

**DRAINAGE REPORT
FOR
SIERRA HILLS 2ND ADDITION
WICHITA, SEDGWICK COUNTY,
KANSAS**

July 11, 2007

**SIERRA HILLS 2ND ADDITION
DRAINAGE ANALYSIS
July 11, 2007**

INTRODUCTION

This report contains supporting documentation and calculations for the proposed Sierra Hills 2nd Addition. The existing site is an L-shaped undeveloped 51.3-acre tract of land located ¼ mile west of 143rd Street East on the north side of Pawnee. The area is currently pasture land and drains generally southeasterly in two drainage basins. The site also has a small portion that drains offsite to the north. The first drainage basin flows to the southeast to a 29”x45” CMP under Pawnee. The second basin flows to the southeast corner of the site to an unnamed branch of the Spring branch of Fourmile Creek. Existing off-site drainage enters the site from Sierra Hills Golf Course in the western basin and at the north of the L from a property owned by USD 259 in the eastern basin. FEMA map 20173C0395E, effective date Feb., 2 2007 shows the proposed project site is located in unshaded Zone X, defined as areas located of the 500 year floodplain. A small portion located at the southeast corner of the site is located in the shaded Zone X, defined as 500-year flood or in the 100-year flood with less than average depth of less than 1 foot. The northeast corners of lots 37 and 38, Block 2 are located in Zone AE and will be placed in a flood plain reserve or drainage easement.

The site will be developed into residential lots with on-site detention provided by the creation of three detention ponds.

HYDROLOGY

Peak flow rates for the tributary areas were determined using HEC-HMS. The times of concentration were calculated using the velocity method and overland flow rates from attachment E of the City of Wichita Drainage Criteria. The parameters and results of the existing and proposed analysis are shown in the tables below. The west offsite area is part of the Sierra Hills Golf course where an 18” pipe has been placed which carries water to another basin to the west. Therefore the amount of offsite water accepted by the proposed project site is reduced by the capacity of the 18” pipe.

| Existing | Area | CN | TC (min.) | Q2 (cfs) | Q5 (cfs) | Q10 (cfs) | Q25 (cfs) | Q100 (cfs) |
|----------|----------|----|--------------|-------------|-------------|--------------|--------------|---------------|
| East | 43.8 ac. | 80 | 42 | 34.7 | 53.1 | 64.6 | 84.1 | 117.8 |
| West | 29.0 ac. | 80 | 44 | 15.2 | 26.9 | 34.2 | 46.6 | 68.2 |
| North | 3.90 ac. | 80 | 15 | 5.9 | 8.9 | 10.7 | 13.9 | 19.3 |

| Proposed | Area | CN | TC (min.) | Q2 (cfs) | Q5 (cfs) | Q10 (cfs) | Q25 (cfs) | Q100 (cfs) |
|----------|----------|------|--------------|-------------|-------------|--------------|--------------|---------------|
| East | 45.0 ac. | 85.7 | 42 | 32.9 | 51.1 | 63.1 | 82.3 | 114.0 |
| West | 30.0 ac. | 83 | 44 | 12.1 | 20.1 | 21.9 | 36.7 | 54.8 |
| North | 2.15 ac. | 87 | 15 | 4.3 | 6.1 | 7.1 | 8.9 | 12.0 |

The rational method was used to determine peak flow rates for the basins located within the plat. The attached Drainage Plan shows the on site drainage calculations.

PAWNEE CULVERT

The hydraulic characteristics of the culvert under Pawnee located in the west basin were modeled using HY-8. The rational equation yielded a Q_{100} of 87.0 cfs and a 100-year headwater of Elev. = 1315.98. The culvert will not over top Pawnee because the north ditch has an overtop elevation of 1314.24 and will allow 33 cfs to flow north along the ditch of Pawnee to the unnamed tributary to the Spring Branch of Fourmile Creek.

Pond Routing Information:

Three ponds will provide the detention required for this development. The western drainage basin contains a series of two ponds while the eastern basin is detained by a single pond.

Rainfall Data: The SCS Type II Rainfall Distribution as modeled by the HEC-RAS program is used for analysis, with a total 100year – 24 hour rainfall event of 7.8 inches (TR-55). This rainfall model is used for all basins.

The schematic hydraulic model indicates the modeling parameters for each of the basins draining to the detention pond area. A summary of the ponds' performance in the various design storms can be found in the tables below.

WEST POND 1

| <u>Design Storm</u> | <u>Peak Inflow (cfs)</u> | <u>Peak Outflow (cfs)</u> | <u>Allowable Release (cfs)</u> | <u>Peak Storage (ac-ft.)</u> | <u>Peak Elevation</u> |
|---------------------|--------------------------|---------------------------|--------------------------------|------------------------------|-----------------------|
| 2-yr | 13.2 | 9.0 | n/a | 0.5 | 1318.5 |
| 5-yr | 23.2 | 17.4 | n/a | 0.7 | 1318.8 |
| 10-yr | 29.4 | 22.9 | n/a | 0.8 | 1319.0 |
| 25-yr | 39.8 | 32.0 | n/a | 1.1 | 1319.2 |
| 100-yr | 57.8 | 48.5 | n/a | 1.4 | 1319.6 |

The stage-storage data was calculated by HEC-HMS using the parameters located in the table below.

| <u>Stage</u> | <u>Area (ac-ft)</u> |
|--------------|---------------------|
| 1318.00 | 0.83 |
| 1319.00 | 0.89 |
| 1320.00 | 0.95 |
| 1321.00 | 1.01 |

The outlet of this pond shall be controlled by a 10'x2' RCBC which will pass under Ironside Court and keep the pond at a static elevation of 1318.00. Lots 16-25, Block 1 as shown on the preliminary plat shall have a minimum pad elevation of 1322.00.

WEST POND 2

| <u>Design Storm</u> | <u>Peak Inflow (cfs)</u> | <u>Peak Outflow (cfs)</u> | <u>Allowable Release (cfs)</u> | <u>Peak Storage (ac-ft.)</u> | <u>Peak Elevation</u> |
|---------------------|--------------------------|---------------------------|--------------------------------|------------------------------|-----------------------|
| 2-yr | 14.9 | 12.1 | 15.2 | 0.2 | 1315.4 |
| 5-yr | 21.7 | 20.1 | 26.9 | 0.3 | 1315.7 |
| 10-yr | 26.9 | 25.9 | 34.2 | 0.4 | 1315.9 |
| 25-yr | 37.1 | 36.7 | 46.6 | 0.5 | 1316.1 |
| 100-yr | 55.6 | 54.8 | 68.2 | 0.7 | 1316.4 |

The stage-storage data was calculated by HEC-HMS using the parameters located in the table below.

| <u>Stage</u> | <u>Area (ac-ft)</u> |
|--------------|---------------------|
| 1315.0 | 0.45 |
| 1316.0 | 0.50 |
| 1317.0 | 0.54 |

The pond outlet of this pond shall be controlled by a broad crested weir 10' in length and will set the static elevation of the pond at 1315.00. Lots 29-36, Block 1 as shown on the preliminary plat shall have a minimum pad elevation of 1319.00

EAST POND

| <u>Design Storm</u> | <u>Peak Inflow (cfs)</u> | <u>Peak Outflow (cfs)</u> | <u>Allowable Release (cfs)</u> | <u>Peak Storage (ac-ft.)</u> | <u>Peak Elevation</u> |
|---------------------|--------------------------|---------------------------|--------------------------------|------------------------------|-----------------------|
| 2-yr | 39.1 | 24.9 | | 1.3 | 1311.9 |
| 5-yr | 55.4 | 39.0 | | 1.8 | 1312.2 |
| 10-yr | 65.2 | 48 | | 2.0 | 1312.3 |
| 25-yr | 81.7 | 62.2 | | 2.3 | 1312.5 |
| 100-yr | 109.6 | 86.2 | | 3.0 | 1312.9 |

The stage-storage data was calculated by HEC-HMS using the parameters located in the table below.

| <u>Stage</u> | <u>Area (ac-ft)</u> |
|--------------|---------------------|
| 1311.0 | 1.46 |
| 1312.0 | 1.53 |
| 1313.0 | 1.61 |

The pond outlet of this pond shall be controlled by a broad crested weir 10' in length and will set the static elevation of the pond at 1311.00. Lots 46-52 and 54-58, Block 2 as shown on the preliminary plat shall have a minimum pad elevation of 1315.00