Exhibit F

An Engineering Analysis of Public Rights-of-Way Processes in the Context of Wireline Network Design and Construction

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1 Introduction: Public rights-of-way processes represent a minor matter relative to the full effort required for broadband deployment

This report describes, from an engineering standpoint, the permitting process in the context of wireline broadband outside plant design and construction process. The observations in this report are based on Columbia Telecommunications Corporation (CTC) staff-members' decades of expert work building out and overseeing build-out of communications infrastructure across the United States.[1]

The report concludes that accommodating permitting and other local government requirements in public rights-of-way is a relatively small part of the cost and time required for design and construction of outside plant for a communications network. The National Broadband Plan asserts that "[t]he cost of deploying a broadband network depends significantly on the costs that service providers incur to access conduits, ducts, poles and rights-of-way on public and private lands. Collectively, the expense of obtaining permits and leasing pole attachments and rights-of-way can amount to 20 percent of the cost of fiber optic deployment…" This statement – assuming it is accurate - conflates permitting and very different activities associated with obtaining access to utility poles and conduit. Fees charged by local governments in connection with the *deployment* of broadband are a very small portion of the cost of fiber deployment, and certainly nothing close to 20 percent of deployment costs.

As discussed in this paper, the outside plant design and construction process, broadly speaking, involves the work from the time a network engineer receives instructions to construct a particular type of line in a particular community through the time the line is actually built. This is, of course, only a part of the work involved in the overall design of a network. Generally speaking, outside plant design and construction occurs at a point when overall network design and marketing principles are already in place. The decision as to *what* and *whether* to build involves additional time and cost. And of course, with broadband systems, the physical plant "design and construction" are only part of effort required to provide services. The design, installation, and integration of electronics and software add significantly to cost, and affect whether, when and where a company will build a system, and how it will stage construction. In our experience, it is other factors, rather than details within the outside plant and construction process, that drive deployment, and the time required for deployment.

[1] CTC provides technology engineering and business planning consulting services for public sector and non-profit clients nationwide and abroad. Since 1983, CTC has assisted hundreds of public and non-profit entities to analyze technology needs and strategies, plan and design broadband systems, and work with the private sector to meet local broadband and technology needs. This report was prepared by CTC's Director of Engineering, Andrew Afflerbach, Ph.D., P.E., who has 15 years of experience designing and evaluating fiber network design, with the support of CTC's outside plant engineers, who, among them, hold more than 100 years of experience designing and building outside plant for both telephone and cable companies.

In our experience with the communications industry and engineering broadband networks, public rights-of-way acquisition costs represent – in those communities that assess them – a remarkably minor factor in the larger analysis of outside plant design and construction processes and expenses—a cost of a few percent of construction (and thus an even smaller percentage of the total cost associated with planning and implementing a communications network).

Labor and material capital costs for outside plant and construction range from $25,000 to $250,000 per mile, depending on the service area and the type of construction used. In our experience, build-out costs are primarily a function of local labor rates, materials pricing as of the date of construction/integration, the complexity of the terrain, real estate acquisition, whether the construction will be aerial or underground, and the make ready process. By comparison, local permitting fees are a small amount of these costs. Operational costs (depending on the nature of the services provided by the broadband facility) are dominated by programming, Internet backhaul, outside plant maintenance, customer service, and billing.

Nor does the permitting process significantly delay deployment. While every project is different, for aerial construction, it is almost always the case that the majority of time in outside plant design and construction is in fact the make-ready process--coordinating with the pole owner and existing utilities to prepare utility poles for attachment, as described in Section 2.

Where local government rights-of-way permitting time is a significant part of the overall outside plant design and construction process in a typical mixed aerial/underground construction project, it will typically be where special reports, inspections, or approvals are required before a permit may issue—and most of these additional reports, inspections, or approvals are based on state and federal requirements. Special permits or other authorizations are required for crossing railroads, waterways or environmentally sensitive areas, or where federal funding mandates environmental assessments, for example. The time required to obtain the necessary approvals from federal environmental officials that are conditions to the issuance of a permit can double or triple total construction time for a particular project. However, it is very difficult to eliminate the requirement for additional time without harming property, creating significant risks to public safety, to the environment, or to other utilities and critical transportation systems.

To some degree, the impact on construction projects can be mitigated by proper planning, routing, and staging by the owner of the communications network. For example, in our experience, if the network deployers (or their contractors) make an effort to stage the filing of permit applications rather than filing hundreds at one time, the processing burden on the locality is spread over a reasonable period of time. In our experience, localities are very willing to work with deployers to establish timetables and processes for reasonable submission – and reasonable review – of permit applications.

In many localities, local permitting processes and fees do not exist. Either as a matter of local or state policy, many localities—particularly those in rural areas—impose little or no process or fee on use of the public rights-of-way. In addition, in some areas, localities are not engaged in rights-of-way permitting. [2]

In our experience, it is in the most unserved and underserved rural areas where local fees are most minimal or non-existent; for example, traffic control in these areas requires less coordination. Thus, the absence of a process or fees does not, in our experience, encourage the deployment of services—providing further support for our conclusion that the consideration is simply not a relevant factor.

However, we have found that a well-managed process of local oversight of network construction often adds value and plays an essential, enabling role in key processes related to construction of broadband networks, including:

1. Reducing hits and cuts to other utilities located in the rights-of-way—for example, in Anne Arundel County and Howard County Maryland, the local governments intervened to improve quality control and remove contractors when Verizon Communications' construction of FiOS caused massive rights-of-way disruption and damage to existing cable and telecommunications utilities and made the project owners accountable for improving their practices and paying for their damages.

2. Enforcing codes which in turn make the finished construction safer and reduce its aesthetic impact—for example, many local governments monitor electrical and safety code in the rights-of-way and require entities in the rights-of-way to fix safety violations such as improper clearances, relocate enclosures in dangerous locations, and repairing damaged infrastructure.

3. Reducing disruption to roadways and economic activity through coordination of joint builds and enforcement of restoration requirements—for example, notifying service providers and coordinating the "open trench" installation of communications conduit in rights-of-way when road or utility construction is taking place.

4. Providing Geographic Information System (GIS) mapping. One of the significant contributions of many local jurisdictions is the availability of GIS base maps. If these are

[2] For example, in many parts of Virginia, rights-of-way including neighborhood streets are managed by the Virginia Department of Transportation; permitting is all done by the state. However, this is simply a consolidation of major and minor rights-of-way under one roof; a full permitting process still exists.

not available from the jurisdictions they must be purchased commercially or generated by the communications provider itself.

2 Understanding broadband network design processes and costs

Outside plant design and construction includes a number of elements. To illustrate the point, consider a five-mile extension of an existing network. For outside construction to proceed, there should be a project plan that encompasses:

- Field surveys
- Route design
- Make-ready
- Construction drawings
- Permitting and licensing (state and local, as well as special permits for river or rail crossing or environmentally sensitive areas)
- Plans for necessarily equipment, materials and labor, and for integrating the extension with the existing network.

To determine the appropriate routing for a project, engineers obtain GIS information from the relevant jurisdictions, if available and study the maps, including details of roadways, railroads, major highways, street centerlines, "hydro lines" (i.e., creeks, streams, rivers), and "hydro areas" (i.e., wetlands, bodies of water). GIS maps must also be developed, overlaying these features with proposed fiber routes, future fiber routes, future locations, and current locations.

The engineers then conduct a full walk-out of the route and complete site surveys of all proposed customer fiber locations. This is needed to complete the design and preliminarily assess permit needs and initiate the permitting process.

A significant portion of the time expended on a fiber design project must be dedicated to the measuring and drawing of aerial and underground routes and facilities (i.e., the creation of field notes) and the conversion of those field notes to a widely-used format such as AutoCAD or MicroStation.

During the route survey, the engineers must note existing pole lines and potential construction barriers, including obstructions, permitting concerns, and possible improvements. For aerial portions of the route, for example, this would include measurement of span distances and the aerial clearances of electric facilities, and recording details including:

- Pole numbers
- Electrical facilities
- Clearance over roads and bridges
- Span distances
- Guys and anchors

For underground portions of the route, engineers must measure the green space available within the rights-of-way for placement of conduit, and record details including:

- Storm drains
- Edge of pavement
- Water and sewer lines
- Street lights
- Required test pits
- Slack storage
- Splice cases
- Pedestals
- Vaults
- Required hardware

Project drawings would include additional details such as:

- Running line of fiber
- Road names
- Railroads and crossings
- Bridges
- Fixed markers/significant landmarks (e.g., fire hydrants, valves, poles)
- Environmental protected areas (e.g. wetlands, bodies of water)
- Flood plains
- Easements
- Rights-of-way
- Any applicable public utilities or assets
- Any applicable private utilities or assets
- Termination points
- Fiber entry and installation, as applicable

Engineers would then complete a base map, a strand map (for aerial portions, based on make-ready or "stick" drawings), and a design drawing with construction detail.

First, however, pole attachment licenses are needed for aerial routes from the pole owners. Make-ready work, the tasks associated with preparing utility poles for attachment, constitutes the single largest portion of the design effort. The pole attachment must be coordinated with all utilities and communications infrastructure owners that are attached to the existing poles. To secure these licenses, engineers will submit the appropriate pole attachment permits to the pole owners, typically commercial power and/or telecommunications companies. Engineers will determine who owns the pole, whether there is joint ownership, and what work the utility or communications company needs to complete to attach fiber to the poles. A single pole application can include from one to 200 poles. Engineers from all utility companies on the poles conduct a joint walkout and identify how to relocate utilities to accommodate the applicant.

The applicant company typically pays for the relocation. In addition to the cost, there is often considerable delay in this process, both in scheduling the walkout and in performing the relocation.

"Engineering work documents" (EWDs) are produced in the final stage of the design process. These documents include a bill of materials, proof of permit issuance, and all required engineered drawings and design specifications. Such EWDs are typically overseen by a licensed Professional Engineer. If the construction vendor were to subsequently create a redline (i.e., deviation from the original design and the "as built" design), the EWDs would have to be updated to reflect those changes. In the event obstructions are discovered during project implementation, additional changes must be made and drawn in CAD or MicroStation.

Rights-of-way and encroachment permits (issued by the county/city and/or the state authorities) are standard and are required for every route. Once the make-ready and EWDs are complete, the route is finalized and the permitting package is submitted. Again, a typical five-mile segment will require one additional day for preparation of the permitting package (beyond the work required for preparation of the EWDs). If the issuing entity identifies any concerns or mistakes in its initial review of a permit application, the reviewer will typically return the plans, send an e-mail about the issue, or call the engineer or project coordinator of the constructing applicant entity to discuss the concern. If an application or portion of an application is returned, the applicant entity must review any potential changes and then make corrections and send a revised application (if necessary), or simply e-mail or call the permit reviewer to provide the requested information.

In our experience, the total outside plant design and construction process for a five-mile segment, if properly staged and planned, can be completed in approximately 100 days.[3] This includes 65 days for make-ready activities with the pole owners and other utilities.

[3] Since design and construction of the various portions will take place in parallel, a large-scale project need not require many multiples of 100 days; this is simply the amount of time it takes a particular portion to go from beginning to end.

3 Understanding broadband network construction processes and costs

Outside plant design and construction is an expensive and multi-faceted process, of which obtaining rights-of-way permits is one relatively modest component. While actual costs may vary by project and geography, it is possible to make rough estimates for a "typical" project. A brief summary of these varied costs and some of the variables that determine their magnitude follows:

Labor

Labor represents the largest share of construction costs—approximately 50 to 80 percent. Materials costs (like the quantity of fiber strands and cables) are a secondary consideration.

All other expenses are dwarfed by labor costs. It is widely recognized that "[l]abor is the biggest expenditure in a FTTH network build-out"[4] or any wireline network build-out.

Of course, labor costs are highly variable. These costs tend to be highest in urban/suburban and affluent areas. Significantly, labor costs (and, therefore, broadband construction costs) are almost universally far lower in rural areas where broadband deployment is least robust.

Labor costs are frequently the single largest line item in a broadband construction project, and the scale of the costs – though always high – will vary geographically depending on local wage structures and union requirements, if any.

For instance, contract labor costs for a recent fiber deployment in rural Tennessee were priced at nearly $20,000 a mile. In our recent experience, in a major metropolitan area, the cost of labor would be far higher, closer to $100,000 per mile, depending on the type of construction (aerial/underground) and the amount of restoration required. This is due to the higher hourly cost of labor, the greater need for make-ready (in the case of aerial construction), the expertise needed for directional boring in heavily congested environments (in the case of underground construction), and the effort needed to restore paved and built-up areas.

Materials

The cost of materials at any one time can greatly influence deployment patterns as well as investment timing. Materials, both for outside plant and for network electronics, represent an enormous part of any build-out budget. With respect to outside plant, materials range from optical fiber to conduits to outside enclosures; on the electronics side, the materials will include the electronics to "light" and operate the fiber and provision services.

[4] Ashley Phillips, Nov. 2006, Broadband Properties, "Best Practices: Building a Fiber Network in a Rural Community," at 23 (http://www.broadbandproperties.com/2006issues/nov06issues/eatel_nov.pdf).

Material costs can dramatically impact investment decisions because they represent a constantly changing variable. Network electronics, like IT hardware, constantly decrease in price as the technologies are adopted and age—and simultaneously increase in capacity. They also require refreshment and replacement over time. Cable plant represents a somewhat more stable item with respect to price, though costs in this area also change over time and are subject to fluctuation; the recent earthquake in Japan, for example, took offline a number of fiber manufacturers, leading to a global shortage of fiber at a time of break-neck build-out in Asia (and BTOP/BIP-related build-out in the US), and thus driving up prices for the fiber still available.

Using the same rural Tennessee community described above, the outside plant material cost for a fiber-to-the-home deployment was priced at over $10,000 per mile. In metropolitan areas, the cost is similar.

Real estate acquisition

In some circumstances, construction must take place on private property. When this occurs, the broadband operator is forced either to purchase the property outright or obtain an easement from the property owner.

Mobilization of contractors

Considerable time and expense is required to initiate construction. Even with a completed design, the network builder must develop detailed specifications, find and maintain a pool of contractors, issue bid documents, review bids, select contractors, order materials, and oversee the contractors. The added expense of contractor management is usually borne by the entity managing the network build—and indirectly through costs reflected in the rates of the building contractor.

Aerial versus underground

A large-scale fiber network will typically include a mixture of aerial and underground construction, generally based on the prevailing type of utilities in the build area. While aerial construction may be cheaper, it is also more vulnerable to extreme weather, particularly in wooded areas and areas with frequent ice and high winds. These factors can increase long-term maintenance costs for aerial construction and may make underground construction a more attractive option in some areas.

Aerial construction is typically cheaper than underground. This is particularly true when existing utility poles are not crowded, and when the network builder has ownership of the utility poles (e.g., in the case of construction by power and utility companies). Actual costs vary dependent upon equipment, the particular contractor, and design specifications. In the best case, aerial construction can be completed for $25,000 per mile including labor and materials. This cost will increase, however, when poles are crowded or when a third-party utility pole owner charges high rates for access. Under such scenarios, costs for aerial construction can reach $100,000 or more per mile (which might prompt consideration of alternative routes or underground construction).

As in all broadband projects, labor represents the largest component of aerial-construction expenses (up to 80 percent). Labor is needed to install the supporting strand, lash fiber optic cable to the strand, splice the fiber optic cable, place the distribution center, and activate testing of the plant. These costs may increase to reflect additional make-ready work, which must be performed to relocate existing aerial attachments (i.e., other fiber, telephone, and cable) or to extend or replace utility poles to ensure compliance with code requirements for minimum clearance. Incremental aerial construction material costs include the fiber cable, splice enclosures, fiber taps for individual subscriber drop connections, strand, and attachment hardware.

Underground construction costs likewise vary significantly depending upon the construction methodology and ground surface. While material costs for underground construction are comparable or only marginally more expensive than aerial construction, labor costs are significantly higher with this approach. In areas where restoration is not important and long continuous runs are possible (e.g., unimproved rural areas on the side of interstate roads), “plowing” the fiber into the ground is a relatively inexpensive option. This approach can cost as little as $70,000 per mile. In more developed areas, however, directional boring is likely necessary. This approach is less destructive to the rights-of-way and requires less restoration, but is substantially more expensive. In fact, costs for boring range from $90,000 to $400,000 per mile. Boring also limits the amount of cable and conduit that can be built.

Terrain and topography

The U.S. Government Accountability Office’s (GAO) seminal paper on broadband deployment identifies a correlation between terrain and broadband deployment decisions. Constructing infrastructure is more expensive in mountainous and forested areas, owing to the difficulty in placing poles or underground utilities in rocky areas and the difficulty in accessing the areas. Broadband is relatively easier and thus more economical in flat, open terrain. Mountainous or rolling terrain and forests can also present a deployment obstacle for broadband technologies that require an unobstructed pathway to transmit radio signals from towers or antennas.[5] Geography and terrain “are almost certainly working through service provision cost,” reporting

[5] US GAO-06-426 at 19.

that "an increase in vertical rise or ruggedness is associated with a decline in broadband deployment."[6]

Make ready

As discussed above, before aerial pole construction can begin, the existing utilities frequently must be moved on the poles, and poles may need to be modified. The utility make-ready may be performed by the existing utilities, by the pole owner, or by the jurisdiction's construction contractor, as decided by all parties as part of a walk-out survey. The make-ready work to be performed by the utilities includes raising, lowering, guying, and re-tensioning of existing aerial cables.

In the event that network construction is aerial, there is an absolute requirement to prepare the poles for new facilities, a multi-party process that may require extensive reengineering of pole facilities and pole replacement. In urban and suburban areas in particular, crowded poles turn make ready into a time-consuming and costly matter for an entity seeking to attach for the first time.

Ability to use existing infrastructure

Costs may be reduced where existing cable infrastructure and pathways are available. Some communications providers have excess fiber strands. Fiber count in cables ranges from 6 to 24 near residences and individual businesses, to more than 1,000 on backbone routes. The cost of a 6-count fiber cable is $2,000 per mile, while an 864-count cable is $50,000 per mile, implying a marginal cost of approximately $50 per fiber per mile. Actual costs for fiber purchase or lease are typically far higher, however, as prices reflect market costs and depend on fiber availability in the project corridor.

Utility pole attachments can be loaded with multiple fiber cables in a process called overlash. Overlashing enables a network provider to attach to utility poles without taking up more space. Overlashing requires the permission of the entity being attached and is limited to the loading capacity of the attachment. Where overlashing is available, make-ready costs can be eliminated and construction costs can be reduced to approximately $13,000 to $20,000 per mile.

[6] Kenneth Flamm, "Diagnosing the Disconnected: Where and Why Is Broadband Unavailable in the U.S.?" preliminary paper presented to the 2006 Telecommunications Policy Research Conference, August 2006, at 19 ("MODIS land cover types 3 and 6 seem to encourage broadband availability relative to a built-up urban land cover baseline. MODIS land cover type 15 seems to reduce broadband deployment"). Dr. Flamm found that hilliness might be "more advantageous than flat or smoothly rising or falling terrain."

Some entities (utilities, service providers, governments) have conduit available for purchase, lease, or trade. Pulling cables through available conduit costs $20,000 to $50,000 per mile, instead of $90,000 to $400,000 for new construction.

Redundancy and survivability

The specific requirements of the network (e.g., public safety grade, mission criticality, cost of outages) will determine the physical and electronic architecture of the network. For availability above 99 percent (i.e., fewer than eight hours of downtime per year), a building will generally need two redundant physical paths from the network to its location, along with an electronic infrastructure to accommodate failure of a fiber route or an electronic component, and backup power of sufficient duration. The network will also need to provide a 24-hour network operations center, a fiber repair crew, intrusion detection, and backup management and recovery facilities. Of course, there is a cost associated with these reliability features.

Ideally, physical redundancy needs will be reflected in the initial project design. In a network designed with redundancy in mind, each portion of the network is constructed as part of a ring, allowing for economical yet reliable construction. Conversely, construction costs are dramatically increased (typically doubling), when redundancy is prioritized after initial construction. In such cases, a custom cable pathway is often required.

State and Local Government Rights-of-Way Permitting

The costs and techniques used to perform and charge for rights-of-way permitting vary but the fees almost always make up a very small part of the project budget -- at most a few percentage points on the projects on which we've worked.[7] And, as discussed earlier, some authorities do not charge fees, waive fees under certain circumstances, or assess a bulk fee for a project.

[7] Fees may be higher or lower as a percentage of total costs depending in part on the nature of the work that is performed and its impact, and the manner in which particular local fee structures operate. To illustrate one example, one suburban Maryland community charges permitting fees to cover its costs for oversight and coordination of the rights-of-way. The fees are $0.50 per foot for underground directional-boring construction, $2.00 for street crossings, and $0.20 per foot for aerial pole attachment, and $300 per application. The point here is that the fees are generally a small part of total outside plant and construction cost.

4 The National Broadband Plan overstates the expense of public rights-of-way access by conflating it with processes for accessing private property

The National Broadband Plan asserts that "[t]he cost of deploying a broadband network depends significantly on the costs that service providers incur to access conduits, ducts, poles and rights-of-way on public and private lands. Collectively, the expense of obtaining permits and leasing pole attachments and rights-of-way can amount to 20% of the cost of fiber optic deployment."[8] This statement's imprecision creates misleading impressions by combining several different processes and expenses and providing the "collective" 20 percent figure. It is essential to differentiate local government rights-of-way processes and costs from the other efforts and costs that are incurred in securing access to facilities in the rights-of-way—and that are entirely unrelated to the cost of securing access to public property and entirely outside the control of local authorities.

In fact, as shown above, rights-of-way processes and fees associated with deployment – outside plant and construction - represent a relatively small component of this suite of expenses.

Indeed, the National Broadband Plan itself acknowledges the relatively large effort and costs associated with pole attachments and make ready. The Plan notes that rental rates for pole attachments are large and variable, ranging from $4.54 per month per household passed to $12.96 in rural areas. This expense is substantially larger in rural areas "where there often are more poles per mile than households."[9] The Plan likewise notes that make ready represents a sizable expense, highlighting comments by FiberNet, which reports that the make ready process for a project in West Virginia averaged $4,200 per mile and took 182 days to complete.[10] The Plan does not provide comparable data on rights-of-way processes and fees.[11]

By combining these expenses into a single measure, the Plan makes itself vulnerable to misunderstanding. For instance, a recent Politico article declares, "In its National Broadband

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[8] Connecting America: The National Broadband Plan, at 109 (available online at http://download.broadband.gov/plan/national-broadband-plan.pdf) Citing: Omnibus Broadband Initiative, The Broadband Availability Gap (forthcoming); *See* Letter from Thomas Jones, Counsel to FiberNet, to Marlene H. Dortch, Sec., FCC GN Docket No. 09-51, WC Docket No. 07-245 (Sept. 16, 2009) (FiberNet Sept. 16, 2009 *Ex Parte*) at 20 (noting average cost for access to physical infrastructure of $4,611-$6,487 per mile); *Comment Sought on Cost Estimates for Connecting Anchor Institutions to Fiber – NBP Public Notice #12, GN Docket Nos. 09-47, 09-51, 09-137, Public Notice, 24 FCC Rcd 12510 (2009) (NBP PN #12)* App. A (Gates Foundation estimate of $10,500-$21,120 per mile for fiber optic deployment); *see also* Letter from Charles B. Stockdale, Fibertech, to Marlene H. Dortch, Secretary, FCC, GN Docket. Nos. 09-47, 09-51, 09-136 (Oct. 28, 2009) at 1-2 (estimating costs ranging from $3,000-$42,000 per mile) (other citations omitted).

[9] Connecting America: The National Broadband Plan, at 110.

[10] Connecting America: The National Broadband Plan, at 111.

[11] *See* Connecting America: The National Broadband Plan, at 113 (asserting that broadband service providers claim that rights-of-way fees "increase the cost and slow the pace of broadband network deployment" and highlighting the variability of rights-of-way fees across jurisdictions, but providing no fee data).

Plan, the commission estimates that *pole attachments* amount to 20 percent of the total cost of deploying fiber-optic cable."[12] This misstatement has likewise been reiterated by various bloggers, who state that, "The FCC estimates that that pole attachment fees are about 20 percent of the total cost of deploying fiber optic cable needed for broadband networks."[13] And the 20 percent figure has taken on a life of its own—even without attribution to the Plan. For example, some sources claim that rights-of-way access alone constitutes 20 percent of construction costs: "The expense of construction and rights-of-way permits for laying fiber often amounts to 20 percent of the cost of building fiber routes for networks."[14] And yet, as shown above, in some places there is no fee at all (and yet no build-out) and in other areas, the fee is dramatically lower.

To be sure, many localities charge ongoing fees for use or occupancy of the rights-of-way. But these costs are part of the ongoing expenses of system operation, not part of the *deployment* costs.

[12] Brooks Boliek, April 7, 2011, Politico, "FCC aims to lower power-pole fees" (available online at http://www.politico.com/news/stories/0411/52665.html#ixzz1Oe1vMPjz).

[13] Fiber to the Whatever, "FCC believes lower pole fees will lead to wider broadband deployments," April 7, 2011 (emphasis added) (available at http://fibertothewhatever.com/wp/news/fcc-believes-lower-pole-fees-will-lead-to-wider-broadband-deployments); *see also* FierceTelecom, Ethernut, "FCC believes lower pole fees will lead to wider broadband deployments," April 9, 2011(available at http://www.ethernut.net/tag/utilities/)

[14] http://riaco-op.net/493652-Optical-Wireless-Solutions-Based-on-Free-Space-Optical-FSO.html, April 9, 2011.

5 Deployment decisions flow from analysis of a wide range of construction and operating costs, of which public rights-of-way access is a relatively minor matter

A commercial broadband deployment decision comes down to a complex comparison of known costs versus expected revenue, a classic return on investment calculation. While it is difficult to isolate the factors that lead to so complex an investment,[15] it is hardly insightful to note that private broadband investment dollars flow to those areas where potential return on investment is highest and the business case for investment is strongest. This ROI analysis is based on a cost versus revenue ratio that calculates where the investor's dollars are best spent.

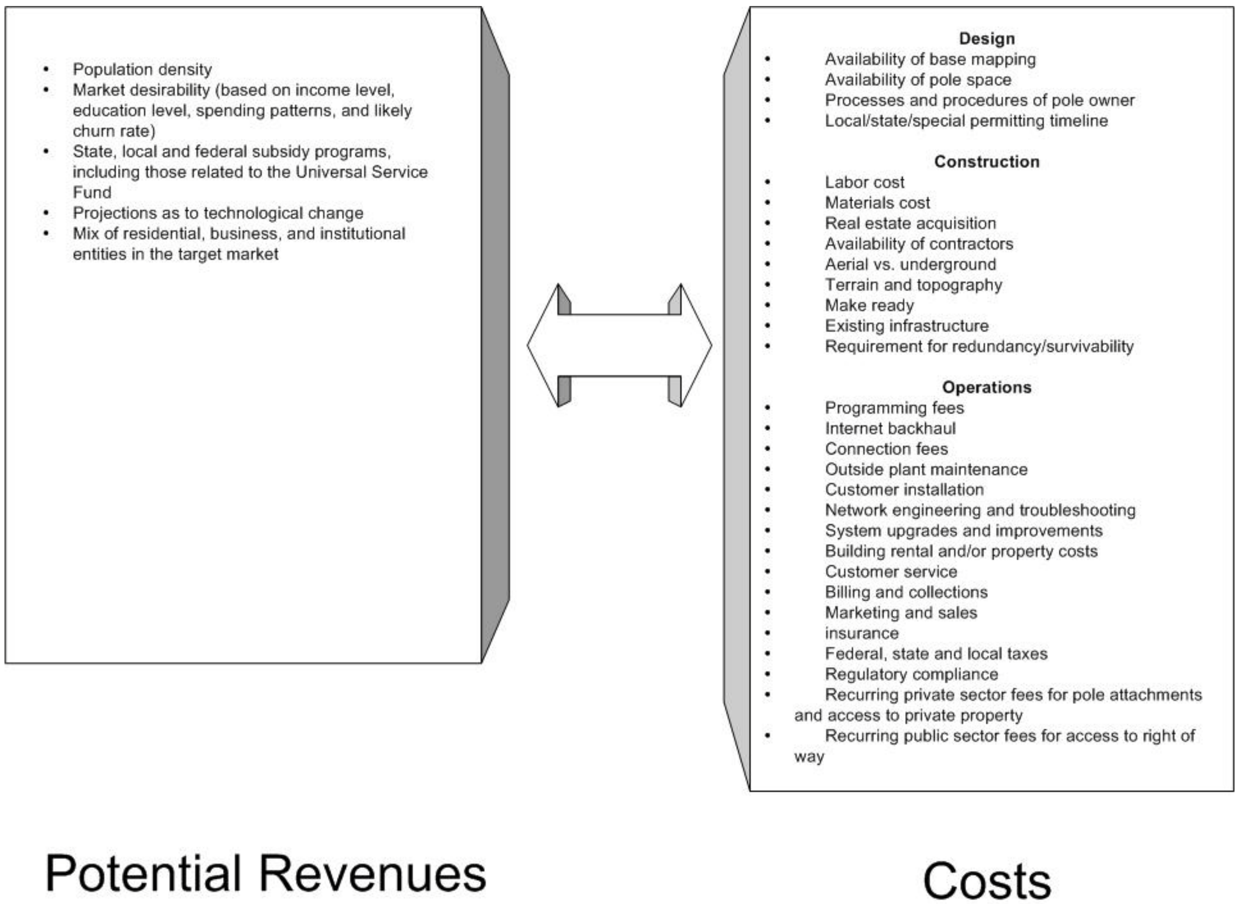
In our experience observing the various sectors of the communications industry, as well as working on public and non-profit broadband projects in the United States and abroad, there exist a wide range of substantial cost and revenue factors that determine investment patterns with respect to construction or upgrade of communications infrastructure. In simplified form, that list can include (on the cost side):

- A full range of costs of design, including those described in Section 2
- A full range of costs of construction, including those described in Section 3
- A full range of costs of operations

These are summarized in Figure 1.

[15]Analogous to rights-of-way fees in this regard is the relatively small tax levied by some states on Internet access. Economists at the University of Tennessee found "no empirical evidence that Internet access rates are lower in states that have levied a tax on Internet access, all else equal." Nor did they find a difference in broadband deployment between those states. Donald Bruce, John Deskins, and William F. Fox, "Has Internet Access Taxation Affected Internet Use?" *Public Finance Review,* volume 32, No. 2, 2004.

Figure 1 – Return on Investment Is Modeled Based on Potential Revenues and Costs



Based on our experience observing broadband communications build-out patterns since the advent of the broadband cable platform in the 1970s, changes to either permitting fees or to ongoing fees for access to rights-of-way access are unlikely to change the ratio enough to encourage investment where it is otherwise unfavorable. This is especially true in a rural area such that it would become more desirable for investment relative to more densely populated areas where per premises build-out costs are lower and per capita revenue projections are higher.

In our experience, the fundamental dynamic of broadband build-out is that wireline build-out is capital intensive and investment dollars flow to areas where projected returns are greatest because demand is highest and most concentrated. Rights-of-way fees do not change that fundamental dynamic. In fact, it is our observation that carrier deployment investment decisions are made centrally and that the carriers' operating entities in various localities and regions are competing with each other for investment dollar allocations. As a result, even where the economics of rural build-out could be marginally improved (though elimination or reduction of a cost of doing business), investment patterns do not change because the fundamental economics do not change. We have never observed a build-out scenario where reduced marginal costs such as rights-of-way diverted to a rural or underserved area funds that were allocated for build-out in more populous areas.

This observation is supported by independently-evaluated data. The U.S. Government Accountability Office attributes broadband deployment decisions to a diverse collection of factors relating to "both the cost to deploy and operate a broadband network and the expected demand for broadband service."[16] Indeed, a company "will deploy broadband service in an area only if the company believes that such a deployment will be profitable."[17]

As the Center on Budget and Policy Priorities has explained in the context of a related proceeding:

> Where to make broadband available, and when, are fundamental strategic decisions for telephone, cable TV, and wireless access providers that affect billions of dollars in annual investment spending. These decisions are largely being driven by the income levels of potential customers. They are also strongly influenced by the enormous cost differences incurred in deploying Internet access infrastructure to sparsely populated rural areas, as compared to crowded urban neighborhoods dominated by multifamily buildings or suburban subdivisions in which single-family homes predominate. There is no evidence at all to suggest that these decisions have been influenced to the slightest degree by the presence or absence of existing state and local access taxes.[18]

Indeed, according to GAO, "the decision to deploy broadband service is a function of:

- The population in the area
- The population density in the area
- The percentage of the population residing in an urban area
- The per capita income in the area
- The educational attainment of the population in the area
- The population teleworking in the area
- The age of the population in the area
- The distance to a metropolitan area with a population of 250,000 or more

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[16] US GAO, GAO-06-426, May 2006, Telecommunications: Broadband Deployment Is Extensive throughout the United States, but It Is Difficult to Assess the Extent of Deployment Gaps in Rural Areas," at 4 (http://www.gao.gov/new.items/d06426.pdf).

[17] Ibid., 46.

[18] Michael Mazerov, "The Internet Tax Freedom Act and the Digital Divide," Center on Budget and Policy Priorities, Sept. 26, 2007, at 6 (http://www.cbpp.org/files/9-11-07sfp.pdf) (while this paper assesses the impact of taxation for Internet services, we contend that rights-of-way access fees represent a similar modest cost relative to the cited factors influencing deployment).

- Whether the state in which the area is located imposed a tax on Internet access"[19]

Frankly, in our experience, there is almost nothing that any local government can do to encourage carrier build-out of advanced networks where the carrier does not already have a compelling business interest and business plan to achieve the same goal. In fact, we have, with and on behalf of many of our local government clients, approached carriers to request enhanced build-out and to inquire as to how the locality can facilitate and enable such build-out (the effort to request and sometimes plead for carrier investment is almost a universal first step before any locality investigates potential public broadband projects). In both rural and urban areas, the responses have uniformly been negative—even where localities commit to eliminating regulation and fees, we have not seen carriers commit to new investment. In addition, we hear carriers frequently inform the locality that existing facilities adequately meet consumer and business needs, and that no additional investment is necessary.

[19] Ibid, 46-47.

6 Conclusion

Local permitting processes and fees have very small impact on the broadband design and deployment process, in the experience of CTC engineers and analysts, participating in and observing wireline broadband deployment across the United States over two decades. In fact, the permitting process and local government coordination can help and facilitate deployment. When it is done effectively, it protects the integrity of existing infrastructure and provides opportunities for joint trench construction and other economies of scale.

The optimal way to facilitate and smooth the permitting process is for carriers to work with localities to prepare for, anticipate, and stage the permitting process. Carriers can help themselves through reasonable collaborative practices such as joint advance planning of the application process, reasonable staging of application filing (rather than filing large numbers all at once and expecting government staff to process them overnight), and filing of complete and accurate applications.

It is our experience that localities are highly motivated to facilitate and incentivize broadband build-out, and that they are willing to use the permitting and other processes to enable and smooth the deployment process as much as possible. Broadband acceleration can best be achieved if carriers undertake a similarly collaborative, constructive engagement with localities.