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Barbara Buikema
Carmel Area Wastewater District

Engineering Review of Carmel Meadows Sewer Replacement Project Design Options

Dear Ms. Buikema:

At the request of the Carmel Area Wastewater District (District), Carollo has completed an evaluation of the two existing design packages for the Carmel Meadows Sewer Replacement Project (Project). Kennedy Jenks' (KJ) design replaces the existing sewer in its existing alignment while SRT's design is a pumping option that conveys flows from Mariposa Drive. In addition to this review, Carollo has also reviewed all the available information to determine if additional alignment alternatives would be more beneficial to the community.

When considering project alternatives, Carollo evaluates three main categories: constructability, operations and maintenance, and lifecycle. While both projects are technically constructable they differ greatly in the last two categories.

Constructability

Carollo attended a site visit on September 18th, 2023, with the District and Harris & Associates (Harris). A constructability memo was produced by Harris after this visit.

KJ Project

The replace in place project (KJ Project) is located behind homes in a narrow easement with minimal to no access and steep slopes. While most of the pipeline is buried with limited cover the topography requires that the pipeline be exposed in some locations and supported up to 16 feet above grade in others. A picture of the exposed pipe due to minimal cover and the width of the access is provided as Figure 1 and a picture of the pipe supports as Figure 2.

The existing support foundations have been compromised due to ground movement and slides. Replacing the pipe supports, removing rock and downed trees, and constructing a pipe replacement will require large equipment to be mobilized. Considering much of the pipeline is not accessible by vehicles, significant vegetation clearing and grading will be required during construction. This is typically done by either cutting into the hill above the alignment or by creating access below and using cranes to move material and equipment. Since the hill side already has slope stability challenges, cutting into the hillside to create a wider bench for access is not recommended.





Figure 1: Limited cover, narrow access, steep slopes



Figure 2: Pipe on Supports

While the project is technically constructable, the permits for the temporary construction easements, significant amount of vegetation removal, environmental disturbance required to gain access, long term bypass pumping for the duration of the project, and project cost create considerable challenges for this alternative.



SRT Project

The pumping option (SRT Project) installs a new pump station at Mariposa Dr. and four small ejector pump stations for the four homes where flows cannot be conveyed by gravity to the primary pumpstation. Flows would be conveyed to the pumpstation at Mariposa Dr. and pumped into an existing force main in Ribera Rd. The pump stations would be installed below grade with the pump station at Mariposa Dr. would require an above ground electrical control panel.

Removing the existing pipeline and pipe supports will be challenging. Based on the alignment and site visit, we believe that most of the pipeline and supports after proper cleaning can be broken down into smaller pieces and removed by a cable and winch system. Since this is just a removal there is no consequence to damaging the pipe or support materials during their removal. Only a small amount of bypass pumping will be required for this project.

Operation & Maintenance

KJ Project

Access to the existing pipeline alignment is very challenging now with an inherent safety risk to maintenance staff. During the site visit a rope, tied to a tree, was necessary to descend steep terrain. This condition would not improve if the project was replaced in its existing easement. For most projects, Carollo recommends that the pipeline owner be allowed to maintain a 20-foot drivable easement when not installed in the public right-of-way. If this type of an easement isn't feasible, it is then recommended that the owner have drivable access to each manhole. Due to the inability to use the alignment's easement to access the manholes with equipment, the temporary construction easement would need to be maintained for future access, if this recommendation is to be met. It is highly unlikely that this will be allowed due to the significant environmental impacts and land ownership. Future maintenance and repair of the alignment may be limited or require additional permitting, clearing, and regrading to perform repairs in the future, potentially slowing the District's ability to perform needed repairs.

SRT Project

Even though pump stations require more regular maintenance than a well-designed gravity sewer that has proper cover and slope, this project will be easier to maintain due to its location. Redundant pumps, backup power, and remote monitoring increase pump station reliability.

It is understood that the District has agreed to take ownership and maintenance responsibilities for the ejector pump stations. As such, the design team and District could investigate the possibility of combining the stations in one or two locations. This could help to move these systems closer to the main access point. However, with redundant pumps, pumps may be removed and swapped out to perform maintenance at another location if a small vehicle is unable to drive to one of the stations in the future. Additional options to maximize access are provided in the conclusions.



Lifecycle

Most pipeline projects are designed with a 50 to 100-year lifecycle whenever possible. The existing pipeline has been in service for approximately 70 years.

KJ Project

The replacement project will have an unpredictable lifecycle. While the pipeline could be designed to meet these requirements, the slope stability challenges and large trees that overhang the existing supports will always present risk. Engineers can design pipe supports that will survive sliding and movement but only to a point. While the supports may survive a slide or downed tree, if either of them make contact with the pipeline, the pipeline will likely fail. This could lead to an extended interruption in service. A similar concern was identified in the geotechnical letter produced by Engeo June 10th 2023.

As stated previously, with no access for heavy equipment to do repairs should movement continue, or a failure occur, significant permitting would be required again. Ground improvements will likely help to prevent future slides, but this would require more workspace. Removing the trees would remove the chance of a tree damaging the pipeline. However, this may also promote future slides. The root system is likely helping to slow or prevent sliding. Removal of the tree would cause this root system to die and increase the risk of slides.

SRT Project

The pumping option will be able to meet the District's lifecycle goals as long as maintenance activities are met. This is true with all assets, not just pump stations. The challenges with the KJ Project are with those variables that the District cannot control.

Conclusion

It is Carollo's opinion that the SRT Project provides the most reliable system for the residents and should move forward. However, the District should reevaluate the four ejector pumpstation locations now that circumstances have changed. The current design assumes that each homeowner will eventually take ownership of their pump station. If the District is going to provide all future maintenance, it makes sense to combine these four stations into one or two, and locate them closer to the main access point. Additionally, there may be an opportunity to run conduit and connect the ejector systems to backup power, adding more reliability. This may be accomplished by connecting to the proposed pump station in Mariposa Dr. or an existing facility.

Sincerely,
CAROLLO ENGINEERS, INC.



Brian Avon, P.E.
Vice President

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