

Sanitary Sewer Analysis of Woodland Oaks and Woodland Shores Sanitary Sewer System

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Subject property

The subject property is 10.3 acres located at the Southwest corner of Colbern Road and Blackwell Road. The property adjoins Woodland Shores subdivision to the South and an undeveloped Agricultural zoned 10 acre tract to the West. To the North of Colbern Road lies Jackson County Park (Lake Jacomo). To the East of Blackwell Road lies Lee's Summit Parkland.

The existing use of the ground is vacant with some scrubby trees to the Eastern side. There are no discharges from Woodland Shores. The property drains to a low area at the North middle of the site.

Description of analysis method

Analysis of the existing sewer system was evaluated using a peak flow equation as provided by the City of Lee's Summit Section 6500 – Sanitary Sewers manual of Peak Flow = PBFNon-res + Peak Infiltration + Peak Inflow. This method of calculating flows requires modeling each drainage area that is associated with each manhole. Attached to this analysis is a drainage area map with the individual areas indicated (Exhibit A). A chart has been composed to calculate each of the Peak Flows for each area. Attached chart indicating all flows used in this analysis (Exhibit B). The existing sewer system was converted into individual areas and attached to this report.

The peak flow calculation is area dependent and each a peak flow was calculated for each individual area. Existing Flow line elevations and layout were sourced from the Lee's Summit GIS system and exported out of Arc/Info (Exhibit E). Each contribution to the sewer system is added as a dry weather 'base' flow in a sewer system modeling software.

Existing condition model

Existing Woodland shores was evaluated with a total peak used as the daily inflow in Autodesk Storm and Sanitary Analysis 2020. The contributory area of woodland oaks was used at 6.89 acres, as that is the only portion that would currently be serviceable by a gravity sewer. The additional 14 acres of proposed Woodland Oaks will be serviced by a pressure sewer is not included in the Sewer profile included attached (Exhibit C).

The attached sewer profile indicates surcharging between several sewer runs. (26-258 → 26-262, 26-169 → 26-170 and 26-170 → 26-173) Surcharging was also indicated between 26-179 and 26-180. This surcharging appears to be very minor and is likely a GIS data anomaly.

Flows used by this analysis total up to approximately 3cfs. Which is being modeled as a steady state flow for this analysis. The City of Lee's Summit provided a subset of measured data to use as a rough verification that the calculation method used here is within nominal bounds. Upon review of this data, the typical peak flows are reasonable to the 3CFS number, though steady state flows are vastly less. This serves to enforce the method used here should be conservative to actual system performance.

Per conversations with the City of Lee's Summit, the only surcharging within Woodland Shores experienced was due to a lift station fault that has been rectified a couple of years ago. This further validates the existing condition model as not creating a daily surcharge event.

Proposed condition model

To create the proposed condition model the existing woodland shores was used, with the proposed Woodland Oaks subdivision added. The indicated 6.89 acres of gravity was deleted and each Woodland Oaks Manhole area was used instead. The proposed 3 pressure sewer systems flow were added as contributors to the gravity sewers they will tie into. After running the new model's simulation, surcharging was once again indicated between several runs. (26-258 →26-262, 26-169 →26-170 and 26-170 → 26-173). The profile indicating this Hydraulic Grade Line is attached as 'Exhibit D'.

Conclusions regarding proposed sewer impacts

Surcharging exists under the existing condition model, though no problems have been indicated to this point. Surcharging exists at the same locations when the system is modeled with Woodland Oaks contribution to the sewer system. Peak flows as measured at a point downstream of Woodland Shores at 26-159 are able to peak to a similar range as the Peak Base Flow indicated by the design Method laid out in Division 6500. The modeling system used treated these peak flows as a dry weather continuous flow. This will magnify the effects of these flows, exposing any shortcomings or problems of the system.

The proposed Woodland Oaks subdivision does not indicate to cause a substantial impact on the performance of the existing Woodland Shores sewer system.