REPORT ON

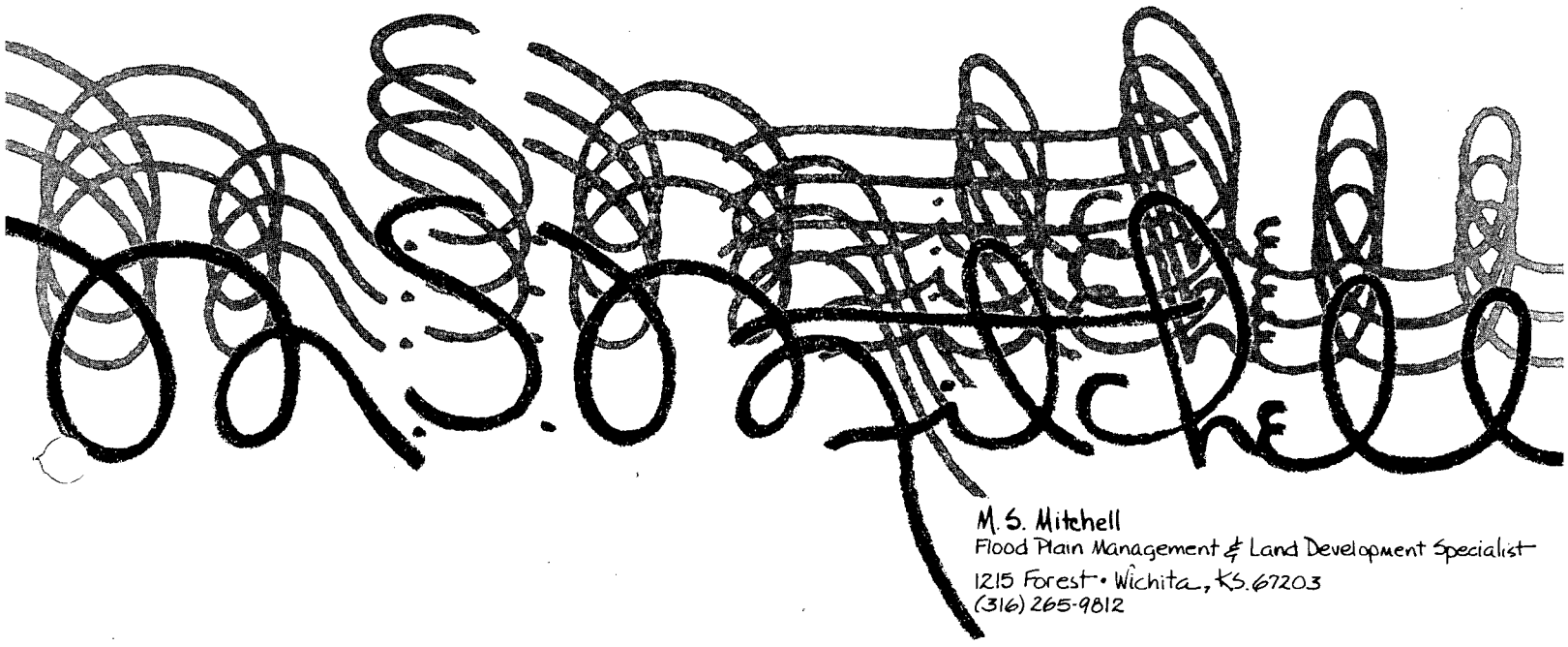
DEFINING THE LEFT BANK REGULATORY FLOODWAY BOUNDARY

OF COWSKIN CREEK

BETWEEN 13TH STREET AND 21ST STREET

FROM SECTION W TO SECTION X

JULY 1987



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This report describes the model and calculations used to support the request to better define the Left Bank Regulatory Floodway Boundary line of Cowskin Creek from Section W to Section X of the City of Wichita Flood Insurance Study. Exhibit 1 is an excerpt from Panel 05 of the City of Wichita Flood Boundary and Floodway Map series showing the portion of left bank Cowskin Creek flood plain and regulatory floodway upstream of 13th Street which is within the corporate limits and Exhibit 2, an excerpt from Panel 125 of the Sedgwick County Flood Boundary and Floodway Map series, shows the remainder of that reach of Cowskin Creek for which a detailed study has been done by the Federal Insurance Administration contractors. Results of the federal studies, shown in greater detail on Exhibit 3, the Geometric Model, were taken from the HEC-2 computer program input data sheet (Exhibit 4) and output data table 110 (Exhibit 5) by Howard Needles Tammen & Bergendoff (HNTB), the original FIS contractor, and from the Floodway Data Tables for Wichita (Exhibit 6) and for Sedgwick County (Exhibit 7) taken from the reports by Greenhorne & O'Mara (G&O), the other FIS contractor.

Notice that the stream mile stationing, labled "DISTANCE" on the Floodway Data Tables prepared by G&O is from a different starting point than that shown on the HEC-2 computer input and output data sheets done by HNTB. In fact, there are differences between the stream mile stations on the Floodway Data Tables for Wichita and for Sedgwick County. Notes have been inserted in the two Floodway Data Tables to correctly identify the Cross Section data found in the G&O tables with the HNTB computer program input and output data sheets.

Additional difficulty was encountered fitting the HNTB input table data setting out the length of channel and overbank flow paths between cross sections to the lengths measured on the topographic map used as the base for the Geometric Model (Exhibit 3), probably due to the wildly meandering course of the stream channel and the difficulty HNTB would have had in measuring that meandering on a USGS 7 1/2 minute quadrangle topographic map. The lengths of stream channel and left and right overbank flow paths measured on the Geometric Model were adjusted to the input data sheet lengths for the reach between Cross Sections W and X.

Once the results of the HNTB computer run were layed out on Exhibit 3, the process of selecting new cross sections to better define the left bank regulatory floodway between G&O Cross Sections W and X was begun. It was obvious that for the right bank floodway to extend from the Cross Section W intercept station 11,636 to the right side of the channel about halfway between W and X, and then on to the Cross Section X intercept station 11,995, the width available between that line and the left channel bank would be at least 1500 feet. Taking note of the fact that the RF width at Cross Section W is 928 feet and at Cross Section X is 1380 feet, it is reasonable that the left bank RF Boundary line could follow the left bank of the channel without violating the standard encroachment surcharge of 1 foot, or without the Base Flood or " With Floodway" elevations exceeding those calculated by HNTB. With that premise in mind, five new cross sections were layed out on the Model and designated W-1 thru W-5. The aim of the layout was to select five left bank channel intercepts which would discretely define a new RF Boundary which would follow the left channel bank in the proposed development north of Autumn Ridge Addition. Two sections, W-1 and W-4, model the outside edges of bends at the south and north ends of the proposed development respectively while sections W-2 and W-3 model the inside of the bend located near the middle of the proposed development. New cross section W-5 is located far enough north of the 180 degree loop of Cowskin Creek at the north edge of the proposed development to model the east edge of the bend on the right side of the flood plain and provide a transition into Cross Section X.

To accomodate the two rules of cross section location and stationing, first that the cross section lineS should be drawn normal to contours and second that the stationing along the cross section should be adjusted to reflect the stationing normal to the direction of flow, it was necessary to construct a scale bar to which the elevations for new sections W-1, W-2 and W-3 would be related and another scale bar for new cross sections W-4 and W-5. Using the cross section lines and scale bars, the stationing and elevation coordinates for the new cross section groundpoints were compiled and plotted as cross sections (Exhibit 8) to assist in locating and assigning parameters such as channel bank stations and 'n' factors to each sub-section. That cross section data was then encoded in a HEC-2 input file to be inserted into the calibration run file taken from the HNTB input data sheet (Exhibit 4). to evaluate the effect of changes in the Model by calculating the flood elevations and RF intercepts for each cross section.

Results of HEC-2 Computer Run 1, the calibration run with HBTB data, are Exhibit 9. Note that there is a difference in the "With Floodway" elevation shown on Exhibits 6 & 7 (1337.6) for Cross Section V at stream mile 22.13 and the "CWSEL" on the encroachment line of Exhibit 5 for stream mile 22.13 (1338.35). Since the purpose of the calibration run is to test the compatability of the calculation systems, and since only the HNTB run results are available for comparison in detail greater than the summary on Exhibits 6 & 7, the HNTB elevation was used. The Regulatory Floodway intercepts from the HNTB output table (Exhibit 5) were set as the floodway limits in the Run 1 input file and the results are well within acceptable limits.

For Run 2, (File CSKATMR2), the five new cross sections were inserted into the input file with the encroachment method set to determine the encroachment limits by equal conveyance with a target surcharge of 0.7 feet (Method 7.4), which is the same procedure used by HNTB. The results of Run 2 (Exhibit 10) show that the left bank floodway intercept is at the left channel bank for each of the first four cross sections as plotted on the model. Table 1 lists the calculated Width, Cross Sectional Area, Mean Velocity, "Without Floodway" and "With Floodway Elevations" and "Increase" between the two elevations for Run 2, and confirms that there is no increase in the flood elevations caused by defining the left bank Regulatory Floodway Boundary along the left bank of the Cowskin Creek channel in the reach between Flood Insurance Study Cross Sections W and X.

The following exhibits and table are attached to support the conculusions that the Left Bank Regulatory Floodway Boundary of Cowskin Creek between G&O Cross Sections W & X can be located at the left channel bank without increasing the Base Flood Elevation and without exceeding the surcharge in water surface elevation calculated by the HNTB detailed study:

Exhibit 1. Excerpt from City of Wichita Flood Boundary and Floodway Panel 05.
Exhibit 2. Excerpt from Sedgwick County Flood Boundary and Floodway Panel 125.
Exhibit 3. Geometric Model of Cowskin Creek U/S from 13th. St.
Exhibit 4. HNTB HEC-2 input data sheet.
Exhibit 5. Excerpt from HNTB HEC-2 output file table 110.
Exhibit 6. G&O Floodway Data Table for Wichita.
Exhibit 7. G&O Floodway Data Table for Sedgwick County.
Exhibit 8. Plotted Cross Sections.
Exhibit 9. HEC-2 Run 1. Results of Calibration Run.
Exhibit 10. HEC-2 Run 2. Results of encroachment run with new cross sections between W & X.
Table 1. Floodway Data Table with new cross sections between cross sections W & X.

END OF REPORT

EXHIBIT 3

GEOMETRIC MODEL

COWSKIN CREEK UPSTREAM FROM 13TH STREET

1393.000	10822.000	1335.600	1330.100	10840.000	1336.000	1328.800	10840.000	1336.000	1335.200
10920.000	1335.000	1335.200	10920.000	1336.000	1333.1	10930.000	1335.800	1334.000	10975.000
1335.000	1333.500	11022.000	1334.100	1333.400	11110.0	1334.200	1333.300	11426.000	1334.000
1352.800	11025.000	1332.500	1332.500	12070.000	1333.000	1333.000	12520.000	1336.000	1336.000
12950.000	1339.000	1338.000	12740.000	1340.000	1340.000	12934.000	1350.000	1350.000	12980.000
1350.200	1350.200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

STB

22.130	36.000	10700.000	10760.000	100.000	80.000	80.000	0.0	0.0	0.0
1350.000	10000.000	1348.000	10055.000	1346.000	10130.000	1344.000	10190.000	1342.000	10365.000
1340.000	10404.000	1336.000	10450.000	1336.000	10492.000	1334.000	10640.000	1332.000	10675.000
1330.000	10700.000	1328.000	10714.000	1326.000	10718.000	1324.000	10720.000	1324.000	10730.000
1322.000	10735.000	1326.000	10737.000	1328.000	10740.000	1330.000	10742.000	1332.000	10752.000
1334.000	10760.000	1334.000	10795.000	1332.000	10844.000	1334.000	10884.000	1334.000	10942.000
1332.000	11250.000	1333.000	11940.000	1334.000	12120.000	1336.000	12480.000	1338.000	12564.000
1340.000	12620.000	1342.000	12640.000	1344.000	12660.000	1346.000	12680.000	1348.000	12710.000
1350.000	12730.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.054	0.053	0.050	0.100	0.300	0.0	0.0	0.0	0.0	0.0

22.570	35.000	10710.000	10782.000	1500.000	1100.000	2325.000	0.0	0.0	0.0
1352.000	10000.000	1350.000	10145.000	1348.000	10210.000	1346.000	10276.000	1344.000	10316.000
1342.000	10370.000	1340.000	10410.000	1338.000	10448.000	1336.000	10550.000	1336.000	10580.000
1334.000	10710.000	1332.000	10718.000	1330.000	10726.000	1326.000	10732.000	1323.600	10734.000
1323.100	10744.000	1323.600	10754.000	1330.000	10760.000	1332.000	10766.000	1334.000	10776.000
1336.000	10782.000	1336.000	10870.000	1336.400	11000.000	1336.000	11150.000	1334.000	11315.000
1334.000	11345.000	1334.700	11610.000	1336.000	11790.000	1338.000	11930.000	1340.000	12000.000
1342.000	12036.000	1344.000	12064.000	1346.000	12110.000	1348.000	12140.000	1350.000	12190.000

24.060	33.000	11905.000	11995.000	2000.000	2700.000	7655.000	0.0	0.0	0.0
1352.500	10000.000	1352.000	10045.000	1350.000	10104.000	1348.000	10112.000	1348.000	10145.000
1344.000	10210.000	1344.000	10244.000	1340.000	10282.000	1338.000	10330.000	1336.000	10550.000
1336.000	10550.000	1338.000	10980.000	1335.500	11060.000	1338.000	11190.000	1337.200	11270.000
1336.000	11425.000	1340.500	11825.000	1340.000	11905.000	1338.000	11912.000	1330.000	11920.000
1329.000	11924.000	1329.000	11946.000	1330.000	11948.000	1340.000	11960.000	1352.000	11995.000
1356.000	12016.000	1356.000	12315.000	1358.000	12370.000	1358.000	12505.000	1358.500	12590.000
1360.000	12654.000	1360.000	12700.000	1362.000	12855.000	0.0	0.0	0.0	0.0
0.065	0.053	0.050	0.300	0.500	0.0	0.0	0.0	0.0	0.0

24.250	34.000	11560.000	11665.000	1400.000	1100.000	1215.000	0.0	0.0	0.0
1352.500	10000.000	1350.000	10130.000	1348.000	10150.000	1346.000	10210.000	1344.000	10230.000
1340.000	10355.000	1340.000	10730.000	1336.000	10745.000	1336.000	10775.000	1340.000	10795.000
1342.000	10940.000	1342.000	10980.000	1342.900	11030.000	1343.200	11180.000	1342.000	11260.000
1342.000	11560.000	1338.000	11580.000	1330.000	11590.000	1329.700	11592.000	1329.700	11602.000
1330.000	11604.000	1332.000	11606.000	1334.000	11610.000	1336.000	11612.000	1338.000	11660.000
1340.000	11665.000	1341.000	11710.000	1340.000	11750.000	1340.000	11775.000	1342.000	12015.000
1344.000	12020.000	1346.000	12036.000	1348.000	12145.000	1360.000	12365.000	0.0	0.0

24.420	21.000	11890.000	12110.000	400.000	800.000	880.000	0.0	0.0	0.0
10.000	0.0	0.0	0.0	0.0	0.0	0.0	1347.000	1347.000	0.0
1354.500	10000.000	1354.000	10340.000	1352.000	10510.000	1346.000	10645.000	1340.000	10815.000
1339.100	11085.000	1340.000	11265.000	1340.000	11550.000	1352.000	11554.000	1344.000	11690.000
1334.000	11940.000	1331.900	12000.000	1334.700	12060.000	1343.100	12110.000	1344.000	12190.000
1350.000	12310.000	1351.000	12470.000	1352.000	12670.000	1354.000	12830.000	1358.000	13020.000
1355.600	13155.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.050	1.600	2.600	0.0	103.000	5.000	2310.000	3.980	0.0	0.0

24.430	0.0	0.0	0.0	50.000	50.000	50.000	0.0	0.0	0.0
0.0	0.0	1.000	1346.600	1350.400	0.0	0.0	0.0	0.0	0.0
10.000	0.0	0.0	0.0	0.0	0.0	0.0	1347.800	1350.000	0.0
16.000	10000.000	1354.500	0.0	10340.000	1354.000	0.0	10510.000	1353.000	0.0

SECNO	STCHL	STCHR	VCH	Q	DIFKWS	DIFWSX	DIFEG	CWSEL	AREA	TOPWID	STENCL	STENCR
20.400	11310.00	11402.00	4.25	15050.00	0.0	1.63	0.0	1330.59	6096.76	1558.65	0.0	0.0
20.400	11310.00	11402.00	4.47	15050.00	0.72	1.72	0.0	1331.30	5571.19	1199.34	10335.61	11534.95
20.910	11925.00	11985.00	6.84	15050.00	0.0	2.70	0.0	1333.28	5002.86	1675.42	0.0	0.0
20.910	11925.00	11985.00	7.03	15050.00	0.75	2.73	0.0	1334.03	4327.46	1067.60	11026.07	12093.67
20.970	12600.00	12660.00	5.04	15050.00	0.0	0.58	0.0	1333.86	6455.64	1850.01	0.0	0.0
20.970	12600.00	12660.00	5.14	15050.00	0.76	0.59	0.0	1334.62	5574.22	1140.87	11637.12	12778.00
20.974	12600.00	12660.00	4.41	15050.00	0.0	0.43	0.0	1334.29	7264.57	1917.64	0.0	0.0
20.974	12600.00	12660.00	4.50	15050.00	0.76	0.43	0.0	1335.05	6314.56	1190.07	11604.79	12794.86
20.990	12620.00	12730.00	5.18	15050.00	0.0	0.05	0.0	1334.33	5855.69	2059.97	0.0	0.0
20.990	12620.00	12730.00	5.32	15050.00	0.75	0.03	0.0	1335.08	4680.02	1036.48	11693.52	12730.00
21.420	11720.00	11800.00	3.81	15050.00	0.0	1.65	0.0	1335.99	6561.62	1793.70	0.0	0.0
21.420	11720.00	11800.00	3.94	15050.00	0.75	1.66	0.0	1336.74	5631.92	1080.73	11319.80	12400.53
22.050	10745.00	10806.00	3.48	15050.00	0.0	1.36	0.0	1337.34	6833.59	1632.21	0.0	0.0
22.050	10745.00	10806.00	3.59	15050.00	0.76	1.36	0.0	1338.10	6092.63	1123.04	10557.45	11680.48
22.110	10840.00	10920.00	2.93	15050.00	0.0	0.07	0.0	1337.41	8819.80	2158.63	0.0	0.0
22.110	10840.00	10920.00	3.02	15050.00	0.76	0.07	0.0	1338.17	7595.60	1335.91	10780.20	12116.11
22.114	10840.00	10920.00	2.81	15050.00	0.0	0.14	0.0	1337.55	9124.03	2169.70	0.0	0.0
22.114	10840.00	10920.00	2.90	15050.00	0.76	0.14	0.0	1338.31	7866.67	1352.45	10776.29	12128.73
22.130	10700.00	10760.00	2.71	15050.00	0.0	0.03	0.0	1337.59	8769.15	2088.05	0.0	0.0
22.130	10700.00	10760.00	2.81	15050.00	0.76	0.03	0.0	1338.35	7612.33	1313.02	10700.00	12013.02
22.570	10710.00	10762.00	5.46	15050.00	0.0	0.99	0.0	1338.57	4937.90	1513.01	0.0	0.0
22.570	10710.00	10762.00	5.73	15050.00	0.71	0.94	0.0	1339.29	4191.21	927.64	10708.18	11635.82
24.080	11905.00	11995.00	2.95	15050.00	0.0	3.43	0.0	1342.01	7522.43	1702.93	0.0	0.0
24.080	11905.00	11995.00	2.97	15050.00	0.79	3.51	0.0	1342.80	7117.52	1379.99	10588.17	11995.00
24.250	11560.00	11665.00	5.87	15050.00	0.0	1.49	0.0	1343.50	4707.55	1773.13	0.0	0.0
24.250	11560.00	11665.00	6.21	15050.00	0.71	1.41	0.0	1344.21	4215.51	1251.29	10513.16	11764.45
24.420	11690.00	12110.00	7.12	15050.00	0.0	1.88	0.0	1345.38	2113.59	220.00	0.0	0.0
24.420	11690.00	12110.00	6.72	15050.00	0.58	1.75	0.0	1345.96	2241.12	220.00	11890.00	12110.00
24.430	11890.00	12110.00	7.08	15050.00	0.0	0.05	0.0	1345.44	2126.36	220.00	0.0	0.0
24.430	11890.00	12110.00	6.68	15050.00	0.58	0.05	0.0	1346.01	2253.09	220.00	11890.00	12110.00
24.470	11550.00	11722.00	2.90	15050.00	0.0	1.12	0.0	1346.56	8787.40	2032.81	0.0	0.0
24.470	11550.00	11722.00	3.21	15050.00	0.44	0.99	0.0	1347.00	7262.62	1340.08	10898.26	12238.34

UMMARY OF ERRORS

OTION SECNO= 17.170 PROFILE= 1 CRITICAL DEPTH ASSUMED
OTION SECNO= 17.170 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
OTION SECNO= 17.170 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
OTION SECNO= 17.170 PROFILE= 2 CRITICAL DEPTH ASSUMED

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
COWSKIN CREEK	HNTB STATION							
J	16.85 9.06	400[3]	6215	2.5	1314.0	1314.0	1314.6	0.6
O	18.92 11.16(4)	1215[3]	10,601	1.4	1327.8	1327.8	1328.4	0.6
P (5)	? 11.28	1020[3]	10,439	2.0	1327.9	1327.9	1328.5	0.6
T	21.42 13.59	500[3]	5632	2.7	1336.0	1336.0	1336.5	0.5
U	22.05 13.90	980[3]	6093	2.5	1337.3	1337.3	1337.4	0.1
V	22.13 13.98	1313[3]	6548	~~2.0~~	1337.6	1337.6	1337.6	0.0
W	22.57 14.49	928[3]	4015	3.6	1338.6	1338.6	1339.1	0.5
X	24.08 16.00	1380	7118	2.1	1342.0	1342.0	1342.8	0.8
Y	24.75 16.17	1251	4216	3.6	1343.5	1343.5	1344.2	0.7
B Z	0[2]	880	3600	1.9	1366.4	1366.4	1367.3	0.9
C AA (6)	3800[2]	540	2140	3.2	1368.6	1368.6	1369.5	0.9
D AB (6)	6150[2]	760	2900	2.4	1370.8	1370.8	1371.8	1.0
H AC (6)	8500[2]	820	4600	1.2	1373.7	1373.7	1374.7	1.0
I AD (6)	10,100[2]	900	4660	1.2	1373.9	1373.9	1374.9	1.0
J AE (6)	11,300[2]	540	2280	2.4	1374.2	1374.2	1375.1	0.9
K AF (6)	13,200[2]	500	1920	2.8	1376.2	1376.2	1377.1	0.9
(4) HNTB HEC PRINTOUT	18.92	1558	10,592				1328.3	0.5
(5) No Input or output	for this section							
(6) - From Corps Flood	Hazard Evaluation		Sept 1980					

[1]MILES ABOVE CONFLUENCE WITH WICHITA-VALLEY CENTER FLOODWAY
[2]FEET ABOVE LIMIT OF DETAILED STUDY WHICH IS 6850 FEET DOWNSTREAM OF STATE HIGHWAY 296
[3]THIS WIDTH EXTENDS WITHIN AREA NOT INCLUDED

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

SEDGWICK COUNTY, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

COWSKIN CREEK

Exhibit 6

FLOODING SOURCE				FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	HNTB STATION	DISTANCE[1]	COUNTY FIS REPORT BY GEO	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
COWSKIN CREEK										
A		6.47		1020	5081	3.4	1303.2	1303.2	1303.6	0.4
B		6.70		782	3800	4.6	1304.3	1304.3	1304.6	0.3
C		7.14		750	5440	3.2	1306.7	1306.7	1307.3	0.6
D		7.59		950	5289	3.3	1308.2	1308.2	1308.6	0.4
E		7.81		965	4135	4.2	1308.8	1308.8	1309.3	0.5
F		8.14		577	3897	4.5	1309.7	1309.7	1310.2	0.5
G		8.54		933	4713	3.7	1311.0	1311.0	1311.7	0.7
H		8.65		700	6792	2.6	1313.1	1313.1	1313.7	0.6
I		8.72		600	5182	3.4	1313.3	1313.3	1313.9	0.6
J	16.85	9.06		400[2]	6215	2.5	1314.0	1314.0	1314.6	0.6
K	17.72	9.83		1333	6208	2.5	1320.1	1320.1	1321.0	0.9
L	17.97	10.08		1147	6419	2.4	1320.5	1320.5	1321.3	0.8
M	18.20	10.30		169	1387	7.2	1321.0	1321.0	1321.7	0.7
N	18.70	10.80		470	2439	6.2	1324.0	1324.0	1324.7	0.7
O	18.92	11.02	11.16	1215[2]	10,601	1.4	1327.8	1327.8	1328.4	0.6
P	19.04	11.14	11.28	1020[2]	10,439	2.0	1327.9	1327.9	1328.5	0.6
Q	19.79	11.89		1029	5792	2.6	1329.0	1329.0	1330.0	1.0
R	20.40	12.50		1199	5571	2.7	1330.6	1330.6	1331.3	0.7
S	20.91	13.01		1068	4327	3.5	1333.3	1333.3	1334.0	0.7
T	21.42	13.40	13.59	500[2]	4532	2.7	1336.0	1336.0	1336.5	0.5
U	22.05	13.71	13.90	980[2]	6093	2.5	1337.3	1337.3	1337.4	0.1
V	22.13	13.79	13.98	1313[2]	6548	2.0	1337.6	1337.6	1337.6	0.0
W	22.57	14.30	14.49	928[2]	4015	3.6	1338.6	1338.6	1339.1	0.5
(3) X	24.08		16.00	1380	7118	2.1	1342.0	1342.0	1342.8	0.8
(3) Y	24.25		16.17	1251	4216	3.6	1343.5	1343.5	1344.2	0.7

Handwritten margin notes: Cross sections A–F: "See USGS" / "Not Rerun by GEO". Cross sections G–Y: "See HNTB FIS" / "Not rerun by GEO".

[1]MILES ABOVE CONFLUENCE WITH WICHITA-VALLEY CENTER FLOODWAY
[2]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS
(3) Taken from Table 3, Floodway Data for Cowskin Creek, Sedgwick County FIS Report

FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
CITY OF WICHITA, KS (SEDGWICK CO.)	**COWSKIN CREEK**

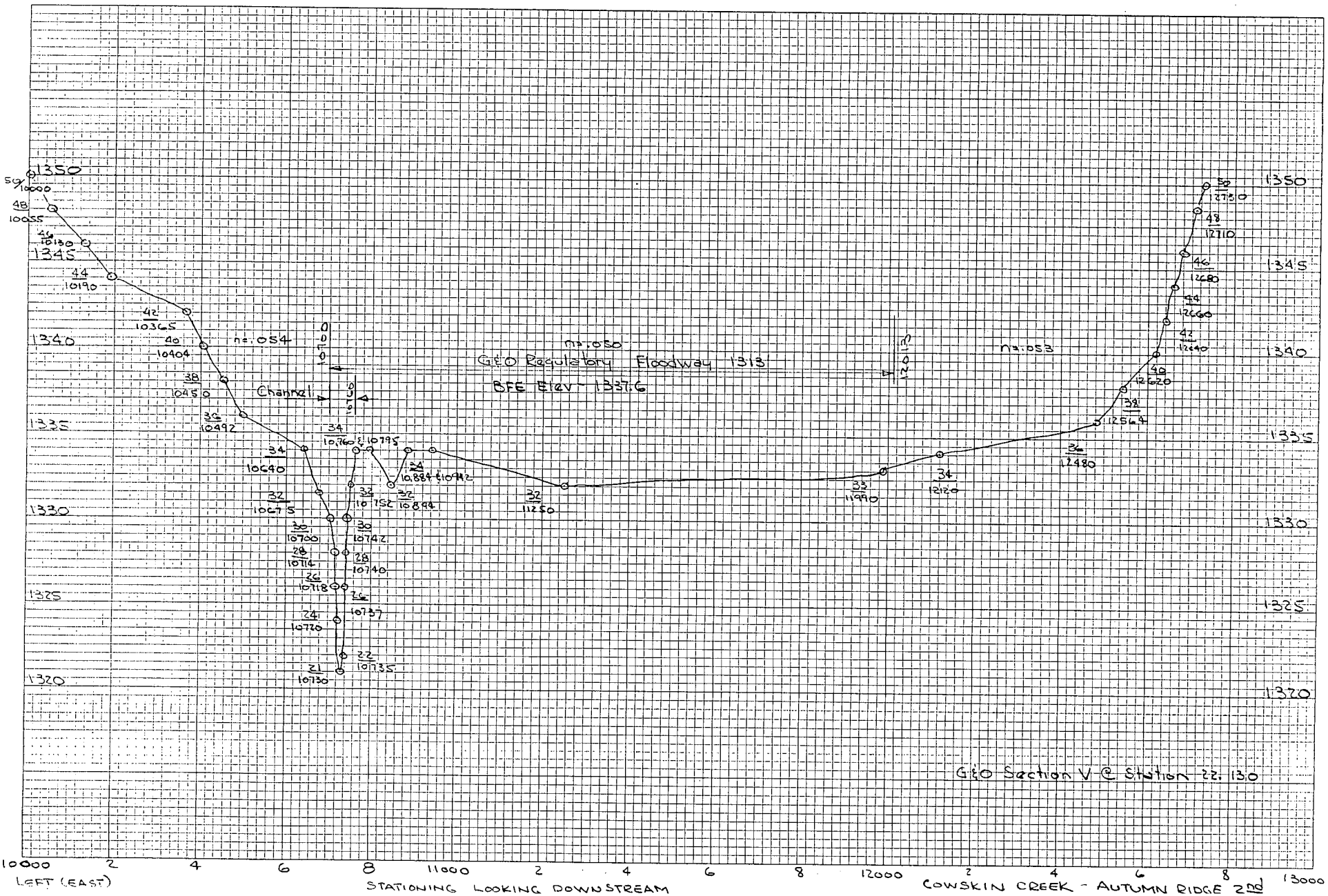
TABLE 4

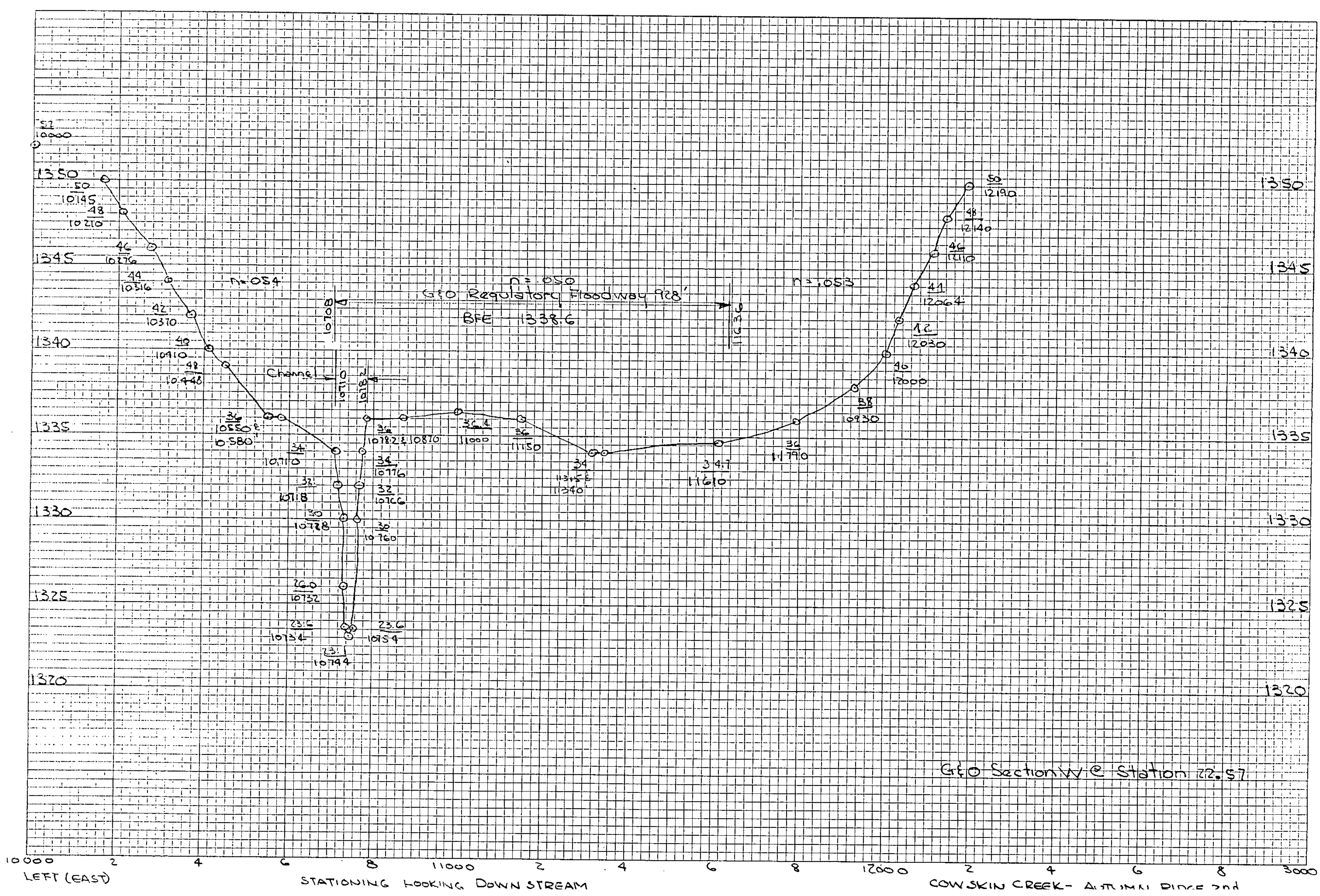
Exhibit 7

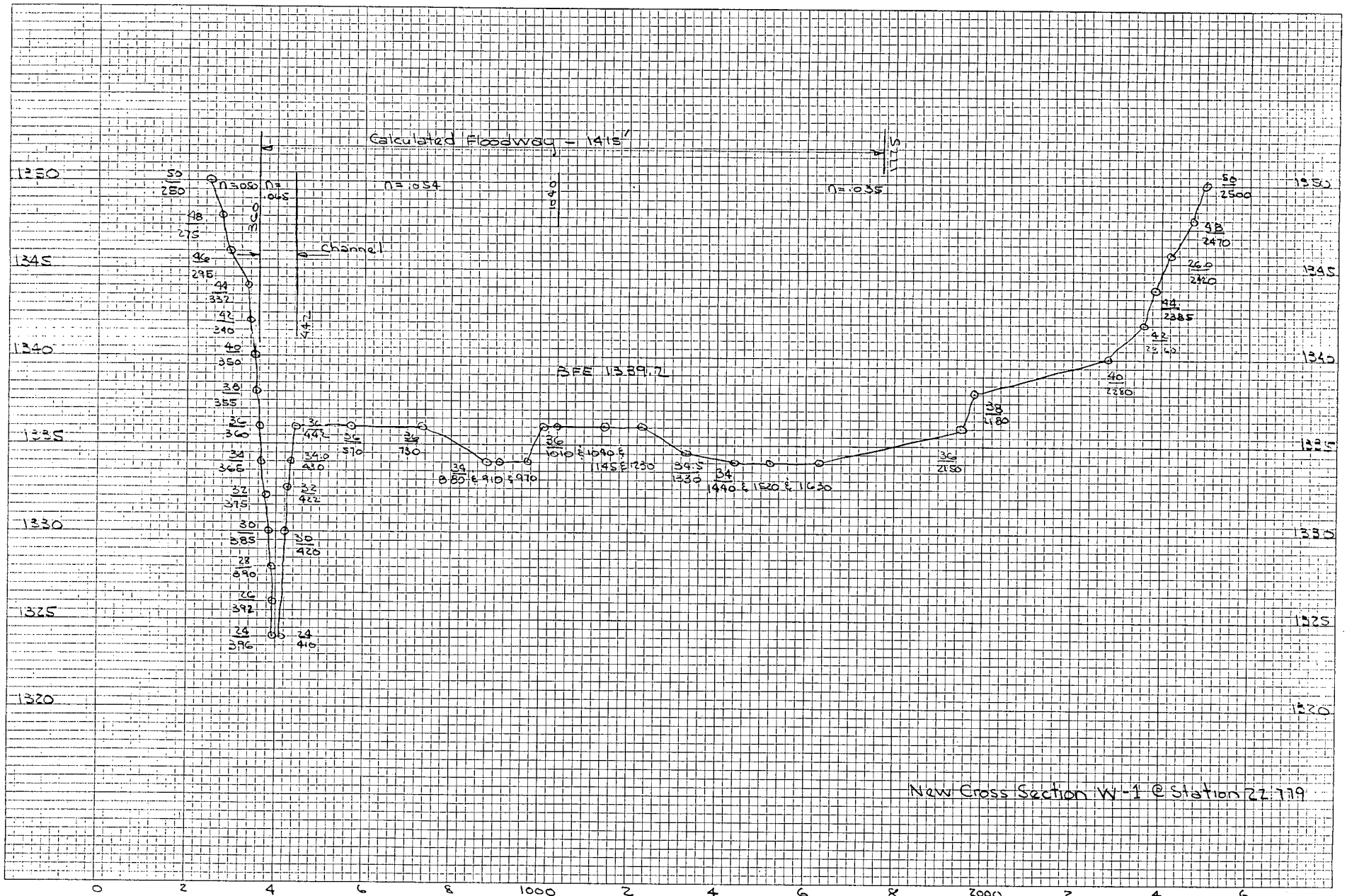
EXHIBIT 8

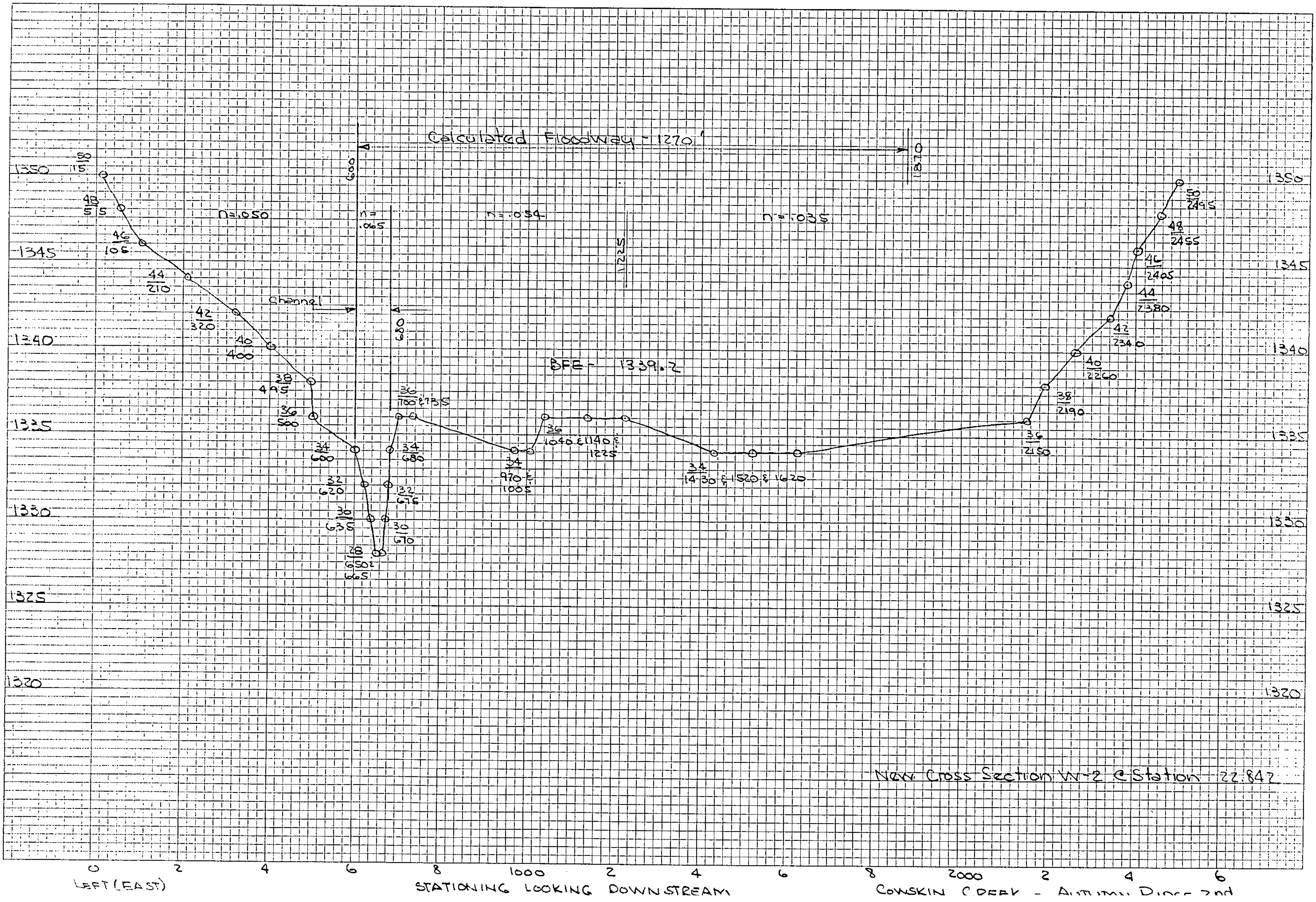
PLOTTED CROSS SECTIONS

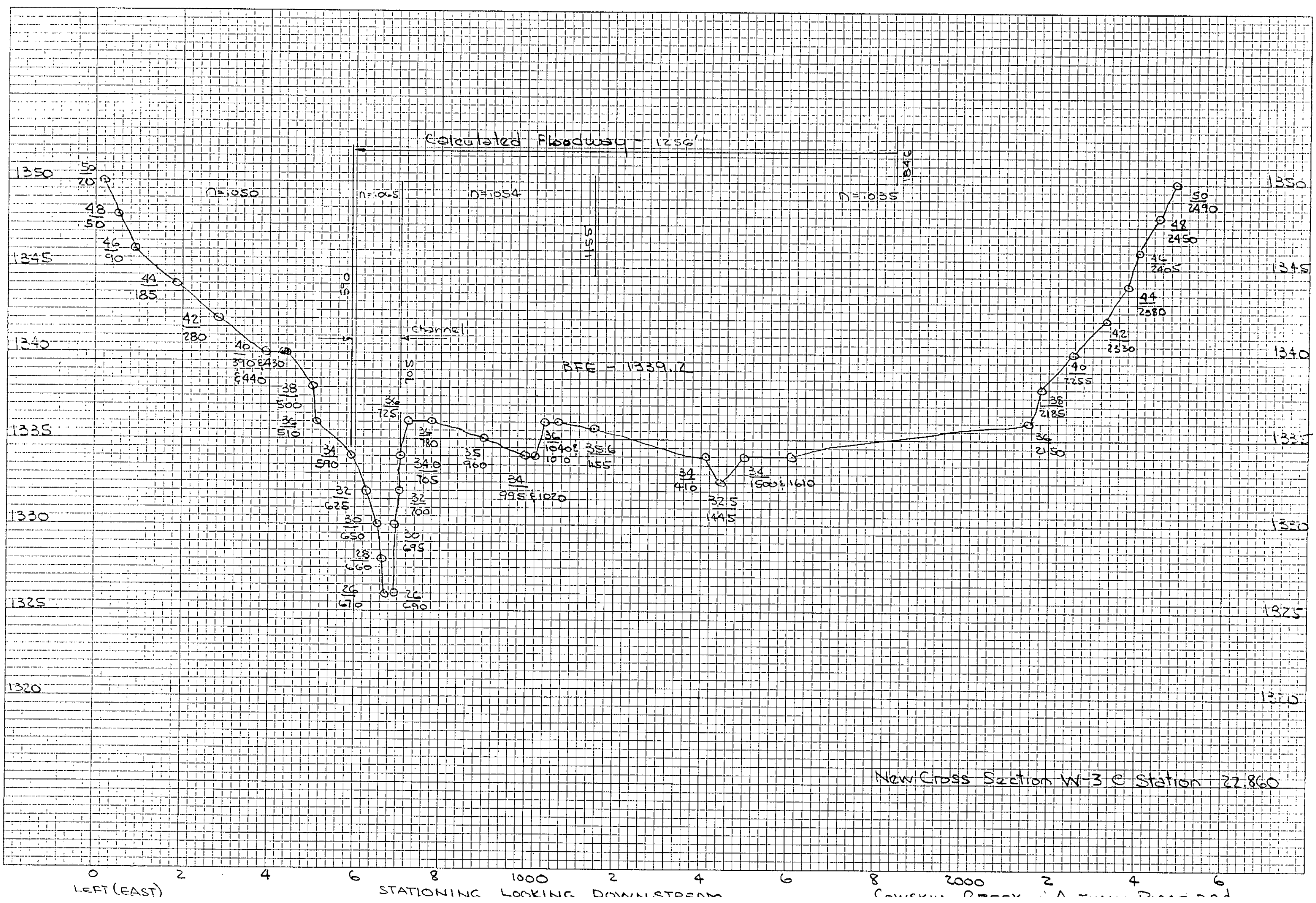
COWSKIN CREEK UPSTREAM FROM 13TH STREET

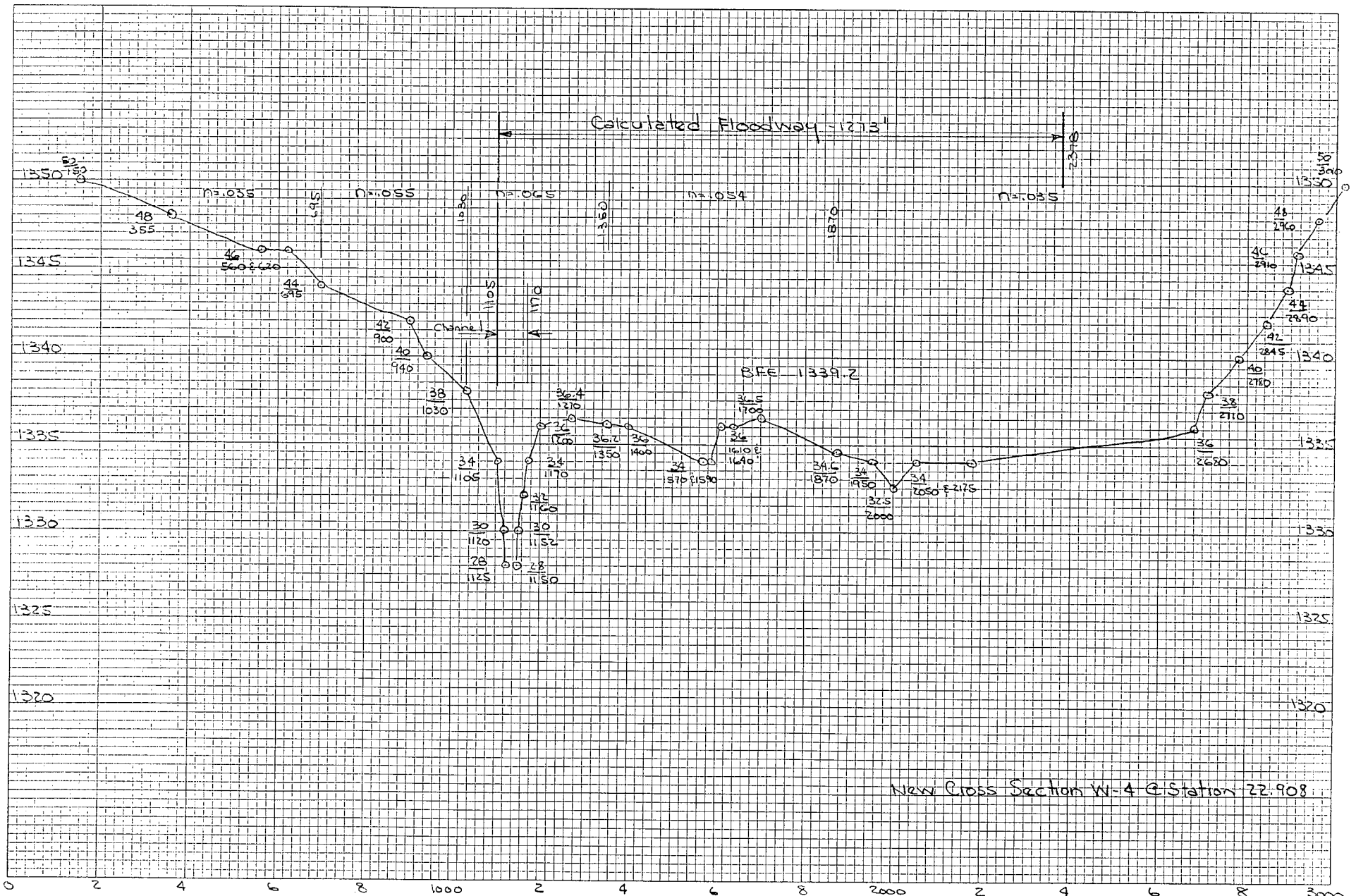

G&O Regulatory Floodway 1318
BFE Elev- 1337.6
Channel
n=.054
n=.050
n=.053
G&O Section V @ Station 22.130
COWSKIN CREEK - AUTUMN RIDGE 2ND
LEFT (EAST)
STATIONING LOOKING DOWNSTREAM
1350
1345
1340
1335
1330
1325
1320
10000
11000
12000
13000

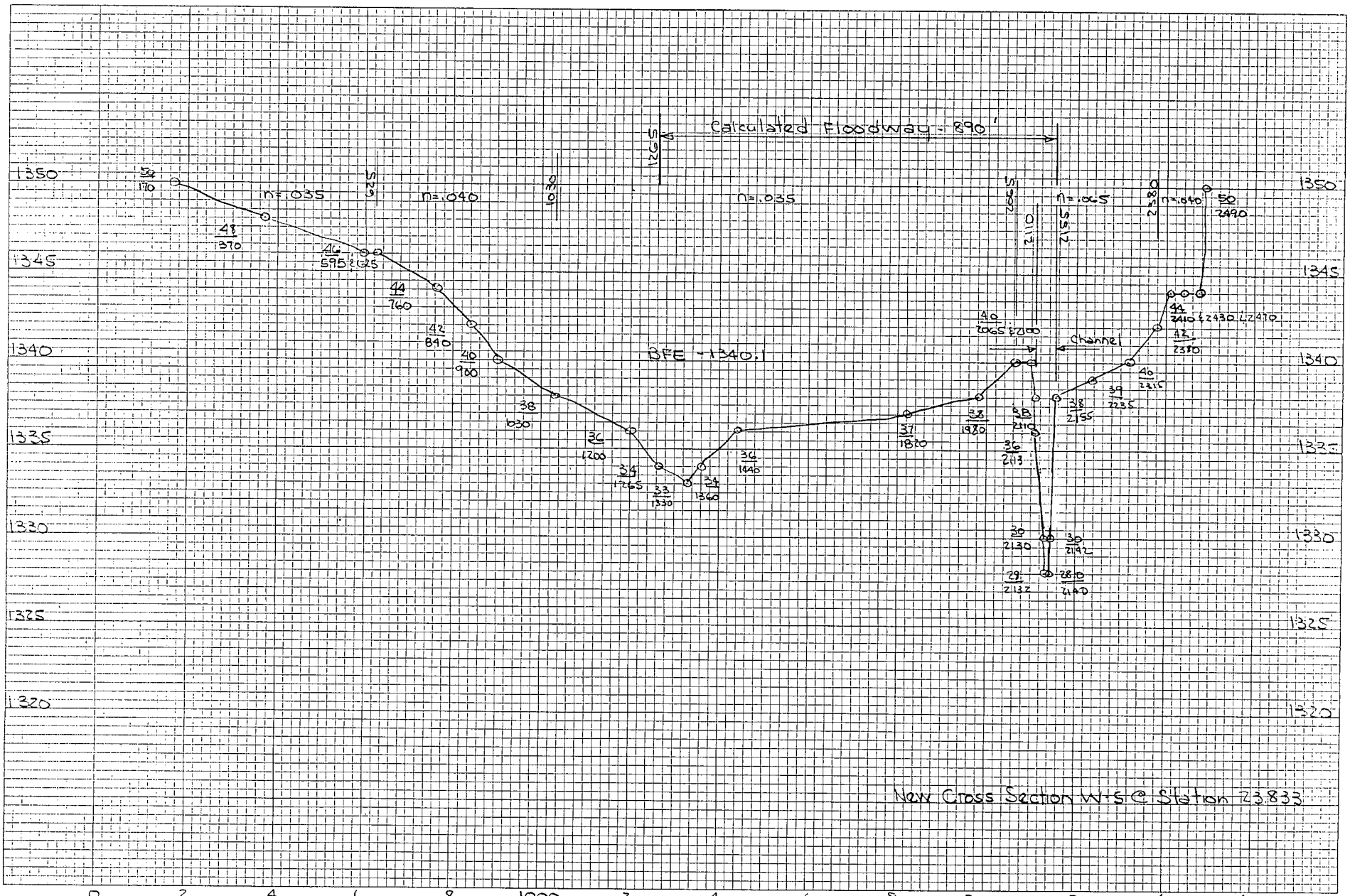

G&O Section W/@ Station 22.57
G&O Regulatory Floodway 928'
BFE 1338.6
n=.054
n=.050
n=.053
Channel
10708
11636
1350
1345
1340
1335
1330
1325
1320
10000
11000
12000
3000
LEFT (EAST)
STATIONING LOOKING DOWN STREAM
COWSKIN CREEK- AUTUMN RIDGE 2nd

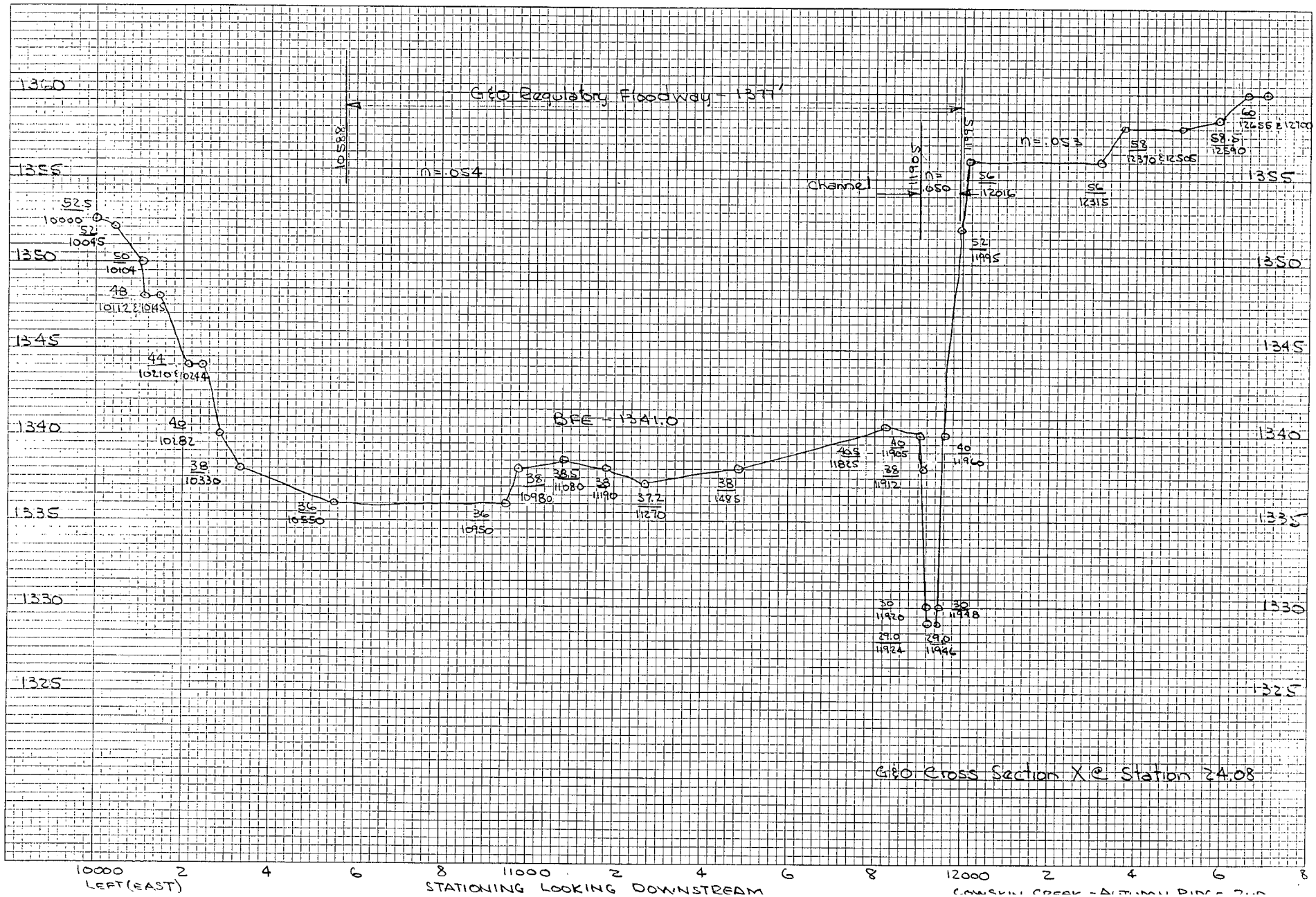

Calculated floodway = 1415'
n=.045
n=.054
n=.035
Channel
WSEL 1339.7
New Cross Section W-1 @ Station 22+79
LEFT (EAST)
STATIONING, LOOKING DOWNSTREAM
CAWSKIN CREEK


Calculated Floodway - 1270'
600
1870
n=.050
n=.065
n=.034
n=.035
1225
Channel
680
BFE - 1339.2
1350
1345
1340
1335
1330
1325
1320
50/15
48/55
46/106
44/210
42/320
40/400
38/495
36/500
34/600
32/620
30/635
28/650 & 665
30/670
32/676
34/680
36/700 & 735
34/970 & 1005
36/1040 & 1140 & 1225
34/1430 & 1520 & 1620
36/2150
38/2190
40/2260
42/2340
44/2380
46/2405
48/2455
50/2495
0
2
4
6
8
1000
2000
LEFT (EAST)
STATIONING LOOKING DOWNSTREAM
New Cross Section W-2 @ Station 22.842
COWSKIN CREEK - AUTUMN RIDGE 2nd


Calculated Floodway - 1256'
n=.050
n=.045
n=.054
n=.035
1155
BFE = 1339.2
channel
New Cross Section W-3 @ Station 22,860
LEFT (EAST)
STATIONING LOOKING DOWNSTREAM
1350
1345
1340
1335
1330
1325
1320
1000
2000


Calculated Floodway - 1273'
BFE 1339.2
n=.035
n=.055
n=.065
n=.054
n=.035
Channel
1350
1345
1340
1335
1330
1325
1320
0
2
4
6
8
1000
2
4
6
8
2000
2
4
6
8
3000
LEFT (EAST)
STATIONING LOOKING DOWNSTREAM
COWSKIN CREEK - AUTUMN RIDGE 2nd
New Cross Section W-4 @ Station 22.908


Calculated Floodway - 890'
n=.035
n=.040
n=.035
n=.040
BFE = 1340.1
Channel
New Cross Section W-S @ Station 23833
1350
1345
1340
1335
1330
1325
1320
0
2
4
6
8
1000
2
4
6
8
2000
2
4
6
LEFT (EAST)
STATIONING LOOKING DOWNSTREAM
COWSKIN CREEK - AUTUMN RIDGE 2nd


G&O Regulatory Floodway = 1377'
n = .054
n = .050
Channel
BFE = 1341.0
G&O Cross Section X@ Station 24.08
1360
1355
1350
1345
1340
1335
1330
1325
10000
11000
12000
LEFT (EAST)
STATIONING LOOKING DOWNSTREAM

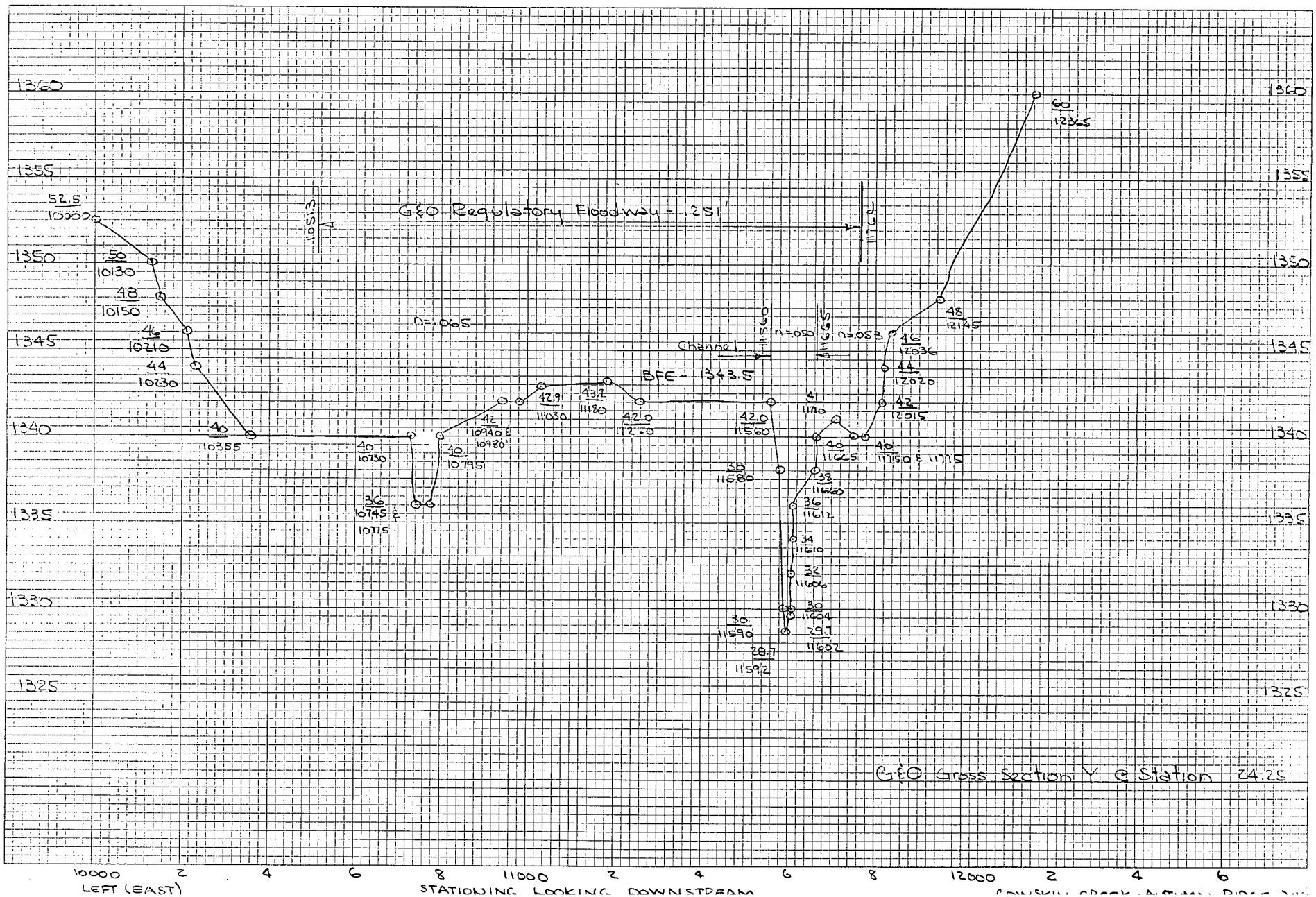

G&O Regulatory Floodway - 1251'
BFE - 1343.5'
Channel
n=.065
n=.080
n=.053
G&O Cross Section Y @ Station 24.25
LEFT (EAST)
STATIONING LOOKING DOWNSTREAM

EXHIBIT 9

HEC-2 RUN 1 - CALIBRATION RUN

COWSKIN CREEK UPSTREAM FROM 13TH STREET

```
**********************************************************
*  WATER SURFACE PROFILES                                *
*  VERSION OF NOVEMBER 1976                              *
*  UPDATED MAY 1984                                      *
*  IBM-PC-XT VERSION                                     *
*  RUN DATE  07/10/87  TIME  08:13:46                    *
**********************************************************
```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****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  THE HYDROLOGIC ENGINEERING CENTER   *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616             *
*  (916) 440-2105 (FTS) 448-2105       *
****************************************
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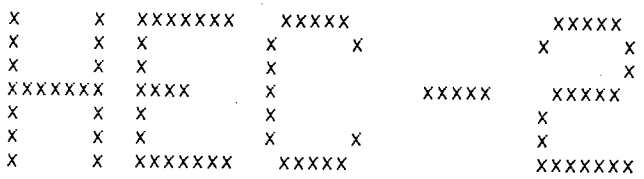

THIS RUN EXECUTED 07/10/87 08:14:12

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION APRIL 1985
**************************************************

C
T1      SEDGWICK COUNTY, KANSAS  COWSKIN CREEK NATURAL 100-YEAR PROFILE
T2      HNTB INPUT DATA CALIBRATION RUN BETWEEN SECTIONS V AND Y
T3      CSK CRK U/S 13TH TO END OF DETAILED STUDY FILE CSKATMR1.HC2

J1  ICHECK     INQ        NINV       IDIR       STRT       METRIC     HVINS      Q          WSEL       FQ

       0.        2.         0.         0.    .000000        .00        .0         0.   1337.590       .000

J2  NPROF      IPLOT      PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE

      .000       .000     -1.000       .000       .000       .000       .000       .000       .000       .000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    110.000    150.000    200.000       .000       .000       .000       .000       .000       .000       .000


NC      .054       .053       .050       .300       .500       .000       .000       .000       .000       .000
QT     2.000  15050.000  15050.000       .000       .000       .000       .000       .000       .000       .000
ET      .000       .000      8.100       .000       .000       .000       .000  10700.000  12013.000       .000
          G&O CROSS SECTION V JUST U/S FROM 13TH STREET
X1    22.130     36.000  10700.000  10760.000       .000       .000       .000       .000       .000       .000
GR  1350.000  10000.000   1348.000  10055.000   1346.000  10130.000   1344.000  10190.000   1342.000  10365.000
GR  1340.000  10404.000   1338.000  10450.000   1336.000  10492.000   1334.000  10640.000   1332.000  10675.000
GR  1330.000  10700.000   1328.000  10714.000   1326.000  10718.000   1324.000  10720.000   1321.000  10730.000
GR  1322.000  10735.000   1326.000  10737.000   1328.000  10740.000   1330.000  10742.000   1332.000  10752.000
GR  1334.000  10760.000   1334.000  10795.000   1332.000  10844.000   1334.000  10884.000   1334.000  10942.000
GR  1332.000  11250.000   1333.000  11990.000   1334.000  12120.000   1336.000  12480.000   1338.000  12564.000
GR  1340.000  12620.000   1342.000  12640.000   1344.000  12660.000   1346.000  12680.000   1348.000  12710.000
GR  1350.000  12730.000       .000       .000       .000       .000       .000       .000       .000       .000

ET      .000       .000      8.100       .000       .000       .000       .000  10708.000  11636.000       .000
          G&O CROSS SECTION W
X1    22.570     35.000  10710.000  10782.000   1500.000   1100.000   2325.000       .000       .000       .000
GR  1352.000  10000.000   1350.000  10145.000   1348.000  10210.000   1346.000  10276.000   1344.000  10316.000
GR  1342.000  10370.000   1340.000  10410.000   1338.000  10448.000   1336.000  10550.000   1336.000  10580.000
GR  1334.000  10710.000   1332.000  10718.000   1330.000  10728.000   1326.000  10732.000   1323.600  10734.000
GR  1323.100  10744.000   1323.600  10754.000   1330.000  10760.000   1332.000  10766.000   1334.000  10776.000
GR  1336.000  10782.000   1336.000  10870.000   1336.400  11000.000   1336.000  11150.000   1334.000  11315.000
GR  1334.000  11345.000   1334.700  11610.000   1336.000  11790.000   1338.000  11930.000   1340.000  12000.000
GR  1342.000  12030.000   1344.000  12064.000   1346.000  12110.000   1348.000  12140.000   1350.000  12190.000
```

ET	.000	.000	8.100	.000	.000	.000	.000	10588.000	11995.000	.000
	G&O CROSS SECTION X									
X1	24.080	33.000	11905.000	11995.000	2000.000	2700.000	7655.000	.000	.000	.000
GR	1352.500	10000.000	1352.000	10045.000	1350.000	10104.000	1348.000	10112.000	1348.000	10145.000
GR	1344.000	10210.000	1344.000	10244.000	1340.000	10282.000	1338.000	10330.000	1336.000	10550.000
GR	1336.000	10950.000	1338.000	10980.000	1338.500	11080.000	1338.000	11190.000	1337.200	11270.000
GR	1338.000	11485.000	1340.500	11825.000	1340.000	11905.000	1338.000	11912.000	1330.000	11920.000
GR	1329.000	11924.000	1329.000	11946.000	1330.000	11948.000	1340.000	11960.000	1352.000	11995.000
GR	1356.000	12016.000	1356.000	12315.000	1358.000	12370.000	1358.000	12505.000	1358.500	12590.000
GR	1360.000	12654.000	1360.000	12700.000	1362.000	12855.000	.000	.000	.000	.000
NC	.065	.053	.050	.300	.500	.000	.000	.000	.000	.000
ET	.000	.000	8.100	.000	.000	.000	.000	10513.000	11764.000	.000
	G&O CROSS SECTION Y									
X1	24.250	34.000	11560.000	11665.000	1400.000	1100.000	1215.000	.000	.000	.000
GR	1352.500	10000.000	1350.000	10130.000	1348.000	10150.000	1346.000	10210.000	1344.000	10230.000
GR	1340.000	10355.000	1340.000	10730.000	1336.000	10745.000	1336.000	10775.000	1340.000	10795.000
GR	1342.000	10940.000	1342.000	10980.000	1342.900	11030.000	1343.200	11180.000	1342.000	11260.000
GR	1342.000	11560.000	1338.000	11580.000	1330.000	11590.000	1328.700	11592.000	1329.700	11602.000
GR	1330.000	11604.000	1332.000	11606.000	1334.000	11610.000	1336.000	11612.000	1338.000	11660.000
GR	1340.000	11665.000	1341.000	11710.000	1340.000	11750.000	1340.000	11775.000	1342.000	12015.000
GR	1344.000	12020.000	1346.000	12036.000	1348.000	12145.000	1360.000	12365.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CCHV= .300 CEHV= .500

*SECNO 22.130

G&O CROSS SECTION V JUST U/S FROM 13TH STREET

22.13	16.59	1337.59	.00	1337.59	1337.64	.05	.00	.00	1330.00
15050.	1061.	1679.	12310.	735.	598.	7440.	0.	0.	1334.00
.00	1.44	2.81	1.65	.054	.050	.053	.000	1321.00	10458.61
.000476	0.	0.	0.	0	0	0	.00	2088.17	12546.78

*SECNO 22.570

G&O CROSS SECTION W

22.57	15.54	1338.64	.00	.00	1338.83	.19	1.12	.07	1334.00
15050.	1747.	3695.	9608.	724.	693.	3623.	199.	50.	1336.00
.11	2.41	5.33	2.65	.054	.050	.053	.000	1323.10	10435.81
.001776	1500.	2325.	1100.	2	0	0	.00	1516.64	11952.45

*SECNO 24.080

G&O CROSS SECTION X

24.08	13.00	1342.00	.00	.00	1342.07	.07	3.20	.04	1340.00
15050.	13468.	1582.	0.	6992.	537.	0.	597.	142.	1352.00
.55	1.93	2.95	.00	.054	.050	.053	.000	1329.00	10262.89
.000636	2000.	7655.	2700.	2	0	0	.00	1702.97	11965.87

CCHV= .300 CEHV= .500

*SECNO 24.250

G&O CROSS SECTION Y

24.25	14.79	1343.49	.00	.00	1343.73	.24	1.58	.09	1342.00
15050.	7685.	4592.	2773.	2982.	782.	944.	787.	196.	1340.00
.66	2.58	5.87	2.94	.065	.050	.053	.000	1328.70	10245.71
.002900	1400.	1215.	1100.	0	0	0	.00	1773.03	12018.74

THIS RUN EXECUTED 07/10/87 08:16:06

```
**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION APRIL 1985
**************************************************

T1      SEDGWICK COUNTY, KANSAS COWSKIN CREEK ENCROACHMENT PROFILE
T2      HNTB INPUT DATA CALIBRATION RUN BETWEEN SECTIONS V AND Y
T3      CSK CRK U/S 13TH TO END OF DETAILED STUDY

J1  ICHECK     INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
       0.       3.        0.        0.   .000000       .00       .0        0.  1338.350      .000
J2  NPROF      IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
    15.000      .000    -1.000      .000      .000      .000      .000      .000      .000      .000
```

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 2

CCHV= .300 CEHV= .500
*SECNO 22.130

3470 ENCROACHMENT STATIONS= 10700.0 12013.0 TYPE= 1 TARGET= 1313.000
G&O CROSS SECTION V JUST U/S FROM 13TH STREET

22.13	17.35	1338.35	.00	1337.59	1338.41	.06	.00	.00	1330.00
15050.	0.	1739.	13311.	0.	643.	6978.	0.	0.	1334.00
.00	.00	2.70	1.91	.054	.050	.053	.000	1321.00	10700.00
.000468	0.	0.	0.	0	0	0	.00	1313.00	12013.00

*SECNO 22.570

3470 ENCROACHMENT STATIONS= 10708.0 11636.0 TYPE= 1 TARGET= 928.000
G&O CROSS SECTION W

22.57	16.26	1339.36	.00	1338.64	1339.60	.24	1.10	.09	1334.00
15050.	16.	4178.	10856.	11.	744.	3506.	170.	30.	1336.00
.10	1.50	5.61	3.10	.054	.050	.053	.000	1323.10	10708.00
.001788	1500.	2325.	1100.	2	0	0	.00	928.00	11636.00

*SECNO 24.080

3470 ENCROACHMENT STATIONS= 10588.0 11995.0 TYPE= 1 TARGET= 1407.000
G&O CROSS SECTION X

24.08	13.82	1342.82	.00	1342.00	1342.89	.07	3.24	.05	1340.00
15050.	13312.	1738.	0.	6546.	586.	0.	546.	99.	100000.00
.53	2.03	2.97	.00	.054	.050	.053	.000	1329.00	10588.00
.000600	2000.	7655.	2700.	2	0	0	.00	1380.19	11968.19

CCHV= .300 CEHV= .500
*SECNO 24.250

3470 ENCROACHMENT STATIONS= 10513.0 11764.0 TYPE= 1 TARGET= 1251.000
G&O CROSS SECTION Y

24.25	15.52	1344.22	.00	1343.49	1344.52	.30	1.51	.11	1342.00
15050.	8410.	5310.	1329.	2995.	858.	375.	724.	140.	1340.00
.63	2.81	6.19	3.54	.065	.050	.053	.000	1328.70	10513.00
.002849	1400.	1215.	1100.	2	0	0	.00	1251.00	11764.00

THIS RUN EXECUTED 07/10/87 08:17:03

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION APRIL 1985
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

CSK CRK U/S 13TH TO END

SUMMARY PRINTOUT TABLE 110

SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
22.130	1337.59	.00	1337.64	2088.17	1060.71	1679.18	12310.10	.00	.00	10700.00	10760.00	.00
22.130	1338.35	.76	1338.41	1313.00	.00	1738.72	13311.28	1313.00	10700.00	10700.00	10760.00	12013.00
22.570	1338.64	.00	1338.83	1516.64	1747.41	3694.53	9608.06	.00	.00	10710.00	10782.00	.00
22.570	1339.36	.72	1339.60	928.00	15.99	4178.33	10855.68	928.00	10708.00	10710.00	10782.00	11636.00
24.080	1342.00	.00	1342.07	1702.97	13467.85	1582.15	.00	.00	.00	11905.00	11995.00	.00
24.080	1342.82	.81	1342.89	1380.19	13312.16	1737.84	.00	1407.00	10588.00	11905.00	11995.00	11995.00
24.250	1343.49	.00	1343.73	1773.03	7685.27	4592.06	2772.67	.00	.00	11560.00	11665.00	.00
24.250	1344.22	.73	1344.52	1251.00	8410.44	5310.38	1329.18	1251.00	10513.00	11560.00	11665.00	11764.00

CSK CRK U/S 13TH TO END

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
22.130	.00	.00	.00	1321.00	15050.00	1337.59	.00	1337.64	4.76	2.81	8772.98	6898.38
22.130	.00	.00	.00	1321.00	15050.00	1338.35	.00	1338.41	4.68	2.70	7621.98	6958.04
22.570	2325.00	.00	.00	1323.10	15050.00	1338.64	.00	1338.83	17.76	5.33	5039.64	3570.94
22.570	2325.00	.00	.00	1323.10	15050.00	1339.36	.00	1339.60	17.88	5.61	4260.66	3559.16
24.080	7655.00	.00	.00	1329.00	15050.00	1342.00	.00	1342.07	6.36	2.95	7528.46	5966.50
24.080	7655.00	.00	.00	1329.00	15050.00	1342.82	.00	1342.89	6.00	2.97	7131.88	6145.33
24.250	1215.00	.00	.00	1328.70	15050.00	1343.49	.00	1343.73	29.00	5.87	4708.34	2794.65
24.250	1215.00	.00	.00	1328.70	15050.00	1344.22	.00	1344.52	28.49	6.19	4227.52	2819.78

CSK CRK U/S 13TH TO END

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
22.130	15050.00	1337.59	.00	.00	.00	2088.17	.00
22.130	15050.00	1338.35	.76	.00	.76	1313.00	.00
22.570	15050.00	1338.64	.00	1.05	.00	1516.64	2325.00
22.570	15050.00	1339.36	.72	1.01	.72	928.00	2325.00
24.080	15050.00	1342.00	.00	3.36	.00	1702.97	7655.00
24.080	15050.00	1342.82	.81	3.46	.81	1380.19	7655.00
24.250	15050.00	1343.49	.00	1.49	.00	1773.03	1215.00
24.250	15050.00	1344.22	.73	1.40	.73	1251.00	1215.00

SUMMARY OF ERRORS AND SPECIAL NOTES

FLOODWAY DATA, CSK CRK U/S 13TH TO END
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WITHOUT FLOODWAY	DIFFERENCE
22.130	1313.	7622.	2.0	1338.4	1337.6	.8
22.570	928.	4261.	3.5	1339.3	1338.6	.7
24.080	1380.	7132.	2.1	1342.8	1342.0	.8
24.250	1251.	4228.	3.6	1344.2	1343.5	.7

THIS RUN EXECUTED 07/10/87 08:18:19

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION APRIL 1985
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EXHIBIT 10

HEC-2 RUN 2 - RUN WITH NEW CROSS SECTIONS

COWSKIN CREEK UPSTREAM FROM 13TH STREET

```
**************************************************
*  WATER SURFACE PROFILES                        *
*  VERSION OF NOVEMBER 1976                      *
*  UPDATED MAY 1984                              *
*  IBM-PC-XT VERSION                             *
*  RUN DATE  07/11/87  TIME  16:39:04            *
**************************************************
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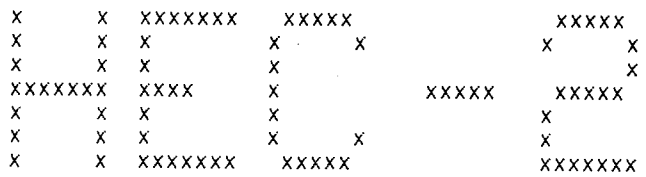
****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  THE HYDROLOGIC ENGINEERING CENTER   *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616             *
*  (916) 440-2105 (FTS) 448-2105       *
****************************************
```



THIS RUN EXECUTED 07/11/87 16:39:30

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION APRIL 1985
**************************************************

C
T1      SEDGWICK COUNTY, KANSAS  COWSKIN CREEK NATURAL 100-YEAR PROFILE
T2      HNTB INPUT DATA W/NEW SECTIONS BETWEEN G&O SECTIONS W AND X
T3      CSK CRK U/S 13TH TO END OF DETAILED STUDY FILE CSKATMR2.HC2

J1  ICHECK     INQ        NINV       IDIR       STRT       METRIC     HVINS      Q          WSEL       FQ

       0.        2.         0.         0.    .000000        .00        .0         0.   1337.600       .000

J2  NPROF      IPLOT      PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE

      .000       .000     -1.000       .000       .000       .000       .000       .000       .000       .000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    110.000    150.000    200.000       .000       .000       .000       .000       .000       .000       .000


NC       .054       .053       .050       .300       .500       .000       .000       .000       .000       .000
QT      2.000  15050.000  15050.000       .000       .000       .000       .000       .000       .000       .000
ET       .000       .000      8.100       .000       .000       .000       .000  10700.000  12013.000       .000
          G&O CROSS SECTION V JUST U/S FROM 13TH STREET
X1     22.130     36.000  10700.000  10760.000       .000       .000       .000       .000       .000       .000
GR   1350.000  10000.000   1348.000  10055.000   1346.000  10130.000   1344.000  10190.000   1342.000  10365.000
GR   1340.000  10404.000   1338.000  10450.000   1336.000  10492.000   1334.000  10640.000   1332.000  10675.000
GR   1330.000  10700.000   1328.000  10714.000   1326.000  10718.000   1324.000  10720.000   1321.000  10730.000
GR   1322.000  10735.000   1326.000  10737.000   1328.000  10740.000   1330.000  10742.000   1332.000  10752.000
GR   1334.000  10760.000   1334.000  10795.000   1332.000  10844.000   1334.000  10884.000   1334.000  10942.000
GR   1332.000  11250.000   1333.000  11990.000   1334.000  12120.000   1336.000  12480.000   1338.000  12564.000
GR   1340.000  12620.000   1342.000  12640.000   1344.000  12660.000   1346.000  12680.000   1348.000  12710.000
GR   1350.000  12730.000       .000       .000       .000       .000       .000       .000       .000       .000

ET       .000       .000      8.100       .000       .000       .000       .000  10708.000  11636.000       .000
          G&O CROSS SECTION W
X1     22.570     35.000  10710.000  10782.000   1500.000   1100.000   2325.000       .000       .000       .000
GR   1352.000  10000.000   1350.000  10145.000   1348.000  10210.000   1346.000  10276.000   1344.000  10316.000
GR   1342.000  10370.000   1340.000  10410.000   1338.000  10448.000   1336.000  10550.000   1336.000  10580.000
GR   1334.000  10710.000   1332.000  10718.000   1330.000  10728.000   1326.000  10732.000   1323.600  10734.000
GR   1323.100  10744.000   1323.600  10754.000   1330.000  10760.000   1332.000  10766.000   1334.000  10776.000
GR   1336.000  10782.000   1336.000  10870.000   1336.400  11000.000   1336.000  11150.000   1334.000  11315.000
GR   1334.000  11345.000   1334.700  11610.000   1336.000  11790.000   1338.000  11930.000   1340.000  12000.000
GR   1342.000  12030.000   1344.000  12064.000   1346.000  12110.000   1348.000  12140.000   1350.000  12190.000
```

NH	4.000	.050	360.000	.065	442.000	.054	1040.000	.035	2500.000	.000
ET	.000	.000	7.400	.000	.000	.000	.000	.000	.000	.000
	NEW CROSS SECTION W-1									
X1	22.779	40.000	360.000	442.000	510.000	400.000	1104.000	.000	.000	.000
GR	1350.000	250.000	1348.000	275.000	1346.000	295.000	1344.000	332.000	1342.000	340.000
GR	1340.000	350.000	1338.000	355.000	1336.000	360.000	1334.000	365.000	1332.000	375.000
GR	1330.000	385.000	1328.000	390.000	1326.000	392.000	1324.000	396.000	1324.000	410.000
GR	1330.000	420.000	1332.000	422.000	1334.000	430.000	1336.000	442.000	1336.000	570.000
GR	1336.000	730.000	1334.000	880.000	1334.000	910.000	1334.000	970.000	1336.000	1010.000
GR	1336.000	1040.000	1336.000	1145.000	1336.000	1230.000	1334.500	1330.000	1334.000	1440.000
GR	1334.000	1520.000	1334.000	1630.000	1336.000	2150.000	1338.000	2180.000	1340.000	2280.000
GR	1342.000	2360.000	1344.000	2385.000	1346.000	2420.000	1348.000	2470.000	1350.000	2500.000
NH	4.000	.050	600.000	.065	680.000	.054	1225.000	.035	2495.000	.000
	NEW CROSS SECTION W-2									
X1	22.842	34.000	600.000	680.000	245.000	25.000	333.000	.000	.000	.000
GR	1350.000	15.000	1348.000	55.000	1346.000	105.000	1344.000	210.000	1342.000	320.000
GR	1340.000	400.000	1338.000	495.000	1336.000	500.000	1334.000	600.000	1332.000	620.000
GR	1330.000	635.000	1328.000	650.000	1328.000	665.000	1330.000	670.000	1332.000	675.000
GR	1334.000	680.000	1336.000	700.000	1336.000	735.000	1334.000	970.000	1334.000	1005.000
GR	1336.000	1040.000	1336.000	1140.000	1336.000	1225.000	1334.000	1430.000	1334.000	1520.000
GR	1334.000	1620.000	1336.000	2150.000	1338.000	2190.000	1340.000	2260.000	1342.000	2340.000
GR	1344.000	2380.000	1346.000	2405.000	1348.000	2455.000	1350.000	2495.000	.000	.000
NH	4.000	.050	590.000	.065	705.000	.054	1155.000	.035	2490.000	.000
	NEW CROSS SECTION W-3									
X1	22.860	39.000	590.000	705.000	45.000	30.000	96.000	.000	.000	.000
GR	1350.000	20.000	1348.000	50.000	1346.000	90.000	1344.000	185.000	1342.000	280.000
GR	1340.000	390.000	1340.000	430.000	1340.000	440.000	1338.000	500.000	1336.000	510.000
GR	1334.000	590.000	1332.000	625.000	1330.000	650.000	1328.000	660.000	1326.000	670.000
GR	1326.000	690.000	1330.000	695.000	1332.000	700.000	1334.000	705.000	1336.000	725.000
GR	1336.000	780.000	1335.000	900.000	1334.000	995.000	1334.000	1020.000	1336.000	1040.000
GR	1336.000	1070.000	1335.600	1155.000	1334.000	1410.000	1332.500	1445.000	1334.000	1500.000
GR	1334.000	1610.000	1336.000	2150.000	1338.000	2185.000	1340.000	2255.000	1342.000	2330.000
GR	1344.000	2380.000	1346.000	2405.000	1348.000	2450.000	1350.000	2490.000	.000	.000
NH	5.000	.035	695.000	.055	1030.000	.065	1350.000	.054	1870.000	.035
NH	3010.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	NEW CROSS SECTION W-4									
X1	22.908	37.000	1105.000	1170.000	195.000	13.000	251.000	.000	.000	.000
GR	1350.000	150.000	1348.000	355.000	1346.000	560.000	1346.000	620.000	1344.000	695.000
GR	1342.000	900.000	1340.000	940.000	1338.000	1030.000	1334.000	1105.000	1330.000	1120.000
GR	1328.000	1125.000	1328.000	1150.000	1330.000	1152.000	1332.000	1160.000	1334.000	1170.000
GR	1336.000	1200.000	1336.400	1270.000	1336.200	1350.000	1336.000	1400.000	1334.000	1570.000
GR	1334.000	1590.000	1336.000	1610.000	1336.000	1640.000	1336.500	1700.000	1334.600	1870.000
GR	1334.000	1950.000	1332.500	2000.000	1334.000	2050.000	1334.000	2175.000	1336.000	2680.000
GR	1338.000	2710.000	1340.000	2780.000	1342.000	2845.000	1344.000	2890.000	1346.000	2910.000
GR	1348.000	2960.000	1350.000	3010.000	.000	.000	.000	.000	.000	.000

NH	5.000	.035	625.000	.040	1030.000	.035	2065.000	.065	2380.000	.040
NH	2490.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	NEW CROSS SECTION W-S									
X1	23.833	31.000	2110.000	2155.000	285.000	1632.000	4884.000	.000	.000	.000
GR	1350.000	170.000	1348.000	370.000	1346.000	595.000	1346.000	625.000	1344.000	760.000
GR	1342.000	840.000	1340.000	900.000	1338.000	1030.000	1336.000	1200.000	1334.000	1265.000
GR	1333.000	1330.000	1334.000	1360.000	1336.000	1440.000	1337.000	1820.000	1338.000	1980.000
GR	1340.000	2065.000	1340.000	2100.000	1338.000	2110.000	1336.000	2113.000	1330.000	2130.000
GR	1328.000	2132.000	1328.000	2140.000	1330.000	2142.000	1338.000	2155.000	1339.000	2235.000
GR	1340.000	2315.000	1342.000	2380.000	1344.000	2410.000	1344.000	2440.000	1344.000	2475.000
GR	1350.000	2490.000	.000	.000	.000	.000	.000	.000	.000	.000
NC	.054	.053	.050	.000	.000	.000	.000	.000	.000	.000
ET	.000	.000	8.100	.000	.000	.000	.000	10588.000	11995.000	.000
	G&O CROSS SECTION X									
X1	24.080	33.000	11905.000	11995.000	660.000	600.000	898.000	.000	.000	.000
GR	1352.500	10000.000	1352.000	10045.000	1350.000	10104.000	1348.000	10112.000	1348.000	10145.000
GR	1344.000	10210.000	1344.000	10244.000	1340.000	10282.000	1338.000	10330.000	1336.000	10550.000
GR	1336.000	10950.000	1338.000	10980.000	1338.500	11080.000	1338.000	11190.000	1337.200	11270.000
GR	1338.000	11485.000	1340.500	11825.000	1340.000	11905.000	1338.000	11912.000	1330.000	11920.000
GR	1329.000	11924.000	1329.000	11946.000	1330.000	11948.000	1340.000	11960.000	1352.000	11995.000
GR	1356.000	12016.000	1356.000	12315.000	1358.000	12370.000	1358.000	12505.000	1358.500	12590.000
GR	1360.000	12654.000	1360.000	12700.000	1362.000	12855.000	.000	.000	.000	.000
NC	.065	.053	.050	.300	.500	.000	.000	.000	.000	.000
ET	.000	.000	8.100	.000	.000	.000	.000	10513.000	11764.000	.000
	G&O CROSS SECTION Y									
X1	24.250	34.000	11560.000	11665.000	1400.000	1100.000	1215.000	.000	.000	.000
GR	1352.500	10000.000	1350.000	10130.000	1348.000	10150.000	1346.000	10210.000	1344.000	10230.000
GR	1340.000	10355.000	1340.000	10730.000	1336.000	10745.000	1336.000	10775.000	1340.000	10795.000
GR	1342.000	10940.000	1342.000	10980.000	1342.900	11030.000	1343.200	11180.000	1342.000	11260.000
GR	1342.000	11560.000	1338.000	11580.000	1330.000	11590.000	1328.700	11592.000	1329.700	11602.000
GR	1330.000	11604.000	1332.000	11606.000	1334.000	11610.000	1336.000	11612.000	1338.000	11660.000
GR	1340.000	11665.000	1341.000	11710.000	1340.000	11750.000	1340.000	11775.000	1342.000	12015.000
GR	1344.000	12020.000	1346.000	12036.000	1348.000	12145.000	1360.000	12365.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CCHV= .300 CEHV= .500

*SECNO 22.130

G&O CROSS SECTION V JUST U/S FROM 13TH STREET

22.13	16.60	1337.60	.00	1337.60	1337.65	.05	.00	.00	1330.00
15050.	1062.	1676.	12312.	738.	598.	7458.	0.	0.	1334.00
.00	1.44	2.80	1.65	.054	.050	.053	.000	1321.00	10458.40
.000473	0.	0.	0.	0	0	0	.00	2088.80	12547.20

*SECNO 22.570

G&O CROSS SECTION W

22.57	15.55	1338.65	.00	.00	1338.83	.19	1.11	.07	1334.00
15050.	1748.	3691.	9611.	725.	693.	3627.	200.	50.	1336.00
.11	2.41	5.33	2.65	.054	.050	.053	.000	1323.10	10435.74
.001771	1500.	2325.	1100.	2	0	0	.00	1516.83	11952.58

1490 NH CARD USED

*SECNO 22.779

NEW CROSS SECTION W-1

22.78	15.19	1339.19	.00	.00	1339.25	.06	.38	.04	1336.00
15050.	11.	1408.	13631.	13.	748.	7092.	271.	67.	1336.00
.19	.86	1.88	1.92	.050	.065	.039	.000	1324.00	352.02
.000387	510.	1104.	400.	2	0	0	.00	1887.62	2239.64

1490 NH CARD USED

*SECNO 22.842

NEW CROSS SECTION W-2

22.84	11.21	1339.21	.00	.00	1339.28	.06	.02	.00	1334.00
15050.	708.	1373.	12969.	468.	692.	6315.	282.	69.	1334.00
.20	1.51	1.98	2.05	.050	.065	.039	.000	1328.00	437.31
.000435	245.	333.	25.	2	0	0	.00	1795.20	2232.51

1490 NH CARD USED

*SECNO 22.860

NEW CROSS SECTION W-3

22.86	13.24	1339.24	.00	.00	1339.29	.06	.01	.00	1334.00
15050.	532.	1937.	12581.	384.	1042.	6407.	289.	70.	1334.00
.20	1.38	1.86	1.96	.050	.065	.039	.000	1326.00	462.87
.000361	45.	96.	30.	0	0	0	.00	1765.46	2228.32

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1490 NH CARD USED
*SECNO 22.908
NEW CROSS SECTION W-4

22.91	11.25	1339.25	.00	.00	1339.32	.07	.02	.00	1334.00
15050.	279.	1244.	13527.	279.	590.	6447.	297.	72.	1334.00
.21	1.00	2.11	2.10	.064	.065	.040	.000	1328.00	973.76
.000469	195.	251.	13.	2	0	0	.00	1779.99	2753.75

1490 NH CARD USED
*SECNO 23.833
NEW CROSS SECTION W-5

23.83	12.06	1340.06	.00	.00	1340.25	.19	.87	.06	1338.00
15050.	13908.	988.	154.	3877.	349.	169.	487.	115.	1338.00
.31	3.59	2.83	.91	.035	.065	.065	.000	1328.00	898.28
.001170	285.	4884.	1632.	2	0	0	.00	1418.58	2316.86

*SECNO 24.080
G&O CROSS SECTION X

24.08	12.02	1341.02	.00	.00	1341.13	.11	.86	.02	1340.00
15050.	13092.	1958.	0.	5364.	477.	0.	567.	139.	1352.00
.38	2.44	4.10	.00	.054	.050	.053	.000	1329.00	10272.34
.001352	660.	898.	600.	2	0	0	.00	1690.63	11962.97

CCHV= .300 CEHV= .500
*SECNO 24.250
G&O CROSS SECTION Y

24.25	14.80	1343.50	.00	.00	1343.74	.24	2.54	.06	1342.00
15050.	7686.	4591.	2773.	2983.	782.	944.	730.	193.	1340.00
.48	2.58	5.87	2.94	.065	.050	.053	.000	1328.70	10245.70
.002899	1400.	1215.	1100.	2	0	0	.00	1773.05	12018.74

THIS RUN EXECUTED 07/11/87 16:43:18

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION APRIL 1985
**************************************************

T1      SEDGWICK COUNTY, KANSAS COWSKIN CREEK ENCROACHMENT PROFILE
T2      HNTB INPUT DATA W\NEW SECTIONS BETWEEN G&O SECTIONS W AND X
T3      CSK CRK U/S 13TH TO END OF DETAILED STUDY

J1  ICHECK     INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
       0.       3.        0.        0.   .000000       .00       .0        0.  1337.600      .000

J2  NPROF      IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
   15.000      .000     -1.000      .000      .000      .000      .000      .000      .000      .000
```

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*PROF 2

CCHV=    .300 CEHV=    .500
*SECNO 22.130

3470 ENCROACHMENT STATIONS=   10700.0   12013.0  TYPE=     1  TARGET=    1313.000
          G&O CROSS SECTION V JUST U/S FROM 13TH STREET
    22.13     16.60  1337.60      .00  1337.60  1337.68      .08       .00       .00  1330.00
   15050.        0.     1941.   13109.        0.      598.   6039.        0.        0.  1334.00
     .00       .00     3.24      2.17      .054      .050      .053      .000  1321.00 10700.00
 .000733        0.        0.        0.         0         0         0       .00  1313.00 12013.00

*SECNO 22.570

3470 ENCROACHMENT STATIONS=   10708.0   11636.0  TYPE=     1  TARGET=     928.000
          G&O CROSS SECTION W
    22.57     15.99  1339.09      .00  1338.65  1339.37      .28      1.59       .10  1334.00
   15050.       16.     4381.   10652.       10.      725.   3274.      153.       30.  1336.00
     .09      1.62      6.04      3.25      .054      .050      .053      .000  1323.10 10708.00
 .002148     1500.     2325.     1100.         2         0         0       .00   928.00 11636.00

1490 NH CARD USED
*SECNO 22.779
 2800 NAT Q1=    7649.40  WSEL=    1339.19  ENC Q1=    7649.40  WSEL=    1339.89  RATIO=     .0000
 NAT Q1=    9814.  RATIOS LOB,CH,ROB=     .0010     .0825     .9166  WSEL=    1339.89

3470 ENCROACHMENT STATIONS=     360.0    1774.7  TYPE=     4  TARGET=        .221
          NEW CROSS SECTION W-1
    22.78     15.80  1339.80      .00  1339.19  1339.86      .07       .43       .06  1336.00
   15050.        0.     1577.   13473.        0.      797.   6325.      216.       42.  1336.00
     .16       .00      1.98      2.13      .050      .065      .041      .000  1324.00   360.00
 .000415      510.     1104.      400.         2         0         0       .00  1414.66  1774.66

1490 NH CARD USED
*SECNO 22.842
 2800 NAT Q1=    7218.91  WSEL=    1339.21  ENC Q1=    7218.91  WSEL=    1339.91  RATIO=     .0000
 NAT Q1=    9234.  RATIOS LOB,CH,ROB=     .0493     .0812     .8695  WSEL=    1339.91

3470 ENCROACHMENT STATIONS=     600.0    1869.9  TYPE=     4  TARGET=        .218
          NEW CROSS SECTION W-2
```

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
22.84	11.81	1339.81	.00	1339.21	1339.90	.08	.02	.01	1334.00
15050.	0.	1520.	13530.	0.	740.	5866.	226.	44.	1334.00
.17	.00	2.05	2.31	.050	.065	.041	.000	1328.00	600.00
.000467	245.	333.	25.	2	0	0	.00	1269.94	1869.94

1490 NH CARD USED
*SECNO 22.860
2800 NAT Q1= 7925.24 WSEL= 1339.24 ENC Q1= 7925.24 WSEL= 1339.94 RATIO= .0000
NAT Q1= 10004. RATIOS LOB,CH,ROB= .0374 .1154 .8472 WSEL= 1339.94

3470 ENCROACHMENT STATIONS= 590.0 1846.1 TYPE= 4 TARGET= .208
NEW CROSS SECTION W-3

22.86	13.84	1339.84	.00	1339.24	1339.91	.07	.02	.00	1334.00
15050.	0.	2160.	12890.	0.	1111.	5827.	232.	45.	1334.00
.18	.00	1.94	2.21	.050	.065	.039	.000	1326.00	590.00
.000387	45.	96.	30.	0	0	0	.00	1256.06	1846.06

1490 NH CARD USED
*SECNO 22.908
2800 NAT Q1= 6952.20 WSEL= 1339.25 ENC Q1= 6952.20 WSEL= 1339.95 RATIO= .0000
NAT Q1= 8856. RATIOS LOB,CH,ROB= .0217 .0734 .9049 WSEL= 1339.95

3470 ENCROACHMENT STATIONS= 1105.0 2377.9 TYPE= 4 TARGET= .215
NEW CROSS SECTION W-4

22.91	11.85	1339.85	.00	1339.25	1339.94	.08	.02	.00	1334.00
15050.	0.	1356.	13694.	0.	630.	5919.	239.	45.	1334.00
.18	.00	2.15	2.31	.064	.065	.042	.000	1328.00	1105.00
.000502	195.	251.	13.	2	0	0	.00	1272.87	2377.87

1490 NH CARD USED
*SECNO 23.833
2800 NAT Q1= 4399.69 WSEL= 1340.06 ENC Q1= 4399.69 WSEL= 1340.76 RATIO= .0000
NAT Q1= 5843. RATIOS LOB,CH,ROB= .9260 .0571 .0169 WSEL= 1340.76

3470 ENCROACHMENT STATIONS= 1265.4 2155.0 TYPE= 4 TARGET= .247
NEW CROSS SECTION W-5

23.83	12.72	1340.72	.00	1340.06	1340.96	.25	.95	.08	1338.00
15050.	13939.	1111.	0.	3446.	378.	0.	417.	77.	1338.00
.27	4.05	2.94	.00	.035	.065	.065	.000	1328.00	1265.45
.001210	285.	4884.	1632.	2	0	0	.00	889.55	2155.00

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 24.080

3470 ENCROACHMENT STATIONS= 10588.0 11995.0 TYPE= 1 TARGET= 1407.000

G&O CROSS SECTION X

24.08	12.72	1341.72	.00	1341.02	1341.84	.12	.84	.04	1340.00
15050.	12951.	2099.	0.	5108.	519.	0.	491.	94.	100000.00
.34	2.54	4.05	.00	.054	.050	.053	.000	1329.00	10588.00
.001232	660.	898.	600.	2	0	0	.00	1377.00	11965.00

CCHV= .300 CEHV= .500
*SECNO 24.250

3470 ENCROACHMENT STATIONS= 10513.0 11764.0 TYPE= 1 TARGET= 1251.000

G&O CROSS SECTION Y

24.25	15.41	1344.11	.00	1343.50	1344.42	.32	2.49	.10	1342.00
15050.	8307.	5421.	1321.	2877.	846.	364.	643.	136.	1340.00
.43	2.89	6.41	3.63	.065	.050	.053	.000	1328.70	10513.00
.003109	1400.	1215.	1100.	2	0	0	.00	1251.00	11764.00

THIS RUN EXECUTED 07/11/87 16:45:23

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  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION APRIL 1985
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

CSK CRK U/S 13TH TO END

SUMMARY PRINTOUT TABLE 110

SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
22.130	1337.60	.00	1337.65	2088.80	1061.76	1675.95	12312.29	.00	.00	10700.00	10760.00	.00
22.130	1337.60	.00	1337.68	1313.00	.00	1941.40	13108.60	1313.00	10700.00	10700.00	10760.00	12013.00
22.570	1338.65	.00	1338.83	1516.83	1748.26	3691.19	9610.55	.00	.00	10710.00	10782.00	.00
22.570	1339.09	.44	1339.37	928.00	16.48	4381.17	10652.35	928.00	10708.00	10710.00	10782.00	11636.00
22.779	1339.19	.00	1339.25	1887.62	11.00	1407.52	13631.48	.00	.00	360.00	442.00	.00
22.779	1339.80	.60	1339.86	1414.66	.00	1576.54	13473.46	.22	360.00	360.00	442.00	1774.66
22.842	1339.21	.00	1339.28	1795.20	707.96	1373.12	12968.92	.00	.00	600.00	680.00	.00
22.842	1339.81	.60	1339.90	1269.94	.00	1519.78	13530.22	.22	600.00	600.00	680.00	1869.94
22.860	1339.24	.00	1339.29	1765.46	531.73	1937.08	12581.19	.00	.00	590.00	705.00	.00
22.860	1339.84	.60	1339.91	1256.06	.00	2159.58	12890.42	.21	590.00	590.00	705.00	1846.06
22.908	1339.25	.00	1339.32	1779.99	279.45	1243.84	13526.71	.00	.00	1105.00	1170.00	.00
22.908	1339.85	.60	1339.94	1272.87	.00	1355.68	13694.33	.22	1105.00	1105.00	1170.00	2377.87
23.833	1340.06	.00	1340.25	1418.58	13907.93	987.58	154.49	.00	.00	2110.00	2155.00	.00
23.833	1340.72	.66	1340.96	889.55	13938.70	1111.30	.00	.25	1265.45	2110.00	2155.00	2155.00
24.080	1341.02	.00	1341.13	1690.63	13092.34	1957.66	.00	.00	.00	11905.00	11995.00	.00
24.080	1341.72	.70	1341.84	1377.00	12950.87	2099.13	.00	1407.00	10588.00	11905.00	11995.00	11995.00
24.250	1343.50	.00	1343.74	1773.05	7685.64	4591.50	2772.87	.00	.00	11560.00	11665.00	.00
24.250	1344.11	.61	1344.42	1251.00	8307.33	5421.23	1321.44	1251.00	10513.00	11560.00	11665.00	11764.00

CSK CRK U/S 13TH TO END

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
22.130	.00	.00	.00	1321.00	15050.00	1337.60	.00	1337.65	4.73	2.80	8793.89	6923.26
22.130	.00	.00	.00	1321.00	15050.00	1337.60	.00	1337.68	7.33	3.24	6637.23	5559.66
22.570	2325.00	.00	.00	1323.10	15050.00	1338.65	.00	1338.83	17.71	5.33	5045.01	3576.36
22.570	2325.00	.00	.00	1323.10	15050.00	1339.09	.00	1339.37	21.48	6.04	4008.72	3247.13
22.779	1104.00	.00	.00	1324.00	15050.00	1339.19	.00	1339.25	3.87	1.88	7852.61	7649.40
22.779	1104.00	.00	.00	1324.00	15050.00	1339.80	.00	1339.86	4.15	1.98	7121.80	7385.58
22.842	333.00	.00	.00	1328.00	15050.00	1339.21	.00	1339.28	4.35	1.98	7474.60	7218.91
22.842	333.00	.00	.00	1328.00	15050.00	1339.81	.00	1339.90	4.67	2.05	6606.30	6965.95
22.860	96.00	.00	.00	1326.00	15050.00	1339.24	.00	1339.29	3.61	1.86	7833.48	7925.24
22.860	96.00	.00	.00	1326.00	15050.00	1339.84	.00	1339.91	3.87	1.94	6938.09	7654.58
22.908	251.00	.00	.00	1328.00	15050.00	1339.25	.00	1339.32	4.69	2.11	7315.79	6952.20
22.908	251.00	.00	.00	1328.00	15050.00	1339.85	.00	1339.94	5.02	2.15	6548.38	6716.83
23.833	4884.00	.00	.00	1328.00	15050.00	1340.06	.00	1340.25	11.70	2.83	4394.61	4399.69
23.833	4884.00	.00	.00	1328.00	15050.00	1340.72	.00	1340.96	12.10	2.94	3823.87	4327.05
24.080	898.00	.00	.00	1329.00	15050.00	1341.02	.00	1341.13	13.52	4.10	5841.19	4092.47
24.080	898.00	.00	.00	1329.00	15050.00	1341.72	.00	1341.84	12.32	4.05	5626.74	4288.29
24.250	1215.00	.00	.00	1328.70	15050.00	1343.50	.00	1343.74	28.99	5.87	4709.21	2795.29
24.250	1215.00	.00	.00	1328.70	15050.00	1344.11	.00	1344.42	31.09	6.41	4087.18	2699.18

CSK CRK U/S 13TH TO END

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
22.130	15050.00	1337.60	.00	.00	.00	2088.80	.00
22.130	15050.00	1337.60	.00	.00	.00	1313.00	.00
22.570	15050.00	1338.65	.00	1.05	.00	1516.83	2325.00
22.570	15050.00	1339.09	.44	1.49	.44	928.00	2325.00
22.779	15050.00	1339.19	.00	.55	.00	1887.62	1104.00
22.779	15050.00	1339.80	.60	.71	.60	1414.66	1104.00
22.842	15050.00	1339.21	.00	.02	.00	1795.20	333.00
22.842	15050.00	1339.81	.60	.02	.60	1269.94	333.00
22.860	15050.00	1339.24	.00	.02	.00	1765.46	96.00
22.860	15050.00	1339.84	.60	.03	.60	1256.06	96.00
22.908	15050.00	1339.25	.00	.01	.00	1779.99	251.00
22.908	15050.00	1339.85	.60	.01	.60	1272.87	251.00
23.833	15050.00	1340.06	.00	.81	.00	1418.58	4884.00
23.833	15050.00	1340.72	.66	.87	.66	869.55	4884.00
24.080	15050.00	1341.02	.00	.96	.00	1690.63	898.00
24.080	15050.00	1341.72	.70	1.00	.70	1377.00	898.00
24.250	15050.00	1343.50	.00	2.48	.00	1773.05	1215.00
24.250	15050.00	1344.11	.61	2.39	.61	1251.00	1215.00

SUMMARY OF ERRORS AND SPECIAL NOTES

FLOODWAY DATA, CSK CRK U/S 13TH TO END
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WITHOUT FLOODWAY	DIFFERENCE
22.130	1313.	6637.	2.3	1337.6	1337.6	.0
22.570	928.	4009.	3.8	1339.0	1338.6	.4
22.779	1415.	7122.	2.1	1339.8	1339.2	.6
22.842	1270.	6606.	2.3	1339.8	1339.2	.6
22.860	1256.	6938.	2.2	1339.8	1339.2	.6
22.908	1273.	6548.	2.3	1339.8	1339.2	.6
23.833	890.	3824.	3.9	1340.8	1340.1	.7
24.080	1377.	5627.	2.7	1341.7	1341.0	.7
24.250	1251.	4087.	3.7	1344.1	1343.5	.6

THIS RUN EXECUTED 07/11/87 16:47:12

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  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION APRIL 1985
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FLOODING SOURCE			FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION		DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
COWSKIN CREEK	HNTB DISTANCE								
V	22.13	13.79	1313	6637	2.2	1337.6	1337.6	1337.6	0.0
W	22.57	14.30	928	4009	3.8	1338.6	1338.6	1339.1	0.5
W-1	22.779		1415	7122	2.1	1339.2	1339.2	1339.8	0.6
W-2	22.842		1270	6606	2.3	1339.2	1339.2	1339.8	0.6
W-3	22.860		1256	6938	2.2	1339.2	1339.2	1339.8	0.6
W-4	22.908		1273	6548	2.3	1339.2	1339.2	1339.8	0.6
W-5	23.833		890	3824	3.9	1340.1	1340.1	1340.7	0.6
X	24.080	16.00	1377	5627	2.7	1341.0	1341.0	1341.7	0.7
Y	24.250	16.17	1251	4087	3.7	1343.5	1343.5	1344.1	0.6

[1]MILES ABOVE MOUTH

TABLE 1

CITY OF WICHITA, KANSAS
(SEDGWICK COUNTY)

FLOODWAY DATA

COWSKIN CREEK


CORPORATE LIMITS
W
W
HUNTER VIEW
14TH STREET
STREET WEST
119TH
V
13TH
BRIARWOOD
U
Cowskin
T
S
PINE GROVE
PONDEROSA
PARKRIDGE
Creek
Cowskin Creek

Exhibit 1

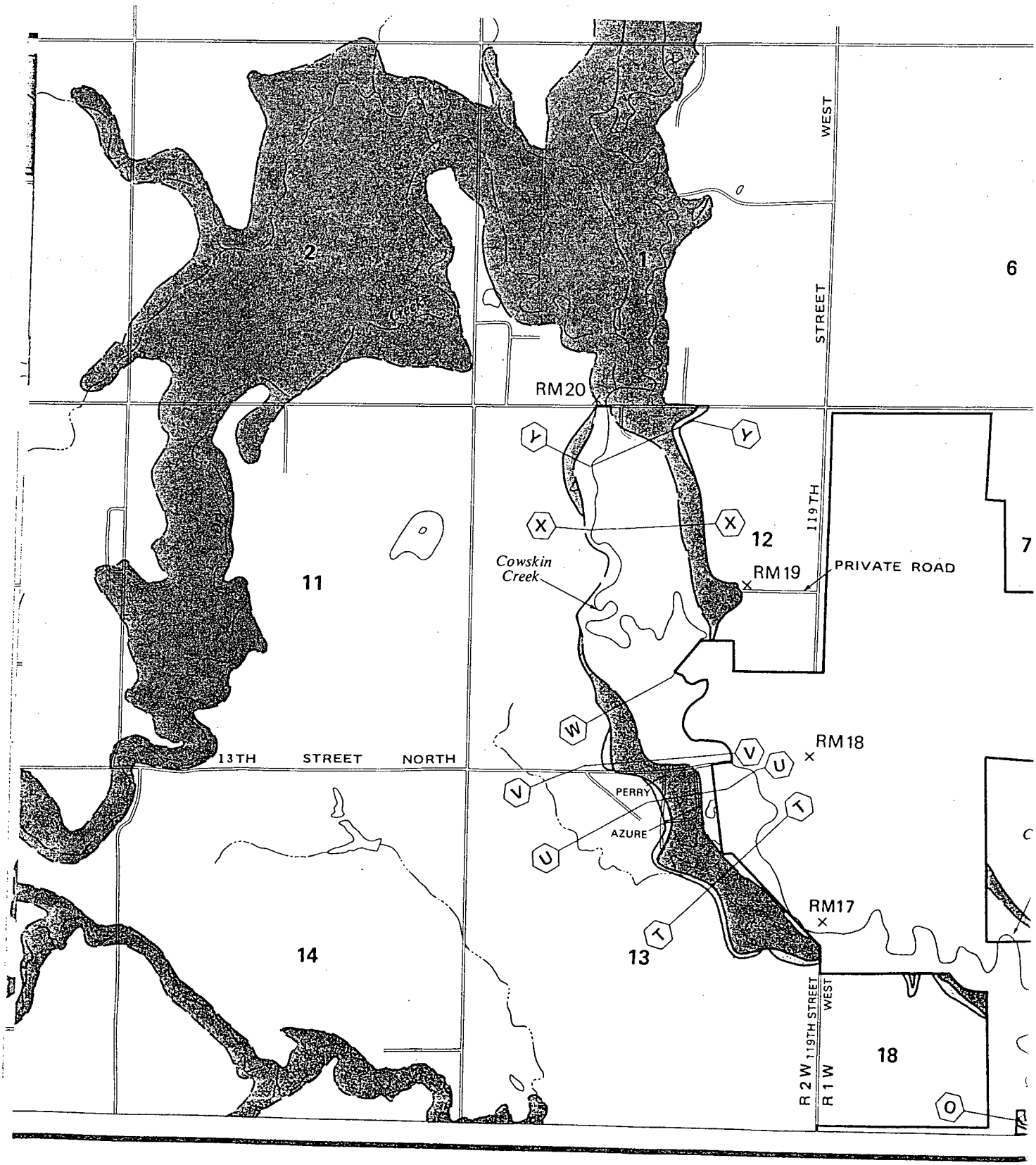
WEST
STREET
6
RM20
Y
Y
X
X
12
119TH
7
Cowskin
Creek
RM19
PRIVATE ROAD
11
W
RM18
V
U
13TH STREET NORTH
V
PERRY
T
AZURE
U
RM17
T
14
13
119TH STREET WEST
R 2 W
R 1 W
18
O

Exhibit 2

GEOMETRIC MODEL
COWSKIN CREEK
13th to 21st