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Mid Continent Airport Plats **Wichita, Sedgwick County, Kansas**

06/01/00

The Mid Continent Airport Plats are made up of six separate parcels surrounding the Mid Continent Airport in Wichita, Sedgwick County Kansas. Parcel 70, almost 12 acres at the intersection of Ridge Road and Harry St. will be known as Mid Continent Airport 2nd Addition. Mid Continent Airport 3rd Addition consists of Parcels 19-2, 59, 62 and 63 which lie north of K-42 on the west side of Hoover Street. The fourth addition includes parcels 56, 57 and 60 and is located at the intersection of Ridge Road and K-42 Highway. The fifth addition is comprised of Parcels 67, 80 and 82 and is about 1.9 acres. The sixth addition includes a large tract at the southwest corner of Mid Continent Airport and is made up of Parcels 38, 54, 55, 65, 66, 68, and 72-75. The seventh addition is approximately 3.8 acres and is north of the airport runways and south of Kellogg. Please see included USGS map for overall addition locations.

Development is not planned in the immediate future for any of the plats. During a study for The Cessna Aircraft Company, the 3rd Addition was included in a 20-year master plan and drainage study. In that study a large portion of the 3rd Addition would be used as a detention storage facility when the area to the west was developed. During the first one phase of this development a portion of the detention basin was constructed to offset the additional runoff generated from the construction of the Cessna ACC Facility. When additional area is developed, additional storage in the detention basin will have to be created. A sketch of the ultimate detention basin is included on the drainage map for Mid Continent Airport 3rd Addition. Development is not planned on any of the other plats so developed drainage conditions were not calculated. If these plats should be developed at a later date, drainage calculations should be performed and detention requirements can be detailed at that time. The drainage plans, supporting computations and data for the Mid Continent Airport Plats drainage plan are presented herein.

Hydrology

Mid Continent Airport 2nd Addition

The proposed plat lies in the E ½, SE ¼, SE ¼, Sec 28, T27S, R1W in Sedgwick County, Kansas. This plat consists of almost 12 acres of cultivated agricultural land with a tree row along the east side adjacent to Ridge Road. The soil consists of Farnum loam with slopes of less than 1 percent. This soil falls into the Hydrologic Soil Group B. The drainage pattern is primarily southeast to the storm sewer located in the Harry and Ridge intersection. This piece of property will continue to be farmed in the immediate future. If this area is ever developed, on site detention may be required to detain the difference in storm water runoff from developed conditions back to existing conditions.

Mid Continent Airport 3rd Addition

The third addition lies in portions of Sections 34 and 35 of T27S, R1W and a portion of Section 3, T28S, R1W in Sedgwick County, Kansas. This plat is about 196 acres in size and is mostly tall grasses and open space. Half of the area is "B" type soils, 40% is "C", and the rest is "D" type soil. Drainage in this basin is primarily to the east and south and is collected in the ditch along Hoover Road and the existing detention basin in the southeast corner of the proposed plat.

This area is a portion of Basin C, which is included in the drainage study for Cessna Mid Continent Facility 20-Year Master Plan which was written in January 1998. The referenced report includes this area as eventually being developed and includes 3 alternatives for regulating storm water peak flows and high water elevations. (See Appendix)

A large portion of the proposed plat is recommended as a large detention basin on the west side of Hoover Road. There is an existing detention basin at the southeast corner of the proposed plat that was constructed as part of the first phase of the Cessna Aircraft Completion Center to reduce peak storm water runoff flows that were generated by the development.

If the recommended 600'x2900' detention basin is not expected to be constructed as part of this plat, it should be recognized that any development within this property would require the storage volume of the existing basin to be increased. Sufficient area on the east side of this lot should be reserved for future expansion of the detention basin. A conceptual layout is included on the drainage map for the 3rd Addition.

Minimum opening elevation for future buildings should be based on the 100 year emergency spillway for the detention basin. This may be Hoover Road or a berm around the basin. It is recommended that the minimum openings be at least 3 feet above the emergency spillway elevation.

Mid Continent Airport 4th Addition

The proposed plat lies in the very northeastern most corner of Section 9 and the very northwesterly corner of Section 10, T28S, R1W in Sedgwick County, Kansas. It is situated between 31st Street South and K-42 Highway. The east half of the plat is primarily D type soil while the western half is primarily B soil. The 3 acre area is mostly tall grasses and some trees with a road through the western part.

Since development is not planned for this plat, no drainage improvements are currently needed. Additional calculations will be required when the impervious area of this plat increases.

Mid Continent Airport 5th Addition

The 1.9 acre piece that will be Mid Continent Airport 5th Addition is located in the NW ¼, NW ¼, Section 9, T28S, R1W of the 6th P.M. The land is mostly open space with some trees. Storm water currently flows either north to the ditch along 31st Street South or south to the ditch along K-42 Highway. As long as the land is not developed, these drainage patterns should be maintained.

Mid Continent Airport 6th Addition

The proposed plat lies in the SE ¼ of Section 5, the S ½, SW ¼ of Section 4, the NE ¼ of Section 8 and the N ½, NW ¼ of Section 9, T28S, R1W in Sedgwick County, Kansas. The existing landscape is mostly tall grasses and floodplain. Runway 1L of Wichita Mid Continent Airport bisects the plat and crosses over the Cowskin Creek. FEMA floodplain currently covers a large portion of the 435 acres in this plat. Floodway is also present and the limits have been included on the plat. Minimum floor elevations and minimum opening elevations for future buildings should be based on the latest revision of the FEMA maps. It is recommended that the minimum floor elevation be at least 2 feet above the Base Flood Elevation (BFE) and the minimum opening at least 3 feet above the BFE.

Mid Continent Airport 7th Addition

The seventh addition is located in the NW ¼, SE ¼, Section 28, T27S, R1W in Sedgwick County, Kansas. The existing landscape is a cultivated agricultural field in type B soil. There is a high point near the center of the plat. About 60% of the plat drains north to the Kellogg right-of-way at about a 1% slope. The remainder of the plat drains to the A.T. & S.F. Railroad right-of-way to the south. As long as the area remains undeveloped, no drainage improvements are needed.

Runoff coefficients were estimated based on tables presented in the Design Aids section and existing land use. A map showing the basin boundaries, drainage calculations and a hydrology summary are included.

The analysis made is based on the available site data which includes the following: 1" = 100' and 1"=200' topographic maps with 1' or 2' contours of the sites and adjacent areas, USGS topographic maps, Sedgwick County Soil Survey Maps and references noted herein.

Storm Sewer Design

Storm sewer systems for these plats were not designed at this time. Some of the commercial and industrial developments already utilize storm sewer systems and these were not modeled. If any portion of these plats is developed at a later date, storm sewer system may be needed to adequately drain the developed area. The calculations for these systems can be done at the time of site development.

Design Aids

This section includes material used to assist in designing the drainage system. A scaled drainage plan map for each addition is enclosed.

References

Design of Urban Highway Drainage - The State of the Art, by Reitz & Jens, Inc., April 1980.

Drainage of Highway Pavements, Hydraulic Engineering Circular #12, by Tye Engineering, Inc., March 1984.

Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation, City of Wichita, Kansas, 1985.

Soil Survey of Sedgwick County, Kansas, US Department of Agriculture, Soil Conservation Service, 1979.

SOIL SUMMARY

Parcel 70 (Mid Continent Airport 2nd Addition)

Soil Types-

Fa – “B” Farnum loam, 0-1% slopes
Fb – “B” Farnum loam, 1-3% slopes

Parcel 59,62,63 and 19-2 (Mid Continent Airport 3rd Addition)

Soil Types-

Ba – “C” Blanket silt loam, 0-1% slopes
Ca – “B” Canadian fine sandy loam, nearly level
Fa – “B” Farnum loam, 0-1% slopes
Fb – “B” Farnum loam, 1-3% slopes
La – “C” Lesho loam, nearly level
Tb – “D” Tabler-Drummond Complex, nearly level
Wa – “C” Waldick sandy loam, nearly level
Wb – “D” Waurika silt loam, nearly level

Parcels 56,57 and 60 (Mid Continent Airport 4th Addition)

Fa – “B” Farnum loam, 0-1% slopes
Ta – “D” Tabler-Drummond Complex, nearly level

Parcels 38,54,55,65-68,72-75,80 and 82 (Mid Continent Airport 5th & 6th Additions)

Ba – “C” Blanket silt loam, 0-1% slopes
Bb – “C” Blanket silt loam, 1-3% slopes
Ea – “B” Elandco silt loam, nearly level
Eb – “B” Elandco silt loam, occasionally flooded, nearly
Ec – “B” Elandco silt loam, frequently flooded
Fa – “B” Farnum loam, 0-1% slopes
Fb – “B” Farnum loam, 1-3% slopes
Ma – “B” Milan loam, 1-3% slopes
Mb – “B” Milan loam, 3-6% slopes
La – “C” Lesho loam, nearly level
Sb – “B” Shellabarger sandy loam, 3-6% slop
Ta – “D” Tabler silty silty clay loam, nearly level
Tb – “D” Tabler-Drummond Complex, nearly level

Parcel 107 (Mid Continent Airport 7th Addition)

Ub – “B” Urban Land – Elandco complex, nearly level, well drained

AIRPORT PLATS

MID-CONTINENT AIRPORT 2ND ADDITION

PARCEL 70

Soil Type – “B”

Area = 11.9 acres

Slope = <1% ~ 0.6%

Ditch flowing south along Ridge Road

EXISTING LAND USE

- Tree row along east property line
- Mostly cultivated agricultural

TIME OF CONCENTRATION

Sheet flow 750 ft @ 0.5 ft/s

Ditch flow 530 ft @ 1.5 ft/s

tc = 30.9 min = 31 minutes

i₂ = 2.59 in/hr

i₅ = 3.26

i₁₀ = 3.72

i₁₀₀ = 5.43

EXISTING OUTLETS

SW – 24” CMP – 30” RCP

SE – 15” CMP – 48” RCP

RUNOFF COEFFICIENTS

(-0.04 for cultivated)

C₂ = 0.12

C₅ = 0.14

C₁₀ = 0.20

C₁₀₀ = 0.33

CN=71

CN = 71 w/ conservation

CN = 81 w/o conservation

FLOWS (Rational Method)

Q₂ = 3.7 cfs

Q₅ = 5.4 cfs

Q₁₀ = 8.9 cfs

Q₁₀₀ = 21.3 cfs

PROPOSED LAND USE

No proposed development at this time.

No drainage improvements are recommended until the site is developed and then addition drainage calculations will need to be done.

MID CONTINENT AIRPORT 3RD ADDITION

<u>Soil Type</u>	<u>Acre</u>	<u>% of Area</u>
B	97.5	50%
C	76.2	39%
D	22.5	11%
Totals	196.2	100%

EXISTING LAND USE

- Open space/pasture
- About 7 acres impervious (3-4%)

RUNOFF COEFFICIENTS

<u>Soil Type</u> <u>B</u> Slopes 1-4%	<u>Soil Type</u> <u>C</u> 1-4%	<u>Soil Type</u> <u>D</u> Slopes < 1%
C ₂ = 0.22	C ₂ = 0.28	C ₂ = 0.30
C ₅ = 0.24	C ₅ = 0.31	C ₅ = 0.35
C ₁₀ = 0.30	C ₁₀ = 0.39	C ₁₀ = 0.45
C ₁₀₀ = 0.43	C ₁₀₀ = 0.55	C ₁₀₀ = 0.65

TIME OF CONCENTRATION

1700' @ 1.5'/s (steep slopes) = 19 min.

2000' @ 1'/s (flat slopes) = 33 min.

1300' @ 2'/s (ditch flow) = 11 min.
63 min. use 1 hour

i₂ = 1.70 in/hr
i₅ = 2.17 in/hr
i₁₀ = 2.50 in/hr
i₁₀₀ = 3.70 in/hr

cont. Mid Continent Airport 3rd Addition

<u>Soil Type</u> <u>B</u>	<u>Soil Type</u> <u>C</u>	<u>Soil Type</u> <u>D</u>
Q ₂ = 36.5cfs	Q ₂ = 36.3cfs	Q ₂ = 11.5cfs
Q ₅ = 50.8cfs	Q ₅ = 51.3cfs	Q ₅ = 17.1cfs
Q ₁₀ = 73.1cfs	Q ₁₀ = 74.3cfs	Q ₁₀ = 25.3cfs
Q ₁₀₀ = 155.1cfs	Q ₁₀₀ = 155.1cfs	Q ₁₀₀ = 54.1 cfs

TOTALS

Q₂ = 84.3.5cfs
Q₅ = 119.2cfs
Q₁₀ = 172.7cfs
Q₁₀₀ = 364.3cfs

Based on the Cessna 20-year plan drainage study this plat is part of a larger basin (Basin C from report). If this basin were to fully develop, approximately 40 acres near Hoover Rd. would need to be used as a detention basin. See Cessna Master Plan drainage study for HEC-1 calculations.

There are currently no plans for development so no drainage improvements are required at this time.

Based on existing conditions:

HW₁₀₀ = 1301.5 w/no constructed detention

With 40 acre detention basin:

HW₁₀₀ = 1298.0

MID CONTINENT AIRPORT 4TH ADDITION

Area = 3.0 acres

Outlet for this area 30"x18" RCE and 2-38"x22" RCE

Soil "B" area = 1.38 ac.

Soil "D" area = 1.62 ac.

EXISTING CONDITIONS

Field with trees (open space)

Slope <1%

"B" Soils

C₂ = 0.16

C₅ = 0.18

C₁₀ = 0.24

C₁₀₀ = 0.37

"D" Soils

C₂ = 0.28

C₅ = 0.33

C₁₀ = 0.43

C₁₀₀ = 0.63

Use tc = 15 minutes

i₂ = 3.80 in/hr

i₅ = 4.62 in/hr

i₁₀ = 5.21 in/hr

i₁₀₀ = 7.40 in/hr

Q₂ = (1.38)(0.16)(3.8) + (1.62)(0.28)(3.8) = 2.6 cfs

Q₅ = (1.38)(0.18)(4.62) + (1.62)(0.33)(4.62) = 3.6 cfs

Q₁₀ = (1.38)(0.24)(5.21) + (1.62)(0.43)(5.21) = 5.4 cfs

Q₁₀₀ = (1.38)(0.37)(7.40) + (1.62)(0.63)(7.40) = 11.3 cfs

MID CONTINENT 5TH ADDITION

Area = 1.93 acres

Soil Type "B"

Slopes <1% (about 0.5%)

TIME OF CONCENTRATION

575 feet at 0.5ft/sec

tc = 19 minutes

i₂ = 3.39 in/hr

i₅ = 4.16 in/hr

i₁₀ = 4.71 in/hr

i₁₀₀ = 6.74 in/hr

MID CONTINENT 6TH ADDITION

TIME OF CONCENTRATION

2000' @ 1.5 ft/s

500' @ 2 ft/s

4800' @ 3.5 ft/s

tc = 49 minutes

RUNOFF COEFFICIENTS

Pasture, slope 1-4%
(+0.02)

<u>Soil Type</u> <u>B</u>	<u>Soil Type</u> <u>C</u>	<u>Soil Type</u> <u>D</u>
C ₂ = 0.22	C ₂ = 0.28	C ₂ = 0.32
C ₅ = 0.24	C ₅ = 0.31	C ₅ = 0.37
C ₁₀ = 0.30	C ₁₀ = 0.39	C ₁₀ = 0.47
C ₁₀₀ = 0.43	C ₁₀₀ = 0.55	C ₁₀₀ = 0.67

MID CONTINENT 7TH ADDITION

PARCEL 107

Soil Type – “B”

Area = 3.8 acres

Slope = 1% towards Kellogg (North 60%)

0.4% towards railroad (South 40%)

EXISTING LAND USE

- Cultivated agricultural field
- Collects runoff from Mid Continent Road

TIME OF CONCENTRATION

Sheet flow 400 feet @ 0.5ft/sec = 13.3 min.

T_c = 15 minutes

i₂ = 3.80 in/hr

i₅ = 4.62

i₁₀ = 5.21

i₁₀₀ = 7.40

RUNOFF COEFFICIENTS (-0.04 for cultrivated)

C₂ = 0.12

C₅ = 0.14

C₁₀ = 0.20

C₁₀₀ = 0.33

CN = 71

CN = 71 w/conservation

CN = 81 w/o conservation

FLOWS (Rational Method)

Q₂ = 1.7 cfs

Q₅ = 2.5 cfs

Q₁₀ = 4.0 cfs

Q₁₀₀ = 9.3 cfs

PROPOSED LAND USE

No proposed development at this time.

Drainage improvements are not needed until this site is developed. Additional drainage calculations will be needed based on proposed development.

Time of Concentration Minutes	Land Use	C ₂	C ₅	C ₁₀	C ₁₀₀	i ₂	i ₅	i ₁₀	i ₁₀₀	Q ₂	Q ₅	Q ₁₀	Q ₁₀₀
31	Cultivated Agricultural	0.12	0.14	0.20	0.33	2.59	3.26	3.72	5.43	3.7	5.4	8.9	21.3
60	Open Space - Pasture	0.25	0.28	0.35	0.50	1.70	2.17	2.50	3.70	84.1	119.0	172.5	363.7
15	Open Space - Slopes <1%	0.22	0.26	0.34	0.51	3.80	4.62	5.21	7.40	2.6	3.6	5.4	11.3
19	Open Space with trees	0.22	0.24	0.30	0.43	3.39	4.16	4.71	6.74	1.4	1.9	2.7	5.6
49	Open Space - Pasture	0.23	0.26	0.32	0.46	1.95	2.48	2.85	4.20	197.1	275.1	396.1	834.1
15	Cultivated Agricultural	0.12	0.14	0.20	0.33	3.80	4.62	5.21	7.40	1.7	2.5	4.0	9.3

RAINFALL INTENSITIES TABLE

SEDGWICK COUNTY KANSAS (revised June 1997)

This table contains average rainfall intensities in inches per hour.

DURATION, HR:MIN	RETURN PERIOD						
	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:05	4.91	5.64	6.64	7.38	8.48	9.34	10.20
0:06	4.62	5.34	6.33	7.07	8.15	9.00	9.84
0:07	4.38	5.09	6.08	6.80	7.86	8.69	9.52
0:08	4.17	4.87	5.85	6.56	7.60	8.41	9.22
0:09	4.00	4.68	5.63	6.33	7.34	8.14	8.93
0:10	3.84	4.50	5.43	6.11	7.10	7.87	8.64
0:11	3.70	4.34	5.25	5.90	6.86	7.61	8.36
0:12	3.56	4.19	5.07	5.71	6.64	7.36	8.09
0:13	3.44	4.05	4.91	5.53	6.43	7.14	7.84
0:14	3.33	3.92	4.76	5.36	6.24	6.92	7.61
0:15	3.22	3.80	4.62	5.21	6.06	6.73	7.40
0:16	3.12	3.69	4.49	5.07	5.91	6.56	7.21
0:17	3.03	3.58	4.37	4.94	5.76	6.40	7.04
0:18	2.94	3.48	4.26	4.82	5.63	6.26	6.88
0:19	2.85	3.39	4.16	4.71	5.50	6.12	6.74
0:20	2.77	3.30	4.06	4.60	5.38	5.99	6.60
0:21	2.70	3.22	3.97	4.50	5.27	5.87	6.47
0:22	2.63	3.14	3.88	4.41	5.17	5.76	6.35
0:23	2.56	3.07	3.80	4.32	5.07	5.65	6.23
0:24	2.50	3.00	3.72	4.23	4.97	5.54	6.12
0:25	2.44	2.93	3.64	4.15	4.88	5.44	6.01
0:26	2.38	2.87	3.57	4.07	4.79	5.35	5.90
0:27	2.33	2.81	3.50	4.00	4.70	5.26	5.80
0:28	2.27	2.75	3.44	3.92	4.62	5.17	5.71
0:29	2.23	2.69	3.37	3.86	4.54	5.08	5.61
0:30	2.18	2.64	3.31	3.79	4.47	4.99	5.52
0:31	2.14	2.59	3.26	3.72	4.39	4.91	5.43
0:32	2.09	2.54	3.20	3.66	4.32	4.83	5.34
0:33	2.05	2.50	3.14	3.60	4.25	4.76	5.26
0:34	2.02	2.45	3.09	3.54	4.18	4.68	5.18
0:35	1.98	2.41	3.04	3.48	4.12	4.61	5.10
0:36	1.94	2.37	2.99	3.43	4.05	4.54	5.02
0:37	1.91	2.33	2.94	3.38	3.99	4.47	4.95
0:38	1.88	2.29	2.90	3.32	3.93	4.40	4.87
0:39	1.85	2.25	2.85	3.27	3.87	4.34	4.80
0:40	1.82	2.22	2.81	3.23	3.82	4.28	4.73
0:41	1.79	2.18	2.77	3.18	3.76	4.22	4.67
0:42	1.76	2.15	2.73	3.13	3.71	4.16	4.60
0:43	1.73	2.12	2.69	3.09	3.66	4.10	4.54
0:44	1.71	2.09	2.65	3.05	3.61	4.04	4.48
0:45	1.68	2.06	2.62	3.01	3.56	3.99	4.42
0:46	1.66	2.03	2.58	2.96	3.51	3.94	4.36
0:47	1.63	2.00	2.55	2.93	3.47	3.89	4.30
0:48	1.61	1.97	2.51	2.89	3.42	3.84	4.25
0:49	1.59	1.95	2.48	2.85	3.38	3.79	4.20
0:50	1.57	1.92	2.45	2.81	3.34	3.74	4.15

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY KANSAS
(revised June 1997)

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DURATION, HR:MIN	RETURN PERIOD						
	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:51	1.55	1.90	2.42	2.78	3.30	3.70	4.10
0:52	1.53	1.87	2.39	2.75	3.26	3.65	4.05
0:53	1.51	1.85	2.36	2.71	3.22	3.61	4.00
0:54	1.49	1.83	2.33	2.68	3.18	3.57	3.95
0:55	1.47	1.80	2.30	2.65	3.14	3.53	3.91
0:56	1.45	1.78	2.28	2.62	3.11	3.49	3.86
0:57	1.43	1.76	2.25	2.59	3.07	3.45	3.82
0:58	1.41	1.74	2.22	2.56	3.04	3.41	3.78
0:59	1.40	1.72	2.20	2.53	3.01	3.37	3.74
1:00	1.38	1.70	2.17	2.50	2.97	3.34	3.70
1:05	1.30	1.61	2.06	2.38	2.82	3.17	3.52
1:10	1.23	1.53	1.96	2.26	2.69	3.02	3.35
1:15	1.17	1.45	1.87	2.16	2.57	2.89	3.20
1:20	1.11	1.38	1.79	2.06	2.46	2.77	3.07
1:25	1.06	1.32	1.71	1.98	2.36	2.65	2.95
1:30	1.01	1.27	1.64	1.90	2.27	2.55	2.83
1:35	0.97	1.21	1.58	1.83	2.18	2.46	2.73
1:40	0.93	1.16	1.52	1.76	2.10	2.37	2.63
1:45	0.89	1.12	1.46	1.70	2.03	2.29	2.54
1:50	0.86	1.08	1.41	1.64	1.96	2.21	2.46
1:55	0.82	1.04	1.36	1.58	1.89	2.13	2.38
2:00	0.79	1.00	1.31	1.53	1.83	2.07	2.30
2:05	0.76	0.97	1.27	1.48	1.77	2.00	2.23
2:10	0.74	0.93	1.23	1.43	1.72	1.94	2.16
2:15	0.71	0.90	1.19	1.39	1.67	1.88	2.10
2:20	0.69	0.87	1.15	1.35	1.62	1.83	2.04
2:25	0.66	0.85	1.12	1.31	1.57	1.78	1.98
2:30	0.64	0.82	1.09	1.27	1.53	1.73	1.93
2:35	0.62	0.80	1.06	1.24	1.49	1.68	1.88
2:40	0.61	0.78	1.03	1.21	1.45	1.64	1.83
2:45	0.59	0.75	1.01	1.18	1.42	1.60	1.79
2:50	0.57	0.74	0.98	1.15	1.38	1.56	1.74
2:55	0.56	0.72	0.96	1.12	1.35	1.53	1.70
3:00	0.55	0.70	0.94	1.10	1.32	1.49	1.67
3:15	0.51	0.66	0.88	1.03	1.24	1.40	1.57
3:30	0.48	0.62	0.83	0.97	1.17	1.32	1.48
3:45	0.45	0.59	0.78	0.92	1.11	1.26	1.40
4:00	0.43	0.56	0.75	0.88	1.06	1.20	1.34
4:15	0.41	0.53	0.71	0.84	1.01	1.14	1.28
4:30	0.40	0.51	0.68	0.80	0.97	1.10	1.22
4:45	0.38	0.49	0.66	0.77	0.93	1.05	1.17
5:00	0.37	0.47	0.63	0.74	0.89	1.01	1.13
5:15	0.36	0.46	0.61	0.72	0.86	0.98	1.09
5:30	0.35	0.44	0.59	0.69	0.83	0.94	1.05
5:45	0.34	0.43	0.57	0.67	0.81	0.91	1.02
6:00	0.33	0.42	0.55	0.65	0.78	0.88	0.98

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY KANSAS
(revised June 1997)

This table contains average rainfall intensities in inches per hour.

DURATION, HR:MIN	RETURN PERIOD						
	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
6:30	0.31	0.39	0.52	0.61	0.73	0.83	0.92
7:00	0.29	0.37	0.49	0.58	0.69	0.78	0.87
7:30	0.28	0.35	0.47	0.55	0.66	0.74	0.83
8:00	0.27	0.34	0.45	0.52	0.62	0.70	0.78
8:30	0.26	0.32	0.43	0.50	0.60	0.67	0.75
9:00	0.25	0.31	0.41	0.47	0.57	0.64	0.71
9:30	0.24	0.30	0.39	0.45	0.54	0.61	0.68
10:00	0.23	0.29	0.38	0.44	0.52	0.59	0.66
10:30	0.22	0.28	0.36	0.42	0.50	0.57	0.63
11:00	0.21	0.27	0.35	0.41	0.48	0.55	0.61
11:30	0.21	0.26	0.34	0.39	0.47	0.53	0.59
12:00	0.20	0.25	0.33	0.38	0.45	0.51	0.57
13:00	0.19	0.24	0.31	0.36	0.42	0.48	0.53
14:00	0.18	0.22	0.29	0.33	0.40	0.45	0.50
15:00	0.17	0.21	0.27	0.32	0.38	0.43	0.47
16:00	0.16	0.20	0.26	0.30	0.36	0.40	0.45
17:00	0.15	0.19	0.25	0.29	0.34	0.39	0.43
18:00	0.15	0.18	0.24	0.27	0.33	0.37	0.41
19:00	0.14	0.18	0.23	0.26	0.31	0.35	0.39
20:00	0.14	0.17	0.22	0.25	0.30	0.34	0.38
21:00	0.13	0.16	0.21	0.24	0.29	0.33	0.36
22:00	0.13	0.16	0.20	0.23	0.28	0.31	0.35
23:00	0.12	0.15	0.20	0.23	0.27	0.30	0.34
24:00	0.12	0.15	0.19	0.22	0.26	0.29	0.32

ATTACHMENT D

(3 pages)

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		2	5	10	100
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. Residential:					
<u>Single Family (Soil Group D)</u>					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
<u>Multi-Family (Soil Group D)</u>					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
<u>Single Family (Soil Group C)</u>					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
<u>Multi-Family (Soil Group C)</u>					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
<u>Single-Family (Soil Group B)</u>					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
<u>Multi-Family (Soil Group B)</u>					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		2	5	10	100
<u>Single Family (Soil Group A)</u>					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
<u>Multi-Family (Soil Group A)</u>					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:					
	15	0.33	0.35	0.42	0.55
5. Schools:					
	40	0.49	0.51	0.56	0.66
Railroad Yard Areas:					
	30	0.43	0.45	0.50	0.62
7. Undeveloped Urban Areas: Offsite Flow Analysis (when land use not defined)					
	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:					
	96	0.87	0.87	0.88	0.89
10. Roofs:					
	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
<u>Soil Group A</u>					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
<u>Soil Group B</u>					
Slope less than 1%	00	0.26	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
<u>Soil Group C</u>					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55

<u>Land Use or Surface Characteristics</u>	<u>Percent Impervious</u>	<u>Frequency</u>			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<u>Soil Group D</u>					
Slope less than 1%	00	0.28	0.33	0.43	0.63
Slope 1% to 4%	00	0.30	0.35	0.45	0.65
Slope more than 4%	00	0.32	0.37	0.47	0.67

Note No. 1: Coefficients shown in the above table are for pervious open space areas with thick turf which includes pervious areas in parks and cemeteries. Coefficients shown above must be increased 0.02 for use with agricultural pasture areas. Coefficients shown above must be reduced by 0.04 for use with agricultural cultivated areas. Group A soils are well-drained, coarse textured sands with high infiltration rates. Group B soils are moderately well-drained, moderately coarse textured soils with moderate infiltration rates. Group C soils are moderately poor-drained, moderately fine textured soils with slow infiltration rates. Group D soils are poor-drained, fine textured soils with very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for large basins.

Table 2-2.--Runoff curve numbers for selected agricultural, suburban, and urban land use. (Antecedent moisture condition II, and $I_e = 0.2S$)

LAND USE DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Cultivated land ^{1/} : without conservation treatment	72	61	65	91
: with conservation treatment	62	71	76	51
Pasture or range land: poor condition	68	79	66	89
good condition	39	61	74	80
Meadow: good condition	30	58	71	78
Wood or Forest land: thin stand, poor cover, no mulch	45	66	77	83
good cover ^{2/}	25	55	70	77
Open Spaces, lawns, parks, golf courses, cemeteries, etc.				
good condition: grass cover on 75% or more of the area	39	61	74	80
fair condition: grass cover on 50% to 75% of the area	49	69	79	84
Commercial and business areas (85% impervious)	89	92	94	95
Industrial districts (72% impervious).	81	88	91	93
Residential: ^{2/}				
Average lot size	Average % Impervious ^{2/}			
1/8 acre or less	65	77	85	90
1/4 acre	38	61	75	83
1/3 acre	30	57	72	81
1/2 acre	25	54	70	80
1 acre	20	51	68	79
Paved parking lots, roofs, driveways, etc. ^{3/}	98	98	98	98
Streets and roads:				
paved with curbs and storm sewers ^{3/}	98	98	98	98
gravel	76	85	89	91
dirt	72	82	87	89

^{1/} For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, Aug. 1972.

^{2/} Good cover is protected from grazing and litter and brush cover soil.

^{1/} Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

^{2/} The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

^{3/} In some warmer climates of the country a curve number of 95 may be used.

ATTACHMENT E

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

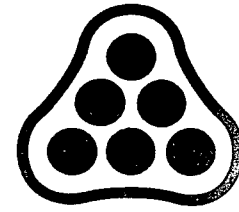
AVERAGE OVERLAND FLOW VELOCITY FOR USE WITH URBANIZED AREAS

Surface Type	VELOCITY IN FEET/SECOND FOR SLOPES IN PERCENT SHOWN																			
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0
Forrest with Heavy Ground Litter or Meadow	0.08	0.11	0.14	0.16	0.18	0.19	0.20	0.22	0.23	0.25	0.35	0.42	0.50	0.55	0.60	0.66	0.70	0.75	0.80	1.10
Fallow or Minimum Tillage Cultivation	0.15	0.21	0.26	0.29	0.33	0.35	0.39	0.41	0.44	0.46	0.65	0.80	0.92	1.10	1.20	1.30	1.40	1.50	1.60	2.10
Short Grass Pasture or Lawns	0.23	0.32	0.38	0.44	0.50	0.53	0.58	0.62	0.66	0.70	1.00	1.20	1.40	1.60	1.80	1.90	2.00	2.10	2.20	3.20
Almost Bare Ground	0.32	0.44	0.53	0.62	0.69	0.75	0.82	0.87	0.92	0.98	1.40	1.70	1.90	2.10	2.30	2.50	2.70	2.90	3.10	4.40
Grassed Waterway	0.50	0.68	0.83	0.95	1.10	1.20	1.30	1.40	1.50	1.60	2.20	2.60	3.00	3.40	3.70	4.00	4.30	4.60	4.80	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow	0.63	0.89	1.10	1.30	1.50	1.60	1.70	1.80	1.90	2.00	2.80	3.40	4.00	4.50	4.90	5.30	5.70	6.00	6.20	9.00

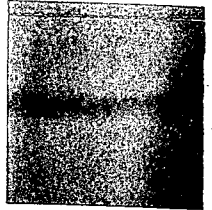
APPENDIX

January 28, 1998

Mr. Douglas Walker, AIA
McCluggage, Van Sickle and Perry
125 S. Washington
Wichita, KS 67201



PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION



Reference: Cessna ACC Drainage Study
PEC Project No. 32-97C97-2474

Dear Mr. Walker:

This letter presents a summary of the engineering analysis performed to determine the hydrologic effects the proposed "Cessna Mid-Continent Facility 20-Year Master Plan" would have on the drainage basin west of Hoover Road. The purpose of the analysis is to provide guidelines for planning future development with regard to drainage.

According to the "20-Year Plan," which was prepared by MVP, future additions to the Cessna plant will be constructed north of the main plant on land to be leased from the Wichita Airport Authority. The total area projected for future development is estimated to be 252 acres. A copy of the Cessna "20-Year Plan" is included with this report.

The drainage basin affected by the proposed development ultimately contributes runoff to major drainage structures at two locations:

1. Approximately 920 acres drain to 7-48" RCP's that cross Hoover Road just north of the Cessna entrance road. This 920-acre drainage area lies west of Hoover Road.
2. Approximately 1042 acres drain to the 4-60" CMP's at the Wichita-Valley Center Floodway east of Hoover Road. This area includes the 920 acres west of Hoover Road, and an additional 122 acres between Hoover Road and the west levee of the Wichita-Valley Center Floodway. The 4-60" CMP's have steel flapgates which prevent flow from entering or exiting the floodway when water flowing inside the levees is above the gates.

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A map which depicts the drainage basin boundaries and the major drainage structures for the existing conditions is included with this report.

In general, the approach taken to assess the impacts of future development may be summarized as follows:

1. Drainage basin boundaries were established for the total runoff that ultimately drains to the 4-60" CMP's at the Wichita-Valley Center Floodway.
2. Computations were made to determine the peak flows, and highwater elevations, at Hoover Road and at the Wichita-Valley Center floodway for existing conditions based on the assumption that the flap gates at the floodway would be free to open. Computations were also made to determine the total volume of runoff produced by various storms on the 920-acre basin west of Hoover Road.
3. Computations were made for three storm water management concepts to determine the hydrologic effects the "20-Year Plan" development would have on the total basin. Construction cost estimates are also provided.

Drainage maps that depict the proposed construction associated with each alternative are included with this report.

Alternate #1: This alternate considers construction of a detention pond and a control structure west of Hoover Road. Also included is a levee designed to contain the 100-year flood within the basin west of Hoover Road. Construction costs for this alternative may be estimated as follows:

Detention Pond Excavation:

220,000 c.y. @ \$2.50/c.y. = \$550,000.00

Reinforced Concrete Control Structure (9'x 4'x 50' RCB):

50 c.y. concrete @ \$400.00/c.y. = \$20,000.00

Total Estimated Construction Cost: = \$570,000.00

The design criteria applied to Alternate #1 may summarized as follows:

Based on the analysis included with this report for Alternate #1, the 100-year flood elevation does not rise above elevation 1298.0. This criteria was applied to two scenarios:

- a. The gates at the floodway are free to open.
- b. The gates at the floodway are closed due to high water in the floodway.

Elevation 1298.0 would be the 100-year flood elevation for areas on both sides of Hoover Road for Alternate #1.

Alternate #2: This alternate considers construction of a detention pond west of Hoover Road. Also included are levees to be constructed west and east of Hoover Road which would contain the 100-year flood. The levees east of Hoover Road would tie into the west levee of the Wichita-Valley Center Floodway. The existing 7-48" RCP's at Hoover Road are proposed to be extended to allow flow inside the levees to cross Hoover Road. Construction costs for this alternative may be estimated as follows:

Detention Pond Excavation:

220,000 c.y. @ \$2.50/c.y. = \$550,000.00

RCP Extensions (7-48" RCP's each extended 200')

1400 l.f. @ \$65.00/l.f. = \$91,000.00

Total Estimated Construction Cost: = \$641,000.00

The same design criteria applied to Alternate #1 was applied to Alternate #2.

Alternate #3: This alternative is similar to Alternate #1, with a detention pond west of Hoover Road, an outlet structure, and a levee. No construction is proposed east of Hoover Road for Alternate #3. Construction costs for this alternative may be estimated as follows:

Detention Pond Excavation:

400,000 c.y. @ \$2.50/c.y. = \$1,000,000.00

Reinforced Concrete Control Structure (9'x 4'x 50' RCB):

50 c.y. concrete @ \$400.00/c.y. = \$20,000.00

Total Estimated Construction Cost: = \$1,020,000.00

The design criteria applied to Alternate #3 is the same as that applied to Alternate #1 with one exception: the 100-year allowable highwater elevation was designed to be 1296.5 for Alternate #3.

HYDROLOGY

Hydrology calculations were made using the U.S. Army Corps of Engineers HEC-1 computer program. The calculations were based on SCS methods for a Type 2 rainfall distribution for a 24-hour duration storm. Hydrographs were developed for each sub-basin, and then combined to determine peak flows at various locations. Rating curves were developed for the structures at Hoover Road and at the Wichita-Valley Center Floodway to relate stormwater discharge to upstream elevations.

Rainfalls for various return periods were used in the HEC-1 analysis. Table 1 shows the total rainfall that occurs over a 24-hour time period and the associated return period for Sedgwick County.

Table 1. Total 24-hour rainfall amounts and return periods for Sedgwick County, Kansas.

<u>Return Period (Years)</u>	<u>Total 24-Hour Rainfall (in)</u>
1	2.9
2	3.5
5	4.5
10	5.3
25	6.1
50	7.0
100	7.8

Figure 1 shows a flow chart for the drainage patterns modeled in the HEC-1 analysis for existing conditions for all basins that ultimately contribute runoff to the 4-60" CMP's at the Wichita-Valley Center Floodway east of the Cessna entrance at Hoover Road.

EXISTING CONDITIONS

The total basin may be subdivided into seven sub-basins (refer to the map entitled "Existing Conditions" included with this report, which includes hydrologic parameters used for the calculations):

Basin A: (21 Acres) Runoff is collected in a storm sewer that outlets into Basin B.

Basin B: (131 Acres) Runoff is collected into the old channel of the Dugan Creek and flows south into Basin C.

Basin C: (389 Acres) Mostly overland flow runoff is ultimately collected at the 7-48" RCP's that cross Hoover Road just north of the Cessna entrance road. The upstream and downstream flowline elevations measured for the RCP's are 1290.60 and 1290.50, respectively.

Basin D: (179 Acres) Runoff is collected in a storm sewer that outlets into Basin C through 2-60" RCP's.

Basin E: (200 Acres) Runoff is collected in storm sewers and outlets into the pond west of Hoover Road and north of K-42. Overflow from this pond has three outlets:

1. 2-12" RCP's that outlet into Basin C.
2. a 3'x 3' RCB that crosses Hoover Road just north of K-42 and outlets into Basin F.
3. a 7'x 3' RCB that crosses K-42 and outlets to the south.

Basins F and G: (30 and 91 acres, respectively) Runoff is collected at the 4-60" CMP's at the floodway. The upstream and downstream flowline elevation measured for the CMP's is 1289.20 and 1288.30, respectively.

Computations were made to determine peak flows at the 7-48" RCP's at Hoover Road and at the 4-60" CMP's at the floodway based on existing conditions, and assuming that the flap gates at the 4-60" CMP's are free to open.

Table 2. Computed Peak Discharges at Hoover Road for existing conditions.

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Computed Peak Elevation</u>
1	238	1293.09
2	322	1293.58
5	475	1294.35
10	604	1294.98
25	713	1297.00 *
50	853	1298.85 *
100	1027	1301.48 *

* These elevations are controlled by the 4-60" CMP's at the Wichita-Valley Center Floodway.

Table 3. Computed Peak Discharges at the Wichita-Valley Center Floodway for existing conditions.

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Computed Peak Elevation</u>
1	286	1292.51
2	386	1293.42
5	567	1294.77
10	718	1295.77
25	847	1297.00
50	1010	1298.85
100	1204	1301.48

Computations were made to estimate the total volume of runoff for a 24-hour storm for each sub-basin west of Hoover Road.

Table 4. Runoff Volumes computed for existing conditions for a 24-hour duration storm.

Return Period (Years)	Basin A (Ac-Ft)	Basin B (Ac-Ft)	Basin C (Ac-Ft)	Basin D (Ac-Ft)	Total (Ac-Ft)
1	1.3	15.0	39.9	25.4	81.6
2	1.8	19.9	54.1	31.8	107.6
5	2.9	29.1	81.0	43.6	156.6
10	3.9	36.8	103.7	53.4	197.8
25	4.9	44.6	127.1	63.5	240.2
50	6.1	53.7	153.7	75.3	288.8
100	7.2	61.9	178.0	86.1	333.2

PROPOSED CONDITIONS - 20 YEAR PLAN

The 20-year plan for future expansion of the Cessna facilities covers approximately 252 acres located north of the existing plant. The proposed development includes construction of buildings and parking lots for a significant portion of the 252-acre area. It is assumed that drainage for the developed site will be collected by a storm sewer system.

With regard to the hydrologic analysis, the proposed construction will increase the impervious area and decrease the time of concentration. Therefore, the effects of the proposed development will increase both the rate and the volume of the runoff.

To determine the effects of the proposed conditions, hydrology calculations were made by modifying the existing conditions HEC-1 model to account for the proposed improvements. These modifications may summarized as follows:

The total drainage area assumed to be drained by a storm sewer system was taken to be 339 acres, which includes approximately 87 acres west of the 252-acre boundary.

The SCS curve number was assumed to be 70.

The impervious area of the 339 acres was estimated to be 70%.

The time of concentration was assumed to be 40 minutes.

Computations were made to estimate the total volume of runoff for a 24-hour storm for each sub-basin west of Hoover Road.

Table 5. Runoff Volumes computed for proposed conditions for a 24-hour duration storm.

Return Period (Years)	Basin A (Ac-Ft)	Basin B (Ac-Ft)	Developed Basin C (Ac-Ft)	Basin D (Ac-Ft)	Total (Ac-Ft)	Total Increase (Ac-Ft)
1	1.3	15.0	69.3	25.4	110.8	29.2
2	1.8	19.9	85.3	31.8	138.7	31.1
5	2.9	29.1	114.2	43.6	189.8	33.2
10	3.9	36.8	138.0	53.4	232.1	34.3
25	4.9	44.6	162.2	63.5	275.3	35.1
50	6.1	53.7	189.7	75.3	324.9	36.1
100	7.2	61.9	214.3	86.1	369.5	36.3

PROPOSED CONDITIONS - DESIGN CRITERIA

As was previously mentioned, the 4-60" CMP's at the floodway have steel flap gates at the downstream ends. When water flowing inside the floodway is above the flap gates, local drainage from outside the floodway is prevented from entering the floodway until flow inside the levees recedes. For this reason, the design criteria applied to each alternate must consider the event when runoff from the 1042-acre drainage basin cannot enter the floodway and is stored outside the floodway levees.

During major floods, a large portion of the discharge collected by both the Arkansas River and the Little Arkansas River basins is diverted from the natural river streams to the Wichita-Valley Center Floodway. Based on information provided in the City of Wichita Flood Insurance Study, the drainage area for the Arkansas River is 40,490 square miles at the control structure that diverts flood waters into the Wichita-Valley Center Floodway, and for the 100-year flood more than half the flow is diverted from the river into the floodway. The actual drainage area for the floodway is not shown in the FIS; however, it may be assumed the drainage area for flow carried in the floodway is at least one half of the 40,490 square miles.

For cases when the difference in the drainage areas for a tributary and a main channel is relatively great, the U.S. Army Corps of Engineers has established design criteria to estimate flood frequencies which takes into account the unlikelihood of coincident flood peaks for both basins. For the case when the ratio of the areas is greater than 10,000 to 1, the following criteria applies:

For the 100-year event, the product of the return periods for each basin should be no less than 200. For example, if a design considers the 100-year flood to occur for the tributary, then it should be assumed that this occurs simultaneously with a 2-year flood for the main channel, and vice versa. Similarly, if the design is for the 100-year event, a 50-year flood for the main channel should be combined with a 4-year event for the tributary.

The U.S. Army Corps of Engineers design criteria should be applied to each alternate for cases when the flap gates are held shut by high water in the floodway.

For the case when the flap gates at the floodway are free to open, the following design criteria should be applied to each alternate:

For the 100-year event, the computed peak discharges for the proposed developed conditions at Hoover Road and at the Wichita-Valley Center Floodway may be no higher than those computed for existing conditions at the same locations. In other words, it must be shown that the proposed development will not increase the peak discharges at downstream locations.

PROPOSED CONDITIONS - ALTERNATE #1

For Alternate #1, a detention pond with an outlet control structure was designed that would meet the previously described design criteria based on an allowable 100-year flood elevation of 1298.0. Calculations were made to determine the size of the detention pond and control structure required to meet the design criteria. The results of the calculations may summarized as follows:

1. The required size of the detention pond was determined to be 2900' long by 600' wide (bottom dimensions). The proposed detention pond will cover approximately 40 acres.
2. The elevations for the bottom of the pond were assumed to be 1291.5 at the south end, and 1293.5 at the north end.
3. The required size of the detention pond was controlled by the case when the gates at the floodway for the 4-60" CMP's are closed, and flow for the 1042-acre basin cannot enter the floodway.

4. For this case, flow inside the floodway was assumed to be at elevation 1298.0
5. Based on the flood profiles for the Wichita-Valley Center Floodway included in the City of Wichita Flood Insurance Study, elevation 1298.0 upstream of K-42 is a 50-year flood.
6. Based on the design criteria used by the U.S. Corps of Engineers, for the 100-year design, the 50-year flood for the main channel should be assumed to occur simultaneously with the 4-year flood in the tributary channel. For this design, to simplify the calculations, the 5-year flood was conservatively used for the tributary channel.
7. If the floodway gates are closed, the detention pond will be capable of storing the total runoff produced by a 5-year, 24-hour storm for Basins A,B,C,D and E below elevation 1298.0.
8. A levee must be constructed up to elevation 1300.0 around the east and south perimeter of the detention pond. The top elevation of the levee should be set at 1300.0 to provide 2' of freeboard for the 100-year flood.
9. Once the pond size was determined, the required size of the outlet control structure was determined.
10. The required size for the control structure was determined to be a 9'x 4' RCB. The structure size was based on the criteria that the 100-year flood elevation in the detention pond may be no higher than 1298.0.

The results of the HEC-1 analysis for Alterntate #1 are summarized in Tables 6,7 and 8.

Table 6. Peak Discharges and Elevations at the 9'x 4' RCB for Alternate #1. (Based on open gates at the floodway).

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Peak Elevation</u>
1	124	1294.28
2	151	1294.65
5	199	1295.35
10	238	1295.93
25	277	1296.54
50	320	1297.23
100	357	1297.87

Table 7. Peak Discharges and Elevations at the 7-48" RCP's for Alternate #1. (Based on open gates at the floodway).

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Computed Peak Elevation</u>
1	124	1292.21
2	151	1292.56
5	199	1292.85
10	238	1293.09
25	277	1293.66 *
50	320	1294.21 *
100	357	1294.57 *

* These elevations are controlled by the 4-60" CMP's at the Wichita-Valley Center Floodway.

Table 8. Peak Discharges and Elevations at the 4-60" CMP's for Alternate #1. (Based on open gates at the floodway).

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Computed Peak Elevation</u>
1	172	1291.89
2	214	1292.12
5	288	1292.53
10	349	1293.06
25	411	1293.66
50	479	1294.21
100	537	1294.57

PROPOSED CONDITIONS - ALTERNATE #2

Alternate #2 is similar to Alternate #1, with the following exceptions:

1. For Alternate #2, levees are proposed to be constructed to contain the 100-year flood both east and west of Hoover Road.
2. The existing 7-48" RCP's are proposed to be extended through the levees to allow flow to cross Hoover Road.
3. Culverts with flap gates are proposed to collect local drainage east of Hoover Road.
4. In the event that the floodway gates are closed, the 5-year rainfall for the 920-acre basin will be contained within the proposed levees both east and west of Hoover Road.

The results of the HEC-1 analysis for Alternate #2 are summarized in Tables 9 and 10.

Table 9. Peak Discharges and Elevations at the extended 7-48" RCP's for Alternate #2. (Based on open gates at the floodway).

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Computed Peak Elevation</u>
1	216	1293.78
2	262	1294.05
5	357	1294.55
10	442	1294.95
25	531	1295.37
50	629	1295.85
100	712	1296.29

Table 10. Peak Discharges and Elevations at the 4-60" CMP's for Alternate #2. (Based on open gates at the floodway).

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Computed Peak Elevation</u>
1	215	1292.13
2	262	1292.38
5	357	1293.14
10	442	1293.95
25	530	1294.53
50	628	1295.16
100	711	1295.72

PROPOSED CONDITIONS - ALTERNATE #3

Alternate #3 is similar to Alternate #1, with the following exceptions:

1. For Alternate #3, the allowable 100-year flood elevation was designed to be 1296.5, thereby enabling flow between Hoover Road and the floodway to be contained essentially within the channel bank lines without levees.
2. The lower allowable elevation requires a much larger detention pond for Alternate #3 than was designed for Alternate #1.
3. The required size of the detention pond was determined to be 3750' long by 800' wide (bottom dimensions). The proposed detention pond will cover approximately 70 acres.
4. Based on the City of Wichita FIS flood profiles for the Wichita-Valley Center Floodway, elevation 1296.5 was estimated to be a 25-year flood. To design for the 100-year event, the pond must be designed to store the 8-year rainfall. To simplify the calculations, the 10-year rainfall was conservatively used to size the detention pond.

The results of the HEC-1 analysis for Alternate #3 are summarized in Tables 11, 12 and 13.

Table 11. Peak Discharges and Elevations at the 9'x 4' RCB for Alternate #3. (Based on open gates at the floodway).

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Computed Peak Elevation</u>
1	83	1293.81
2	106	1294.04
5	139	1294.49
10	165	1294.86
25	192	1295.25
50	222	1295.70
100	250	1296.11

Table 12. Peak Discharges and Elevations at the 7-48" RCP's for Alternate #3. (Based on open gates at the floodway).

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Computed Peak Elevation</u>
1	83	1291.67
2	106	1291.98
5	139	1292.40
10	165	1292.64
25	192	1292.81
50	222	1293.32 *
100	250	1293.79 *

* These elevations are controlled by the 4-60" CMP's at the Wichita-Valley Center Floodway.

Table 13. Peak Discharges and Elevations at the 4-60" CMP's for Alternate #3. (Based on open gates at the floodway).

<u>Return Period (Years)</u>	<u>Peak Discharge (cfs)</u>	<u>Computed Peak Elevation</u>
1	127	1291.36
2	167	1291.86
5	226	1292.19
10	274	1292.45
25	323	1292.81
50	377	1293.32
100	425	1293.79

DISCUSSION

Based on the hydrologic analysis, each alternative concept presented in this report would reduce the peak discharges at Hoover Road and at the floodway to values significantly lower than those computed for existing conditions. For each alternate, the controlling criterion for the required size of the detention pond was based on the event when the floodway gates are closed, and storm water must be stored outside the floodway levees up to an allowable elevation.

The construction proposed for Alternate #1 is estimated to be the least expensive of the three concepts. Benefits over existing conditions may be summarized:

1. Based on the analysis, if the 100-year rainfall occurred (7.8 inches in 24 hours), and the floodway gates were open, the 100-year peak discharge at the Wichita-Valley Center Floodway would be reduced from 1204 c.f.s. to 537 c.f.s. The corresponding high water elevations at the floodway computed for these discharges are 1301.48 and 1294.57; therefore, conditions for the 100-year flood would be significantly improved over existing conditions for this case.
2. When the gates at the floodway are closed, the additional storage provided west of Hoover Road, estimated to be 136 acre feet, is considerably greater than the 36.3 acre feet increase in runoff volume attributed to the proposed "20-Year Plan."

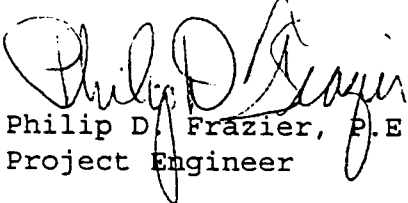
Construction costs for Alternate #2 are estimated to be slightly higher than those for Alternate #1. Benefits associated with Alternate #2 are similar to those associated with Alternate #1, i.e., reductions in peak flows and high water elevations at Hoover Road and at the floodway. Additional benefits associated with Alternate #2 may be summarized:

1. The proposed levees extend to the floodway for Alternate #2, and the 100-year flood is contained within the levees up to elevation 1298.0.
2. Areas east of Hoover Road and outside the levees would receive additional protection since the 100-year flood is contained within the proposed levees. To receive the additional protection, culverts with flap gates must be provided to collect local drainage east of Hoover Road.

Construction costs for Alternate #3 are estimated to be nearly twice as high as those for Alternates #1 and #2. The major benefit associated with Alternate #3 is the additional protection provided for the 100-year flood: the 100-year flood elevation for this alternative is 1296.5. For this case, most existing buildings east of Hoover Road would be above the 100-year flood.

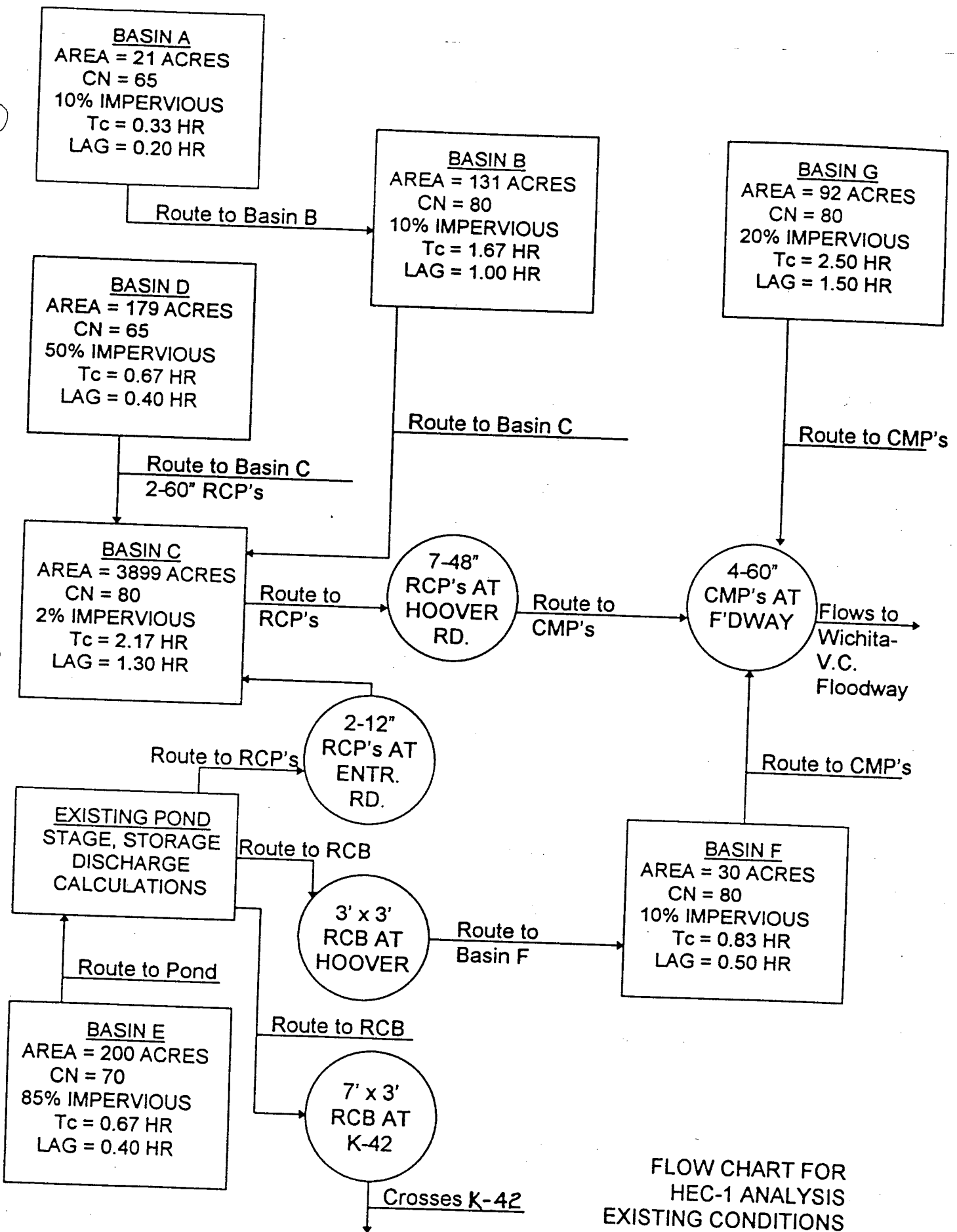
Very truly yours,

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.


Philip D. Frazier, P.E.
Project Engineer

PDF:pdf

cc: Monroe Funk, Wichita Airport Authority
John Fowler, Cessna



FLOW CHART FOR
HEC-1 ANALYSIS
EXISTING CONDITIONS

FIGURE 1