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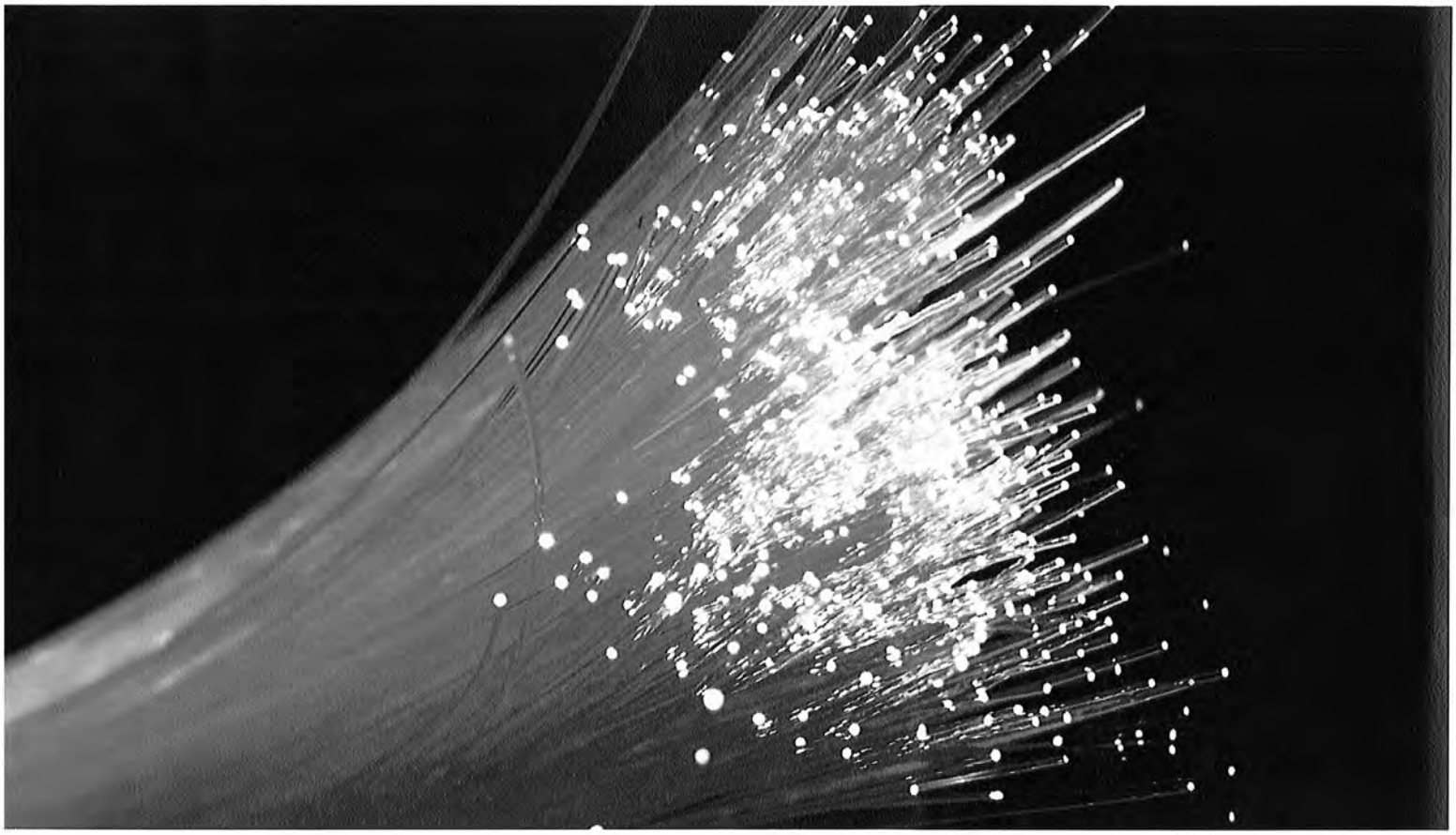

Technical Guide to Dig Once Policies
April 2017

http://www.ctnet.us/wp-content/uploads/2017/05/CTC-White-Paper-Dig-Once-20170414.pdf

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1 Executive Summary

During his campaign, President Trump vowed to rebuild the nation's infrastructure, with a plan to spend more than $500 billion fixing the country's aging roads and highways. This type of investment could also provide an opportunity for local and state governments seeking to increase the deployment of broadband networks.

While internet service providers are often trying to reach new consumers, the process of installing fiber networks can be prohibitively expensive and time-consuming. Local and state governments can ease the process by adopting a "dig once" policy, which requires public and private excavators to coordinate with local government on the installation of extra fiber or conduit whenever ground will be broken in the public right-of-way (PROW).

"Dig once" policies were identified as a best practice for local governments by the Obama administration's Broadband Opportunity Council as a means of enhancing competition in the broadband market.[1] The Council noted an important truth: "While sound national policies and programs are important, most decisions on broadband investment are made by Local governments in partnership with the private sector, guided by State law."

Dig once policies have many benefits,[2] including:

- Protecting newly and recently paved roads and sidewalks
- Enhancing the uniformity of construction
- Ensuring efficient, non-duplicative placement of infrastructure in the PROW
- Reducing overall costs of all underground work in the PROW, both utility- and telecommunications-related, for public and private parties
- Facilitating private communications network deployment by reducing construction costs

[1] "Broadband Opportunity Council Report and Recommendations," U.S. Department of Commerce and U.S. Department of Agriculture, August 20, 2015, https://www.whitehouse.gov/sites/default/files/broadband_opportunity_council_report_final.pdf (accessed July 26, 2016). *See also:* "Executive Order on Accelerating Broadband Infrastructure Development," Federal Highway Administration, U.S. Department of Transportation, May 5, 2016, http://www.fhwa.dot.gov/policy/otps/exeorder.cfm (accessed July 26, 2016).

[2] We analyzed the benefits of dig once policies in "Gigabit Communities," an independent white paper commissioned by Google (http://www.ctcnet.us/wp-content/uploads/2014/01/GigabitCommunities.pdf).

- Leveraging construction by third-party entities for the deployment of a public communications network, or deployment of conduit that can be made available to other entities

While dig once policies are beneficial, they are not a one-size-fits-all policy prescriptive. To develop "best practices" guidance for local governments, we surveyed the approaches adopted or proposed by jurisdictions across the country. In the process, we interviewed representatives of cities and other government entities that have adopted such policies, and reviewed the treatment of costs in dig once scenarios.

Based on our survey and our own experience, we identified three general approaches:

1. Some communities require an excavator applying for a permit in the PROW to notify utilities and other relevant entities about the project and invite their participation.
2. Localities with a "shadow conduit" installation policy require the excavator to install excess conduit for future use; depending on the policy, the excavator or the jurisdiction may then lease that excess capacity.
3. Other localities undertake a longer-term process, coordinating multi-year plans with excavators.

We recommend that localities consider the following steps in developing an ordinance or policy:

- Prioritize projects suitable for additional construction, based on a scoring mechanism
- Develop a refined estimate of the incremental costs during the design stage
- Develop a standard engineering specification for dig-once conduit
- Develop a procedure to systematically track and manage the construction and to create a repository of existing infrastructure

2 The Case for Dig Once Policies

Constructing fiber optic communications cables is costly, complex, and time-consuming. The high cost of construction creates a barrier to entry for potential broadband communications providers.

While aerial construction methods, requiring attachments to utility poles, are usually less expensive than underground construction, aerial installation may have significant drawbacks—including a limit to the quantity of cables and attachments that can be placed on existing utility poles in more crowded areas, and greater exposure to outside conditions.

Underground construction, using protective conduit, generally provides scalable, flexible, and durable long-term communications infrastructure, but is also typically more expensive than aerial construction. Further, cutting roads and sidewalks substantially reduces the lifetime and performance of those surfaces. And each excavation diminishes the space available for future infrastructure.

Accordingly, encouraging or requiring simultaneous underground construction and co-location of broadband infrastructure in the PROW creates benefits for both the community and private sector communications providers.

Dig once policies reduce the long-term cost of building communications facilities by capitalizing on significant economies of scale through:

1. Coordination of fiber and conduit construction with utility construction and other disruptive activities in the PROW.
2. Construction of spare conduit capacity where multiple service providers or entities may require infrastructure.

These economies exist primarily because fiber optic cables and conduit are relatively inexpensive, often contributing to less than one-quarter of the total cost of new construction. While material costs typically fall well below $40,000 per mile (even for large cables containing hundreds of fiber strands), the cost of labor, permitting, and engineering commonly drives the total fiber construction price toward $200,000 per mile for standalone projects.

Another motivation for coordinating construction is to take the opportunity to build multiple conduit in a closely packed bank. Banks of conduit constructed simultaneously allow a single excavation to place several conduit in the physical space usually used by one or two. Conversely, multiple conduit installed at different times must be physically spaced, often by several feet, to prevent damage to one while installing the next. Once the PROW becomes crowded, the options

for future construction are reduced, leaving only less desirable methods and more-costly locations for construction of additional infrastructure.

The key benefits achieved through coordinated construction efforts include reduced costs for:

- Labor and material, through reduced crew mobilization expenses and larger bulk material purchases;
- Trenching or boring, when coordination enables lower-cost methods (e.g., trenching as opposed to boring) or allows multiple entities to share a common trench or bore for their independent purposes;
- Traffic control and safety personnel, particularly when constructing along roadways that require lane closures;
- Engineering and surveys associated with locating existing utilities and specifying the placement of new facilities;
- Engineering and surveys associated with environmental impact studies and approvals;
- Leasing access to private easements, such as those owned by electric utilities;
- Railroad crossing permits and engineering;
- Restoration to the PROW or roadway, particularly in conjunction with roadway improvements; and
- Bridge crossing permits and engineering.

3 Dig Once Conduit Installation

There are several possible standardized approaches to conduit installation. We describe below two potential dig once approaches that consider the placement of "shadow" communications conduit in coordination with trenching performed by an excavator. The two approaches are designed for two different scenarios. In the first, the added dig once infrastructure can share the same trench with no modifications; in the second, the additional conduit cannot share the standard trench (e.g., due to potential interference between the dig once conduit and the primary construction), thus requiring the two conduit to be offset in a wider trench.

These scenarios assume that the locality has identified a given corridor as suitable for conduit installation, and that it has justified the incremental cost and effort for installation—potentially based on a standard set of criteria such as those in Section 5.1.

Ideally, the dig once conduit is placed over the excavator utilities. This reduces or eliminates the need for additional trenching and would incur the lowest incremental cost. With the permission of the utility owner, it may be possible to place the dig once conduit directly over the utility conduit (see "Model A" in Figure 1 below). This is a potential approach when the utility is a communications utility. Reducing the clearance between the utility and the dig once conduit will reduce or eliminate any incremental excavation to accommodate the dig once conduit.

In some scenarios, the conduit may need to be offset horizontally from the utility infrastructure. This may be the case where the infrastructure is a water pipe that should be offset for ease of maintenance, for example. Offsetting the dig once conduit may also reduce the risk of the conduit being damaged by a broken water pipe or by repair to that pipe. "Model B" in Figure 1 depicts a dig once scenario in an offset trench.

Figure 2 is a vertical profile for a typical vault installation. (A vault—also known as a manhole or handhole—is an underground enclosure for accessing or storing fiber cable.) There should be space for third-party vaults for use by third parties, adjacent to the main vaults. Third-party service providers will have access to the conduit at their vaults; all other vaults and conduit will only be accessible by the locality or by contractors managing the conduit for the locality.

Figure 1: Typical Configuration for Conduit in Dig Once Opportunity

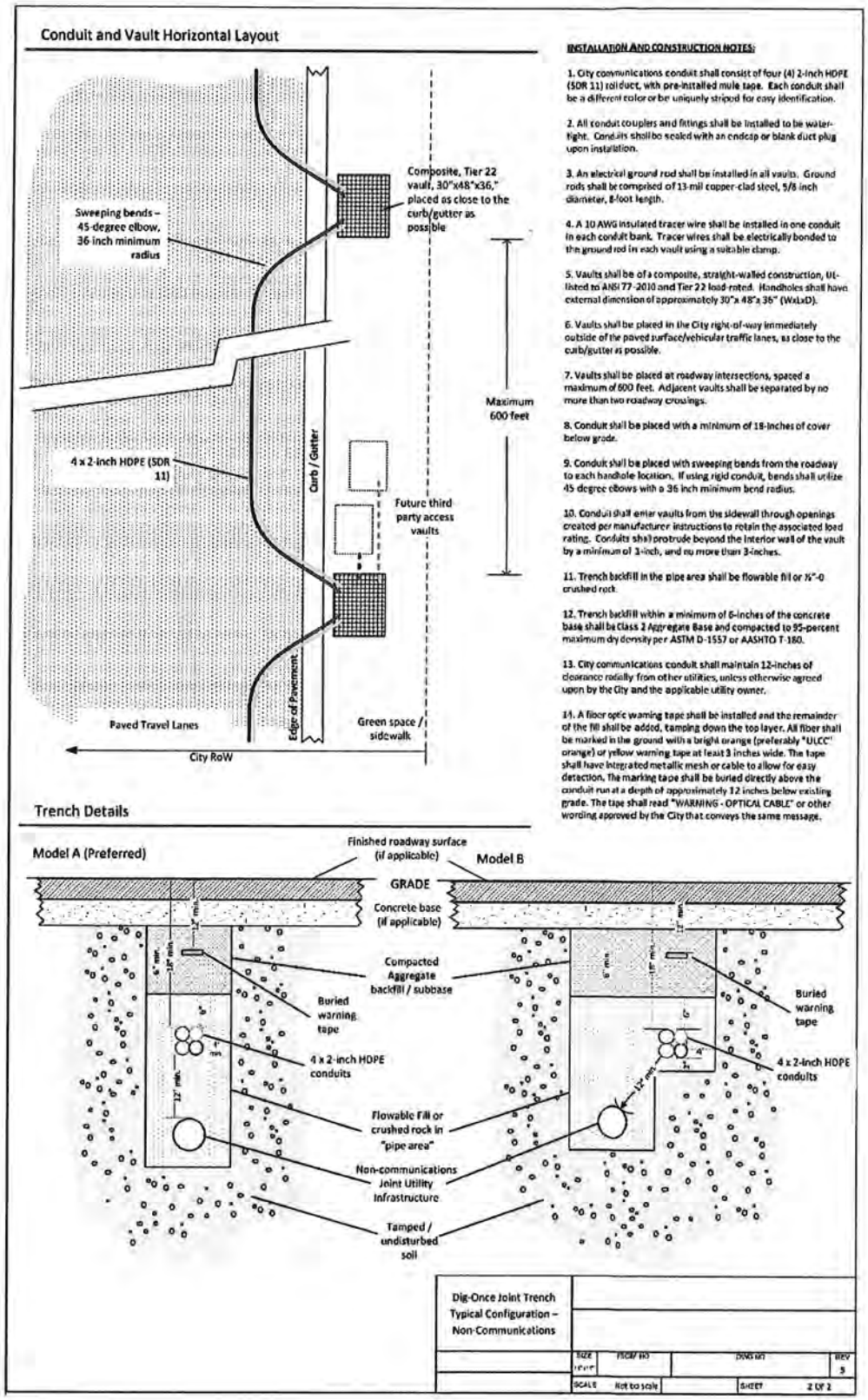
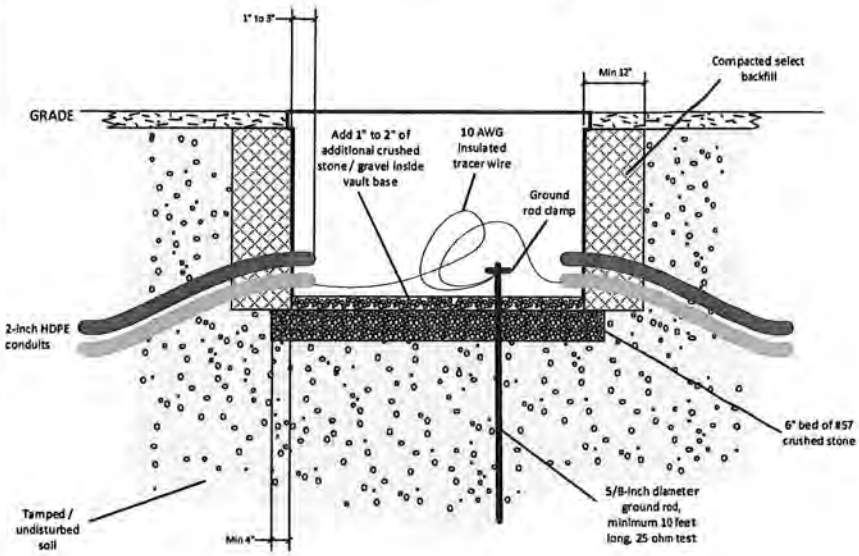


Figure 2: Vertical Profile for Typical Vault Installation

Typical Vault Installation



INSTALLATION AND CONSTRUCTION NOTES:

1. An electrical ground rod shall be installed in all vaults. Ground rods shall be comprised of 13-mil copper-clad steel, 5/8-inch diameter, minimum 10-foot length, and tested to have an electrical resistance to ground of 25 ohms or less.

2. Vaults shall be of a composite, straight-walled construction, UL-listed to ANSI 77-2010. Vaults and lids shall be Tier 22 load-rated. Vaults shall have external dimension of approximately 30"x 48" x 36" (WxLxD). Vault lids shall be etched with the words, "City of San Francisco Fiber Optics"

3. Conduit shall enter vaults from the sidewall through openings created per manufacturer instructions to retain the associated load rating. Conduits shall protrude beyond the interior wall of the vault by a minimum of 1-inch, and no more than 3-inches.

4. Vaults shall be installed flush with grade on a 6-inch bed of #57 crushed stone or gravel. An additional 1-inch to 2-inches of stone shall be placed inside the base of the vault.

5. A minimum of 12-inches of select, compacted backfill must surround the vault on all sides. Backfill must not contain large rocks or chunks, and there should be no voids between the vault sidewalls and the native surrounding soil.

Dig-Once Joint Trench Typical vault Elevation				
	SIZE 11"x17"	FSCM NO	DWG NO	REV B
	SCALE	Not to scale	SHEET	1 OF 4

4 Dig Once Policies Across the Country

Cities and counties across the country have developed and implemented dig once policies. The primary motivation for municipalities has been to preserve the PROW and improve the telecommunications competition in the market.

The following are a range of policies we have seen. Table 1 summarizes the different examples.

a. Boston was one of the first major cities in the country to implement a dig once policy, adopted in 1988. In the first few years of adoption, all excavators in the PROW were required to install a bank of four 1.5-inch conduit during construction. The cost to lease the conduit was a one-time fee of the inflation-adjusted value of the original construction cost of the conduit,[3] plus an annual fee of $5 per foot.

   The quality of the conduit varied greatly across the system, however, and the service attracted few users. The costs associated with leasing were high, and there was no discount to reflect the decreased value of the conduit due to depreciation. Potential users of the conduit often chose to build on parallel streets. Thus, the extent to which this policy became successful depended on factors such as cost and demand for interconnectivity.

   The City is now in the process of conducting a survey to assess the quality of the existing conduit. Over the past year, the policy was modified to require excavators to install 4-inch shadow conduit for the City and other future users. Future users will be required to lease space in the conduit from the shadow builder before being allowed to dig again in that corridor. The lease price is the initial value of construction for the right of entry (or equivalent)[4] in addition to an annual fee of $5 per foot. The City also has a five-year moratorium once construction in a particular PROW takes place (i.e., a new excavator in that location would have to conduct restoration from curb to curb).

b. The City of Berkeley, California, does not have a dig once ordinance but it has municipal policies aimed at reducing the impact of construction in the PROW for telecommunications systems. These policies mandate that any excess capacity in existing or future duct, conduit, manholes, or handholes be made available by the excavator for use by third parties. Also, a prospective excavator would have to coordinate major construction efforts in the PROW with other utility companies through City-sponsored utility coordination meetings. In new developments, a provider would contact the

[3] The user pays for the fraction of the bank used. If the user uses one of the four conduit, it pays one-fourth of the construction cost.

[4] Based on e-mail correspondence with City staff. A review of the finalized lease agreement has been requested for confirmation of the lease pricing.

developer to determine whether any surplus conduit exists and whether any joint trenching or boring projects are feasible.

In a new installation that would require excavation, the provider shall install within existing infrastructure whenever sufficient excess capacity is available on reasonable financial terms. Also, the City does not allow a company to excavate if the street has been reconstructed in the preceding five-year period.

c. The City of Bellevue, Washington, does not have a dig once requirement. However, the City conditions development projects on the excavator providing the City with conduit through the length of the frontage and also possible street lighting and/or signal upgrades. Every transportation project that constructs on the sidewalk is required to install conduit.

d. The Central Coast Broadband Consortium (CCBC) is a group of local governments that aims to promote broadband availability, access, and adoption in Monterey, Santa Cruz, and San Benito counties in California. The CCBC has developed a model shadow conduit policy for the local governments that would allow for the installation of additional conduit in the PROW when a construction permit is requested by a telecommunications or utility service provider. The model policy would allow for the jurisdiction to open a 60-day window to notify all other known telecommunications and utility providers in order to coordinate with the placement of conduit in the PROW. The permit applicant would be the lead company and the other providers would piggyback on the installation. Under California law, the lead company has the ability to charge fees for the installation of communications conduit in the PROW. One of the goals of the CCBC through this policy is to increase competition by reducing the cost of entry for future service providers.

e. The City of Gonzales, California, developed a dig once policy for public works projects, including construction and maintenance of transportation and utility infrastructure. Excavators in the PROW are required to install communications conduit. An exception is allowed if the City determines there is insufficient cost benefit. The City developed common standards related to the conduit, including:

- Use of PVC Schedule 40 material (color orange)
- Laid to a depth of not less than 18 inches below grade in concrete sidewalk areas, and not less than 30 inches below finished grade in all other areas when feasible, or the maximum feasible depth otherwise
- A minimum 2-inch diameter

The costs associated with the installation of the conduit are covered by the public works budget, and the City owns the conduit.

f. The City of Santa Cruz, California, implemented a dig once policy with the primary aim to foster telecommunications market competition and to create a provision for the installation or upgrade of telecommunications cable or conduit for City use. Staff notifies all excavators in the City of the opportunity to join the open trench and helps coordinate efforts for multiple parties to join the dig. City staff works with contractors to identify the most cost-effective approach consistent with City requirements to obtain upgrades in the PROW. The City also enacted a moratorium on standalone construction in the excavation area, in order to protect the PROW after the excavation.

g. The City of San Francisco, California, developed a dig once ordinance that modifies the city's Public Works Code provisions governing utility excavation—specifically, the Code's requirements for coordination.[5] The Department of Public Works (DPW) can only approve an application for an excavation permit if the applicant's plans include the installation of communications facilities (e.g., conduit) that meet the Department of Technology (DT) specifications, unless DT has opted out of the excavation project.

   Excavators (both internal and external) are required to place conduit for the use of DT as well as conduit available for leasing. DT is responsible for the excavator's incremental costs. The city requires proposing the installation of four 1-inch conduit with manholes at regular intervals. The shadow conduit is required to be placed in a joint trench above the excavator's conduit.

   The beginning phase of this ordinance was started in Fall 2014 and the Order was adopted in 2015. The City is now in process of prioritizing projects (based on a cost-benefit analysis) through a scoring mechanism, because the costs are higher with joint build construction. These high costs are typical of urban settings. The City is using its Accela right-of-way asset management system (formerly Envista), a map-based application, to document and analyze excavator plans, in some cases years ahead of construction, to identify, analyze, and coordinate projects.

h. San Benito County, California, has incorporated a dig once policy as part of its multi-use streets policy by requiring County roadway construction projects involving more than surface pavement treatment to include underground utility conduit. The County is also a partner in a municipal fiber network and aims to use this policy to expand the network.

[5] "Article 2.4: Excavation in the Public Right-of-Way," Public Works Code, available at: http://tinyurl.com/kqqqop5

i. In Arlington County, Virginia, a large electric utility project by Dominion Virginia Power, an investor-owned utility, required construction of underground conduit along many miles of congested urban PROW. As part of the utility permitting and coordination, the County entered into an agreement with the utility to construct fiber optics for the County's use in parallel conduit and manholes. The County, which pursued the project independently of any dig once ordinance, received cost estimates for each segment in the design phase and decided to proceed based on the estimates. As part of the agreement, the County provided the specifications for the conduit and the fiber. The specifications included:

- Two 4-inch conduit with tracer wire installed at a minimum of 24 inches from the top of the power line trench
- Splice boxes (24 x 36 x 36 inches) located approximately 600 feet apart
- Installation of one set of three 1.25-inch innerduct in each 4-inch conduit
- Installation of one 144-fiber cable in one innerduct of each 4-inch conduit, leaving a 50-foot coil in each

The acceptance of the installation was done only after the County had inspected and tested the conduit and fiber, and payment was made thereafter.

Table 1: Sample Dig Once Summaries

Locality/Network	Summary	Costs
(a) City of Boston, MA	• Shadow conduit installation • Conduit system not standardized • Expensive for potential users of conduit	One-time cost: Value of construction + $5/foot/year
(b) City of Berkeley, CA	• Excess capacity required to be made available for leasing	Determined by lessor of excess capacity
(c) CCBC	• Consortium of local governments developed a model ordinance • Shadow conduit installation • 60-day notification window when permit application is received	Not determined, possibly shared construction costs or charges by lead company

Locality/Network	Summary	Costs
(d) City of Bellevue, WA	• Additional conduit during some capital improvement and development projects • Transportation projects required to install conduit	Funded from City budget
(e) City of Gonzales, CA	• Shadow conduit installation • Standards developed for conduit • Decision to install conduit only if the cost-benefit analysis is favorable	Public Works budget
(f) City of Santa Cruz, CA	• Joint build based on costs • Optional bids for extra ducts	Joint build costs and/or City budget
(g) City of San Francisco, CA	• Shadow conduit installation and conduit available for leasing • Project prioritization based on scoring mechanism	Incremental costs paid by City, priced at $20.07 per foot (shared trench) and $29.14 per foot (offset trench)
(h) San Benito County, CA	• Conduit to be constructed as part of County road projects • Coordination with County fiber build	County capital program funds
(i) Arlington County, VA	• Obtained conduit and fiber as part of an agreement for an electric grid upgrade project in the PROW by investor-owned electric utility • County developed specifications and inspected installation	County funds, $392,082 for 21,700 feet

5 Recommendations for Enacting a Dig-Once Policy

We recommend that a locality considering a "Dig Once Ordinance" or related policies consider the following processes:

5.1 Prioritize Projects for Building

The cost of installing conduit is drastically reduced when a trench is already dug. However, the cost is still significant, and a locality will need to prioritize projects that achieve the most value for the money spent, and maximize the likelihood of the conduit being used. Because of the cost of conduit installation, even in a dig once opportunity, it is necessary to prioritize construction to ensure that 1) priorities are identified when dig once opportunities emerge, and 2) resources are not wasted in building conduit that is unlikely to be used.

We observe that the following factors typically result in less useful conduit, based on our experience in a range of dig once settings:

- Ability to use utility poles along the same path with a reasonable cost of attachment;
- Excavation projects that extend only a short distance, such as for a few blocks;
- Excavation projects isolated from other projects and existing fiber and conduit infrastructure;
- Excavation projects in low- and medium-density residential areas, not in proximity to government facilities, community anchor institutions, or large developments; and
- Excavation projects that only affect the top layer of the street

We also note that the cost of conduit construction is approximately 50 percent higher in dig once opportunities where the excavator is not digging a trench,[6] or where the trench cannot be shared or needs to be widened for placement of the dig once conduit.

To ensure that dig once projects are both financially feasible and consistent with a locality's long-term goals, we recommend prioritization based on the following factors:

1. Ability to place conduit over long, continuous corridors
2. Proximity of the project to government and community anchor facilities requiring service
3. Lack of existing locality communications infrastructure in the vicinity

[6] An excavator may use directional boring or microtrenching instead of trenching, typically resulting in higher incremental cost for dig once than a project where the excavator is digging a trench.

4. Potential interest in conduit from partners or customers (e.g., government departments, service providers, or developers)
5. Lack of cost-effective alternatives due to physical constraints in the vicinity (e.g., targets of opportunity such as bridges or freeway underpasses)
6. Lack of capacity on utility poles along the route
7. Low risk to dig once communications infrastructure (e.g., electrical and communications conduit in dig once construction is in closer proximity to the dig once conduit than other types of utilities, making the dig once conduit more visible to the excavator and therefore easier to avoid in the event the excavator's conduit needs to be repaired)
8. Limited delays to critical infrastructure (i.e., the incremental days for dig once coordination must not create a public safety risk)
9. Beneficial project cost (i.e., prioritizing projects with lower-than-average costs)
10. Synergies with opportunistic major projects, such as highway, mass transit, or bridge replacement
11. Plans for major right-of-way crossings, such as railroad, water, highway, or interstate, which often are difficult for private carriers to facilitate or justify
12. Conduit placement for building fiber into key sites, data centers, or facilities deemed potential targets for redevelopment

As opportunities emerge, or as existing opportunities are reviewed, we recommend they be evaluated, scored, and ranked based on the above criteria.

5.2 Estimate Incremental Costs

Localities need to understand the incremental costs associated with design and construction of the additional infrastructure in order to determine whether the project is a good opportunity for dig once. In many cases, the incremental costs of construction are borne by the jurisdiction. Many policies also provide exceptions or forego the excess conduit construction if the cost-benefit analysis is not reasonable.

For cost estimation purposes, the incremental cost is the cost of additional materials (conduit, vaults, location tape, building materials) and labor (incremental engineering, incremental design, placement and assembly of incremental conduit, placement of incremental vaults, interconnection, testing, and documentation).

The cost does not have to include roadway or sidewalk restoration or paving (which we assume to be part of the original project) beyond that which is specifically required for the placement of vaults for a locality's communications conduit within paved or concrete surfaces outside of the original project boundaries.

In a trenching project, where trenches are joint, the cost does not include trenching or backfilling. Where the dig once trench is separate from the original trench, the incremental cost includes trenching and backfill, but does not include repaving or restoring the road surface (again, assumed to be part of the original project).

Average costs may be derived based on multiple contractor pricing schedules. As a locality gains experience by participating in projects, it will develop a more accurate sense of cost.

5.3 Develop a Standard Specification

The challenge in developing a standard specification for a dig once project is to incorporate the requirements of known and unknown users, and to provide sufficient capacity and capability without excessive costs.

The following factors may be considered in developing a conduit specification:

1. Capacity—sufficient conduit needs to be installed, and that conduit needs to have sufficient internal diameter, to accommodate future users' cables and to be segmented to enable conduit to be shared or cables added at a future date

2. Segmentation—users need to have the appropriate level of separation from each other for commercial, security, or operational reasons

3. Access—vaults and handholes need to be placed to provide access to conduit and the ability to pull fiber. Vaults need to be spaced to minimize the cost of extending conduit to buildings and other facilities that may be served by fiber

4. Costs—materials beyond those that are likely to be needed will add cost, as will the incremental labor to construct them. Beyond a certain point, trenches need to be widened or deepened to accommodate conduit

5. Robustness—the materials, construction standards, and placement need to reasonably protect the users' fiber, and not unduly complicate maintenance and repairs

6. Architecture—sweeps, bend radius, and vault sizes need to be appropriate for all potential sizes of fiber

We recommend further discussions with private carriers to better develop a specification. It may be appropriate to have a different specification for different projects. Based on our knowledge

of a range of dig once efforts, we believe the following sample approach is suitable for major corridors and can be modified as discussion proceed with excavators in the PROW:

- One or more 2-inch conduit, minimum SDR 11 HDPE, each of a separate color or unique striping to simplify identification of conduits within vaults and between vaults, in the event conduit must be accessed or repaired at intermediate points
- Composite vaults sized for the likely number of cables, placed in the sidewalk or available green space within the PROW, as close to the curb or gutter as possible
- Vaults spaced at intervals of 600 feet or less, typically at intersections (in urban and suburban areas)
- Sweeping conduit bends with a minimum radius of 36 inches to allow cable to be pulled without exceeding pull-tension thresholds when placing high-count fiber cables (e.g., 864-count)
- Conduit placed in the same trench directly above the excavator's infrastructure or, where this is not possible, placed with minimum horizontal offset to minimize cost

It is important to note that the above approach is designed to create consistency and predictability in costs and deployment and, of necessity, is a compromise among the potential users. Some users might prefer larger conduit for consistency with earlier builds. Others might seek a larger count of smaller conduit, to provide more flexibility. If an excavation project has a long time horizon and sufficient budget, it is possible to customize the dig once build, potentially adding conduit or adding vaults at particular locations.

Two-inch conduit has become a standard size for a wide range of construction projects, and can support the widest range of use cases. A single 2-inch conduit can accommodate a range of multi-cable configurations while retaining recommended fill ratios, allowing a single user to serve its backbone and access cable requirements with a single, dedicated conduit.

Compared to placing fewer, larger conduit segmented with innerduct, this approach provides greater opportunity for individual conduit to be intercepted and routed for future vault installation by a particular user. Additionally, 2-inch conduit is substantially cheaper to install and physically more flexible than larger varieties, offering more options to route around existing utilities and other obstructions.

5.4 Develop a Procedure to Track and Manage Infrastructure

A locality needs to develop a system to track its planned, ongoing, and completed construction in a timely way (potentially using an asset management system) and prioritizing and selecting projects for locality participation. The locality also needs a way to quickly notify potentially

interested parties and to coordinate participation with excavators. The impact on the excavator can be minimized through the use of a well-thought-out process that minimizes delays.

We recommend, at a high level, the following type of procedure. First, the excavator should submit dig once plans and cost estimates to the locality; the plans would need to include conduit per the dig once specifications. The locality should review the plans and cost estimates for consistency with the dig once requirements. If the plans are compliant and the cost estimates reasonable according to local costs and industry standards, the project could proceed; otherwise, the applicant would need to resubmit compliant plans. If the locality and the applicant were to reach an agreement, the locality could issue an approval; if not, the locality could decline to participate in the project.

After the excavator installs the conduit, the locality should inspect the conduit for quality and compliance with the dig once requirements. If the conduit were compliant, the excavator would submit as-built information. If the conduit were not compliant, the excavator and the locality would negotiate a remedy, and the excavator would perform the negotiated remedy. The locality would then re-inspect the conduit; if the conduit were compliant, the excavator would submit the as-built information and request reimbursement.

The excavator's as-built information should include scale plans of the completed project, including:

1. Vertical and horizontal position of conduit and vaults;
2. GPS coordinates for manholes;
3. Edge-of-curb offset measurement every 50 feet; and
4. Colors, diameters, and materials of conduit

6 Conclusion

For state and local governments and the public, the advantages of dig once policies are significant and easily understood. But, while fiber and conduit materials are relatively inexpensive, dig once construction is still costly—so many factors should be taken into consideration to ensure dig once policies are implemented in a cost-effective and useful way. Communication between local government and the companies that would potentially use the conduit is critically important. Localities should also establish a system to track its planned, ongoing, and completed construction.