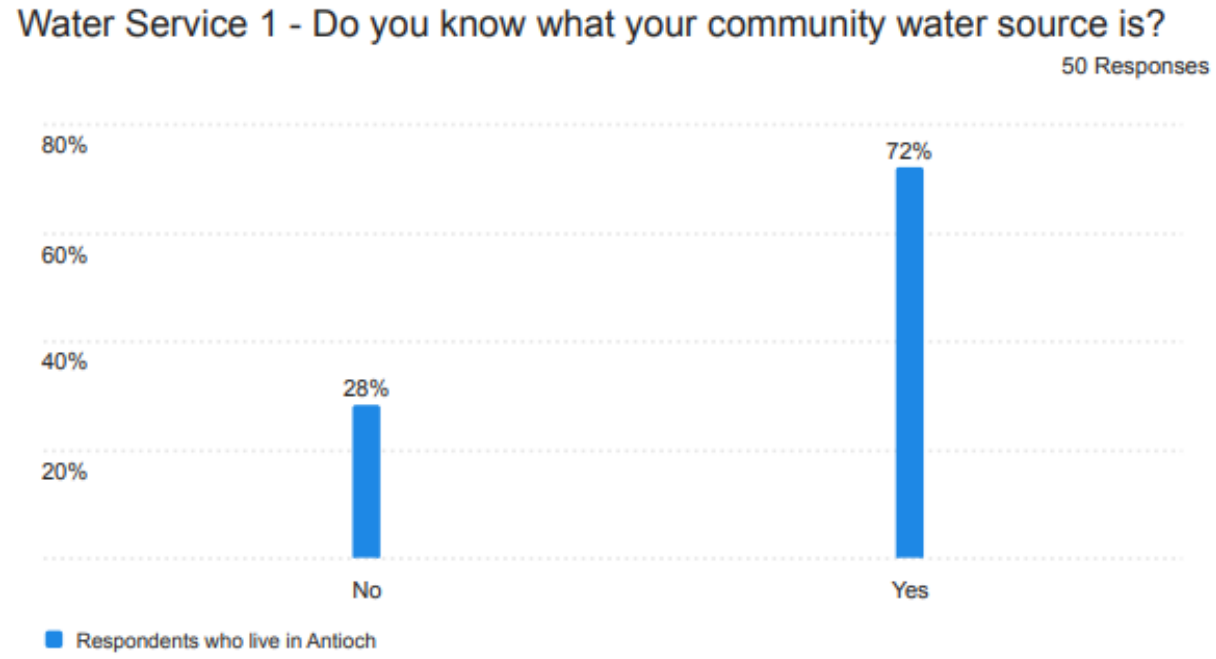
Demographic 5 - Combined Annual Household Income?



Demographic 5 - Combined Annual Household Income?

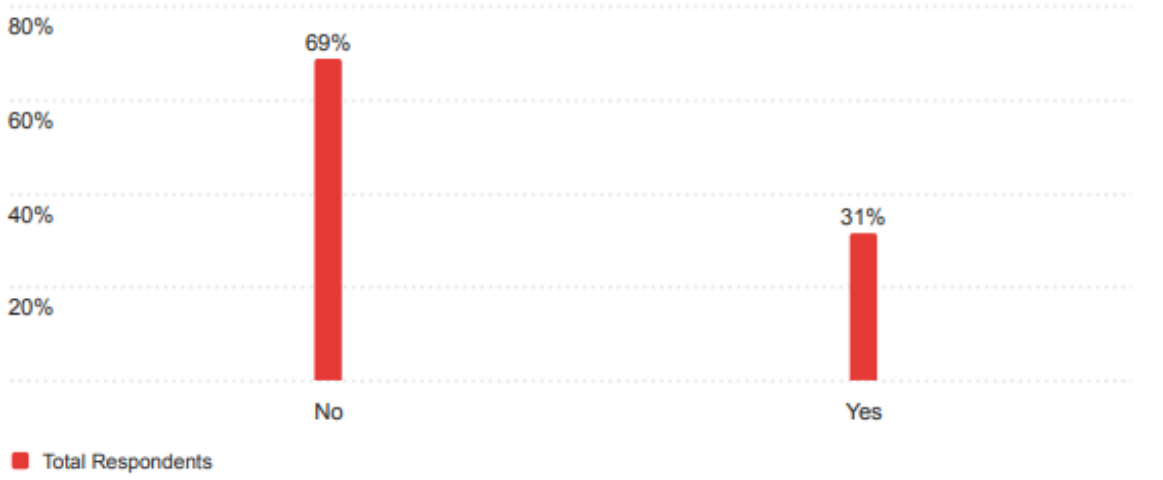



Water Service 1 - Do you know what your community water source is?
70 Responses
80%
60%
40%
20%
24%
76%
No
Yes
All Respondents


Water Service 1 - Do you know what your community water source is?
50 Responses
80%
60%
40%
20%
28%
72%
No
Yes
Respondents who live in Antioch

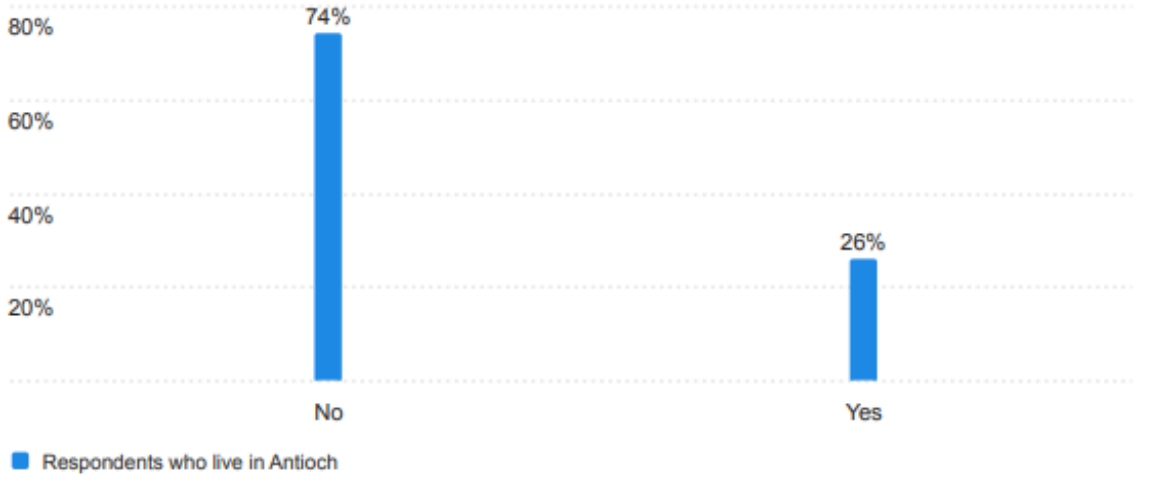
Water Service 2 - Are you currently informed on or aware of your community's Lake Michigan water allocation standing?

70 Responses

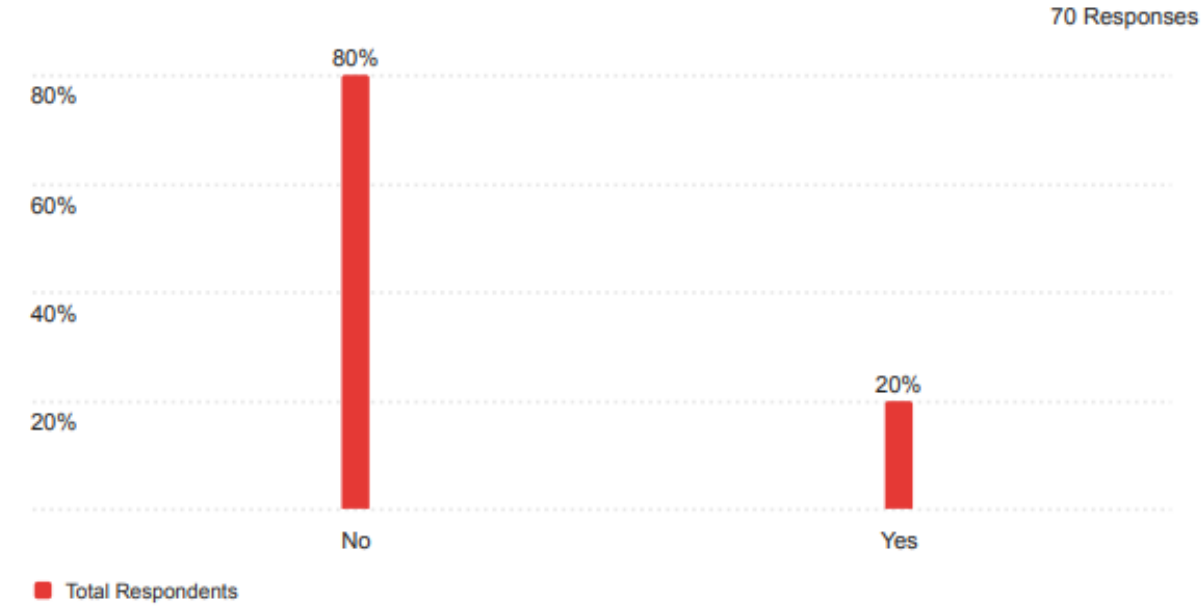


Water Service 2 - Are you currently informed on or aware of your community's Lake Michigan water allocation standing?

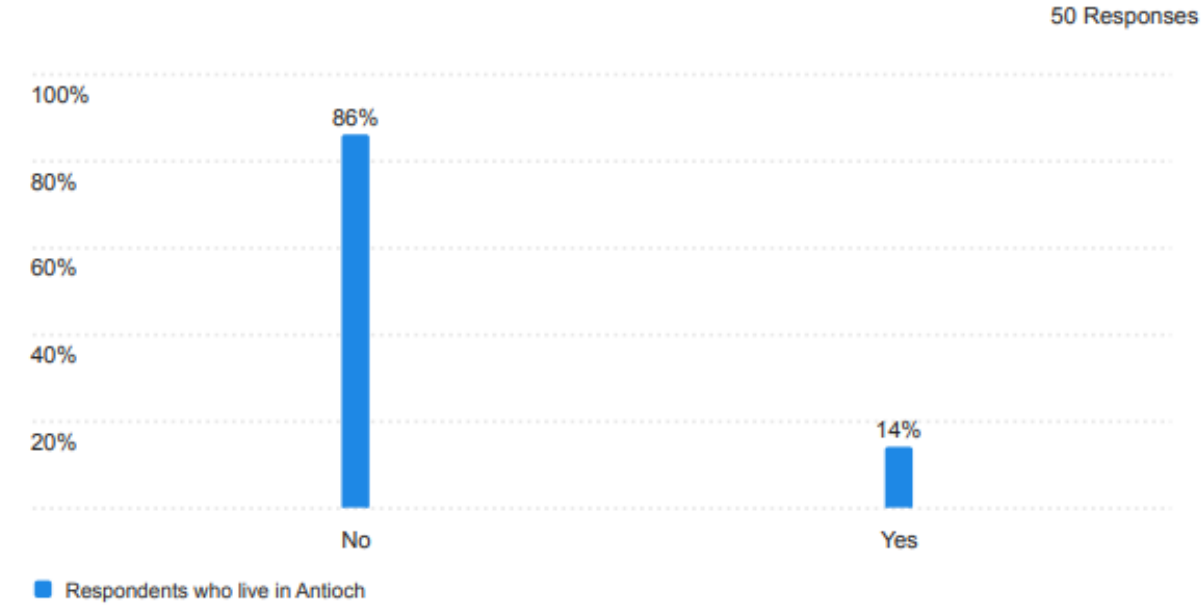
50 Responses

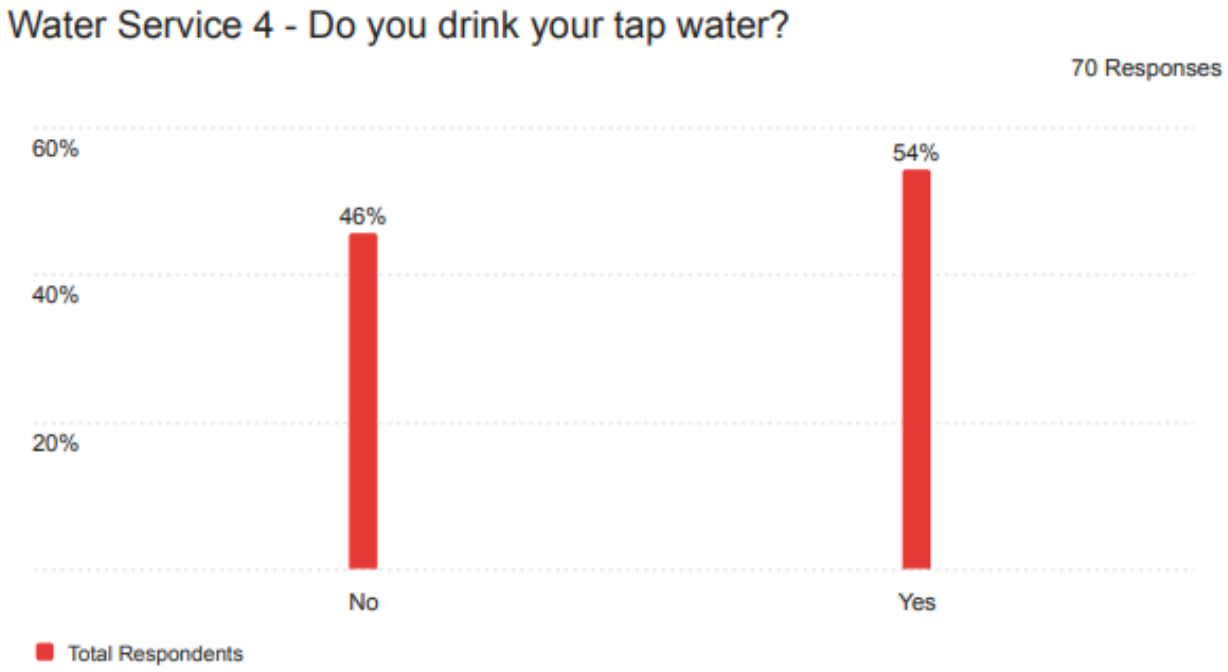


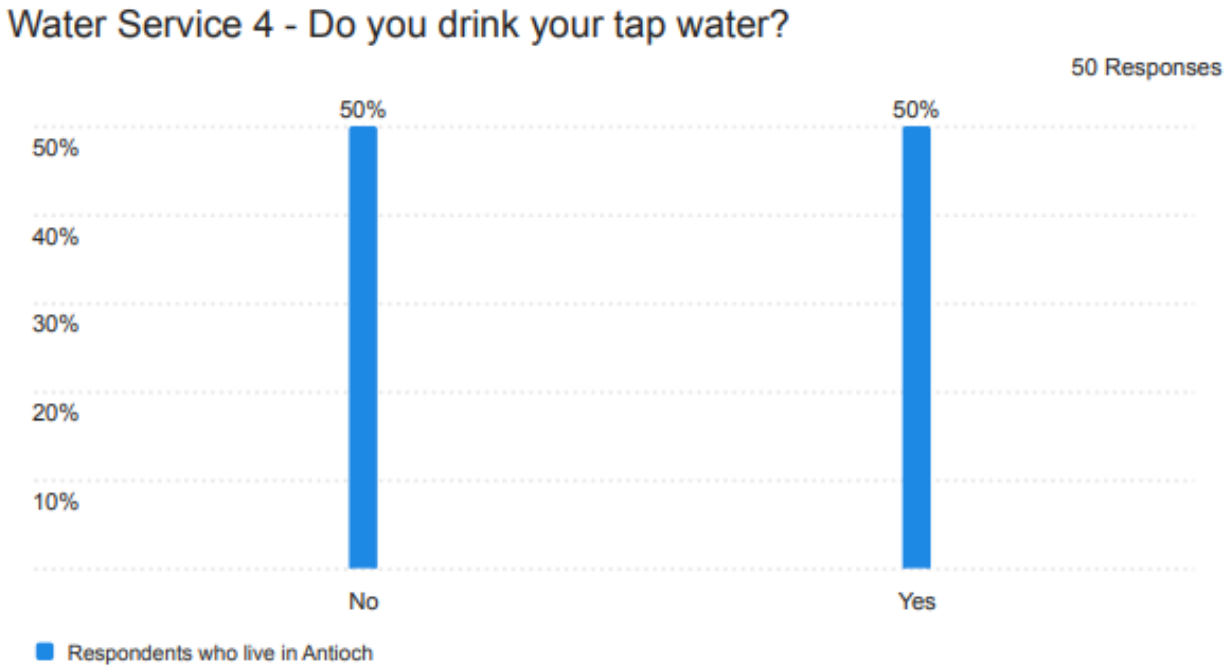
Water Service 3 - Do you have a private well?



Water Service 3 - Do you have a private well?

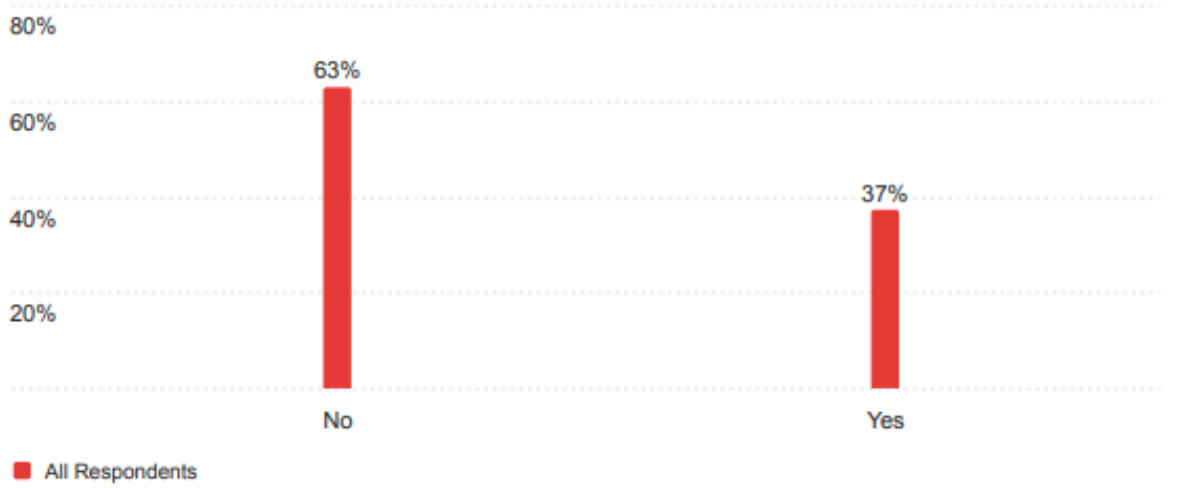



Water Service 4 - Do you drink your tap water?
70 Responses
60%
40%
20%
46%
54%
No
Yes
Total Respondents


Water Service 4 - Do you drink your tap water?
50 Responses
50%
40%
30%
20%
10%
50%
50%
No
Yes
Respondents who live in Antioch

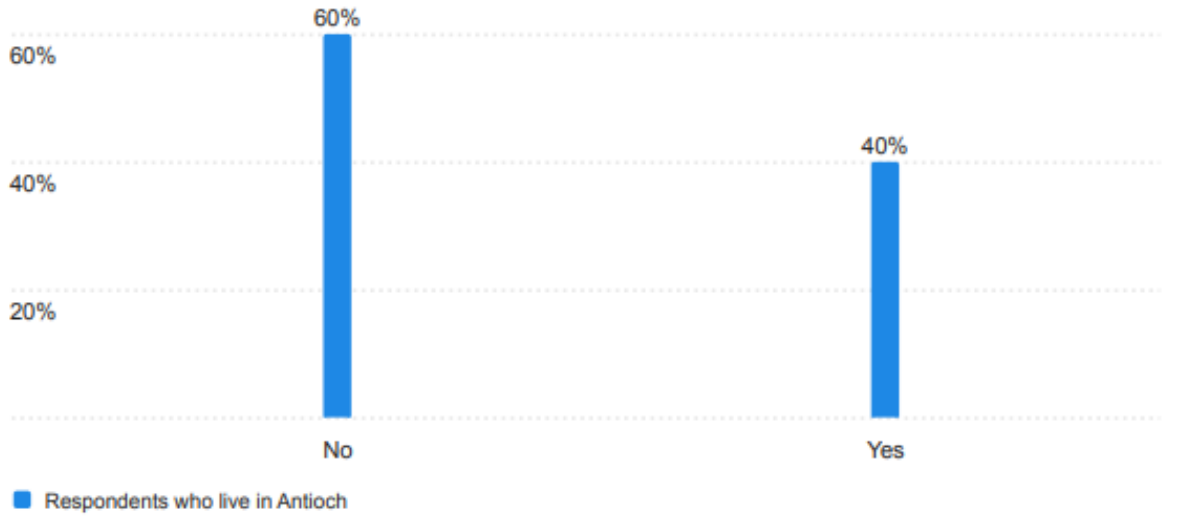
Water Service 5 - Do you have concerns about the safety of your drinking water? - Selected Choice

70 Responses



Water Service 5 - Do you have concerns about the safety of your drinking water? - Selected Choice

50 Responses



Water Service 6 - How would you rate the water quality for the following:

67 Responses

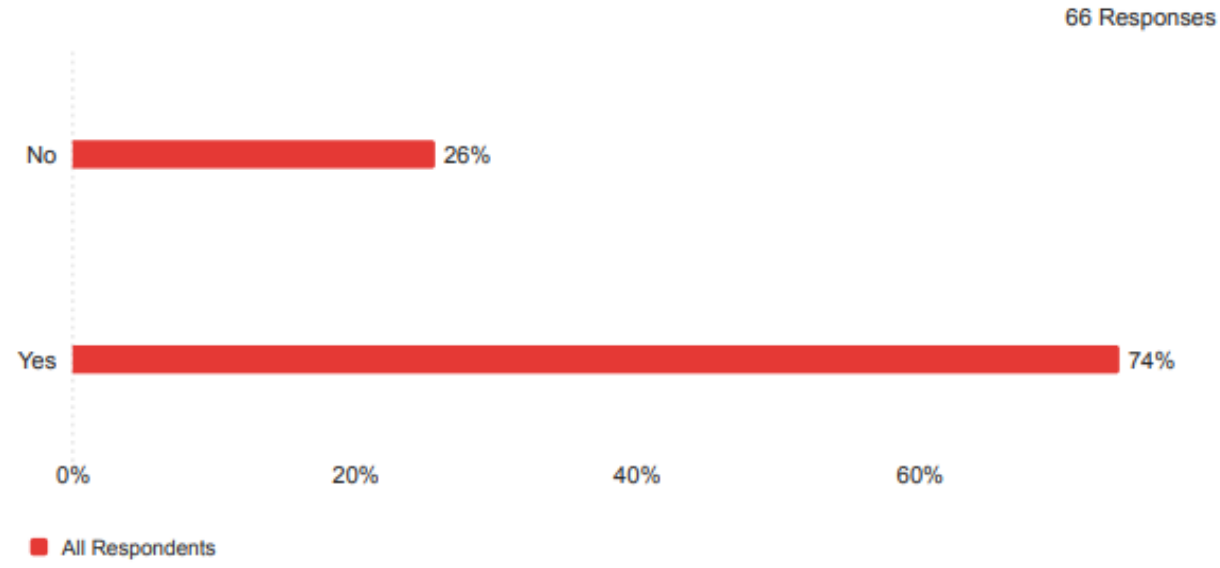
Field	Min	Max	Mean	Standard Deviation	Variance	Responses
Taste?	0	100	46	27	718	66
Odor?	0	78	35	21	458	58
Color?	0	100	40	28	764	56
Water Pressure?	0	100	37	31	931	58

Water Service 6 - How would you rate the water quality for the following:

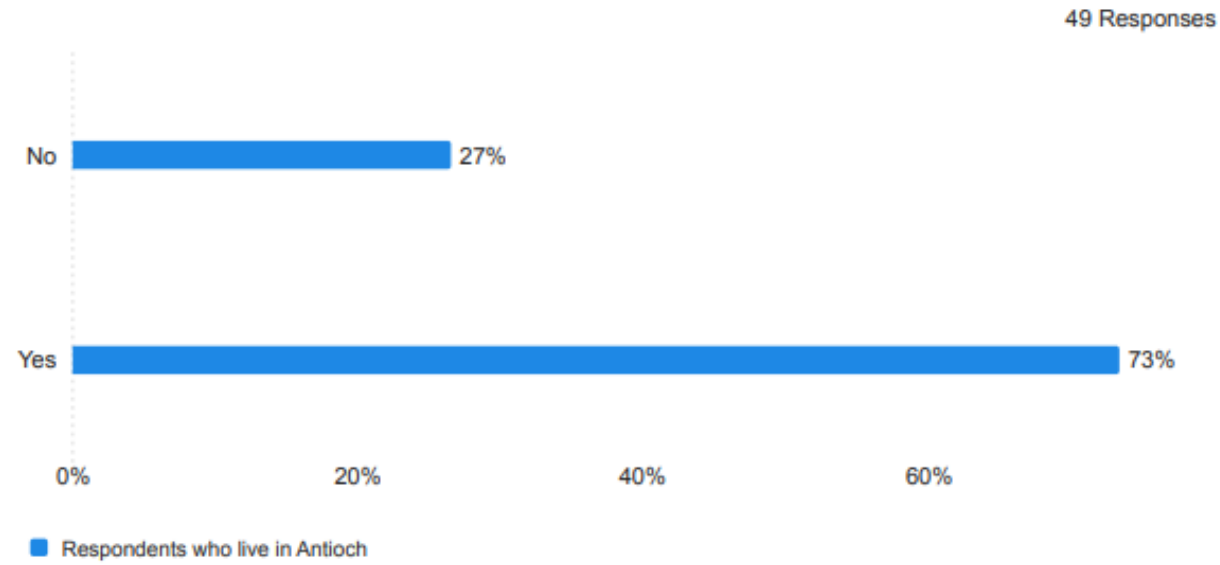
48 Responses

Field	Min	Max	Mean	Standard Deviation	Variance	Responses
Taste?	0	100	47	24	589	47
Odor?	0	75	35	20	381	43
Color?	0	100	42	26	671	41
Water Pressure?	0	100	41	30	900	42

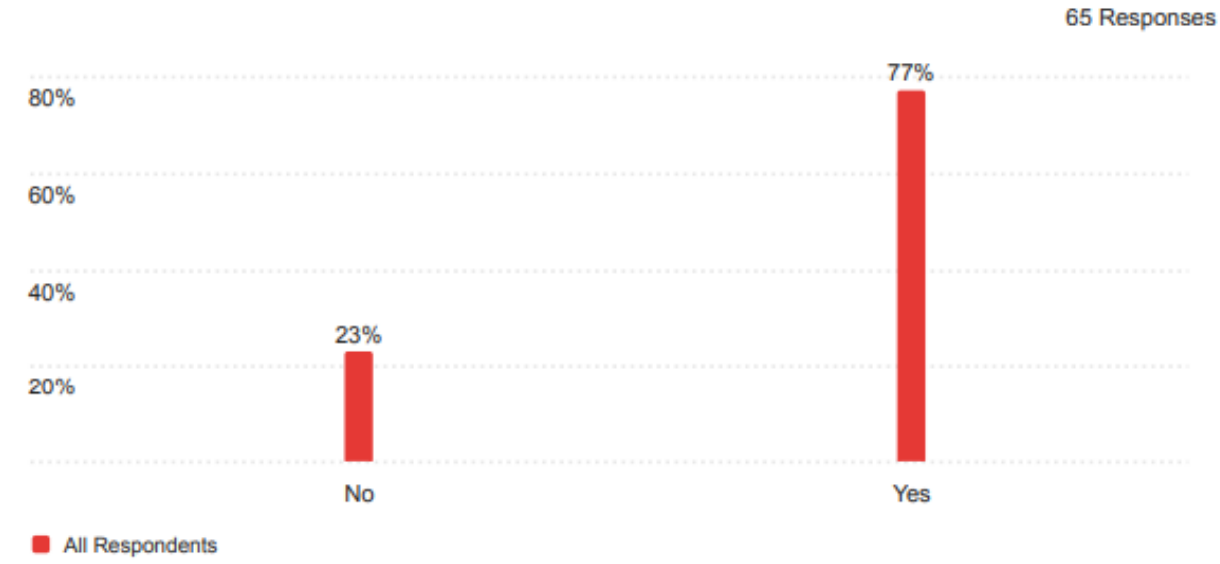
Water Service 8 - Overall, are you satisfied with your current community water service?



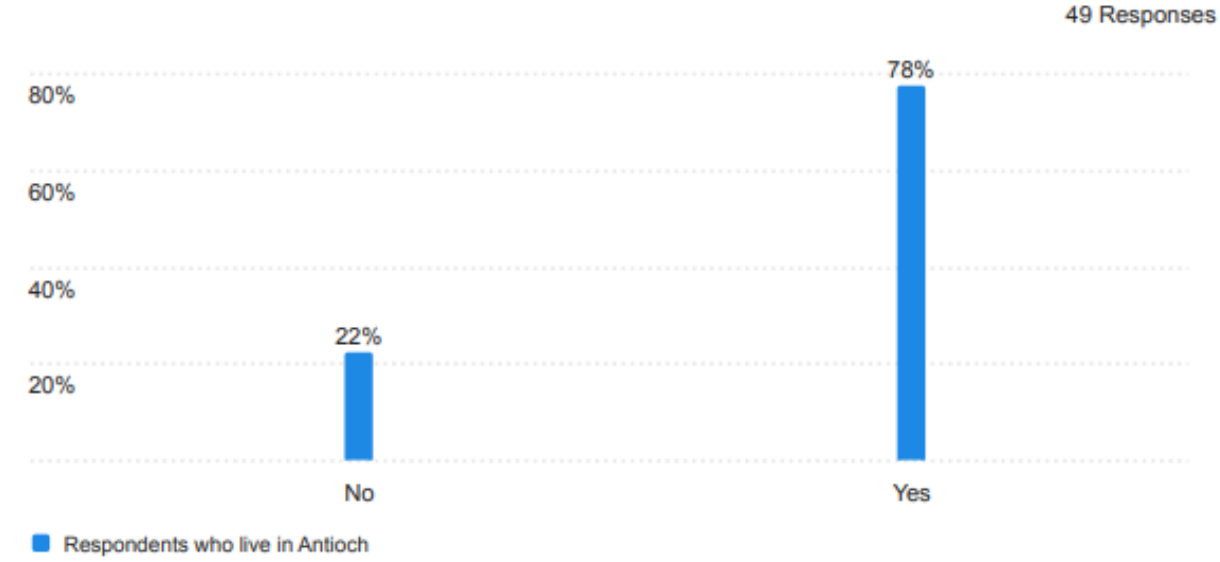
Water Service 8 - Overall, are you satisfied with your current community water service?



Water Service 9 - Do you think the cost of your water service is reasonable?

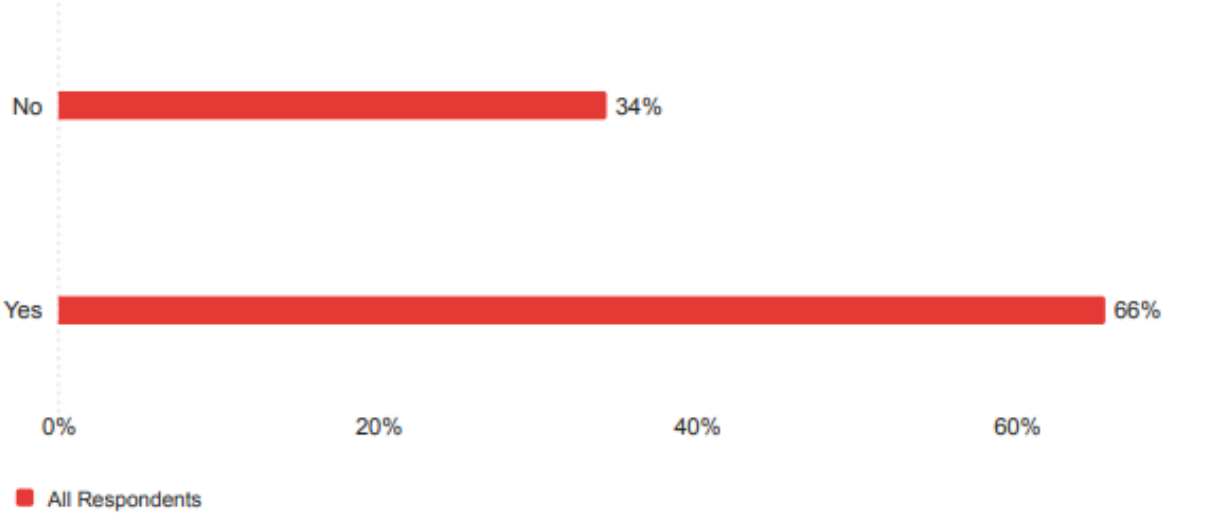


Water Service 9 - Do you think the cost of your water service is reasonable?



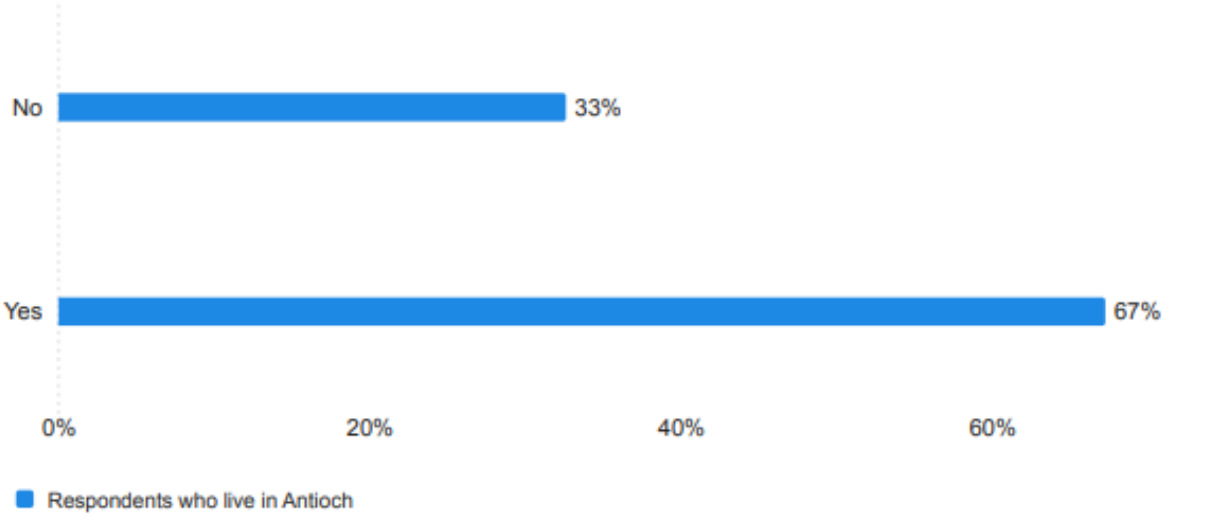
Water Service 10 - Do you support water service rate increases for maintaining or upgrading the current water system?

64 Responses



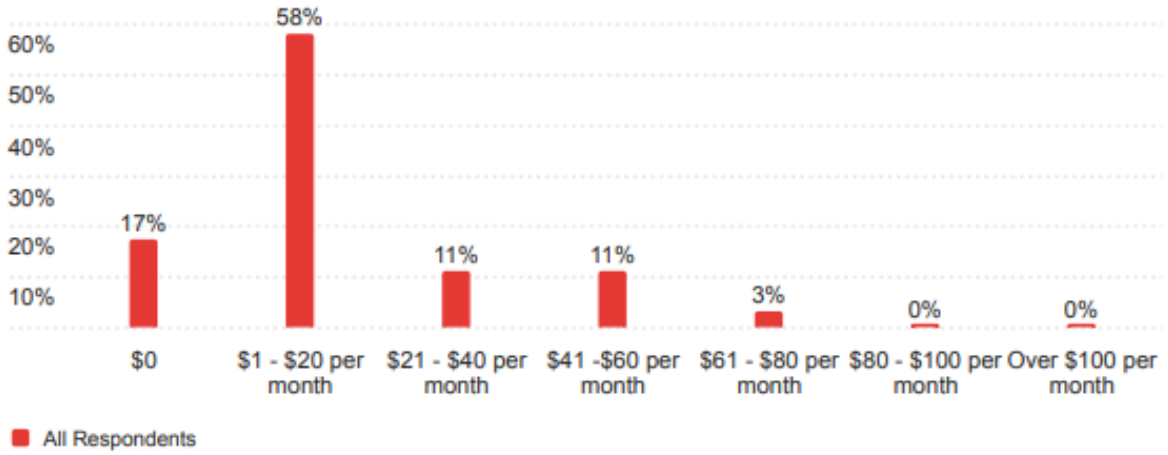
Water Service 10 - Do you support water service rate increases for maintaining or upgrading the current water system?

49 Responses



Water Service 11 - What up charge, per month, on your water service bill would you find reasonable to support the increase in water quality, service, and sustainability?

64 Responses



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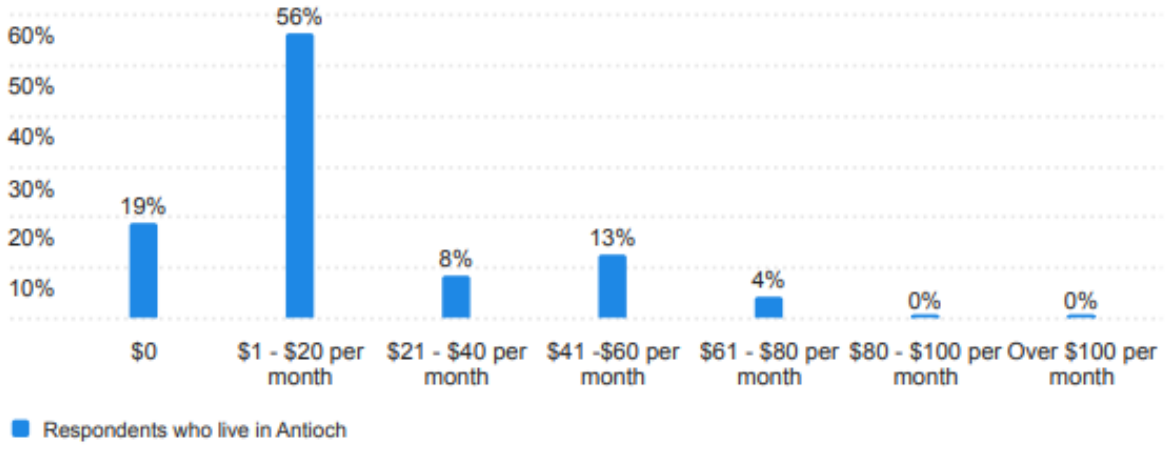
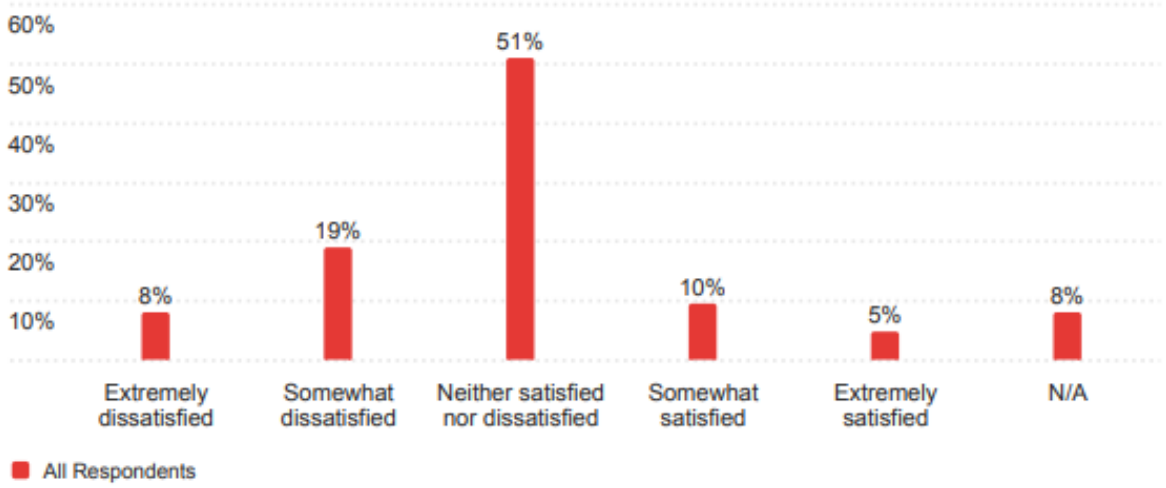
48 Responses



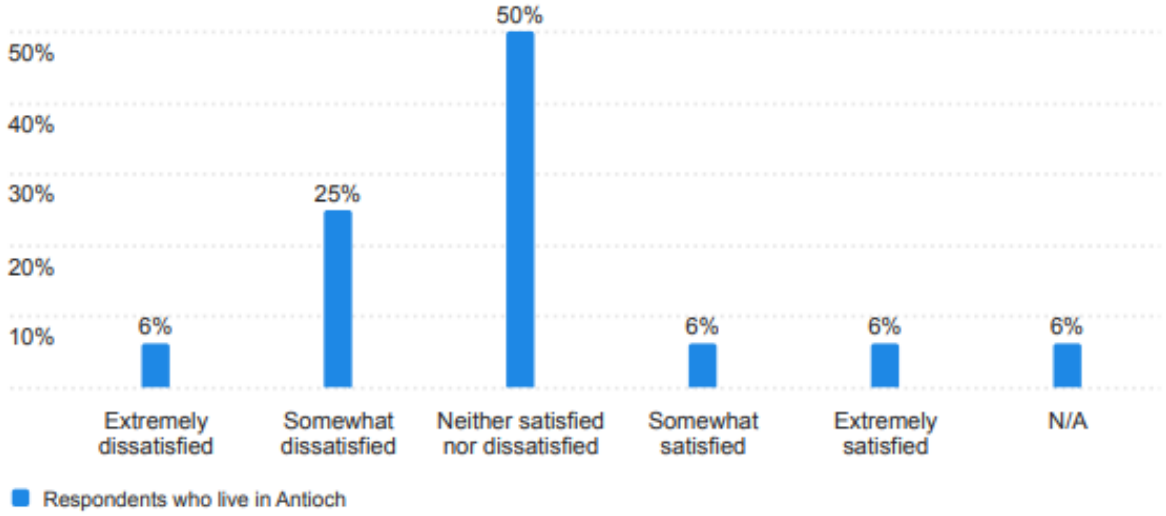
Water Service 12 - How would you rate the overall communication from your water provider regarding your community water system?

63 Responses



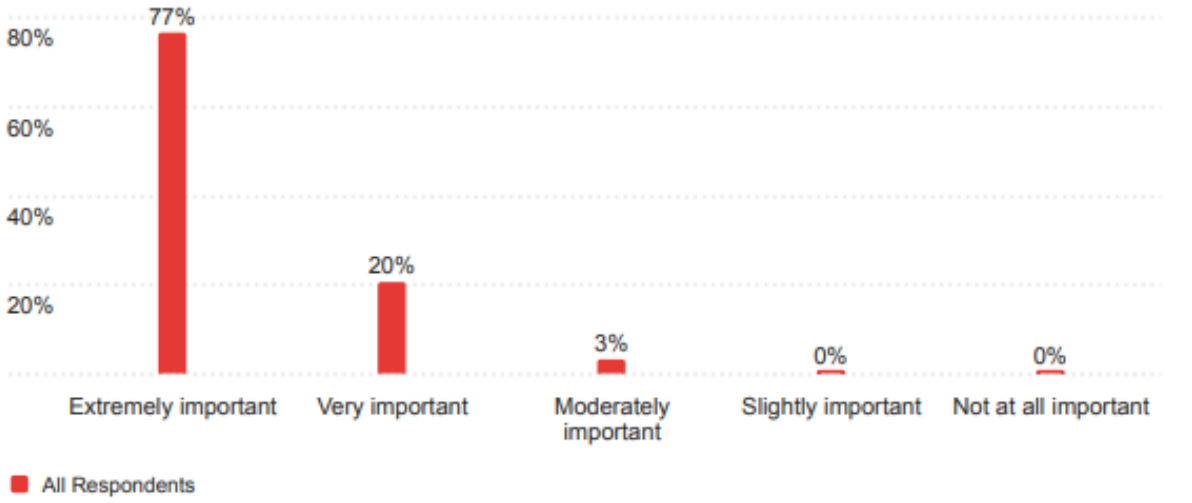
Water Service 12 - How would you rate the overall communication from your water provider regarding your community water system?

48 Responses



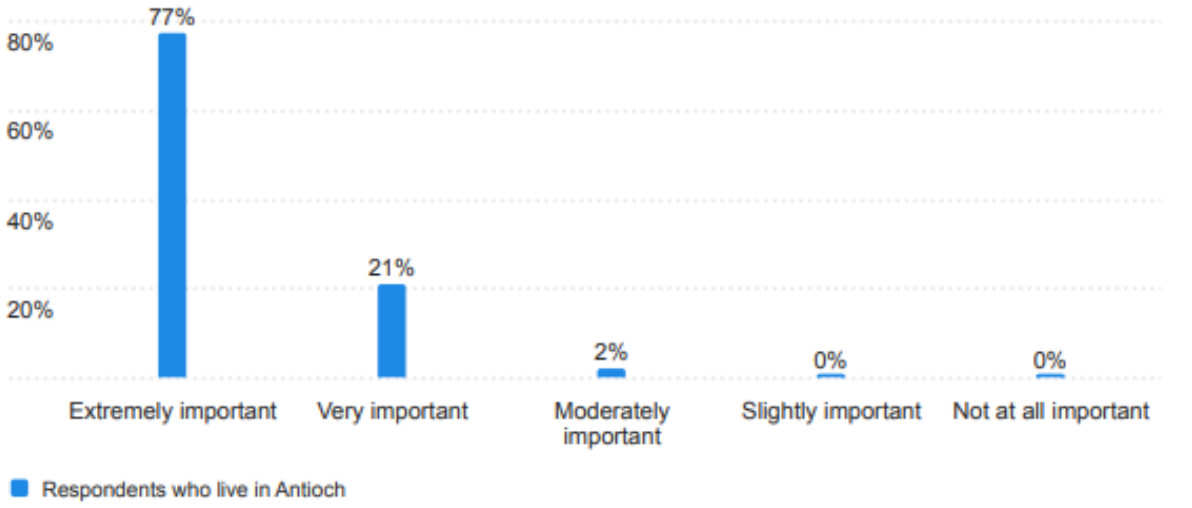
Water Service 13 - How important is safe, reliable drinking water to your community?

64 Responses



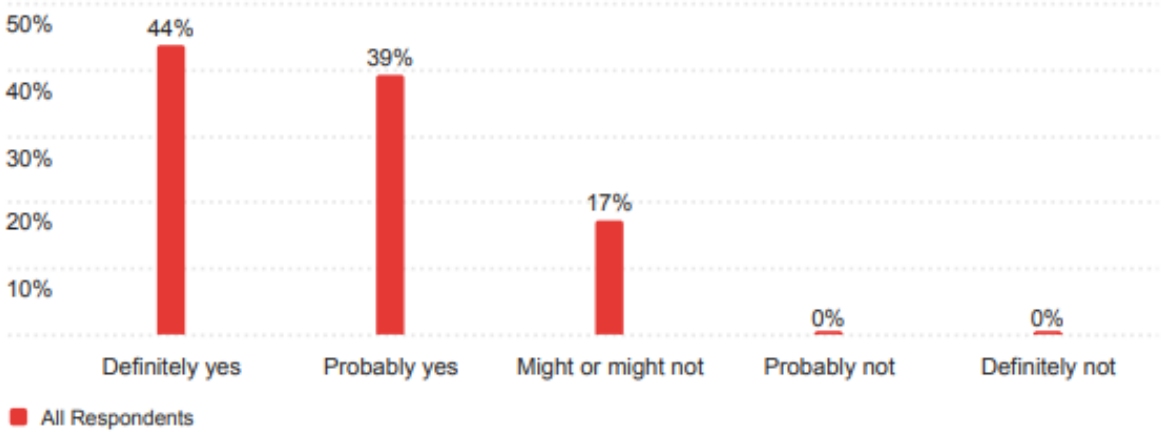
Water Service 13 - How important is safe, reliable drinking water to your community?

48 Responses



Water Service 14 - Do you believe that your community should invest in infrastructure development and opportunities to increase community growth?

64 Responses



Water Service 14 - Do you believe that your community should invest in infrastructure development and opportunities to increase community growth?

48 Responses