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Penngrove Sanitation Zone Capacity Evaluation

Executive Summary

Introduction

Sonoma Water completed a hydraulic capacity evaluation of the Penngrove Sanitation Zone (PSZ) sewer collection system to assess the system's ability to convey peak wet weather flows and comply with the State Water Resources Control Board's 2022 Waste Discharge Requirements for sanitary sewer systems. The evaluation included development and calibration of a dynamic hydraulic model using flow monitoring data collected between January and April 2024. The study assessed both existing conditions and projected future development conditions within the Penngrove service area.

Existing System Conditions

The Penngrove system currently serves approximately 376 sewer connections, representing about 547 equivalent single-family dwelling units (ESDs), through a network of gravity sewers, siphons, a lift station, and a force main that conveys wastewater to the City of Petaluma system for treatment. The modeled system included approximately 3.1 miles of trunk sewers and evaluated flows generated under both dry weather and wet weather conditions.

Dry Weather and Wet Weather Performance

Under dry weather conditions, the system generally performs adequately, with flows primarily driven by base wastewater generation and seasonal groundwater infiltration. However, wet weather conditions substantially increase system loading due to rainfall-dependent inflow and infiltration (RDI/I). During major storm events in early 2024, monitoring identified significant surcharge conditions upstream of the Penngrove Lift Station, including up to seven feet of backup within portions of the system. These conditions were attributed primarily to lift station and downstream conveyance limitations during periods of elevated rainfall and creek levels.

Hydraulic Modeling and Capacity Analysis

The hydraulic model was calibrated using observed rainfall and flow monitoring data and evaluated against a 10-year, 24-hour design storm consistent with Sonoma Water standards and NOAA Atlas 14 rainfall criteria. The analysis found that peak wet weather flow conditions — rather than average dry weather conditions — govern system capacity limitations. In particular, infiltration and inflow associated with storm events and elevated groundwater conditions create substantial short-term peak flows that exceed portions of the system's available capacity.

Limitations and Uncertainties

The report identified several important limitations and uncertainties associated with the analysis. The monitoring period did not include extended dry weather conditions, limiting the ability to fully distinguish between groundwater infiltration and base wastewater flow. Additionally, the monitored storm events were smaller than the selected design storm, requiring extrapolation of wet weather response behavior to larger events. The study also notes uncertainty associated with the influence of Lichau Creek flooding and antecedent soil saturation on infiltration and inflow rates.

Future Conditions

Future development assumptions incorporated planned housing element sites, potential septic-to-sewer conversions, accessory dwelling units, and other anticipated growth within the service area. While future dry weather flows are expected to increase, the study concludes that wet weather infiltration and inflow will remain the dominant driver of system capacity constraints.

Recommended Next Steps

The report recommends additional evaluation of lift station and force main improvements, targeted infiltration and inflow investigations, rehabilitation of aging sewer infrastructure, and continued system monitoring to better characterize wet weather performance. The study also recommends continued refinement of the hydraulic model and prioritization of capital improvement projects to reduce surcharge risk and improve long-term system reliability.