

APPENDIX G
SEWER SIZING CALCULATIONS AND TABLE

Sewer Sizing Calculations and Table
Wastewater Master Plan
City of De Soto, Kansas

Residential Flow: 2.5 dwelling units / acre x 2.8 capita / d.u. x 75% developable = 5.25 capita / acre
 5.25 capita / acre x 100 gal / capita-day x 1440 min / day = 1,823 gpm / acre

Mixed Use Flow: De Soto residential flow factor = 1.823 gpm/acre + 448.83 gpm / cfs = 0.00406 cfs / acre
 (Commercial / Light APWA residential flow factor = 0.02 cfs / acre
 Industrial) De Soto percentage of APWA residential flow factor = 0.00406 cfs / acre + 0.02 cfs / acre x 100 = 20.3 %
 KDHE residential flow factor = 0.0046 cfs / acre

Flow = 0.0125 cfs / acre (per APWA) x 448.83 gpm / cfs x 20.30% = 1.14 gpm / acre

Recommended flow for mixed use from KDHE = 0.0116 cfs / acre = 5.21 gpm / acre

For comparison to residential flow, this equates to:
 1.14 gpm / acre x 1440 min / day + 100 gal / capita-day + 5 Peak Factor = 3.28 capita / acre

Industrial Flow = 180,330 gpd from major industries in De Soto

Pipe Slope = 0.5 % = 0.005
 Percent Full = 65%
 Manning Coeff. (n) = 0.013

| Sewer Diameter (in) | Sewer Diameter (ft) | Sewer Area (ft ²) | Full Pipe | | d / D | 65% Full Pipe | | Area of Residential Flow (acre) | Area of Mixed Use Flow (acre) |
|---------------------|---------------------|-------------------------------|-----------------|------------|-------|-----------------|------------|---------------------------------|-------------------------------|
| | | | Velocity (ft/s) | Flow (cfs) | | Velocity (ft/s) | Flow (gpm) | | |
| 8 | 0.667 | 0.349 | 2.454 | 0.857 | 0.65 | 2.258 | 0.548 | 135.01 | 216.09 |
| 10 | 0.833 | 0.545 | 2.848 | 1.553 | 0.65 | 2.620 | 0.994 | 244.79 | 391.80 |
| 12 | 1.000 | 0.785 | 3.216 | 2.526 | 0.65 | 2.959 | 1.617 | 398.05 | 637.12 |
| 14 | 1.167 | 1.069 | 3.564 | 3.810 | 0.65 | 3.279 | 2.439 | 600.43 | 961.04 |
| 15 | 1.250 | 1.227 | 3.732 | 4.580 | 0.65 | 3.434 | 2.931 | 721.72 | 1,155.17 |
| 16 | 1.333 | 1.396 | 3.896 | 5.440 | 0.65 | 3.585 | 3.482 | 857.25 | 1,372.11 |
| 18 | 1.500 | 1.767 | 4.215 | 7.448 | 0.65 | 3.877 | 4.767 | 1,173.59 | 1,878.43 |
| 24 | 2.000 | 3.142 | 5.106 | 16.040 | 0.65 | 4.697 | 10.265 | 2,527.47 | 4,045.43 |
| 30 | 2.500 | 4.909 | 5.924 | 29.082 | 0.65 | 5.450 | 18.612 | 4,582.61 | 7,334.86 |
| 36 | 3.000 | 7.069 | 6.690 | 47.290 | 0.65 | 6.155 | 30.265 | 7,451.83 | 11,927.29 |
| 42 | 3.500 | 9.621 | 7.414 | 71.333 | 0.65 | 6.821 | 45.653 | 11,240.55 | 17,991.46 |
| 48 | 4.000 | 12.566 | 8.105 | 101.845 | 0.65 | 7.456 | 65.181 | 16,048.44 | 25,686.90 |