MOEHRING & ASSOCIATES ——— CONSULTING ENGINEERS

30 June 1989

Ms. Vicky Hruska
City Engineers Office
455 N. Main
Wichita, KS. 67202

Re: Wyatt Center Addition
Storm Sewer Evaluation
Paving 45th Street So.

Dear Vicky:

As requested, we are submitting this hydrologic evaluation for determination of the need and/or sizing of storm water sewer to be constructed in conjunction with the paving of 45th Street So., along the South side of the Wyatt Center Addition.

On the following page is a map of the off-site drainage area contributing to 45th Street at Hydraulic (Node # 1). The outline of the drainage area assumes that at least one tier of lots fronting on Laura Ave., North of 45th St., and also one tier of lots fronting on 45th St., East of Laura will be contributing to the proposed storm sewer.

The contributing drainage area as shown, is 15.33 Ac. The soils in the basin are identified by the S.C.S. Soils Map, as "Canadian", a fine sandy loam, in hydrologic group "B".

Approximately 65% of the drainage area is presently developed with single family lots, with average areas of 1/2 Ac., and corresponding "C" factors of 0.36 for the 2 year frequency design storm. The remaining 35% of the area is presumed to be developed with smaller lots, approximately 4 to the acre, and a corresponding value of 0.44 for the value of "C". Then, "C" = 0.38 will be the weighted value for the basin.

The time of concentration will be the sum of the overland travel time to Node # 3, and the gutter flow time from Node # 3 to # 2 to # 1. From Attachment B, City of Wichita Drainage Criteria, the velocity of overland flow is 0.5 fps for lawns with a 0.5% gradient. The length of overland flow is 120'. Then T = 120/0.5/60 = 4.0 minutes (overland).

The drainage basin is quite flat, and it is probable that the average curb and gutter gradient will approximate 0.2%. With an "n" value of 0.016, the average velocity of gutter flow was determined from the nomograph for velocity in triangular gutter sections (Chart 2), in H.E.C. # 12, to be 1.87 fps. The length of gutter flow from Node # 3 to # 2 to # 1 is 1790, and the the gutter travel time would be

1790 / 1.87 / 60 = 15.35. Use 16 minutes.

The time of concentration @ Node # 1 = 4 + 16 = 20 minutes.

From Attachment "A", the corresponding rainfall intensity for the 2 year design period (I) = 3.33 inches per hour.

For that portion of the drainage basin contributing to the flow in the North curb of 45th St., the drainage area is 8.9 acres, and the discharge is computed as follows:

Q = C I A = 0.38 x 3.33 x 8.9 = 11.26 c.f.s.

The drainage area contributing to the flow in the South curb of 45th St. is 6.43 acres, and the discharge is computed as follows:

Q = C I A = 0.38 x 3.33 x 6.43 = 8.14 c.f.s.

To conform to the requirements for allowable pavement encroachment for the initial (5year) design storm, the flow may spread across the crown but not overtop the curb.

From the nomograph for flow in triangular channels, (H.E.C. # 12), it can be determined that the maximum discharge in a standard height curb of 0.55 ' is 10.17 cfs., based on the anticipated average gradient of 0.2% and "n" value of 0.016.

The design flow of 8.14 cfs in the South curb of 45th St. at Hydraulic will have a flow depth of 0.50 ' and will not overtop standard curb. In the North gutter of 45th St., flow interception by curb inlet and storm sewer should be provided at such location that the design discharge does not exceed 10 c.f.s., to prevent overtopping.

By the reduction of the drainage area contributing to the proposed point of interception, there would also be a corresponding reduction of the time of concentration, to the minimum of 15 minutes and an increase of rainfall intensity to 3.83 in/hr. A recomputation of the peak discharge to a curb inlet (Node # 4), located approximately 832' West of Node # 1, would be as follows:

Q = C I A = 0.38 x 3.83 x 6.67 = 10.0 c.f.s.

With a standard curb inlet, constructed on grade, the length of opening for total interception is calculated to be 19 feet and the efficiency of the opening for an inlet with L = 6'-4" is calculated to be 49.3 % of the total flow. Then, the intercepted flow = 5 cfs, and the by-pass flow = 5 cfs. toward Node # 1.

The intercepted flow at Node # 4 of 5 cfs would be conveyed in a 18 " R.C.P storm sewer at a flow depth of 1.08 ' and with a velocity of 3.67 fps., constructed on a minimum gradient of 0.3 %.

At Node # 1 the flow approaching from the West, in the North curb of 45th St. would be 6.26 cfs, and 8.14 cfs in the South curb of 45th Street.

At this point in time, the receiving drainage system is the West ditch of Hydraulic St., and curb inlets and storm sewer leads will be required to collect the flow from 45th St., and direct the discharge to the West ditch of Hydraulic. Additionally, a ditch inlet constructed on the North side of 45th at the West line of Wyatt Center Addition, will be required to introduce the present flow in the existing ditch into the proposed 18" storm sewer along the South side of the Addition.

On the following page is a sketch of paving and associated drainage improvements which are required to be guaranteed as a part of the platting process. Also included is a preliminary cost estimate for preparation of the petition, to be submitted by the applicant.

Respectfully Submitted,

MOEHRING & ASSOCIATES
CONSULTING ENGINEERS

Don C. Moehring II

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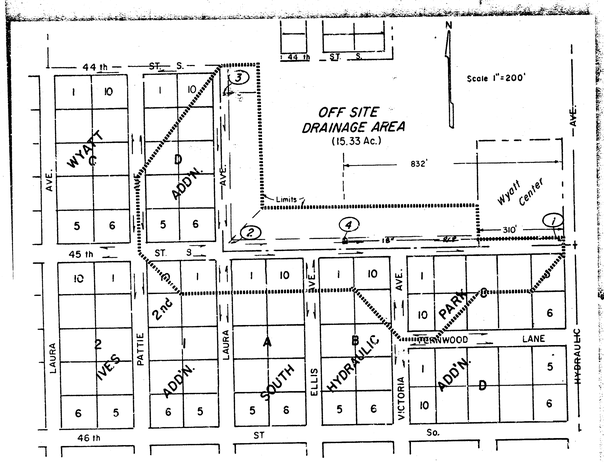


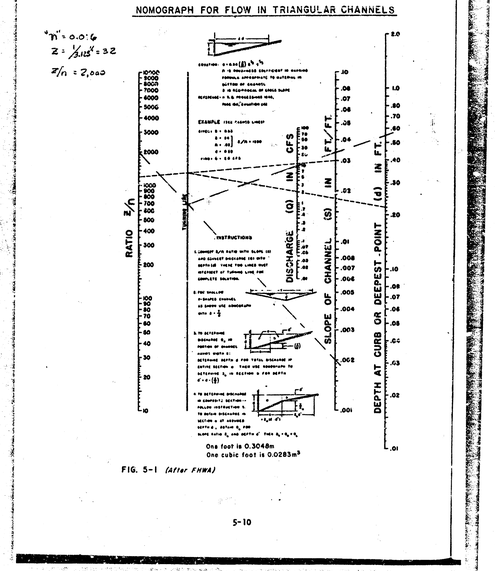
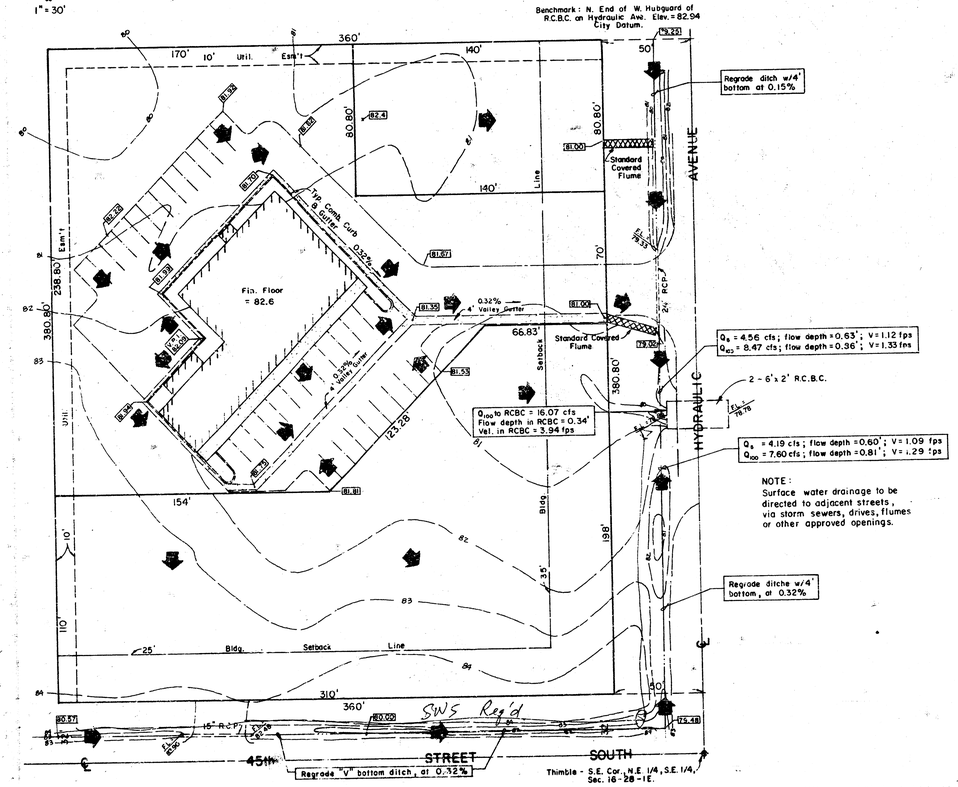


FIG. 5-1 *(after FHWA)*

5-10



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