

MEMORANDUM

To: Vern Philips, PE, Principal Engineer, Harris & Associates
From: Jeff Krebs, PE, Construction Engineer, Harris & Associates
RE: Carmel Area Wastewater District – Carmel Meadows Sewer Replacement Project
Constructability Review Memo
Date: 10/17/2023

Introduction

At the request of you and the District, a field visit was made by me and staff from Graniterock Construction on September 18, 2023, to assess the constructability of the Carmel Meadows sewer replacement in the existing alignment, based on plans by Kennedy Jenks done in 2016.

We also review plans by SRT, done in February 2022, which replaces the sewer in a new alignment.

Environmental constraints to construction are unknown and not considered in this memo. However, from experience, projects near riparian habitats will have constraints that would affect the constructability of any replacement option.

Access for future maintenance of the sewer was only generally considered in this memo since we do not know the specific maintenance activities the District employs. However, again from experience, access to manholes with maintenance equipment carried by vehicles is critically important.

Discussion of the options

1. **Construction issues to remove / replace the sewer utilizing hand tools and small equipment in the existing alignment and easement.**
 - a. Bypass pumping will be required for existing flows from existing manholes to new downstream sections of replaced sewer main pipe or manholes. The pumps would be required during installation of replacement pipe, then the existing system reconnected for afterhours utilization. Pumps and equipment can be mobilized in areas accessible for vehicles.
 - b. The existing pipe is mostly buried in shallow cover, but there is approximately 130 feet of pipe supported by an aerial structure up to 16 feet above grade with very difficult access. Demo of old and removal / install for new pipe in the buried portions of the existing alignment could possibly be done with hand tools and manual labor, but not in the area of the aerial supported pipeline.
 - c. The existing aerial supports for the sewer have significantly moved out of alignment and the aerial support foundations have been compromised, due to slope slippage. Reconstructing the aerial support structure will require stable foundation anchored to rock. The slope would need to be stabilized. It is unclear as to the extent of work required to stabilize the existing slope but this typically requires large equipment and access for it, and we don't know how this can be done with just hand tools and small equipment.

- d. Dealing with rock with hand equipment. In walking the path of the existing sewer, there are several rock out cropping. Without significant equipment requiring an access road, it will be very difficult to alter any of the rock slope areas, if they need to be altered, for reconstruction of the sewer main.
- e. Several trees have fallen due to slope slippage. There are existing trees above slope of the exposed sewer main that should be removed. This will be a large job to remove the trees and debris by hand, removing everything out to the roadway for reduction of fire fuel.
- f. Several tree trunks have grown around the exposed sewer main, which would need to be removed, to allow proper sewer main alignment both horizontally and vertically.

2. Construction issues to remove / replace the sewer utilizing conventional construction equipment in the existing alignment and obtaining construction easements outside of the existing 20' easement.

- a. Building vehicle/equipment access road for construction. This will be difficult due to the terrain and adjacent environmental wet land areas. To shore up the alignment, in the slide out areas will incur significant construction. A construction access road would need to be constructed at the toe of slope, key in rip rap rock material, then bench/fill up to the sewer alignment
- b. Getting equipment and materials to inaccessible areas. The only access currently is from the narrow ac road to the pump station. This will limit the size of equipment to bring in material for stabilization and fill. A temporary construction road could possibly be made to bring in material from the toe of the slope but this again would be difficult.
- c. The existing aerial supports areas could be utilized, providing their foundation supports are secure. Also we would want to reduce any significant tree hazards that could break the exposed sewer main. Reconstructing the aerial support structure will require stable foundation supports and the slope would need to be stabilized. It is unclear as to the extent of work required to stabilize the existing slope or existing foundation but heavy equipment would be required.
- d. Securing the sliding hillside with drilled anchors, benching into the hillside or similar stabilization. Typically in past projects dealing with hillside slip outs, we have started at the bottom of the slope, keyed in a stable bench, then compacted and filled in the hillside up the access bench for the sewer main. Utilization of drilled in anchors will require larger equipment and benched platforms for the equipment to use.
- e. Once the sewer alignment is benched in and the slopes stabilized, then maintenance of the sewer main can be maintained with vehicles and equipment.

3. Construction issues to remove sewer in existing alignment and replace the sewer in an alternative alignment, adjacent to the residences in the back yards at the top of slope.

- a. Will require pumping for the last four residences, to a new gravity main picking up the remainder residences, and then a pump station at Mariposa Dr. The Mariposa pump station would pump up to the existing force main in Ribera Rd.
- b. Access to construct the sewer main will allow construction equipment to excavate or pipe burst the pipe, move materials, and place the new sewer main and structures. In this new alignment it will be easier to access for maintenance.
- c. Provides use of the existing system, until able to connect to the new system, therefore will not require much, if any, bypass pumping of sewage during construction. This removes a significant risk of sewage spills into the nearby lagoon.
- d. The relocated alignment will not be as susceptible to falling trees or land slippage on the slope of the hillside, like it currently is.

Conclusion

- 1. Reconstruction of a new sewer main in the existing alignment, utilizing hand tools and small equipment carried to the difficult to access areas around the aerial structure, would be extremely challenging and

unrealistic. It would not address the continued slope slippage issues to the alignment or stable support needed. It also would not provide vehicle access for maintenance and would take the longest construction time to complete.

2. The construction for replacing the sewer main in the current alignment, could be viable using conventional equipment and vehicle access roads. However, this would require temporary construction easements outside of the sewer easement to stabilize the sewer alignment in a benched path within the construction easement. Stabilizing the slopes, utilizing the current access or other temporary construction access roads capable of allowing vehicular equipment would need to be constructed. This could provide a benched area along the sewer alignment, and access for maintenance. However, environmental constraints would probably severely limit disturbance of habitat in the area to do this construction.
3. The construction of a sewer and pump stations in a new alignment, similar to that proposed in the SRT plans, would have the least constructability challenges and would provide the best access for construction and maintenance. This alternative would also have the least impact on the environment surrounding the existing and new sewer alignments and be constructed in the least amount of time.