



Background Information Relating to Jollyville Transmission Line Recommendation

Analysis of Alternatives: Hybrid West-of- 620 Route (Three Approaches)

Hybrid West-of- 620 Route in the PEC ROW: Surface Piping

Surface piping the hybrid West-of-620 route would require a water pipe that is 84 inches in diameter –nearly twice the size of the Alaskan Pipeline. Foundations would need to be built on flat ground every 40 to 50 feet along the route and closer together along hilly terrain to provide necessary support. These foundations could significantly impact the sensitive Edwards Formation geology, as each would likely require the installation of pilings to support the foundations from deeper, more stable rock below the surface. This area of the Edwards Formation contains an abundance (up to 80 percent of the line's length) of Karst Zones 1 and 2, formations most likely to contain karst invertebrate species. Additionally, as proposed, the surface pipe would run through Grandview Hills Elementary School. It would also increase operation and maintenance costs due to a greater risk of air entering the pipe as it traverses the Hill Country. Another important fact to point out is that the Hybrid West-of-620 route is more than two miles longer than the preferred Spicewood Springs route from WTP4 to the Jollyville Reservoir.

Hybrid West-of-620 Route in the PEC ROW: Tunneling/Trenching Combination

A trenching approach in general is an extremely dusty, intrusive process that would be disruptive to the surrounding area. Based on our initial findings, there are between 300 and 350 residential structures and between 200 and 250 businesses within a quarter-mile of the proposed trench/shaft sites. Tunneling or trenching this particular route could also require an amendment to the Section 10a permit for the Balcones Canyonlands Preserve, which would create delay. In addition, trenching requires substantial heavy equipment, including cranes, which would be working near high voltage lines and around electrical tower foundations. As a result, we have been informed by the Pedernales Electric Cooperative that it will not allow us to trench in its right-of-way. In addition to construction costs, up to three miles of surface easements along private property would need to be purchased along the proposed trench. Trench and shaft construction areas are also in the vicinity of known Black Capped Vireo and Golden Cheeked Warbler Habitat. This alternative also calls for trenching across several streams and through more than 4,000 feet of drainage areas that feed known Jollyville Plateau Salamander habitat.

Hybrid West-of- 620 Route in the ROW: Tunneling

This route is two miles longer than tunneling the preferred Spicewood Springs Route, which would add costs and extend the construction schedule. Shafts would likely be needed near the intersections of RM 620/Anderson Mill, Anderson Mill/Hwy. 183/Pond

Springs and at a location to be determined along RM620 for a total of five shaft sites. Anderson Mill Road is already over traffic capacity, which should be considered when contemplating additional truck traffic. Based on our initial findings, there are between 250 and 300 residential structures and up to 200 businesses within a quarter-mile of the proposed shaft sites. Construction costs for this option are \$50 million dollars more than the proposed Spicewood Springs route.

Explanation of Shaft Types

For this discussion, it is important to have an understanding of the types of shafts involved in the project and the purposes they serve.

Working Shaft

A working shaft, also known as a tunnel construction shaft, is typically the busiest type of shaft and can be used for multiple activities, including:

- Launching the tunnel-boring machine;
- Removing most of the excavated tunnel debris, such as rock, water and dirt;
- Providing power delivery;
- Installing pipe and grouting; and
- Long-term maintenance access.

For this project, a construction tunnel shaft is estimated to be approximately 30 to 40 feet in diameter.

Maintenance and Retrieval Shaft

A maintenance and retrieval shaft, while similar to a working shaft, is typically less active. It can involve several construction activities, including:

- Removing the tunnel-boring machine;
- Removing some water from the tunnel;
- Providing power delivery;
- Installing pipe and grouting; and
- Long-term maintenance activities.

For this project, a maintenance and retrieval shaft is estimated to be between 20-30 feet in diameter.

Ventilation Shaft

A ventilation shaft provides fresh air underground and an exit for the air. It also provides some long-term maintenance activities. For this project, a maintenance and retrieval shaft is estimated to be between six to eight feet in diameter. A ventilation shaft is also commonly used during the construction process for utilities and backfill grouting.

Analysis of Alternatives: Other Shaft Site Types and Locations Considered

Alternative 1: *Working shafts at Four Points and Spicewood Springs; Retrieval shafts at WTP4 and Jollyville.* This alignment was originally considered because it was at the lowest point of the line and would require the shortest shaft to gather a significant amount of excavated material in the Spicewood Springs area. It would also allow for uphill tunneling, which is the preferred method. However it is located in close proximity to a tributary of Bull Creek. The community has also requested restricted trucking hours between 9:00 a.m. and 3:00 p.m. due to the proximity of neighbors and Canyon Vista Middle School. This alternative is estimated to be in the same cost range as Alternative 2 when schedule impacts are considered.

Alternative 2: This shaft alternative shifts the major tunneling activities to the Jollyville Reservoir and Four Points area, and converts the Spicewood Springs/Old Lampasas Trail shaft to a retrieval shaft. This option would improve operations and maintenance of the pipeline by shifting the low point of the tunnel to the Jollyville Reservoir. This shaft alternative would also reduce the amount of work needed in the Spicewood Springs/Old Lampasas Trail area.

Shaft Site Alternative 2:

- Reduces truck traffic at the Spicewood Springs/Old Lampasas Trail shaft site by more than 90 percent: from more than 11,500 trucks to less than 800 trucks.
- Reduced the number of construction days by half at the Spicewood Springs/Old Lampasas Trail site: from nearly 1,000 days to less than 400.
- Reduces potential environmental impacts to Bull Creek.
- Relocated the vast majority of truck traffic to RM 620 and Hwy. 183; both are major roadways.
- Shifts the bulk of excavation work from a residential area to a commercial area, where construction impacts are more easily absorbed.
- Honors the restricted working hours of 9:00 a.m. to 3:00 p.m. for truck traffic at the Spicewood Springs/Old Lampasas Trail shaft site.
- Provides the lowest cost solutions when schedule impacts are considered.

Alternative 3: *Working shafts at Four Points and Jollyville; Retrieval shafts at WTP4 and Spicewood Springs.* The difference between this alternative and Alternative 2 is a deeper shaft at the Four Points location to allow for uphill tunneling on the longest stretch of tunnel between Four Points and Spicewood. This option will cost more and take longer than Alternative 2. Alternative 3 will also increase long-term operations and maintenance costs when the pipeline needs to be accessed (and completely dewatered) for maintenance by creating more than one low point. This alternative is estimated to be \$5 to \$10 million more than Alternative 2 when schedule impacts are considered.

Alternative 4: *Working shafts at Four Points and Jollyville, Retrieval shaft at WTP4; and a Ventilation shaft at Spicewood Springs.* This alternative would eliminate the retrieval of equipment from the Spicewood Springs area, as well as the pipe installation. It would, however, increase the complexity of constructing the tunnel because equipment would have to be sacrificed inside the tunnel and backed out to be retrieved. Installation of piping and grouting would also be more difficult, which would increase costs and the schedule timeline. Grouting would still take place from the Spicewood location. By limiting activity at this shaft, construction risks increase. This would further decrease truck traffic and construction days at the Spicewood Springs shaft site. This alternative is estimated to be \$10 to \$15 million more than Alternative 2 when schedule impacts are considered.

