2022

Strategic Plan – 2022-24

PREPARED BY ARCHULETA COUNTY BROADBAND SERVICES MANAGEMENT OFFICE (BSMO): JANUARY 2022

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Strategic Plan – 2022-2024

Archuleta County Broadband Services Management Office (BSMO)

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Archuleta County Broadband Services Management Office (BSMO)

Executive Summary

The Archuleta County Broadband Services Management Office (BSMO), formed in June 2019, aims to align public and private interests in Archuleta County to improve the availability, speed, reliability and affordability of modern broadband services in the community. The BSMO, jointly funded during its startup phase from 2019 to 2022 by monies allocated from Archuleta County and the Town of Pagosa Springs, oversees the strategic planning, project management, operational implementation and maintenance of municipal community-owned broadband networks while working with private Internet service providers (ISPs) to coordinate deployment and operation of a robust community broadband network that meets the needs of the 21st century workforce and residential needs in Archuleta County. Administered under the Pagosa Springs Community Development Corporation (CDC), the BSMO meets regularly with CDC Broadband Committee and receives oversight from the CDC Board of Directors.

The area in which we reside has some of the most beautiful mountain and river terrain in the Rocky Mountains and beyond. This beauty provides excellent relaxation therapy and photo opportunities but creates a significant barrier to deployment of broadband infrastructure. The rocky ground, mountainous terrain and sparsely distributed population all create headaches for Internet service providers when installing networks and these barriers drive costs up much higher than in non-mountainous areas. Through public-private partnership collaboration, the BSMO, public and quasi-governmental entities and private ISPs can address the broadband deployment gap using a combination of public funding, grants, existing shared infrastructure and matching private funds.

Strategic Goal: Bring Modern Broadband to Community Homes and Businesses

To realize the vision of providing affordable broadband with sufficient speed to meet the current and future needs of most homes and businesses in Archuleta County, the BSMO aims to tie together key broadband resources in the community to create a core open-access network that connects community anchor institutions (CAIs) among key players. These stakeholders include the Town of Pagosa Springs, Archuleta County, La Plata Electric Association (LPEA), Pagosa Area Water and Sanitation District (PAWSD), Archuleta School District, Pagosa Springs Medical Center, as well as many other community entities with broadband infrastructure needs. This interconnected core network, called a “middle-mile network” in industry parlance, will tie together the distribution of broadband to customers in neighborhoods and business parks and the delivery of broadband to Archuleta County from the broader Internet connection points in places like Durango, Colorado Springs, Denver and beyond.

Partners and Stakeholders

Since the BSMO officially formed in June 2019, the Office has engaged with many stakeholders to further the vision of building a modern broadband infrastructure in Archuleta County. The partnerships with all stakeholders prove key to successfully realizing the broadband vision and this project will fail without collaboration and cooperation. Acting as an information clearinghouse as well as coordinating broadband project planning and management, the BSMO really ties the entire broadband project together to represent the interests of as many stakeholders as possible, public and private.

In the last three years, the BSMO has met and collaborated with more than 60 stakeholders at the local, regional, state and federal levels. These stakeholders include Internet service providers (ISPs), governmental and quasi-governmental entities, utility providers and private companies and organizations.

ISPs

- Local: Zito, CenturyLink/Lumen, Visionary
- Regional: FastTrack, Forethought/Brainstorm, Cedar, Cielo, Zeo, Hurricane Electric, Windstream, Kit Carson Electric Co-Op, Emery Electric, Elevate (DMEA), Deeply Digital
- National: Arcardian, Conexion
- Satellite: Starlink, Hughes.NET, ViaSat
- Cellular: Verizon, T-Mobile, AT&T, Comnet

Governments, Special Districts and Quasi-Governmental Entities

Town of Pagosa Springs (TOPS), Archuleta County (BoCC, Road & Bridge, Planning, Archuleta County Office Emergency Mgmt, Sheriff's office, Fairgrounds), SWCCOG, Region 9 EDD, City of Cortez, Montezuma County, DOLA, Colorado State OIT/Broadband Office, CDOT, NWCCOG, NM PRC, SLV COG Broadband Office, Archuleta School District, PSMC/EMS, Fire District, Dispatch/911, PLPOA

Utility Providers

PAWSD, LPEA, BHE, TOPS Sanitation GID/Geothermal

Private Businesses (Non-Profits and For-Profits)

Pagosa Springs Community Development Corporation, Chamber Members, Western Heritage, Numerous private businesses and citizen groups including potential project investors, Archuleta County Democrats, Potential residents, Realtors, Potential businesses for startup and relocation

Broadband Capital and Operational Funding Sources

Over the last decade, several consultants have produced widely ranging cost estimates to provide sufficient reliable modern broadband in Archuleta County. Using various approaches ranging from natural market forces doing their own work to providing fiber-to-the-premise (FTTP) to every home and business in Archuleta County, these consultants have analyzed and proposed several approaches to building a resilient community broadband network.

With costs ranging from zero dollars to north of $70 million, confusion reigns about the best way to use a properly balanced approach to bring modern broadband to Archuleta County in a timely fashion. Doing nothing will help ensure that modern broadband will not serve the area for at least 10 years (or possibly never), while spending tens of millions of dollars on a completely buried optical fiber network seems like an overkill approach that doesn't use public funding wisely, or at least within the realistic range of available funding.

The BSMO aims to find the best middle ground to leverage grant funding from local, state and federal sources, to promote community investment into broadband infrastructure, to collaborate with community anchor institutions and to partner with private ISPs and other stakeholders to properly build a balanced network that multiplies the publicly invested dollars to the greatest extent possible. This diversified approach to public-private partnerships (P3) spreads the risk among multiple public and private stakeholders while also providing incentives for all stakeholders to invest in community broadband. Using a methodology to spread the risk and coordinate resource utilization proves the wisest use of public monies while accelerating and empowering private deployment of broadband services to meet the needs of residents, businesses and visitors in Archuleta County.

Public-Private Partnerships

As of early 2022, the BSMO already has seen the public-private partnership concept bear fruit with a local Internet service provider. Through a collaborative project with Visionary Broadband that began in 2019, the BSMO worked with Visionary Broadband to land a Colorado State Broadband Fund grant worth over $740,000. Using $125,000 of public money as a seed investment plus a matching investment from Visionary Broadband, the BSMO coordinated leveraging these seed dollars at a six-to-one ratio of public monies to land the broadband grant through the Colorado Department of Regulatory Agencies (DORA).

The Colorado State Broadband Fund grant enabled Visionary Broadband to build seven new broadband communications towers in areas of Archuleta County with the least amount of broadband coverage. , Slated for project completion in the spring of 2022, these new towers enable previously unserved and underserved broadband areas in Archuleta County access to modern, reliable high-speed broadband at competitive market prices.

This first project demonstrates how the commitment of local time and resources already has direct impacts on incenting private partner investment into local broadband projects in Archuleta County. Based on the original project's success, Visionary Broadband now is using its own capital to partner with the Town of Pagosa Springs and Archuleta County to provide fiber-to-the-premise in the Pagosa Springs downtown and uptown core areas, using existing fiber infrastructure owned by the Town and County on the Southwest Colorado Access Network (SCAN). This new investment from Visionary Broadband has already resulted in dozens of businesses gaining connectivity to gigabit-speed Internet along the US 160 corridor where before there was no access to anything approaching this type of broadband reliability and performance.

Further demonstrating the investment from a private entity that was seeded by the DORA broadband fund grant, Visionary Broadband has committed to implementing and rolling out fiber zones that will soon connect many residents and businesses in the US 160 corridor at low prices like those available in much larger communities. Starting with the center of downtown Pagosa Springs, the first fiber zone already has been built and turned up for service while the next currently is in the process of building out to the east side neighborhoods of downtown Pagosa Springs.

In November 2020, Visionary Broadband also reaffirmed its commitment to investing in broadband in Archuleta County by bidding on the Pagosa Springs Uptown and Pagosa Lakes Property Owners Association (PLPOA) areas through an auction offered by the Federal Communication Commission's Rural Digital Opportunity Fund (RDOF.) Visionary Broadband won the right to build broadband communications networks in these areas and this right includes an obligation to provide gigabit services to these areas within six years of the award, or otherwise face penalties and fines. Visionary Broadband already has started its planning to bring fiber-to-the-premise to the auction areas and beyond over the next few years to ensure satisfaction of the RDOF obligations as well as reach more residents, businesses and visitors.

This strategic plan helps feed and continue to encourage collaborative investment by private providers whenever possible. With the BSMO coordinating funding assistance via grants and other opportunities that leverage local, state and federal broadband funds, the overall amount of funding for broadband projects goes up exponentially and leads to much faster and more complete deployment of broadband networks that serve residents, businesses and visitors in Archuleta County.

Broadband Network Maintenance

One key omission in the current broadband plans stems from the lack of a dedicated maintenance fund for community broadband assets, particularly the Southwest Colorado Access Network (SCAN) jointly owned by the Town of Pagosa Springs and Archuleta County. Without a maintenance reserve fund, network sustainability suffers as community broadband assets have no readily available dollars to repair damage or perform necessary preventative maintenance. Retaining revenues in a maintenance reserve fund will help mitigate the issue of scrambling for general fund or other budgeted dollars to maintain open-access community broadband assets. It would also provide for necessary fiber relocations for utility pole relocations, building and road construction, other purposes.

In the future, the BSMO intends to create sustaining revenue streams using broadband leases of community-owned or managed broadband infrastructure. Lease revenues from these community assets will in turn support some or all operations of the BSMO while possibly providing surplus revenues to line network maintenance reserve coffers and even to help fund future capital expenditures for additional community-owned strategic broadband infrastructure assets.

Key Regional Partnerships for True Broadband Success

To truly provide a robust community broadband network that serves Archuleta County, the BSMO works with regional partners outside the county including, among others, the Southwest Colorado Council of Governments (SWCCOG), Region 9 Economic Development District (Region 9 EDD) the Southwest Region Department of Local Affairs (DOLA) office and San Luis Valley Broadband Services Management Office. These critical partners provide guidance for local broadband projects and help ensure that local broadband network planning fits into broader regional plans in a congruent fashion that best benefits all stakeholders, locally and in southwest Colorado and beyond.

Strategic Projects

In the pursuit of the vision to connect Archuleta County residents, businesses and community anchor institutions (CAIs) to a modern, resilient, fast and affordable broadband network, the BSMO will coordinate deployment of several projects beginning in 2021 and lasting through 2025. These projects, implemented in a series of phases, will provide for all aspects of a robust open-access community broadband network that partners and supports local Internet service providers (ISPs) to deliver modern broadband to residents and visitors in Archuleta County.

Phase I of the BSMO strategic projects includes two sub-phases, A and B. The BSMO plans to submit one grant application to DOLA for both projects and the projects in Phase I cover different key geographical areas and have separate budgets for each sub-phase.

Mission Statement and Driving Principles

To bridge the broadband gap that currently exists in Archuleta County, the BSMO has focused on one core mission:

"To create a core municipal fiber-based network that supports modern broadband service for to up to 80% of businesses, residents and visitors in Archuleta County."

For the remaining 20% of residents and businesses that cannot realize the benefits of a fiber-based network because of cost challenges, the BSMO will work with partners and stakeholders to provide at least the minimum standard of broadband service via non-fiber methods including technologies like fixed wireless, low-earth orbit (LEO) satellites (including SpaceX's Starlink Internet service and Amazon's upcoming satellite Internet solution, Project Kuiper), along with other delivery methods as appropriate to each area and circumstance.

The following driving principles implement the BSMO's mission statement to create a modern resilient broadband network that provides its users access to reliable, affordable high-speed Internet connectivity critical in today's world for business, personal, community and social support.

- Use existing assets as much as possible with long-term IRUs and other contractual agreements with stakeholders
- Leverage middle mile projects w/ existing builds and new builds to create high-performance reliable core that is open access and interconnects to parallel backhaul projects
- Examine impact to last-mile neighborhoods touched by middle mile core to enable Internet service providers to establish service into local communities
    - Understand ISP needs via significant relationships and project coordination
    - Build handholes in proper places
    - Obtain proper easements into place for things like wireless access points for WISPs to hang off fiber and provide last-mile service
- Increase redundancy and create new opportunities to establish a modern resilient core middle-mile community open access broadband network
    - Southern Loop – South Pagosa Boulevard
        - Tie into LPEA existing network from PSMC and illustrate redundancy and new last-mile opportunities as well as overall benefit for core middle mile network

        - Cost is very low for a high return in strategic terms
    - Northern Loop – Piedra Road
        - Use PAWSD and other fiber to get to PAWSD HQ and treatment station on Lyn Avenue and put new builds up North Pagosa Boulevard and Piedra Road
        - Will need to build in multiple phases where Piedra Road is first and North Pagosa Boulevard comes next to create redundancy from community anchor institutions like 911 services at Nick's Hangar and last-mile services to a large population of residents
    - Additional Loops
        - BSMO plans to look at a connection in the middle of a future network that would include a run from North Piedra Road to connect with North Pagosa Boulevard around Mission Drive
- Provide additional connectivity for last-mile neighborhood opportunities in Archuleta County
    - Chris Mountain 2 conduit and fiber
        - Could really act as a community asset since this area might include workforce housing in the subdivision
        - Look at a loop that could possibly interconnect to US 160 through Martinez Canyon
- Focus on community assets to include in middle-mile connectivity projects
    - Identify locations of community assets and understand how those assets can benefit from direct fiber service for monitoring, SCADA, access control and other community benefits
    - Local utilities like PAWSD currently dependent somewhat on wireless networks can employ fiber for more secure, reliable monitoring
- Connect and enhance regional partnerships
    - Make sure the planning efforts of the BSMO tie into regional plans
        - Stay in touch with organizations like the SWCCOG and San Luis Valley community broadband initiatives to ensure we're working toward the same local and regional goals
        - Understand how the THOR idea from the NWCCOG can apply in our region and share that information with regional and local partners

BSMO Operations Plan: 2022-24

The BSMO will continue to provide operational, maintenance and coordination support services for all fiber assets for Town- and County-owned fiber, even after all the strategic projects in this plan are complete. To ensure ongoing maintenance the BSMO has modeled its budget to include these ongoing activities in future budget cycles.

If future capital build projects include adding additional government-owned fiber route miles, the BSMO will need to increase the costs of managing ongoing maintenance and providing management oversight

for each build. These needs include all 811 fiber locates, fiber moves and make-ready management, as well as project coordination, ISP engagement and periodic outage coordination with downstream users for any planned maintenance. Additional needs may also include fiber-splice mapping and management of ISP leases with private providers.

Funding for the management portion of the BSMO duties will increasingly receive funding through revenues from fiber leases to ISPs, with a target of achieving a revenue stream of at least $50,000 per year by the end of 2024. Each budgeted project in this strategic plan includes a project management component as part of the overall project budget, paid separately through local government funding and state and federal broadband grant monies.

Fiber Project Phase I-A: Southern Fiber Loop - Middle-Mile Fiber from PSMC to LPEA

The BSMO will pursue a project in 2022 to build a fiber link between existing local government fiber on the Southwest Colorado Access Network (SCAN) and La Plata Electric Association (LPEA) network fiber near South Pagosa Boulevard. This fiber link will create a critical redundant loop in the local municipal middle-mile network, called the Southern Loop. This loop will benefit both the SCAN and LPEA fiber networks by providing resiliency in both networks while offering the ability for ISPs to connect neighborhoods along South Pagosa Boulevard to broadband service.

The Southern Loop connects the fiber terminal at Pagosa Springs Medical Center (PSMC) to a fiber terminal on the LPEA fiber electrical service distribution monitoring supervisory control and data acquisition (SCADA) network.

Benefits

The Southern Loop will provide several benefits for the community, including supporting key community anchor institutions (CAIs) in the downtown core and Putt Hill area.

Redundancy & Resiliency for Primary Core of Community Middle-Mile Network in SCAN

- Archuleta School District depends on this connection for necessary bandwidth to Internet resources and redundancy is very helpful
- Town of Pagosa Springs, Archuleta County Offices and many other downtown business and residential connections depend on this bandwidth

Distance Learning

- Possibility of better Internet service in the Timber Ridge, Meadows and other South Pagosa Boulevard communities

Better Future Possibilities for Cable Company Expansion and Fiber-to-the-Premise (FTTP)

- 100% dark fiber leasable lines used in fiber swaps and to provide service from local ISPs

Timeline

The BSMO submitted the DOLA grant application in the winter of 2021/2022 with the intent to receive project funding by early summer 2022 for possible installation of the fiber link and related broadband infrastructure in summer or fall of 2022. This project will couple with Phase I-B and each project will have its own separate budget.

Partners

- Colorado Department of Local Affairs (DOLA): Grant funding
- Archuleta County Broadband Services Management Office (BSMO): Grant matching funds
- La Plata Electric Association (LPEA): In-kind matching IRU contribution, Senate Bill 107 (SB-107) activation on route, legal fees and process for easement perfection

Cost Estimates and Contingencies

Current localized utility standards require a portion of the fiber installed for this project to be buried. The cost estimates include approximately 0.8 miles of the 1.5-mile total fiber run as buried fiber. The BSMO and its installation partners do predict that a good portion of this buried route could hit hard

bedrock and significantly increase the project cost, which the BSMO has also included in these cost estimates for contingency planning purposes.

Cost Calculations

To ensure the costs of the new build section of this project is within the budget, the BSMO will need to put cash into the project to the tune of approximately $282,000. This cost could come in lower if bids come in lower and the distances for each section come in slightly lower.

Based on other installation costs in Archuleta County, along with recent cost quotes provided through regional fiber contractors, the high-side estimate has a very good chance of completely covering the cost of the project. Going forward, the BSMO will use the high-cost estimation approach rather than estimating low and incurring possible cost overruns because of incorrect assumptions.

Fiber Build Portion	Time & Materials (Low-side Estimate)	Fixed Price (High-side Estimate)
Buried Fiber - Bedrock	$84,480 ($80/ft for 0.2 miles)	$142,560 ($90/ft for 0.3 miles)
Buried Fiber – Dirt/Soft Rock	$95,040 ($18/ft for 0.6 miles)	$92,400 ($25/ft for 0.7 miles)
Aerial Fiber	$12,672 ($6/ft for 0.4 miles)	$21,120 ($8/ft for 0.5 miles)
Enclosures/Handholes	$2,000	$2,000
Other Costs	$4,000 (Northeast terminal aerial interlinks and enclosures)	$4,000 (Northeast terminal aerial interlinks and enclosures)
Project Management & Engineering	$22,000	$22,000
Total Cost	$220,0192	$282,080

For estimation purposes and as a worst case, if 25% of the buried fiber path of 1.0 miles encounters bedrock, this could add up to 0.3 miles of bedrock total. The cost to use a rock cutter tool to cut through bedrock comes to more than $90 per lineal foot, which computes to a total of $142,560, in the hard bedrock section of the fiber build.

The lowest cost portion of buried fiber uses a plowing tool that costs at least $25 per lineal foot for 0.7 miles, computing to a cost of $92,400 for this section.

For the aerial fiber run on this project, the BSMO estimates that 0.5 miles of the fiber route can use aerial poles, which proves to be the most affordable installation portion of the fiber at $8 per lineal foot and amounts to a cost of $21,120 for the aerial route. In addition, the Southern Loop fiber link will require around $2,000 for aerial enclosures and handhole boxes to allow access to the fiber line for ISPs and other stakeholders.

On the low end, the costs for a time-and-material build will come to around $220,0192 for the entire fiber build on the route, including buried and aerial portions along with enclosures and handhole boxes. Uncertainty creeps into the cost prediction when considering possibilities about the amount of bedrock encountered, the softness of the bedrock and other unknown factors that can contribute to cost escalations. Each of these factors adds to the uncertainty of a fixed price project and the BSMO requested the higher amount for the build to be more certain of the costs involved.

This cost estimate also includes $22,000, which is 3.9% of the estimated total project cost presented in the DOLA grant application. This cost estimate includes in-kind cost values from Terminus A at PSMC to Terminus B at the Archuleta County Extension Office enclosure near US 84 and Mill Creek Road, or 8.5% of new build costs. This portion of the budget will go to project management, planning and engineering costs both before the project commences and until the project finishes.

Finally, the project will require an additional $4,000 for the short 200- to 400-yard aerial interlink and enclosure at the northeast end of each fiber run that terminates close to US Highway 84 and Mill Creek Road near the LPEA substation just north of the Archuleta County Fairgrounds. This brings the total high-side fixed price to $282,080.

Cost-Value Analysis

Taking into consideration all carefully estimated costs, the total value for Phase I-A to build a redundant fiber core network from Terminus A (PSMC) to Terminus B (Archuleta County Extension Office Enclosure) comes to a range between $563,762 and $1,002,800. Depending on how this value is estimated, the total value depends on either:

1. The value of actually building the new link plus the in-kind section IRU value (not accounting for legal costs/easements)
2. The value accorded to a four-strand IRU for 5.84 miles already built and provided by LPEA

The full calculations below show how the BSMO derived this value.

Estimated New Build Cost	**$282,080**	**Cash match and DOLA grant**
Cash Contribution	$40,000	BSMO from Archuleta County funding
In-Kind IRU Contribution	$700,800	Existing LPEA and SCAN fiber
5.84 Miles of Aerial Fiber provided by LPEA	$175,200 (One line) $700,800 (Four lines)	Via fiber exchange with Archuleta County @ $1500/line mile/year x 20 years
Archuleta County Cash + Fiber IRU Value for I-A	$740,800	
DOLA Contribution	$242,080	

This request and its in-kind value is calculated using a suggestion gleaned from Virgil Turner, former Regional Broadband Director for Region 10 Economic Development District of Colorado, who also performed the role of technical consultant to DOLA applications in this region.

In late 2020, Virgil reviewed the original concept for this and other Archuleta County project and expressed general support for the fiber projects and Carrier Neutral Locations. After reviewing the original ideas presented by the BSMO, Virgil offered to help the BSMO with the challenge of finding cash to fund the new build portion of the project by refining the scope of the project and acquiring in-kind IRUs for value through existing fiber used in the project. The concept leverages existing investments into local broadband infrastructure in the LPEA and SCAN networks to create value in the link from PSMC to LPEA. This project truly creates a redundant local middle-mile network that interconnects two existing networks in a loop that protects the critical core backbone of the network for both entities. Thereby, the BSMO defines the endpoints for this project at Terminus point A on the west side of Pagosa Springs (at

the Pagosa Springs Medical Center) to Terminus point B on the east side of town near the Archuleta County Fairgrounds to complete the loop.

The existing LPEA-owned 72-strand fiber along the substation-to-substation link on this path would cost significantly more if the BSMO created an entirely new fiber link along these poles and had to finance the fiber to be installed on this link. Employing the IRU, the BSMO does not have to build this six-mile-long path since the IRU will be granted or purchased from LPEA. This conveys the in-kind value to allow completion of the project in a short amount of time for a relatively low cost.

DOLA representatives indicated that the value used in other projects submitted for broadband grant funding amounted to $1,500 per route mile per strand per year with a maximum of four strands along the route allowed to be used toward in-kind value for a period of 20 years based upon a 20-year IRU. Should Archuleta County build fiber along this path without the in-kind contribution, Archuleta County would still need LPEA's approval for pole attachments, to perfect easements with each landowner along the route and to incur hardware and labor costs that will not have to be expended using the in-kind approach.

Project Maps

The project maps show two slightly different versions of the Southern Loop, including one each from LPEA and the BSMO. The route considered in the BSMO map version shows the preferred route for the fiber link. The green highlighted area on the left side of each image shows the proposed fiber link between Pagosa Springs Medical Center and the La Plata Electric Association network.

Both maps show a high commitment level from the two entities involved in understanding the value of interlinking their respective networks. LPEA has been working toward getting commercial communication easements perfected along this fiber path for more than a year, through either the traditional method of negotiating with each landowner or by executing the provisions within Colorado Statute SB19-107. After many hours of looking at both options, the LPEA Board of Directors approved this section of fiber as its first use of SB19-107 at a board meeting in November 2021.

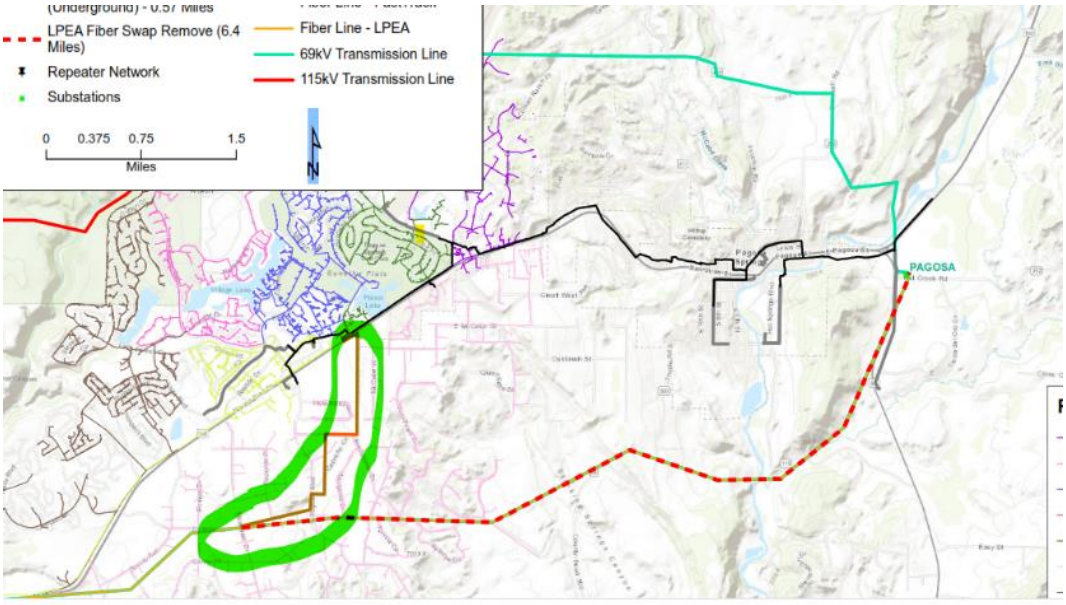

Figure 1: Map of Southern Loop - LPEA version from HR Green, Inc., Engineering Consultants (2019)

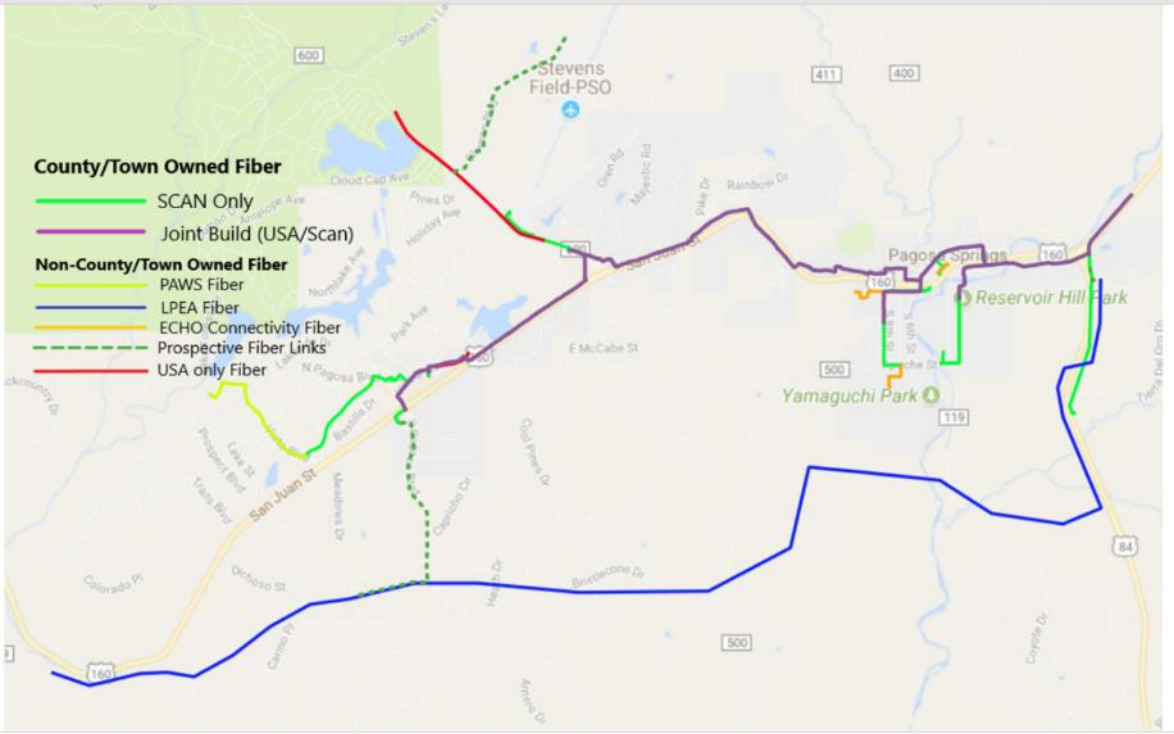

Figure 2: Map of Southern Loop - BSMO version and actual fiber installation path (CDC presentation to Town/County governments, Sept 2018)

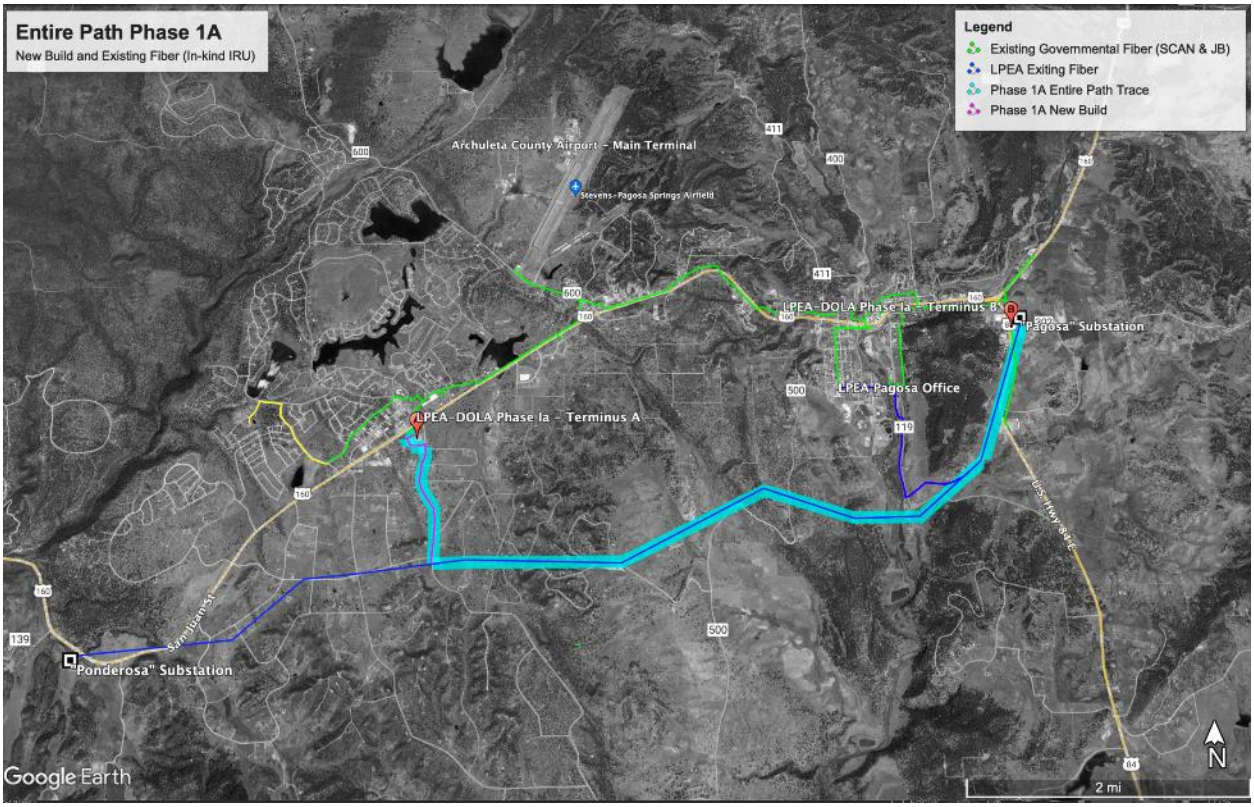

Figure 3: Map of Southern Loop Full Path from Terminus A at PSMC, to Terminus B at Archuleta County Extension Office Enclosure

Fiber Phase I-B: Cloman Park – Middle-Mile Fiber from Nick's Hangar to Stevens Reservoir

To connect key community anchor institutions (CAIs) for Archuleta County, Pagosa Area Water & Sanitation District (PAWSD) and La Plata Electric Association (LPEA) facilities, the BSMO proposes to install a fiber run in the area of Stevens Field Airport and Cloman Industrial Park that will serve these key entities. This project will provide broadband service from the existing Southwest Colorado Access Network (SCAN) terminus at the Nick's Hangar facility of Archuleta County to critical CAIs including the Stevens Field Airport terminal and important PAWSD and LPEA plant facilities at Stevens Reservoir north of Cloman Park.

The installation of this fiber and connection to the existing SCAN provides more resiliency for supervisory control and data acquisition (SCADA) networks used to monitor and control systems used by PAWSD and LPEA at the Stevens Reservoir facility. Currently, these facilities rely on wireless communications that can have intermittent broadband connectivity and can possibly pose public health risks because of communications outages. The Cloman Park connection could also act as part of a redundant loop for the future Phase III implementation of the Northern Loop that connects SCAN fiber to PAWSD facilities at Hatcher Reservoir. With the cooperation of a local ISP, It would also allow for a fixed-wireless Point-to-Multipoint AP antenna for commercial wireless to be attached to the Steven's Lake PAWSD water tanks that could be used to provide Internet to surrounding households.

Benefits

Bringing fiber into Cloman Park and Stevens Reservoir will allow key CAIs to greatly improve their network reliability while providing an enticing attraction for new business location in Cloman Industrial Park—especially in the high-tech sector—because of the availability of high-speed broadband.

Resiliency for PAWSD and LPEA Facilities in Middle-Mile Network, County Airport Terminal

- Current facilities at Stevens Reservoir use somewhat unreliable wireless services for SCADA network
- Archuleta County operates an airport and terminal at Stevens Field and could use additional bandwidth and fiber reliability as the airport continues to increase in usage with the growing population and business operations located in the county

Increased Technology Businesses in Cloman Industrial Park

- Cloman Industrial Park has many vacant parcels primed for business development and the community could locate new and existing businesses from outside the community with the availability of modern high-speed broadband Internet service

Future Loop Connection to Northern Loop

- Connecting the Cloman Park fiber to the future Northern Loop will provide additional resiliency for both the Cloman Park fiber run and the Northern Loop in the future

Timeline

The BSMO will submit the DOLA grant application in the winter 2021/2022 with intent to receive project funding in late spring or summer 2022, for possible installation of the fiber link and related broadband infrastructure in Summer or Fall 2022. This project will couple with Phase I-A and each project will have its own separate budget.

Partners

- Colorado Department of Local Affairs (DOLA): Grant funds
- Archuleta County Broadband Services Management Office (BSMO): Grant matching funds
- La Plata Electric Association (LPEA): In-kind matching contribution
- Pagosa Area Water and Sewer Dist. (PAWSD): letter of support, potential roof access for fixed wireless.

Cost Estimates and Contingencies

Similar to the approach in Phase I-A, the BSMO is looking at the probable worst-case scenario to best accommodate the costs of a fixed-price contract by looking at the high-side cost structure.

Cost Calculations

The BSMO has estimated the high-side cost of the Cloman Park fiber project by breaking the fiber segments into multiple subsections for individual analysis. The total cost of all subsections comes to a high-side estimate of $579,562.

Nick's Hangar to Cloman Boulevard Intersection

Around 0.51 miles is very likely to have at least some hard rock to cut through. Using an estimate of 25% of the path being bedrock, the total subsection cost comes to $111,381.

Cloman Boulevard to Industrial Circle

For this section, the BSMO incurs some cost savings since Archuleta County is rebuilding Cloman Boulevard in the spring and summer of 2022 and fiber contractors will be able to bore above bedrock on roadbed. The BSMO can thus calculate the cost as soft rock at $25 per foot for a total subsection cost of $72,600.

Industrial Circle Path

This 0.93-mile section has a high possibility of hard rock and the BSMO estimates up to one quarter of the length will cost $80 per foot for hard rock cutting with the remaining 75% at $25 per foot for soft rock. This results in a total subsection cost of $218,856: $133,056 for the hard rock section and $85,800 for the remaining soft rock section.

LPEA Transmission Line from Industrial Lane to Stevens Lake Substation

This subsection includes a combination of aerial and buried fiber. The Aerial Pole Line on the existing LPEA transmission line (in green on drawing) goes for 0.74 miles at a cost of $8 per foot for a total aerial cost of $31,258. The distance between this aerial path and the proposed Industrial Circle buried fiber (in yellow on drawing) is 342 feet at 85 feet of hard rock (25%) at $90 per foot and 257 feet of soft rock at $25 per foot for a total buried cost of $14,107. This brings the total subsection cost to $45,365.

Fiber Build Portion	Project Cost
Buried Fiber – Nick's Hangar to end of Cloman (soft rock/dirt, 75% estimate)	$ 50,556 ($25/ft for .383 miles)
Buried Fiber – Nick's Hanger to end of Cloman (Bedrock w/ Rock Cutting 25% estimate)	$ 60,825 ($90/ft for .128 miles)

Buried Fiber – Cloman Boulevard to Industrial Circle (bore above bedrock on road bed)	$72,600 ($25/ft for 0.55 miles)
Industrial Circle Path (Hard Rock Est. 25%)	$133,056 ($90/ft for 0.28 miles)
Industrial Circle Path (Soft Rock Est. 75%)	$85,800 ($25/ft for 0.65 miles)
Terminus I-A LPEA Transmission Line from Industrial Lane to Stevens Lake Substation (Aerial Fiber)	$31,258 ($8/ft for 0. 74 miles); $14,107 (Buried w/25% length rock estimate for 0.065 miles)
Enclosures/Handholes	$5,000
Proj Mgmt & Engineering	$30,000
Terminus I-B (County Airport Terminal) to Industrial Lane/LPEA Corner	$96,360 ($25/ft for 0.73 miles)
Total Build Cost	$579,562

Cost-Value Analysis

This Cost estimate also includes $30,000 (2.3% of estimated total project value, including in-kind cost values from Terminus A at Nick's Hangar to Terminus B at the LPEA Stevens Lake Substation enclosure, or 5.2% of new build costs). This will be used for project management, planning, and engineering costs both before the project commences and until it's complete.

Taking into consideration all carefully estimated costs, the total value for Phase I-B to build a fiber core network from Terminus A (Nick's Hangar) to Terminus B (LPEA Stevens Lake Substation) comes to a range between $825,562 and $1,300,978. Depending on how this value is estimated, the total value depends on either:

1. The value of building the new link plus the in-kind section IRU value (not accounting for legal costs/easements)
2. The value accorded to a two-strand IRU for 4.2 miles already built and provided by Town of Pagosa Springs and Archuleta County-owned SCAN fiber

The full calculations below show how the BSMO derived this value.

Estimated New Build Cost	***$579,562***	**Cash match and DOLA grant**
Cash Contribution	$60,000	BSMO from Archuleta County funding
In-Kind IRU Contribution	$300,000	Existing SCAN fiber
2.15 Miles of Aerial Fiber provided by SCAN *and 4.0 miles buried fiber*	$249,000	Via fiber exchange with Archuleta County @ $1500/line mile/year x 20 years
Archuleta County Cash + Fiber IRU Value for I-B	$309,000	
DOLA Contribution	$519,562	

Project Maps

The BSMO put together maps to show different components of the Cloman Park route as it connects Nick's Hangar to the La Plata Electric Association aerial network connecting to Stevens Reservoir.

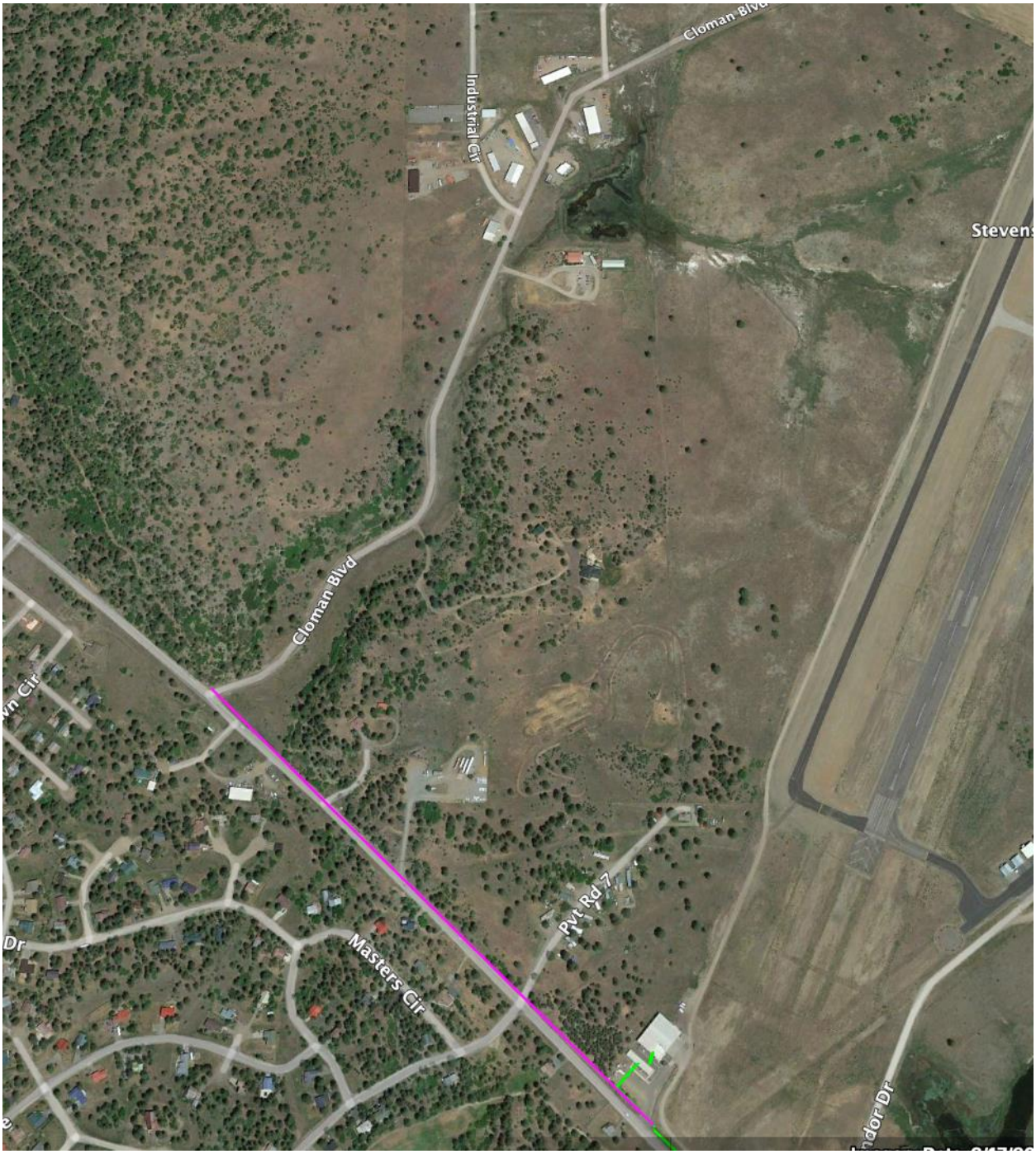

Figure 4: Detail of Nick's Hangar to Cloman Boulevard

Figure 5: Detail of Cloman Boulevard & County Road 600 to Industrial Lane

Figure 6: Detail of Industrial Circle Path

Figure 7: Detail of Aerial LPEA Transmission Line from Industrial Lane to Piedra Substation and PAWSD Water Towers

Figure 8: Detail of Stevens Field Airport Terminal to Industrial Circle

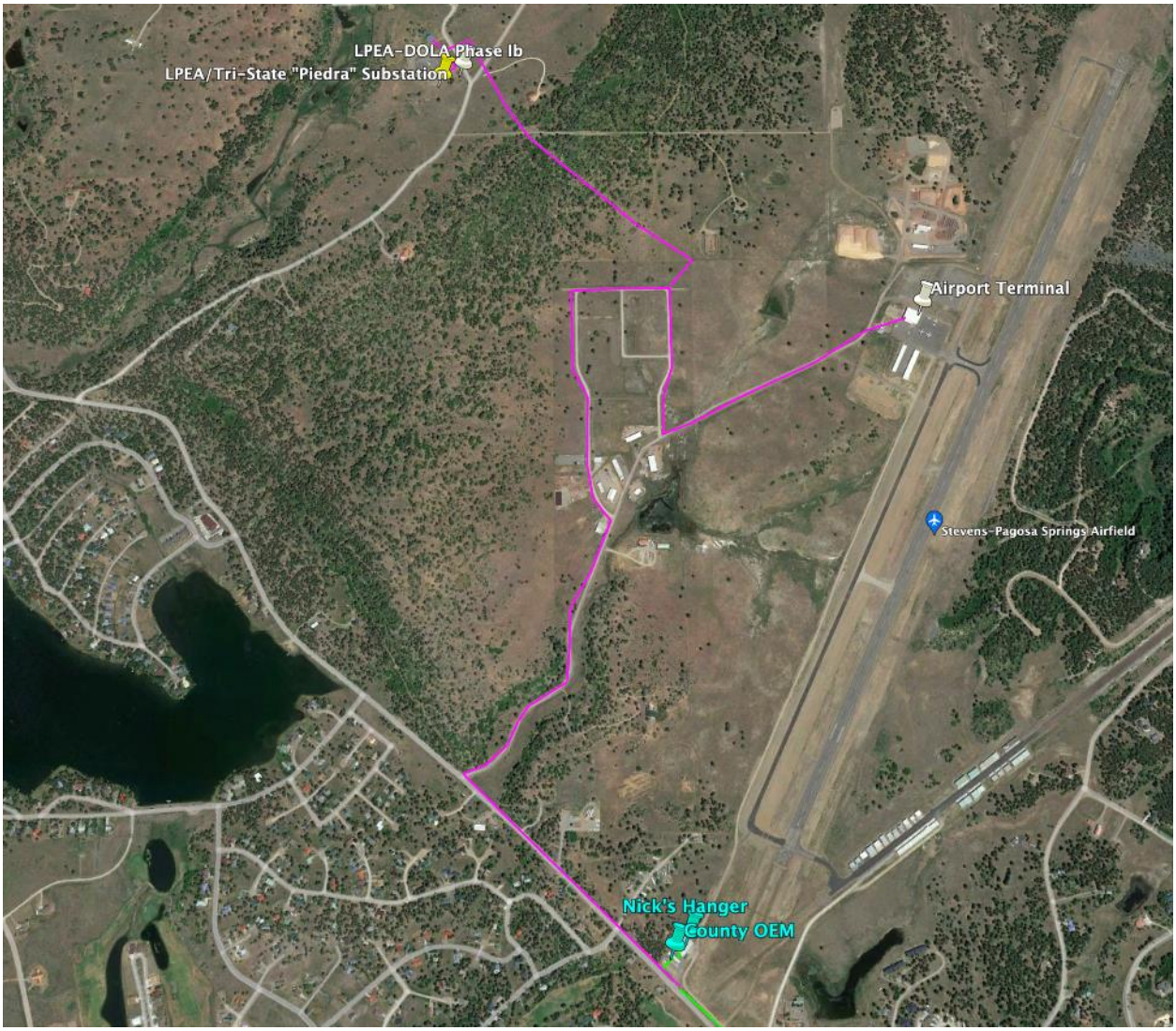

Figure 9: Full Path New Build Fiber for Phase I-B (magenta line)

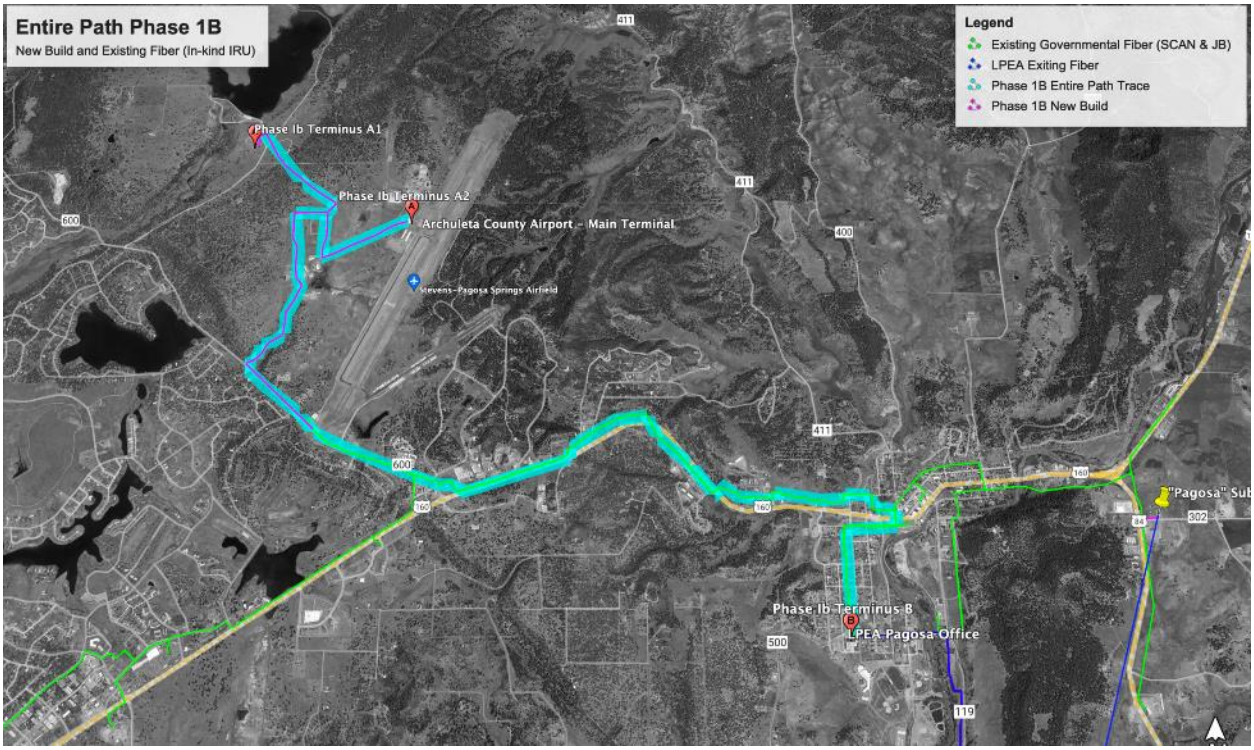

Figure 10: Full Path Phase I-B (new-build in magenta, existing fiber in green)

Phase II-A: Northern Fiber Loop – Open-Access Middle-Mile Fiber along Piedra Road to Hatcher Reservoir

In 2022, the BSMO will undertake a project to create a critical fiber route that serves Pagosa Area Water and Sanitation District (PAWSD) facilities at Hatcher Reservoir, existing wireless and cellular facilities and a large portion of residents in the Pagosa Lakes Property Owners Association (PLPOA) north of US Highway 160 and off Piedra Road. This loop, deemed the "Northern Loop", will serve critical community PAWSD facilities at Hatcher Reservoir and the Hatcher water tank, and will also provide a bandwidth feed to Internet service providers (ISPs) and cellular communication carriers at Hatcher Reservoir. In addition, the loop will allow private ISPs to easily connect to the middle-mile network to provide broadband service to end-users in neighborhoods adjacent to the middle-mile network. In turn, the middle-mile network leases used by private ISPs to provide end-user service creates a revenue stream for the BSMO.

The Northern Loop connects the fiber terminal at Nick's Hangar on Piedra Road to a fiber terminal at the PAWSD facility on Lynn Drive off North Pagosa Boulevard while serving the PAWSD facilities and communications facilities at Hatcher Reservoir. This loop will benefit both the Southwest Colorado Access Network (SCAN) and PAWSD fiber networks by providing resiliency in both networks while offering the ability for ISPs to connect neighborhoods along North Pagosa Boulevard and Piedra Road, a very large number of business and residential housing and one of the most dense and underserved areas of Archuleta County.

Benefits

The Northern Loop has a huge positive impact for Archuleta County, especially the PLPOA area. In addition to supporting critical water management facilities in the PAWSD Hatcher Reservoir area, bringing fiber into Hatcher Reservoir via the loop greatly increase the availability of high-speed broadband to thousands of homes in the densely populated neighborhoods adjacent to the fiber networks running along Piedra Road and North Pagosa Boulevard.

Emergency Operations Management for CAIs and Community in General

- Will support at least one and possibly more cellular providers on the Hatcher water tank along with FirstNet services
- Enhances 800 MHz emergency operations communications

Resiliency for PAWSD Facilities in Middle-Mile Network

- Current facilities at Hatcher Reservoir use somewhat unreliable wireless services for supervisory control and data acquisition (SCADA)

Distance Learning

- Immediate assistance for distance learning for thousands of underserved homes in PLPOA

Better Future Possibilities for Cable Company Expansion and Fiber-to-the-Premise (FTTP)

- 100% dark fiber leasable lines used in fiber swaps and to provide service from local ISPs

Timeline

The BSMO will submit a DOLA grant application or other appropriate grant application in 2022 or 2023 with the intent to receive project funding for installation of the fiber loop in 2023.

Partners

- Colorado Department of Local Affairs (DOLA): Grant funds
- Archuleta County Broadband Services Management Office (BSMO): Grant matching funds
- Pagosa Area Water and Sanitation District (PAWSD) : In-kind matching contribution

In addition to the partners above, potential partners include:

- Black Hills Energy (gas main/SCADA needs)
- Private ISP investment/IRU
- Private equity partners
- Pagosa Lakes Property Owners Association (PLPOA)

Cost Estimates and Contingencies

The BSMO has estimated the Northern Loop fiber installation after breaking up the fiber segments into multiple sections. The loop initially will focus on the Piedra Road route as this one is shorter than the North Pagosa Boulevard route but ideally both routes can proceed with construction concurrently.

Cost Calculations – Fixed Price

These estimates use high-side costing of $90 per foot for rock cutter buried fiber through hard bedrock, $25 per foot for plowed fiber in soft rock and $6 per foot for aerial fiber on existing LPEA utility pole installations.

Total "Piedra" Path Overview

The total cost estimate based on a worst-case high-cost scenario comes to $945,416.

Piedra Road Route – Total Distance Nick's Hangar to PAWSD Water Tank

The total length of the fiber run from Nick's Hangar to PAWSD facilities at Hatcher Reservoir is 5.1 miles, including 4.5 miles to Hatcher Dam and the PAWSD processing building and approximately 3,800 additional feet to the PAWSD water tank along the access road from the PAWSD building.

Section 1: Nick's Hanger to Aspenglow Boulevard - 1.0 Mile

This section must be buried with some hard rock likely along the path. The route parallels the Zitomedia fiber route installed in 2018. The BSMO will invoke the rock clause for 0.25 Mile at $90 per foot for a cost of $118,000 with the remaining 0.75 mile at $25 foot at a cost of $99,000 for a total estimate for this section of $218,000.

Section 2 Description: Aspen Glow to Mission Ave - 1.15 Mile

This section also has no pole line and this section up Piedra Road will also invoke the rock clause for 0.29 Mile at $90 per foot for a cost of $137,800 with the remaining 0.86 mile at $25 per foot at a cost of $151,800 for a total estimate for this section of $289,000.

Section 3 Description: Mission Ave to Hatcher Dam - 1.7 Mile

The BSMO can deploy aerial fiber for this entire section and will likely incur a per year pole attachment fee under agreement with LPEA. Upon cursory visual inspection, the poles look to allow for additional weight without incurring the cost of re-engineering the poles as a make-ready step, but this assumption must be confirmed to finalize the section cost. Aerial fiber proves the most affordable means to bring

fiber in this section and avoids having to bury through a steep ravine in this area. The total estimate for this section for 1.9 miles at $6 per foot comes to $60,192.

Section 4: Hatcher Dam to PAWSD building fiber term hub/CNL - 0.49 Mile

Rocks below 18 inches may not be an issue along the dam portion so the BSMO may not require a rock clause, but the conservative estimate assumes a worst-case scenario. The BSMO will plan for hard rock on 0.12 mile at $90 per foot at a cost of $58,212. The remaining section of 0.37 mile at $25 per foot comes to $48,840, with a total section estimate of $107,052.

Section 5: PAWSD building fiber term to Hatcher Water tank location - 0.74 Mile

Rocks below 18 inches may not be an issue and distance may be shorter if the route can extend up the electric line to the top of the hill rather than proceeding along the access road utility easement, but the conservative estimate assumes a worst-case scenario. The BSMO will plan for hard rock on 0.19 mile at $90 foot at a cost of $87,912. The remaining section of 0.56 mile at $25 per foot comes to $73,260, with a total section estimate of $161,172.

The conservative subtotal of fiber and attachments along the entire run of sections, not counting make-ready and pole attachment fees, comes to $835,416.

The BSMO will need to include other costs for the entire project:

- 10 Handholes and 10 Enclosures along path (for tapping off to other communities/entities along path): $10,000
- ~$300/handhole, ~$900/enclosure
- Lean-to or separated area in Paws building, cooling, electric service work, rack, exterior door for provider access: $30,000
- Engineering and project management costs: $60-70,000 (includes make-ready engineering costs, potential resulting pole replacements, and project management costs).

This brings the total cost estimate on a worst-case basis to $945,416.

In August 2021, the BSMO requested and received $408,000 from Archuleta County for the purposes of using these monies as a cash match toward this project build. If the above worst-case cost above comes to fruition and the BSMO must provide a 50% DOLA grant match, the BSMO will either need to acquire additional funds, justify further in-kind matches or find cost savings in the project to cut the overall project cost. The BSMO may also be able to go the broader route of expanding partners, including Black Hills Energy or private ISPs, to achieve the goal of bringing a fiber trunk to the Hatcher area.

Project Costs

Fiber Build Portion	Project Cost
Section 1 (Buried Fiber) – Nick's Hanger to Aspenglow Boulevard Tank	$218,000.25 Mile @ $90/hr. $118,000. Remaining .75 Mile at $25/mi $99,000
Section 2 (Buried Fiber) – Aspen Glow to Mission Ave - 1.15 Mile	$289,000 rock clause for .19 Mile @ $90/hr. $87,912. Remaining .56 Mile at $25/mi $73,260.
Section 3 (Aerial fiber)– Mission Ave to Hatcher Dam	$60,192 Mission Ave to Hatcher Dam

Section 4 (Buried Fiber) -- Hatcher Dam to PAWSD building fiber term hub/CNL	$107,052 .12 Mile @ $90/hr. $58,212. Remaining .37 Mile at $25/mi $48,840.
Section 5 (buried fiber) -- PAWSD building fiber term to Hatcher Water tank location	$161,172 rock clause for .19 Mile @ $90/hr. $87,912. Remaining .56 Mile at $25/mi $73,260.
Handholes, Enclosures, Hut/Cabinet Structure at Hatcher	$40,000
Engineering, Make-Ready, and Project Management Costs	$70,000
Total Cost	$945,416

Project Maps

The BSMO put together maps to show different components of the Piedra Road route as it connects Nick's Hangar to the Pagosa Area Water and Sanitation District (PAWSD) facility at Hatcher Reservoir.

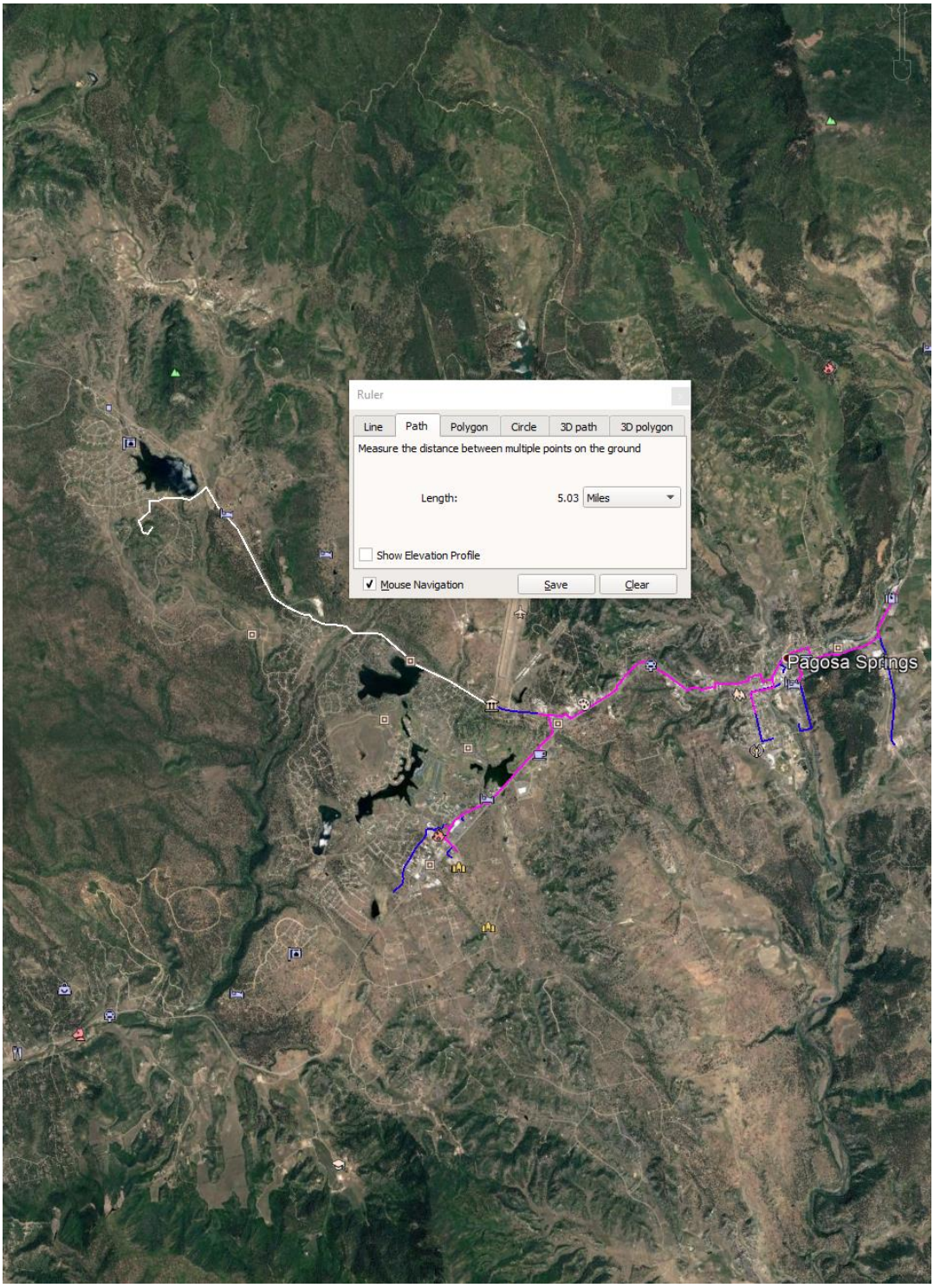

Figure 11: Total Piedra Path Overview

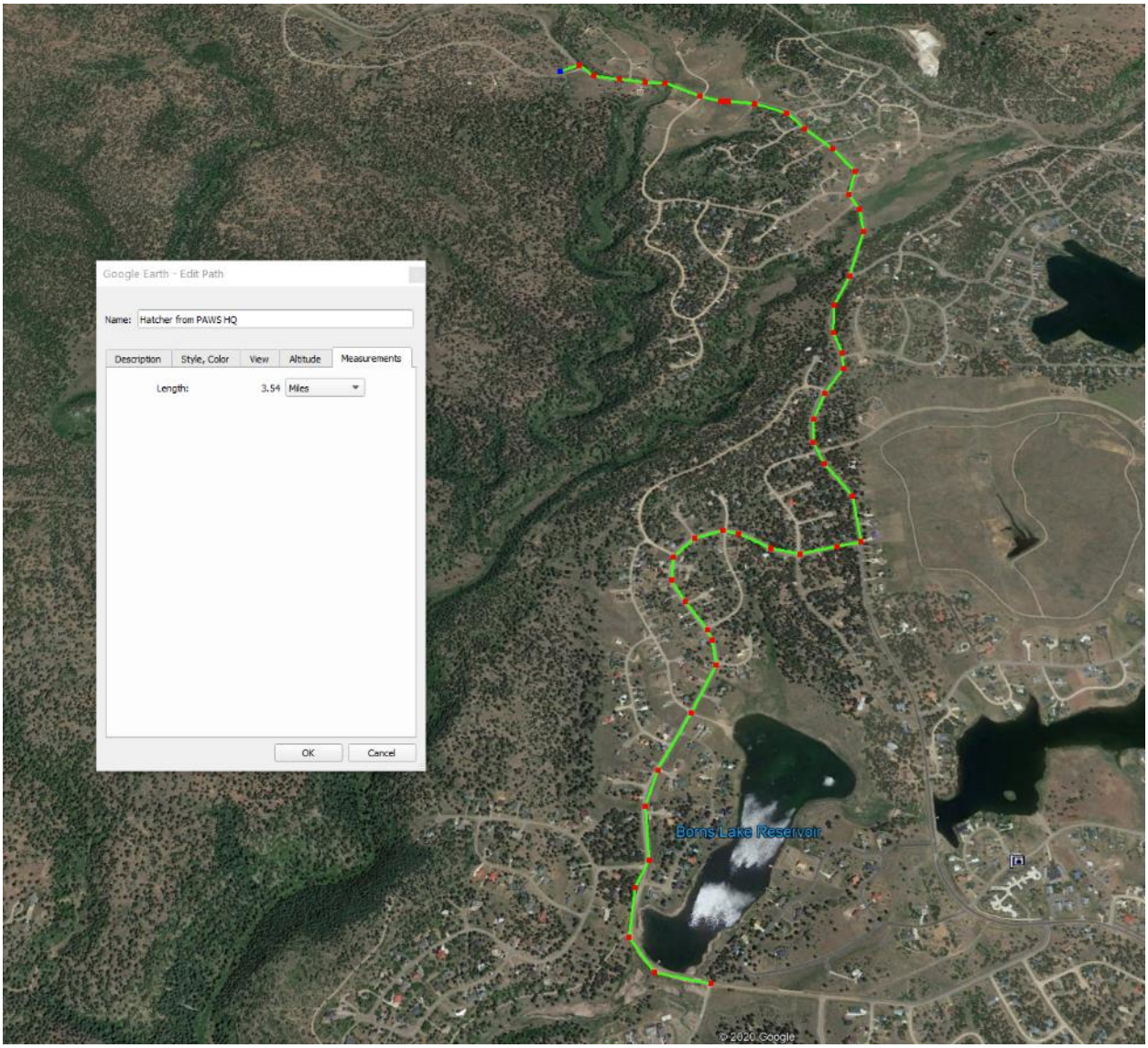

Figure 12: North Pagosa Path from PAWSD HQ Intersection on Lake Forest Circle to Aerial LPEA poles along Coronado Circle (buried)

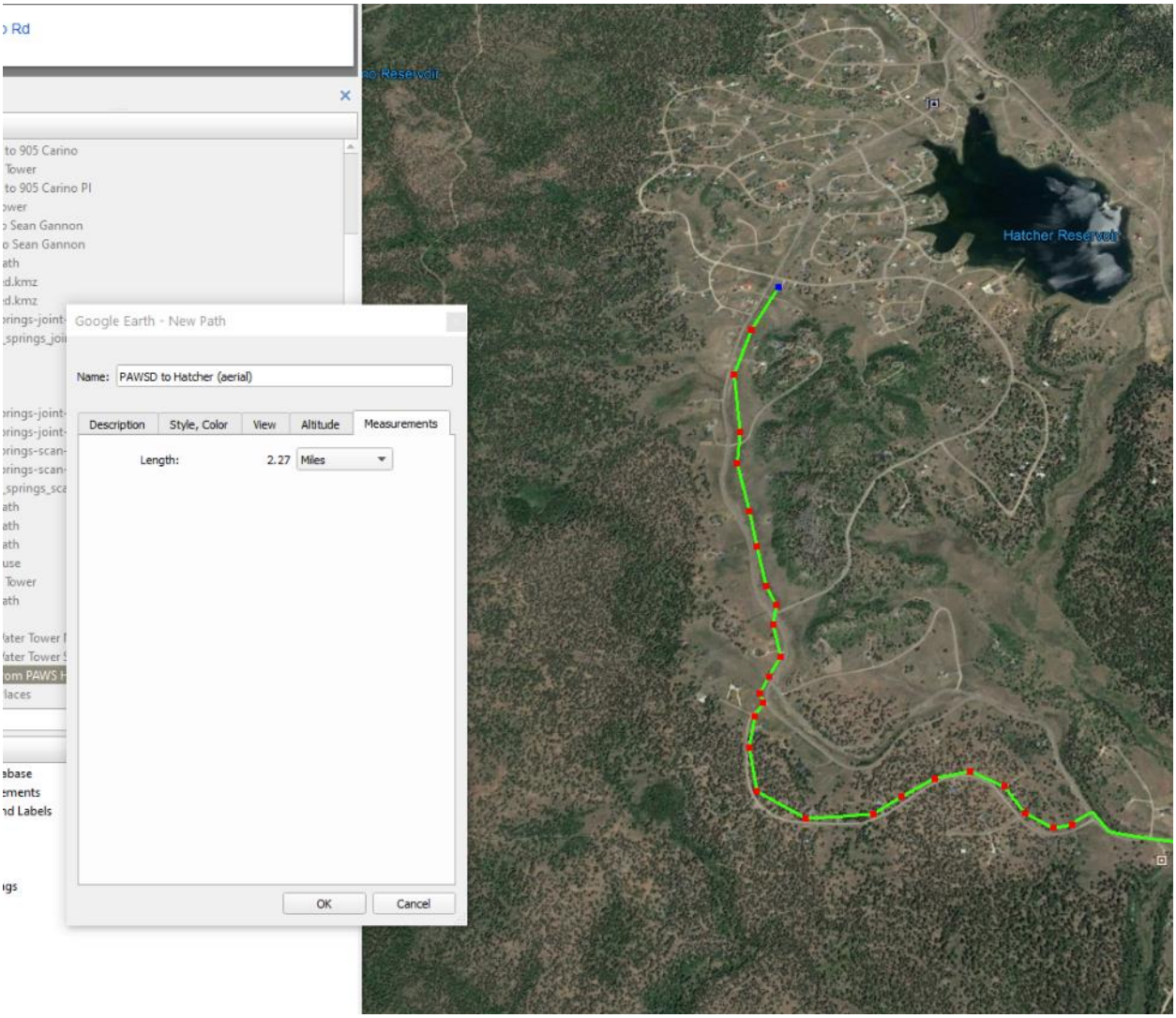

Figure 13: From Coronado Circle to Hatcher Circle Intersection (aerial)

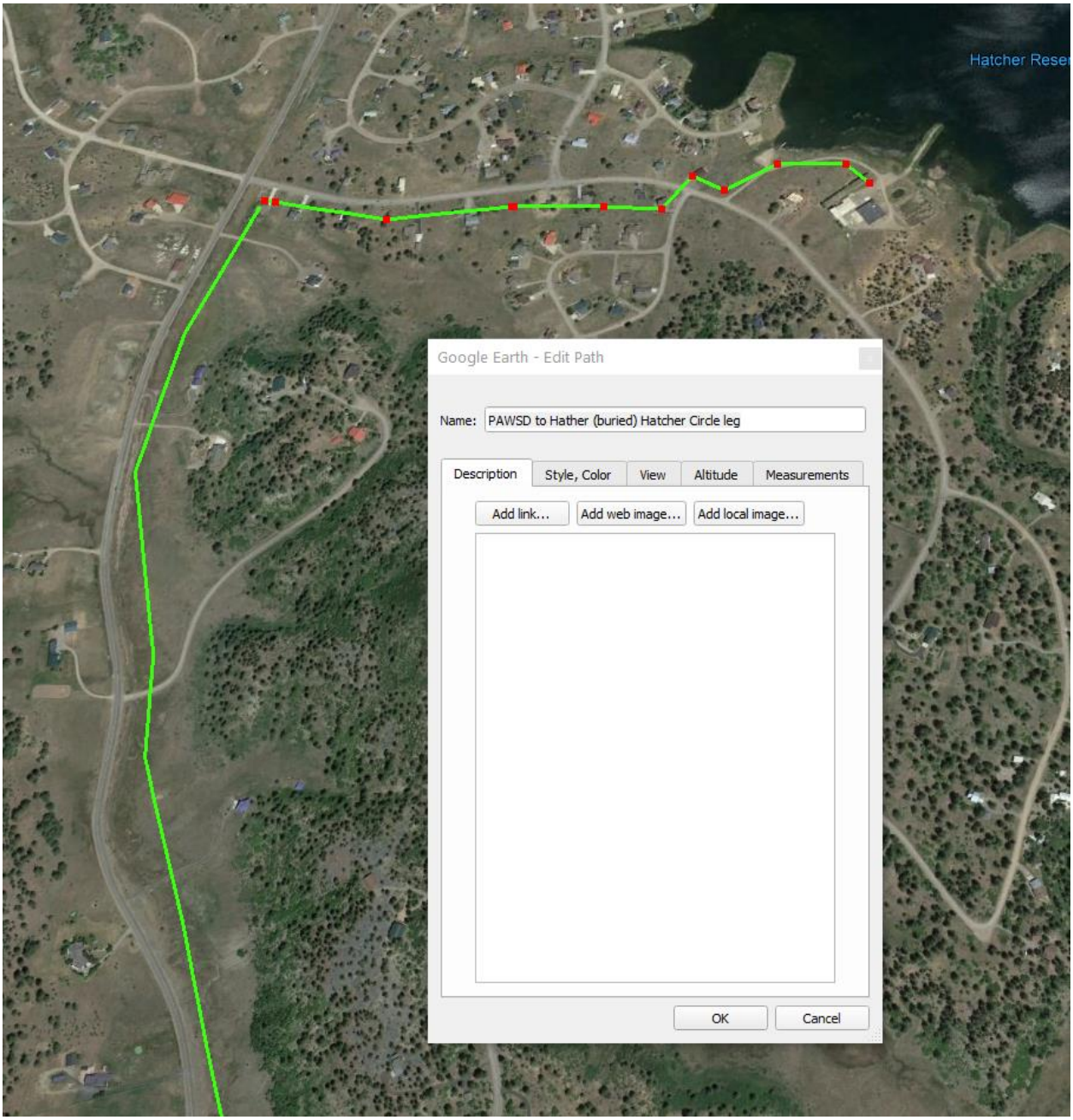

Figure 14: From Hatcher Circle to PAWSD facility (buried)

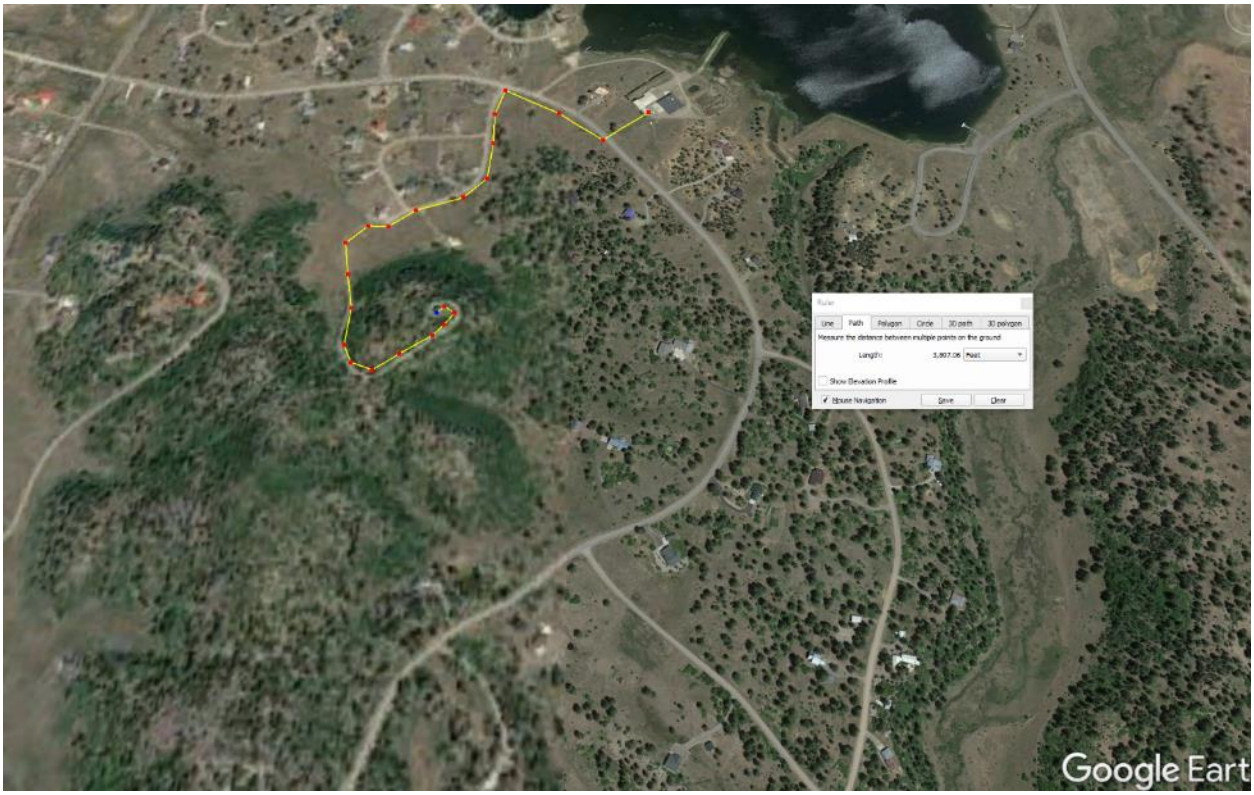

Figure 15: Long Path from PAWSD building to Water Tank (along road utility easement)

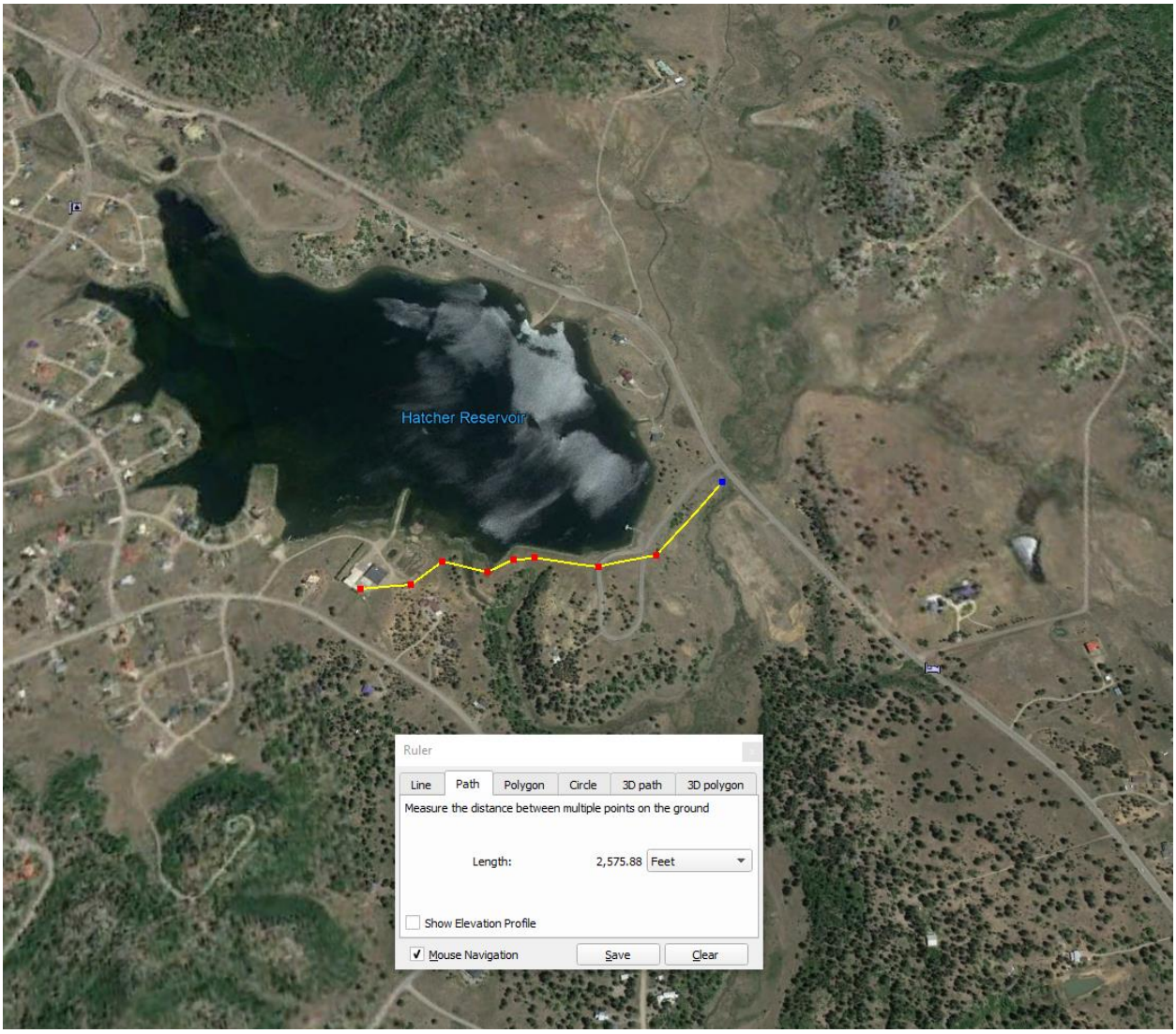

Figure 16: Approximate buried path from PAWSD bldg. to Piedra, past dam

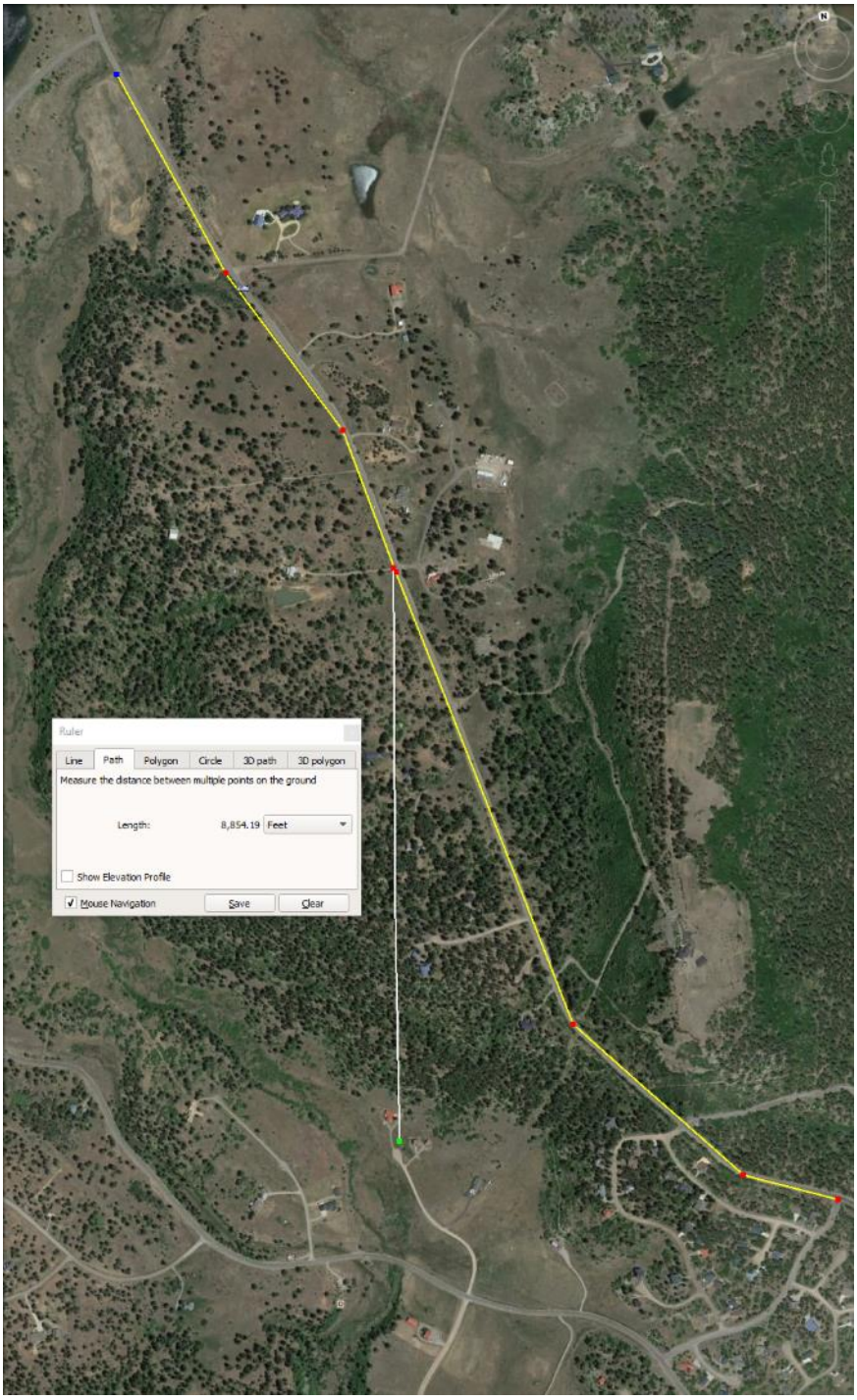

Figure 17: Mission to Hatcher Dam

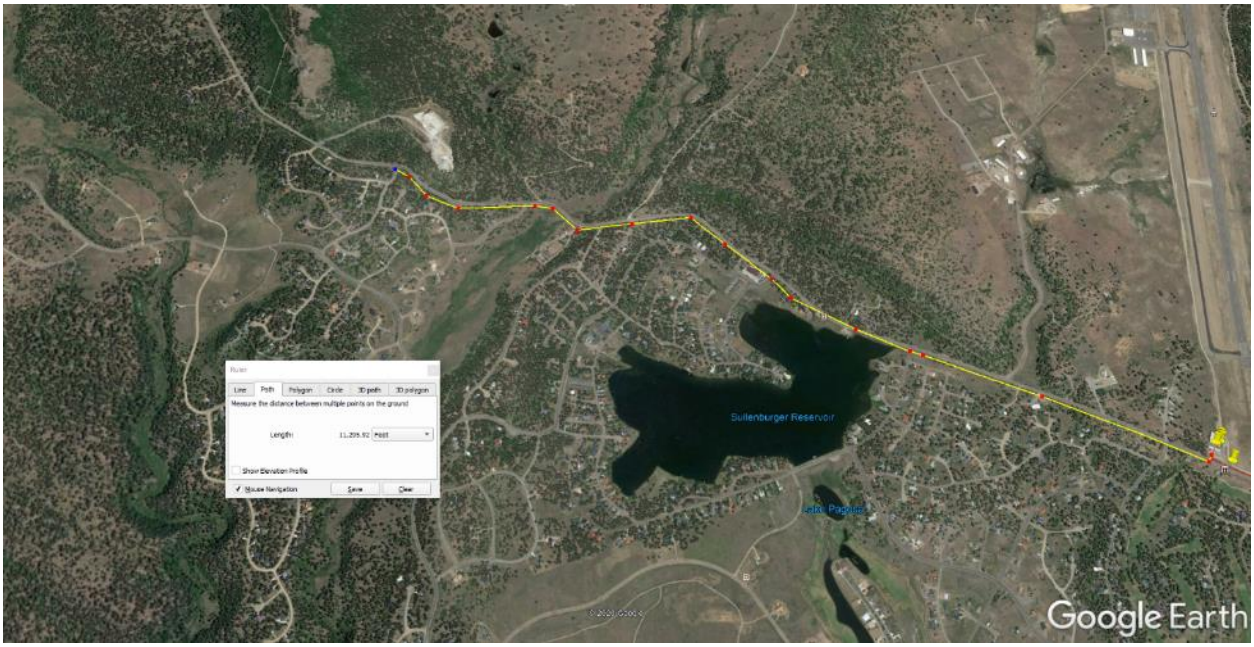

Figure 18: Section 1 and 2: Nick's Hangar Fiber to Mission Drive

Pictures of Area

Figure 19: Hatcher area from water tank access road

Figure 20: Good view showing a lot of the houses in the area from further up the hill

Figure 21: From water tank hill looking south

Figure 22: PAWSD Hatcher Water Tank

Figure 23: Archuleta County Assessor's Map showing the number of lots in Hatcher area subdivisions, at least 50% of them look to be already built and occupied

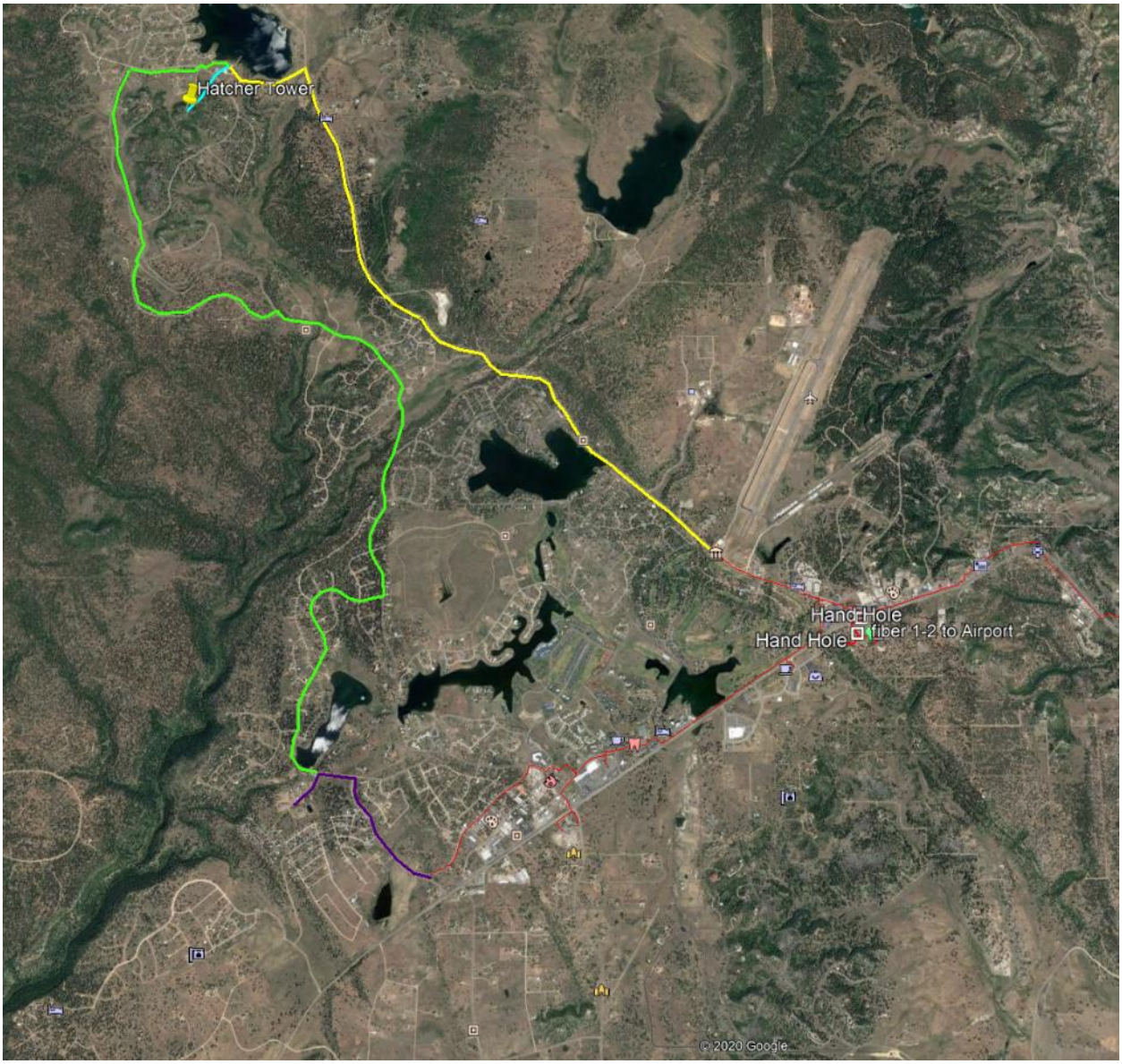

Figure 24: Hatcher Routes A and B (North Pagosa route in green, Piedra route in yellow, North Pagosa Loop in green)

Phase II-B: Northern Fiber Loop – Open-Access Middle-Mile Fiber along Pagosa Boulevard

In any fiber deployment, redundant diverse loops create resilient networks that stand the test of time. For reasons including redundancy against accidental damage or planned maintenance to one side of a loop that allows communications to continue uninterrupted, building fiber loops proves the best practice for ensuring the network can deliver capacity in the most scenarios. With the added benefit of bringing a potential core "trunk" line through sets of neighborhoods, private providers can use the trunk line to deploy service to local businesses, residents and visitors. See Figure 21 above, to see the potential path of the line along North Pagosa Boulevard from Hatcher reservoir to the PAWSD headquarters fiber, which already exists as part of the SCAN.

As more of an aspirational goal, the BSMO will likely require significant amounts of private provider investment and exchanges to afford the costs involved. These costs will likely be very high due to the large number of buried utilities and prevalence of shallow bedrock along this path, which costs more than running fiber trenches through soft dirt or putting up fiber on aerial pole attachments.

Benefits

The completion of the Northern Loop as a true redundant facility will especially benefit the PLPOA area by completing the fiber link running along Piedra Road and connecting that fiber link to the North Pagosa Boulevard link for a true fiber loop.

Emergency Operations Management for CAIs and Community in General

- Will support at least one and possibly more cellular providers on the Hatcher water tank along with FirstNet services
- Enhances 800 MHz emergency operations communications

Resiliency for PAWSD Facilities in Middle-Mile Network

- Current facilities at Hatcher Reservoir use somewhat unreliable wireless services for supervisory control and data acquisition (SCADA)

Distance Learning

- Immediate assistance for distance learning for thousands of underserved homes in PLPOA

Better Future Possibilities for Cable Company Expansion and Fiber-to-the-Premise (FTTP)

- 100% dark fiber leasable lines used in fiber swaps and to provide service from local ISPs

Timeline

The BSMO will submit a DOLA grant application or other appropriate grant application in 2022 or 2023 with the intent to receive project funding for installation of the North Pagosa Boulevard fiber link in 2023.

Partners

- Archuleta County Broadband Services Management Office (BSMO): Grant matching funds

In addition to the partners above, potential partners include:

- Pagosa Area Water and Sanitation District (in-kind matching contribution)
- Black Hills Energy (gas main/SCADA needs)

- Private ISP investment/IRU
- Private equity partners
- Pagosa Lakes Property Owners Association

Cost Estimates and Contingencies

This project does not yet have cost estimates and contingencies and that information will be available once the project comes closer to execution.

Project Maps

This project does not yet have detailed project maps and maps will be available once the project comes closer to execution.

Phase III: Carrier Neutral Locations (Primary Uptown and Secondary Downtown)

A Carrier Neutral Connect (CNL) is the nerve center of a network, for both local middle-mile trunk lines and for longer, neutral backhaul uplinks out of the area. It's also a sort of co-location facility where ISPs can securely host their equipment and interconnect to these networks. The BSMO currently manages two *de facto* CNL locations that, while hosting some critical network functions for ISPs, do not provide desirable long-term solutions for several reasons.

Benefits

These CNLs, hosted at Pagosa Springs Medical Center and the Town Hall of the Town of Pagosa Springs, need upgrades to permanent, secure, fully-functional CNL facilities.

According to Corey Bryndal with Region 10 Economic Development District, Carrier Neutral Locations (CNLs) perform many critical broadband network functions, including:

- Connecting middle-mile to last-mile networks;
- Providing a quick, easy low-cost inter-connection among networks;
- Decreasing the time required for ISPs to invest into a community;
- Acting as a neutral site location that provides a hosting location with no commercial bias in pricing or policies; and
- Encouraging partnerships in the community with private, public and other interests.

Carrier Neutral Location - Primary Uptown Facility

Archuleta County has a sort of *de facto* CNL connecting upstream broadband providers to the local middle-mile fiber network at the Pagosa Springs Medical Center (PSMC). While somewhat functional, this CNL is not optimal for several reasons.

Chief among the issues with the current CNL is lack of secure access around the clock. Network service providers do not have independent, 24x7 access to their equipment to perform any needed upgrades and maintenance. These providers must depend on hospital personnel to let them in and escort them the entire time the provider accesses its equipment, which places a significant burden on hospital IT personnel.

The CNL at PSMC is located in a very small room that also houses the hospital's internal IT infrastructure, allowing for only a small amount of space for Internet Service Providers to house middle-mile fiber equipment. The CNL's proximity to the hospital's internal servers and core networking switch also raises HIPAA privacy concerns and puts broadband providers under the onus of adhering to the hospital's strict Covid-19 access requirements.

The PSMC board has discussed and approved, in principle, placing a true, purpose-built CNL on PSMC property, likely to the northwest of the section of the building that currently houses the CNL. All local middle-mile fiber would be terminated in the future CNL, rather than in the internal room in the hospital that currently houses the CNL. The BSMO will ensure that a conduit runs from the new CNL to cross-connect the hospital's data room to the new CNL to connect to current and future middle-mile and upstream providers housed in the CNL.

This location also will be strategically located on the west side of Pagosa Springs, adjacent to US Highway 160, and will be along the path of future CDOT fiber and any other long-haul fiber builds likely to come to Pagosa Springs from the west along US Highway 160 from Durango or Bayfield, Colorado.

The design of the CNL will all encourage further middle-mile and last-mile development of the area. The facility will be a convenient, accessible and neutral location for ISPs to connect to the local government fiber network (SCAN) and will allow for long-haul middle mile providers to house their equipment in a safe reliable space. The CNL will be designed with industry standards including redundant power, adequate heating and cooling and fire-suppression, all monitored via alarms and cameras that provide additional security measures. The building itself will be constructed from material that will withstand any extreme weather event typical to the Pagosa Springs area.

Through inspection of similar CNLs and co-location facilities in the Region 10 EDD area as well as Montezuma County, Colorado, the BSMO has solicited a quote from a well-regarded fiber hut and modular co-location manufacturer, Thermo-bond, as well as estimated costs for site preparation and middle-mile fiber relocation from the current PSMC data facility to the new CNL.

The 12 feet by 16 feet Thermo-bond modular fiber hut will feature:

12' O.D. x 16' O.D. x 9' I.D. Lightweight Shelter

1. *(1) 3'x7' exterior steel door with passage, closer & deadbolt hardware, Electric strike*
2. *Stone Aggregate Exterior (Ozark/Brown)*
3. *Minimum R-values of 15 in the walls and floor & R-30 in the roof*
4. *Painted "I" beam box skid assembly*
5. *Single-ply rubber roofing material with Kynar 500 coated roof edging*
6. *Vinyl tile floor covering*
7. *5/8" OSB/FRP interior finish*
8. *Full set of construction drawings for review – Colorado PE stamped*
9. *Freight to Site (Pagosa Springs, CO) if site is accessible to semi-truck & trailer.*

Electrical package:

1. *(1) - 200 Amp single phase Load Center with main breaker*
2. *(1) – Surge Protective Device, Atlantic Scientific MLZM11214*
3. *(1) – 200 Amp single phase Manual Transfer Switch, Ronk 7215*
4. *(1) – 200 Amp Generator Receptacle, Appleton AJA20034-200RS*
5. *(4) - 4 foot LED light fixtures with switch*
6. *(1) - LED exterior light with photocell, RAB SLIM12-PC*
7. *(4) - 120v duplex receptacles*
8. *(1) – Exterior GFI receptacle*
9. *(2) - 3 Ton cool/5kW heat wall mount air conditioners, BARD*
10. *(1) – HVAC Controller, Lead/lag, with base alarm board, BARD MC4002-A*

11. *(1) – 4" x 20" x 1/4" master ground bar*
12. *(1) – Bonded Halo, #2 Bare Copper*
13. *(A/R) – 12" wide ceiling mounted cable ladder*
14. *(1) Alarm Package – Door, Smoke Detector, High/Low Temperature, Power Fail, dry relays wired to 66 punch down block in 12x16 junction box*
15. *All electrical wires, breakers, boxes, conduit, etc. to make a complete assembly*

Beyond the features above, the facility will also include:

- Space for 6 full-sized (42RU) 4-post racks and 1-2 2-post network racks
- ATS (Automatic Transfer Switch)
- 2 Different Ground Rings (one for A/C and one for Equipment, due to lots of lightning and low humidity in area)
- Humidifier
- Dual Air Conditioning Units
- Dual (one active and one-roughed in) 200Amp Utility Power Panels
- Vault for East/West Fiber feed.
- Outdoor (pad-mount) generator
- Security Bollards
- Lightning arrestor
- TVSS surge suppressor
- Proximity badge access capability

Carrier Neutral Location - Secondary Downtown

Like the PSMC data room uptown, the BSMO uses the network closet at the Town of Pagosa Springs Town Hall as another sort of *de facto* CNL, connecting upstream broadband providers to last-mile deployments in downtown Pagosa Springs. The closet at Town Hall is not optimal for this purpose both for its lack of size and accessibility. The cabinet also houses Colorado Bureau of Investigation (CBI) and Police Department data requiring separate storage and limited access. This situation requires Town of Pagosa Springs staff members to limit access whenever possible and escort any provider personnel while on site working with network equipment.

When Archuleta County Department of Human Services (DHS) moves out of the downstairs floor of Town Hall in 2022 to its new location across Hot Springs Boulevard, the BSMO plans to build an externally accessible CNL closet for ISPs to use to connect to the local SCAN fiber loop and to house fiber equipment necessary to provide high-speed broadband services more effectively to downtown businesses, residents and visitors.

The downtown secondary CNL will be a much smaller room than the primary CNL at PSMC, but this facility will still include redundant power, heating and air conditioning, and redundant fiber feeds, to enhance stability and reliability of the services coming out of this facility and to make 24x7 maintenance much more efficient for the providers.

As part of this effort, the BSMO will complete the connection across the parking lot to the new DHS building, continuing south on Hot Springs Boulevard to the LPEA pole enclosure at the corner of Apache Street. This new connection will provide a diverse redundant path of fiber out of Town Hall itself toward the hospital, which will benefit Town of Pagosa Springs facilities, Archuleta County DHS and any private

ISP network assets in the downtown area. The BSMO estimates a likely cost around $7,000 for this new connection with a one-third cost share for this critical link among Archuleta County, the Town of Pagosa SCADA project (which this link would also support) and the BSMO.

Timeline

In 2022, at least one of these CNL builds (likely the Uptown CNL), if not both, will be eligible for DOLA funding and the BSMO plans to use DOLA funds to upgrade the current CNLs to modern standards. Both facilities will be complete by the end of 2023.

Partners

Several critical partners will enable the BSMO to successfully build and operate the Uptown and Downtown CNLs, including:

- Pagosa Springs Medical Center
- Town of Pagosa Springs
- Archuleta County Department of Human Services (DHS)

Cost Estimates and Contingencies

Based upon research conducted by the BSMO, the Uptown CNL can be completed on the following budget.

Uptown CNL Costs

- CNL structure
    - Pre-built building cost & config: $80,580
    - Shipping: $6,900
    - Concrete pad: $20,000
    - Crane to lift off and set structure on pad: $4,200
- Pad-mount Generator (40kVA)
    - Generator itself: $50,000
    - Shipping: $5,000
    - Concrete Pad: $5,000
- Utilities
    - 200 amp service: $20,000
    - On-site electriction connection of Utility power and Generator/ATS: $6,000
    - ATS (Automatic Transfer Switch): $3,000
- External and Internal IP Camera and licensing: $3,500 (2 ”Verkada” type: 1 external, 1 internal type cameras)
- Fiber termination/move
    - Conduit and 48 count SM fiber to hospital: $15,000
    - Cross-connect/move coordination from hospital to CNL: $7,500

- Engineering/Project Management: $11,300

Total Build Cost: $238,014

Funding Calculations:

- Archuleta County (General Fund and/or ARPA): $120,000
- Non-cash new build shortfall (to come from DOLA): $118,014

Downtown CNL Costs

Costs should range in the $50,000-$80,000 level and will be drawn predominately from the $97,000 2021 budget allotment to the BSMO from the Town of Pagosa Springs.

Project Maps

Figure 25: Example of Thermobond modular "Fiber Hut" building similar to one quoted in proposal

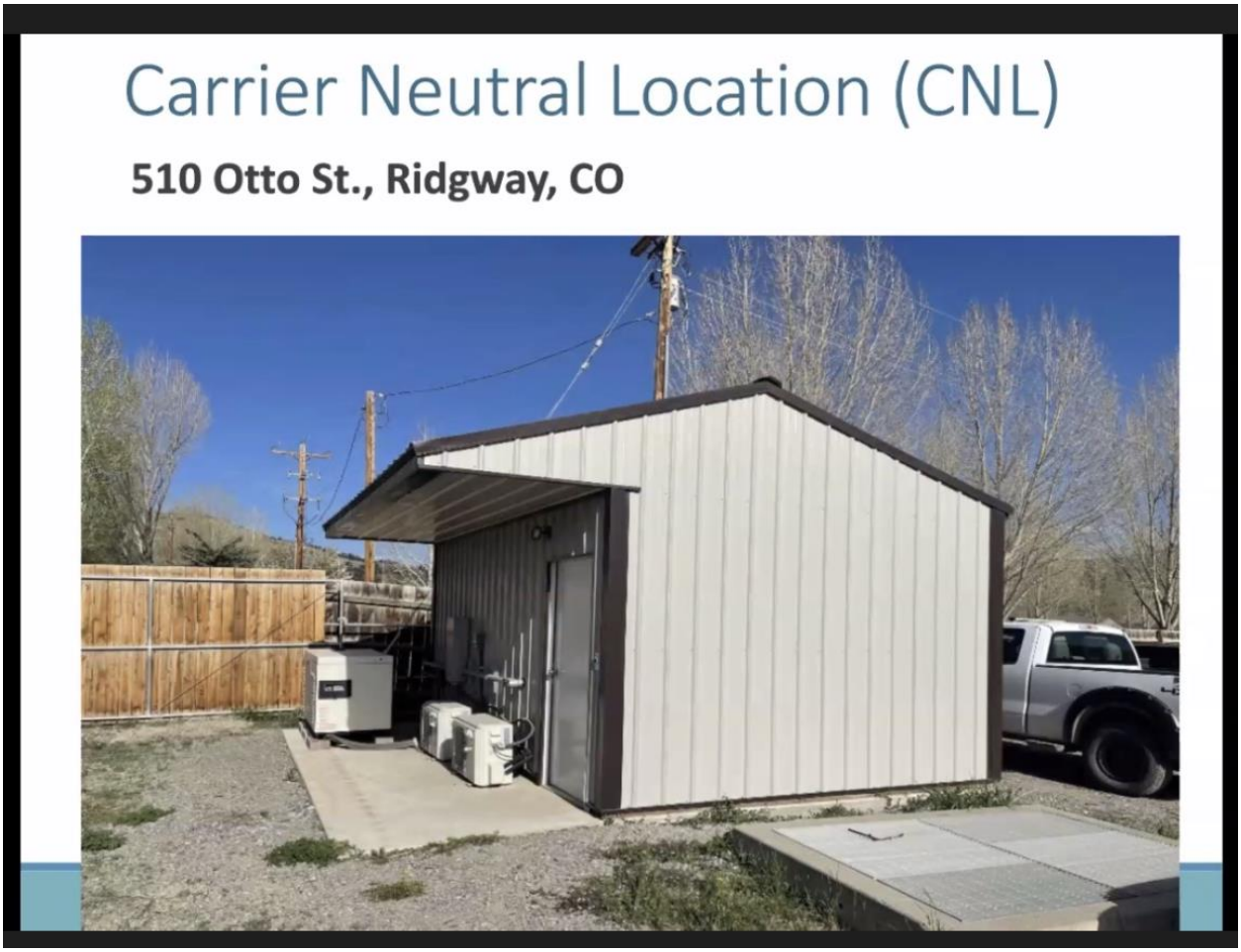

Figure 26: Region 10 example CNL (exterior)

Figure 27: Region 10 example CNL (interior)

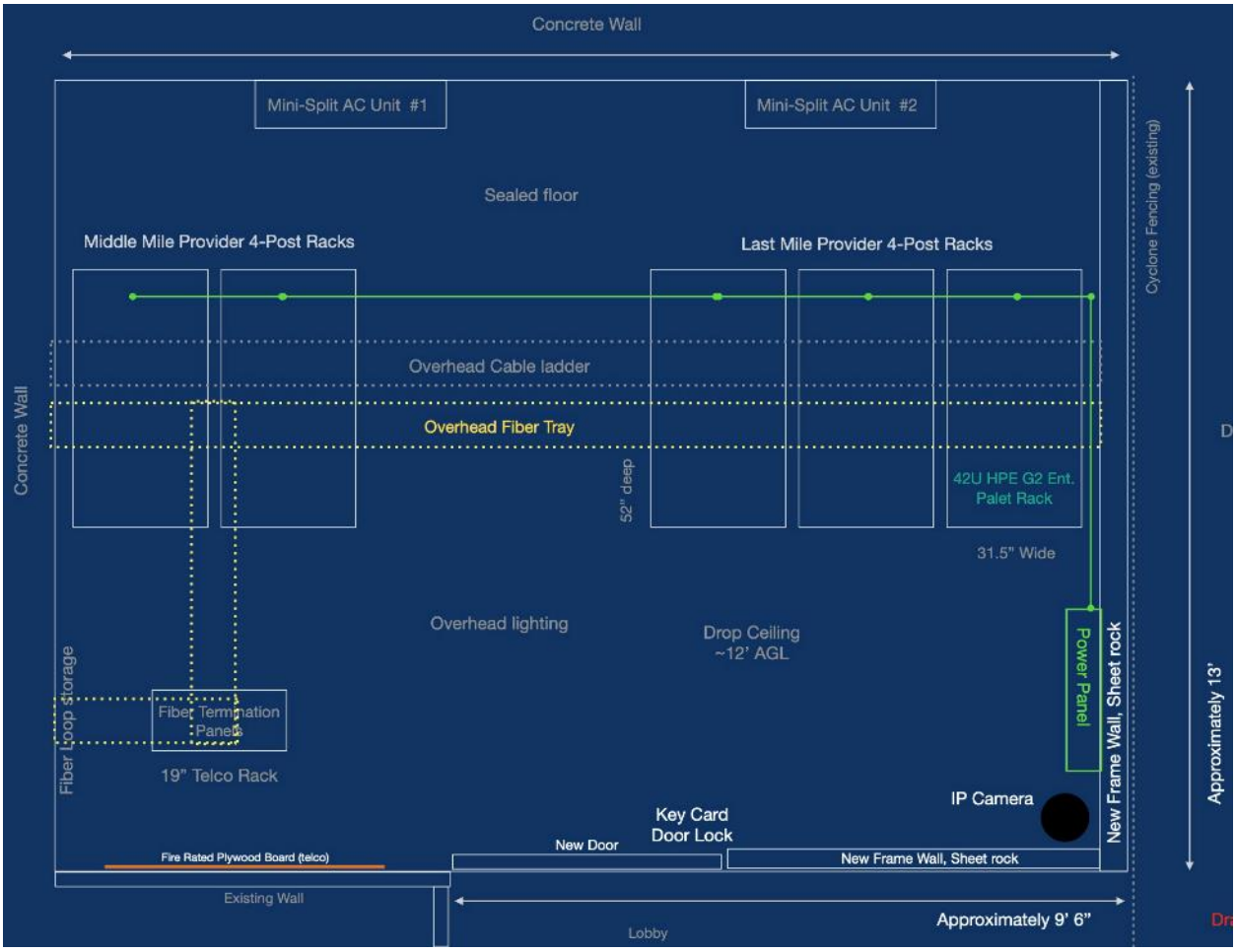

Figure 28: Region 10 example CNL (layout schematic)

Figure 29: Used Thermobond-style former Verizon building used as Data Center in Cortez, CO

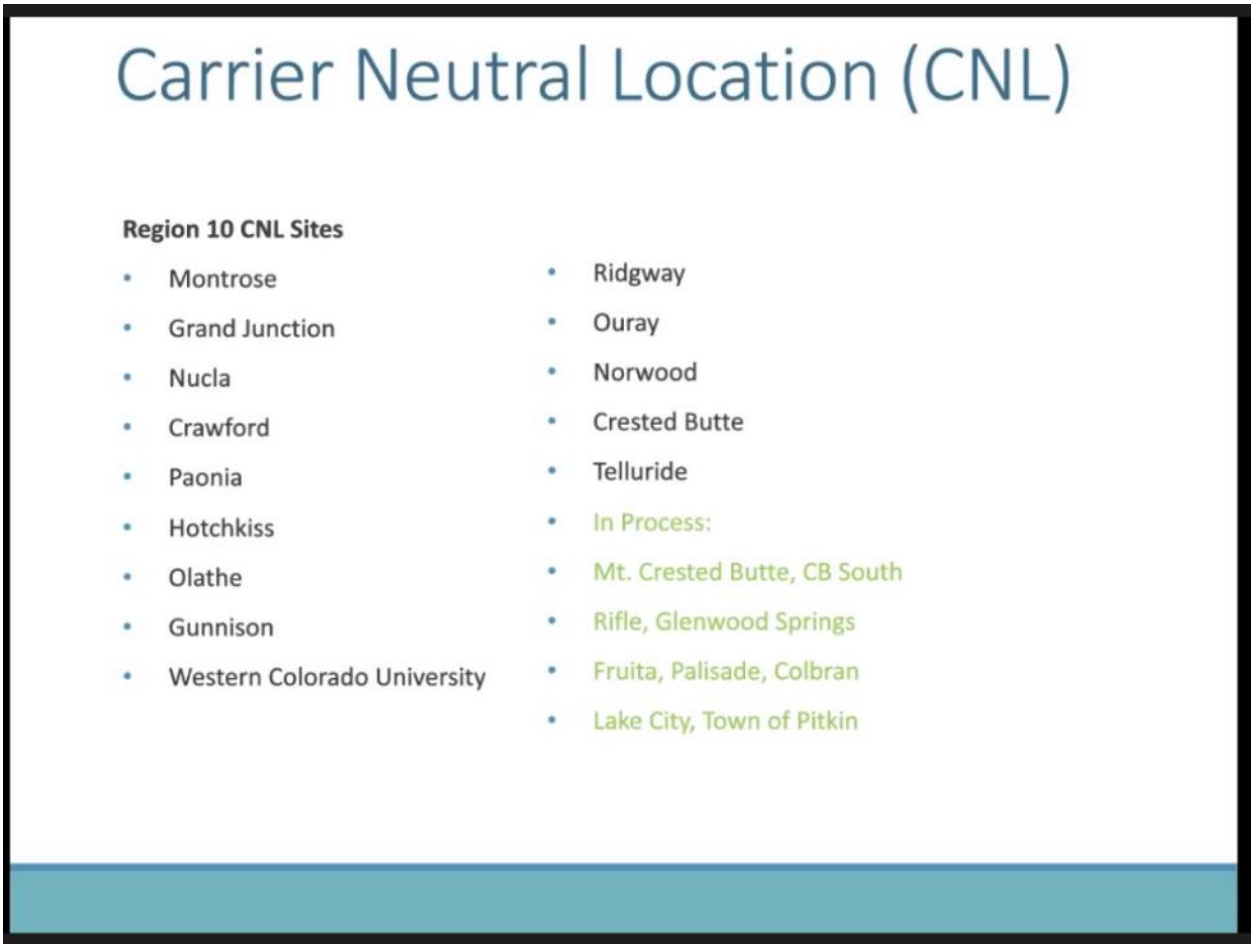

Figure 30: Regional CNLS on Colorado's Western Slope

Phase IV: Wolf Creek Pass Backhaul Fiber

The CDOT fiber coming down from the top of Wolf Creek pass represents a once-in-a-lifetime opportunity to get a northeast directional fiber backhaul route out of the area. This opportunity will be the first non-proprietary fiber backhaul link that Pagosa Springs and Archuleta County will have available to serve broadband needs. When the project completes in late summer 2023, CDOT will provide a leasable fiber link from South Fork, Colorado, to the intersection of US Highway 84 and US Highway 160 on the east side of Pagosa Springs.

Benefits

Once completed, fiber assets will be available from South Fork, Colorado, via Cielo, Visionary, and other ISPs that can interconnect all the way back to Denver from South Fork. This represents a huge connection opportunity for Archuleta County as it provides a critical redundant backhaul route that mitigates the current single point of fiber failure as well as contributing an exponentially higher amount of new bandwidth available to the area.

The BSMO will entice at least one provider of bandwidth, and preferably many, to utilize this connection to bring wholesale bandwidth to the area, and eventually beyond Pagosa Springs to Durango. The BSMO has made arrangements with CDOT and Archuleta County to help ensure that Archuleta County can get access to four fiber strands from Pagosa Springs to South Fork for a 20-year lease at low inter-governmental pricing. The BSMO should be able to use the lease and fiber link both for feeding connections and neighborhoods along the path (see Appendix B for maps of this concept) as well as for a new 43-mile bandwidth expressway to South Fork from which we can access at least 100 gigabits per second (Gbps) of Internet fed from multiple upstream sources.

From the outset, this additional upstream bandwidth availability represents a tenfold increase in bandwidth available in Archuleta County, and more capacity will come online as needs and technology evolves going forward. The BSMO should make this project one of its highest priorities, both in coordination before the fiber is built to ensure bandwidth can be provided to neighborhoods along the path without great cost, and after the fiber is built to coordinate with upstream bandwidth providers, regional network stakeholders, and current and future local ISPs.

Timeline

As of 2020, CDOT fiber was installed on the north side of Wolf Creek Pass all the way to the Wolf Creek Pass summit. The new CDOT fiber build to bring fiber down from Wolf Creek Pass to Pagosa Springs will begin in spring 2022 and should complete the link from Pagosa Springs to the Bootjack Ranch by the end of summer 2022. The second leg of the project will run up the south side of Wolf Creek Pass in spring and summer of 2023 with a connection to the existing CDOT fiber at the top of the pass commencing once the fiber project is finished.

Partners

To ensure the community takes full advantage of this critical new broadband resource, the BSMO must consider pairing with the San Luis Valley of Colorado Council of Governments (SLVCCOG) and the City of Durango and La Plata County entities to build a regional loop that will help all participants create and use a robust, redundant regional middle-mile broadband network. Emulating the Project THOR model already employed by the Northwest Colorado Council of Governments (NWCCOG), this approach will strengthen broadband availability and reliability in all southwest Colorado.

Partners in this project include:

- Archuleta County
- DOLA (Capital Projects Fund or Federal Infrastructure Funding for this lease/and equipment/network operations)
- Colorado Department of Transportation (CDOT) and Arcadian Infracom: Gain access to a fiber route over Wolf Creek Pass from Pagosa Springs to South Fork, Colorado
- BootJack Ranch discussion:
- SWCCOG could possibly fit in as a regional partner working with the BSMO and DOLA

Cost Estimates and Contingencies

As of early 2022, the BSMO is awaiting more information from CDOT and Arcadian Infracom to fully understand the costs that will be incurred from local interests to complete this project.

Project Maps

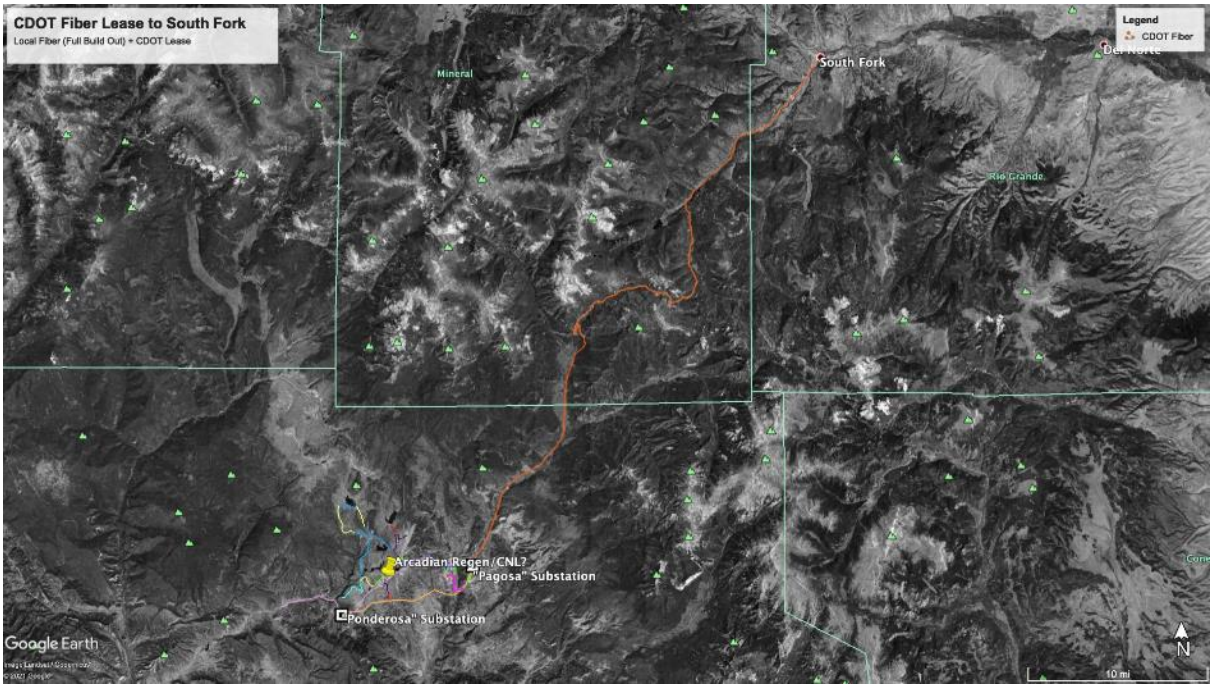

Figure 31: CDOT 2022-2023 Fiber Route from Pagosa Springs to South Fork Phase I due to commence Spring 2022, slated for completion end of 2023

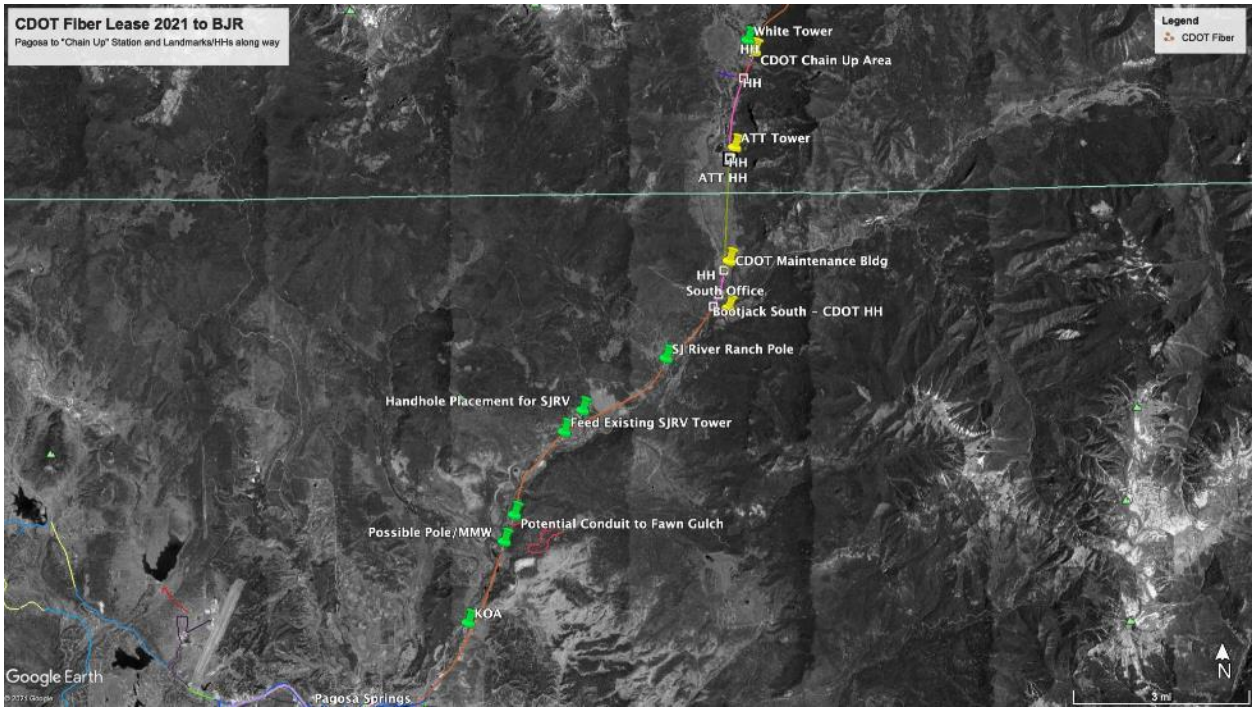

Figure 32: CDOT 2022- Fiber Route towards South Fork Shows section slated to be completed 2022 and potential BSMO administered Hand-holes along route to tap County leased lines

Phase V: Last-mile DORA Routes

Several efforts currently are underway in Archuleta County to connect last-mile neighborhoods with modern broadband.

Benefits

These efforts will provide fast, reliable and affordable broadband internet connectivity to relatively remote outlying neighborhoods in Archuleta County that lie beyond the reach of the core fiber middle-mile network the BSMO will help build. To reach many of these areas, the BSMO will engage partners who can provide fixed wireless and low-earth orbit (LEO) satellite capabilities to deliver broadband service to the premise.

Timeline

Depending on the outcome of these last-mile efforts, including working with partners like Connexon, LPEA, Starlink, the Southern Ute Indian Tribe and others, the BSMO may still need to provide last-mile service to some neighborhoods in Archuleta County by 2024.

Partners

Potential partners for last-mile DORA routes include:

- Archuleta County
- Connexon
- LPEA
- Starlink
- Southern Ute Indian Tribe
- Private ISPs

Cost Estimates and Contingencies

If other partners commence the process of building out to Archuleta County locations, the BSMO may not need to overbuild to these locations and this would cost very little. However, depending on other partners' plans, the BSMO may need to take up last-mile projects and funding to help reach these unserved and underserved areas of Archuleta County. To this end, the BSMO will continue to pursue and strengthen its relationships with critical broadband partners in the region.

Project Maps

This section describes area residential neighborhoods for which to consider last-mile projects to service for future broadband efforts. To best put together last-mile projects, the BSMO prefers to use a demand aggregation model that builds out to neighborhoods that make a commitment to broadband by soliciting commitments from neighborhoods to use broadband services before building last-mile networks.

Last mile project candidates for the Colorado Broadband Fund (CBF) through the Colorado Department of Regulator Agencies (DORA) include the following areas and neighborhoods.

- US Highway 84 (Fixed wireless)
    - Upper Blanco
    - Coyote Park
- Northeast of the Town of Pagosa Springs (Fiber/Fixed wireless)
    - Log Hill Rd/Fawn Gulch (GPON Project)

    - San Juan River Village (GPON Project)
    - San Juan River Ranch (GPON Project)
    - Boot Jack Ranch/West Fork Road Clients
- West
    - Aspen Springs 6/Cat Creek Rd (GPON project possibly)
    - Chimney Rock/Piedra River (GPON/Fixed wireless)

Phase VI: SCAN Joint Build Independence

To gain better control over the community's broadband destiny, the BSMO intends to build long-term buried fiber along the core SCAN (Southwest Colorado Access Network) route from uptown to downtown Pagosa Springs. This new route will reduce dependence on the current sub-standard aerial joint-build fiber installed in 2013-14 among Archuleta County and the Town of Pagosa Springs on the public side and Zitomedia (formerly USA Communications at installation time) on the private side.

The current SCAN fiber does not have the future capacity needed for Archuleta County to fully support a robust fiber buildout as described in other projects included with this strategic plan. The SCAN route along US Highway 160 comprises the most important fiber trunk line in the Pagosa Springs area, upon which all other fiber paths are based. Since the SCAN acts as the spinal column and backbone for the community broadband network, this route requires the most capacity, longevity and security of all fiber links in Archuleta County. The current 10-year old aerial line has approximately a 30- to 40-year lifetime, which indicates that only 20 to 30 years remain in the current line's useful life.

When originally installed, the SCAN installers did not always use best practices for installation and often used sub-standard lashing and splice enclosure lashings to save money. In general, aerial lines have more vulnerability to damage than buried lines, both from weather—particularly ice and snow—as well as the sun, animal damage (squirrels and aerial fiber have had a long-running battle), and potential cuts because of vehicles on highway crossings. When combined with the issue of a less-than-optimal maintenance plan, the joint fiber enclosures have taken significant damage over the years, including seal breakage that allows water and ice to get into the enclosures, potentially causing damage to the fragile fiber strands encased in the enclosures.

Benefits

Installing a buried fiber trunk line along the SCAN route from uptown to downtown Pagosa Springs will give the community exponentially more current and future capacity along this critical main trunk line that acts as the backbone for the community broadband network. When installed, the joint-build fiber allocated half of the 72 fiber strands for Town of Pagosa Springs and Archuleta County purposes. The fiber loop itself uses eight strands for its dedicated management connections, which leaves a maximum of 28 strands available for other uses. In some parts of downtown, the SCAN fiber already has only 18 strands to allocate in some locations, and in some areas the fiber only has 48 strands instead of 72 strands, meaning a maximum of 24 strands can be used with now less than 12 available for allocation in those areas. The need to expand this critical component is nearly upon us and getting ahead of the need will best serve the future of broadband in Archuleta County.

Ultimately, installing a buried fiber trunk link along the SCAN route will allow the community to gain independence from the jointly-built Zitomedia-owned fiber and the BSMO could possibly sell 36 strands back to Zitomedia. This will improve Zitomedia's own service in this area as well as allow the BSMO to operate the SCAN completely independently of any other competing interests or non-community needs.

Timeline

The BSMO could build this 12-mile section according to CDOT standards in 2024, assuming funding comes to fruition.

Partners

The improved buried SCAN fiber link can include a number of partners on both the public and private sides, including:

- Archuleta County
- Town of Pagosa Springs
- Zitomedia
- CDOT
- Arcadian Infracom

Cost Estimates and Contingencies

Through funding from the federal Infrastructure Investment and Jobs Act (IIJA) or American Rescue Plan Act (ARPA) capital project money, the BSMO will build a 144-strand or possibly even 288-strand buried fiber link from Pagosa Springs Medical Center to the Town of Pagosa Springs Town Hall. This improvement also has the benefit of providing a significant revenue stream trough leases back to providers who want to obtain routes to Durango and would like to use the SCAN fiber, including current incumbent providers and plus new interests like Arcadian Infracom.

Project Maps

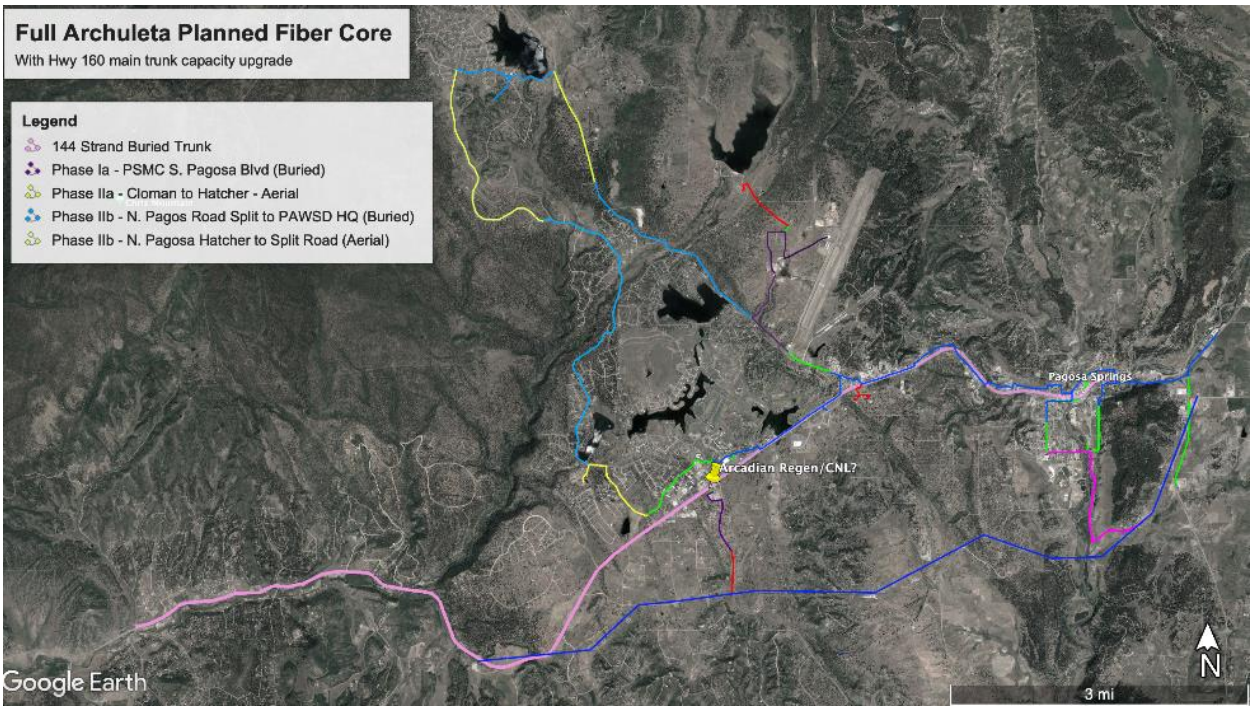

Figure 33: Buried High-Capacity, in magenta (144 Strand or better); Fiber along Highway 160 backbone to augment/replace 2012 Joint Build Install (32 strand)

Phase VII: Pagosa to Durango Fiber

The BSMO has considered the possibility of an independent community fiber link between Pagosa Springs and Durango, Colorado. Possibly in partnership with LPEA, this link will provide critical middle-mile bandwidth for redundancy, capacity and to overbuild private links that may not be available to lease at fair market rates.

Benefits

Primarily, building a new fiber route from Pagosa Springs to Durango allows the ability to connect to internet backbone networks in Durango and gain independence from private fiber, which today is the only option available in Archuleta County to connect to the broader internet.

Timeline

The BSMO can look at this project in the 2024-25 time frame, assuming the CDOT/Arcadian Infracom project proceeds as planned as of 2022.

Partners

This project will be expensive and requires a few partners.

- DOLA: Funding and regional partnerships
- LPEA: Partnership and possible use of power lines from Pagosa Springs to Durango

Cost Estimates and Contingencies

As of this writing in January 2022, the total path to connect fiber nodes between Pagosa Springs and Durango comes to 50.19 miles of aerial fiber with 1,024 feet of buried fiber. A very loose estimate on the high end would cost $5 per foot for aerial installation at a cost of $1.32 million with around $40,000 in buried fiber cost. For 100 fiber enclosures along the route, add $80,000 to the cost and this brings the total project to $1.44 million, With project management added at 10% of the project, the cost is $144,000 and the total project all in comes to $1.59 million.

Project Maps

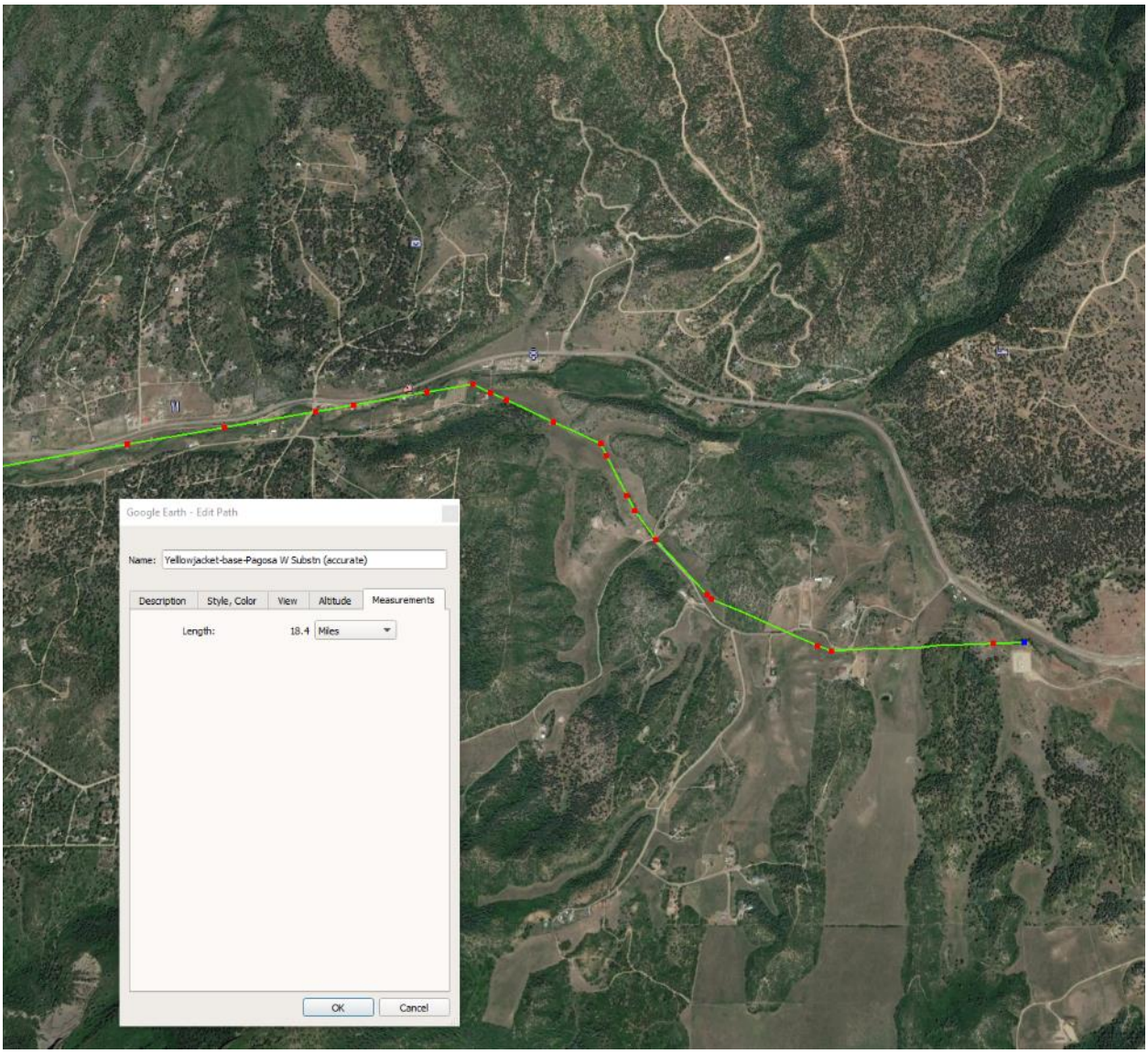

Figure 34: Aerial route section 1 from "Ponderosa" Substation via existing LPEA poles transmission poles

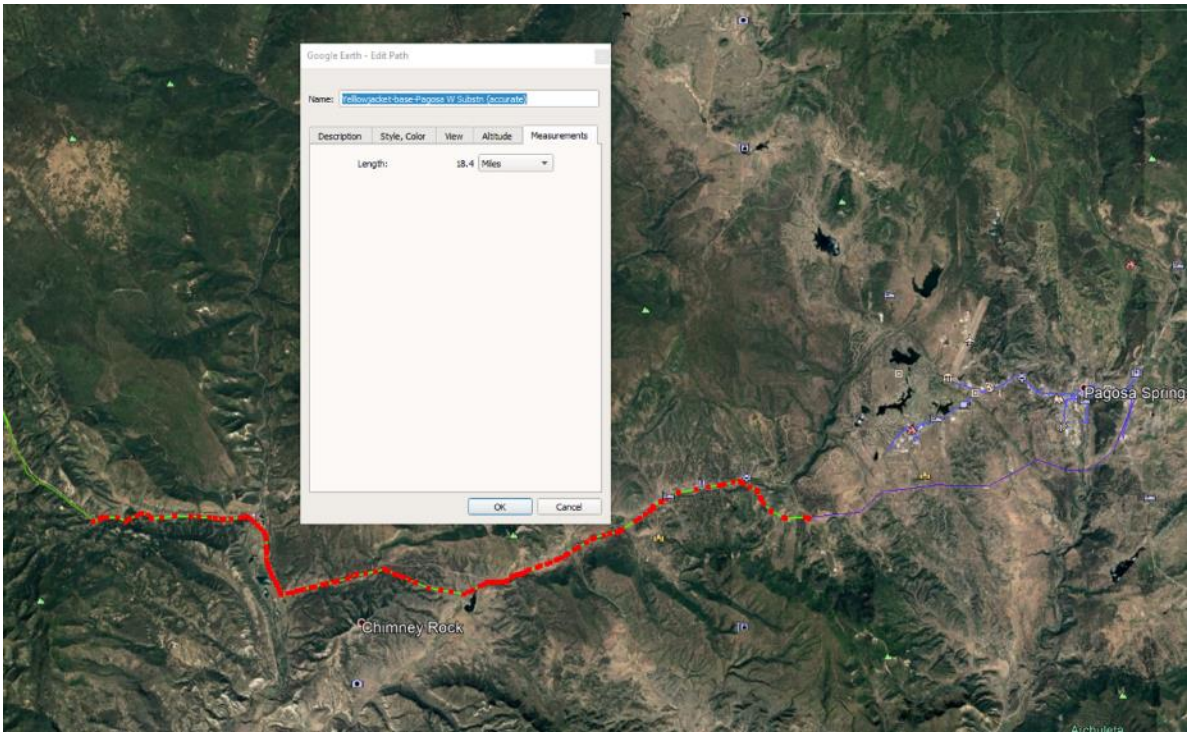

Figure 35: Whole Pagosa to Yellow Jacket Base Path

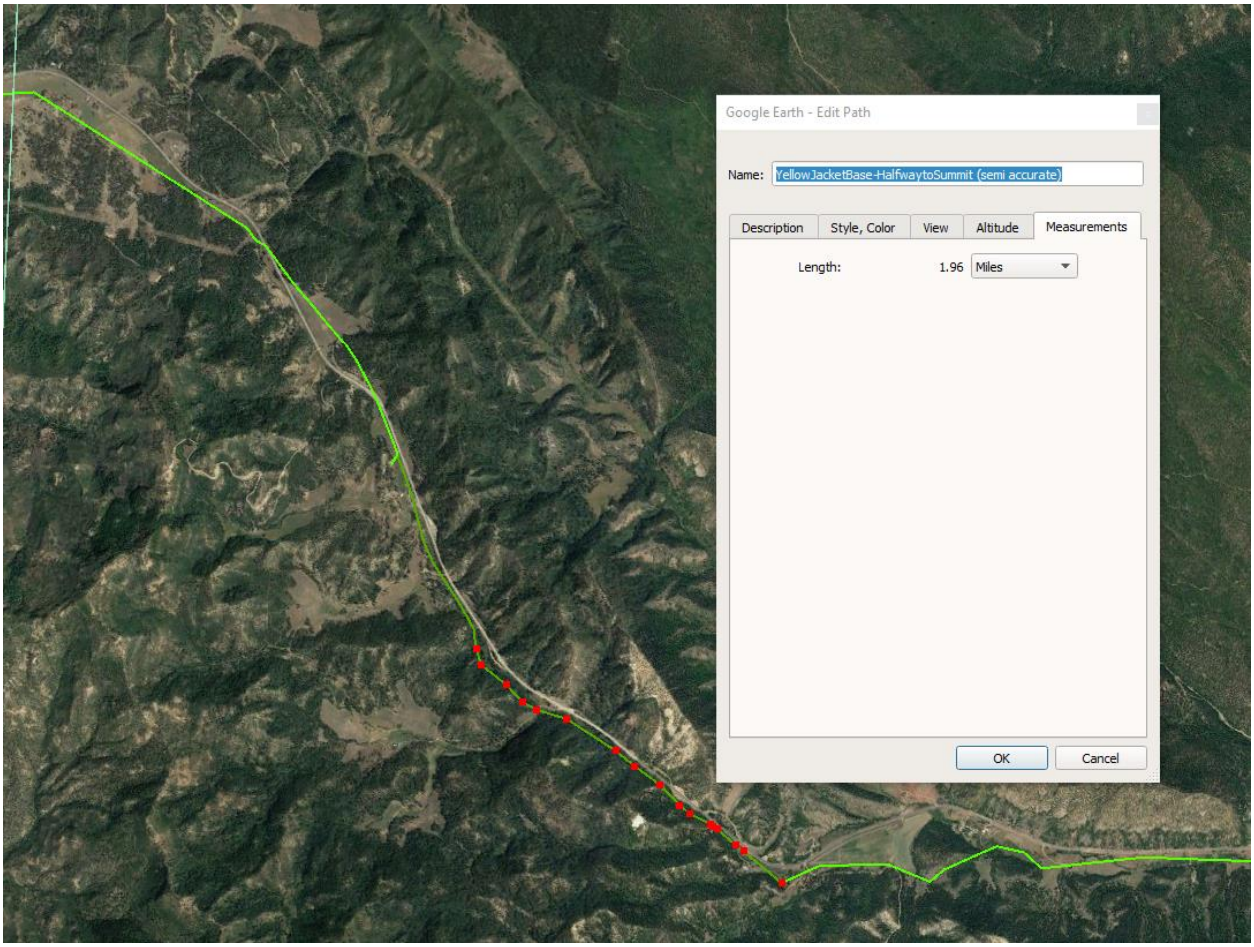

Figure 36: Yellowjacket Section 1 (uncertain)

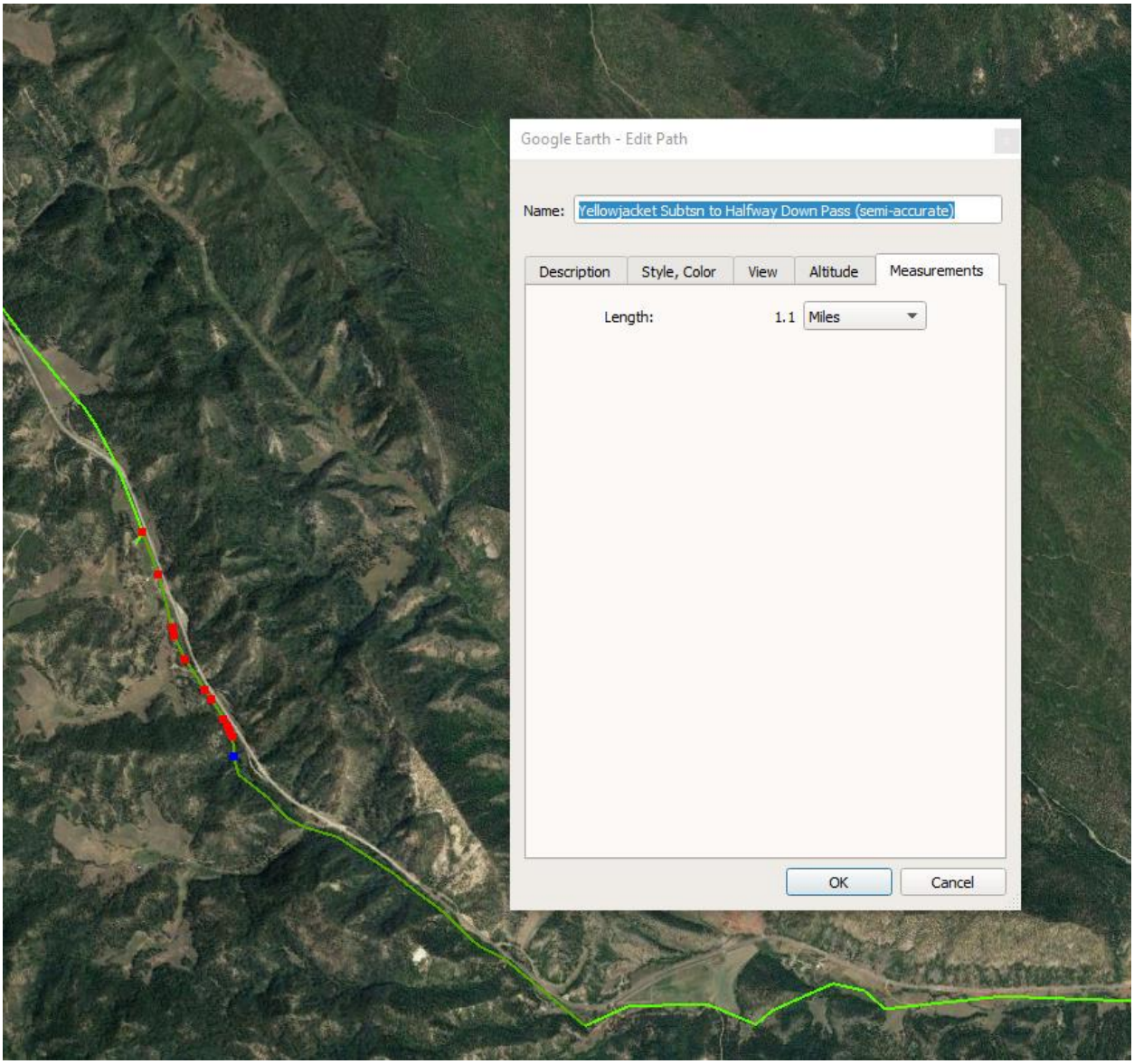

Figure 37: Yellowjacket Section 2 (uncertain)

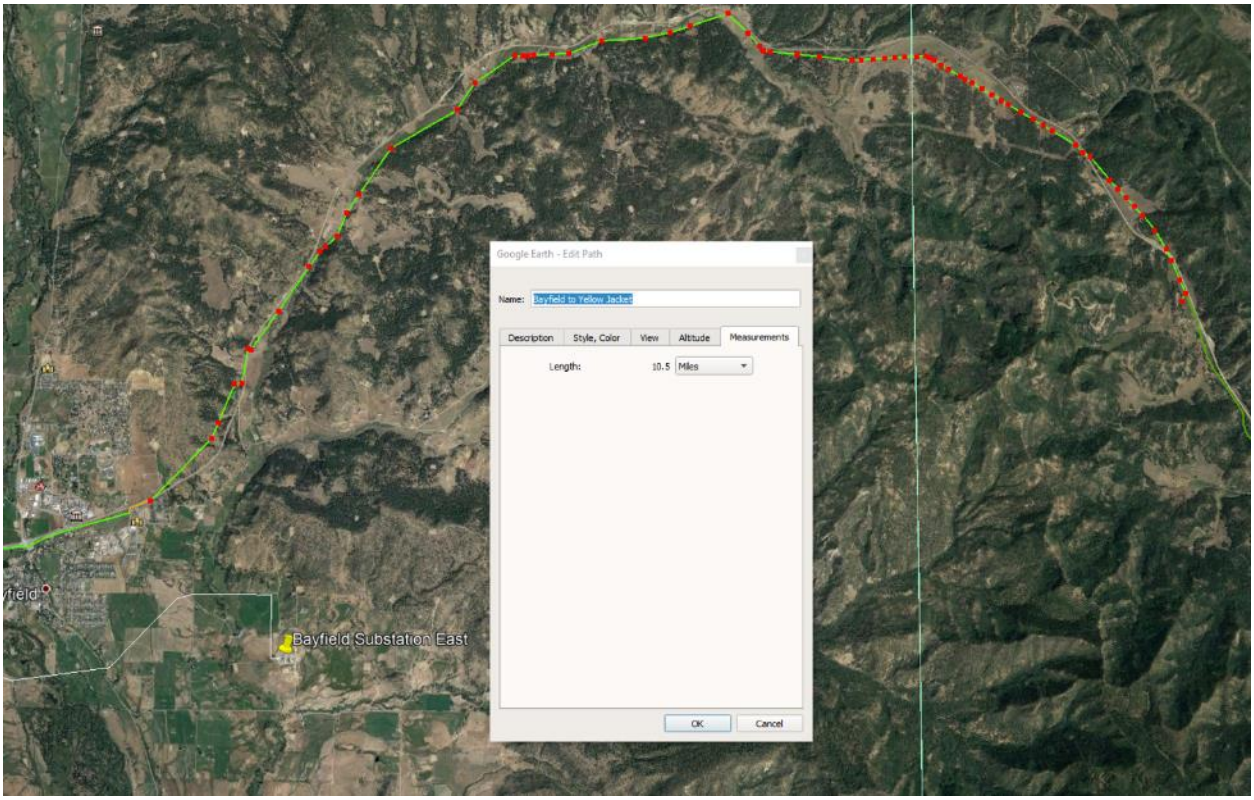

Figure 38: Yellowjacket to Bayfield

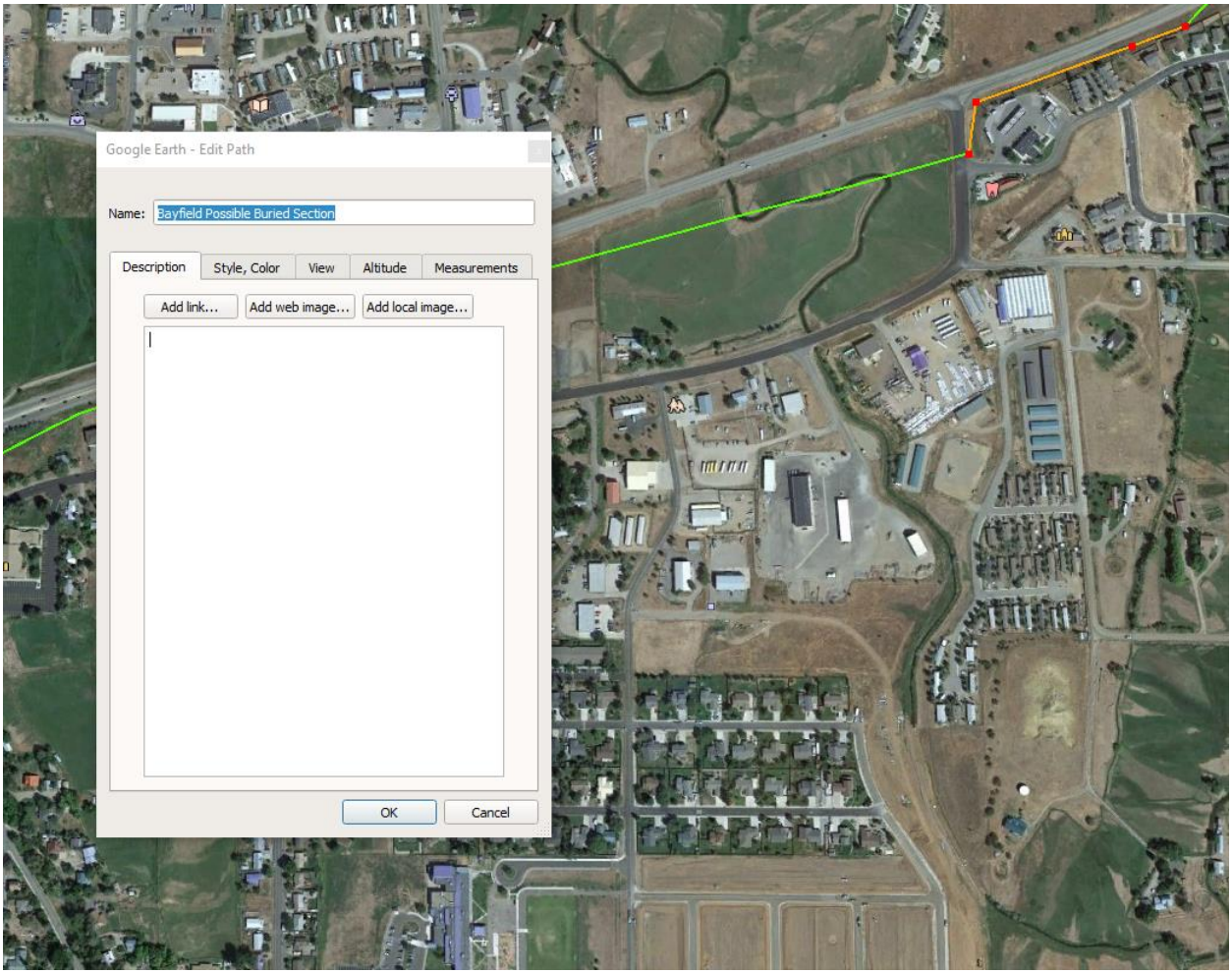

Figure 39: Possible Bayfield Buried Section

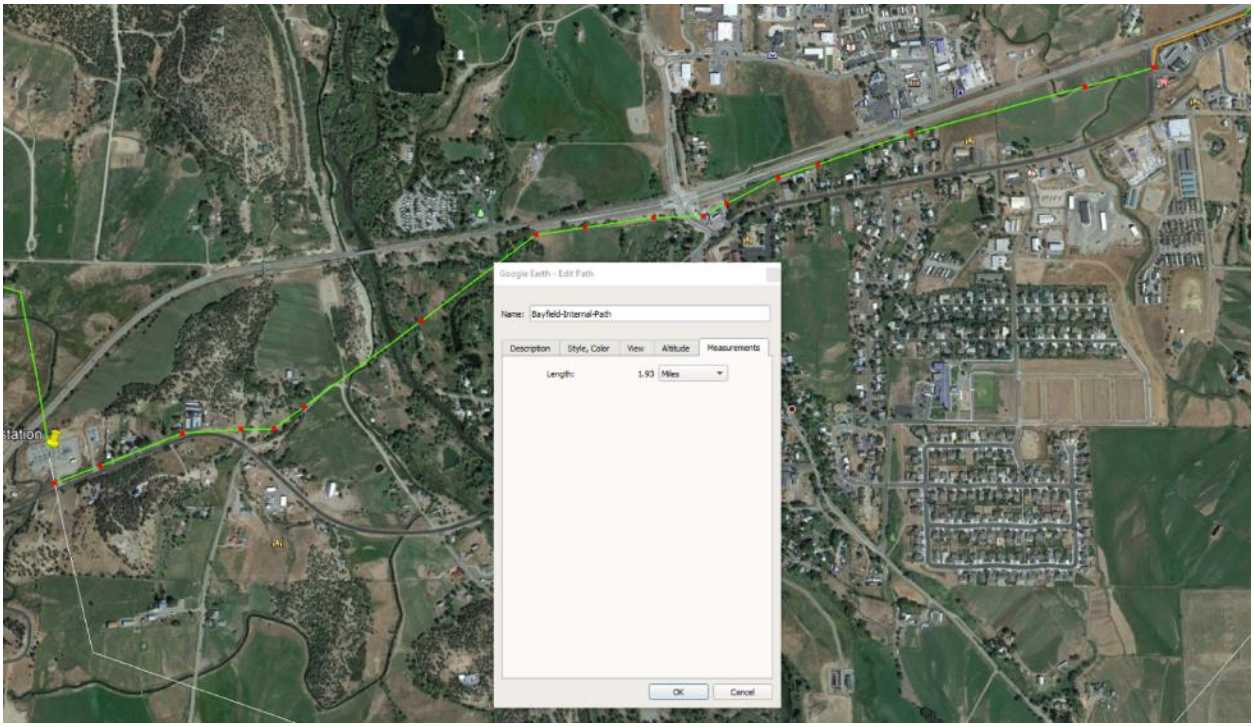

Figure 40: Bayfield Internal Aerial Section

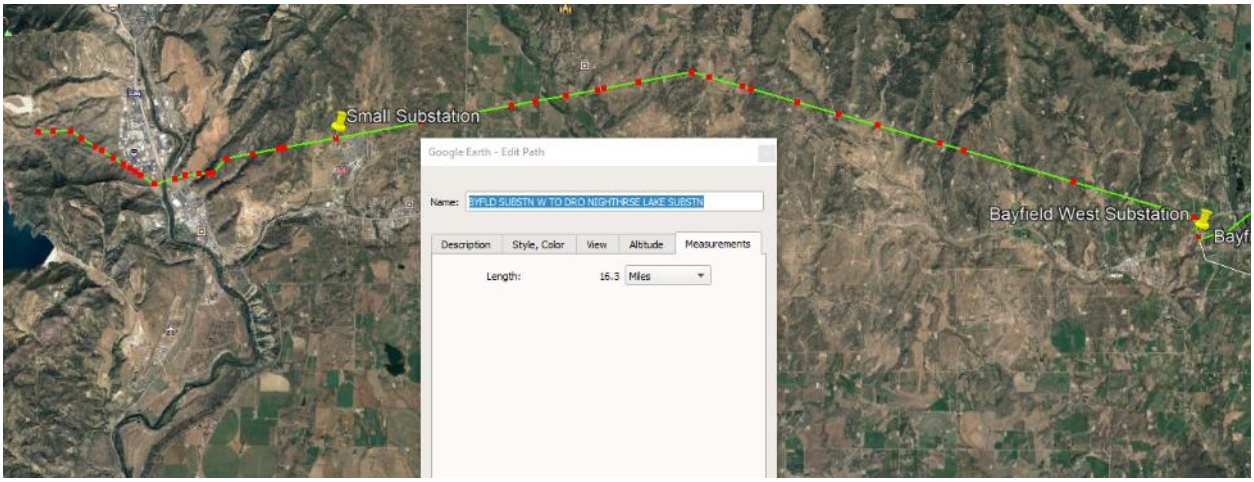

Figure 41: Tri-State (?) Bayfield W Substation to Nighthorse Lake substation in Durango

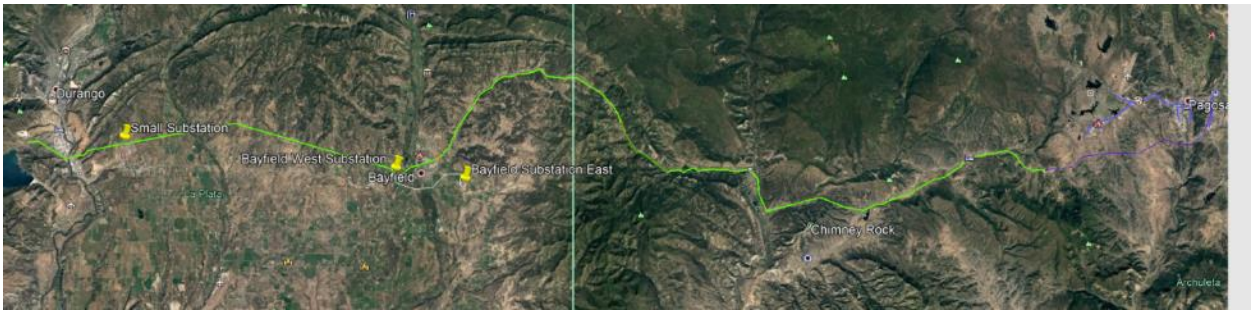

Figure 42: Whole Path – Pagosa Springs to Durango Fiber

Phase VIII: Chris Mountain Village II

The current and future development of the Chris Mountain Village II subdivision west of Pagosa Springs just north of US Highway 160 provides a unique opportunity to pair with developers and install fiber from the beginning of the development. Many of the buildings in this subdivision are planned to be targeted for workforce housing and fiber will be a critical part of the future of productive housing stock of this nature.

Benefits

The community has not yet been built out so any fiber infrastructure can be installed without interfering with other utilities. In fact, the overlay of utilities and inclusion of multiple utilities on the same lines or trenches can provide cost savings to all utility providers.

Timeline

The BSMO estimates tackling this project in the 2024-25 time frame.

Partners

Several partners could possibly have an interest in the Chris Mountain Village II fiber project.

- Archuleta County
- DOLA
- LPEA
- Black Hills Energy
- Private developers

Cost Estimates and Contingencies

The BSMO estimates that Chris Mountain Village II will require 2.41 miles of buried fiber with a reasonably high chance of rock throughout the route, based upon the known geology of the neighborhood. Assuming at least 25% of the route is hard rock at $80 per foot with the rest of the installation at $30 per foot, and with the need to trench (not bore) 18-24” wide and 24” deep, to leave space for space for both electrical and fiber conduit spaced at least 12” apart, the estimated cost for trench comes to $254,500 for hard rock and $286,284 for soft rock. This totals $540,784 and the BSMO will add $10,000 for handholes and enclosures plus $50,000 for engineering and project management costs for a total estimated project cost of $600,784.

Project Maps

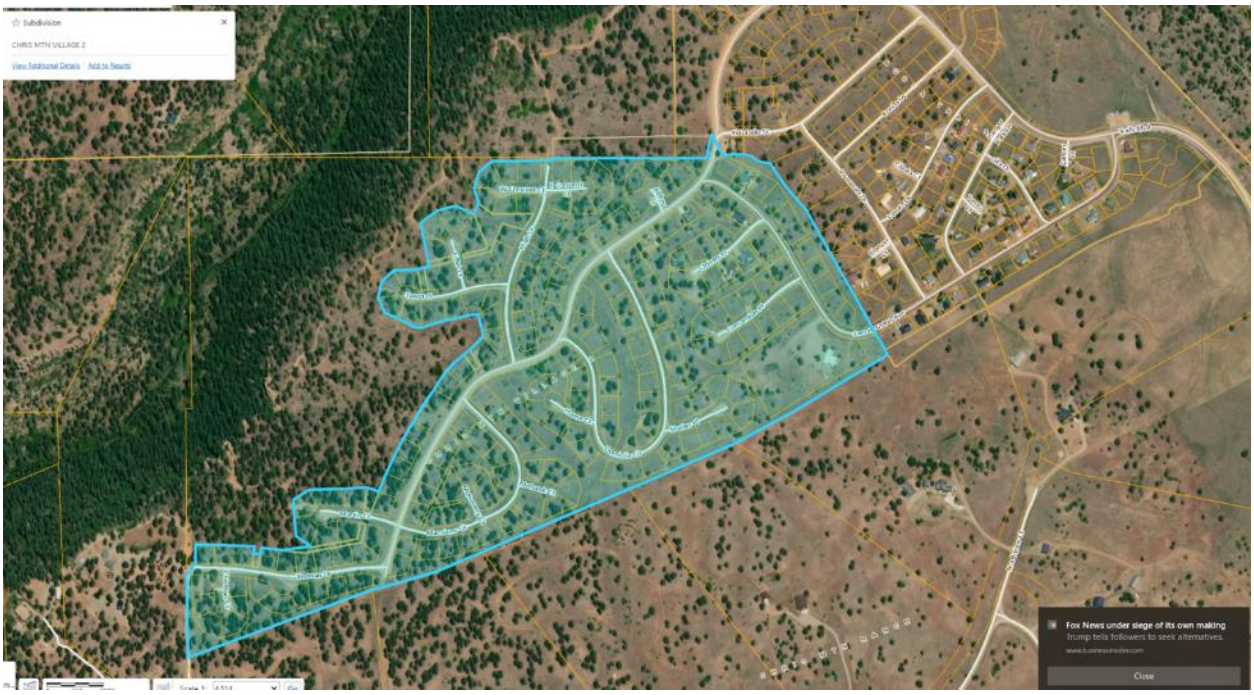

Figure 43: Chris Mountain Village II Neighborhood

Figure 44: Chris Mountain Village I Neighborhood

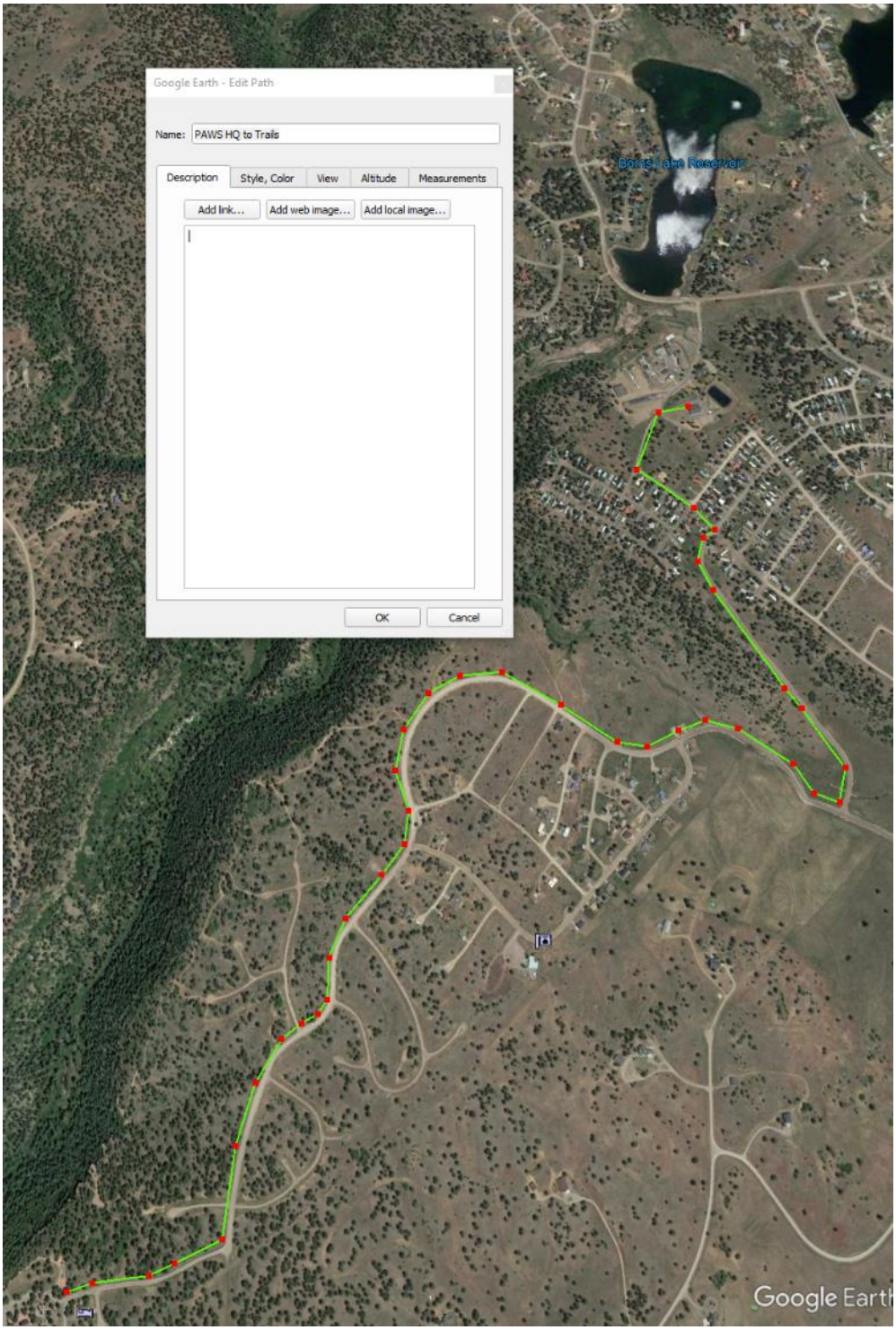

Figure 45: PAWSD HQ (fiber termination point) to End of Trails Boulevard

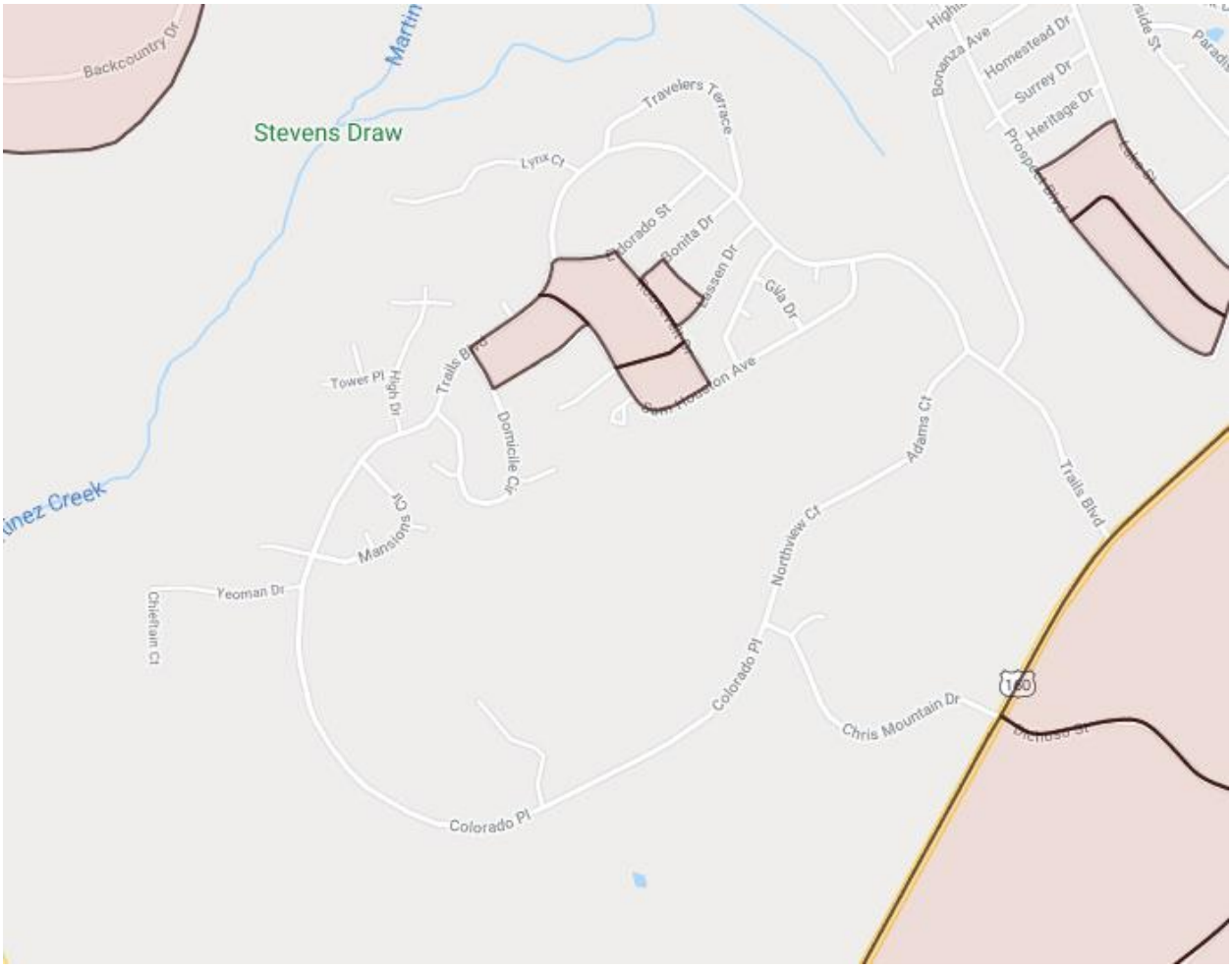

Figure 46: Interestingly, part of this development is a RDOF Block

Phase IX: Longer Term (+5 years) Fiber Expansion Beyond Pagosa Springs Core

Once the BSMO coordinates the installation and deployment of the core fiber loops in Archuleta County, along with other strategic priorities like Chris Mountain Village II, the BSMO can focus on expanding to extending the reach of SCAN fiber to the furthest reaches of the county.

Benefits

Using critical community anchor institutions (CAIs) as targets, the BSMO would like to extend SCAN fiber to each of the seven outlying Pagosa Fire Protection District stations throughout Archuleta County. Many funding opportunities exist to connect fiber to CAIs like fire stations. With fire stations embedded close to the communities they serve, this makes an excellent starting point for a provider to base a local Fiber-to-the-Premise (FTTP) network option.

Timeline

The BSMO will focus on this project after 2025.

Partners

Many partners could help with the core fiber extension project and the primary partners will include:

- Archuleta County
- Pagosa Fire Protection District
- Archuleta County Office of Emergency Management

Cost Estimates and Contingencies

The BSMO currently does not have a cost estimate for these projects as of January 2022. Based on the nature of the connectivity of the proposed core fiber connections, the BSMO estimates at least half of the cost will qualify for grant match funding from entities including DOLA and federal IIJA monies.

Project Maps

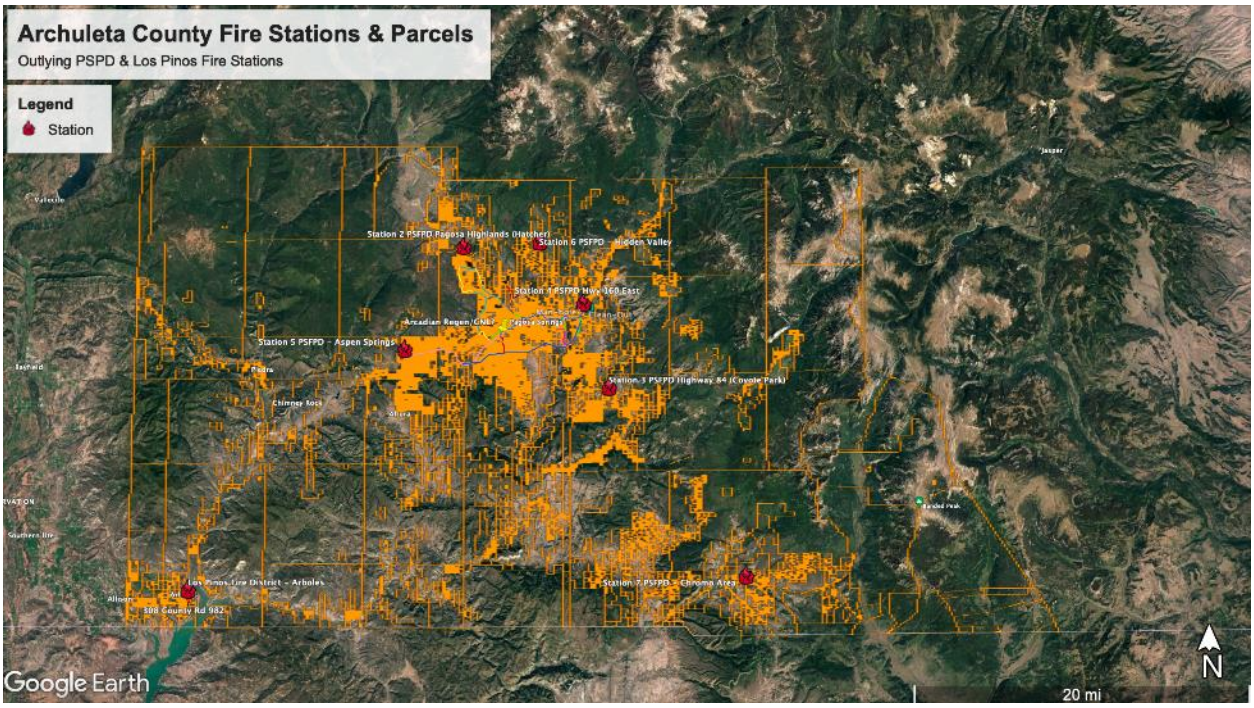

Figure 47: Location of Pagosa Fire District Stations, possible expansion target CAIs for future growth

Phase X: Toward the Moon - Starlink

Archuleta County and the BSMO cannot afford on their own to complete all broadband projects to reach every business, resident and visitor in Archuleta County.

Benefits

To reach this lofty goal requires key partnerships with connections from organizations like Starlink that can provide low-earth orbit (LEO) satellite internet services to areas the BSMO's plan does not reach. Based on conversations in the spring of 2021 with Starlink's corporate office, the organization has an interest in deploying satellites to focus on our area and aggregating demand will provide a critical method to get this type of internet available in Archuleta County more quickly.

Timeline

These partnerships and projects have already commenced as of 2020 and the BSMO needs to continue to manage, grow and develop existing and new key partnerships to realize the broadband goals in this strategic plan.

Partners

Many partners exist in this effort, including local residents to international conglomerates.

- Local residents and neighborhoods (demand aggregation)
- Archuleta County (advocate for outlying rural areas)
- Archuleta School District (distance learning)
- Starlink (ISP)
- Other satellite and technology companies

Cost Estimates and Contingencies

The BSMO will not include many costs outside of time to build relationships as the majority of capital costs will be borne by ISPs.

Project Maps

The BSMO does not have project maps as of January 2022 for this phase, but the focus for the phase includes the following areas of rural Archuleta County.

- Lower Blanco
- Trujillo Rd
- Lost Valley of the San Juans
- Other neighborhoods and outliers not in reach of strategic plan projects

Appendix A – Broadband Concepts and Terminology

What is broadband and why is it important?

Broadband is another term used for bandwidth – or the amount of data that can be sent through a connection – to access high-speed Internet. The more bandwidth, the more information a user can send or receive at any given time.

Why does speed matter?

Broadband speed is important because it allows for faster transmission (uploading and downloading) of data. As data is transmitted digitally, text, images and sound are all translated into "bits" of data. Broadband is accessed through various high-speed transmission technologies that allow these bits to move faster.

How do I access broadband?

Broadband is accessed using several technologies, including these below:

- **Digital subscriber lines** transmit data to homes and businesses over traditional copper telephone lines that are already installed. Not all copper telephone lines, however, are capable of transmitting data as DSL.
- **Cable modems** transmit data through the same coaxial cables that generate pictures and sounds on television sets.
- **Fiber-optic cables** convert electrical signals carrying data into light and send the light through transparent glass fibers about the diameter of a human hair. Fiber transmits data at speeds much faster than DSL and cable, typically tens and even hundreds of Mbps.
- **Wireless** can be mobile or fixed. Fixed wireless involves the wireless transmission of data from a local antenna to a permanent location like a home or business. The service is similar to what is delivered via DSL or cable modem, but the transmission is wireless. Mobile wireless connects users in temporary locations like coffee shops. Mobile broadband is transmitted through technologies such as portable modems and mobile phones.
- **Satellite** is another form of wireless that is useful for serving remote or sparsely populated areas.

Broadband Terms & Definitions

Backbone

A generic term referring to the part of a network that interconnects all sites on the network, and, therefore, handles the majority of the network traffic. Smaller networks are attached to the backbone through aggregation sites by means of additional circuits and network devices, such as routers.

Backhaul

Generally refers to the side of the network that communicates with the global Internet, paid for at wholesale commercial access rates to or at an Internet exchange point or other core network access location.

Broadband

A high-capacity transmission technique using a wide range of frequencies, which enables a large number of messages and data to be communicated simultaneously

Carrier Neutral Location (CNL)

Facilities that allow the interconnection of networks between competing service providers and for hosting of Web servers, storage devices and other network equipment. Such facilities are open to carriers, Web hosting firms and application service firms, Internet service providers, and other providers and users. Most CNLs feature a "meet-me" room where fiber cables can be cross-connected to any service provider using the local network. With a simple change in the optical patch panel in the collocation facility, the customer can quickly and easily change service providers on very short notice.

Community anchor institution (CAI)

According to the Federal Communications Commission (FCC), community anchor institutions (CAIs) are, "schools, libraries, medical and healthcare providers, public safety entities, community colleges, and other institutions of higher education, and other community support organizations and agencies that provide outreach, access, equipment, and support services to facilitate greater use of broadband service by vulnerable populations, including low-income, the unemployed, and the aged."

Dark/Lit Fiber

***Dark fiber** refers to unused optical fiber infrastructure comprising a mixture of switches, repeaters, and cabling of fiber optic cables. The name "dark fiber" has evolved to now include the practice of leasing unused fiber optic lines from network operators and providers.*

***Lit fiber** service uses a large high-bandwidth connection to provide high-speed Internet or data services delivered over fiber optic lines. Lit fiber is used by businesses that are engaged in telecommunications, wholesale Internet access, or wholesale ISP services to provide the bandwidth capacity needed for customer applications including email, file sharing, web hosting, data backup, video, VOIP, or VPN access.*

Internet Service Provider (ISP)

A company that provides Internet access.

Last Mile

The final leg of a telecommunications network that delivers services to retail end-users by connecting a middle-mile network that connect the customer's equipment to the backhaul network and, in turn, the Internet.

Middle Mile

The segment of a telecommunications network linking a core backhaul network to a local network. Middle mile links provide access to local loops from the backhaul network

Open Access

Open-access networks permit any broadband provider to connect to the network on nondiscriminatory terms and conditions.

SCAN

The Southwest Colorado Access Network, an open access network built in 2012-13 using public and private funding sources. The network includes 72 fibers from PSMC to downtown on the US 160 corridor in Pagosa Springs and this fiber link provides a critical data highway to move massive amounts of data from downtown to uptown and vice versa.

Supervisory control and data acquisition (SCADA)

A control system architecture comprising computers, networked data communications and graphical user interfaces for high-level supervision of machines and processes. It also covers sensors and other devices, such as programmable logic controllers, which interface with process plant or machinery.

Appendix B – Pagosa Area Fiber Map Progression

Image B-1: Fiber Jointly Built by Town & County and USA Communication in 2012-2013. Funded 50% by USA Communications, and 50% DOLA Grant through SWCCOG (of which Town/County paid 25% match) Sole-source contract awarded to USA for construction, 50 of each section owned/allocated to each entity

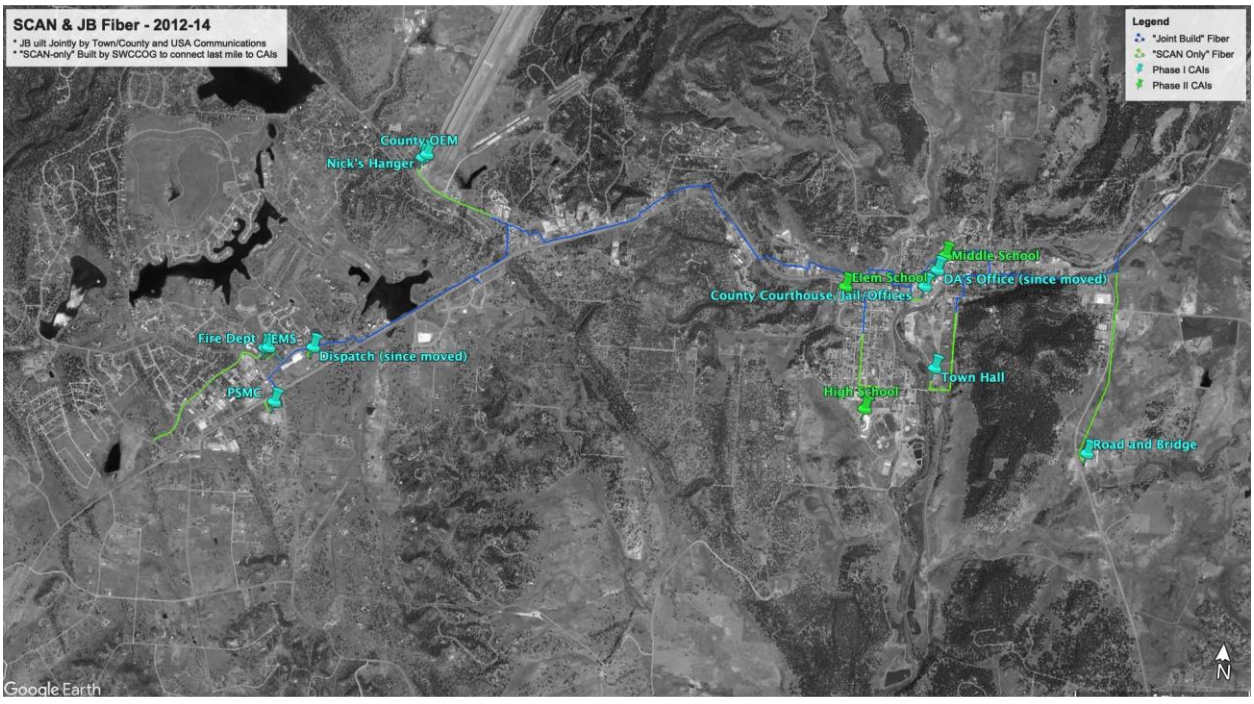

Image B-2: Next sections to be built off Joint Build Fiber by SWCCOG administered grant, generally referred to as "SCAN" fiber. Built to connect area CAI (Community anchor institutions). 100% Funded by SWCCOG administered grant (25% cash match from Town/County)

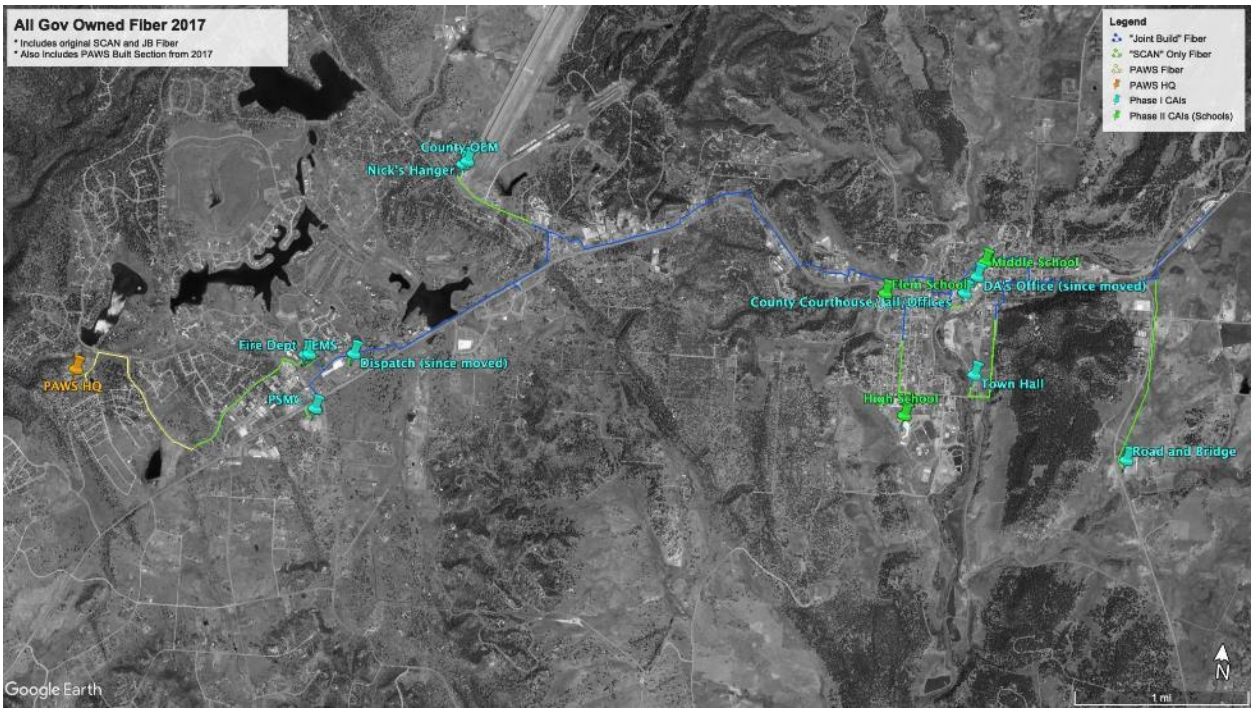

Image B-3: 2017 PAWSD HQ connection. Includes "Joint Build" and "SCAN" fiber, and PAWSD Built section along Vista Boulevard and Lake Forest Circle to connect PAWSD Headquarters Building to Fiber. Agreement with USA to provide fiber along Vista, which PAWSD installed with water line. Section along Park Ave pulled through by DBTech for PAWSD through SCAN installed conduit)

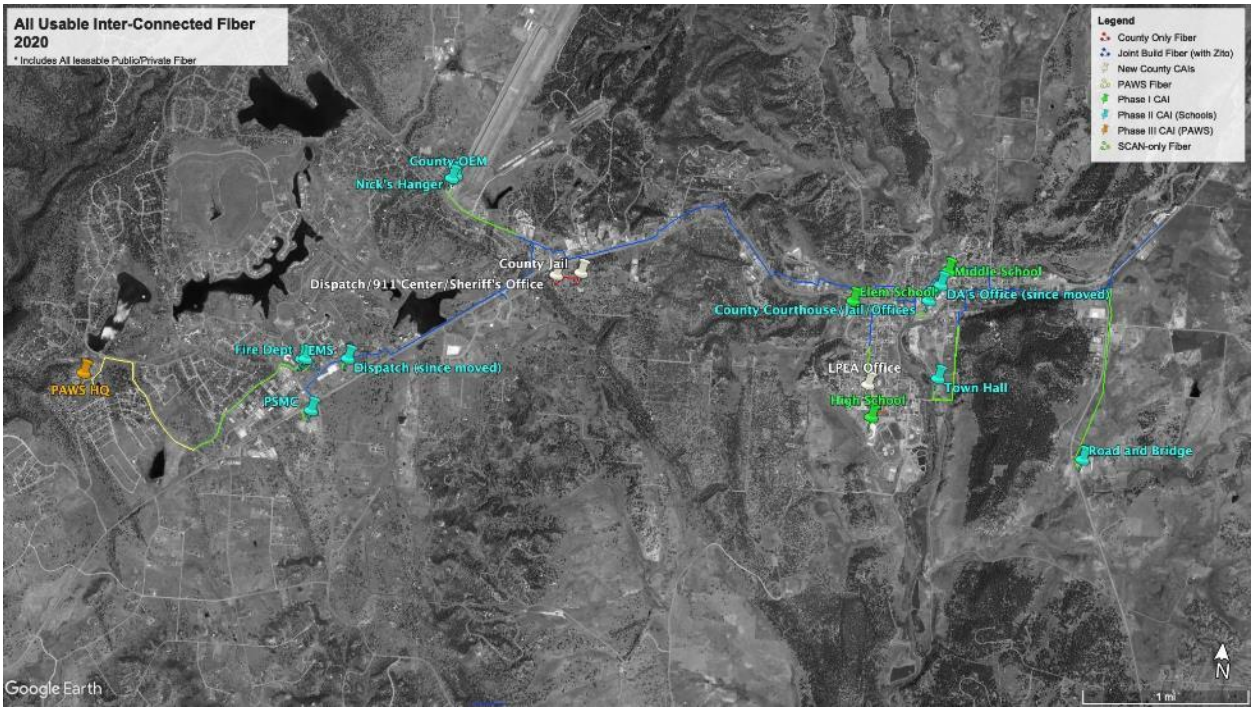

Image B-4: Includes new County Fiber build to Harman Park To service new County Jail, Courthouse, and Sheriff's Dept/Dispatch

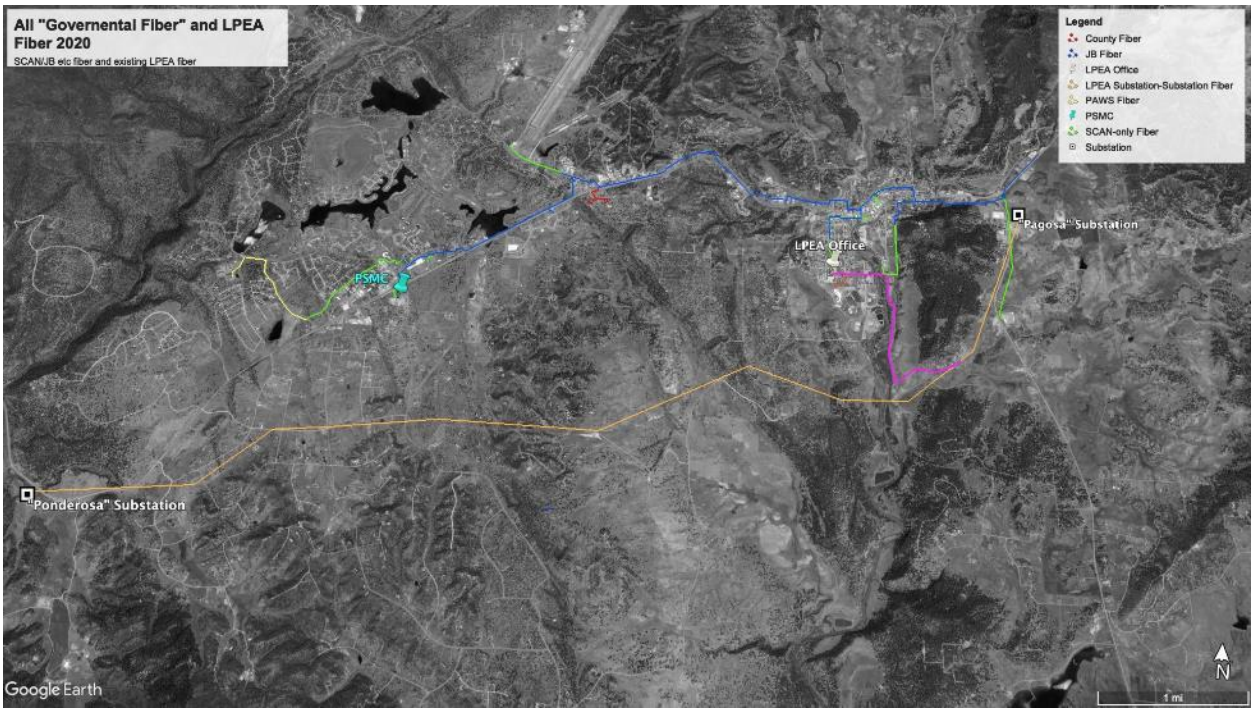

Image B-5: Includes new all currently available "Governmental" owned fiber, and path of current LPEA owned Fiber

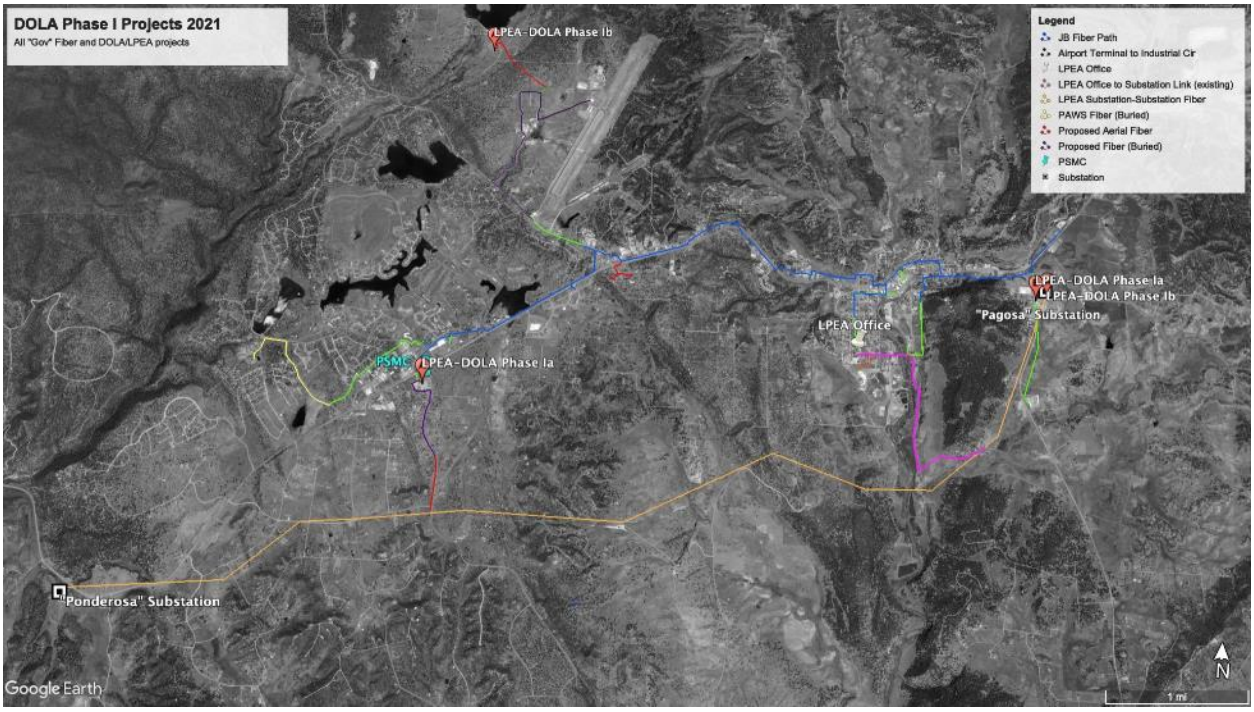

*Image B-6: ***FUTURE*** New Fiber - Phase I-A and I-B of new fiber build AKA Dola Phase I-A/I-B; Likely path of two new connections to interconnect to LPEA Substation link, provide alternate path from Town Hall, and connect Cloman Boulevard/Steven's Lake Substation*

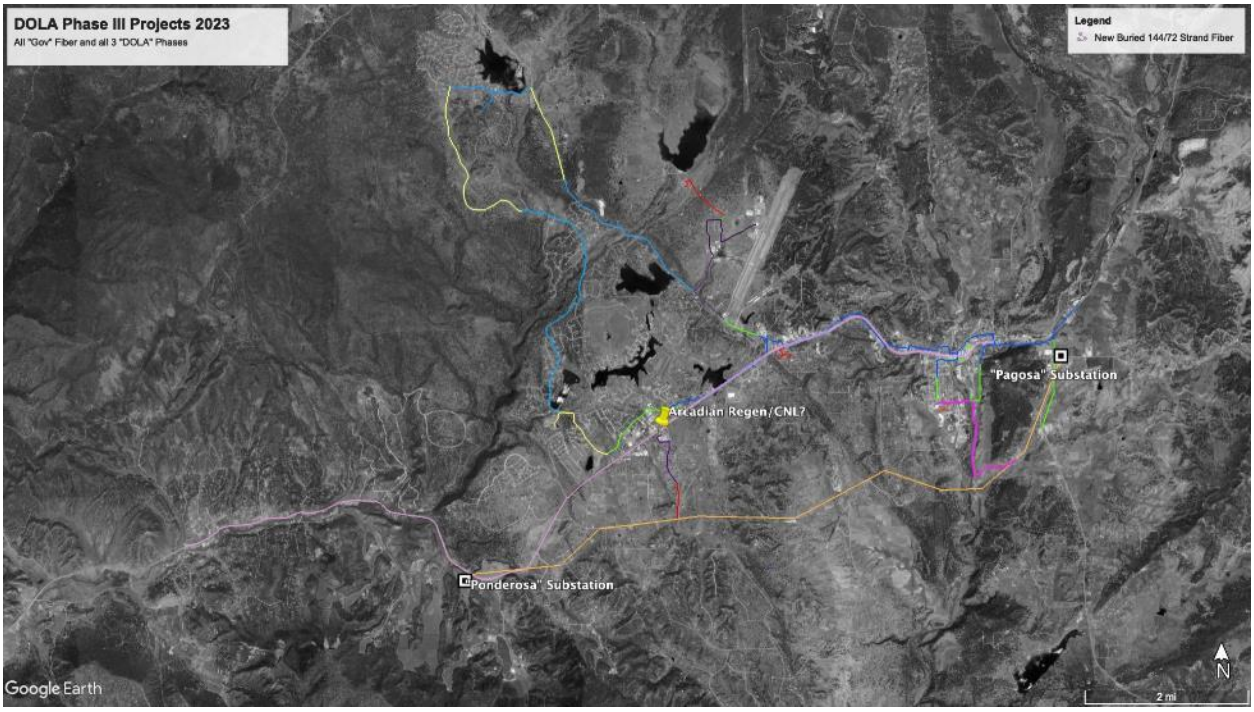

*Image B-7: ***FUTURE*** New Fiber - Phase II-A and II-B AKA DOLA Phase II-A/II-B; Connection from existing fiber at County Airport to Hatcher Reservoir (Terminating at PAWSD treatment facility) and redundant loop (IIb) coming down North Pagosa Boulevard to connect at PAWSD HQ*

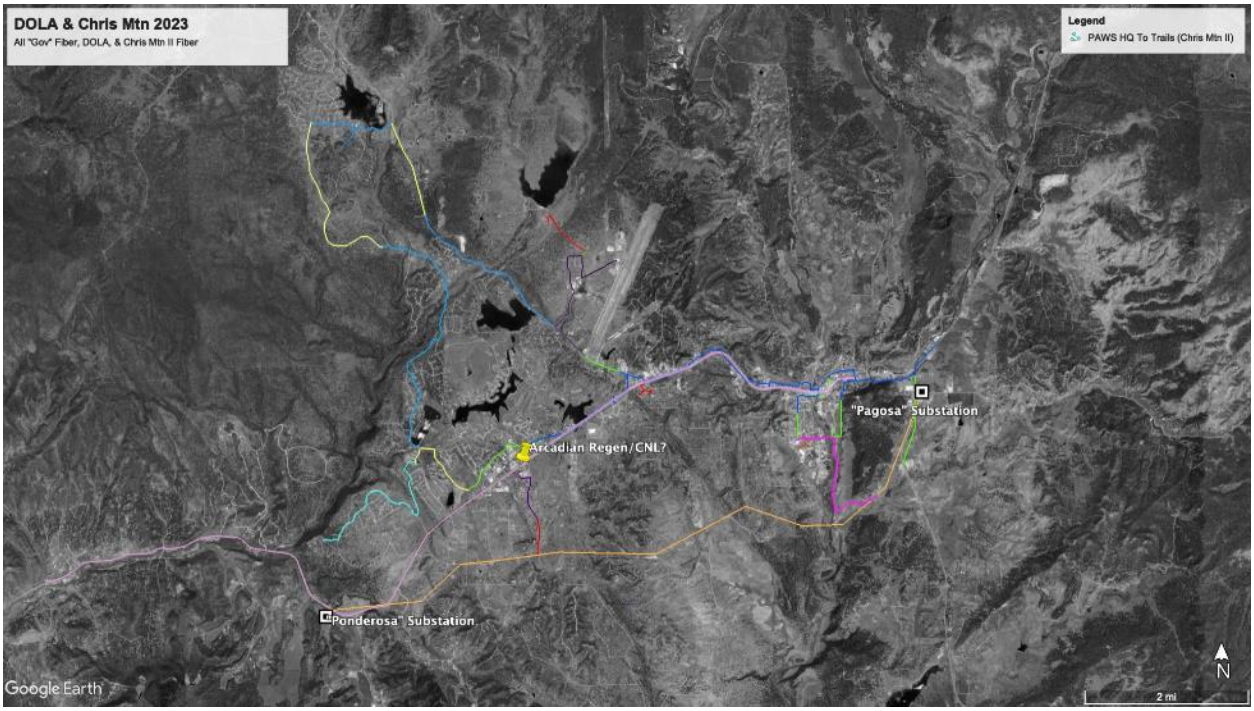

*Image B-8: ***FUTURE*** New Fiber – Chris Mountain Connection; Connection from existing fiber at PAWSD HQ down Vista and Trails Boulevards to connect Chris Mountain II neighborhood*

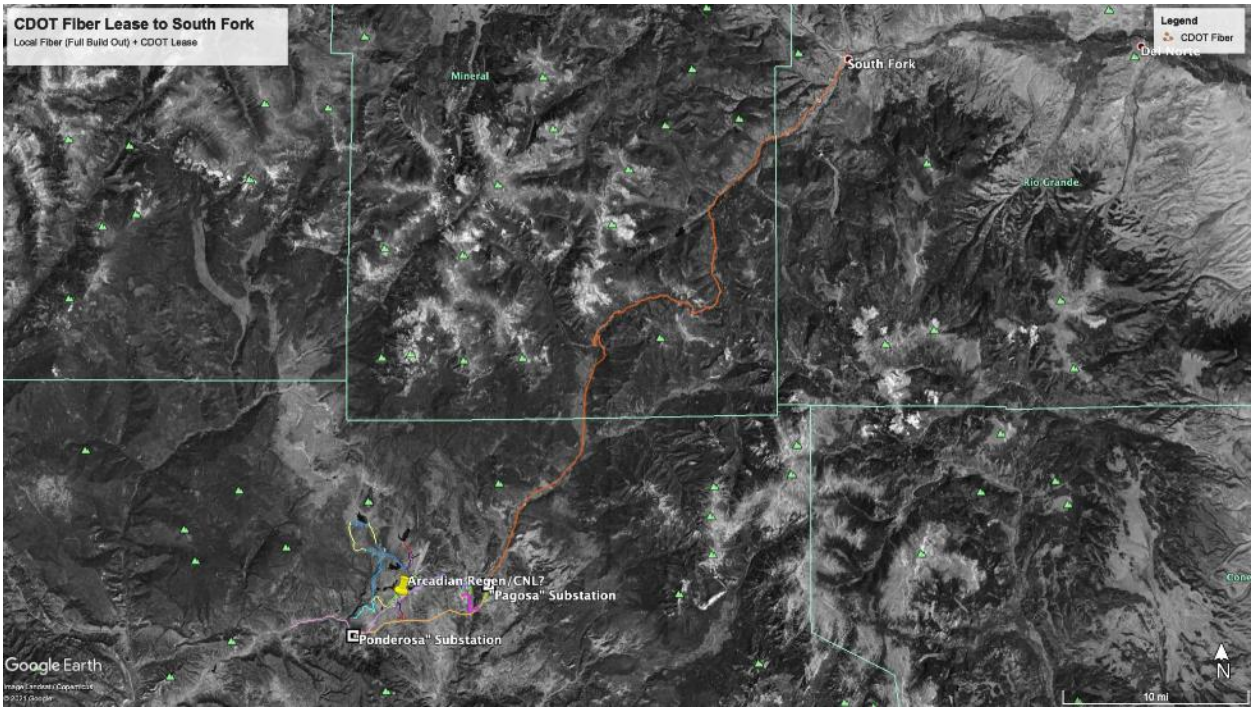

*Image B-9: *FUTURE* CDOT 2022-2023 Fiber Route from Pagosa Springs to South Fork Phase I due to commence Spring 2022, slated for completion end of 2023*

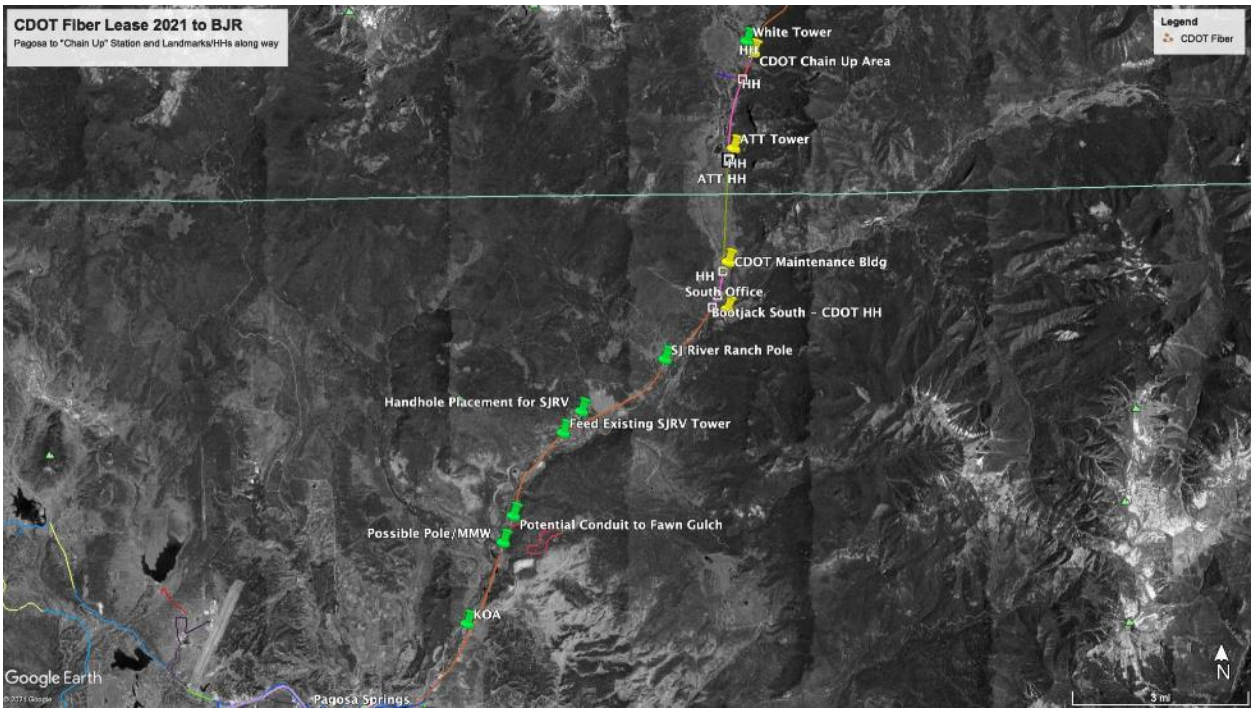

*Image B-10: ***FUTURE*** CDOT 2022- Fiber Route towards South Fork Shows section slated to be completed 2022 and potential BSMO administered Hand-holes along route to tap County leased lines*

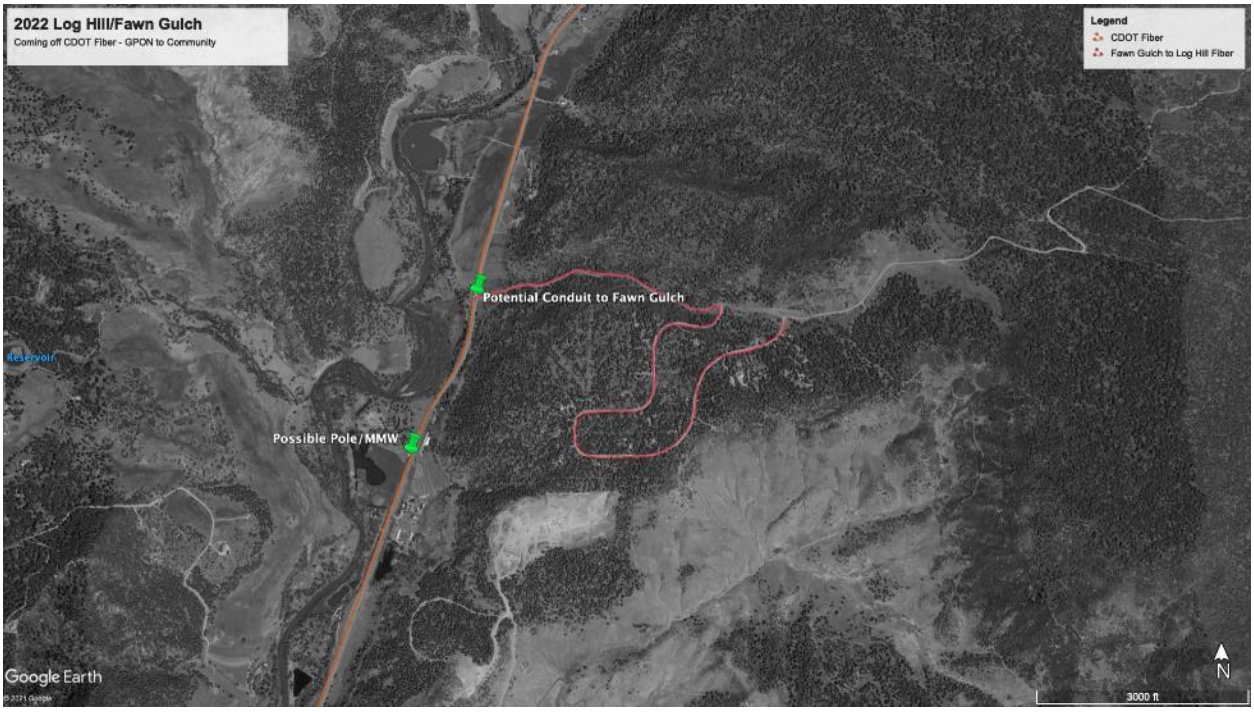

*Image B-11: ***FUTURE*** New Fiber – Log Hill Road Loop; Connection from existing leased fiber from CDOT to Log Hill Road neighborhood*

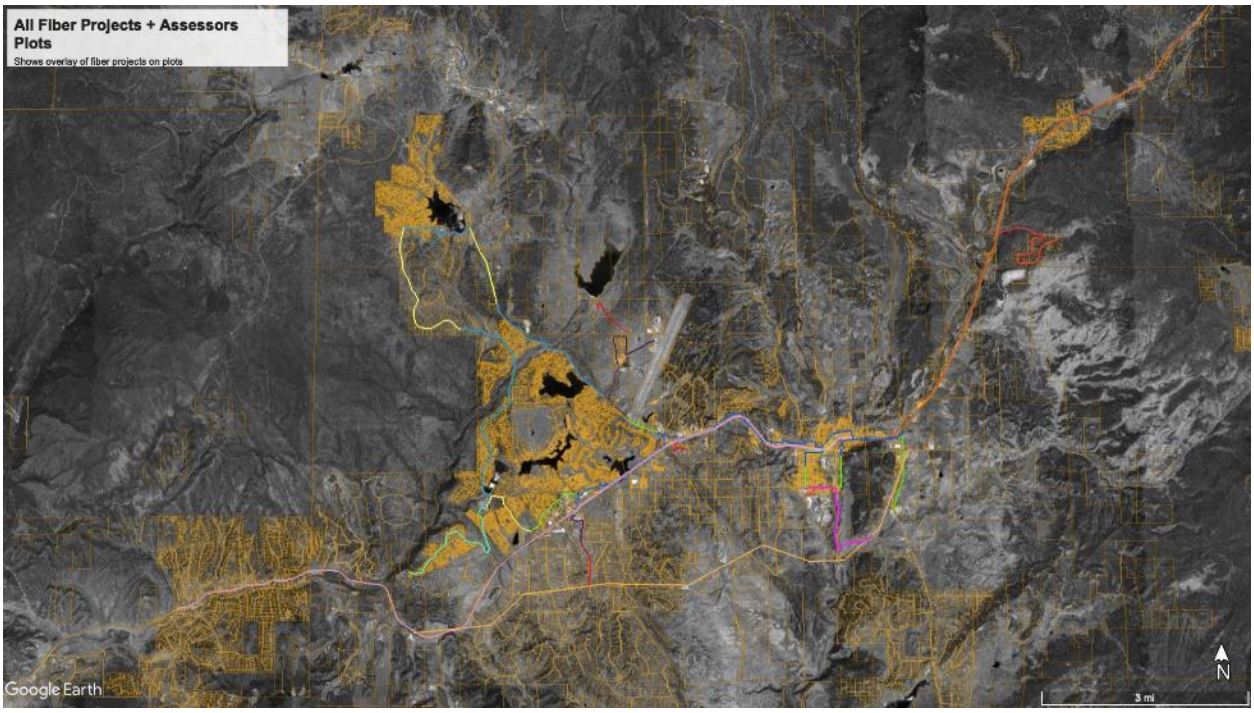

*Image B-12: *FUTURE* New Fiber – All proposed new fiber sections and County Assessor Plot Data; Shows how close these loops will run through a large percentage of Pagosa Springs area lots*

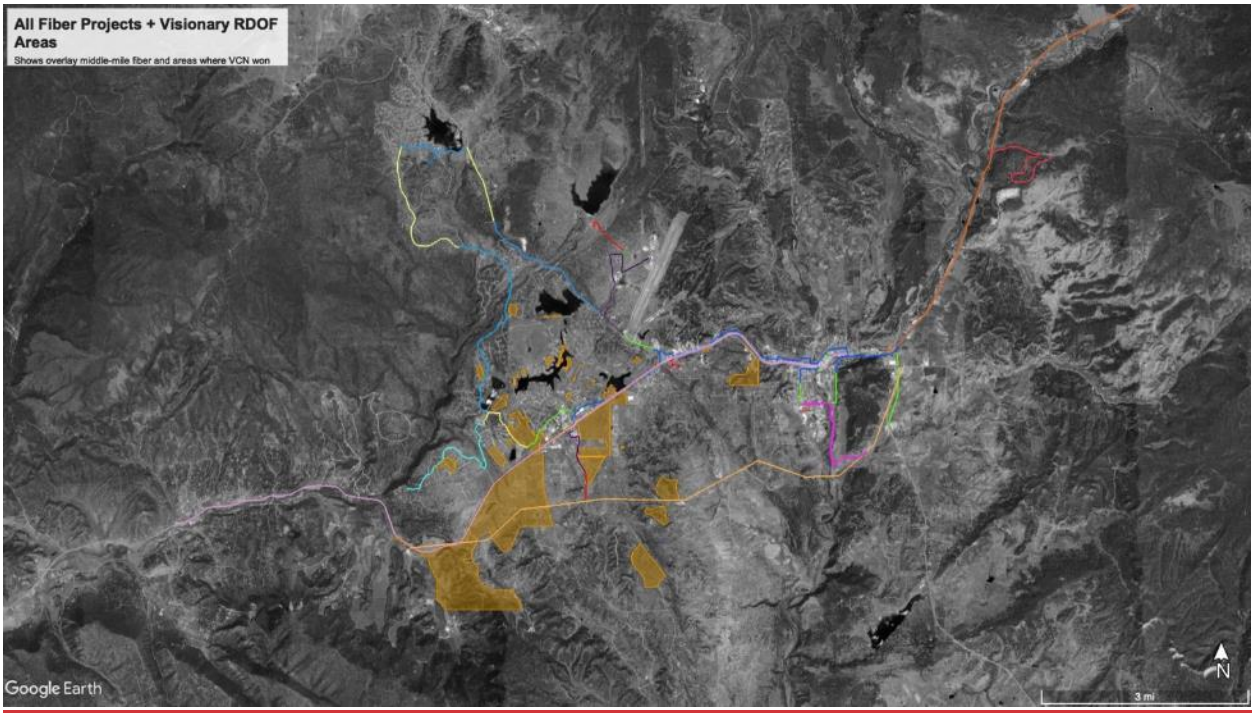

*Image B-13: ***FUTURE*** New Fiber – All proposed new fiber sections and Visionairy communications RDOF areas won; Shows how close proposed "trunk" lines come to these committed, Gigabit service areas*