

SECTION IV – DRAINAGE BASIN

WATERSHED DELINEATIONS

There are 49 drainage systems and 188 subbasins were delineated based on the LiDAR DEM dataset for this project using ArcHydro tools and HEC-GeoHMS extension. The 49 drainage systems cover approximately 238 square miles, as displayed in **Figure 5**.

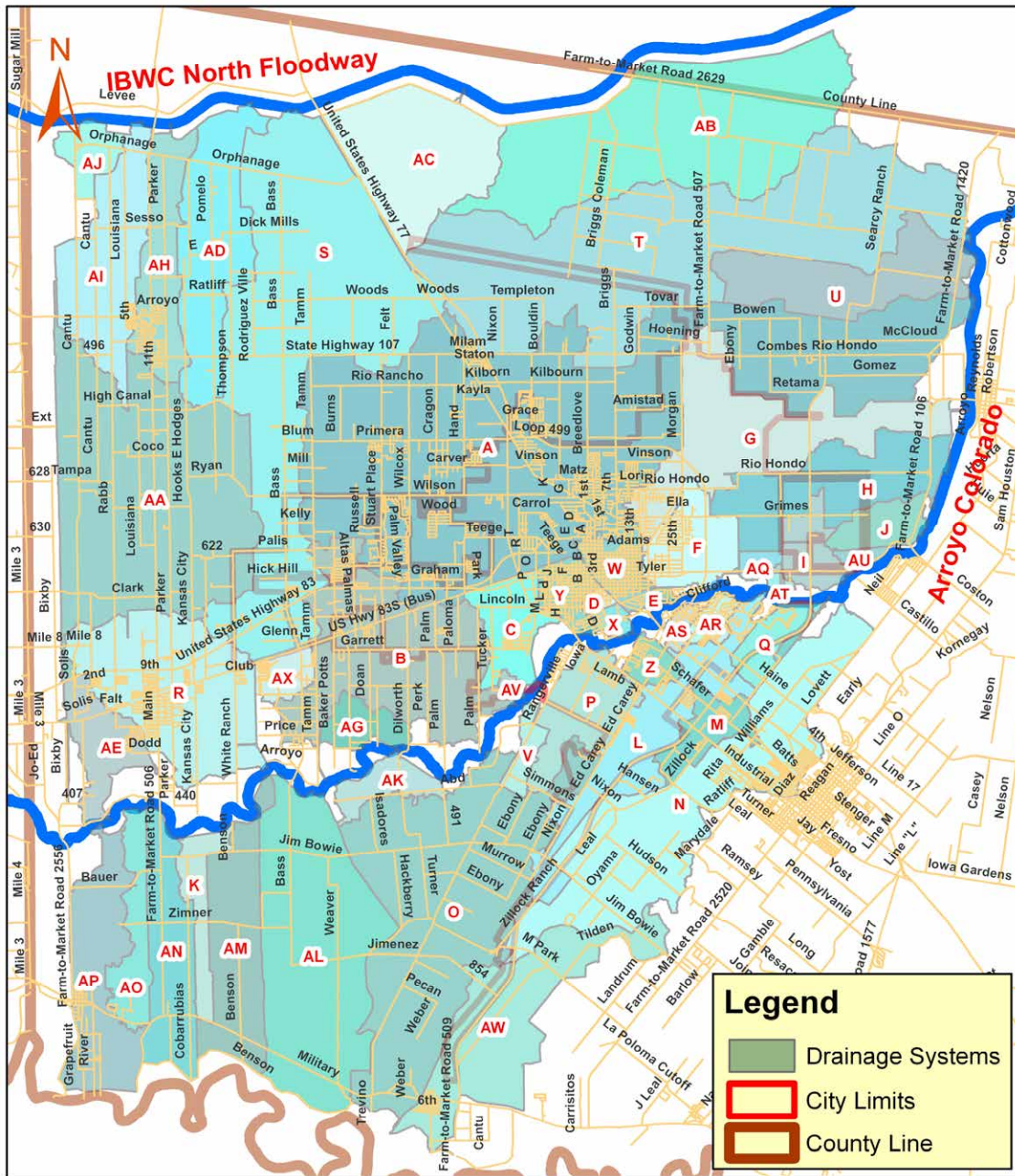


FIGURE 5. OVERALL DRAINAGE SYSTEMS MAP

As shown in **Figure 5**, coverage of the delineated drainage systems extends beyond the City limit and 3 ½ mile ETJ (the study area). The additional drainage systems were delineated, which provide for the benefit to the City and adjacent municipalities for future drainage planning studies.

Systems A, B, C, and AG were previously studied by CCDD5 with detailed hydrologic and hydraulic models. These drainage systems were identified as North Main Drain, Stuart Place Drain, Dixieland Drain, Southwest Drain respectively in the CCDD5 Flood Protection Plan report. The drainage ditches studied by CCDD5 were limited to those contained within the district boundary. Ditches maintained by the City, TxDOT and others, such as 13th Street, 3rd Street, Matz Drain, and T Street within System A, Wal Mart and TxDOT ditches within System C, and Adams Gardens Irrigation District No. 19 ditches within System S were not studied by the CCDD5 study. Drainage ditches which provide outfalls for the storm systems within the City were studied in detailed. These ditches are contained within nine drainage basins delineated in this study. The nine drainage systems cover a total drainage area of approximately 72 square miles, as shown in **Figure 6**. The nine drainage systems are:

- System A – North Main Drain City Tributaries
- System C – Dixieland Main
- System E – Little Creek
- System F – 32nd Street
- System G – Airport Ditches
- System H – Rio Hondo Ditches
- System P – Lipscomb Drain
- System S – Adams Gardens Irrigation District No. 19 Ditches
- System Z – Glasscock Ditch

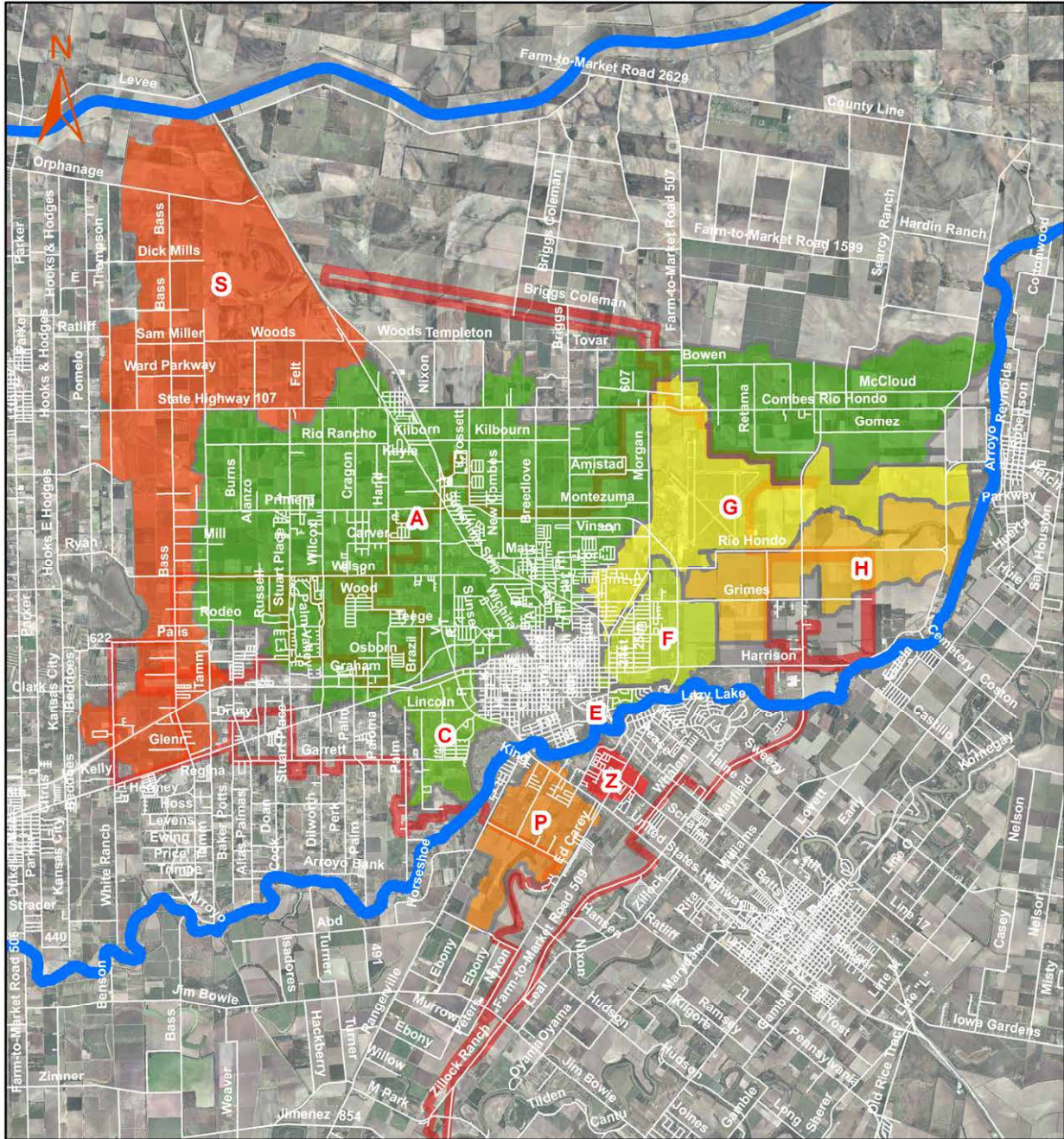


FIGURE 6. DRAINAGE BASINS WITH DETAILED ANALYSIS

HYDROLOGIC ANALYSIS

Corresponding to the 49 drainage systems delineated, 49 HEC-HMS models were developed to simulate hydrologic conditions within each drainage system. Peak flows and hydrographs were computed for each frequency storm event. As discussed earlier, drainage ditches which are contained in nine drainage basins were studied with detailed HEC-RAS hydraulic models. For this reason, drainage and hydrologic parameters and peak discharges for the nine drainage systems were presented in **Tables 8 and 9**. Also, it should be noted that parameters and peak flows for System A are provided for only the studied tributaries drainage areas.

TABLE 8. WATERSHED AND HYDROLOGIC PARAMETERS

SUBAREA	ACREAGE	SQUARE M	CN	SLOPE	LENGTH	484 TLAG	200 TLAG
SYSTEM A – CITY TRIBUTARIES TO NORTH MAN DRAIN: 13TH STREET & 3RD STREET DITCHES							
A_13 TH _1	531.2	0.830	80.5	0.0014	5580	199	481
A_13 TH _2	678.9	1.061	80.5	0.0014	8190	270	654
A_3 RD _1	956.1	1.494	84.9	0.0011	8220	267	645
A_3 RD _2	539.1	0.842	84.9	0.0011	12120	364	880
SYSTEM A – CITY TRIBUTARIES TO NORTH MAN DRAIN: MATZ, T-STREET, UNKNOWN DITCHES							
MATZ	182.0	0.284	79.0	0.0006	5280	304	735
T-STREET	864.0	1.350	84.0	0.0006	9609	417	1010
UNKNOWN	12.0	0.019	76.0	0.0090	800	19	46
SYSTEM C – DIXIELAND, WALMART, & TXDOT DITCHES							
AA1	148.5	0.232	79.7	0.0003	3585	320	773
AA2	201.3	0.315	79.7	0.0008	3745	196	474
AA3	220.8	0.345	79.7	0.0006	6472	344	834
C1	238.9	0.373	83.5	0.0021	5621	147	355
C2	226.9	0.355	83.5	0.0022	5034	132	320
C3	225.0	0.352	83.5	0.0006	6522	309	747
SYSTEM E – LITTLE CREEK							
E	161.3	0.252	86.7	0.0004	5447	308	745
SYSTEM F – 32ND DRAIN, PETER PIPE-JEFFERSON, LOOP-HARRISON, WASHINGTON							
F1	525.1	0.821	84.5	0.0018	9900	241	583
F2	163.3	0.255	84.5	0.0018	5300	146	354
F3	386.2	0.603	84.5	0.0018	4800	135	327
F4	148.7	0.232	84.5	0.0018	8300	209	507
F5	243.9	0.381	84.5	0.0018	5800	157	380
F6	549.8	0.859	84.5	0.0018	6750	177	429

TABLE 8 (CONT). WATERSHED AND HYDROLOGIC PARAMETERS

SUBAREA	ACREAGE	AREA	CN	SLOPE	LENGTH	484 TLAG	200 TLAG
SYSTEM G – CCDD5 (AIRPORT) DITCHES: G_CC1, G_CC2, G_CC3, G_CC5, G_CC7							
G1	915.6	1.431	81.1	0.0005	11890	593	1436
G2	942.7	1.473	81.1	0.0002	8711	686	1660
G3	244.2	0.382	81.1	0.0005	7793	420	1016
G4	504.4	0.788	81.1	0.0003	6322	452	1094
G5	334.5	0.523	78.8	0.0001	7690	887	2146
G6	367.4	0.574	78.8	0.0006	8792	472	1142
G7	419.6	0.656	82.1	0.0002	9723	767	1856
G8	355.0	0.555	82.1	0.0006	6734	336	814
G9	151.7	0.237	82.1	0.0002	4508	399	966
SYSTEM H - CC & TxDOT DITCHES: RIO HONDO ROAD (FM 1595) DITCH							
H1	178.8	0.279	81.7	0.0002	4740	432	1045
H2	239.6	0.374	81.7	0.0002	5710	550	1331
H3	472.8	0.739	81.7	0.0003	8710	550	1330
H4	263.7	0.412	81.7	0.0005	4270	267	645
H5	687.7	1.075	81.7	0.0005	6090	345	836
H6	238.7	0.373	81.7	0.0004	6690	390	944
H7	973.6	1.521	81.7	0.0002	10680	878	2124
H8	215.6	0.337	81.7	0.0002	4980	460	1114
SYSTEM P - LIPSCOMB & CANTU DITCHES							
C1	224.1	0.3502	81.78	0.0012	4300	167	404
C2	85.4	0.1334	81.78	0.0015	3400	124	300
C3	75.7	0.1183	81.78	0.0006	3150	184	446
C4	172.7	0.2698	81.78	0.0003	5300	395	956
CT	121.8	0.1903	81.78	0.0014	2800	110	266
L1	309.8	0.4841	81.78	0.0003	6100	442	1069
L2	256.5	0.4008	81.78	0.0009	5400	231	560
L3	244.3	0.3817	81.78	0.0009	5650	240	581
L4	216.3	0.3380	81.78	0.0008	4800	223	541

TABLE 8 (CONT). WATERSHED AND HYDROLOGIC PARAMETERS

SUBAREA	ACREAGE	AREA	CN	SLOPE	LENGTH	484 TLAG	200 TLAG
SYSTEM S - ADAMS GARDENS IRRIGATION DISTRICT NO. 19 DITCHES							
S1	2041.0	3.189	69.67	0.0003	15173	1245	3014
S2	1987.3	3.105	74.16	0.0002	25121	1934	4681
S3	238.7	0.373	72.17	0.0004	7816	634	1534
S4	459.8	0.718	70.22	0.0004	13459	1050	2541
S5	439.4	0.686	70.22	0.0003	12027	1014	2454
S6	265.7	0.415	70.22	0.0002	5690	767	1855
ST1-1	863.5	1.349	72.96	0.0004	18444	1239	3000
ST1-2	617.7	0.965	71.49	0.0007	7603	483	1168
ST1-3	1340.9	2.095	71.50	0.0003	17370	1413	3419
ST1-4	743.8	1.162	70.78	0.0003	9960	903	2184
ST1-5	910.0	1.422	66.88	0.0004	13262	1126	2725
ST2-1	457.1	0.714	72.66	0.0003	11294	1009	2442
ST2-2	1005.3	1.571	72.66	0.0003	13788	1133	2742
ST2-3	375.5	0.587	70.22	0.0002	6230	704	1704
SYSTEM Z - GLASSCOCK DITCH							
Z	422.9	0.661	85.07	0.0008	4938	203	492

TABLE 9. HEC-HMS PEAK FLOW RESULTS

DITCH SYSTEM	DRAINAGE AREA/ NODE	CHANNEL STATION	AREA (S.M.)	2-YR	5-YR	10-YR	25-YR	100-YR
SYSTEM A – NORTH MAIN DRAIN CITY TRIBUTARIES								
13th STREET	DA 13TH_1	9889	0.830	82	146	190	253	366
13th STREET	DA 13TH_2		1.061	81	146	189	252	364
13th STREET	JCT-13TH	6435	1.891	145	263	340	453	648
SYSTEM B - 3RD STREET								
3rd STREET	DA 3RD_1	8594	1.494	129	226	289	380	540
3rd STREET	DA 3RD_2		0.842	56	99	126	166	235
3rd STREET	JCT-3RD	2262.3	2.336	172	303	387	510	721
SYSTEM D - MATZ DITCH								
MATZ DITCH	MATZ	2990	0.280	19	34	44	59	86
T-STREET DITCH	T-STREET	2698	1.350	78	139	177	236	333
UNKNOWN DITCH	UNKNOWN	617	0.020	10	18	24	31	42
SYSTEM C - DIXIELAND MAIN								
DIXIELAND	DA-AA1		0.232	15	28	36	48	69
DIXIELAND	DA-AA2		0.315	31	55	72	96	139
DIXIELAND	DA-AA3		0.345	21	38	50	67	96
DIXIELAND	JCT AA1	11832.0	0.232	15	28	36	48	69
DIXIELAND	JCT AA2	8478.0	0.547	41	74	96	128	186
DIXIELAND	JCT AA3	4842.0	0.892	60	110	143	191	276
SYSTEM D - TXDOT								
TXDOT	DA-C1		0.373	52	89	115	150	216
WALMART	DA-C2	2860.9	0.355	53	92	119	155	222
TXDOT	DA-C3		0.352	26	46	59	78	111
TXDOT	JCT C1	7580.3	0.373	52	89	115	150	216
TXDOT	JCT C2	5707.3	0.728	104	180	233	304	436
TXDOT	JCT C3	2412.9	1.079	121	211	272	357	512
TXDOT	OUTLET_C	279.9	1.971	166	294	380	503	724
SYSTEM E - LITTLE CREEK								
LITTLE CREEK	OUTLET_E	2985.5	0.252	18	34	43	57	81
SYSTEM F - 32ND DRAIN								
	F1		0.820	77	134	172	226	322
	F2		0.260	37	63	82	106	152
	F3		0.600	91	156	200	261	372
LOOP-HARRISON	F4	2610.4	0.230	24	42	54	71	101
	F5		0.380	51	88	113	147	210
	F6		0.859	104	179	231	302	432
32ND_DRAIN	JCT-F1	8134.9	0.820	77	134	172	226	322
32ND_DRAIN	JCT-F2	3171.7	2.539	261	477	615	806	1138
PP-JEFFERSON	JCT-F3	1047.7	1.719	212	378	487	634	907
PP-JEFFERSON	JCT-F4	2808.9	1.119	137	237	305	398	569
32ND_DRAIN	JCT-F5		3.149	330	601	774	1015	1438
PP-JEFFERSON	JCT-F6	5932.3	0.859	104	179	231	302	432
32ND_DRAIN	OUTLET_F1	742.6	3.149	330	601	774	1015	1438

TABLE 9 (CONT). HEC-HMS PEAK FLOW RESULTS

DITCH SYSTEM	DRAINAGE AREA/NODE	CHANNEL STATION	AREA (S.M.)	2-YR	5-YR	10-YR	25-YR	100-YR
SYSTEM G - AIRPORT DRAINAGE SYSTEM								
	G-1		1.431	57	105	134	181	255
	G-2		1.473	51	96	122	165	233
	G-3		0.382	20	37	48	64	91
G_CC2	G-4	4598.1	0.788	39	72	93	124	177
	G-5		0.523	14	26	33	46	65
	G-6		0.574	26	49	63	85	121
	G-7		0.656	21	39	50	68	95
	G-8		0.555	37	66	85	113	161
	G-9		0.237	13	25	31	42	60
G_CC1D	JCT 1	36776.8	1.431	57	105	134	181	255
G_CC1C	JCT 2	29194.9	2.904	108	200	254	345	487
G_CC1C	JCT 3	24444.8	3.285	120	222	283	384	543
G_CC1B	JCT 4	19771.1	4.073	151	280	357	483	683
G_CC5B	JCT 5	13093.0	0.523	14	26	33	46	65
G_CC1A	JCT 6	18794.3	5.170	33	62	80	109	155
G_CC5A	JCT 6A	2791.9	1.097	33	62	80	109	155
G_CC1A	JCT 7	15132.3	5.826	204	378	483	655	926
G_CC1A	JCT 8	4232.5	6.380	216	402	512	696	983
G_CC1A	OUTLET_G	2004.6	6.617	223	414	528	717	1013
SYSTEM H – RIO HONDO ROAD (FM 1595) DITCH								
	H-1		0.279	15	27	34	46	65
	H-2		0.374	16	30	38	51	72
	H-3		0.739	32	58	74	100	141
	H-4		0.412	33	59	76	101	145
	H-5		1.075	68	124	159	213	303
H_TXDOT2	H-6	4031.7	0.373	21	39	50	67	95
	H-7		1.521	43	81	102	139	196
	H-8		0.337	17	31	39	53	75
H_TXDOT1	JCT 1	23054.3	0.279	15	27	34	46	66
H_TXDOT1	JCT 2	20684.7	0.654	30	55	71	95	135
H_TXDOT1	JCT 3	17888.6	1.392	61	113	144	194	275
H_TXDOT1	JCT 4	15096.7	1.805	75	139	177	239	337
H_TXDOT1	JCT 5	11000.3	2.879	139	255	327	438	623
H_CC	JCT 6	8150.7	3.252	161	294	377	505	718
H_CC	JCT 7	5178.8	4.773	182	334	427	575	816
H_CC	OUTLET_H	920.4	5.110	198	364	466	628	890

TABLE 9 (CONT). HEC-HMS PEAK FLOW RESULTS

DITCH SYSTEM	DRAINAGE AREA/ NODE	CHANNEL STATION	AREA (S.M.)	2-YR	5-YR	10-YR	25-YR	100-YR
SYSTEM P - LIPSCOMB DITCH								
LIPSCOMB	J2	6003.7	0.8849	50	91	118	157	225
LIPSCOMB	J1A	4604.9	1.2666	83	149	192	256	367
LIPSCOMB	J1	3473.7	2.329	169	302	392	521	751
LIPSCOMB	OUTLET_P	1756.1	2.667	200	357	463	615	887
CANTU	J6	7379.7	0.350	42	73	95	125	180
CANTU	J5	4426.7	0.674	87	153	198	261	376
CANTU	J4	2551.2	0.792	99	174	225	297	428
CANTU	J1B	1022.0	1.062	104	184	239	315	455
ED CAREY	CT	2441.8	0.190	32	55	72	94	135
SYSTEM S - ADAMS GARDENS IRRIGATION DISTRICT NO. 19 DITCHES								
AGID19_R3	JS6	55508.6	0.415	10	20	26	36	53
AGID19_R3	JS5	47535.5	1.102	22	44	58	81	118
AGID19_R3	J180	41259.0	1.820	35	70	91	128	186
AGID19_R2	J176	33992.6	5.065	96	191	248	349	506
AGID19_R2	J191	21139.3	8.170	117	231	298	419	605
AGID19_R1	J196	12132.9	15.163	218	432	559	789	1142
AGID19_R1	OUTLET_S	1520.7	18.352	266	528	684	966	1398
AGID19_1_R1	J181	13114.1	3.933	67	133	173	245	355
AGID19_2_R2	JT23	22242.2	0.587	14	28	36	51	74
AGID19_2_R2	--	18462.6		24	47	61	86	124
AGID19_2_R1	JT22	12017.5	2.157	40	80	103	145	210
AGID19_2_R1	J171	9928.7	2.872	55	108	139	196	283
SYSTEM Z - GLASSCOCK DITCH								
GLASSCOCK	OUTLET_Z	3600.3	0.661	72	125	160	210	299

All resulting HEC-HMS models and modeling results are contained on the attached **CD-ROM**.