

SANTA YNEZ COMMUNITY SERVICES DISTRICT
MEMORANDUM

TO: Board of Directors
FROM: Loch Dreizler, General Manager
DATE: September 21, 2022
SUBJECT: Sewer Project Soil Subsidence

Recommendation

Review and discuss the Horizon Drive sewer easement subsidence update

Policy Implications

On March 10, 2022, the Board approved a motion to flood (*soaker hose*) the soil from Horizon Drive to Highway 246 to verify compaction on the recently installed Horizon Drive sewer line.

The District has minimum backfill and compaction requirements in our *Design and Construction Standards for Public Sewage System Improvements*. These standards and the project construction documents included Drawing Detail S-2. Sewer pipe installations follow these requirements to minimize the potential for trench settlement.

Fiscal Implications

The contract warranty will expire on November 17, 2022

Alternatives Considered

None

Discussion

The Board approved the Notice of Completion for the Horizon Drive sewer main project on November 17, 2021. However, during December 2021 rain events, surface soil subsidence occurred within the District's easements. As a result, in mid-February 2022, the contractor, Specialty Construction Inc., completed warranty work to repair the subsidence. Also, the District's Construction Management consultant observed and agreed that the warranty work was complete.

Before the last board meeting, two of the three property easements were soaked. The Sanja Cota property has been completed now, with no additional areas of concern discovered.

Based on previous board discussions, staff met with the District's project manager, with the soil engineer on site, and reviewed past recommendations by the District's engineer.

Project Manager

David E. Kerr, the District's project manager, sat down with the General Manager and Operations Supervisor on Thursday, August 18, and discussed the difference between latent and patent defects. A patent defect is evident during the inspection or something already known. On the other hand, a latent defect is hidden or concealed. This means that you cannot always easily observe the issue, like subsidence. He was confident that the project was completed to specification but recommended that we show our soaker results to the soil engineer.

Project Soils Engineer (See Attached Trench Compaction Considerations)

Kelly Robinson, the project soils engineer from GEO Solutions, met on-site with the General Manager and Operations Supervisor on Tuesday, August 23, 2022, observed the soaker project, and commented on the commitment to determining future subsidence. However, she did conclude that based on the nature of soil mechanics, it is unlikely that subsequent settlement would occur as the soil has consolidated. The void ratio (i.e., air space within the soil matrix) has been minimized.

GEO Solutions believed that the trench backfill was subject to a significant storm event that resulted in saturation of the subsurface over a short period. This resulted in the consolidation of the previously compacted materials. Therefore, additional settlement of trench backfill materials is not anticipated.

District Engineer

Michael Kielborn, the District's engineer and representing Cannon Engineering, gave a Board presentation on June 15, 2022, and had the following comments about District Construction Standards that may help minimize future subsidence: Currently, there is limited technical information for non-paved areas, District Specifications should be reviewed before future projects in regards to native soils.

Summary

The District's S-2 detail recommends a 90% relative compaction if outside of a roadbed. In addition, GEO Solutions Test results were summarized in the Report of Field Density Testing and indicated minimum relative compaction of 95 percent at the locations tested. Therefore, the settlement likely did not jeopardize the relative compaction achieved during construction.

While helpful in recognizing areas of concern, the soaker project should not be interpreted as the definitive approach to determining future subsidence. For example, there could be minimal significant soil subsidence in the future. However, it is also possible that there could be repairable soil subsidence from future rain events, including the impact of nearby groundwater.

Attachment(s):

1. Geo-Solutions Letter
2. Drawing S-2, Sewer Pipe Bedding and Backfill Details



RFI NO. 1 – TRENCH COMPACTION CONSIDERATIONS

DATE

September 2, 2022

PROJECT NUMBER
GS00189-1

CLIENT

Santa Ynez
Community Service
District

Attn: Loch Dreizler
General Manager
1070 Faraday Street
Mail: PO Box 667
Santa Ynez, CA
93460

PROJECT NAME

Santa Ynez
Community Service
District
Horizon Drive Sewer
Horizon Drive and
Easement
Santa Ynez Area
Santa Barbara County
California

Dear Mr. Dreizler:

GeoSolutions, Inc. is pleased to present this RFI No. 1 – Trench Compaction Considerations for the Santa Ynez Community Service District (SYCSD) Horizon Drive Sewer project located along Horizon Drive and adjacent easement in the Santa Ynez area of Santa Barbara County, California. This RFI No. 1 was prepared at the request of Santa Ynez Community Service District.

BACKGROUND

GeoSolutions, Inc. performed intermittent field density testing between September 7 and 29, 2021, during trench backfill construction along the easement located between Horizon Drive and Hwy 246. Trench backfill in this area included approximate fill depths of up to 9 feet. Test results were summarized in the Report of Field Density Testing (GeoSolutions, Inc. 2021) and indicated a minimum relative compaction of 95 percent (ASTM D1557) at the locations tested.

Based on information from SYCSD, settlement of the trench was observed following a significant storm event in December 2021. It is our understanding, groundwater in the area rose several feet during the storm event. The damage has since been repaired. GeoSolutions, Inc. performed a site visit on August 22, 2022, to observe the site conditions and discuss the potential for future damage with the client. It is our understanding the SYCSD contract for this work will expire in November 2022 and the SYCSD would like to address any potential issues before contract expiration.

CONCLUSIONS

During the December 2021 storm event, the trench backfill materials likely became saturated as a result of rising groundwater and abundant rainfall. Under the saturated conditions, the soils consolidated. It is typical for soils to consolidate under saturated conditions due to increased loading from the weight of the water and reduced shear strength from increased moisture content. Consolidation can occur under these conditions even where 95 percent relative compaction (ASTM D1557) has been achieved. Deeper fill areas have a higher potential for settlement.

Based on the nature of soil mechanics, it is unlikely that subsequent settlement would occur as the soil has consolidated and the void ratio (i.e. air space within the soil matrix) has been minimized. Settlement may occur under saturated conditions due to additional loading (i.e. structure, heavy equipment, etc.).

The settlement that did occur likely did not jeopardize the relative compaction that was achieved during construction. Based on our understanding of soil mechanics, reduction in the relative compaction of the trench backfill is not feasible unless the trench backfill soil has somewhere to migrate / scour. Given the trench conditions, this scenario is unlikely.

It is our opinion that the trench backfill was subject to a significant storm event that resulted in saturation of the subsurface over a short period of time. This resulted in consolidation of the previously compacted materials. Additional settlement of trench backfill materials is not anticipated.

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CLOSURE

Thank you for the opportunity to have been of service in preparing this letter. If you have any questions, please contact the undersigned at (805) 543-8539.

Sincerely,
GeoSolutions, Inc.

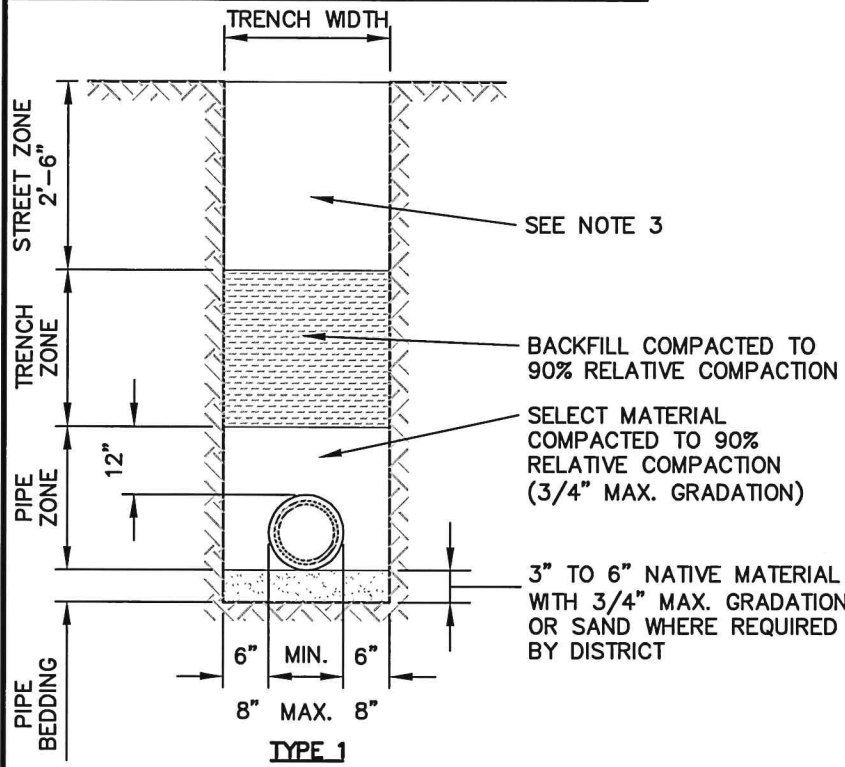


Kelly M. Robinson, PhD, GE
Principal Engineer, GE 3118

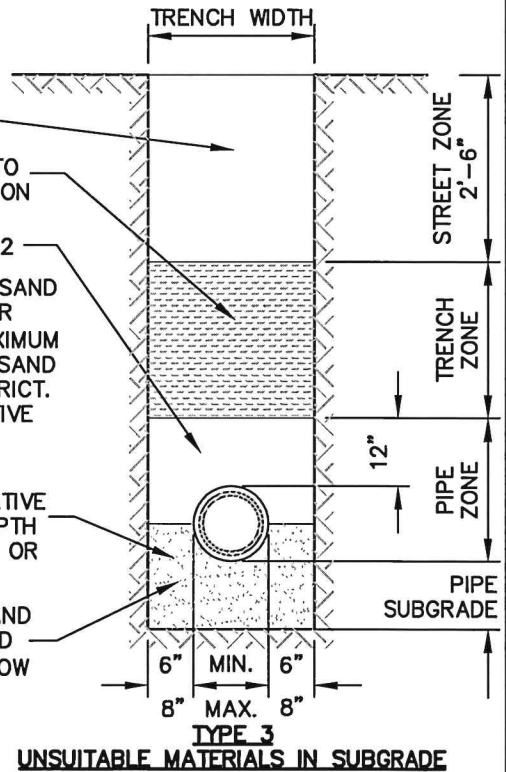
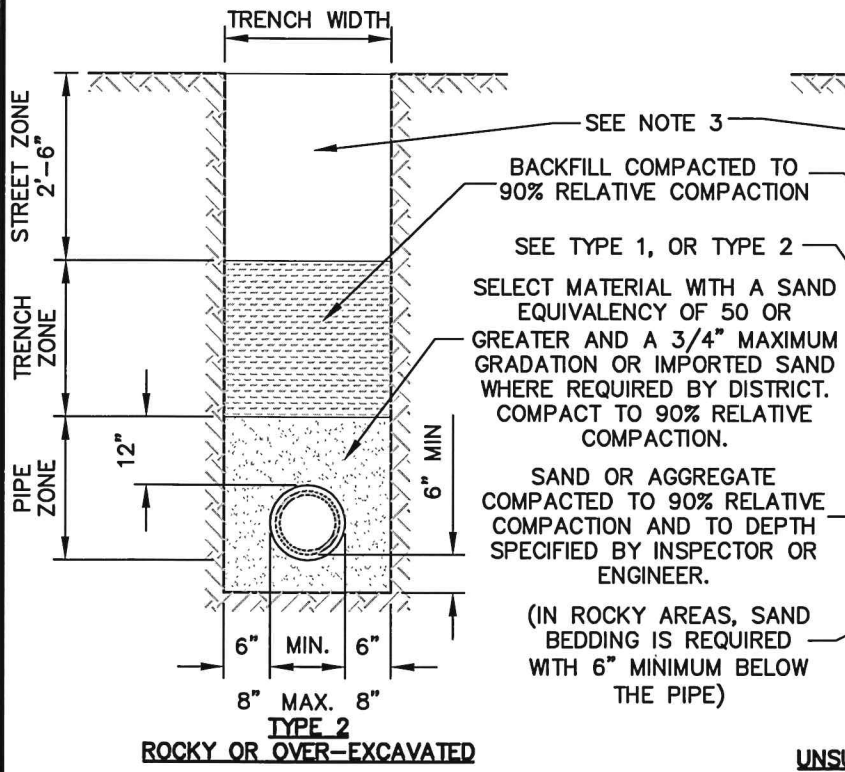


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REVISIONS			
DESCRIPTIONS	BY	DATE	APPROVED



- NOTES:**
1. SAND AND SELECT MATERIAL SHALL BE PER STANDARD SPECIFICATIONS FOR EARTHWORK.
 2. SEE STANDARD SPECIFICATIONS FOR EARTHWORK IF TRENCH WIDTH EXCEEDS THE MAXIMUM SHOWN ON THIS DRAWING.
 3. STREET ZONE TO BE COMPACTED TO 95% RELATIVE COMPACTION IF WITHIN ROADBED OR TO 90% RELATIVE COMPACTION IF OUTSIDE OF ROADBED. SEE STANDARD SPECIFICATIONS FOR EARTHWORK.
 4. MINIMUM COVER OVER ALL SEWER MAINS TO BE 6' AS MEASURED FROM FINISHED GRADE.
 5. PERCENT RELATIVE COMPACTION IS THE PERCENT OF THE MAX. DRY DENSITY AS DETERMINED BY ASTM D-1557 (5 LAYER)
 6. PAVEMENT, BASE, AND SUBBASE SHALL BE REPLACED IN STREET ZONE PER STANDARD SPECIFICATIONS.



DATE	SANTA YNEZ COMMUNITY SERVICES DISTRICT	DRAWING NO.
JANUARY 2007	SEWER PIPE BEDDING AND BACKFILL DETAILS	S-2