

CE 3372 – Water Systems Design
Exercise Set 13

Purpose:

Demonstrate conduit sizing using Rational equation method for eventual application of SWMM for analysis of a storm drainage system.

Objectives:

- Determine drainage areas to each inlet
- Determine inlet times and pipe travel times, to size conduits for a storm drain system.
- Prepare data for hydraulic model testing in SWMM

Problem Statement and Background

Figure 1 is an older (circa 1993) aerial image of a portion of Houston, Texas. The red polygon is the drainage boundary for a storm sewer system that drains North from the part of the area near Westheimer Road to a tributary of Buffalo Bayou and East from the area. The drainage ditch is shown as the “blue” fuzzy line on the figure. Drainage in the ditch is from West to East. The two main streets in the study area are highlighted in magenta.

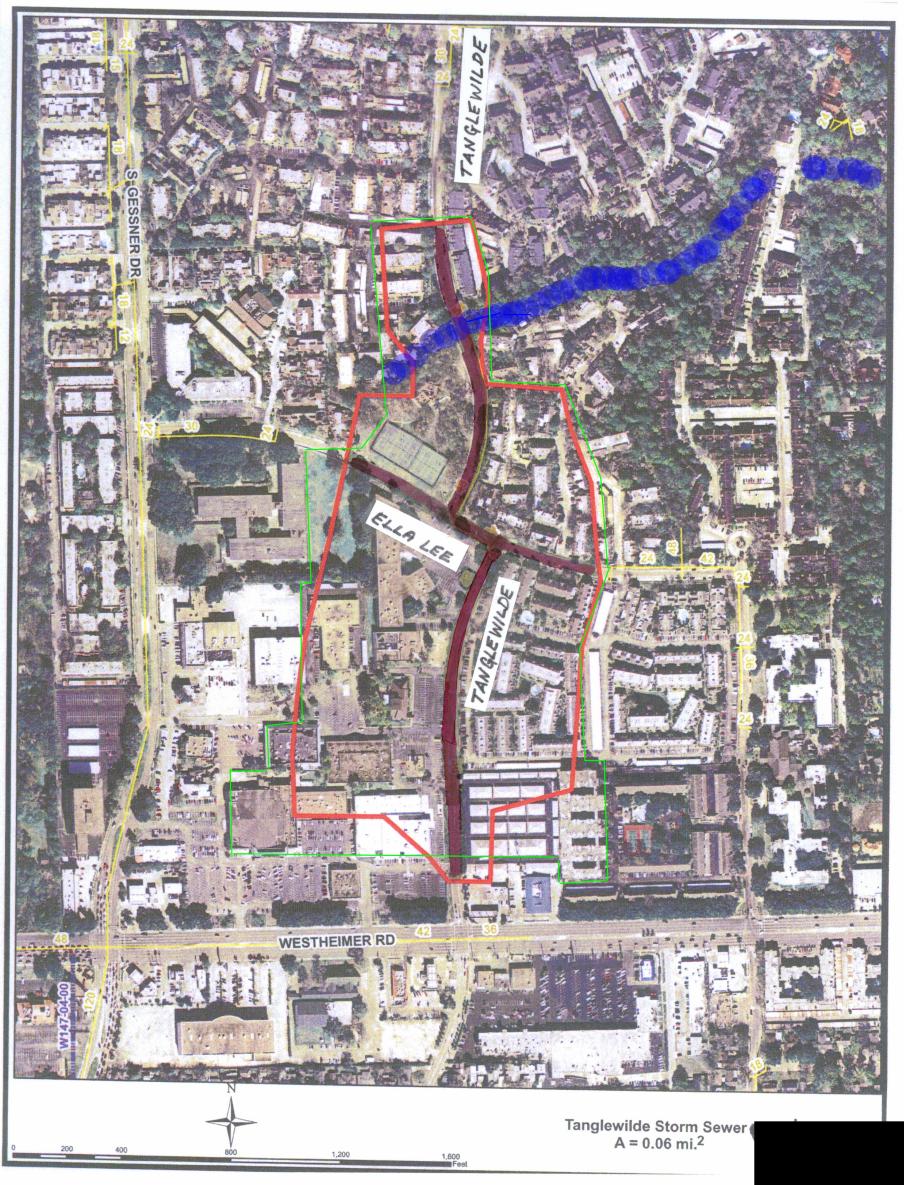


Figure 1: Tanglewilde Drive Study Area

Figure 2 is a map showing storm drainage alignments and inlets location.

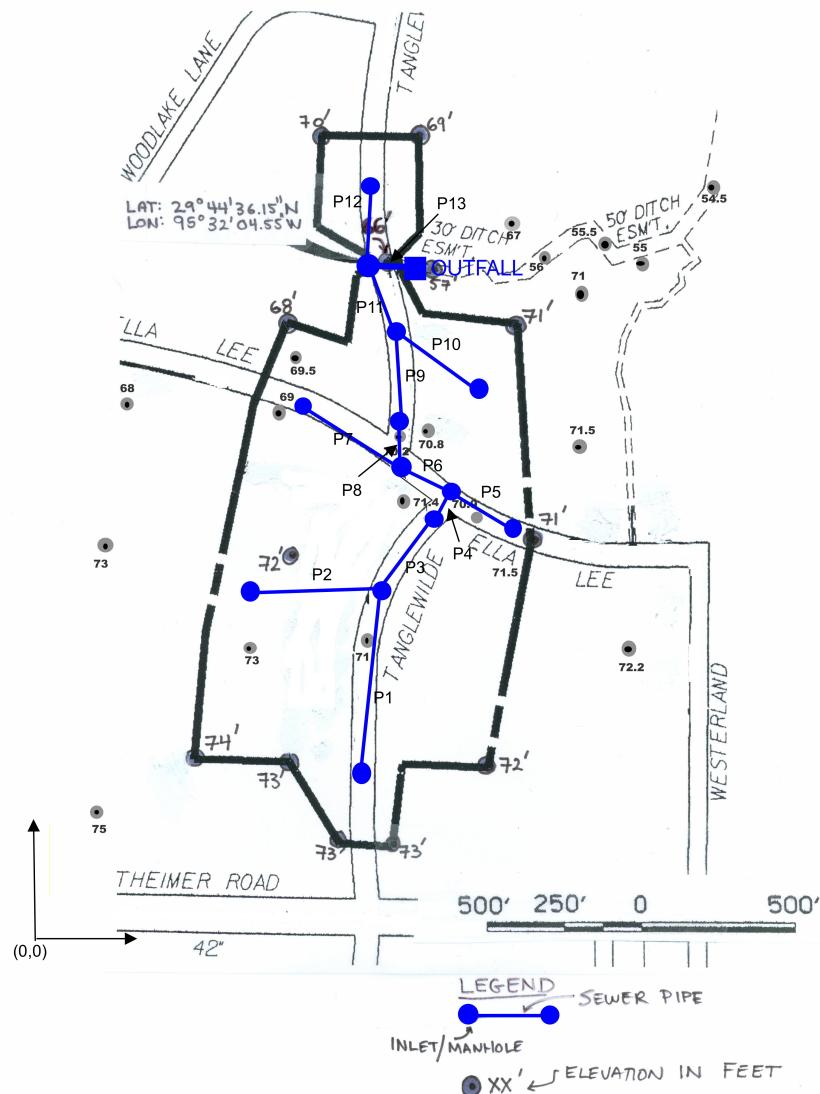


Figure 2: Tanglewilde Drive Storm Drain Inlet and Pipe Alignments

The figure shows land surface elevations in feet at the indicated locations. A linear scale is

shown in the legend. Use the map(s) and:

1. Constructed a contour map of the same area. Use the contour map to inform your selection of the drainage areas to each inlet node. Indicate which nodes you do not assign drainage (junction nodes for connecting pipes).
2. Use the rational design method to size the conduits for a 5-year storm, for Harris County, Texas.
3. Specify the invert (flow line) elevations of the nodes (inlets and junction boxes).
4. Specify the soffit (crown) elevations for the pipes at each node.
5. Construct a SWMM model of the storm sewer system you just designed. Adjust the width of each drainage area so that the rational method (timing) is approximated in SWMM for each inlet, then apply a 3-hour, 5-year storm to the project. Specify the outlet as a free outfall, with the invert elevation as the bottom of the ditch.