



**Appendix L**





# M.J. HARDEN ASSOCIATES, INC.

Photogrammetry ■ Digital Mapping ■ AM/FM/GIS

Post-it <sup>®</sup> Fax Note	7671	Date	# of pages ▶ 1
To	Kent Lage	From	
Co./Dept.		Co.	
Phone #		Phone #	
Fax #	339 3626	Fax #	

January 12, 1995

Mr. Kent Lage  
Black & Veatch  
8400 Ward Parkway  
Kansas City, MO 64114

RE: City of Leavenworth

Dear Kent:

The following is conformation of the decisions made at the meeting on December 29, 1994 regarding the digital data of the storm sewers in Leavenworth, Kansas. As we discussed, MJH will 1) separate the pipe size into its own column, 2) import the text files into an Informix database and 3) create a RIS link between the text files and the graphics.

I hope this will allow you to proceed with the services in your contract. If you need additional information or clarification, please give me a call.

Sincerely,

Randall L. Mayden  
Project Consultant

*verified per phone conversation  
w/ Randy Mayden on 1/13/95  
that RIS linkage will be  
between Informix & Graphics.*

*Verbal commitment from  
Randy to include m/r/m  
elevations in Informix.*

*KL  
1/13/95*



# BLACK & VEATCH

8400 Ward Parkway, P.O. Box No. 8405, Kansas City, Missouri 64114, (913) 339-2000

## FACSIMILE COVER SHEET

TO: ROBERT PATZOLD

FAX PHONE NO.: (913) 682-1521

FROM: JEFF HENSON

DATE: 4-27-95

PROJECT NO.: 26592.110

NUMBER OF PAGES: 3 (including this sheet)

COMMENTS: \_\_\_\_\_

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In case of transmission problems, please call Michelle Burns at (913) 339-3550.

This FAX number is (913) 339-3626.

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MEMORANDUM

City of Leavenworth Public Works Department  
Stormwater Masterplan  
Intergraph budgeting Information

B&V Project 26592.110  
B&V File C-1.0  
April 25, 1995

To: Jeff Henson

From: Kent Lage/Jennifer Barber <sup>LLC</sup> <sub>JHB</sub>

Following is a summary of our recommendations for hardware and software for Leavenworth Public Works Department. Our understanding of Leavenworth's present needs is that they are not looking to develop and implement an AM/FM/GIS system at this time, but rather to view, manipulate, update, and plot base map data provided by MJ Harden (in Intergraph format) as well as the results of the Stormwater Master Plan. Therefore, we view the Public Works staff to be end users and not programmers at this time. Based on our understanding, Intergraph/Microstation is a very appropriate AM/FM/GIS solution at this time. The Intergraph software may also be their long-term AM/FM/GIS solution, however, our hardware and software recommendations should be viewed as minimizing expenditures to meet the short-term needs and not be construed as an AM/FM/GIS platform recommendation.

Hardware:

90 mhz pentium PC with Windows (CAD pc-based workstation)	\$ 6,000*
- CD-ROM	
- Dual color graphics card	
- Two 17-inch color SVGA monitors	
- Digitizer tablet	
- 1Gb hard drive	
- 32 mb RAM	
- External Colorado Tape Backup	

HP650C color Plotter	\$ 9,000
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Software:

Intergraph Microstation	\$ 4,000
dBase IV	\$ 500
Total	\$19,500

\* This cost is conservative and will vary depending on brand of computer purchased and the city's purchasing agents requirements. From our conversations with Mike and Bob, it appears that they have a PC capable of running Microstation, so the actual



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MEMORANDUM

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Leavenworth Public Works Department  
Stormwater Masterplan  
Intergraph budgeting Information

B&V Project 06592.110

April 25, 1995

hardware cost may be reduced significantly. We have included the cost of the PC for their budgeting purposes.

We feel the above hardware and software will provide Public Works with the basic capabilities they need over the next one to two years. Although there is limited flexibility in the software compared with a "full-blown" AM/FM/GIS setup, we do not envision Public Works needing the additional flexibility at this time, and therefore the additional costs.

We would be happy to discuss this with you and/or Public Works Staff.

cc: Dave Hunt

## MODELING

At the inception of the Stormwater Master Plan, Leavenworth did not have a labeling system for the stormwater conveyance system network. The labeling system was developed by M.J. Harden & Associates, Inc., as part of the aerial mapping project. Five-digit numbers, between 84464 and 92284, were assigned randomly to manholes, junctions, inlets, and culvert ends. Three-digit and four-digit numbers to 2547 were assigned randomly to pipes and culverts. Open channels and bridges not numbered by M.J. Harden were labeled randomly with four-digit numbers between 2548 and 3331 by Black & Veatch. Nodes in the model not representing stormwater structures, but necessary to separate long stretches of open channel, were added by Black & Veatch and assigned five-digit numbers between 92285 and 92870. Nodes and conduits in the external (EMC) watershed models were numbered 1, 2, 3, etc., starting at the upstream reach of each system. Labels are shown on the figures in Chapter VIII and Appendices J and K.

The SWMM model was developed in 1969-1971 under the supervision of the US EPA for analyzing both stormwater runoff quantity and non-point pollution problems. The model is being continuously updated and is the choice of many experts for analyzing stormwater runoff from both water quantity and quality standpoints. The basic unit of the SWMM model is the "block." SWMM is composed of several interrelated blocks, all of which can be used together or separately.

The Runoff block simulates the rainfall onto the watershed and routes the excess rainfall (total rainfall minus infiltration and depression storage) overland to inlets, and also determines the overland flow runoff hydrographs. The Runoff, Transport, and Extended Transport (Extran) blocks route flows and pollutants through the sewer or drainage system. Very sophisticated hydraulic routing, including surcharging pipes and backwater conditions, may be performed with Extran. Control devices upon flow and quality are simulated in the Storage/Treatment block. The engineer/technician/modeler typically uses the Runoff block to enter the hydrologic and surface data to simulate the rainfall-runoff process. Then, either the Transport or Extran block is used to route the runoff hydrographs and/or other inflow through the drainage channels, structures, and/or underground system(s). In XP-SWMM, treatment devices are incorporated in the Transport block, and storage options are available in both Transport and Extran.

According to XP Software, the graphical EXPERT environment (XP) is a friendly, graphics-based environment utilized by a number of drainage packages. It encompasses data entry, run-time graphics and post-processing of results in graphical form. The EXPERT shell acts as an interpreter between the user and the model in the classical style

of an "embedded" expert system. The shell incorporates both pre- and post-processors which use the expert knowledge of experienced users to filter the input data, and to create and interpret a valid and reasonable model of the system being simulated.

The EXPERT environment allows the engineer to devote more time to gaining an understanding of the problem rather than to the mechanical tasks of entering and checking data, getting a program to run, and interpreting reams of output.

## GIS

The development of the database was patterned from the requirements of the input for the stormwater analysis software. The mapping for the stormwater project was divided into three areas: watershed maps (hydrologic information), sewer maps (hydraulic information), and questionnaire maps. Database tables containing information on each of these areas were created and linked to the graphics. The purpose of this linkage is to provide intelligence to the graphics as well as providing a tool for storing information on the stormwater drainage system.

The watershed maps contain the boundaries of the individual drainage areas in the Three Mile Creek, Five Mile Creek, and external watersheds. Table L-A contains the hydrologic information pertinent to each of the drainage basins.

The storm sewer maps contain the schematic drainage system for structures 18" in diameter and larger for the Three Mile Creek, Five Mile Creek, and external watersheds. Tables L-B and L-C contain the hydraulic information on the drainage system pertinent to each of the drainage basins.

The questionnaire maps contain location markers indicating a response to the stormwater questionnaire distributed as part of the project. These markers are linkage to Table L-D containing resident information and flooding problem information.

**Table L-A  
Drainage Area Data**

Column	Data Type	Length	Nulls	Description
mmlink	integer		no	Microstation linkage
mapid	integer		yes	MGE mapid
watershed	character	3	yes	Watershed abbreviation
id	char	5	yes	Watershed id #
drain_id	char	5	yes	Channel/pipe for drain
width	real		yes	Width of subarea
sub_area	real		yes	Area of subarea (acres)
per_imperv	real		yes	Percent impervious (existing conditions)
fut_per_imperv	real		yes	Percent impervious (future conditions)
avg_slope	real		yes	Slope of watershed
imp_roughness	real		yes	Impervious area manning's roughness
per_roughness	real		yes	Pervious area manning's roughness
imp_storage	real		yes	Impervious area depression storage
per_storage	real		yes	Pervious area depression storage
max_infil	real		yes	Max. initial infiltration rate
min_infil	real		yes	Min. (asymptotic) infiltration rate
decay	real		yes	Decay rate of infiltration
cap_suction	real		yes	Average capillary suction
conductivity	real		yes	Sat. Hydraulic conductivity of soil
moisture_def	real		yes	Initial moisture deficit for soil
remarks	character	80	yes	Remarks

Table L-B Conduit Data				
Column	Data Type	Length	Nulls	Description
mmlink	integer		no	Microstation linkage
mapid	integer		yes	MGE mapid
watershed	character	3	yes	Watershed abbreviation
id	char	6	yes	Drainage element id #
from_node	char	6	yes	Upstream node #
to_node	character	6	yes	Downstream node #
ntype	character	2	yes	Element type
length	real		yes	Element length
first-dim	real		yes	First dimension
slope	real		yes	Element's slope
roughness	real		yes	Manning's roughness
sec_dim	real		yes	Second dimension
barrel	real		yes	Number of barrels
third_dim	real		yes	Third dimension
from_invert	real		yes	Upstream invert elevation
to_invert	real		yes	Downstream invert elevation rate
x1	real		yes	Upstream x coordinate
y1	real		yes	Upstream y coordinate
x2	real		yes	Downstream x coordinate
y2	real		yes	Downstream y coordinate
ecc	real		yes	Expansion/contraction coefficient
entr	real		yes	Entrance loss coefficient
exit	real		yes	Exit loss coefficient
remarks	character	80	yes	Remarks

**Table L-C  
Manhole, Junction, and Node Data**

Column	Data Type	Length	Nulls	Description
mmlink	integer		no	Microstation linkage
mapid	integer		yes	MGE mapid
watershed	character	3	yes	Watershed abbreviation
node	character	6	yes	Node number
ntype	character	2	yes	Element type
dist	real		yes	Constant inflow into node
geom1	real		yes	Pollutant 1 concentration
slope	real		yes	Pollutant 2 concentration
rough	real		yes	Pollutant 3 concentration
geom2	real		yes	Pollutant 4 concentration
geom3	real		yes	Number of barrels
x	real		yes	X coordinate
y	real		yes	Y coordinate
z	real		yes	Z coordinate
invert	real		yes	Invert elevation
remarks	character	80	yes	Remarks

The columns DIST, GEOM1, SLOPE, ROUGH, GEOM2, and GEOM3 mean different things depending upon the node type (NTYPE). The following extracted from the SWMM Modeling software manual describes what each column means for the particular NTYPE.

**Table L-D**  
**Questionnaire Response Data**


Column	Data Type	Length	Description
mmlink	integer		Microstation linkage
mapid	integer		MGE mapid
survey_no	character	4	Survey number
survey_date	date		Survey date
name	character	20	Name of resident
years_here	integer		Number of years at residence
address_no	character	5	Address number
streetname	character	22	Street name
streets_5	character	30	5. Nearby cross-street intersection
zip_code	character	4	Zipcode
zip_plus_4	character	5	Zipcode extension
residence	character	1	Address of residence?
business	character	1	Address of business?
area_code	character	3	Area code
phonenumber	character	8	Phone number
The responses to question #7 are: Major, Minor, Not, or DK			
no_7a	character	5	7a. Basement flooding
no_7b	character	5	7b. Street flooding
no_7c	character	5	7c. Yard flooding
no_7d	character	5	7d. Trash/debris in ditches
no_7e	character	5	7e. Soil erosion
no_7f	character	100	7f. Other
The responses to questions #8 and #9 are either: Yes, No, or Don't Know			
no_8a	character	3	8a. Floor drains
no_8b	character	3	8b. Bathtub/toilet/sink

Table L-D Questionnaire Response Data			
Column	Data Type	Length	Description
no_8c	character	3	8c. Window/window wells
no_8d	character	3	8d. Floors or walls
no_8e	character	3	8e. Front yard or back yard
no_8f	character	100	8f. Other
no_9a	character	3	9a. Erosion of ditches
no_9b	character	3	9b. Flooded yard, little or no damage
no_9c	character	3	9c. Debris deposited by floodwaters
no_9d	character	3	9d. Damage to lawn, trees, or shrubs
no_9e	character	3	9e. Damage to fences or buildings
no_9f	character	3	9f. Extensive damage, loss of property
no_10	character	1	10. Frequency of flooding
no_11	character	3	11. Travel altered by flooding in 1993
streets_11	character	100	11. Impassable roadway intersections
no_12	character	3	12. Travel altered by flooding in past five years
streets_12	character	100	12. Impassable roadway intersections
no_13	character	3	13. Flooding near property
streets_13	character	100	13. Flooding street locations
no_14	character	3	14. Flooding of inlets/culverts
streets_14	character	100	14. Location of flooding



**Table L-D**  
**Questionnaire Response Data**

Column	Data Type	Length	Description
no_15a	character	3	15a. Opinion on criteria/policy
no_15b	character	3	15b. Opinion on criteria/policy
no_15c	character	3	15c. Opinion on criteria/policy
no_15d	character	3	15d. Opinion on criteria/policy
no_15e	character	3	15e. Opinion on criteria/policy
no_15f	character	3	15f. Opinion on criteria/policy
no_15g	character	3	15g. Opinion on criteria/policy
no_15h	character	3	15h. Opinion on criteria/policy
no_15i	character	3	15i. Opinion on criteria/policy
no_15j	character	3	15j. Opinion on criteria/policy
no_15k	character	3	15k. Opinion on criteria/policy
no_15l	character	3	15l. Opinion on criteria/policy
no_15m	character	3	15m. Opinion on criteria/policy
no_16a	character	1	16a. Ranking of improvements
no_16b	character	1	16b. Ranking of improvements
no_16c	character	1	16c. Ranking of improvements
no_16d	character	1	16d. Ranking of improvements
no_16e	character	1	16e. Ranking of improvements
no_16f	character	1	16f. Ranking of improvements
no_16g	character	1	16g. Ranking of improvements
no_16h	character	1	16h. Ranking of improvements
comments	character	255	Comments



Model Results Summary Tables

Table L-1	3 Mile Creek and South Branch
Table L-2	3 Mile Creek 1L
Table L-3	3 Mile Creek 2L
Table L-4	3 Mile Creek 3L
Table L-5	3 Mile Creek 4L
Table L-6	3 Mile Creek 1R
Table L-7	3 Mile Creek 5L
Table L-8	3 Mile Creek 2R
Table L-9	3 Mile Creek 3R
Table L-10	3 Mile Creek 6L
Table L-11	3 Mile Creek 4R
Table L-12	3 Mile Creek 7L
Table L-13	3 Mile Creek 5R
Table L-14	3 Mile Creek 6R
Table L-15	3 Mile Creek 8L
Table L-16	3 Mile Creek 9L
Table L-17	3 Mile Creek 10L
Table L-18	3 Mile Creek 7R
Table L-19	3 Mile Creek 8R
Table L-20	3 Mile Creek S1R
Table L-21	3 Mile Creek S1L
Table L-22	3 Mile Creek S2R
Table L-23	3 Mile Creek S3R
Table L-24	3 Mile Creek S2L
Table L-25	3 Mile Creek S3L
Table L-26	3 Mile Creek S4R
Table L-27	3 Mile Creek S5R
Table L-28	3 Mile Creek S6R
Table L-29	3 Mile Creek S4L
Table L-30	3 Mile Creek S7R
Table L-31	3 Mile Creek S8R
Table L-32	5 Mile Creek
Table L-33	5 Mile Creek 1L
Table L-34	5 Mile Creek 1R
Table L-35	5 Mile Creek 2R
Table L-36	5 Mile Creek 3R
Table L-37	5 Mile Creek 2L
Table L-38	5 Mile Creek 4R
Table L-39	5 Mile Creek 3L
Table L-40	5 Mile Creek 1R
Table L-41	5 Mile Creek 6R
Table L-42	5 Mile Creek 4L
Table L-43	5 Mile Creek 5L
Table L-44	5 Mile Creek 7R
Table L-45	5 Mile Creek 8R
Table L-46	5 Mile Creek 6L
Table L-47	5 Mile Creek 9R
Table L-48	5 Mile Creek 7L
Table L-49	5 Mile Creek 8L
Table L-50	5 Mile Creek 10R
Table L-51	5 Mile Creek 11R
Table L-52	5 Mile Creek 9L
Table L-53	5 Mile Creek 10L
Table L-54	5 Mile Creek 11L
Table L-55	EMC 1
Table L-56	EMC 2
Table L-57	EMC 3
Table L-58	EMC 4
Table L-59	EMC 5
Table L-60	EMC 6
Table L-61	EMC 7
Table L-62	EMC 8
Table L-63	EMC 9
Table L-64	EMC 10
Table L-65	EMC 11
Table L-66	EMC 12
Table L-67	EMC 13
Table L-68	EMC 14





Table L-1  
3 Mile Creek and South Branch  
Peak Flow c's

Conduit	Manning's Capacity	100-Year
3229	36000	7770
3228	7740	7740
3227	48000	7840
3226	11000	7650
3225	44000	7600
3224	1910	7550
3223	5500	7540
3222	13640	7480
3221	3990	7350
3220	3530	7130
3219	28000	7090
3218	3970	7070
3217	25000	7020
3215	3640	6960
3216	30000	6940
3166	3580	6930
3165	3590	6910
3161	15900	6530
3160	5650	6520
3159	22400	6510
3158	1963	6510
3156	30000	6500
3155	18060	5920
3152	28000	5920
3149	17000	5920
3016	3032	5920
3017	39000	5910
3020	13000	5900
3019	27000	5840
2994	82500	5640
2993	64000	5840
2992	82000	3980
3243	9990	3980
3000	5540	3980
2999	810	3960
3002	16000	3950
3004	20000	3950
3003	1353	3950
3008	26000	3960
3007	20000	3980
3006	15000	3980
2589	11000	3980
2580	14000	3530
2579	19000	3520
2578	12000	3520
2577	9500	3500
2576	3640	2870
2575	23000	2860
3246	25000	2860
2574	11000	2860
1418	4060	2860
3248	26000	2780
3247	44000	2780
2596	17890	2780
2595	3540	2790
3035	19000	2170
South Branch		
2997	17000	2030
1368	484	2020
3146	32000	2020
3142	1170	2020
3141	6720	2020
3140	488	2020
3139	14000	2020
1248	3510	2020
3132	28000	2020
3131	749	2020
3130	14960	2020
3261	8300	2020
3128	31000	2020
3127	2390	2020
3093	41000	2020
3092	294	2020
3088	10000	2020
3260	1630	2020
3088	14060	2020
3258	9930	2020
3086	83000	2020
3078	52000	1930
3257	9580	1900
3083	140000	1790
3080	53000	1860
3255	14000	1860
940	1740	1860
3066	39000	1860
3065	20000	1860
3063	37000	1860
942	3337	1860
2300	658	1508
1289	2357	1375
1288	3230	1370
3051	9940	1340
3050	7540	1330
3059	36000	691

Table L-2  
3 Mile Creek Subsystem 1L

Conduit	Manning's Capacity	Peak Flow, cfs	
		10-Year	50-Year
1092	369		457
1089	351		457
1324	330		457
1323	250		449
1322	417		449
2323	611		327
1316	270		327
1311	177		176
1310	137		172
1309	84		172
2320	133		172
First Lateral			
2355	6	105	
2373	100	105	
1319	113	105	
1317	31	105	

Table L-3  
3 Mile Creek  
Subsystem 2L  
Peak Flow, cfs

Conduit	Manning's Capacity	10-Year
Left Side		
2200	96	34
1093	36	34
Right Side		
2198	63	45
2197	8	45
2196	34	45
1095	33	20
2194	51	20

Table L-4  
3 Mile Creek  
Subsystem 3L  
Peak Flow, cfs

Conduit	Manning's Capacity	50-Year
Left Side		
1099	38	19
1098	80	28
Right Side		
1103	147	29
1102	12	29

Table L-5  
3 Mile Creek 4L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
3164	2130	445	
3163	511	445	
3162	2130	445	
1202	539	445	623
1201	374	428	
1200	713	428	
1198	311	428	
1197	382	405	
1354	291	405	
2393	19	404	566
1353	173	380	
1352	244	378	
1351	23	376	
1350	304	357	
1349	15	357	
2392	315	356	
1607	160	338	
2390	226	338	
1347	198	338	
2389	13	338	
1345	324	309	
2388	399	309	
1344	310	309	
2387	592	309	
2386	121	309	
1346	210	290	
2385	19	290	
1343	150	290	
2384	524	290	392
1342	379	290	
2383	273	248	
1340	195	248	
3032	380	248	
1339	555	248	
1337	242	214	
1336	20	214	
1335	314	214	
2376	116	214	296
2375	106	128	
1333	63	128	
1331	54	128	
1529	59	89	
1528	107	57	
2509	12	53	77
2988	198	53	
2506	97	53	77
1522	107	41	
1521	81	10	
1520	306	10	18

Table L-6  
3 Mile Creek 1R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
1207	302	479	
1206	379	479	
2261	354	479	
1205	745	479	
2260	410	458	
3167	486	458	
1204	317	458	
2259	1410	458	
1203	364	413	
3168	303	413	
1177	25	413	
3169	279	413	
1176	348	413	
3170	630	365	
2255	460	365	
1175	271	365	
1174	332	361	
1172	421	274	
1171	252	273	
1170	155	262	
1169	350	262	
2254	245	262	
2118	222	244	
1007	151	244	
1006	280	244	300
1005	189	224	
1004	224	224	
1003	136	196	
1002	98	157	
1001	84	157	
2127	269	98	
1000	123	85	
999	81	80	
996	33	32	
995	34	13	
<b>First lateral</b>			
1173	49	72	
994	591	72	
993	76	72	
2116	39	49	
<b>Second lateral</b>			
2098	29	9	
2097	28	9	
1011	26	9	
<b>Third lateral</b>			
998	58	26	
2091	23	25	
2090	28	9	



Table L-7  
3 Mile Creek 5L  
Peak Flow, cfs

Conduit	Mannings Capacity	10-Year
<b>System 1</b>		
1195	25	20
1194	8	20
<b>System 2</b>		
1196	17	20
1256	25	20

Table L-8  
3 Mile Creek 2R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
3157	Abandoned		
1193	Abandoned		
1192	Abandoned		
3154	Abandoned		
3153	28	1090	
3180	127000	1090	
3273	22500	1090	
3272	63100	1040	
3179	18600	1040	
3178	abandon	1040	
3177	12400	1040	
3171	819	1040	
991	444	1030	
3212	6530	978	
3271	23100	978	
988	3270	978	
3211	12100	964	
3270	71100	369	
3208	21900	369	
3207	11900	276	
2107	5	270	
3206	13200	256	
3205	17400	213	
2106	588	195	
982	166	194	225
1116	112	168	
2231	188	166	
1115	166	139	
1114	122	118	134
1487	3	88	
729	67	67	
728	39	63	
727	56	63	
2663	8020	63	
724	81	63	
723	47	63	
Lateral 1			
3176	260	134	
1178	84	134	
3175	72	134	
2268	132	133	
1182	99	117	
1179	95	83	
2267	61	82	
1181	98	82	
1224	53	54	
Lateral 2			
990	70	35	46

2124	28	0	
Lateral 3			
3209	22900	623	
1138	60	174	209
2111	106	163	
1137	280	163	
3185	6590	163	
1141	116	141	
3183	4310	141	
1150	143	141	
2251	120	130	
1149	118	130	
1146	49	78	
1148	86	66	
3182	4010	64	
1159	4	64	
1158	48	63	
3181	810	59	
1157	54	59	70
3187	3190	46	
1156	37	46	
3186	620	20	
1599	46	20	
1603	87	20	
2079	46	20	
1598	67	20	
Lateral 3A			
987	320	454	551
1136	382	449	
1135	430	449	
3189	4780	449	
1134	831	449	
3190	946	449	
1133	550	449	
3191	4570	449	
2237	301	447	
1128	197	447	
2236	384	430	
3192	3390	430	
1167	211	382	
1165	342	291	
1164	369	291	
3199	2430	291	
3269	3650	291	
1117	438	291	
721	465	291	
716	376	277	
2662	1750	83	
715	74	83	
2661	11600	72	
3279	9310	72	
1901	146	72	
702	71	72	

Lateral 3B			
2247	50	51	
1142	117	51	
Lateral 3C			
1147	99	68	
1219	51	29	
1217	53	29	
Lateral 3Aa			
1131	42	15	
Lateral 3Ab			
1166	156	128	
3195	1520	113	
1120	458	111	146
1119	88	81	
3125	1170	65	
950	68	65	
949	51	65	
948	44	61	
1440	17	61	
3124	10200	61	
946	75	61	
Lateral 3Ac			
722	85	13	
Lateral 3Ad			
720	29	26	
718	35	17	
Lateral 3Ae			
3203	206	185	259
3202	90	185	259
3201	235	166	235
3200	58	166	235
694	246	139	193
2689	176	139	193
2688	165	107	162
1898	291	107	
Lateral 3Aba			
3196	962	7	11
2238	24	7	11
Lateral 3Abb			
3197	5020	9	21
1121	12	9	21
3198	965	4	
1122	21	4	
Lateral 4			
981	96	45	
Lateral 5			
3204	727	19	
980	15	19	
978	43	19	
Lateral 6			
2664	12100	21	
726	29	21	

Table L-9 3 Mile Creek 3R Peak Flow, cfs		
Conduit	Mannings Capacity	10-Year
Downstream		
3151	81	8
1191	50	8
2265	22	8
Upstream		
3150	81	27
1190	56	27
1189	58	27
1259	11	20

Table L-10  
3 Mile Creek 6L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
3018	20500	180	
1367	207	180	
3021	9110	180	
1366	290	180	
3022	4490	169	
1365	258	167	
3023	1460	167	
1364	225	166	
3024	1660	156	
1363	153	155	
3025	2850	155	
1362	132	155	
3026	131	144	
1361	269	143	
3027	7180	143	
1360	189	143	222
1359	132	134	
1358	276	134	
3030	44300	134	
3029	13600	112	
1357	180	112	
3031	12100	112	
1355	159	107	
2989	3860	107	
2499	176	107	
1543	91	85	
1542	30	55	
1541	51	54	
1540	46	14	
1539	99	14	23
Lateral 1			
3028	5470	65	
1356	371	65	
2990	1180	65	
2986	114	65	
1393	100	47	69
2985	1620	38	
1390	124	38	
2984	1460	17	
1553	33	15	
2524	26	15	
2983	804	15	

Table L-11  
3 Mile Creek 4R  
Peak Flow, cfs

Conduit	Mannings Capacity	50-Year
2400	83	27
2399	21	27
1373	29	27

Table L-12  
3 Mile Creek 7L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
3001	79900	113	
1381	685	113	
3011	7270	113	
1384	313	113	204
3012	9210	88	
1385	58	88	
3013	15400	88	
1386	140	88	
3014	5020	72	
2412	473	71	
1388	532	50	
1387	2	50	
3015	28700	50	
1389	154	50	
2981	3680	48	
1568	21	44	
2980	21200	44	
2979	22300	44	
1561	34	44	
2516	41	37	
2978	13200	26	
2517	36	24	
2977	2200	24	
1572	100	24	52
Lateral			
1565	33	36	
1560	23	22	
1559	22	22	
1558	23	22	
2515	28	15	
2514	83	15	25



Table L-13 3 Mile Creek 5R Peak Flow, cfs		
Conduit	Mannings Capacity	10-Year
2582	9260	49
2581	64	49
1405	76	49
1404	60	49
1403	66	38

Table L-14  
3 Mile Creek 6R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
2588	11400	654	
3249	15400	654	
2587	3730	546	
1422	1740	541	
1423	264	508	
1421	612	460	
1420	380	459	681
1468	417	429	
1467	403	427	
1461	458	359	
2451	268	349	
1460	262	349	
2449	266	349	
1458	486	321	
1457	300	321	
2448	372	321	
1454	266	293	
1455	294	203	286
1303	185	178	248
1304	286	171	242
2314	334	171	242
2594	371	26	40
1306	104	7	10
2592	836	7	10
1307	11	7	10
Lateral 1			
2586	338	125	
2585	173	107	
1434	105	107	
2428	74	93	
1433	80	81	
2427	87	81	
2426	69	71	
1432	69	71	
2425	53	71	
1431	56	59	
Lateral 2			
1464	63	54	
2456	27	54	
1463	22	54	
3033	98	54	88
2458	33	31	
1477	19	31	
Lateral 3			
2447	133	99	138
2446	39	51	73
1452	46	15	
1450	58	15	
Lateral 3A			
1449	55	21	31
1448	76	10	
Lateral 4			
2312	91	31	45
Lateral 5			
3039	791	55	
1299	71	55	
Lateral 6			
2593	846	27	41
1305	41	25	41

Table L-15  
3 Mile Creek 8L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
2572	5310	661	
2544	947	661	
3244	4050	637	
2569	44500	637	
2530	814	650	
2566	725	577	
1581	280	574	
2565	1110	574	
1582	908	574	973
Lateral 1			
1412	19	17	
2571	13300	13	
2437	31	13	
Lateral 2			
2568	1210	45	
2534	114	26	
1585	80	26	
1584	20	26	41
Lateral 2A			
2567	308	0*	
1583/7777	21	20	24
* 2567, 1583 abandoned			

Table L-16  
3 Mile Creek 9L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
1417	131	81	123
2434	91	74	114
1575	123	74	
1586	21	41	
2539	1	41	
3245	16500	40	
2563	9030	40	
1587	33	40	74

White  
✓

Table L-17  
3 Mile Creek 10L  
Peak Flow, cfs

Conduit	Mannings Capacity	50-Year
1595	336	306
1594	287	306
1592	683	282
1593	347	282
1591	1480	282
Lateral		
3037	12900	70
1596	851	53

Table L-18  
3 Mile Creek 7R  
Peak Flow, cfs

Conduit	Mannings Capacity	50-Year
1470	158	34
1476	38	34
2461	34	32
2460	21	32
1472	12	32
Lateral		
1474	35	10

Table L-19  
3 Mile Creek 8R  
Peak Flow, cfs

Conduit	Mannings Capacity	50-Year
Left Side		
3034	6990	16
1478	25	16
Right Side		
3036	18700	32
1597	55	32

Table L-20  
3 Mile Creek S1R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
3144	2070	59	
1240	79	57	
2287	60	57	80
1242	41	32	42
1238	58	32	42
2285	37	20	26
2284	44	20	26
1237	33	20	26
Lateral			
1241	1	27	40
Upstream			
3143	9720	36	
2282	91	36	
1235	62	36	
2281	17	16	
1234	14	16	



Table L-21  
3 Mile Creek S1L  
Peak Flow, cfs

Conduit	Mannings Capacity	10-Year
1255	31	42
2280	13	42
1254	19	29
2279	25	29
1253	19	29
1252	19	29

Table L-22  
3 Mile Creek S2R  
Peak Flow, cfs

Conduit	Mannings Capacity	10-Year
3094	61000	142
3091	59800	104
3090	21100	48
1265	81	48

Table L-23  
3 Mile Creek S3R  
Peak Flow, cfs

Conduit	Mannings Capacity	50-Year
3087	47200	42
3258	1760	42
965	287	39
2077	430	39
3084	879	15
968	19	15
Lateral		
3085	1190	4
1263	65	4

Table L-24  
3 Mile Creek S2L  
Peak Flow, cfs

Conduit	Mannings Capacity	10-Year
3075	14100	64
3074	19600	30
1275	40	30

Table L-25  
3 Mile Creek S3L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
3077	5190	49	
1281	84	49	
3076	2840	47	
1282	1	47	120
3043	197	47	
3042	37100	10	
1290	21	10	
2301	20	10	

Table L-26  
3 Mile Creek S4R  
Peak Flow, cfs

Conduit	Mannings Capacity	50-Year
3081	55700	459
3082	2840	459
962	2520	444
Lateral		
963	59	13
964	29	13
2076	45	13

Table L-27  
3 Mile Creek S5R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
3239	14900	368	
939	36	368	595
3095	25400	368	
3251	39900	278	
957	68	37	
956	39	37	
Lateral 1			
3079	1340	24	70
960	26	24	34
961	145	24	34
958	13	15	
2075	17	15	
Lateral 2			
3267	402	97	
Upstream			
3064	4190	41	
938	28	10	56

Table L-28  
3 Mile Creek S6R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
941	20	299	
2068	375	298	430
3110	58900	226	
3250	91900	194	
3111	32900	135	
3112	41000	32	43
2743	73	32	
2741	52	18	
Lateral 1			
3100	203	50	
3101	42	38	
3102	79	38	
3103	68	38	
3104	43	32	
3105	36	27	
3106	29	23	
3107	48	23	
3109	43	16	
3108	38	16	
Lateral 2			
3116	21700	35	
3115	165	35	
3114	47	35	
3113	106	20	



Table L-29 3 Mile Creek S4L Peak Flow, cfs		
Conduit	Mannings Capacity	10-Year
3049	15100	116
3047	11400	116
3056	29400	116
3055	117	116
3054	221	116
Lateral 1		
3048	1200	10
1285	27	10

Table L-30  
3 Mile Creek S7R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
3060	6140	194	
936	2600	159	292
3097	5210	154	
3098	8780	146	
923	17	124	
2067	180	111	
925	151	102	
Lateral 1			
3058	682	16	
935	1	16	
Lateral 2			
3096	1590	15	
928	19	15	
927	7	15	
Lateral 3			
2066	21	8	
920	44	8	

Table L-31  
3 Mile Creek S8R  
Peak Flow, cfs

Conduit	Mannings Capacity	50-Year
933	355	55
3057	659	55
932	41	55
929	49	55
931	52	55

Table L-32  
5 Mile Creek  
Peak Flow, cfs

Conduit	Manning's Capacity	100-Year
2618	44800	8840
2617	7290	8840
2616	20500	8840
2615	4590	8840
3315	89200	8840
2614	70300	8840
3314	123000	8840
911	2970	8840
2613	82000	8840
3313	5950	8840
2556	21100	8600
2555	119700	8600
2619	73200	8600
2628	73700	8010
3306	103000	8010
2627	71600	8010
2626	3436	8010
2625	74300	8010
850	6800	7565
2630	411000	7565
2855	50300	7522
2854	31600	7490
2857	90000	7490
2856	91900	7490
2858	85300	7223
3296	208000	7223
2846	96500	7223
2852	103000	7180
3295	13800	6998
2849	10900	6998
3294	15200	6998
2840	14600	6762
2839	171000	6395
2823	145000	6209
203	10270	6209
2825	321500	6209
2827	243000	6080
3291	10300	6038
2826	10500	5980
245	409	5980
2795	18000	5850
3289	16200	5850
2785	10900	5850
3288	15700	5850
2784	13700	5850
2783	16900	5850
2801	20000	5438
2800	25500	5438
2781	29100	5438
2780	27200	5438
2765	36900	2235
454	8260	2235
2761	5870	2204
2760	2170	2204
2777	3850	2204
3286	3790	2204
2762	16800	2204
2759	31500	1761
2752	28000	1761

Table L-33 5 Mile Creek 1L			
Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2043	170		94*
862	183		94*
1444	134		94*
865	109		94*
2022	185		94*
2019	167		160
1964	337		160
779	80		160
1961	86		136
1959	183		138
1957	142		138
777	170		93
1953	188		93
1951	189		93
775	124		70
1948	108		70
774	105		43
772	79		43
771	75		43
770	1		43
1942	56		43
1938	108	66	
768	48	66	
1937	30	66	
766	76	66	
765	58	66	
764	38	17	
763	28	17	
Lateral 1			
2016	136		138*
861	78		44
1441	46		44
Lateral 2			
864	156		95
916	97		95
918	416		95
912	0		0
Lateral 2a			
915	15		12
781	15		12
780	1		12
Lateral 3			
1941	47		17

\* Recommend splitting the flow between lateral 1 and the main trunk.

Table L-34 5 Mile Creek 1R			
Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
909	399		183
908	172		167
905	178		153
903	81		87

Table L-35  
5 Mile Creek 2R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2612	28100	1260	
2044	1450	1230	
3310	8130	1180	
2611	118000	1160	
2610	20900	1160	
3311	18900	1160	
1767	1430	1007	1404
2913	29300	982	
2912	24000	978	
2910	20800	881	
2911	23600	837	
2908	5550	832	
2907	5990	734	
266	498	715	
2889	1860	682	
258	5810	556	
2887	5810	556	
156	202	516	
2886	1320	387	
3312	3270	387	
155	478	387	
154	153	158	
2885	116	158	
2884	116	158	
2883	5	123	
148	80	123	
3240	204	123	
Lateral 1			
312	581	180	266
309	82	75	106
1442	94	68	95
308	106	68	95
1756	88	50	71
304	68	50	71
Lateral 1A			
1758	203	105	
2608	747	89	
886	26	89	
2607	3420	89	
885	4	89	
2606	4210	76	
2057	134	76	
882	466	70	
2605	8060	54	
2028	144	54	
Lateral 1B			
310	178	20	

Lateral 2			
297	86	47	
303	37	47	
1755	31	23	
302	41	23	
Lateral 3			
2909	1220	74	
249	64	74	
Lateral 4			
2905	56	9	
276	21	9	
Lateral 5			
2906	778	90	
250	101	90	
Lateral 6			
2888	762	44	
252	49	34	
1698	23	9	
316	33	9	
Lateral 6A			
253	39	10	
Lateral 7			
2893	6330	110	
260	118	110	
259	152	110	
2891	39	52	
263	50	52	
2890	653	52	
1705	42	26	34
Lateral 7A			
2892	4700	16	
261	34	8	10
Lateral 8			
256	92	17	
255	67	8	
Lateral 8A			
254	38	27	
Lateral 8B			
315	32	1	
Lateral 9			
2882	7850	98	
153	316	98	130
Lateral 9A			
2881	7850	113	
1658	113	113	170
Lateral 10			
152	64	36	45
Lateral 11			
150	52	72	86
2880	821	49	58
133	82	49	58



Table L-36  
5 Mile Creek 3R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
895	114		57
2038	105		48
894	52		48
2037	70		31
893	36		28
2035	20		28

Table L-37  
5 Mile Creek 2L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2620	10000	648	
3309	24200	450	
2624	61600	439	
857	518	439	
2623	29800	423	
755	18	350	490
753	671	297	430
2553	7040	265	
3307	2370	234	
2551	27700	234	
2550	33000	148	
1919	484	148	209
2649	180	110	
820	93	105	
819	82	62	
818	77	62	
1969	67	62	
1968	62	62	
Lateral 1			
2621	11200	181	
876	219	181	
2014	82	181	
2013	109	132	
874	210	132	
872	163	127	
2005	49	62	
870	52	62	
2004	44	62	
Lateral 1a			
2015	44	2	
875	68	2	
Lateral 2a			
1933	69	1	1
754	37	1	1
Lateral 2b			
749	302	94	132
747	118	76	
746	73	76	
1926	67	76	
743	48	49	
Lateral 3			
752	59	37	52
Lateral 4			
2552	2610	66	
3308	49400	68	
736	1260	68	95
735	59	41	
734	141	41	
2652	1380	33	
798	61	33	
2651	2760	33	
797	1	33	
2650	4070	22	
796	1	22	

Table L-38  
5 Mile Creek 4R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
853	176	318	459
847	167	318	459
1479	159	262	391
845	64	262	391
1748	155	262	319
285	608	242	319
2900	250	111	
2899	244	110	
2898	288	110	
2897	303	111	
1725	88	22	
3327	28	21	
3328	29	21	
3329	27	21	
3330	23	21	
3331	25	21	
Lateral 1a			
2902	60	27	35
2901	29	27	35
Lateral 1b			
1749	24	29	37
286	57	23	37
Lateral 2a			
284	140	92	123
324	18	29	40
1750	44	19	
844	17	19	
Lateral 2b			
2903	68	20	
2904	100	20	
Lateral 3			
2896	198	7	
2895	50	3	
320	16	3	4
Lateral 3a			
2894	35	1	
Lateral 4			
1717	36	1	
1716	35	1	

Table L-39 5 Mile Creek 3L			
Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2629	17600	792	
2631	19700	782	
3305	8760	782	
1485	6346	777	1087
468	687	753	1050
467	656	753	1050
2633	4650	741	
474	714	741	
2634	3910	741	
475	629	741	
2639	14000	712	
2644	19900	720	
2648	7490	340	
494	262	340	
2647	3860	340	
495	248	340	
2646	10500	340	
500	796	340	456
2656	3240	296	
2660	7280	238	
1977	293	238	
807	14	63	170
731	36	63	89
1904	52	49	70
708	46	47	
1913	47	12	
705	54	12	
703	68	12	
Lateral 1			
2002	92	70	
849	59	70	96
Lateral 2			
848	45	26	34
1999	2	25	34
Lateral 3			
333	73	17	
1784	39	17	
Lateral 4			
1817	77	59	86
469	73	59	86
1816	53	46	68
473	69	46	68
472	67	46	68
471	58	46	68
337	55	32	48
1783	34	32	48
344	34	25	36
Lateral 5			
2637	3210	49	
476	62	49	
Lateral 6			
2643	6410	421	
493	155	421	
2642	5900	421	
492	437	421	
2641	18400	421	

*Thompson*

486	495	409	
2645	611	365	
488	394	340	471
1602	116	324	
552	192	324	
553	193	324	
543	146	146	
1850	37	40	
541	27	16	
539	15	16	
537	22	15	
535	47	15	
Lateral 6a			
1601	28	37	
2640	5760	30	
485	54	31	
484	29	21	
1821	26	21	
483	27	21	
482	1	21	
2665	17200	20	
511	22	20	
2666	7150	20	
513	1	20	
1834	35	20	
Lateral 6b			
491	53	26	
490	41	22	
489	21	5	
Lateral 6c			
558	144	167	
556	205	147	
555	129	123	
554	127	123	
Lateral 6d			
549	46	5	
Lateral 7			
2655	9940	63	
1989	63	63	
806	103	64	
2657	31	26	
2658	7360	26	
810	30	26	
811	28	26	
Lateral 7a			
805	10	30	
2654	4080	30	
804	43	30	
Lateral 8			
808	14	115	
2659	2020	77	
809	100	77	
1915	136	77	104
1909	46	46	63
712	56	47	63
711	53	48	63
Lateral 9			
502	491	21	31

Table L-40  
5 Mile Creek 1R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2863	40400	357	
3304	77700	338	
2861	4710	278	
3303	112000	278	
2865	13700	273	
2866	7340	217	
1665	107	186	
1481	83	173	
179	301	173	
1680	155	140	
172	145	113	151
171	149	91	122
170	98	91	120
168	24	11	15
Lateral 1			
2862	18300	37	
1994	39	37	
841	52	15	
840	82	15	
Lateral 1a			
1484	46	22	
Lateral 2			
821	17	16	
822	18	16	
Lateral 3			
176	37	35	
175	28	26	
Lateral 4			
173	144	27	35
277	55	27	35

Table L-41 5 Mile Creek 6R			
Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2859	205000	78*	
3301	87000	18*	
2860	21500	18*	
1483	1260	18*	
2874	13200	8*	
2875	22900		114
3299	3310		108
2873	18500	1*	
2872	50100		109
3297	11000	47*	
2870	19400		59
85	317		59
2926	47700		59
2929	15400	1*	
2928	5560	1*	
2927	6290		41
1630	98		41
111	96		41
111	96		54
Lateral 1			
197	58		108
196	140		99
2879	2830		92
2877	9770		81
2876	6510		62
161	160		62
160	51		7
Lateral 1a			
1676	45		21
194	41		9
193	29		9
Lateral 1b			
2878	1520		23
188	37		23
Lateral 2			
3298	18600		74
2871	13900		74
82	152		56
82	152		83
Lateral 3			
2925	3350		42
86	70		42
86	70		63

\*Downstream of storage ponds.

Table L-42  
5 Mile Creek 4L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Left Side			
326	196	26	
325	10	1	
Right Side			
327	78		122
2845	349		122
328	5		122
2844	930		122
329	197		122
2843	256		122
330	1		122
2842	2440	7	
332	15	7	
331	13	7	



Table L-43  
5 Mile Creek 5L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2851	4380	211	
2850	8170	211	
359	9	211	
2848	2050	189	
358	110	189	
2847	4610	189	
1778	99	68	100
350	130	66	100
1776	59	54	100
509	52	38	58
508	66	38	58
507	42	38	56
506	14	19	28
Lateral 1			
356	26	29	
1786	57	29	
Lateral 2			
351	29	44	63
353	64	44	63
352	22	17	23
Lateral 3			
466	208	91	
2821	1770	71	
379	72	60	
378	37	60	
377	23	42	
376	28	15	
1791	41	15	22
1790	49	15	22
1789	28	15	22
Lateral 3a			
2820	976	14	
1605	15	15	22
Lateral 3b			
375	18	27	
373	36	15	
Lateral 4			
347	25	10	16
Lateral 5			
349	12	1	1

Table L-44  
5 Mile Creek 7R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2841	479	166	
224	133	166	
221	277	138	
1685	123	112	
219	41	60	
217	53	45	
201	26	29	44
200	284	12	18
Lateral 1			
223	28	18	
222	229	18	
Lateral 2			
220	270	52	

Table L-45 5 Mile Creek 8R			
Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2838	24100	690	
2949	25200	688	
2948	50000	687	
2944	1300	594	
2943	1390	513	
2942	391	513	
1648	780	500	
109	380	500	
107	1282	500	
106	347	423	
2940	5560	407	
2939	5020	341	
2937	15300	219	
2930	13000	66	
87	120	66	105
Lateral A			
205	18	5	
Lateral 1			
2947	31300	37	
2946	33	37	
2945	59	27	
102	3	27	36
Lateral 2			
3326	86	60	
3325	70	60	
3324	79	60	
3323	79	60	
3322	49	60	
3321	48	60	
Lateral 3			
3320	149	89	122
3318	121	61	84
3317	65	61	84
3316	82	60	84
Lateral 3a			
3319	65	30	40
Lateral 4			
105	152	96	
1647	139	96	
103	31	1	
Lateral 4a			
104	54	90	
Lateral 5			
2941	4790	63	
1643	186	63	85
97	50	63	85
Lateral 6			
2938	9020	128	
2935	17300	95	
2933	5210	72	
90	204	59	
2932	8100	48	
89	115	48	77
Lateral 6a			
2936	84300	8	
95	22	8	
Lateral 6b			
1640	72	14	
91	37	14	
Lateral 7			
2931	18300	33	
88	65	33	131

Table L-46  
5 Mile Creek 6L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2822	15900	366	
2837	13400	363	
207	39	351	491
2819	3540	313	
2817	8180	313	
2815	52400	261	
384	1150	261	
2814	5380	259	
3293	64600	259	
2813	1740	259	
2811	327	188	
407	86	188	
406	349	180	
1800	39	180	
405	139	166	
403	235	158	
1797	86	148	
397	173	148	224
1795	307	148	224
525	62	107	
1830	16	107	
519	43	93	
1828	19	36	50
518	34	18	
517	19	18	
516	26	18	
Lateral 1			
2812	1730	56	
392	43	56	
391	118	56	
1798	65	50	
389	38	50	
388	74	50	
387	12	23	
386	45	23	
385	25	23	33
530	43	23	

Table L-47  
5 Mile Creek 9R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2824	3280	802	1060
244	907	802	1060
2830	64	802	1060
2835	288	802	
2834	10900	802	
3292	19400	802	
2833	2880	738	
225	1310	738	
2836	4050	734	
2954	17800	450	
3302	44400	450	
2951	4650	106	
112	37	106	179
Lateral 1			
2829	8740	9	
2828	1410	9	
213	31	9	
Lateral 2			
1684	29	23	30
212	25	10	14
Lateral 3			
2832	11600	17	
234	29	17	
233	31		
Lateral 4			
1697	112	1	
226	13	1	
Lateral 5			
2953	31300	229	
2952	593	9	
127	80	9	
125	23	9	13
123	23	9	13
Lateral 6			
2950	2480	190	
118	117	190	
117	722	174	237
115	27	7	9
Lateral 6a			
119	59	16	24
120	19	8	12
Lateral 6b			
116	641	138	

Table L-48  
5 Mile Creek 7L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2794	7160	933	
2791	73	933	
2793	16500	906	
3290	9320	907	
2787	6220	879	
2788	3160	878	
2789	51200	877	
443	79	877	1420
2790	27800	854	
2680	8140	854	1420
2679	5750	806	
3282	5860	504	
2687	59100	504	
2686	14200	471	
2685	7440	465	
596	23	465	651
3265	14700	388	
3280	52900	378	
2696	17000	378	
3281	17900	378	
2683	14600	348	
2698	8570	314	
650	535	314	
2697	401	286	
2702	10100	271	
2701	9420	267	
2700	11700	261	
2699	20300	224	
661	301	224	
659	289	184	
658	208	182	256
3266	1890	86	
2737	4830	11	
2735	56	11	
2736	53	5	
Lateral 1			
2796	1110	15	
227	24	15	
Lateral 2			
2681	955	75	111
1805	126	72	111
572	67	56	
571	79	56	
1856	86	56	
570	76	40	
1855	29	40	59
568	138	28	41
567	75	28	41
2669	24	28	
566	21	18	
564	26	18	
Lateral 2a			
575	43	6	
573	16	3	
Lateral 2b			
569	27	12	18
Lateral 3			
2678	74	346	
589	243	346	
584	364	346	

582	222	346	
579	357	346	475
2677	19900	346	
2675	3400	346	
2674	2030	149	
611	115	149	
614	67	142	
613	5	142	
612	104	142	
2682	13700	142	
2692	1900	122	
701	73	49	
700	48	37	
698	58	25	
697	40	25	
695	5	16	
Lateral 3a			
585	22	4	
1861	10	1	
Lateral 3b			
1860	32	4	
580	13	4	6
Lateral 3c			
578	61	10	
577	13	8	11
1859	18	8	11
1858	23	8	11
Lateral 3ca			
576	12	2	3
Lateral 3d			
2676	866	15	
598	44	15	
Lateral 3e			
601	46	192	
2799	303	183	
3283	2670	182	
2673	4040	182	
2672	2400	139	
2670	15800	66	
1874	171	66	
1873	40	45	
618	41	34	
1871	57	34	
1870	33	34	
617	52	34	
Lateral 3ea			
605	17	5	
Lateral 3eb			
600	17	6	
Lateral 3ef			
608	111	31	
1865	14	9	
607	20	9	
Lateral 3efa			
1868	21	22	
Lateral 3f			
610	31	7	
Lateral 3g			
1877	54	18	26
624	1	15	21
Lateral 4			
595	168	22	
593	50	13	18
1862	57	13	
591	57	13	18

590	55	13	18
Lateral 5			
2726	374	101	146
2725	252	101	146
597	44	10*	15
2684	7640	10*	
2724	177	101	146
2723	1830	100	146
2722	216	97	141
2720	121	66	95
2715	131	57	
2714	139	57	
2713	141	50	
2712	145	50	
2711	56	44	
2710	159	42	
2708	86	33	
2707	33	17	
2706	37	15	
Lateral 5a			
2719	54	19	
Lateral 5b			
2716	28	3	
Lateral 5c			
2709	21	8	
Lateral 6			
637	52	44	
636	12	36	
635	18	35	
634	31	35	
631	34	35	
Lateral 7			
649	46	38	
647	28	25	
Lateral 8			
651	14	5	
Lateral 9			
656	54	41	
1891	80	41	
655	70	25	34
1889	1	25	34
653	24	25	33
1884	32	25	33
1883	25	18	24
669	1	18	24
668	30	18	24
666	64	18	24
Lateral 10			
1886	253	50	72
684	159	50	
682	89	50	
680	169	50	
1894	69	23	
1893	64	20	
675	7	20	
Lateral 11			
2703	248	68	
2704	199	62	
2729	3	62	
2705	80	34	
2730	116	28	
2731	100	24	
2734	40	8	



Table L-49  
5 Mile Creek 8L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
431	134	62	
429	86	33	
427	31	33	
2786	30	33	
Lateral 1			
413	48	16	
687	41	7	

Table L-50  
5 Mile Creek 10R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
3262	11500	461	
3242	8700	374	
3263	43300	343	
3241	11500	293	
2807	74	23	
2808	26	14	
Lateral 1			
2802	6170	44	
2803	53	24	
Lateral 2			
3264	15800	83	
Lateral 3			
2806	141	43	64
Lateral 4			
2810	590	127	

Table L-51  
5 Mile Creek 11R

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2764	3290		3120
3287	26700		3120
2766	7690		3120
2756	5860		3020
2754	11000		173
247	422		173
Lateral 1			
2755	5290		31
246	157		31

Table L-52  
5 Mile Creek 9L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2776	92	104	
2775	96	104	
2774	95	87	
2773	83	87	
2772	108	37	
2770	84	37	
2769	23	37	
2768	56	13	
2767	19	13	
Lateral 1			
2778	1680	19	
435	24	19	

Table L-53  
5 Mile Creek 10L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
2758	2800	46	
2763	19000	32	
457	86	32	40
2693	16500	25	
638	42	25	30
Lateral 1			
2757	6480	26	
456	75	26	40
Upstream			
2753	3630	73	
458	157	73	195
2695	517	73	
639	93	73	130

Table L-54  
5 Mile Creek 11L

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
3284	26400	703	
3285	30100	300	
1113	172	300	
Lateral 1			
1112	77	36	
2226	51	23	
1111	23	23	
1107	31	22	

Table L-55  
EMC 1

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
1	107		107

Table L-56  
EMC 2

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
20	36	95	
19	596	95	
10	91	95	
9	91	95	
8	39	87	
7	39	87	157
6	46	66	
5	80	66	
4	57300	63	
3	53100	48	
2	23	48	
1	12	17	19
Lateral 1			
17	27	27	
16	46	27	
Lateral 2			
15	26	41	
14	19	15	
Lateral 3			
13	19600	23	
12	14	23	
Lateral 4			
11	24	12	44



Table L-57  
EMC 3

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
11	159	151	
10	156	151	
9	150	124	
8	151	99	
7	150	91	
6	315	64	
5	201	64	
4	31	64	
3	15	42	
2	24	32	
1	23	32	
Lateral 1			
16	46	28	
Lateral 2			
13	22	9	
14	9	9	
Lateral 3			
12	11	27	

Table L-58  
EMC 4

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
4	119	157	
3	130	79	
2	50	54	
1	42	31	
Lateral 1			
10	47	46	
9	15	34	
8	39	28	
7	33	26	
6	24	15	
5	23	14	

Table L-59  
EMC 5

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
26	677	285	
25	16300	236	
23	361	233	271
21	303	233	
20	92	212	
19	42	212	
18	144	212	
17	307	179	
16	4380	179	
15A	308	179	
15	123	179	
14	284	179	
13	282	175	201
12	117	175	
11	91	99	
10	256	99	
9	267	99	
8	100	99	
7	100	99	
6	100	87	
5	100	87	
4	100	87	
3	201	87	
2	201	87	123
1	617	75	
Lateral 1			
34	36	29	
33	17	29	43
Lateral 2			
35	63	19	26
Lateral 3			
30	142	51	
31	67	26	35
Lateral 3A			
28	51	27	40
27	140	27	40

Table L-60  
EMC 6

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
40	3980	453	
39	353	453	
38	227	453	
37	227	453	
36	32	453	
35	325	429	528
34	198	428	
33	6580	389	
32	462	389	
31	241	362	
30	1280	347	433
29	6430	209	
28	376	211	
27	333	211	
26	292	189	
25	166	189	
24	254	189	
23	361	189	
22	640	189	
21	32900	168	
20	150	166	
19	203	166	
18	203	142	
17	117	142	
16	17300	144	
15	250	144	
14	8420	137	
13	176	137	
12	166	137	
11	8220	110	
10	437	104	
9	242	104	127
8	47	65	
7	37	29	
6	52	29	
5	35	29	
4	35	29	
3	35	29	
2	35	29	
1	35	29	
Lateral 1			
50	67800	106	
49	304	106	
48	188	106	
47	29700	84	
46	161	84	

45	47300	33	
44	97	33	
43	30	33	
42	6160	20	
41	31	20	
Lateral 1A			
53	20600	24	
52	18	24	
51	20	24	
Lateral 2			
63	62	52	76
62	101	52	76
61	36	19	28
60	74	19	28
59	55	19	28
58	35	19	28
57	26	19	28

Table L-61  
EMC 7

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
9	680		201
8	19000		28
7	23700		21
6	23700		21
5	30000		21
4	59		10
3	37		10
2	1		10
1	45		10
Lateral 1			
11	229		13
10	16		13

Table L-62  
EMC 8

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
1	68		12

Table L-63 EMC 9			
Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
6	107	57	78
5	71	36	
4	60	28	
3	18	13	
2	8	13	
1	37	13	
Lateral 1			
7	10	15	
Lateral 2			
11	18	26	
10	50	11	
9	8	11	
8	47	11	



Table L-64  
EMC 10

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
1	15		7

Table L-65  
EMC 11

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
12	1740	440	625
11	19400	439	
10	21000	439	
9	61200	439	
8	50000	306	
7	27600	265	
6	18800	35	
5	10600	35	
4	26300	13	
3	9	13	15
2	5	6	8
Lateral 1			
29	2950	60	
28	24	20	
27	12	20	
26	10	20	
Lateral 1A			
36	43	49	
35	25	21	
34	21	21	
33	23	21	
32	31	21	
31	23	16	
30	22	16	
Lateral 2			
21	3320	56	
20	7040	56	
19	125	56	90
Lateral 3			
18	26000	59	
17	5450	159	
16	426	159	
Lateral 4			
15	42100	34	46
14	68	34	46

Table L-66  
EMC 12

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
1	37		75

Table L-67  
EMC 13

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
9	5320	273	
8	3430	164	
7	45	75	
6	101	75	
5	49	62	
4	41	29	
3	43	16	21
2	9	16	21
1	17	16	21
Lateral 1			
22	550	114	
21	120	94	
20	78	84	
19	176	63	
18	72	24	
Lateral 1A			
23	51	19	
Lateral 2			
14	86	114	
13	8360	114	
12	22800	25	
11	59	25	39
Lateral 2A			
17	335	54	
16	38	57	
15	28	37	
Lateral 3			
10	12	20	

Table L-68  
EMC 14

Conduit	Mannings Capacity	Peak Flow, cfs	
		10-Year	50-Year
Main Channel			
1	27		31