January 20, 2022

ctc technology & energy
engineering & business consulting

Sy Gezachew, VCA
Procurement Officer
Office of the Purchasing Agent
Arlington County
2100 Clarendon Boulevard, Suite 500
Arlington, VA 22201

Subject: Proposal to provide broadband study consulting services to Arlington County

Dear Mr. Gezachew:

Columbia Telecommunications Corporation (dba CTC Technology & Energy) (CTC) and our subcontractor, HR&A, are pleased to present this proposal to Arlington County. CTC and HR&A's experienced teams of engineers, analysts, and statisticians are equipped to support the County's needs. CTC has a longstanding relationship with the County and its affiliated agencies that will enhance and further inform this work. We applaud the County in furthering its digital equity goals of ensuring all residents have access to affordable high-speed home broadband service and the needed technology and skills to ensure their engagement in the community and local economy.

For more than two decades, CTC has assisted Arlington County in addressing the broadband needs of the County and its residents and businesses. From the initial offerings of internet providers via copper and coaxial cables to today's fiber optic networks, the team at CTC has played a significant role in assisting the County in advancing availability and multiple options for services. Throughout our firm's work, we have served the public sector specifically in executing projects that excel in adaptability to the changing needs of people, institutions, and entities, and sustainability as broadband has emerged at the crux of the digital landscape. CTC is committed to applying a digital equity framework that, in addition to addressing the needs of your constituents, will help to alleviate inequities in digital access for generations to come.

HR&A has assisted George Mason University (GMU) on a strategy to increase innovation-based economic growth throughout Northern Virginia, leveraging GMU's three campuses in Arlington, Fairfax, and Manassas. A current project is underway to assist GMU on the programming, financing, and redevelopment of its Arlington Campus into a Digital Innovation Hub in support of the Commonwealth of Virginia's successful pursuit of Amazon's HQ2.

Our reputation rests on our track record of providing independent, objective, and unbiased guidance. We *do not bid* on construction or implementation of the strategies our clients adopt as a result of our advisory services.

We have indicated in the proposed tasks the CTC and HR&A team members that will lead those specific efforts. Our experts are committed to collaborative engagement with the County and key stakeholders.

Our team would be ready to initiate the project within two weeks of the award and contract signing, and the work would proceed over the following nine months.

I will be serving as the overall Project Manager and have included my contact information below. Please do not hesitate to contact me with any questions about the project team or our proposal. We would be delighted to be your independent advisors on this important project.

Best regards,
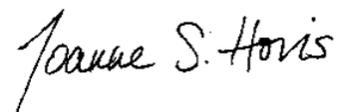
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1. Project Approach

1.1 Understanding of Project and Technical Requirements

Our team will act in direct support of the County's objectives, as outlined in the RFP, that necessitate a deeper understanding of the region's available broadband resources and technical solutions to ensure that all County residents have equitable access to reliable, affordable high speed broadband internet services, devices, and technology skills.

For more than 25 years, CTC has provided expert and independent services on the technical, strategic, and business aspects of ensuring broadband for local communities. We provide inclusive, accessible, and equitable planning across the nation and globe, with a longstanding relationship with Arlington County on many projects, like ConnectArlington, evaluation and inspection of provider plant and facilities, and exploring broadband availability and affordability to low-income residents. Our team includes our subcontractor, HR&A, who we work with frequently in conducting similar broadband studies. Together, we have recently assisted New York City with a similar scope of work that examines the significant challenges that a large city may face in examining digital equity. Our team is also currently working with Clark County, Nevada; Lancaster County Economic Development Company, Pennsylvania; Howard County, Maryland; and many jurisdictions to assist them in understanding their broadband and digital equity needs, and in developing strategic broadband action plans. Our team excels in working with local communities to develop technology strategy to offset market distortions that have created digital haves and have-nots.

During the proposed timeline, CTC's team will serve the County as the region expands and transforms its broadband landscape to alleviate digital confines. We seek to provide a framework for the County that is independent, objective, and realistic—our core philosophy aligns with the County's commitment to serving its constituents. We seek to plan and forecast the long-term fulfillment of the County's digital equity goals, prioritizing partnerships and collaboration with local stakeholders and community members to inclusively put these actions forth.

1.2 Scope of Work and Project Methodology

The CTC team will work with the County to conduct a Broadband Study that utilizes a multi-pronged approach— one that is independent from conflicts of interest, data-driven, holistic, and caters directly to the unique needs of the County's residents to address obstacles of digital inequities in the region. Over the past several years, the County has made investments in its communities to improve broadband services and digital equity programming. Unserved/underserved neighborhoods have long been vulnerable to the digital divide. We are witnessing across the country that these communities are more sensitive to broadband disparities than ever. The County's digital equity goals align with CTC's digital equity framework to: (1) establish connectivity through infrastructure investment; (2) provide access to all residents; (3) foster education & training for constituents; and (4) ensure program sustainability & community capacity. Our proposed plan will prioritize four key aspects:

Accessibility: High-speed broadband infrastructure exists throughout all landscapes and neighborhoods, and reliable high-speed broadband plans are ubiquitously available for purchase.

Affordability: High-speed broadband service is readily available at reasonable, appropriate costs for all residents, regardless of socioeconomic status.

Connection to devices: Residents own or have access to well-functioning, up-to-date computers and technical devices— and have the capacity to maintain and replace these devices if needed.

Skills and training: Residents have the ability to make full use of the often-complex functions of computers and online resources—and thus can use these tools to communicate, work, learn, attend medical appointments, tend to bills, get public safety updates, and avoid online harms. Digital literacy training is widespread and available for residents to obtain and maintain these skills.

With respect to the County's core considerations—including the extent and quality of broadband infrastructure; the available broadband resources' efficacy; the nature and extent of the unserved/underserved population; long-term broadband speed and technology needs; and infrastructure development and internet service delivery options—CTC's study for the County will capture necessary components of data retrieval and analysis.

Our steps include:

1. Identify Needs: To immediately assess, determine, and identify the County's broadband needs through utilizing data collection and analysis.

2. Evaluate Models: To distinguish and evaluate the efficacy of implementation & policy-related models for the County's digital access priorities and needs.

3. Determine Recommendations: To provide strategic, realistic recommendations to support the implementation of the County's broadband expansion efforts.

4. Develop Inclusive Planning Materials: To develop accessible and productive planning materials that inclusively engage the region's public servants, stakeholders, and community members.

5. Strategize Long-term Sustainment: To maximize and solidify the longevity and sustainment of Arlington's Digital Equity goals through long-term planning and process-building.

We will begin the study with efforts to gather initial data, capitalize on existing incumbent service availability, and develop potential solutions for serving unconnected residents. We will then conduct research to identify, quantify, and understand the nature of the digital divide affecting the Arlington County community, with a goal of developing a long-term strategy that effectively evaluates what types of models will be sustainable.

As detailed in the following sections, our efforts will cater directly to the County's digital equity goals through the establishment of strategic analysis and inclusive planning. We will:

- Conduct research regarding what segments of the community lack broadband availability or face challenges with respect to affordability, including how many residents do not use broadband—and the reasons why this is the case.

- Evaluate implementation and policy-related models based on their fit for the County's existing infrastructure, needs, and the assessments that CTC and HR&A conduct.

- Perform outreach to the private sector to understand how planned private efforts may serve to address gaps absent in current efforts; and what kind of effort(s) by the County could serve to enable or incent the private sector to better address these gaps. Additionally, we will strategize on the potential for public-private collaboration going forward.

- Gather data on the device and skills gaps that residents face that limit their ability to make the most effective use of broadband and computers; what programmatic efforts already exist to address those problems; and develop recommendations with respect to best practices on interventions that will help close these gaps.

CTC will identify specific actionable strategies with the following questions in mind:

- Infrastructure: Are there targeted infrastructure solutions that would be well-suited for Arlington County, such as in public housing developments or low-income neighborhoods where high-speed broadband infrastructure may be lacking?

- Affordability: Are the subsidy solutions, such as finding ways to boost enrollment in Verizon or other internet service providers, or identifying a bulk-purchase option that could allow a single payer to cover a housing development or other discrete group?

- Programmatic: Are there programmatic solutions that could be initiated, such as a device provision or skills training program?

The data and analysis we develop will subsequently inform, among other key deliverables listed below, our development of a written report containing a comprehensive plan intended to sustainably bridge the digital divide.

Element 1: Resource Evaluation and Needs Assessment

To assess the current and future needs of broadband for businesses, organizations, anchor institutions throughout Arlington County, the CTC team will perform the following tasks that will align with the County's digital equity goals and Racial Equity Assessment. Specifically, HR&A will be responsible for carrying out these tasks, with the exception that CTC will handle the survey task specified in Task 3.

Task 1: Strategic Planning Workshop

In initiating the engagement, **we will lead a strategic planning workshop** with Arlington County's project team and key stakeholders identified by the County.

The goal of the workshop—and the value in all participants of committing their time—will be to define the project's goals and parameters; by doing so, we will ensure that our work is aligned with the County's vision, inclusive of all project team members, local stakeholders, and community members & residents.

Among the questions we will seek to answer are the following:

1.   What are the respective roles of Arlington County, and the other stakeholders as we design and plan technical and programmatic approaches for addressing digital equity gaps?

2.   What data does the County possess about the scale of the problem—and on the several questions listed in the County's RFP?

3.   What efforts are already underway to address the four elements of digital equity—including device and skills programs—and what data exists about these efforts and any unmet need?

4.   What maps, data, studies, and other relevant materials can the County or each stakeholder provide to CTC?

Task 2: Stakeholder engagement and report

We will then develop a detailed information request—designed to gather insights on the full range of broadband gaps of interest to the County, including relevant questions for stakeholders outlined in the RFP—and share this document with the County for comment and refinement. With the consulting team's assistance as needed, the County will then be responsible for distributing the final approved information request to stakeholders chosen by the County. The consulting team will also participate in up to seven stakeholder meetings. The County is responsible for scheduling the meetings and inviting participants. We will then work from the written responses to draft a report from this process and submit a draft to the County. Further, we will then improve this document based on any written feedback we receive from the County. With respect to households, the consulting team will conduct the mail survey described in Task 3.

Task 3: Conduct a Mail-Based, Scientific Survey for Digital Equity Data Collection and Analysis

In CTC's extensive experience, infrastructure-based solutions to the digital divide are critical, but at the same time, access to broadband service itself may not be sufficient to fully bridge the digital divide. We know from 20 years of data and experience that there are other factors at work that preclude the participation of some American families—most of them experiencing severe socio-economic disparities—in the digital economy.

Indeed, given the likelihood that many intended beneficiaries of an effort to close the digital divide in Arlington County will be low-income residents, a critical set of question arises: What level of service and equipment fees would be a barrier to those residents' adoption of services? Is lack of ease with computers and the internet interfering with the ability of families to use broadband for basic life functions? And does the cost and complexity of owning a broadband-enabled device, such as a laptop or tablet, reduce use of the internet?

This recommended methodology is designed to enable collection of data that will illuminate to what degree these factors are present in the Arlington County area, how these factors relate to each other, and how they can be alleviated through targeted strategies designed to provide (1) service access; (2) devices; and (3) training and support.

We will perform a mail-based random sample survey of 7,500 households from two groups – one from residents of <$50,000 income and the other from those with an income level of $50,000+. This statistically valid survey approach can provide a baseline for measuring changes going forward, including the impact of future efforts and interventions for the residents of the County. Based on our experience we anticipate—but do not guarantee—a response rate of 400 responses per group. This would provide results with a +/- 3.5 percent confidence at a 95% probability level for n=800.

The mail survey will be designed to gather data on barriers to accessing and using broadband, computers and other devices, and online resources. The questions will also be designed to understand what kinds of training might be helpful and if there exist language or cultural barriers to digital learning. The survey will be 16 pages, in booklet format and printed in English. If additional pages or languages are required, we will provide a custom quote for the additional cost. (In terms of translation services, the County also has the option of fielding requests for translations and providing translation support directly as needed.) The County will have an opportunity to review and comment on the survey instrument prior to mailing.

The survey will require an estimated 10 minutes to complete. To encourage participation, the survey will be printed as a booklet (which enhances readability) and mailed in a non-standard sized envelope (which increases the likelihood that it will be noticed and opened by the recipients).

We will manage all aspects of survey distribution, return mailing, processing, and data analysis. Survey responses will be entered into a database format and analyzed. The raw data will be reviewed and processed following our standard data-cleaning protocol. This might include coding missing responses, establishing new response categories, verifying skip logic, and other steps necessary to ensure a clean and valid dataset.

Data analysis will include, at minimum, development of frequency tables for all responses and selected cross-tabulations and/or comparisons of mean ratings by geographic area and key demographics. We will seek to identify key target segments by examining demographic, income, and other relevant drivers.

One key goal of this effort is to determine how many low-income residents use subsidized internet access services, how many are eligible but not using the programs, and what barriers to awareness and adoption may exist that could be addressed through targeted interventions.

Our deliverable for this task will be a comprehensive written summary that describes the data collection processes, results, and analysis. The report will include a detailed narrative analysis, supported by extensive tables, maps, and charts that illustrate the survey findings. We will provide the County with an electronic draft of our report, incorporate your feedback, and deliver an electronic version of the final report. We will also make available electronic copies of the raw data so that they can be archived and utilized in the future as a baseline for measuring progress and changes.

Element 2: Model Evaluation

To evaluate infrastructure- and policy-related models for meeting the County's digital access priorities and needs, the consulting team will explore the range of topics listed in the County's RFP, as well as components included below. We will also provide the County with a structured model evaluation that considers existing infrastructure, efficacy and cost.

Task 1: Perform High-Level Assessment of the Broadband Infrastructure and Market

With the survey underway, we will seek to understand whether broadband is uniformly available in the County—the "access" of the digital equity framework. Federal Communications Commission Form 477 data is known to overstate broadband availability, because if even one address can be served within a census block, the entire block is regarded as served. We will evaluate the Form 477 data, as well as other relevant data sources, and prepare a high-level assessment of the regional broadband marketplace and infrastructure. Specifically, we will:

- For more than a decade, our firm has assisted the County with cable franchise management and technical review of the existing cable franchise agreements. We will review existing cable franchise agreements to identify where the cable companies are obligated to build and where, if any, lower population density has resulted in them not having an obligation.
- We will consult the providers retail websites by entering up to 20 addresses in various parts of the area to see what level of service is offered and what prices are charged; in our experience, DSL speeds can vary widely in a given jurisdiction, and in many cases, the service falls far below broadband speeds.
- We will review relevant maps, studies, reports, documents, surveys, or other data that the County and its partners share that sheds light on service availability and its subsequent impact on digital equity gaps.

Task 2: Recommend Long-term Planning for an Infrastructure-Based Approach to Closing the Divide Among Arlington County Households

If our research finds gaps in high-speed broadband infrastructure in parts of the County, we will recommend long-term infrastructure-based solutions for ensuring all households have access to broadband.

Our work in this task will guide the County in making decisions about how to proceed over the long term. We will seek to answer a series of critical questions that will best enable those decisions—including issues such as these:

1. Is broadband infrastructure present in public housing developments, subsidized housing, and low-income neighborhoods?

2. Is there a long-term infrastructure solution that can incorporate some or all of the short-term efforts put in place to deal with connectivity needs during the coronavirus crisis?

3.   Are there partner entities that could contribute funding or in-kind support to an infrastructure solution, either one time or as an ongoing commitment?

4.   Could federal grant funds be accessed, and how would that affect sustainability?

At a high level, this task will entail a methodical process of data collection, analysis, and planning, which aligns with the research and deliverables sought by the County:

Evaluation of available broadband-enabling infrastructure. The consulting team will review any broadband-enabling assets and other critical infrastructure to support efforts in service of closing the digital divide. We will review maps, datasets, and related material to be provided by the stakeholders, and will evaluate the ways in which the County can best capitalize on these physical assets. The data and analysis we develop will inform our potential technical solutions.

Fiber and wireless network engineering. CTC's engineers will work with the County to develop a high-level candidate design and cost estimate for a fiber and fixed wireless network that might fill identified broadband access gaps. This generally means areas not already served by a provider, but the County may wish to evaluate the costs of, for example, providing a second, free service in public housing.

This technical solution will be aligned with the requirements and governance framework identified in the strategic planning workshop and will include physical assets identified as available by the County.

To be clear, we will not provide a blueprint-level network design. Rather, the deliverable will be appropriate for this stage of planning: conceptual design, high-level maps, and system-level overview of the potential infrastructure—which in turn will become a roadmap for future decisions. Our engineers will develop a high-level estimate of likely capital costs for phased construction of the candidate infrastructure. We will also estimate the solution's ongoing network operation costs to illustrate the project's long-term requirements.

We will clearly identify the assumptions underpinning both the capital and operating cost estimates. These will include a range of factors affecting network deployment costs, from the percentage of aerial and underground utilities in a given neighborhood to the number of wireless access points needed to serve an apartment building (and the lifecycle and replacement costs for that equipment).

Our goal here will be to determine whether there is a path toward at least partial funding for an infrastructure-based solution that addresses the digital divide. To make the funding strategy more actionable, we will identify the efforts the County would need to undertake to engage each funding option.

Task 3: Identify Applicable Funding Options for Project Implementation
We will provide the County with information about current federal and state grant and loan programs for which it might be eligible (alone or in partnership with a private entity).

Public sector broadband network deployments reflect both an ambitious vision and, often, a public commitment to financing broadband access for all citizens. Many local governments have pursued grants or loans, taken out bonds, or otherwise sought funding for construction of publicly owned fiber networks.

We will help the County develop realistic options for federal, state, or regional funding. We will draw on our hands-on knowledge of broadband funding opportunities and our ongoing research in this area—particularly the many broadband funding allocations in the American Rescue Plan Act—to conduct a high-level evaluation of existing and pending state and federal grant programs that the County government, a partner, or a combination of applicants might consider. Our goal in this task is to help the County determine whether there is a path toward at least partial funding for broadband deployment to unserved and underserved residents.

Task 4: Develop a Candidate Business Model

In consultation with the County, and drawing on our experience both advising municipal operators and developing public–private partnerships (P3) and other collaboration approaches for local governments,[1] we will recommend a business model for the County's consideration.

We will consider partnerships with public, private, and membership-owned companies—and existing public and private networks—in the City's project service area. These potential partners may include electric utilities, incumbents, and competitive service providers.

We will consider, at a high level, issues related to risk, benefits, and control. We will focus on determining what role the County would play and what role the private sector would play in addressing broadband needs. At a more granular level, we will work with the County to frame the key technical and business deal points of a collaboration with a private partner.

Notably, we have singular experience in developing broadband P3s on behalf of public sector clients. For example, we assisted the governments of Garrett County, Maryland, the Town of Holly Springs, North Carolina, and the City of Westminster, Maryland in identifying private partners to assume operating risk in providing services to the public. In each case we developed partnership models and technology strategies aligned with the unique needs of these communities.

Our goal in this task will be to identify an approach that minimizes the County's costs and risks while achieving the County's broadband goals—and that positions the County (and its potential partner, if that is the approach the County chooses) to develop a strong grant application.

Task 5: Develop Financial Analysis and Business Plan

Our business analysts will next develop a business case and financial model based on the high-level engineering and cost estimates developed in Task 4, the business model identified in the previous task, and direction provided by the County.

We will build into the plan our strategies for the initial and ongoing provision of service, including routine maintenance, emergency repairs, and equipment refresh cycles.

Our focus here will be on making the County investment in broadband infrastructure as modest as possible, and using it to leverage the largest possible private sector investment (whether from incumbent providers, new competitive entrants, or a non-traditional service provider) in last-mile broadband service to underserved parts of the County.

The business case will evaluate and describe the critical operational benefits that can be delivered by the fiber network, including avoided costs and other savings to the County over time; economic development and community benefits; public safety communications reliability; and infrastructure resilience and reliability.

The financial model for the County's proposed fiber construction will include all the data developed during the engineering and cost estimation phases of this project, as well as additional costs, such as financing, operations, maintenance, and management.

We will develop a narrative regarding operational attributes and processes including policies, staffing levels, maintenance agreements, and other considerations. We will pay particular attention to financing and funding sources and approaches and to the potential impact of federal and state grants (or other federal funding streams) on the business model and financial forecasts.

Our analysts will discuss and provide cost estimates for operating requirements and working capital projections. They will also develop a strategy and cost estimates for fiber maintenance and management based on best practices and the particular circumstances in the County.

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[1] CTC President Joanne Hovis authored "The Emerging World of Broadband Public–Private Partnerships: A Business Strategy and Legal Guide"—a seminal work published by the Benton Foundation (https://www.benton.org/sites/default/files/partnerships.pdf).

The model's assumptions will be clearly stated. The model will be designed to provide the County with an order-of-magnitude estimate of the overall project cost.

Task 6: Assistance in Contract Negotiations with Incumbent Providers to Subscribe Families to Wireline Services

We will also immediately work with Arlington County to engage with incumbent telecommunications providers on efforts to make them a part of the solution. Specifically, we will:

- Draft a letter and facilitate other communications between Arlington County and incumbents' representatives seeking their cooperation in increasing outreach to eligible families to facilitate enrollment in programs for low-income households, such as Comcast "Internet Essentials" (We also note that as part of our survey task, we will include questions designed to learn whether local families are aware of these programs, are enrolled, or have sought to enroll, but were declined.)

- Request from relevant providers their terms for any proposed bulk purchase on the part of the County (or other entity) so that the County can understand its options with respect to purchasing broadband services on behalf of local residents without going through the often-cumbersome process of submitting individual applications for low-cost programs.

Element 3: Strategic Recommendations

To determine strategic recommendations for the County's broadband expansion and digital equity efforts, we will utilize the assessments and evaluations listed in our proposal. We will also do the following:

Task 1: Recommend Programmatic Solutions

After we document the extent to which digital divides exist in the County because of affordability, digital literacy, or other existing factors unrelated to the availability of broadband services, we will develop recommendations for programmatic solutions that could complement infrastructure-based approaches.

Depending on the findings, these programmatic solutions may include efforts to

- expand adoption of low-cost services, such as Comcast Internet Essentials.

- create new local subsidy programs (for providers or residents) to make broadband cheaper or free for target communities

- establish or expand skills training and device provisioning to residents in need

- establish or expand loaner programs for laptops and hotspots

- establish a call center to assist residents in navigating subsidy, device, and skills programs

We also may recommend ways for the County to engage with nonprofits and foundations to assist in launching or expanding programs aimed at closing digital literacy and device ownership gaps.

We might also recommend partnership approaches in which the County allows access to public assets, such as conduit and fiber by private ISPs that agree to provide services that meet County goals; or other efforts that might lower barriers and promote broadband adoption.

Task 2: Conduct Funding Analysis and Recommend a Grant Strategy

We will develop a realistic strategy for seeking funding for the candidate infrastructure solution and other potential efforts to address the County's broadband goals. We will draw from our hands-on knowledge of broadband funding opportunities, including the federal E-rate program and various grant programs; and will evaluate other State and federal grant programs for which the County and its potential partners might qualify. We will also seek to identify potential support from philanthropic entities.

Our goal here will be to determine whether there is a path toward at least partial funding for an infrastructure-based solution that addresses the digital divide. To make the funding strategy more actionable, we will identify the efforts that the County would need to undertake to engage each funding option.

Element 4: Development of Project Deliverables

We concur with providing project deliverables as outlined in the County's RFP.

Optional Task: Assistance in RFI or RFP Development and Vendor Selection for Long-Term Infrastructure Solutions

Following the County's determination of a long-term infrastructure solution approach, we will prepare the technical portions of a request for proposal (RFP) or request for information (RFI) that the County or a partner will issue to identify a construction vendor. This document will clearly define the requirements, parameters, and expectations for the engineering, construction, operation, and maintenance of the planned solution.

Following release of the RFI or RFP we will develop a scoring matrix, review all proposals or information submittals, and make recommendations regarding which respondents merit consideration and further negotiation. We will present a short list of finalists, along with our analysis of their strengths and weaknesses.

We can also be an active participant in finalist negotiations—including in the development of term sheets and other technical elements of a final contract between the County and the selected partner. We anticipate this task might also include developing and negotiating agreements among school districts and governmental agencies.

This task is optional and, if appropriate, will be performed at the project team's hourly rates.

Anticipated Challenges and Solutions

With keen attention to the specific needs of Arlington County as a city with a diverse population, CTC and HR&A will prioritize the safety and participation of all who are involved. *Covid-19* is a key consideration for safety of all personnel involved in the broadband study process. To this accord, we will host the majority of our meetings virtually as the public health situation is subject to changes in state and local guidance. For those who suffer from socioeconomic disparities, cost and transportation may be a barrier for some residents to participate in certain activities; in this case, we will recommend how best to support the population in their participation.

Onsite Visits and Local Stakeholder Collaboration

CTC and HR&A will prioritize the safety of all participants and follow local and state guidelines for meetings hosted during the Covid-19 pandemic. Activities will be held majority virtually. Meetings held in-person will depend on the viability of such tasks and change at the discretion of involved personnel.

Subcontractors

HR&A will be subcontracting to CTC on specific tasks. These tasks are detailed in Section 2.

2 Project Schedule

2.1 Proposed Project Timeline

CTC and HR&A propose a nine-month timeline. We will have our strategic planning meeting within two weeks of contract award. We will then follow the timeline outlined in the chart below.

Element/Task	Month (Deliverable Submission Date after Contract Issuance)									
	1	2	3	4	5	6	7	8	9	10
Task 1.1: Strategic Planning Workshop	▓									
Task 1.2: Stakeholder engagement report	▓	▓	▓	▓	▓					
Task 1.3: Mail-based Survey	▓	▓	▓							
Task 2.1: Perform High-Level Assessment of Broadband Infrastructure and Market	▓									
Task 2.2: Recommend Long-term Planning for an Infrastructure-Based Approach	▓	▓	▓	▓	▓	▓				
Task 2.3: Identify Applicable Funding Options for Project Implementation	▓	▓	▓	▓	▓	▓	▓			
Task 2.4: Develop a Candidate Business Model	▓	▓	▓	▓	▓	▓	▓			
Task 2.5: Develop Financial Analysis and Business Plan	▓	▓	▓	▓	▓	▓	▓	▓	▓	
Task 2.6: Assist in Contract Negotiations	▓									
Task 3.1: Recommend Programmatic Solutions	▓	▓	▓	▓	▓	▓	▓	▓	▓	
Task 3.2: Conduct Funding Analysis and Recommend a Grant Strategy	▓	▓	▓	▓	▓	▓	▓	▓	▓	

3 Project Cost

3.1 Project Fee Summary

The CTC team proposes to perform the tasks described in the Scope of Work (see Section 2 above) for a not-to-exceed cost of $300,000. We will bill our work at the following hourly rates inclusive of travel and other expenses. We reserve the right to move hours among tasks as needed while staying within the total project budget.

Labor Category	Hourly Rate	Total Hours
CTC		
Chief Technology Officer	$225	
Director of Business Consulting	$225	
Vice President	$200	
Director	$200	
Principal Engineer	$200	
Senior Engineer	$175	
Staff Engineer	$155	
Principal Analyst/Research Director	$200	
Senior Analyst	$175	
Staff Analyst	$155	
Aide	$80	
HR&A		
Managing Partner	$450	
Senior Analyst	$255	
Research Analyst	$160	

Hours	Staff	Task 1.1	Task 1.2	Task 1.3	Task 2.1	Task 2.2	Task 2.3	Task 2.4	Task 2.5	Task 2.6	Task 3.1	Task 3.2
	CTC											
50	Chief Technology Officer	2				12		4	8	10	6	
69	Director of Business Consulting	5		6			6	5	15	12	10	10
51	Vice President	5		4	5	10	6	6			5	10
50	Director	5		4	5	8	8	8			6	6
100	Principal Engineer	5				60		30	10			
70	Senior Engineer					40		20	10			
58	Staff Engineer					28		20	10			
298	Principal Analyst/Research Director	5		150	35		20	16	16	16	24	16
92	Senior Analyst			20	20	6	6	8	12	6	8	6
90	Staff Analyst			20	20	6	6	8	12	6	8	4
	Aide											
	HR&A											
66	Managing Partner	5	6	6	4	6	6	8	8	8	6	3
220	Senior Analyst	5	40	16	15	24	30	15	30	4	26	15
227	Research Analyst	5	50	12	20	16	30	15	30	4	30	15

3.2 Acknowledgment

We acknowledge that any final price per Task/Element will be subject to a cost reasonableness determination and negotiation.

3.3   Proposed Payment Schedule

We propose that the project payment schedule will coincide with the receipt of each project deliverable outlined in Section 2.

4   Organizational Experience and Capacity

CTC is an established, woman-owned consulting firm that offers a unique combination of qualifications and capabilities in wireless and fiber broadband engineering, financial analysis, business planning, strategic planning, E-rate and grant funding strategy, and project management. We conduct needs assessments, market research, and feasibility analyses (technical and financial), and support clients through all phases of procurement, vendor selection, negotiation, and construction oversight.

Founded in 1983, we have decades of experience providing independent technical, financial, and strategic guidance for public and non-profit communications networks, including those of K-12 school systems, local and state governments, non-profit consortia, universities, and municipal utilities. We offer a unique set of capabilities:

We are independent and have no conflicts of interest with vendors, ISPs, or any representative of the County, local government, or school entities.

We have developed broadband analyses for many of the leading cities in North America, including San Francisco, Seattle, Boston, Atlanta, Portland, Boulder, Palo Alto, and Tacoma. We understand local and national internet service provider (ISP) markets and digital divide issues.

We have designed, engineered, and overseen the construction of thousands of miles of outside plant, as well as citywide and localized wireless networks, for public sector clients nationwide including Arlington County and surrounding areas.

We have strong experience in planning and deploying wireless technologies to meet County and localized needs. Our expertise includes wireless coverage mapping, spectrum analysis (licensed and unlicensed), technology selection, network design, and FCC spectrum-related regulations. We have worked extensively with the range of established and emerging technologies, from commonly deployed equipment to emerging Citizens Broadband Radio Service (CBRS), millimeter wave, prototype 5G, and TV White Spaces applications. We have a demonstrated understanding of federal telecommunications regulatory requirements.

We have strong but independent relationships with technology vendors, particularly those that are offering new solutions for delivering broadband services.

We are expert advisers on federal broadband grant and loan programs, and the E-rate program for schools and libraries. We routinely evaluate our public sector clients' opportunities for funding—and develop technical solutions and grant funding strategies.

We deliver presentations and written deliverables that are deeply detailed yet accessible to a lay audience. We have decades of experience presenting to executive committees, elected officials, and the public.

4.1   CTC and HR&A Qualifications and Experience

CTC Experience
The following projects illustrate CTC's qualifications and experience. Many additional examples are available on request.

New York City
Working in collaboration with a project team and a range of City stakeholders, CTC delivered strategic planning, technical analysis, and fiber and wireless engineering expertise to support New York City's efforts to develop a citywide broadband

solution—as documented in its "Internet Master Plan."[2] We conducted field surveys, developed typologies to categorize City neighborhoods, developed candidate wireless and fiber solutions, and recommended state-of-the-art wireless technologies for pilot testing. In July 2020, the City announced a $157 million investment in broadband infrastructure to serve low-income and other underserved residents—based on CTC's engineering and strategic approach.[3]

City and County of San Francisco

CTC has advised San Francisco on fiber and wireless broadband planning for a dozen years—most recently completing an innovative evaluation of options for an integrated Smart Cities wireless and fiber communications strategy to meet the City's public safety and municipal communications needs (June 2020). Notably, we evaluated the feasibility of deploying a city-run LTE or 5G network using CBRS technologies. We also surveyed and inventoried a sample of the city's call boxes, outdoor public warning system, Wi-Fi, and fiber infrastructure in coordination with the City's Department of Technology, Public Works, Public Utilities Commission, and Municipal Transportation Agency.

CTC previously completed a major broadband strategic planning project with the City. We provided strategic, financial, and technical advisory services as part of a broad effort to analyze the City's broadband options. That project culminated in the delivery of a major study in 2018.[4]

In another strategic initiative, CTC assisted the City in developing and evaluating options for backhaul to deliver City-operated Wi-Fi service to the public and to residents of public housing.

City of Baltimore

Over the course of a year-long engagement, CTC's engineers and analysts developed a broadband strategic plan to guide the City's future broadband planning and investments, and to enable the City to maximize its existing infrastructure. Among the key issues we investigated was the community's needs related to broadband access, and the reasons for those gaps. We developed a range of candidate technical solutions and partnership approaches to address the City's digital equity goals, including a fiber and wireless design for bringing free broadband access to low-income residents living in public housing buildings.

Arlington County, Virginia

Leveraging CTC's experience with connectivity needs in the County and the design and implementation of ConnectArlington, CTC conducted a study in 2021 for two local nonprofit housing providers. The focus was to develop a high-level technical approach and cost estimate for delivering internet connectivity to affordable housing in Arlington. The study estimated costs to install fiber from ConnectArlington to approximately 69% of Arlington's affordable housing properties and to connect each of the properties' units to Wi-Fi or fiber. The report offers a high-level engineering, market, and policy analysis to the nonprofit providers.

Pierce County, Washington

CTC recently completed a project with Pierce County—which has a population of about 900,000 residents—to develop a strategy to secure federal and state grant funding based on rigorous data collection and the identification of well-defined service areas. Our approach includes first developing reliable broadband availability data to give the county a better understanding of where gaps exist and to determine grant eligibility. CTC is working to map the areas of the county where broadband is deficient using several sources of data. In addition, CTC is hosting an online speed test and helping to launch a promotional program that will generate detailed address-level data about broadband gaps in the county. Together, these data will serve as a foundation to develop potential technical solutions that could form the basis for a strong grant or loan application and a future private partnership.

CTC is also now completing similar projects for Howard County, MD; Lancaster County Economic Development Company (PA); and other jurisdictions.

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[2] https://www1.nyc.gov/assets/cto/#/project/internet-master-plan
[3] https://www1.nyc.gov/office-of-the-mayor/news/499-20/mayor-de-blasio-taskforce-racial-inclusion-equity-accelerated-internet-master
[4] http://www.ctcnet.us/publications/fiber-for-san-francisco-initiative-the-potential-for-ubiquitous-open-fiber-to-the-premises-in-san-francisco/

City of Cambridge, MA

The City of Cambridge commissioned CTC to conduct a digital equity study to develop data and strategies. The goal of the study was to develop a full and clear understanding of all problems affecting the ability of residents to obtain and effectively use broadband and to suggest a range of solutions. [The report can be found here](#).

HR&A Experience

The following are project experience summaries regarding projects for HR&A.

George Mason University Innovation Consortia

HR&A advised George Mason University (GMU) on a strategy to increase innovation-based economic growth throughout Northern Virginia, leveraging GMU's three campuses in Arlington, Fairfax, and Manassas. HR&A assisted GMU by: defining the key sectors and occupations constituting the innovation economy; analyzing local demographic and socioeconomic conditions, including populations that have historically been left out of the innovation economy; engaging and synthesizing feedback from interviews with nearly forty innovation stakeholders from across Northern Virginia; developing case studies of best-in-class innovation districts to identify recommendations for the governance, funding, and implementation of a new GMU-led Partnership for inclusive innovation; and identifying key short-term actions that the Partnership could take.

George Mason University Digital Innovation Hub

HR&A is advising George Mason University (GMU) on the programming, financing, and redevelopment of its Arlington Campus into a Digital Innovation Hub in support of the Commonwealth of Virginia's successful pursuit of Amazon's HQ2. The Digital Innovation Hub will support key academic programs in computing and related data analytics offered through the Schools of Engineering, Business, Law, and Policy and Government, as well as the College of Science. HR&A is assisting GMU to refine the vision for the property, engage potential stakeholders in the technology industry, and evaluate funding strategies for the proposed facilities to anchor the campus alongside an expanded School of Computing.

National Landing Market and Economic Impact Analysis

On behalf of the National Landing Business Improvement District (BID), HR&A conducted a market and economic impact study and developed strategies for the growth of an innovation district. National Landing is an increasingly dynamic, mixed-use neighborhood selected for Amazon's HQ2 in 2018. HR&A conducted an analysis of recent market and employment trends and assessed the neighborhood's future trajectory, which will be driven by 20,000 new Amazon jobs, a Virginia Tech innovation campus, cutting-edge smart city investments, and $4B in planned infrastructure improvements. Leveraging national case studies, HR&A helped the BID understand National Landing's strengths, challenges, and opportunities with respect to becoming a regional innovation district. HR&A crafted strategic, actionable recommendations for programmatic investments to help support the creation of a dynamic, premier innovation districts. In addition to these strategic recommendations, HR&A analyzed the economic and fiscal benefits generated by the neighborhood today and those to be generated by future development to make the case for public sector investment and support.

DC Tech Pathways to Inclusion Study, Washington, DC

On behalf of the Washington D.C. Economic Partnership (WDCEP) and the Office of the Deputy Mayor for Planning & Economic Development (DMPED), and in collaboration with OHUB and Brick & Story, HR&A is conducting a comprehensive assessment of the state of inclusion in the local tech ecosystem and developing strategies for fostering greater equity for women, LGBTQ residents, differently abled residents, and people of color. In collaboration with Brick & Story, HR&A conducted interviews and roundtables with over 50 stakeholders from representing workforce, entrepreneurship, market capital, education, and early exposure in tech. Building on the 2016 Pathways to Inclusion report, this research will culminate in new and revised strategy recommendations for enhancing inclusion in Washington D.C.'s tech economy.

Fairfax County Economic Recovery Framework, VA

HR&A worked with Fairfax County and the Fairfax County Economic Development Authority to develop an Economic Recovery Framework – a document that reflects the key needs and challenges the county's workers, businesses, and residents face in recovering from the COVID-19 pandemic and that includes a roadmap to guide an equitable recovery. HR&A estimated the impact of the COVID-19 pandemic on the local economy by analyzing job losses through the end of 2020 in aggregate, by industry, and by worker demographics. To identify specific needs and challenges to which recommendations should respond, HR&A interviewed County staff, local small businesses and business support organizations, local non-profit service providers, and local and regional institutions, and collected responses to an online questionnaire. The implications of these challenges on the economy were analyzed by the HR&A team to inform recommendations that would both support and accelerate economic recovery and increase economic opportunities and equitable outcomes throughout the county. HR&A's final recommendations focused on: programs to support business

recovery and plan for future resilience; regulatory actions that improve the business environment in the county, particularly for local and minority-owned businesses; programs that link job seekers with employment and increase economic opportunity; interventions that support workers and their families, creating a positive ripple effect throughout the economy; and the creation of teams to address specific challenges to economic recovery in different parts of the county, recognizing the disparities that exist along racial and economic lines and the level of effort required to narrow individual, business-level, and community-level economic outcomes. These recommendations supported the County's prioritization of resources for new programs and partnerships to support recovery.

4.2   Project References

We invite you to contact the following references for CTC and our team regarding the depth of our analysis and our commitment to meeting our clients' needs:

New York City

Joshua Breitbart
Former Deputy Chief Technology Officer
(347) 242-1170, Joshua.Breitbart@gmail.com

Working in collaboration with a project team and a range of City stakeholders, HR&A and CTC delivered strategic planning, technical analysis, and fiber and wireless engineering expertise to support New York City's efforts to develop a citywide broadband solution—as documented in its "Internet Master Plan."[5] We conducted field surveys, developed typologies to categorize City neighborhoods, developed candidate wireless and fiber solutions, and recommended state-of-the-art wireless technologies for pilot testing. In July 2020, the City announced a $157 million investment in broadband infrastructure to serve low-income and other underserved residents—based on CTC's engineering and strategic approach.[6]

City and County of San Francisco

Brian Roberts
Senior Policy Analyst, Dept of Telecommunications & Information Services
(415) 581-4061, brian.roberts@sfgov.org

CTC has advised San Francisco on fiber and wireless broadband planning for a dozen years—most recently completing an innovative evaluation of options for an integrated Smart Cities wireless and fiber communications strategy to meet the City's public safety and municipal communications needs (June 2020). Notably, we evaluated the feasibility of deploying a city-run LTE or 5G network using CBRS technologies. We also surveyed and inventoried a sample of the city's call boxes, outdoor public warning system, Wi-Fi, and fiber infrastructure in coordination with the City's Department of Technology, Public Works, Public Utilities Commission, and Municipal Transportation Agency.

CTC previously completed a major broadband strategic planning project with the City. We provided strategic, financial, and technical advisory services as part of a broad effort to analyze the City's broadband options. That project culminated in the delivery of a major study in 2018.[7]

In another strategic initiative, CTC assisted the City in developing and evaluating options for backhaul to deliver City-operated Wi-Fi service to the public and to residents of public housing.

City of Baltimore

Kenya Asli
Director of Strategic Initiatives
Baltimore City Office of Information & Technology (BCIT)
(443) 833-2933, KenyaN.Asli@baltimorecity.gov

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[5] https://www1.nyc.gov/assets/cto/#/project/internet-master-plan
[6] https://www1.nyc.gov/office-of-the-mayor/news/499-20/mayor-de-blasio-taskforce-racial-inclusion-equity-accelerated-internet-master
[7]   http://www.ctcnet.us/publications/fiber-for-san-francisco-initiative-the-potential-for-ubiquitous-open-fiber-to-the-premises-in-san-francisco/

Over the course of a year-long engagement, CTC's engineers and analysts developed a broadband strategic plan to guide the City's future broadband planning and investments, and to enable the City to maximize its existing infrastructure. Among the key issues we investigated was the community's needs related to broadband access, and the reasons for those gaps. We developed a range of candidate technical solutions and partnership approaches to address the City's digital equity goals, including a fiber and wireless design for bringing free broadband access to low-income residents living in public housing buildings.

Pierce County, Washington

Hugh Taylor
Senior Legislative Analyst, Pierce County
(253) 798-3665, hugh.taylor@piercecountywa.gov

CTC worked with Pierce County—which has a population of about 900,000 residents—to develop a strategy to secure federal and state grant funding based on rigorous data collection and the identification of well-defined service areas. Our approach includes first developing reliable broadband availability data to give the county a better understanding of where gaps exist and to determine grant eligibility. CTC is working to map the areas of the county where broadband is deficient using several sources of data. In addition, CTC is hosting an online speed test and helping to launch a promotional program that will generate detailed address-level data about broadband gaps in the county. Together, these data will serve as a foundation to develop potential technical solutions that could form the basis for a strong grant or loan application and a future private partnership.

City of Cambridge, MA

Lee Gianetti
Director of Communications
(617) 349-3317, lgianetti@cambridgema.gov

The City of Cambridge commissioned CTC to conduct a digital equity study to develop data and strategies. The goal of the study to develop a full and clear understanding of all problems affecting the ability of residents to obtain and effectively use broadband and to suggest a range of solutions. The project team played a pivotal role in providing data and strategic recommendations in the expansion of the City's digital equity efforts. The report can be found here.

4.3   Project Team Bios

Listed below is biographical information on each of the CTC and HR&A project team members. Resumes are included as Attachment 1 to this proposal.

Complete biographical information on each proposed member of the CTC and HR&A project team is included in the resume provided for each person in Attachment 1.

CTC Project Team Bios

Joanne Hovis | President and Director of Business Consulting

Joanne Hovis is a nationally recognized authority on broadband markets and on the evolving role of public–private partnerships in the provision of communications services to the public. For more than 20 years, she has overseen directed CTC's consulting services related to strategic planning, market analysis, business modeling, and financial analysis for localities, states, and tribal governments throughout the country.

Joanne leads the CTC teams that advise the states of Alabama, Connecticut, Nebraska, New Mexico, and New York; the cities of Atlanta, Boston, San Francisco, Seattle, and Washington, D.C.; and the statewide broadband networks in Colorado, Maryland, and Pennsylvania. She also leads CTC's advisory work regarding federal broadband funding programs such as E-Rate, ReConnect, the Connect America Fund, the Rural Digital Opportunity Fund, and the Healthcare Connect Fund.

Joanne is also CEO of the Coalition for Local Internet Choice (CLIC) and a member of the boards of directors of the Benton Institute for Broadband & Society, Consumer Reports, and the Fiber Broadband Association. She is a former president of the National Association of Telecommunications Officers and Advisors (NATOA).

Andrew Afflerbach, Ph. D, P.E. | CEO and Chief Technology Officer

Dr. Andrew Afflerbach specializes in the planning, designing, and implementation oversight of broadband communications networks, smart cities strategies, and public safety networks. His expertise includes state-of-the-art fiber and wireless technologies, the unique requirements of public safety networks, and the ways in which communications infrastructure enables smart and connected applications and programs for cities, states, and regions.

Andrew has planned and designed robust and resilient network strategies for dozens of clients, including state and local governments and public safety users. He has delivered strategic technical guidance on wired and wireless communications issues to cities, states, and national governments over more than 20 years. He has advised numerous cities and states, including New York City, San Francisco, Seattle, Atlanta, Washington, D.C., and Boston, and served as a senior advisor to Crown Fibre Holdings, the public entity directing New Zealand's national fiber-to-the-home project.

Heather Mills | Vice President, Grant & Funding Strategies

Heather Mills has more than a decade of experience in project management and data analysis. She has exceptional skills in long-term strategic planning for broadband funding; execution of complex tactical funding plans; and grant administration, budgeting, and financial reporting. Heather leads the CTC team the develops grant funding strategies and delivers tactical application and post-award support to our public sector clients. She has authored guidance on new and emerging federal broadband funding programs that is highly regarded by industry colleagues.

At CTC, Heather guides clients on strategic funding for network planning, as well as applying for and complying with the requirements of major federal broadband and communications grant programs, including ARC/EDA POWER grants, USDA RUS grants (such as ReConnect and Community Connect), and New Market Tax Credits. She has particular expertise in the Federal Communications Commission's E-Rate program, Lifeline program, and Healthcare Connect Fund.

Ziggy Rivkin-Fish, CGEIT | Vice President, Broadband Strategy

Ziggy Rivkin-Fish has been a business and strategy analyst and project manager at CTC since 2005. He has managed multiple federal-grant-funded interoperability projects that interconnect jurisdictional communications networks, and has led broadband planning, strategy, and feasibility studies for local government clients nationwide. Ziggy has also applied his management, technical, and governance expertise to the implementation of large-scale network infrastructures and has developed governance frameworks to manage small and large public broadband networks. His background in organizational sociology and certification in Governance of Enterprise IT has enabled him to advise multiple clients on structuring their operations to manage IT departments and fiber optic network services.

Ziggy specializes in strategic planning, including public-private partnership analysis and grant strategies. In that capacity, he has led or contributed to numerous projects leveraging federal and state grants to build or expand broadband networks around the country. His recent broadband strategic planning projects include engagements with King County, WA, Pierce County, WA, the State of Alabama, Greene County, PA, the State of New Mexico, Harford County, MD, Charles County, MD, and Queen Anne's County, MD.

Ziggy also leads CTCs digital inclusion and equity team and is both leading projects specifically oriented toward addressing the digital divide and addressing those issues within the context of broadband strategy planning.

Shawn Thompson | Vice President, Analytics

Shawn Thompson is a recognized expert in wireless engineering, radio propagation, and issues related to wireless siting in the public rights-of-way and on private property. He has overseen the design and implementation of more than 1,000 distributed antenna systems nationwide, and has advised wireless carriers such as Sprint, Verizon, and AT&T in solving their indoor coverage and capacity needs.

Shawn manages the CTC teams that provide ongoing wireless facility siting application review services to Montgomery and Prince George's counites in Maryland, and Fauquier and Louisa counties in Virginia. He also supported the State of Texas Department of Transportation (TxDOT) on strategic planning and the development of standards for its wireless facility siting program. Shawn's expertise includes strategic approaches that local governments can take to address the FCC's 2018 preemption Order.

David Talbot | Director of Research Services

David Talbot joined CTC from the Berkman Klein Center for Internet & Society at Harvard University, where, as a fellow researching community networks, he convened local leaders and wrote case studies about municipal fiber business models, paybacks, and pricing.

Dave currently is serving as CTC's project manager for broadband digital equity studies in Cambridge, MA and Waukegan, IL. He also served as the project manager for an I-Net replacement feasibility study for the Town of Milton, MA., and as CTC's local point of contact for fiber strategic planning for Norwich Public Utilities and Hingham Municipal Lighting Plant. He is also supporting other CTC clients around the country on policy studies and other reports.

He is currently chairman of the Reading (MA) Municipal Light Department Board of Commissioners, giving him practical experience in local government and municipal utility governance and management.

Previously, as chief correspondent at MIT Technology Review, the magazine and website owned by MIT, he frequently wrote about internet policy topics, emerging communications technologies, and digital divide issues.

Marc Schulhof | Principal Analyst and Director of Editorial Services

Marc Schulhof has more than 25 years of experience in technical writing, financial journalism, and public and corporate communications. As an analyst and editor, he plays an integral role in developing CTC's client deliverables, including strategic and master plans (business and engineering); needs assessments; feasibility studies; RFPs and RFIs; survey instruments; expert witness testimony; federal and regional grant applications; wireless facility siting reports; E-rate RFPs and bids; research reports; and white papers.

 Over the course of his ten years as CTC's senior technical writer, Marc has supported dozens of CTC clients—including the District of Columbia, the states of Connecticut, Delaware, Kentucky, Maryland, and New Mexico, and the cities of Atlanta, Boston, New York, Palo Alto, San Francisco, and Seattle. He has collaborated on white papers on topics related to fiber optic and wireless technologies, including technical reports filed with the Federal Communications Commission. He is the co-author, with CTC President Joanne Hovis, of "The Emerging World of Broadband Public–Private Partnerships: A Business Strategy and Legal Guide."

Mala Goodrich | Civic Technology Analyst

Mala Goodrich supports CTC clients on grant strategy, grant application, and digital equity engagements. Before joining CTC Mala served as a Business Development Associate for Broadband Breakfast, a news organization covering technology policy and digital equity. She graduated from the University of Virginia in May 2020 with a BA in Media Studies.

Traci Janikowski | Research Director (Clearspring Research)

Traci Janikowski serves as the Research Director at Clearspring Research and on behalf of CTC. Prior to joining Clearspring Research, Ms. Janikowski held management and analyst positions at marketing research consulting firms for nearly 15 years. Ms. Janikowski is an experienced consultant, having directed numerous qualitative and quantitative market research projects to customers in a variety of industries, including telecommunications.

Traci is a trained professional in survey research methodology and analysis, and she is experienced in all phases of the research process. She has assisted clients with assessing attitudes, opinions, and behavior, including brand image and positioning, satisfaction and loyalty, service quality, community needs, employee and member engagement, and customer segmentation studies.

She holds a Bachelor's Degree in Sociology with a Concentration in Analysis and Research, and a Master's degree in Human Relations and Business, a multidisciplinary program in business, communications, and human development. Her expertise lies in combining her knowledge of data analysis techniques with an interest in human behavior to better understand clients' customers, members, or target markets.

HR&A Project Team Bios
Astha Puri | Research Analyst

Astha Puri supports projects with financial analysis, market research, geospatial analysis, and data analysis skills. Her work at HR&A has spanned across real estate advisory, broadband strategy, and impact analysis for public authorities, local governments, and private technology companies across the United States.

Before coming to HR&A, Astha served as high yield debt and leveraged loan analyst at DWS Group, covering companies in the technology and food and beverages industries. Astha also interned with the commercial real estate and mortgage-

backed securities teams. Prior, she completed coursework and internships focusing on economic development in Durham, NC and Detroit, MI.

Carlos Xavier Bonilla | Senior Analyst

Carlos Xavier Bonilla provides a wide range of experience in economic and fiscal impact modeling, market analysis, geospatial analysis, and scripting and workflow automation. He has provided economic consulting services for clients in a variety of different sectors, including economic development, equity and inclusion, transportation and infrastructure, and universities and hospitals.

Prior to HR&A, Carlos served as a Senior Analyst for Econsult Solutions, a Philadelphia-based economic consulting firm. Carlos was the firm's lead for its University and Equity practice areas, focusing on socioeconomic equity and institutions' impact on local economies. Carlos has also worked as a data analyst for Azavea, a civic-minded software company. There he conducted geographic data analysis for local nonprofits to help improve their programming efforts across the city.

Danny Fuchs | Managing Partner

Danny bridges the gap between urbanists and technologists. Integrating technology with city building, he specializes in managing complex and creative urban development initiatives, as well as infrastructure, real estate, planning, and economic development. Danny helps clients succeed by balancing urban economics, public policy, and design considerations to develop and fund vibrant public spaces. His work focuses on strategies for urban tech and innovation implementation, public-private real estate transactions, large-scale capital investment programs, district development strategies and large-scale master plans, open space development and stewardship strategies, and multidisciplinary project management.