Final Conceptual Design Report For Rittenhouse Road Channel From Signal Butte Road to the East Maricopa Floodway

FCDMC Contract No. 92-13

FLOOD CONTROL DISTRICT of MARICOPA COUNTY

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I. *Introduction*

A. Project Location:

This project is located in Eastern Maricopa County predominantly in T2S, R7E with small portions of the project in T2S, R6E and T1S, R6E of the Gila and Salt River Base and Meridian (see Figure 1). The drainage area mainly consists of agricultural land with small pockets of residential, commercial and industrial development. The project limits extend from Signal Butte Road on the east, to the East Maricopa Floodway (EMF) on the west, and to the limits of drainage areas which contribute to the floodplain on the north side of the Southern Pacific Railroad (SPRR) located approximately 200 feet north of Rittenhouse Road.

B. Description of Improvements:

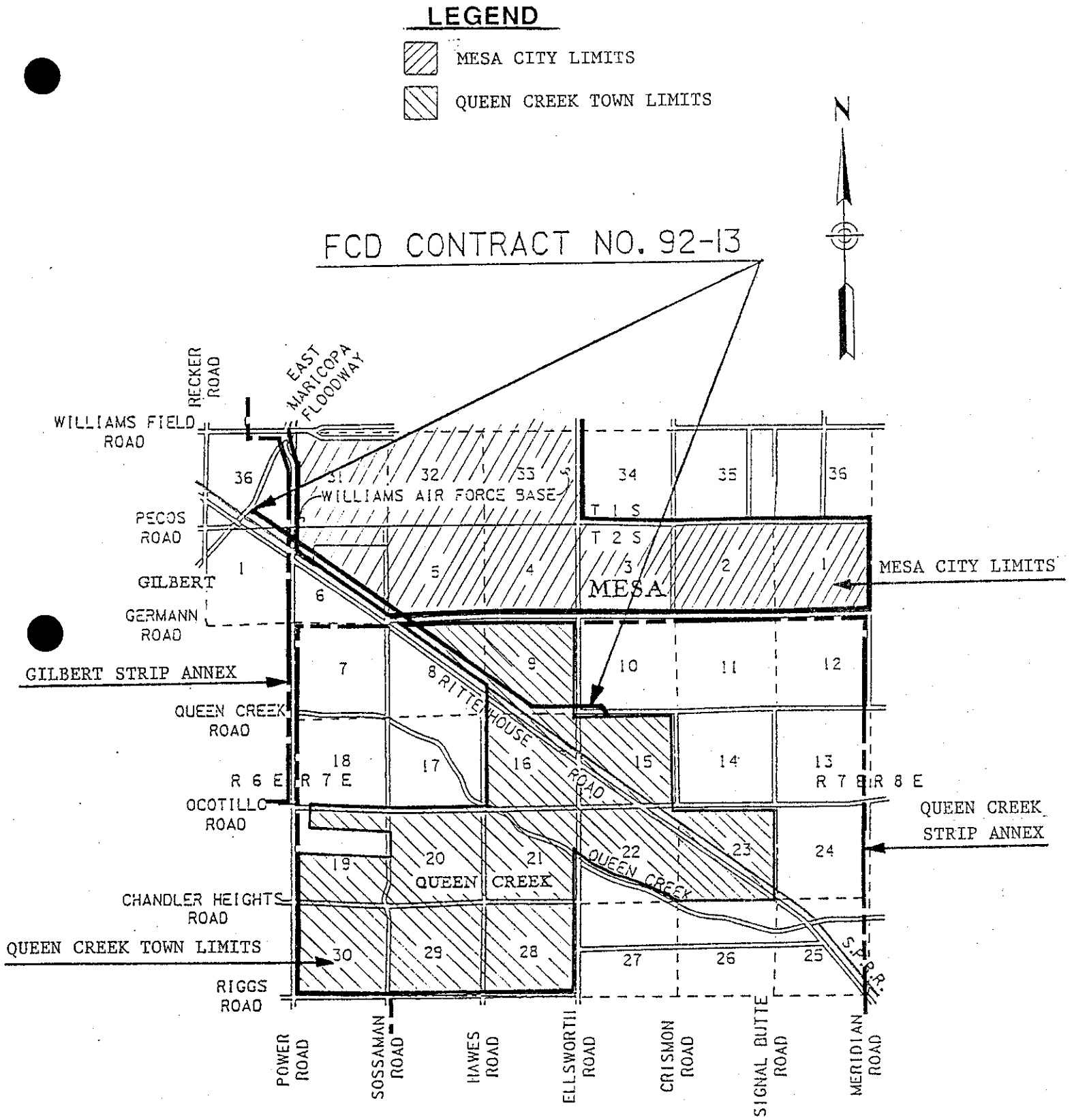
Proposed improvements for this project consist of a main flood control channel which will carry runoff from the Queen Creek School west to the EMF. The channel will have a 12-foot maintenance road to the south of the main channel, and a low flow channel and a collector channel on the north side of the main channel. The collector channel will be used to accumulate small flows before dumping into the main channel via a lined down drain. The use of the collector channel will minimize erosion of the side slopes caused by sheet flow entering the channel. In the future, tributary channels will be used to collect runoff along roadways and other concentration points and to carry the water to the main channel. Although the confluence of the tributary and main channels will be included in this project, the design and alignment for tributary channels will be completed in future projects.

C. Previous Reports:

This project has previously been studied in the "Queen Creek Area Drainage Master Study, FCD Contract No. 86-23", (QCADMS) by Wood and Associates, Inc. This project is part of Phase II of the overall drainage system proposed for the area of Maricopa County east of the EMF and south of Elliot Road. The HEC-1 file for this project that was developed by Wood and Associates has been revised to more accurately model the drainage subareas and routing paths. Existing detention areas and culverts were added to the HEC-1 model to further detail the model and to account for losses in the runoff.

D. Scope of Investigation:

The investigation for this report is primarily of the existing and proposed hydrologic and hydraulic conditions. Investigations of the soils, existing utilities, easements and rights-of-way have also been completed. As a part of the utility investigation, a pothole program will be submitted to the Flood Control District (FCD) for approval before beginning work in the field.



VICINITY MAP

NOT TO SCALE

FIGURE NO. 1

The investigation of the hydrologic and hydraulic conditions began with a review of the drainage report for this area and 200-scale topographic data provided by the FCD. After completing the office investigation, several site visits were made to determine the location and size of culverts, the condition of existing swales, ditches and channels and the feasibility of using depressed areas and tailwater ponds for detention.

At the same time that the office and field investigations were proceeding, a survey to develop detailed topographic data was in progress. The detailed topographic data was entered into the computer to generate base sheets for developing conceptual plans. The base sheets will also be used to develop the construction drawings during the design phase of the project.

After base sheets were developed, the geotechnical investigation began. The geotechnical investigation included sampling from 10 boring locations and analysis. (See Section III of this report.)

Utility coordination was an ongoing process during the conceptual study phase. Utility maps and field survey data were combined to plot utility locations in plan view. Plans were sent to utility companies for verification of utility locations as depicted. Utility responses were checked against the drawings and the plans revised accordingly. (See Section V of this report.)

II. *Drainage Area and Hydrology*

A. Description of Drainage Area:

The contributing drainage area of Rittenhouse Channel encompasses approximately twenty-three (23) square miles of mostly desert and agricultural land. Small pockets of residential, commercial and industrial development exist in the drainage area but these have little effect on the overall volume of runoff. The drainage area is bordered on the east by the CAP canal, on the north by the GM Proving Grounds and the Williams Air Force Base flood channels, on the south by the Southern Pacific Railroad track embankment and on the west by the EMF. This area slopes towards the west at approximately 0.36 percent and outfalls to the EMF. Existing drainage systems in this area consist of small roadside channels, culverts and storm drains which transport water to the EMF (see Table No. 1). These existing systems do not have capacity for the 100-year runoff and flooding has occurred for storms smaller than the 100-year event.

Table No. 1
Existing Culverts Along Proposed Alignment

Location	Type	Number and Size
Power Road	Concrete Box Culverts	3 - 3' x 10'
Sossaman Road	Corrugated Metal Pipe	36"
Germann Road	Corrugated Metal Pipe	36"
Ellsworth Road at Queen Creek School	Concrete Culvert with Inlets	24"

B. Drainage Area Characteristics and HEC-1 Parameters:

This area had been previously subdivided into subbasin areas in the QCADMS. Field reviews and 200-scale contour maps were used to make minor adjustments in the drainage area boundaries and routing patterns. All of the parameters used in the HEC-1 files for the QCADMS were used for the HEC-1 files for this study. Therefore, lag times and total runoff developed will remain relatively unchanged (see Table 2). The FCD has adopted the use of the 100-year 6-hour storm for design of flood control structures. However, the 100-year, 24-hour storm has been used in this study so that the study will be compatible with the QCADMS. The original analysis of this site did not incorporate detention areas or some of the existing culverts. Existing tailwater ponds were used as detention basins but only one-half of the total capacity of the basins were assumed available for storm runoff retention. A large depressed area at the intersection of Ocotillo Road and the SPRR was also used as a detention basin. Three existing culverts under the SPRR, located east of the Ocotillo Road intersection carry flow south under the SPRR to Queen Creek. The culverts (71"x47" CMPA) have a 60-inch equivalent diameter. An equivalent diameter indicates the size of a circular pipe which will have the same flow characteristics as an arched pipe. The equivalent "circular" diameter of the pipes has been used in the HEC-1 model to determine the capacity of the culverts. In conjunction with the previously mentioned detention area, the three culverts have adequate capacity to pass all 100-year runoff reaching the Ocotillo Road and SPRR intersection to the south.

TABLE 2

LAG TIME CALCULATIONS

AREA	TOP ELEV.	BOTTOM ELEV.	LENGTH ft.	SLOPE %	CN (1)	V fps (1)	Tc hr. (2)	T (LAG) (3)
278A	1496.5	1418.0	9500	0.83	75	0.98	2.69	**1.62**
278B	1440.0	1420.5	3580	0.54	75	0.98	1.01	**0.61**
278C	1420.5	1412.0	4180	0.20	75	0.98	1.18	**0.71**
260	1452.0	1432.0	9020	0.22	75	1.03	2.43	**1.46**
264	1430.5	1412.0	7240	0.26	76	0.90	2.23	**1.34**
268A	1412.0	1395.0	6400	0.27	76	0.84	2.12	**1.27**
268B	1412.0	1395.0	4840	0.35	76	0.84	1.60	**0.96**
268C	1404.0	1394.0	2840	0.35	76	0.89	0.89	**0.53**
268D	1395.0	1379.0	4120	0.39	76	0.84	1.36	**0.82**
242	1448.0	1422.0	8300	0.31	76	1.06	2.18	**1.31**
246A	1428.0	1417.0	3700	0.30	75	0.92	1.12	**0.67**
246B	1432.0	1408.0	7580	0.32	75	0.92	2.29	**1.37**
250	1412.0	1392.0	7480	0.27	75	0.90	2.31	**1.39**
254A	1392.0	1374.0	5920	0.30	77	0.90	1.83	**1.10**
254B	1394.0	1366.0	7620	0.37	77	0.90	2.35	**1.41**
254C	1373.0	1356.0	5340	0.32	77	0.90	1.65	**0.99**
254D	1366.0	1356.0	5740	0.17	77	0.90	1.77	**1.06**
222A	1440.0	1420.0	8040	0.25	76	0.95	2.35	**1.41**
222B	1426.0	1418.0	2780	0.29	76	0.95	0.81	**0.49**
226A	1422.0	1410.0	7200	0.17	78	0.92	2.17	**1.30**
226B	1416.0	1400.0	7320	0.22	78	0.92	2.21	**1.33**
230	1408.0	1385.0	7520	0.31	75	1.00	2.09	**1.25**
234A	1388.0	1366.0	5980	0.37	76	1.02	1.63	**0.98**
234B	1391.0	1372.0	5980	0.32	76	1.02	1.63	**0.98**
238A	1372.0	1340.0	9620	0.33	75	0.98	2.73	**1.64**
238B	1352.0	1330.0	6700	0.33	75	0.98	1.90	**1.14**
290	1384.0	1366.0	13920	0.13	79	1.18	3.28	**1.97**
292	1330.0	1316.0	3520	0.40	77	0.88	1.11	**0.67**

(1) – TAKEN FROM THE "QUEEN CREEK AREA DRAINAGE MASTER STUDY" BY WOOD & ASSOC.

(2) – Tc = L / V

(3) – Tlag = Tc x 0.60

FILE = TLAG2

C. HEC-1 Analysis:

After completing the revisions to the QCADMS HEC-1 file for drainage areas and routing paths, the program was run (see Figure No. 3, back pocket). The output was compared to the output from the QCADMS and no significant differences were found. After completing the review two more HEC-1 files were created. Both contain the same detention basin configurations, however, each models a different culvert scenario at Ocotillo Road.

There are three existing arch pipes at Ocotillo Road which carry water under the railroad tracks and into a wash which leads to Queen Creek. These culverts are approximately 71"x47" and were not included in the original HEC-1 model. To model these culverts in the HEC-1 program a "divert" record was used. This modeling method checks inflow to the detention area at the culverts versus the outflow capacity of the culverts. If the culverts do not have capacity for all of the incoming flow, runoff will be routed along the route north of the SPRR. Equivalent culvert sizes were used when modeling these culverts to simplify the calculations and so that common pipe diameters could be used. Equivalent pipe diameters have been determined by pipe manufacturers based on the capacity of culverts and are shown in Figure 3.

Figure 2

52 STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS

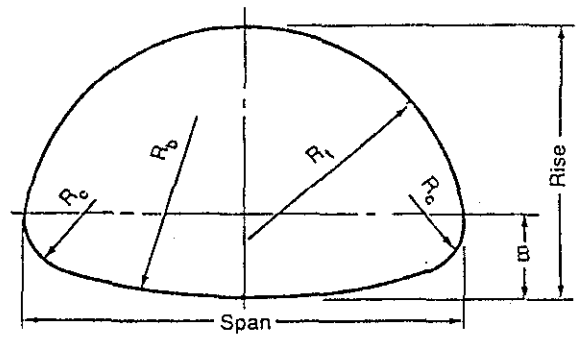


Table 1-16 Sizes and Layout Details—CSP Pipe Arches
2⅔ x ½ in. Corrugation

Equiv. Diameter, in.	Span, in.	Rise, in.	Waterway Area, ft²	Layout Dimensions			
				B in.	R_c in.	R_t in.	R_b in.
15	17	13	1.1	4⅛	3½	8⅝	25⅝
18	21	15	1.6	4⅞	4⅛	10¾	33⅛
21	24	18	2.2	5⅝	4⅞	11⅞	34⅝
24	28	20	2.9	6½	5½	14	42¼
30	35	24	4.5	8⅛	6⅞	17⅞	55⅛
36	42	29	6.5	9¾	8¼	21½	66⅛
42	49	33	8.9	11⅜	9⅝	25⅛	77¼
48	57	38	11.6	13	11	28⅝	88¼
54	64	43	14.7	14⅝	12⅜	32¼	99¼
60	71	47	18.1	16¼	13¾	35¾	110¼
66	77	52	21.9	17⅞	15⅛	39⅜	121¼
72	83	57	26.0	19½	16½	43	132¼

Dimensions shown not for specification purposes, subject to manufacturing tolerances.

The first file used 60-inch diameter culverts to determine the effect of the culverts if they were properly maintained (see Appendix B). The second file used 48-inch diameter culverts to approximate the existing capacity of the clogged culverts (see Appendix C). After reviewing the existing field conditions, and meeting with the Town of Queen Creek, SPRR representatives and Maricopa County Department of Transportation representatives, the FCD determined that modeling the culverts as 60-inch diameter, unclogged pipes would provide an accurate model for determining the peak discharges for the channel design.

The final HEC-1 design file (Appendix B) indicates that no runoff will flow from Ocotillo Road and the SPRR to the west. Therefore, since no runoff needs to be carried from Ocotillo Road to Ellsworth Road this portion of the channel design has been eliminated from the report. However, the HEC-1 design file also indicated a large volume of runoff concentrated at the northeast corner of the Queen Creek School site. Table 3 lists the runoff volumes and routes at various points in the drainage basin. Due to the volume of runoff and the concerns of the Town of Queen Creek and the School District, it was determined by the FCD that it would be appropriate to extend the main channel to the Queen Creek School to capture this flow and eliminate historical flooding at the school.

Table 3
Existing Runoff Data

Concentration Point	Q_{100} (cfs)	Discharge Route
Ocotillo Road and SPRR	361	Under SPRR to Queen Creek
Intersection of Signal Butte and Queen Creek Roads	506	NE Corner of Queen Creek School
NE Corner of Queen Creek School	516	West to Germann and Sossaman Roads
Intersection of Germann and Sossaman Roads	813	Existing Power Road Boxes North of SPRR
Power Road at Existing Box Culverts	1,053	East Maricopa Floodway North of SPRR
East Maricopa Floodway North of SPRR	1,047	East Maricopa Floodway

III. Geotechnical Considerations

The geotechnical survey of this site includes 10 boring and sampling locations. The geotechnical investigation indicates that soils in the proposed channel Alternate A alignment consist of fine grained soils. The Unified Soils Classification System designation for the project soils include clayey silty sand (SC-SM), sandy clay (CL), silty sand (SM), sandy silt (ML), and clayey sand (SC). When comparing these classifications with the Federal Highway Administrations soil types listed in Table 5.1 of the FCD Hydraulics Manual it is apparent that a low velocity design is required for this project. A copy of the geotechnical report for this project is included in Appendix A.

The preliminary conceptual design report for this project was completed prior to the completion of the geotechnical survey. Therefore, the maximum allowable channel velocity was set at 5 feet per second (5 fps) as listed in the QCAMDS. However, upon reviewing the geotechnical investigation it was determined that the channel velocity would need to be reduced considerably to 2.5 fps - 3.5 fps.

The design for Alternates A and B used a velocity of approximately 5 fps and the existing ground slope and approximately one-half the existing ground slope, respectively. These alternates require a thin soil cement lining to prevent excess erosion. Alternates C and D have a design velocity of approximately 3 fps and use a slope of 0.0005 ft./ft. and existing ground slope, respectively.

Included in the geotechnical report is the recommendation that for Phase II (design) of this project the depth of borings be reduced to 10 feet and the number of borings increased. Since all road crossings are box culverts, borings deeper than 10 feet are unnecessary. Boring 10 feet deep along the channel alignment will give ample data for design and the increased boring locations will define the existing soils better.

IV. Hydraulics and Alternate Designs

A. Design Criteria and Sources:

The hydraulic design for this project will use criteria from the following four sources:

1. Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics
2. HEC-2 Computer Model and Manual
3. Open Channel Hydraulics, V.T. Chow
4. Geotechnical Report for the Rittenhouse Channel, ATL, Inc.

From these four manuals, the following list of parameters was obtained.

Mannings "n"	= 0.027 (dirt channel with weeds)
Maximum Velocity (Unlined)	= 3.0 feet per second (+/-)
Maximum Velocity (1' Soil Cement)	= 5.0 feet per second (+/-)
Maximum Velocity (Lined)	= 10.0 feet per second
Expansion Coefficient	= 0.3 (channel)
	0.5 (bridge/box culvert)
Contraction Coefficient	= 0.1 (channel)
	0.3 (bridge/box culverts)
Curve Centerline Radius (Min.)	= 3 times water surface width
Freeboard (Min.)	= 1.0 foot
Froude No (Max.)	= 0.86

The design of this channel is controlled by the allowable velocity and the economic consideration of reasonable construction costs. The geotechnical report indicates that the soils in this area are equivalent to those listed in Table 5.1 of the Maricopa County Hydraulics Manual (Item 1 above) with maximum velocities of 2.5 to 3.5 fps. The decision to use a design velocity of 3.0 fps +/- for an unlined channel was based on the fact that a majority of the soils in the study area contained some clays. The Froude No. for the unlined channel Alternate C is 0.27 (see Appendix F). This indicates that steady laminar flow, which has low erosion capability, should occur in the channel.

Two parameters which greatly affect the design of channels are the allowable velocity and channel slope. If the allowable velocity is decreased, then the width of the channel will likely increase. Conversely, if the allowable velocity is increased, the channel width will decrease. The slope of large channels is typically set to match the existing ground slope. While decreasing the slope of the channel below that of the existing ground will help to reduce the overall channel width it will require the use of drop structures. Using drop structures in a channel will generally increase costs and maintenance requirements and limit future use of the channel for recreational facilities. When both the channel velocity and channel slope are decreased, a deep and relatively narrow channel section can be used.

Bank stabilization will generally not be required for this channel. As previously discussed the design velocity has been set at a velocity which will be non-erosive. Banks often incur erosion when sheet flow runoff is allowed to enter the channel in an uncontrolled manor. Therefore, the north bank will be protected by the construction of a side collector channel. This channel will

collect the sheet flow and minor concentration point runoff and convey it to the bottom of the main channel in riprap-lined downdrains. Riprap will also be used at the entrance and exit of all box culverts and drop structures. Calculations for the protection at drop structures are included in Appendix B. Similar protection will be used at the outlets of box culverts.

Box culverts were sized by three methods. The first method was the use of inlet control nomographs prepared by the FHWA. The second method was to insert the box culvert sizes from the FHWA charts into the HEC-2 model (see Appendix J). The results of the model indicated that the proposed box culverts will function adequately. At the request of the FCD, the box culverts shown on the plans and used in the HEC-2 model were manually checked for outlet control. Of the four box culvert locations, three will have a drop at the outlet. These three box culvert installations will function under inlet control according to the manual calculations. The fourth box culvert location (Sta. 118+00 +/-) does not have a drop at the outlet and will function under outlet control (see Appendix C for calculation). It is interesting to note that the water surface elevation calculated by manual methods (54.42) is only 0.09' greater than the water surface elevation calculated by the HEC-2 program (54.33). Since the computer model accounts for upstream and downstream effects on the flow, we believe that the HEC-2 evaluation of the box is more reliable. Since most of the culverts will have drop structures at the outlet, the protection provided at the outlets will be the same as that for the drop structures.

Although a sedimentaion analysis was not included in the scope of work, a review of the available data indicates that sedimentation should not be problematic. Table 2 indicates that the overland velocities of the runoff will be approximately 1.0 fps. With a non-erosive velocity of approximately 3.0 fps the sediment transported to the channel at a velocity of 1.0 fps should remain in suspension. During minor storms flow may enter the channel with sediment then infiltrate into the ground before exiting the channel. In this instance, sedimentation will occur. For this reason, the low flow channel was designed at a width that would be easy to maintain.

The side collector channel was sized to approximate the tailwater ditches located in this area. The velocity in the side collector channel must be kept above 1.0 fps to keep sediment in suspension and below 3 fps to prevent erosion. The downdrains for the side collector channel will be located at points where the contributing area will produce approximately 9 cfs of runoff during the 100 year storm. The "County Hydraulics" manual (Item 1 above) states that low flow channel should have capacity for the base flows which are less than the 5-year or 10-year storm. Since most of the frequent discharges to this channel will be tailwater discharges, the low flow channel was sized to carry small volumes of runoff (12 cfs) at a velocity equal to or greater than the natural overland velocity of the runoff (1.0 fps). Calculations for the low flow, the side collector channel, and the 5-year storm flow in the channel are included in Appendix F.

B. <u>Alternate A-1 and Alternate B-1: EMF to Power</u>:

This section will run from the EMF to Power Road and will be centered approximately 175 feet north of the SPRR centerline. The channel will be routed around a gas pumping plant which is near the EMF. Since the access road for the gas facility will be blocked by the proposed channel, access to the facility will have to be by the channel maintenance road. (See sheet 3 of the Construction Plans, Appendix K.) A grouted riprap down drain will be used to prevent erosion at the confluence of the Rittenhouse channel and the EMF.

Alternate A-1 approximately follows the existing ground slope (0.28%) for the channel design. For Alternate A-1, a second set of curves will be used to align the channel with the outlet from the existing box culverts at Power Road. Three additional box culverts will be added to the existing boxes to provide adequate capacity for the 100-year storm. A 10'x5' box will be used to allow the low flow channel to pass under Power Road. Two 10'x4' boxes will be used to provide the remaining capacity required under Power Road. Although the existing boxes at Power Road are only three feet high, the use of additional three foot boxes will require more concrete, steel and construction time than the configuration presented. During low flow conditions all of the water will pass through the five-foot high box. When the volume of runoff exceeds the capacity of the low flow channel, runoff will also pass through the two four-foot high boxes. As the runoff volume continues to increase the three-foot high boxes will begin to accept flow. Since the boxes are set with the same crown elevation, each will be flowing under the same headwater/rise condition when the peak flow from the 100-year storm passes through the Power Road boxes. Riprap channel protection will be required at the inlet to protect from erosion. It is proposed that a combination concrete headwall, wing walls and floor also be used in this area. Because of the varying box heights, a drop will occur at the outlet. The flow velocity will also be high as water exits the box culverts. Therefore, riprap protection (grouted) will be required for approximately fifty feet downstream. Appendix D contains the hand calculations for Alternate A.

Alternate B-1 will use a channel slope (0.15%) approximately one-half of the existing ground slope. This will create a channel cross section that is narrower but deeper than Alternate A-1. A shallower slope will also require the use of drop structures to make up for five feet of elevation drop which is not developed with the shallow channel slope. Since drop structures are to be limited to 3 feet of drop, two drop structures will be used. At Power Road the existing boxes will be removed and replaced with new boxes. The new boxes will parallel the SPRR alignment thus eliminating the need to curve the channel to match the existing box alignment. The boxes required will be one 8'x5' for the low flow channel and four 10'x4' for the main channel. These boxes will be longer than those used in Alternate A-1 since they will cross Power Road at a skewed angle. Inlet and outlet protection will also be required for these boxes similar to that used for Alternative A-1. Hand calculations for Alternate B are included in Appendix E.

C. <u>Alternate A-2 and Alternate B-2: Power to Sossaman</u>:

This section of the channel will run from the east side of Power Road to the west side of Sossaman Road. The channel centerline will be about 175 feet north of the centerline of the SPRR. Alternate A-2 will follow the existing ground slope (0.32%). There are no obstructions which will interfere with the channel alignment.

Alternative A-2 will begin with a transition section which will use curves to route the channel from the alignment with the existing boxes to an alignment that is centered 175' north of the SPRR. Alternate A-2 will follow the existing ground slope (0.32%). This transition area will also be the confluence of two channels. The second channel will come from the Williams Air Force Base (WAFB) site and will follow the alignment of the existing channel. The peak flow at Power Road is 1,053 cfs. However, the peak flow in the WAFB channel is 561 cfs and the peak flow in Alternate A-2 is 804 cfs. Therefore, although the channel east of Power Road will be wide, it will quickly reduce to two smaller channels east of Power Road. The design for the WAFB channel has been included with the Alternate A designs in Appendix D even though it will not be constructed as a part of this project.

Alternate B-2 will have a transition section to the east of Power Road to provide adequate capacity for the confluence of the WAFB channel and the main channel. Beyond the transition section this alternate will continue on an alignment that is 175 feet north of the SPRR centerline. Alternate B will use a slope (0.17%) which is approximately one-half of the existing ground slope. This alternate will require the use of four drop structures to account for 11.5 feet of elevation not used with the shallow channel slope. The channel will have a single curve as it reaches Sossaman Road so that the channel will be aligned with the culverts discussed in Alternate B-3. Calculations for the design of Alternate B-2 are included in Appendix E.

D. Alternate A-3 and B-3: Sossaman to Germann:

This section of channel will begin on the west of Sossaman Road, continue along the north side of Germann Road and end on the south side of Germann Road. This route was selected to eliminate the need to relocate the trailers to the south of Germann Road and to reduce the overall box culvert length. Box culverts will be required under Sossaman Road and Germann Road. The channel slope for both alternates will be 0.11%.

Alternate A-3 will cross under Sossaman Road with one 8'x4' CBC and six 8'x4' CBC's at a skewed angle that approximately follows the channel alignment 175 feet north of the SPRR. After passing under Sossaman Road, a short concrete channel section will be used to curve the channel to an alignment parallel to Germann Road. An unlined open channel will be used to extend the channel to a point where the channel can pass under Germann Road without interfering with the existing trailers. The channel will then pass under Germann Road at a skewed angle with the same box culverts as used at Sossaman Road. Inlet and outlet protection will be required for both sets of boxes and guard rail will be required along Germann Road. Because of the multiple boxes and direction changes within such a short distance, it is recommended that this section of the channel be completely enclosed by chain link fence. No maintenance road will be constructed for this section because of its short length and proximity to existing roads. Calculations for the box culverts and the channel are in Appendix D.

Alternate B-3 will use the same size boxes and channel sections as Alternate A-3, but on a different alignment. The channel west of Sossaman will curve to the north so that the box culverts will be perpendicular to the road as they pass under Sossaman Road. The channel on the east side of Sossaman will begin further to the north of Germann Road than Alternate A-3 and shall continue to the east along the Sossaman Road box culvert alignment. As the channel continues to the east, it will curve to the south so that it ends perpendicular to Germann Road. The multiple box culverts will then pass perpendicular to the road under Germann Road. Inlet and outlet protection will be required at the box culverts. This alignment will leave an island of land between the road and the channel. Therefore, a maintenance road will be required for this alternate, but guard rail and extensive fencing will not be needed. Calculations for the box culverts are in Appendix D and those for the channel are in Appendix E.

E. Alternate A-4 and Alternate B-4: Germann to Queen Creek Road:

This section of the channel begins on the south side of Germann Road then turns east to follow an alignment centered 175 feet north of the SPRR centerline until reaching a point marked by the extension of Queen Creek Road. No box culverts or obstructions occur along this stretch of the channel. In the future, a tributary channel will carry flows from the east along the south side of

Germann Road. Therefore, the channel immediately south of Germann Road will have the same cross section as on the north side of Germann Road to provide adequate capacity for the confluence of the two channels.

Alternate A-4 will follow the existing ground slope (0.29%). A drop structure will be used to adjust the elevation of Alternate A-4 south of Germann Road as the channel turns east. Typical drop structure calculations are included in Appendix E. Channel calculations for this alternate are in Appendix D.

Alternate B-4 will follow the same alignment as Alternate A-4. The channel slope (0.15%) will be approximately one-half of the ground slope. Therefore, five drop structures will be used to adjust for the 13.3 feet of elevation not used by the shallow channel slope. Channel and drop structure calculations are included in Appendix E.

F. <u>Alternate A-5 and Alternate B-5: SPRR to Queen Creek School</u>:

This section of the channel will begin at the point where Queen Creek Road extended would cross the SPRR. The alignment will parallel the SPRR centered 175 feet north of the SPRR for approximately 1,250 feet before turning east towards the Queen Creek School. The exact alignment of the channel from the SPRR east will depend heavily on the opinions of the landowners. Therefore, the preliminary alignment for the channel from the SPRR to around the Queen Creek School site has been set based on the existing school fence line. Adjustment of the alignment either north or south will have little effect on the channel configuration. This section of the channel will have one 10'x4' CBC and three 8'x3' CBC's for the Ellsworth Road crossing. The maintenance road will be eliminated on the east side of Ellsworth Road and the side collector channel will be relocated to the south side of the main channel. An access ramp to the channel bottom will be provided on the east side of Ellsworth Road. This section of the channel (and this project) will end on the south side of Queen Creek Road to the east of the school's sports field. The channel will end with a flared section to improve the entrance flow characteristics for the existing condition. To minimize the right-of-way need, the channel curve at the corner of the school has a radius of 50 feet. Although this is below the recommended minimum, the superelevation will only be 0.58 feet. (See Appendix D, Sheet 7 of 7.) The radius of this curve will be increased if the channel alignment is moved to the south. A preliminary review of a channel along the south side of Queen Creek Road from east of the school to Ellsworth Road indicated that the limited right-of-way would require the use of a concrete channel. The preliminary estimates indicated that this concrete channel north of the school would cost five times as much as an earth channel around the south side of the school. Therefore, the option for a channel along the south side of Queen Creek Road has not been included in this report.

Alternate A-5 will follow the existing ground slope (0.33%). No drop structures will be required. Calculations for this section are included in Appendix D.

Alternate B-5 will have a channel slope (0.16%) approximately one-half of the existing ground slope. A total of four drop structures will be required to adjust for the 10.51 feet of elevation not used by the shallower slope. Calculations for this section are included in Appendix E.

G. Alternate C-1 and C-2: EMF to Germann:

This channel alternate uses a velocity of 3.0 fps and a channel slope of 0.0005 ft./ft. Since the channel slope will remain constant, the channel shape will only change at points where the total design flow changes.

Alternate Section C-1 will run from the EMF to Power Road. The channel section will be approximately 122 feet wide and will be centered about 161 feet northeast of the SPRR. This alignment will vary as the channel is routed around the existing gas buildings and at the Power Road CBC's. A 6'x8' CBC will be added to the Power Road CBC's for the low flow channel. Two 5'x7' CBC's will also be added to provide the additional capacity needed to pass 1,047 cfs. A total of four drop structures will be used to adjust the channel for eleven feet of natural slope not used with the shallow design slope. The depth of flow for this section is 5.0 feet.

Alternate Section C-2 will run from east of Power Road to north of Germann Road. Since two channels converge at Power Road a special transitional section will be used on the east side of Power Road. This section will carry about 800 cfs. The section is approximately 108 feet wide and will be centered about 154 feet northeast of the SPRR. This channel section will have a flow depth of 5.0 feet. The alignment will be constant except at Power Road and between Sossaman and Germann to allow for alignment with the CBC's. One 6'x8' CBC for the low flow channel and two 5'x9' CBC's will be used under Sossaman and Germann Roads. The alignment chosen will prevent the removal of the residence at the intersection of Sossaman, Germann and the SPRR. A total of six drop structures will be used to adjust the channel for 19 feet of natural slope not used with the shallow design slope.

The hand calculations for these designs are included in Appendix F and the HEC-2 output file is in Appendix J. Appendix K contains the plans which detail the proposed horizontal and vertical designs.

H. Alternate C-3A and C-3B: Germann to Queen Creek School:

The hydraulic design of these two sections is identical since channel capacity (504 cfs), velocity (3 fps) and slope (0.0005 ft./ft.) are unchanged. The only difference will be in the alignment of the channel as it approaches the Queen Creek School. Alternate C-3A will follow the SPRR until it passes the Queen Creek Road alignment and then turn east to pass along the south side of Queen Creek School. Alternate C-3B will follow the SPRR until reaching the Queen Creek Road alignment where it will turn east and continue along the north side of Queen Creek Road. Alternate C-3B will require one more set of boxes than Alternate C-3A since it will have to cross Queen Creek Road to collect runoff at its concentration point. This channel section is about 92 feet wide and will be centered approximately 146 feet northeast of the SPRR where the alignments are parallel. The channel will flow 5.70 feet deep and will have a bottom width of 10 feet. A low flow channel will not be included in the design since the channel bottom width is narrow. Two 5'x9' box culverts will be used to cross Ellsworth Road. Alternate C-3B will use the same size boxes to cross Queen Creek Road. Hand calculations are included in Appendix F and the HEC-2 output file is included in Appendix J. Construction plans for the C-3B alignment are in Appendix K.

I. Alternate D: EMF to Queen Creek School:

Alternate D uses a channel velocity of 3 fps and follows the natural ground slope. The total channel width for this design ranges from 176 feet to 376 feet. This quantity of channel right-of-way would be unacceptable to the property owners in the area. Therefore, no further calculations or cost estimates were completed for this alternate.

J. Summary of Hydraulics and Alternate Designs:

The hydraulics for this channel indicate that erosion and scour in the channel should be minimal ($F<0.86$) when the velocity is approximately 3.0 fps. Inlets and outlets of boxes, channel sections with small radius curves, drop structures and other locations which commonly experience erosion will be protected with riprap.

In addition to some alternate alignments, the alternate designs for this channel involved revisions in the channel slope and allowable velocity. Alternative channel linings were not considered due to their expense. A 1.0 foot thick soil cement plating will be included in estimates for the channels which have a velocity of 5.0 fps. Reducing the channel slope while maintaining the same velocity will give an alternate which is narrower but deeper. While this will reduce the amount of right-of-way required, it will not decrease the overall earthwork required. The use of a shallower channel slope will require the use of multiple drop structures. The following table lists all of the new box culverts proposed for the various alternates. Table 5 lists various channel data for the HEC-2 output file which is in Appendix J.

Table 4
Box Culvert Sizes and Number

Location/Alternates	Alternate A	Alternate B	Alternate C
Power Road	1 - 10' x 5' 2 - 10' x 4'	1 - 8' x 5' 4 - 10' x 4'	1 - 8' x 6' 2 - 7' x 5'
Sossaman Road	1 - 8' x 4' 6 - 8' x 3'	1 - 8' x 4' 6 - 8' x 3'	1 - 8' x 6' 2 - 9' x 5'
Germann Road	1 - 8' x 4' 6 - 8' x 3'	1 - 8' x 4' 6 - 8' x 3'	1 - 8' x 6' 2 - 9' x 5'
Ellsworth Road	1 - 10' x 4' 3 - 8' x 3'	1 - 10' x 4' 3 - 8' x 3'	2 - 9' x 5'
Queen Creek Road	---	---	2 - 9' x 5'

TABLE 5

HEC-2 CHANNEL DATA

SECNO	Q	VCH	DEPTH	10*KS	CWSEL	BOTTOM WIDTH	SIDE SLOPE Z
1093.000	1047.00	2.75	5.94	5.92	18.71	42	4
1119.000	1047.00	3.10	5.95	8.78	18.73	42	4
1150.000	1047.00	3.10	5.95	5.20	18.75	42	4
1739.000	1047.00	3.10	5.96	5.18	19.06	42	4
1887.000	1047.00	3.09	5.96	5.16	19.13	42	4
2034.000	1047.00	3.09	5.96	5.17	19.21	42	4
2048.000	1047.00	3.10	5.96	8.71	19.22	42	4
2099.000	1047.00	3.34	5.97	9.70	19.25	42	4
2100.000	1047.00	10.71	4.24	154.65	19.52	26	0.26
2120.000	1047.00	3.00	6.08	8.00	21.37	42	4
2121.000	1047.00	3.00	6.08	7.95	21.37	42	4
2346.000	1047.00	2.94	6.16	7.53	21.56	42	4
2493.000	1047.00	2.91	6.21	7.30	21.68	42	4
2640.000	1047.00	2.89	6.23	7.17	21.78	42	4
2848.000	1047.00	2.90	6.28	7.32	21.93	42	4
2899.000	1047.00	3.21	6.27	8.25	21.95	42	4
2900.000	1047.00	10.72	4.57	156.67	22.85	26	0.26
2920.000	1047.00	3.06	6.00	8.42	24.69	42	4
[illegible]21.000	1047.00	3.05	6.01	4.98	24.70	42	4
[illegible]48.000	1047.00	3.05	6.01	8.39	25.26	42	4
4099.000	1047.00	3.42	6.00	9.92	25.28	42	4
4100.000	1047.00	10.71	4.24	154.65	26.52	26	0.26
4120.000	1047.00	3.00	6.08	8.00	28.37	42	4
4121.000	1047.00	3.00	6.08	4.73	28.37	42	4
4271.000	1047.00	3.01	6.07	4.79	28.44	42	4
4452.000	1047.00	3.90	5.96	1.44	28.43	BOX	0
4564.000	1047.00	5.63	3.58	4.49	31.38	BOX	0
4609.000	1047.00	3.03	6.03	4.90	31.85	42	4
5041.000	804.00	2.71	6.05	4.32	32.09	28	4
5266.000	804.00	2.93	6.03	4.89	32.18	28	4
5998.000	804.00	2.94	6.03	8.31	32.55	28	4
6049.000	804.00	3.39	6.02	10.39	32.57	28	4
6050.000	804.00	10.55	4.05	162.03	33.60	20.5	0.25
6070.000	804.00	3.09	6.14	8.83	35.70	28	4
6071.000	804.00	3.08	6.14	5.21	35.70	28	4
7500.000	804.00	2.87	6.12	7.79	36.40	28	4
7549.000	804.00	3.31	6.12	9.72	36.42	28	4
7550.000	804.00	10.56	4.05	162.28	37.35	20.5	0.25
7570.000	804.00	2.83	6.16	7.53	39.47	28	4
7571.000	804.00	2.82	6.18	4.43	39.49	28	4
8148.000	804.00	2.85	6.15	7.62	39.75	28	4
8199.000	804.00	3.28	6.15	9.52	39.77	28	4
8200.000	804.00	10.56	4.05	162.35	40.67	20.5	0.25
8220.000	804.00	2.83	6.16	7.53	42.79	28	4
[illegible]21.000	804.00	2.82	6.17	4.44	42.80	28	4
9248.000	804.00	2.85	6.11	7.72	43.26	28	4

TABLE 5

HEC-2 CHANNEL DATA

SECNO	Q	VCH	DEPTH	10*KS	CWSEL	BOTTOM WIDTH	SIDE SLOPE Z
9299.000	804.00	3.31	6.12	9.73	43.29	28	4
9300.000	804.00	10.64	4.07	166.24	44.24	20.5	0.25
9320.000	804.00	2.79	6.23	7.20	46.41	28	4
9321.000	804.00	2.78	6.23	4.25	46.41	28	4
10448.000	804.00	2.84	6.15	7.58	46.90	28	4
10499.000	804.00	3.28	6.15	9.48	46.92	28	4
10500.000	804.00	10.56	4.05	162.37	47.82	20.5	0.25
10520.000	804.00	2.83	6.16	7.53	49.94	28	4
10521.000	804.00	2.82	6.18	4.43	49.96	28	4
11027.000	804.00	4.18	5.06	2.36	50.09	BOX	0
11185.000	804.00	6.62	4.68	5.49	52.78	BOX	0
11400.000	804.00	3.55	5.35	8.35	53.56	28	4
11600.000	804.00	3.47	5.42	7.87	53.73	28	4
11675.000	804.00	3.08	5.43	1.06	53.80	BOX	0
11819.000	804.00	5.26	5.89	2.79	54.32	BOX	0
11869.000	804.00	2.75	6.28	4.10	54.76	28	4
12037.000	504.00	2.25	6.33	3.04	54.87	19	4
12038.000	504.00	2.25	6.33	5.10	54.87	19	4
12089.000	504.00	2.85	6.31	7.97	54.88	10	4
12090.000	504.00	9.62	3.71	152.39	55.28	10	1.11
12110.000	504.00	2.91	5.45	10.19	57.03	10	4
12111.000	504.00	2.90	5.45	10.09	57.03	10	4
13448.000	504.00	2.56	5.88	7.21	58.13	10	4
13499.000	504.00	3.21	5.87	10.96	58.14	10	4
13500.000	504.00	9.67	3.70	154.69	58.93	10	1.11
13520.000	504.00	2.91	5.45	10.14	60.69	10	4
13521.000	504.00	2.90	5.45	5.98	60.69	10	4
14648.000	504.00	2.83	5.54	9.39	61.35	10	4
14699.000	504.00	3.52	5.55	14.03	61.38	10	4
14700.000	504.00	9.66	3.70	154.30	62.53	10	1.11
14720.000	504.00	2.91	5.45	10.15	64.29	10	4
14721.000	504.00	2.90	5.45	5.98	64.29	10	4
17048.000	504.00	2.67	5.80	7.91	65.61	10	4
17099.000	504.00	3.47	5.60	13.48	65.63	10	4
17100.000	504.00	9.66	3.70	154.41	66.73	10	1.11
17120.000	504.00	2.91	5.45	10.18	68.49	10	4
17121.000	504.00	2.90	5.45	6.00	68.49	10	4
17698.000	504.00	2.86	5.51	9.66	68.84	10	4
17749.000	504.00	3.55	5.53	14.37	68.86	10	4
17750.000	504.00	9.66	3.70	154.28	70.06	10	1.11
17770.000	504.00	2.91	5.45	10.15	71.82	10	4
17771.000	504.00	2.90	5.45	5.98	71.82	10	4
18948.000	504.00	2.82	5.55	9.32	72.51	10	4
18999.000	504.00	3.51	5.56	13.93	72.54	10	4
19000.000	504.00	9.66	3.70	154.32	73.68	10	1.11

TABLE 5

HEC-2 CHANNEL DATA

SECNO	Q	VCH	DEPTH	10*KS	CWSEL	BOTTOM WIDTH	SIDE SLOPE Z
19020.000	504.00	2.91	5.45	10.14	75.44	10	4
19021.000	504.00	2.90	5.45	5.98	75.44	10	4
19948.000	504.00	2.83	5.54	9.42	75.99	10	4
19999.000	504.00	3.53	5.53	14.18	76.01	10	4
20000.000	504.00	9.66	3.70	154.28	77.18	10	1.11
20020.000	504.00	2.91	5.45	10.15	78.94	10	4
20021.000	504.00	2.90	5.45	5.98	78.94	10	4
21048.000	504.00	2.82	5.55	9.37	79.55	10	4
21099.000	504.00	3.53	5.54	14.11	79.57	10	4
21100.000	504.00	9.82	3.76	157.19	80.79	10	0.97
21120.000	504.00	2.79	5.59	9.10	82.63	10	4
21121.000	504.00	2.78	5.59	5.36	82.63	10	4
22048.000	504.00	2.98	5.37	10.83	82.88	10	4
22099.000	504.00	3.70	5.38	15.99	82.91	10	4
22100.000	504.00	9.67	3.70	154.71	84.23	10	1.11
22120.000	504.00	2.91	5.45	10.14	85.99	10	4
22121.000	504.00	2.90	5.46	5.98	86.00	10	4
23048.000	504.00	2.84	5.53	9.49	86.54	10	4
23099.000	504.00	3.53	5.53	14.16	86.56	10	4
23100.000	504.00	9.66	3.70	154.28	87.73	10	1.11
23120.000	504.00	2.91	5.45	10.15	89.49	10	4
23121.000	504.00	2.90	5.45	5.98	89.49	10	4
23506.000	504.00	2.89	5.48	5.91	89.73	10	4
23556.000	504.00	3.62	5.43	1.79	89.70	BOX	0
23686.000	504.00	6.28	4.45	6.00	91.72	BOX	0
23720.000	504.00	3.53	4.85	10.15	92.20	10	4
24200.000	504.00	3.25	5.10	8.13	92.67	10	4
24650.000	504.00	3.12	5.22	7.32	93.03	10	4
25147.000	504.00	2.97	5.38	6.41	93.39	10	4
25148.000	504.00	3.02	5.33	11.23	93.39	10	4
25199.000	504.00	3.77	5.32	16.91	93.40	10	4
25200.000	504.00	9.97	3.83	159.93	94.91	10	0.83
25220.000	504.00	2.93	5.43	10.36	96.52	10	4
25221.000	504.00	2.92	5.43	6.12	96.52	10	4
25650.000	504.00	2.89	5.47	5.94	96.78	10	4
25700.000	504.00	3.85	5.41	2.01	96.74	BOX	0
26003.000	504.00	6.20	4.51	5.78	99.78	BOX	0
26103.000	504.00	3.35	5.01	14.84	100.33	10	4
26203.000	504.00	6.42	1.34	168.86	101.34	01	4

IV. Utility Relocations

At this time, a full determination of utility relocations has not been made. Utility coordination was completed before a channel alignment north of Queen Creek Road was selected for study. Therefore, some additional relocations may be found in Phase II (design). There are a number of utilities which cross the proposed Rittenhouse channel alignment which may need to be relocated. These utilities include:

1. Utilities owned by Santa Fe Pacific Pipeline Partners, L.P.: A 6-inch petroleum products pipeline crosses the channel alignment at the petroleum plant east of the EMF. They will not make this determination until a potholing program is completed.

2. Salt River Project (SRP): Possible overhead power relocations at Sossaman and Germann Roads. Also, possible overhead and underground power at Queen Creek Road depending on the final alignment.

3. Southwest Gas Corporation:

   a. There is a 4-inch gas line in Power Road which crosses the box culvert alignment.

   b. There is a 4-inch gas line at Germann Road which crosses the channel and box culvert alignment.

   c. There is a 2-inch gas line on the east side of Ellsworth Road which crosses the channel and box culvert alignment north of Queen Creek School.

   d. There is a 2-inch gas line in Queen Creek Road which crosses the box culvert alignment.

4. U.S. West:

   a. There are underground telephone lines on the east and west side of Power Road. There are also telephone and fiber optic lines in Power Road.

   b. There is an underground telephone line between Power and Germann Roads, paralleling the SPRR on the north side, an unknown distance from the tracks. These lines are located in a U.S. West easement.

   c. There are underground telephone lines in Germann Road which cross the proposed box culvert alignment.

   d. There are two underground telephone lines on the west side of Ellsworth Road which cross the proposed channel and box culvert alignment.

   e. The presence of telephone lines in Queen Creek Road has not been determined.

5. Queen Creek Water Company: There is an 8-inch asbestos cement domestic water pipeline 19 feet west of the centerline of Ellsworth Road which crosses the channel and box culvert alignment. This is a dead end line which cannot be shut down for extended periods.

6. Queen Creek Irrigation Company: There is a 24-inch concrete irrigation pipe on the west side of Ellsworth Road approximately 40 feet from the centerline.

Utility costs have not be incorporated into the cost estimates as line item expenses. Utility relocation costs are assumed to be included as a part of the 25% contingency. Responses from the utility companies (except plans) are included in Appendix I.

Potholing of utilities is expected to commence at the start of the Phase II design.

VI. Construction Considerations and Cost Estimates

A. Constructibility:

The construction of Alternate A, Alternate B or Alternate C will not involve any difficult construction methods. While a majority of the work will involve excavating, hauling, and grading, there will be other trades involved. Construction of the box culverts at Power, Sossaman, Germann, Ellsworth and Queen Creek Roads can be accomplished using a paved traffic detour. This will allow the contractor full access to the work area and reduce construction time and inconvenience to the public. Drop structures which may be required should be located early in the construction period and be built before the channel excavation is completed to reduce the possibility of damage from runoff.

B. Maintenance:

Maintenance of this channel will mainly involve weed control. Although the Mannings "n" value for this channel assumed some vegetation, a periodic mowing schedule should be developed to prevent trees or large amounts of brush from developing. Removal of sediment will be required after heavy storms until the drainage area has lost its predominantly agricultural characteristic. Although the inlets and outlets to the box culverts will be protected from erosion, a yearly inspection should be made to confirm that the systems are functioning, as required.

C. Cost Estimates:

Unit prices used for the cost estimates were obtained from Means, ADOT and previous construction projects designed by Gannett Fleming. When cost data was not available, engineering judgement was used. Unit prices for 15 items were previously submitted to FCD for review and requested changes have been incorporated into the estimates. Maintenance costs have been calculated based on the present value for 20 years of maintenance at an interest rate of 3.5%. The unit price for maintenance was corrected based on formulas and interest tables in the "Civil Engineering Reference Manual", by Michael R. Lindeburg, P.E. Table 2 lists the project cost for each alternate section and a total for each channel alternate. The cost estimates corresponding to the various alternates follow.

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TABLE 6

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

COST ESTIMATE SUMMARY
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ALTERNATE A-1	$980,238.61	ALTERNATE B-1	$1,015,798.61	ALTERNATE C-1	$948,629.32	ALTERNATE C-1	$948,629.32
ALTERNATE A-2	$1,485,502.77	ALTERNATE B-2	$1,324,691.16	* ALTERNATE C-2	$1,496,888.22	* ALTERNATE C-2	$1,496,888.22
ALTERNATE A-3	$555,907.80	ALTERNATE B-3	$512,638.05				
ALTERNATE A-4	$1,522,019.98	ALTERNATE B-4	$1,708,444.98	** ALTERNATE C-3A	$2,570,651.17	** ALTERNATE C-3B	$2,453,443.09
ALTERNATE A-5	$1,162,258.89	ALTERNATE B-5	$1,279,046.39				
TOTAL	$5,705,928.05	TOTAL	$5,840,619.19	TOTAL	$5,016,168.71	TOTAL	$4,898,960.63

* - ALTERNATE C-2 INCLUDES THE ENTIRE CHANNEL LENGTH OF ALTERNATES A-2 & A-3 OR B-2 & B-3.

** - ALTERNATE C-3 INCLUDES THE ENTIRE CHANNEL LENGTH OF ALTERNATES A-4 & A-5 OR B-4 & B-5.

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-1
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	12	1000.00	$12,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	42200	4.00	$168,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	270	30.00	$8,100.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2300	30.00	$69,000.00
310-1	4" ABC MAINTENANCE ROAD	CY	500	18.00	$9,000.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	13826	20.00	$276,520.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	225	8.00	$1,800.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	450	12.00	$5,400.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	2	800.00	$1,600.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	270	165.00	$44,550.00
505-2	REBAR (FOR BOX CUVERTS)	LB	39500	0.35	$13,825.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	32	165.00	$5,280.00
505-4	REBAR (FOR MISC. ITEMS)	LB	2620	0.35	$917.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	12	10000.00	$120,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	3330	14.2339	$47,398.89

SUBTOTAL	$784,190.89
CONTINGENCIES (25%)	$196,047.72
TOTAL	$980,238.61

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-2
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	21.5	1000.00	$21,500.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	88200	4.00	$352,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	340	30.00	$10,200.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	550	30.00	$16,500.00
310-1	4" ABC MAINTENANCE ROAD	CY	1020	18.00	$18,360.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	22827	20.00	$456,540.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	0	8.00	$0.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	0	12.00	$0.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	0	800.00	$0.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	0	165.00	$0.00
505-2	REBAR (FOR BOX CUVERTS)	LB	0	0.35	$0.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	0	165.00	$0.00
505-4	REBAR (FOR MISC. ITEMS)	LB	0	0.35	$0.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	21.5	10000.00	$215,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6850	14.2339	$97,502.22

SUBTOTAL	$1,188,402.22
CONTINGENCIES (25%)	$297,100.55
TOTAL	$1,485,502.77

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-3
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	1	1000.00	$1,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	18000	4.00	$72,000.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	60	30.00	$1,800.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	520	30.00	$15,600.00
310-1	4" ABC MAINTENANCE ROAD	CY	0	18.00	$0.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	1322	20.00	$26,440.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	235	8.00	$1,880.00
415-1	GUARD RAIL	LF	450	15.00	$6,750.00
420-1	CHAIN LINK FENCE (6')	LF	1300	12.00	$15,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	3	800.00	$2,400.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	1210	165.00	$199,650.00
505-2	REBAR (FOR BOX CUVERTS)	LB	197000	0.35	$68,950.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	40	165.00	$6,600.00
505-4	REBAR (FOR MISC. ITEMS)	LB	3080	0.35	$1,078.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	450	20.00	$9,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	1	10000.00	$10,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	420	14.2339	$5,978.24

SUBTOTAL	$444,726.24
CONTINGENCIES (25%)	$111,181.56
TOTAL	$555,907.80

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-4
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	21	1000.00	$21,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	99800	4.00	$399,200.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	430	30.00	$12,900.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	525	30.00	$15,750.00
310-1	4" ABC MAINTENANCE ROAD	CY	1305	18.00	$23,490.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	19208	20.00	$384,160.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	0	8.00	$0.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	0	12.00	$0.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	0	800.00	$0.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	0	165.00	$0.00
505-2	REBAR (FOR BOX CUVERTS)	LB	0	0.35	$0.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	0	165.00	$0.00
505-4	REBAR (FOR MISC. ITEMS)	LB	0	0.35	$0.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	1300	20.00	$26,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	21	10000.00	$210,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	8790	14.2339	$125,115.98

SUBTOTAL	$1,217,615.98
CONTINGENCIES (25%)	$304,404.00
TOTAL	$1,522,019.98

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-5
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	13.5	1000.00	$13,500.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	71200	4.00	$284,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	425	30.00	$12,750.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	1500	30.00	$45,000.00
310-1	4" ABC MAINTENANCE ROAD	CY	160	18.00	$2,880.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	12839	20.00	$256,780.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	600	8.00	$4,800.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	600	12.00	$7,200.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	3	800.00	$2,400.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	260	165.00	$42,900.00
505-2	REBAR (FOR BOX CUVERTS)	LB	41500	0.35	$14,525.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	11	165.00	$1,815.00
505-4	REBAR (FOR MISC. ITEMS)	LB	900	0.35	$315.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	750	20.00	$15,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	120	30.00	$3,600.00
	PURCHASE ROW	Ac	13.5	10000.00	$135,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6080	14.2339	$86,542.11

SUBTOTAL	$929,807.11
CONTINGENCIES (25%)	$232,451.78
TOTAL	$1,162,258.89

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-1
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	9	1000.00	$9,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	54200	4.00	$216,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	310	30.00	$9,300.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2561	30.00	$76,830.00
310-1	4" ABC MAINTENANCE ROAD	CY	500	18.00	$9,000.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	8749	20.00	$174,980.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	325	8.00	$2,600.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	450	12.00	$5,400.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	2	800.00	$1,600.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	765	165.00	$126,225.00
505-2	REBAR (FOR BOX CUVERTS)	LB	109000	0.35	$38,150.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	28	165.00	$4,620.00
505-4	REBAR (FOR MISC. ITEMS)	LB	2100	0.35	$735.00
505-5	REPLACE IRRIGATION DITCHES	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	9	10000.00	$90,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	3330	14.2339	$47,398.89

SUBTOTAL	$812,638.89
CONTINGENCIES (25%)	$203,159.72
TOTAL	$1,015,798.61

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-2
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	16	1000.00	$16,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	104700	4.00	$418,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	600	30.00	$18,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2401	30.00	$72,030.00
310-1	4" ABC MAINTENANCE ROAD	CY	940	18.00	$16,920.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	13388	20.00	$267,760.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	0	8.00	$0.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	0	12.00	$0.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	0	800.00	$0.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	0	165.00	$0.00
505-2	REBAR (FOR BOX CUVERTS)	LB	0	0.35	$0.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	0	165.00	$0.00
505-4	REBAR (FOR MISC. ITEMS)	LB	0	0.35	$0.00
505-5	REPLACE IRRIGATION DITCHES	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	16	10000.00	$160,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6340	14.2339	$90,242.93

SUBTOTAL	$1,059,752.93
CONTINGENCIES (25%)	$264,938.23
TOTAL	$1,324,691.16

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-3
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	2	1000.00	$2,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	22000	4.00	$88,000.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	60	30.00	$1,800.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	520	30.00	$15,600.00
310-1	4" ABC MAINTENANCE ROAD	CY	115	18.00	$2,070.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	2446	20.00	$48,920.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	205	8.00	$1,640.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	800	12.00	$9,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	4	800.00	$3,200.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	810	165.00	$133,650.00
505-2	REBAR (FOR BOX CUVERTS)	LB	131000	0.35	$45,850.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	40	165.00	$6,600.00
505-4	REBAR (FOR MISC. ITEMS)	LB	3080	0.35	$1,078.00
505-5	REPLACE IRRIGATION DITCHES	LF	950	20.00	$19,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	2	10000.00	$20,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	780	14.2339	$11,102.44

SUBTOTAL	$410,110.44
CONTINGENCIES (25%)	$102,527.61
TOTAL	$512,638.05

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-4
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	19.5	1000.00	$19,500.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	135800	4.00	$543,200.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	660	30.00	$19,800.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2750	30.00	$82,500.00
310-1	4" ABC MAINTENANCE ROAD	CY	1310	18.00	$23,580.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	16603	20.00	$332,060.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	0	8.00	$0.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	0	12.00	$0.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	0	800.00	$0.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	0	165.00	$0.00
505-2	REBAR (FOR BOX CUVERTS)	LB	0	0.35	$0.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	0	165.00	$0.00
505-4	REBAR (FOR MISC. ITEMS)	LB	0	0.35	$0.00
505-5	REPLACE IRRIGATION DITCHES	LF	1300	20.00	$26,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	19.5	10000.00	$195,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	8790	14.2339	$125,115.98

SUBTOTAL	$1,366,755.98
CONTINGENCIES (25%)	$341,689.00
TOTAL	$1,708,444.98

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-5
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	13.1	1000.00	$13,100.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	92800	4.00	$371,200.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	660	30.00	$19,800.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	3060	30.00	$91,800.00
310-1	4" ABC MAINTENANCE ROAD	CY	0	18.00	$0.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	11038	20.00	$220,760.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	160	8.00	$1,280.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	600	12.00	$7,200.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	3	800.00	$2,400.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	260	165.00	$42,900.00
505-2	REBAR (FOR BOX CUVERTS)	LB	41500	0.35	$14,525.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	11	165.00	$1,815.00
505-4	REBAR (FOR MISC. ITEMS)	LB	900	0.35	$315.00
505-5	REPLACE IRRIGATION DITCHES	LF	750	20.00	$15,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	120	30.00	$3,600.00
	PURCHASE ROW	Ac	13.1	10000.00	$131,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6080	14.2339	$86,542.11

SUBTOTAL	$1,023,237.11
CONTINGENCIES (25%)	$255,809.28
TOTAL	$1,279,046.39

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE C-1
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	10	1000.00	$10,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	95100	4.00	$380,400.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	900	30.00	$27,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2738	30.00	$82,140.00
310-1	4" ABC MAINTENANCE ROAD	CY	1534	18.00	$27,612.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	325	8.00	$2,600.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	450	12.00	$5,400.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	2	800.00	$1,600.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	207	165.00	$34,155.00
505-2	REBAR (FOR BOX CUVERTS)	LB	32080	0.35	$11,228.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	92	165.00	$15,180.00
505-4	REBAR (FOR MISC. ITEMS)	LB	7090	0.35	$2,481.50
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	11	10000.00	$110,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	3450	14.2339	$49,106.96

SUBTOTAL	$758,903.46
CONTINGENCIES (25%)	$189,725.86
TOTAL	$948,629.32

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE C-2
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	17	1000.00	$17,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	136000	4.00	$544,000.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	1800	30.00	$54,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	3453	30.00	$103,590.00
310-1	4" ABC MAINTENANCE ROAD	CY	2878	18.00	$51,804.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	203	8.00	$1,624.00
415-1	GUARD RAIL	LF	450	15.00	$6,750.00
420-1	CHAIN LINK FENCE (6')	LF	1300	12.00	$15,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	3	800.00	$2,400.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	383	165.00	$63,195.00
505-2	REBAR (FOR BOX CUVERTS)	LB	75570	0.35	$26,449.50
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	102	165.00	$16,830.00
505-4	REBAR (FOR MISC. ITEMS)	LB	8664	0.35	$3,032.40
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	450	20.00	$9,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	19	10000.00	$190,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6480	14.2339	$92,235.67

SUBTOTAL	$1,197,510.57
CONTINGENCIES (25%)	$299,377.64
TOTAL	$1,496,888.22

FILE = ALTCCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE C-3A
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	35	1000.00	$35,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	232534	4.00	$930,136.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	2700	30.00	$81,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	6207	30.00	$186,210.00
310-1	4" ABC MAINTENANCE ROAD	CY	6610	18.00	$118,980.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	160	8.00	$1,280.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	800	12.00	$9,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	4	800.00	$3,200.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	156	165.00	$25,740.00
505-2	REBAR (FOR BOX CUVERTS)	LB	25210	0.35	$8,823.50
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	183	165.00	$30,195.00
505-4	REBAR (FOR MISC. ITEMS)	LB	14160	0.35	$4,956.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	1300	20.00	$26,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	120	30.00	$3,600.00
	PURCHASE ROW	Ac	38	10000.00	$380,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	14880	14.2339	$211,800.43

SUBTOTAL	$2,056,520.93
CONTINGENCIES (25%)	$514,130.23
TOTAL	$2,570,651.17

FILE = ALTCCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE C-3B
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	31	1000.00	$31,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	216398	4.00	$865,592.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	2700	30.00	$81,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	6207	30.00	$186,210.00
310-1	4" ABC MAINTENANCE ROAD	CY	5991	18.00	$107,838.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	320	8.00	$2,560.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	800	12.00	$9,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	4	800.00	$3,200.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	312	165.00	$51,480.00
505-2	REBAR (FOR BOX CUVERTS)	LB	50430	0.35	$17,650.50
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	183	165.00	$30,195.00
505-4	REBAR (FOR MISC. ITEMS)	LB	14160	0.35	$4,956.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	1300	20.00	$26,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	120	30.00	$3,600.00
	PURCHASE ROW	Ac	35	10000.00	$350,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	13480	14.2339	$191,872.97

SUBTOTAL	$1,962,754.47
CONTINGENCIES (25%)	$490,688.62
TOTAL	$2,453,443.09

FILE = ALTCCOST

VII. Public Meetings

Three public meetings were held during the development of the Conceptual Design of Rittenhouse channel. The purpose of these meetings was to describe project progress to the public and to solicit feedback and input.

The first meeting was held on January 7, 1993 at the Queen Creek Town Hall. At this initial meeting the project scope was described to the public. The discussion which ensued centered on the public's major concerns: the purpose and need for the project, the alignment and right-of-way requirements of the channel, and the consideration for utilizing existing drainage structures.

A second meeting was held on February 17, 1993 at the Queen Creek Town Hall. At this meeting drainage patterns within the contributing drainage areas were reviewed. The revisions to the original (Woods & Associates) HEC-1 study and proposed channel alignment alternatives were discussed. The public indicated a continued concern for the required right-of-way and questioned the need for a channel east of Ellsworth Road due to the existence of a culvert system under the SPRR tracks near Ocotillo Road.

A third meeting was held on April 28, 1993 at the Queen Creek Town Hall. At this meeting the Preliminary Conceptual Design Report and plans were reviewed. Landowners were interested in possible tax breaks for donating the land. Representatives of the school and Town Council asked if a review of an alignment north of Queen Creek Road could be investigated. Mr. Barnes expressed his concern for the width of the channel from Ellsworth Road to the SPRR.

Refer to Appendix H for public meeting minutes.

VIII. Recommendations

Gannett Fleming recommends that the FCD construct Alternates C-1, C-2, and C-3B of this project. These sections will be less expensive and easier to maintain than Alternates A, B or D. Section C-2 will be subject to horizontal relocation between Sossaman and Germann Roads before final design, but this should have little effect on the construction cost.

Gannett Fleming does not recommend constructing a channel along the SPRR east of Ellsworth Road. The study indicates that if the existing culvert system near Ocotillo Road is maintained, then there would be minimal flow contributing to a channel north of the railroad.

IX. References

1. Final Report, Queen Creek Area Drainage Master Study, FCD Contract No. 86-23, July, 1991 (Revised August and January, 1991). By - Wood & Associates, Inc.

2. Drainage Design Manual for Maricopa County, Arizona, Volume I - Hydrology, and Volume II - Hydraulics. By - Flood Control District of Maricopa County.

3. HEC-1, Flood Hydrograph Packages, September, 1990 and HEC-2, Water Surface Profiles, September, 1990. By - U.S. Army Corps of Engineers.

4. Open Channel Hydraulics, Ven Te Chow, Ph.D., 1959.

Appendix A
Geotechnical Report

ATL Inc.
GEOTECHNICAL AND MATERIALS CONSULTANTS

April 5, 1993

Ellis-Murphy Division of Gannett Fleming
3001 E. Camelback, Suite 130
Phoenix, Arizona 85016-4498

Attn: Mr. Ronald Schreier, P.E.

Re: Rittenhouse Channel
MCFCD Contract No. 92-13
ATL Job No. 192023

Gentlemen:

This letter report presents the results of ATL, Inc. (ATL) Phase I geotechnical investigation of the Rittenhouse Channel. ATL conducted the investigation in accordance with the contract with Ellis-Murphy Gannett Fleming (EM) dated January 27, 1993 and ATL's Proposal No. P92255.

The proposed Rittenhouse Channel will be a shallow, wide flood control channel to intercept storm water from the area east and north of Rittenhouse Road and convey it to the east Maricopa Floodway. The proposed channel will be approximately 4.5 miles in length beginning east of Queen Creek School and terminating at the East Maricopa Floodway.

FIELD INVESTIGATION

The field investigation consisted of drilling ten (10) borings to 20 feet of depth at locations selected by Ellis-Murphy. The boring locations are shown on Plates 3 and 4. The borings were completed with a Mobile B50 drill rig.

LABORATORY INVESTIGATION

Selected bulk samples were transported to ATL's laboratory for basic index tests consisting of moisture content, plasticity index and gradation. In addition, pH, resistivity and Standard Proctor determinations were made on selected samples. The laboratory test results are tabulated in the attached sheets.

2922 WEST CLARENDON
1850 WEST 169TH STREET, BLDG. C
PHOENIX, ARIZONA 85017
GARDENA, CALIFORNIA 90247
TELEPHONE (602) 241-1097 / FAX (602) 234-0699
TELEPHONE (310) 538-3757 / FAX (310) 538-0725

SUMMARY OF SUBSURFACE CONDITIONS

The soils encountered from the East Maricopa Floodway to Sossaman Road within the upper 10 feet consist of clayey silty sand (SC-SM), sandy clay (CL), clayey sand (SC), and silty sand (SM). From Sossaman Road to Queen Creek School, the upper 10 feet of soil consists of sandy silt (ML), silty sand (SM) and clayey sand (SC). The soil classifications appearing in parentheses are from the Unified Soils Classification System (USCS).

DISCUSSION AND RECOMMENDATIONS

The design guidelines of the Maricopa County Flood Control District (MCFCD) call for a shallow, wide channel with earthen bottom and side slopes. The main channel will be sized to carry a maximum depth of 2 feet of water with 1 foot of freeboard. All embankment slopes will be a maximum of 4:1 (H:V). Within the main channel, a low-flow section, 1-foot depth will be constructed on the north side for the entire channel length.

The "Alternate A" design of E-M has flow velocities ranging from 2.8 to 5.3 feet per second (fps), a maximum channel slope of 0.28 percent, and box culverts at road crossings with grouted riprap lining at the transitions where flow velocities are increased. Proposed box culvert depths would be 3 feet in the main channel and 4 feet in the low flow portion of the channel.

The MCFCD uses the Federal Highway Administration (FHWA) - Hydraulic Design Series 3 and 4 with Table 5.1 entitled "Maximum Permissible Velocities for Roadside Drainage Channels With Erodible Linings" for the design of earthen channels. Several soil types listed in Table 5.1 have permissible velocities of less than 5 fps. As excerpted from Table 5.1, the soils type with permissible velocities less than 5 fps are given below:

Soils Type of Lining (Earth, No Vegetation)	Maximum Permissible Velocity, fps
Fine Sand (noncolloidal)	2.5
Sandy Loam (noncolloidal)	2.5
Silt Loam (noncolloidal)	3.0
Ordinary Firm Loam	3.5
Alluvial Silts (noncolloidal)	3.5

Based upon the FHWA criteria, field and laboratory data, a major portion of the project has soil types requiring lower maximum permissible velocities or channel lining to prevent erosion. This area with increased soil erosion potential is represented by Boring Nos. 4, 5, 6, 7, 8, 9 and 10. Alternatives for this area should include:

- Soil cement lining of channel bottom and sides.
- Plating the channel bottom and sides with clayey soil from other areas of the project.
- Concrete lining.
- Riprap lining.

Project economics will likely preclude the latter two alternatives.

Four (4) soil samples had pH and box resistivity tests performed. pH values ranged from 7.9 to 8.5. Box resistivities ranged from 734 to 3869 ohm-cm. The sample from Boring No. 4 had a resistivity of 734 ohm-cm. All other samples were above 1500 ohm-cm. Corrosion protection should be provided for metal pipes when resistivities are less than 1500 ohm-cm.

For the Phase II investigation, it is recommended that the frequency and number of borings to 10 feet of depth be increased in order to gain more soil classification information along the route of the proposed shallow channel. With box culverts at road crossings, borings deeper than 10 feet would not be necessary.

It has been ATL's pleasure to serve Ellis-Murphy Gannett Fleming on Phase I of this project. ATL looks forward to performing the work in Phase II of this project.

Reviewed by:

David P. Hayes, P.E.
Executive Vice President

Very truly yours,

James D. Rose, P.E.
Vice President, Geotechnical

JDR/mms

Enclosure

Guidelines in the Use and Interpretation of This Geotechnical Report

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The geotechnical report was prepared for the use of the Owner in the design of the subject facility and should be made available to potential contractors and/or the Contractor for information on factual data only. This report should not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by the interpretive boring and test pit logs, cross sections, or discussion of subsurface conditions contained herein.

The analyses, conclusions and recommendations contained in the report are based on site conditions as they presently exist and assume that the exploratory borings, test pits, and/or probes are representative of the subsurface conditions of the site. If, during construction, subsurface conditions are found which are significantly different from those observed in the exploratory borings and test pits, or assumed to exist in the excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

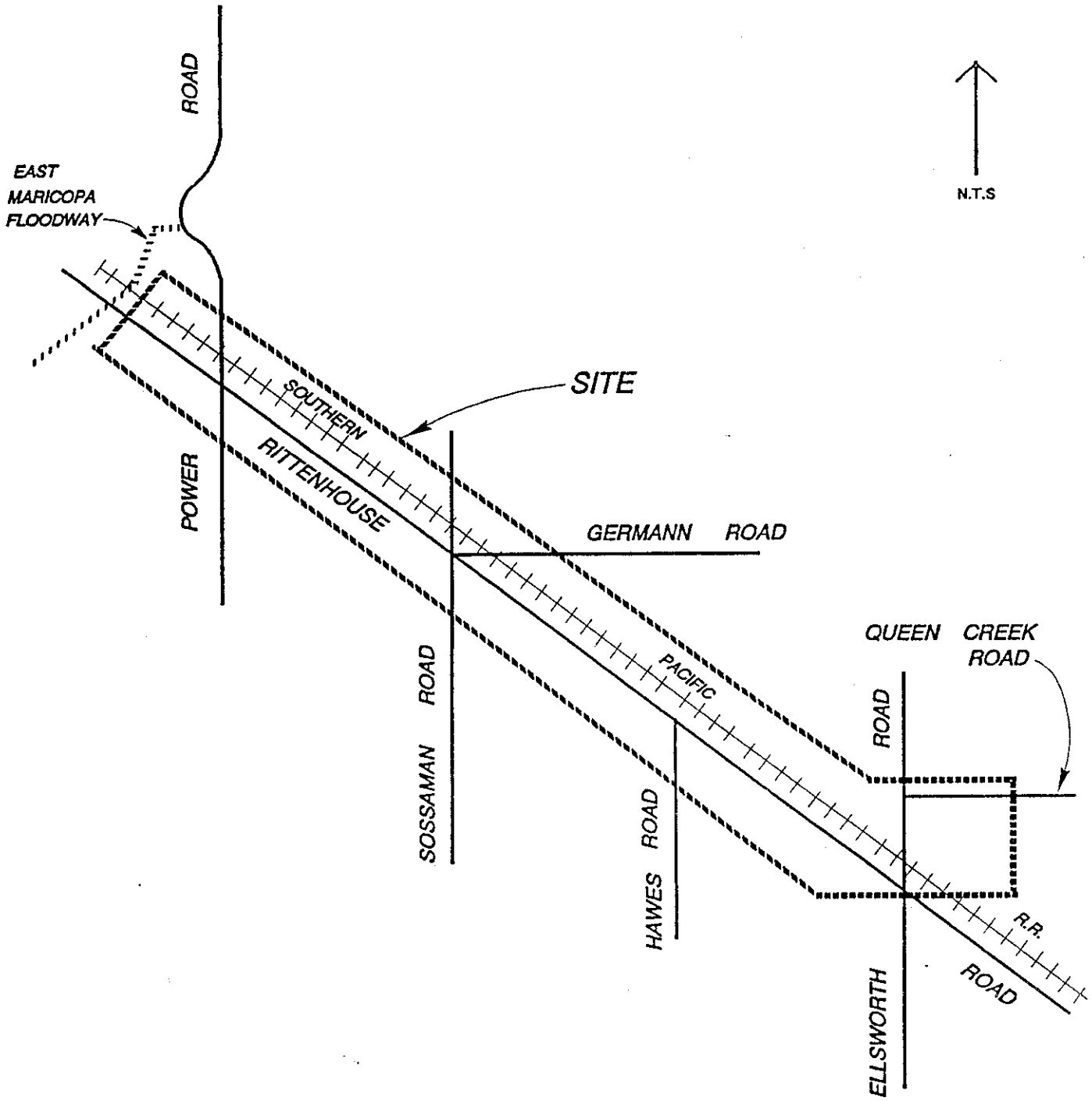
The Summary Boring Logs are our opinion of the subsurface conditions revealed by periodic sampling of the ground as the borings progressed. The soil descriptions and interfaces between strata are interpretive and actual changes may be gradual.

The boring logs and related information depict subsurface conditions only at these specific locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the soil conditions at these boring locations.

Groundwater levels often vary seasonally. Groundwater levels reported on the boring logs or in the body of the report are factual data only for the dates shown.

Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples, borings or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. It is recommended that the Owner consider providing a contingency fund to accommodate such potential extra costs.

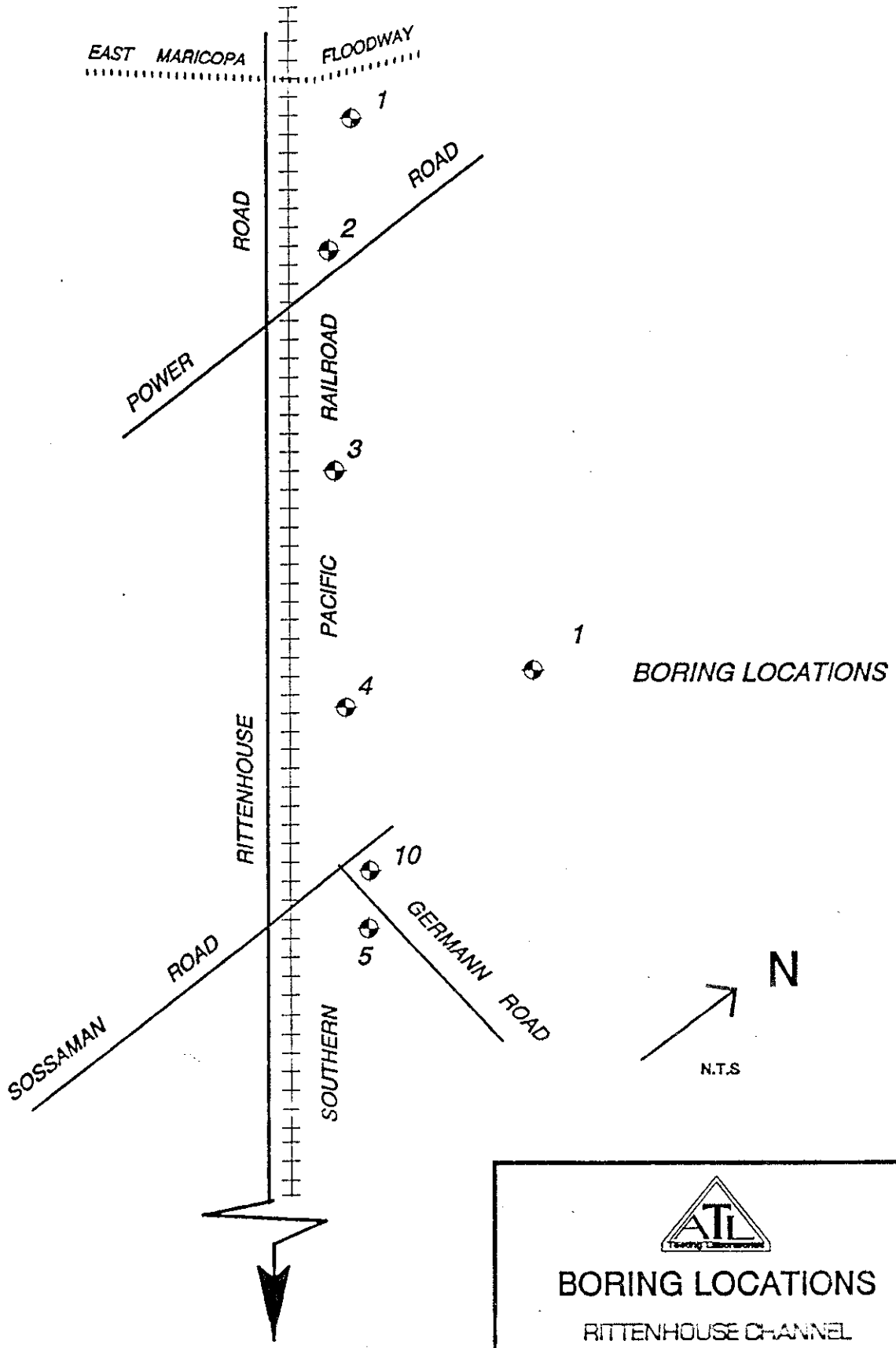
This firm cannot be responsible for any deviation from the intent of this report including, but not restricted to, any changes to the scheduled time of construction, the nature of the project or the specific construction methods or means indicated in this report; nor can our firm be responsible for any construction activity on sites other than the specific site referred to in this report.



VICINITY MAP

RITTENHOUSE CHANNEL
PHASE 1
MCFCD CONTRACT 92-13

ATL JOB NO. 192023



CONTINUED ON PLATE 4

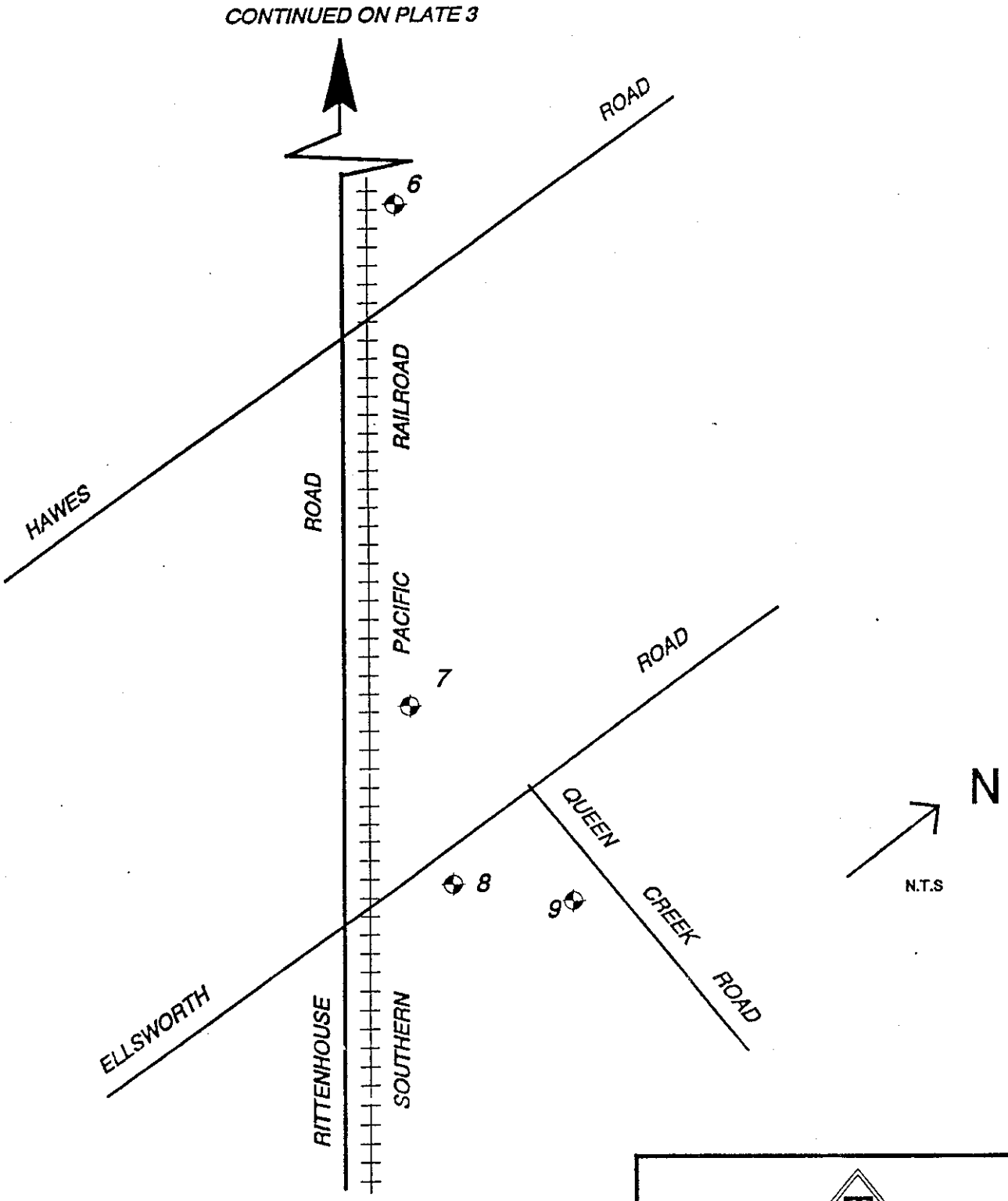
BORING LOCATIONS

RITTENHOUSE CHANNEL

PHASE I

MCFCD 92-13

ATL JOB NO. 192023



1 BORING LOCATIONS

BORING LOCATIONS

RITTENHOUSE CHANNEL

PHASE I

MCFCD 92-13

ATL JOB NO. 192023

RITTENHOUSE CHANNEL
PHASE I
MCFCD CONTRACT NO. 92-13

ATL Job No. 192023

Boring Number: *01*
Boring Location: *2485' N.W. of Power Road C/L, 111' N.E. of Railroad C/L*
Date of Boring: *3/15/93*
Elevation of Boring: *Existing Grade*

Boring Equipment: *Mobile B-50 With 6 Inch Diameter Hollow Stem Auger*
Driller: *L. Usrey*
Logger: *J. Cowell*
Reviewed By: *J. Rose*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		BROWN SILTY CLAYEY FINE SAND, (SC-SM), MOIST			*10.3*	
	5	*LIGHT BROWN SANDY CLAY, (CL), SLIGHTLY MOIST, HARD TO VERY STIFF, WEAK CEMENTATION*	*73*			
	10		*28*			
	15	*BROWN SILTY FINE SAND,(SM), SLIGHTLY MOIST, MEDIUM DENSE*	*20*			
	20	*LIGHT BROWN SAND AND GRAVEL, (SP), WITH SOME SILT, DENSE*	*53*			
		BOTTOM AT 21.5 FEET				
	25					

Boring Stopped at *21.5* Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A1

RITTENHOUSE CHANNEL
PHASE I
MCFCD CONTRACT NO. 92-13

ATL Testing Laboratories

ATL Job No. 192023

Boring Number: *02*
Boring Location: *75' W. of Power Road C/L, 250' N. of Rittenhouse Road C/L*
Date of Boring: *3/15/93*
Elevation of Boring: *Existing Grade*

Boring Equipment: *Mobile B-50 With 6 Inch Diameter Hollow Stem Auger*
Driller: *L. Usrey*
Logger: *J. Cowell*
Reviewed By: *J. Rose*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		BROWN SILTY FINE SAND, (SM), MOIST				
	5	*BROWN SANDY CLAY, (CL), MOIST, HARD, WEAK CEMENTATION*	24			
	10					
		LIGHT BROWN SILTY FINE SAND, (SM), MOIST, MEDIUM DENSE, WEAK CEMENTATION	16			
	15	*LIGHT BROWN SANDY CLAY, WITH NODULES OF OF STRONG CEMENTATION TO 1.25 INCH SIZE, (CL), VERY MOIST*				
		BROWN SILTY SAND, WITH TRACE OF GRAVEL, (SM), LOOSE	10			
		LIGHT BROWN SANDY CLAY, (CL)				
	20		14			
		BROWN SILTY SAND WITH TRACE OF GRAVEL, (SM)				
		BOTTOM AT 21.5 FEET				
	25					

Boring Stopped at *21.5* Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY. A2

RITTENHOUSE CHANNEL PHASE I
MCFCD CONTRACT NO. 92-13

ATL Job No. 192023

Boring Number: 03
Boring Location: 1531' S.E. of Power Road, 109' N.E. of Railroad C/L
Date of Boring: 3/15/93
Elevation of Boring: Existing Grade

Boring Equipment: Mobile B-50 With 6 Inch Diameter Hollow Stem Auger
Driller: L. Usrey
Logger: J. Cowell
Reviewed By: J. Rose

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
	5	LIGHT BROWN POORLY GRADED CLAYEY SAND, (SC), SLIGHTLY MOIST	73		7.2	
	10	LIGHT BROWN SILTY SAND, (SM), SLIGHTLY MOIST, VERY DENSE, WEAK CEMENTATION	50			
	15	LIGHT BROWN SILTY CLAYEY FINE SAND, WITH TRACE OF GRAVEL, (SC-SM), SLIGHTLY MOIST, MEDIUM DENSE	24			
	20	LIGHT BROWN SANDY CLAY, (CL), SLIGHTLY MOIST, HARD, WEAK CEMENTATION	31			
		BOTTOM AT 21.5 FEET				
	25					

Boring Stopped at 21.5 Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A3

RITTENHOUSE CHANNEL
PHASE I
MCFCD CONTRACT NO. 92-13

ATL Job No. 192023

Boring Number: *04*
Boring Location: *1409' N.W. of Sossaman Road, 108' N.E. of Railroad C/L*
Date of Boring: *3/16/93*
Elevation of Boring: *Existing Grade*

Boring Equipment: *Mobile B-50 With 6 Inch Diameter Hollow Stem Auger*
Driller: *J. Cowell*
Logger: *R. Smith*
Reviewed By: *J. Rose*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
	5	*BROWN SILTY FINE SAND, (SM), MOIST, LOOSE*	12			
	10	*LIGHT BROWN SILTY FINE SAND WITH GRAVEL, (SM), SLIGHTLY MOIST TO MOIST, DENSE TO VERY DENSE, WEAK CEMENTATION*	66			
		LIGHT BROWN CLAYEY SAND WITH FINE GRAVEL, (SC), SLIGHTLY MOIST TO MOIST, DENSE TO VERY DENSE, WEAK CEMENTATION				
	15	*TAN CLAYEY FINE SAND, (SC), SLIGHTLY MOIST, DENSE, WEAK CEMENTATION*	42			
	20	*TAN CLAYEY SAND, (SC), SLIGHTLY MOIST, DENSE, NONE TO WEAK CEMENTATION*	25			
		BOTTOM AT 21.5 FEET				
	25					

Boring Stopped at *21.5* Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

RITTENHOUSE CHANNEL
PHASE I
MCFCD CONTRACT NO. 92-13

ATL Job No. 192023

Boring Number: *05*
Boring Location: *Germann Road, 650' E. of Sossaman Road, 22' S. of C/L*
Date of Boring: *3/16/93*
Elevation of Boring: *Existing Grade*

Boring Equipment: *Mobile B-50 With 6 Inch Diameter Hollow Stem Auger*
Driller: *L. Usrey*
Logger: *J. Cowell*
Reviewed By: *J. Rose*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
	5	*BROWN SILTY FINE SAND, (SM), MOIST, VERY LOOSE, OCCASIONAL THIN CLAY LENSES*	3			
	10	*LIGHT BROWN SILTY FINE SAND,(SM), MOIST, LOOSE*	9			
	15	*LIGHT BROWN SILTY FINE SAND WITH CEMENTED NODULES, (SM), MOIST, LOOSE TO MEDIUM DENSE, WEAK CEMENTATION*	18			
	20	*LIGHT BROWN CLAYEY FINE SAND,(SC), MOIST, WEAK CEMENTATION*	25			
	25	*BOTTOM AT 21.5 FEET*				

Boring Stopped at *21.5* Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A5

RITTENHOUSE CHANNEL
PHASE I
MCFCD CONTRACT NO. 92-13

ATL Job No. 192023

Boring Number: 06
Boring Location: 5636' W. of Ellsworth Road, 106' N. E. of Railroad C/L
Date of Boring: 3/16/93
Elevation of Boring: Existing Grade

Boring Equipment: Mobile B-50 With 6 Inch Diameter Hollow Stem Auger
Driller: J. Cowell
Logger: R. Smith
Reviewed By: J. Rose

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
	5	BROWN SANDY SILT, (ML), MOIST, SOFT	4		16.5	
	10	BROWN SILTY FINE SAND,(SM),MOIST, MEDIUM DENSE TO DENSE, WEAK CEMENTATION	42			
	15	BROWN CLAYEY SAND, (SC), VERY MOIST, MEDIUM DENSE, WEAK CEMENTATION	18		20.0	
	20		12			
	25	BOTTOM AT 21.5 FEET				

Boring Stopped at 21.5 Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A6

RITTENHOUSE CHANNEL
PHASE I
MCFCD CONTRACT NO. 92-13

ATL Job No. 192023

Boring Number: *07*
Boring Location: *1433' N. W. of Ellsworth Road, 107' N. E. of Railroad C/L*
Date of Boring: *3/16/93*
Elevation of Boring: *Existing Grade*

Boring Equipment: *Mobile B-50 With 6 Inch Diameter Hollow Stem Auger*
Driller: *J. Cowell*
Logger: *R. Smith*
Reviewed By: *J. Rose*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
	5	*BROWN SILTY FINE SAND, (SM), MOIST, VERY LOOSE*	3			
	10	*LIGHT BROWN CLAYEY SAND, (SC), MOIST, MEDIUM DENSE TO DENSE, WEAK CEMENTATION, LAYERS OF STRONG CEMENTATION FROM 12.5 TO 14.5 FEET*	29			
	15		21			
	20	*LIGHT BROWN FINE SAND, (SP), VERY MOIST, MEDIUM DENSE*	32			
	25	*BOTTOM AT 21.5 FEET*				

Boring Stopped at *21.5* Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A7

RITTENHOUSE CHANNEL PHASE I
MCFCD CONTRACT NO. 92-13

ATL Job No. 192023

Boring Number: 08
Boring Location: 50' E. of Ellsworth Road C/L, 40' S.of S. Fence at Queen Creek School
Date of Boring: 3/16/93
Elevation of Boring: Existing Grade

Boring Equipment: Mobile B-50 With 6 Inch Diameter Hollow Stem Auger
Driller: J. Cowell
Logger: R. Smith
Reviewed By: J. Rose

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
	5	BROWN SILTY SAND, (SM), MOIST, LOOSE	10		8.9	
	10	LIGHT BROWN SILTY SAND , (SM), MOIST, MEDIUM DENSE TO DENSE, WEAK CEMENTATION	42		14.4	
	15	LIGHT BROWN CLAYEY SAND WITH CEMENTED NODULES, (SC), MOIST, DENSE TO VERY DENSE, WEAK TO MODERATE CEMENTATION	56			
	20	LIGHT BROWN FINE SAND WITH THIN CLAYEY SAND LAYERS, (SP), MOIST, DENSE	36			
	25	BOTTOM AT 21.5 FEET				

Boring Stopped at 21.5 Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

RITTENHOUSE CHANNEL
PHASE I
MCFCD CONTRACT NO. 92-13

ATL Job No. 192023

Boring Number: *09*
Boring Location: *422' S. of Queen Creek Road C/L, 600' E. of Ellsworth Road C/L*
Date of Boring: *3/16/93*
Elevation of Boring: *Existing Grade*

Boring Equipment: *Mobile B-50 With 6 Inch Diameter Hollow Stem Auger*
Driller: *J. Cowell*
Logger: *R. Smith*
Reviewed By: *J. Rose*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
	5	*BROWN SILTY FINE SAND, (SM), MOIST, LOOSE,*	16			
	10	*LIGHT BROWN CLAYEY SAND , (SC), MOIST, VERY LOOSE*	9			
	15	*LIGHT BROWN CLAYEY SAND, (SC), MOIST, VERY DENSE,*	50/3"			
	20		43			
		BOTTOM AT 21.5 FEET				
	25					

Boring Stopped at *21.5* Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

RITTENHOUSE CHANNEL PHASE I
MCFCD CONTRACT NO. 92-13

ATL Job No. 192023

Boring Number: 10
Boring Location: 176' N. of Railroad C/L, 28' E. of Sossaman Road C/L
Date of Boring: 3/16/93
Elevation of Boring: Existing Grade

Boring Equipment: Mobile B-50 With 6 Inch Diameter Hollow Stem Auger
Driller: L. Usrey
Logger: J. Cowell
Reviewed By: J. Rose

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		LIGHT BROWN SILTY FINE SAND, (SM), MOIST				
	5	TAN SANDY SILT, (ML), MOIST, STIFF	12		9.2	
	10	LIGHT BROWN SANDY CLAY, (SC), SLIGHTLY MOIST, WEAK CEMENTATION	48			
		LIGHT BROWN SILTY FINE SAND, (SM)				
	15	LIGHT BROWN SILTY SAND, (SM), VERY MOIST, LOOSE TO MEDIUM DENSE, WEAK CEMENTATION	9		15.9	
	20		19			
		BOTTOM AT 21.5 FEET				
	25					

Boring Stopped at 21.5 Feet Below Existing Grade

Groundwater		
Initial Depth	Hour	24 Hour Depth
Not Encountered		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A10

SUMMARY OF LABORATORY ANALYSIS

PROJECT: Rittenhouse Channel DATE: 03-31-93

LOCATION: Rittenhouse Road, Maricopa County, Arizona

MATERIAL: Borehole Samples SAMPLING DATE: 03-16-93

REQUESTED BY: J. Rose ATL JOB NO: 192023

LOG NO.	DEPTH (FT)	MOIST (%)	USCS	LL	PI	SIEVE ANALYSIS – PERCENT PASSING											
						200	100	50	40	30	16	10	4	3/8	3/4	1 1/2	3
1	0-2.5	10.3	SC-SM	23	6	14.7	33	55	61	67	78	85	99	99	100		
3	0-6	6.1	SC	27	8	6.1	15	42	60	70	79	84	95	99	100		
3	6-14	7.2	SM		NP	43.6	54	65	69	73	80	85	94	99	100		
3	14-19	8.7	SC	27	8	11.4	30	50	56	62	72	79	88	92	100		
6	0-8	16.5	ML	19	1	72.4	74	90	97	99	99	99	100				
6	12-20	20.0	SC	27	8	47.2	53	57	58	59	61	62	64	82	100		
8	0-5	8.9	SM		NP	31.4	42	71	80	85	89	90	92	96	100		
8	10-15	14.4	SM		NP	12.9	19	33	41	49	62	72	88	93	100		
10	5-9.5	9.2	ML		NP	62.6	73	84	86	88	91	93	96	99	100		
10	15-20	15.9	SM		NP	18.2	34	47	51	55	65	76	92	97	100		

RITTENHOUSE CHANNEL
MCFCD Contract No. 92-13
Maricopa County, Arizona
Ellis-Murphy Gannett Fleming
ATL Job No. 192023

pH and Box Resistivity Test Results

Boring No.	Sample Depth, ft.	USCS	pH	Box Resistivity (ohm-cm)
1	2.5 - 9	CL	8.5	1668
4	0 - 8	SM	7.9	734
6	0 - 8	ML	8.0	1801
8	0 - 8	SM	8.2	3869

RITTENHOUSE CHANNEL
MCFCD Contract No. 92-13
Maricopa County, Arizona
Ellis-Murphy Gannett Fleming
ATL Job No. 192023

STANDARD PROCTOR TESTS (ASTM D698)

Boring No.	Sample Depth (ft)	USCS	Maximum Dry Density (pcf)	Optimum Moisture (%)
1	2.5 - 9	CL	105.7	17.0
3	0 - 6	SC	105.0	8.4
6	0 - 8	ML	112.0	14.0
8	0 - 8	SM	115.6	13.8

Appendix B
HEC-1 60" Diameter Pipe Output File

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  03/17/1993  TIME  10:53:16 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
```

FILE NAME = RIT60D.OUT

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              *DIAGRAM
    1         ID       QUEEN CREEK AREA DRAINAGE MASTER STUDY - HYDROLOGY
    2         ID       EXISTING CONDITIONS MODEL   **QC.DAT**
    3         ID       REVISED: MARCH 1991  100-YEAR RAINFALL EVENT
    4         ID                REVISED AGAIN NOVEMBER 1992 BY FCD TO REPRESENT FLOWS
    5         ID                CONTRIBUTING TO THE SOUTHERN PACIFIC RAILROAD (RITTENHOUSE
    6         ID                ROAD DRAINAGE IMPROVEMENTS ALIGNMENT)
    7         ID       REVISED: GANNETT FLEMING  3-1-93 FOR RITTENHOUSE RD. CHANNEL
    8         ID               FILE NAME = RIT60D.DAT (TRIPLE 60" DIAMETER PIPE @ OCOTILLO)
    9         ID
   10         ID       DIVERSIONS AT RAY RD. (OVER 7000 CFS), CHANDLER RD. (OVER 7000 CFS)
   11         ID
   12         IT     10                    300
   13         IO      5
   14         IN     15
   15         JD   3.62    0.01
   16         PC   0.00    0.00    0.00    0.01    0.01    0.01    0.02    0.02    0.02    0.03
   17         PC   0.03    0.03    0.04    0.04    0.04    0.04    0.05    0.05    0.06    0.06
   18         PC   0.06    0.07    0.07    0.08    0.08    0.08    0.09    0.10    0.10    0.11
   19         PC   0.11    0.12    0.12    0.13    0.13    0.14    0.15    0.15    0.16    0.17
   20         PC   0.18    0.19    0.20    0.22    0.24    0.26    0.28    0.39    0.66    0.71
   21         PC   0.74    0.76    0.78    0.79    0.80    0.81    0.82    0.83    0.84    0.85
   22         PC   0.86    0.86    0.87    0.88    0.88    0.89    0.89    0.90    0.90    0.91
   23         PC   0.91    0.92    0.92    0.93    0.93    0.93    0.94    0.94    0.95    0.95
   24         PC   0.95    0.96    0.96    0.96    0.96    0.97    0.97    0.97    0.98    0.98
   25         PC   0.98    0.99    0.99    0.99    1.00    1.00    1.00
   26         JD   3.54      5.
   27         JD   3.44     10.
   28         JD   3.33     20.
   29         JD   3.26     30.

   30         KK  SB222A
   31         KM       FUNOFF FROM SUBBASIN 222A
   32         BA  0.794
   33         LS             76
   34         UD   1.41

   35         KK  RO225A
   36         KM       ROUTE CO222A TO CO228
   37         RM      4    0.73    0.20

   38         KK  SB222B
   39         KM       RUNOFF FROM SUBBASIN 222B
   40         BA   .142
   41         LS             76
   42         UD   0.49

   43         KK  DB222B
   44         KM       ROUTE THROUGH TAILWATER POND
   45         RS      1    ELEV    1416
   46         SV      0     1.5     3.0
   47         SE   1416    1417    1418
   48         SS   1417      75     2.7     1.5
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 173          KK   C0248
 174          KM        COMBINE R0245B & SB246B
 175          HC       2

 176          KK   R0249
 177          KM        ROUTE C0248 TO C0252
 178          RM       4    1.64    0.20

 179          KK  SUB250
 180          KM        RUNOFF FROM SUBBASIN 250
 181          BA    1.10
 182          LS              75
 183          UD    1.39

 184          KK   C0252
 185          KM        COMBINE R0249 AND SUB250
 186          HC       2

 187          KK  R0253A
 188          KM        ROUTE C0252 TO C0256A
 189          RM      12    1.52    0.20

 190          KK  SB254A
 191          KM        RUNOFF FROM SUBBASIN 254A
 192          BA    0.51
 193          LS              77
 194          UD    1.10

 195          KK  C0256A
 196          KM        COMBINE C0256A & SUBBASIN 254A
 197          HC       2

 198          KK  R0253C
 199          KM        ROUTE CO 256A TO CO 256C
 200          RM      12    1.48    0.20

 201          KK  SB254C
 202          KM        RUNOFF FROM SUBBASIN 254C
 203          BA    0.15
 204          LS              77
 205          UD    0.99

 206          KK  C0256C
 207          KM        COMBINE R0256C & SB254C
 208          HC       2

 209          KK  SUB258
 210          KM        RUNOFF FROM SUBBASIN 258
 211          BA    3.68
 212          LS              78
 213          UD    3.87
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  214         KK   R0259
  215         KM        ROUTE SUB258 TO C0262
  216         RM       8    1.47    0.20

  217         KK  SUB260
  218         KM        RUNOFF FROM SUBBASIN 260
  219         BA    0.92
  220         LS              75
  221         UD    1.46

  222         KK   C0262
  223         KM        COMBINE SUB260 AND R0259
  224         HC       2

  225         KK   R0263
  226         KM        ROUTE C0262 TO C0266
  227         RM       4    1.54    0.20

  228         KK  SUB264
  229         KM        RUNOFF FROM SUBBASIN 264
  230         BA     .75
  231         LS              76
  232         UD    1.34

  233         KK   C0266
  234         KM        COMBINE SUB264 AND R0263
  235         HC       2

  236         KK   R0267
  237         KM        ROUTE C0266 TO C0270A
  238         RM       8    1.01    0.20

  239         KK  SB268A
  240         KM        RUNOFF FROM SUBBASIN 268A
  241         BA     .28
  242         LS              76
  243         UD    1.27

  244         KK  C0270A
  245         KM        COMBINE RUNOFF FROM R0267 AND SUB268A
  246         HC       2

  247         KK  R0267A
  248         KM        ROUTE C0270A TO C0270C
  249         RM       4    1.01    0.20

  250         KK  SB268C
  251         KM        RUNOFF FROM SUBBASIN 268C
  252         BA    0.20
  253         LS              76
  254         UD    0.53
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 255          KK  CO270C
 256          KM       COMBINE RO267A &  SB268C
 257          HC      2

 258          KK  RO267C
 259          KM       ROUTE CO270C TO CO270D
 260          RM      4    0.69    0.20

 261          KK  SUB272
 262          KM       RUNOFF FROM SUBBBASIN 272
 263          BA   0.59
 264          LS             75
 265          UD   1.38

 266          KK   RO273
 267          KM       ROUTE SUB272 TO CO276
 268          RM     12    2.35    0.20

 269          KK  SUB274
 270          KM       RUNOFF FROM SUBBASIN 274
 271          BA   1.45
 272          LS             76
 273          UD   2.62

 274          KK   RO275
 275          KM       ROUTE SUB274 TO CO276
 276          RM     12    2.68    0.20

 277          KK  SB278A
 278          KM       RUNOFF FROM SUBBASIN 278A
 279          BA   1.10
 280          LS             75
 281          UD   1.62

 282          KK  CO280A
 283          KM       COMBINE SUB278A AND CO276
 284          HC      3

 285          KK  DB280A
 286          KM       ROUTE THROUGH TAILWATER POND
 287          RS      1    ELEV    1411
 288          SV      0     2.0    5.53
 289          SE   1411    1414    1416
 290          SS   1414      75     2.7     1.5

 291          KK  RO279A
 292          KM       ROUTE DB280A TO CO280C
 293          RM      4    0.64    0.20
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 294          KK  SB278B
 295          KM        RUNOFF FROM SUBBASIN 278B
 296          BA    0.18
 297          LS              75
 298          UD    0.61

 299          KK  RO279B
 300          KM        ROUTE SB278B TO CO280C
 301          RM       8    1.20    0.20

 302          KK  SB278C
 303          KM        RUNOFF FROM SUBBASIN 278C
 304          BA    0.33
 305          LS              75
 306          UD    0.71

 307          KK   CO280
 308          KM        COMBINE RO279A, RO279B &SB278C
 309          HC       3

 310          KK   DF280
 311          KM        DIVERT FLOW TO SOUTH AT DETETION AREA
 312          DT  DIVERT
 313          DI      50      95     105     130     210     290     300     380
 314          DQ      50      95     105     130     210     290     300     380

 315          KK   DB280
 316          KM        ROUTE FLOWS THROUGH DETENTION
 317          RS       1    ELEV  1407.5
 318          SV       0    0.05    5.09   31.43
 319          SE  1407.5    1408    1410    1412
 320          SS  1410.5     100     2.7     1.5

 321          KK   RO281
 322          KM        ROUTE DB280 TO CO270B
 323          RM      14    1.61    0.20

 324          KK  SB268B
 325          KM        RUNOFF FROM SUBBASIN 268B
 326          BA     .30
 327          LS              76
 328          UD    0.96

 329          KK  CO270B
 330          KM        COMBINE SB268B & RO281
 331          HC       2

 332          KK  RO267B
 333          KM        ROUTE CO270B TO CO270D
 334          RM       4    0.51    0.20
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 335          KK  C0270D
 336          KM        COMBINE R0267B & R0267C
 337          HC       2

 338          KK  R0267D
 339          KM        ROUTE C0270D TO C0270E
 340          RM       4    0.50    0.20

 341          KK  SB268D
 342          KM        RUNOFF FROM SUBBASIN 268D
 343          BA    0.14
 344          LS              76
 345          UD    0.82

 346          KK  C0270E
 347          KM        COMBINE  SB268D & R0267D
 348          HC       2

 349          KK  R0253B
 350          KM        ROUTE C0270E TO C0256B
 351          RM       4    0.50    0.20

 352          KK  SB254B
 353          KM        RUNOFF FROM SUBBASIN 254B
 354          BA    0.49
 355          LS              77
 356          UD    1.41

 357          KK  C0256B
 358          KM        COMBINE SB254B &  R0253B
 359          HC       2

 360          KK  R0253D
 361          KM        ROUTE C0256B TO C0256D
 362          RM      12    1.33    0.20

 363          KK  SB254D
 364          KM        RUNOFF FROM SUBBASIN 254D
 365          BA    0.18
 366          LS              77
 367          UD    1.06

 368          KK  C0256D
 369          KM        COMBINE C0256C, R0256B & SB254D
 370          HC       3

 371          KK   R0285
 372          KM        ROUTE FLOW FROM C0284 TO C0288
 373          RM       8    1.86    0.20
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 374          KK  SB238B
 375          KM       RUNOFF FROM SUBBASIN 238B
 376          BA   0.31
 377          LS            75
 378          UD   1.14

 379          KK   C0288
 380          KM       COMBINE R0285 AND R0287 AND SB238B
 381          HC      3

 382          KK   R0293
 383          KM       ROUTE C0288 TO C0294
 384          RM      4    1.01    0.20

 385          KK  SUB292
 386          KM       RUNOFF FROM SUBBASIN 292
 387          BA   0.21
 388          LS            77
 389          UD   0.67

 390          KK   C0294
 391          KM       COMBINE R0293 AND SUBBASIN 292
 392          HC      2
 393          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        ((---) RETURN OF DIVERTED OR PUMPED FLOW

   30     SB222A
               V
               V
   35     RO225A
               .
               .
   38          .      SB222B
               .           V
               .           V
   43          .      DB222B
               .           V
               .           V
   49          .      RO225B
               .           .
               .           .
   52          .           .      SB226A
               .           .           V
               .           .           V
   57          .           .      DB226A
               .           .           .
               .           .           .
   63     CO228A.......................
               V
               V
   66      RO225
               .
               .
   69          .      SB226B
               .           V
               .           V
   74          .      DB226B
               .           .
               .           .
   80      CO228............
               V
               V
   83      RO229
               .
               .
   86          .      SUB230
               .           .
               .           .
   91      CO232............
               V
               V
   94      RO233
               .
               .
   97          .      SB234B
               .           .
               .           .
  ...      ...............
               V
               V
  105     RO 237
               .
               .
  108          .      SB234A
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                .          V
                .          V
113             .     R0237A
                .          .
                .          .
116             .          .      SB238A
                .          .          .
                .          .          .
121             .          .          .      SB290
                .          .          .        .
                .          .          .        .
126       C0286.................................
              V
              V
129       R0287
                .
                .
132             .     SUB240
                .          V
                .          V
137             .      R0241
                .          .
                .          .
140             .          .      SUB242
                .          .          .
                .          .          .
145             .      C0244............
                .          V
                .          V
148             .     R0245A
                .          .
                .          .
151             .          .      SB246A
                .          .          V
                .          .          V
156             .          .      DB246A
                .          .          .
                .          .          .
162             .     C0248A............
                .          V
                .          V
165             .     R0245B
                .          .
                .          .
168             .          .      SB246B
                .          .          .
                .          .          .
173             .      C0248............
                .          V
                .          V
176             .      R0249
                .          .
                .          .
179             .          .      SUB250
                .          .          .
                .          .          .
184             .      C0252............
                .          V
                .          V
187             .     R0253A
                .          .
                .          .
190             .          .      SB254A
                .          .          .
                .          .          .
195             .     C0256A............
                .          V
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                .         .
                .         V
198             .     R0253C
                .         .
                .         .
201             .         .     SB254C
                .         .         .
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206             .     C0256C............
                .         .
                .         .
209             .         .     SUB258
                .         .         V
                .         .         V
214             .         .      R0259
                .         .         .
                .         .         .
217             .         .         .     SUB260
                .         .         .         .
                .         .         .         .
222             .         .      C0262............
                .         .         V
                .         .         V
225             .         .      R0263
                .         .         .
                .         .         .
228             .         .         .     SUB264
                .         .         .         .
                .         .         .         .
233             .         .      C0266............
                .         .         V
                .         .         V
236             .         .      R0267
                .         .         .
                .         .         .
239             .         .         .     SB268A
                .         .         .         .
                .         .         .         .
244             .         .     C0270A............
                .         .         V
                .         .         V
247             .         .     R0267A
                .         .         .
                .         .         .
250             .         .         .     SB268C
                .         .         .         .
                .         .         .         .
255             .         .     C0270C............
                .         .         V
                .         .         V
258             .         .     R0267C
                .         .         .
                .         .         .
261             .         .         .     SUB272
                .         .         .         V
                .         .         .         V
266             .         .         .      R0273
                .         .         .         .
                .         .         .         .
269             .         .         .         .     ...
                .         .         .         .         V
                .         .         .         .         V
274             .         .         .         .     R0275
                .         .         .         .         .
                .         .         .         .         .
277             .         .         .         .         .     SB278A
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                .         .         .         .         .         .
262             .         .         .     C0280A.......................
                .         .         .         V
                .         .         .         V
285             .         .         .     DB280A
                .         .         .         V
                .         .         .         V
291             .         .         .     R0279A
                .         .         .         .
                .         .         .         .
294             .         .         .         .     SB278B
                .         .         .         .         V
                .         .         .         .         V
299             .         .         .         .     R0279B
                .         .         .         .         .
                .         .         .         .         .
302             .         .         .         .         .     SB278C
                .         .         .         .         .         .
                .         .         .         .         .         .
307             .         .         .     C0280........................
                .         .         .         .
                .         .         .         .
312             .         .         .         .-------)  DIVERT
310             .         .         .     DF280
                .         .         .         V
                .         .         .         V
315             .         .         .     DB280
                .         .         .         V
                .         .         .         V
321             .         .         .     R0281
                .         .         .         .
                .         .         .         .
324             .         .         .         .     SB268B
                .         .         .         .         .
                .         .         .         .         .
329             .         .         .     C0270B............
                .         .         .         V
                .         .         .         V
332             .         .         .     R0267B
                .         .         .         .
                .         .         .         .
335             .         .     C0270D............
                .         .         V
                .         .         V
338             .         .     R0267D
                .         .         .
                .         .         .
341             .         .         .     SB268D
                .         .         .         .
                .         .         .         .
346             .         .     C0270E............
                .         .         V
                .         .         V
349             .         .     R0253B
                .         .         .
                .         .         .
352             .         .         .     SB254B
                .         .         .         .
                .         .         .         .
357             .         .     C0256B............
                .         .         V
                .         .         V
360             .         .     R0253D
                .         .         .
                .         .         .
363                                     SB254D
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365          .          .          .      SB2340
             .          .          .          .
             .          .          .          .
368          .     CO256D.......................
             .          V
             .          V
371          .      RO285
             .          .
             .          .
374          .          .      SB238B
             .          .          .
             .          .          .
379       CO288........................
             V
             V
382       RO293
             .
             .
385          .     SUB292
             .          .
             .          .
390       CO294............
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  06/29/1993  TIME  21:38:52 *
*                                      *
****************************************
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```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
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QUEEN CREEK AREA DRAINAGE MASTER STUDY - HYDROLOGY
EXISTING CONDITIONS MODEL **QC.DAT**
REVISED: MARCH 1991 100-YEAR RAINFALL EVENT
REVISED AGAIN NOVEMBER 1992 BY FCD TO REPRESENT FLOWS
CONTRIBUTING TO THE SOUTHERN PACIFIC RAILROAD (RITTENHOUSE
ROAD DRAINAGE IMPROVEMENTS ALIGNMENT)
REVISED: GANNETT FLEMING 3-1-93 FOR RITTENHOUSE RD. CHANNEL
FILE NAME = RIT60D.DAT (TRIPLE 60" DIAMETER PIPE @ OCOTILLO)

DIVERSIONS AT RAY RD. (OVER 7000 CFS), CHANDLER RD. (OVER 7000 CFS)

```
13 IO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT        HYDROGRAPH TIME DATA
                   NMIN         10  MINUTES IN COMPUTATION INTERVAL
                  IDATE     1    0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE     3    0  ENDING DATE
                 NDTIME       0150  ENDING TIME
                 ICENT          19  CENTURY MARK

            COMPUTATION INTERVAL     .17 HOURS
                 TOTAL TIME BASE   49.83 HOURS

      ENGLISH UNITS
          DRAINAGE AREA          SQUARE MILES
          PRECIPITATION DEPTH    INCHES
          LENGTH, ELEVATION      FEET
          FLOW                   CUBIC FEET PER SECOND
          STORAGE VOLUME         ACRE-FEET
          SURFACE AREA           ACRES
          TEMPERATURE            DEGREES FAHRENHEIT

15 JD        INDEX STORM NO. 1
                  STRM       3.62  PRECIPITATION DEPTH
                  TRDA        .01  TRANSPOSITION DRAINAGE AREA

16 PI         PRECIPITATION PATTERN
                 .00       .00       .00       .01       .00       .00       .00       .00       .01       .00
                 .00       .00       .01       .00       .00       .00       .00       .01       .00       .00
                 .00       .00       .00       .01       .00       .00       .01       .00       .00       .00
                 .01       .00       .00       .01       .00       .00       .00       .00       .01       .01
                 .00       .00       .01       .00       .00       .01       .00       .00       .01       .00
                 .00       .01       .01       .01       .00       .00       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01       .01       .01       .01       .07
                 .13       .18       .03       .03       .02       .01       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

26 JD INDEX STORM NO. 2

STRM 3.54 PRECIPITATION DEPTH

TRDA 5.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.01	.00	.00	.00	.00	.01	.00
.00	.00	.01	.00	.00	.00	.00	.01	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.01	.00	.00	.00	.00	.01	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.01	.01	.01	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.07
.13	.18	.03	.03	.02	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

27 JD INDEX STORM NO. 3

STRM 3.44 PRECIPITATION DEPTH

TRDA 10.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.01	.00	.00	.00	.00	.01	.00
.00	.00	.01	.00	.00	.00	.00	.01	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.01	.00	.00	.00	.00	.01	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.01	.01	.01	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.07
.13	.18	.03	.03	.02	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

28 JD INDEX STORM NO. 4

STRM 3.33 PRECIPITATION DEPTH

TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.01	.00	.00	.00	.00	.01	.00
.00	.00	.01	.00	.00	.00	.00	.01	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.01	.00	.00	.00	.00	.01	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.01	.01	.01	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.07
.13	.18	.03	.03	.02	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00

.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

29 JD INDEX STORM NO. 5

STRM 3.26 PRECIPITATION DEPTH

TRDA 30.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.01	.00	.00	.00	.00	.01	.00
.00	.00	.01	.00	.00	.00	.00	.01	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.01	.00	.00	.00	.00	.01	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.01	.01	.01	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.07
.13	.18	.03	.03	.02	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SB222A	200.	13.50	94.	30.	15.	.79		
ROUTED TO	R0225A	191.	14.17	94.	30.	15.	.79		
HYDROGRAPH AT	SB222B	72.	12.33	18.	5.	3.	.14		
ROUTED TO	DB222B	67.	12.50	15.	5.	2.	.14		
ROUTED TO	R0225B	42.	13.67	15.	5.	2.	.14		
HYDROGRAPH AT	SB226A	152.	13.33	67.	21.	10.	.51		
ROUTED TO	DB226A	150.	13.50	57.	18.	9.	.51		
3 COMBINED AT	C0228A	350.	13.83	165.	53.	25.	1.45		
ROUTED TO	R0225	331.	14.67	163.	53.	25.	1.45		
HYDROGRAPH AT	SB226B	150.	13.33	67.	21.	10.	.51		
ROUTED TO	DB226B	149.	13.33	63.	20.	9.	.51		
2 COMBINED AT	C0228	408.	14.50	220.	72.	35.	1.96		
ROUTED TO	R0229	351.	16.17	214.	72.	35.	1.96		
HYDROGRAPH AT	SUB230	260.	13.33	114.	36.	17.	1.00		
2 COMBINED AT	C0232	410.	16.17	294.	108.	52.	2.96		
ROUTED TO	R0233	360.	17.67	285.	108.	52.	2.96		
HYDROGRAPH AT	SB234B	168.	13.00	62.	20.	9.	.51		
2 COMBINED AT	C0236	397.	17.67	310.	127.	61.	3.47		
ROUTED TO	R0 237	385.	20.17	307.	127.	61.	3.47		
HYDROGRAPH AT	SB234A	171.	13.00	63.	20.	10.	.52		
ROUTED TO	R0237A	134.	15.67	62.	20.	10.	.52		
HYDROGRAPH AT	SB238A	336.	13.17	138.	44.	21.	1.21		
HYDROGRAPH AT	SB290	319.	14.00	182.	60.	29.	1.39		
4 COMBINED AT	C0286	578.	13.50	499.	244.	117.	6.59		
ROUTED TO	R0287	561.	14.17	497.	244.	117.	6.59		
HYDROGRAPH AT	SUB240	200.	14.83	207.	74.	35.	1.86		
ROUTED TO	R0241	280.	16.67	202.	73.	35.	1.86		
HYDROGRAPH AT	SUB242	264.	13.33	118.	38.	18.	.99		
2 COMBINED AT	C0244	336.	16.33	279.	111.	53.	2.85		

ROUTED TO	R0245A	331.	17.33	276.	111.	53.	2.85
HYDROGRAPH AT	SB246A	100.	12.67	29.	9.	4.	.25
ROUTED TO	DB246A	104.	12.83	23.	7.	3.	.25
2 COMBINED AT	C0248A	339.	17.33	288.	118.	57.	3.10
ROUTED TO	R0245B	334.	18.17	286.	118.	57.	3.10
HYDROGRAPH AT	SB246B	187.	13.33	87.	28.	13.	.77
2 COMBINED AT	C0248	361.	18.17	331.	145.	70.	3.87
ROUTED TO	R0249	352.	19.67	326.	145.	70.	3.87
HYDROGRAPH AT	SUB250	264.	13.50	124.	40.	19.	1.10
2 COMBINED AT	C0252	385.	16.50	371.	184.	89.	4.97
ROUTED TO	R0253A	382.	18.00	370.	184.	89.	4.97
HYDROGRAPH AT	SB254A	162.	13.17	65.	20.	10.	.51
2 COMBINED AT	C0256A	396.	18.00	383.	202.	98.	5.48
ROUTED TO	R0253C	394.	19.50	382.	202.	98.	5.48
HYDROGRAPH AT	SB254C	52.	13.00	19.	6.	3.	.15
2 COMBINED AT	C0256C	398.	19.50	385.	207.	100.	5.63
HYDROGRAPH AT	SUB258	476.	16.17	379.	151.	73.	3.68
ROUTED TO	R0259	469.	17.67	376.	151.	73.	3.68
HYDROGRAPH AT	SUB260	214.	13.50	103.	33.	16.	.92
2 COMBINED AT	C0262	506.	17.67	415.	184.	89.	4.60
ROUTED TO	R0263	493.	19.17	411.	184.	89.	4.60
HYDROGRAPH AT	SUB264	197.	13.33	89.	28.	14.	.75
2 COMBINED AT	C0266	513.	19.17	432.	210.	102.	5.35
ROUTED TO	R0267	511.	20.17	432.	210.	102.	5.35
HYDROGRAPH AT	SB268A	77.	12.33	34.	11.	5.	.28
2 COMBINED AT	C0270A	516.	20.17	438.	220.	106.	5.63
ROUTED TO	R0267A	511.	21.17	436.	220.	106.	5.63
HYDROGRAPH AT	SB268C	98.	12.50	25.	8.	4.	.20
2 COMBINED AT	C0270C	512.	21.17	439.	226.	110.	5.83
ROUTED TO	R0267C	511.	21.33	439.	226.	110.	5.83
HYDROGRAPH AT	SUB272	143.	13.33	67.	21.	10.	.59
ROUTED TO	R0273	123.	15.83	65.	21.	10.	.59
HYDROGRAPH AT	SUB274	229.	14.83	155.	55.	26.	1.45

ROUTED TO	R0275	214.	17.67	152.	55.	26.	1.45
HYDROGRAPH AT	SB278A	237.	13.67	122.	40.	19.	1.10
3 COMBINED AT	C0280A	346.	16.67	284.	115.	55.	3.14
ROUTED TO	DB280A	346.	16.67	284.	114.	55.	3.14
ROUTED TO	R0279A	344.	17.33	283.	114.	55.	3.14
HYDROGRAPH AT	SB278B	77.	12.50	21.	7.	3.	.18
ROUTED TO	R0279B	62.	13.83	21.	7.	3.	.18
HYDROGRAPH AT	SB278C	127.	12.67	39.	12.	6.	.33
3 COMBINED AT	C0280	361.	17.33	313.	132.	64.	3.65
DIVERSION TO	DIVERT	361.	17.33	313.	132.	64.	3.65
HYDROGRAPH AT	DF280	0.	.17	0.	0.	0.	3.65
ROUTED TO	DB280	0.	.17	0.	0.	0.	3.65
ROUTED TO	R0281	0.	.17	0.	0.	0.	3.65
HYDROGRAPH AT	SB268B	100.	13.00	37.	11.	6.	.30
2 COMBINED AT	C0270B	98.	13.00	36.	11.	5.	3.95
ROUTED TO	R0267B	94.	13.50	36.	11.	5.	3.95
2 COMBINED AT	C0270D	511.	21.83	441.	234.	114.	9.78
ROUTED TO	R0267D	495.	22.33	428.	228.	111.	9.78
HYDROGRAPH AT	SB268D	52.	12.83	17.	5.	3.	.14
2 COMBINED AT	C0270E	498.	22.33	430.	232.	113.	9.92
ROUTED TO	R0253B	497.	22.83	430.	232.	113.	9.92
HYDROGRAPH AT	SB254B	131.	13.50	61.	20.	9.	.49
2 COMBINED AT	C0256B	505.	22.83	438.	248.	121.	10.41
ROUTED TO	R0253D	502.	24.17	437.	248.	121.	10.41
HYDROGRAPH AT	SB254D	59.	13.00	23.	7.	3.	.18
3 COMBINED AT	C0256D	813.	23.50	737.	433.	212.	16.22
ROUTED TO	R0285	804.	25.33	734.	433.	212.	16.22
HYDROGRAPH AT	SB238B	87.	13.17	36.	11.	5.	.31
3 COMBINED AT	C0288	1053.	21.00	981.	642.	315.	23.12
ROUTED TO	R0290	1044.	22.00	979.	641.	315.	23.12
HYDROGRAPH AT	SUB292	93.	12.67	27.	8.	4.	.21
2 COMBINED AT	C0294	1047.	22.00	981.	644.	318.	23.33

*** NORMAL END OF HEC-1 ***

Appendix C
HEC-1 48" Diameter Pipe Output File

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
* RUN DATE  03/25/1993  TIME  14:32:58 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

FILE NAME = RIT48D.OUT

```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X       XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              *DIAGRAM
    1         ID       QUEEN CREEK AREA DRAINAGE MASTER STUDY - HYDROLOGY
    2         ID       EXISTING CONDITIONS MODEL   **QC.DAT**
    3         ID       REVISED: MARCH 1991  100-YEAR RAINFALL EVENT
    4         ID                REVISED AGAIN NOVEMBER 1992 BY FCD TO REPRESENT FLOWS
    5         ID                CONTRIBUTING TO THE SOUTHERN PACIFIC RAILROAD (RITTENHOUSE
    6         ID                ROAD DRAINAGE IMPROVEMENTS ALIGNMENT)
    7         ID       REVISED: GANNETT FLEMING  3-1-93 FOR RITTENHOUSE RD. CHANNEL
    8         ID               FILE NAME = RIT48D.DAT (TRIPLE 48" DIAMETER PIPE @ OCOTILLO)
    9         ID
   10         ID       DIVERSIONS AT RAY RD. (OVER 7000 CFS), CHANDLER RD. (OVER 7000 CFS)
   11         ID
   12         IT     10                    300
   13         IO      5
   14         IN     15
   15         JD   3.62    0.01
   16         PC   0.00    0.00    0.00    0.01    0.01    0.01    0.02    0.02    0.02    0.03
   17         PC   0.03    0.03    0.04    0.04    0.04    0.04    0.05    0.05    0.06    0.06
   18         PC   0.06    0.07    0.07    0.08    0.08    0.08    0.09    0.10    0.10    0.11
   19         PC   0.11    0.12    0.12    0.13    0.13    0.14    0.15    0.15    0.16    0.17
   20         PC   0.18    0.19    0.20    0.22    0.24    0.26    0.28    0.39    0.66    0.71
   21         PC   0.74    0.76    0.78    0.79    0.80    0.81    0.82    0.83    0.84    0.85
   22         PC   0.86    0.86    0.87    0.88    0.88    0.89    0.89    0.90    0.90    0.91
   23         PC   0.91    0.92    0.92    0.93    0.93    0.93    0.94    0.94    0.95    0.95
   24         PC   0.95    0.96    0.96    0.96    0.96    0.97    0.97    0.97    0.98    0.98
   25         PC   0.98    0.99    0.99    0.99    1.00    1.00    1.00
   26         JD   3.54      5.
   27         JD   3.44     10.
   28         JD   3.33     20.
   29         JD   3.26     30.

   30         KK  SB222A
   31         KM       FUNOFF FROM SUBBASIN 222A
   32         BA   0.794
   33         LS             76
   34         UD    1.41

   35         KK  RO225A
   36         KM       ROUTE CO222A TO CO228
   37         RM      4    0.73    0.20

   38         KK  SB222B
   39         KM       RUNOFF FROM SUBBASIN 222B
   40         BA    .142
   41         LS             76
   42         UD    0.49

   43         KK  DB222B
   44         KM       ROUTE THROUGH TAILWATER POND
   45         RS      1    ELEV    1416
   46         SV      0     1.5     3.0
   47         SE   1416    1417    1418
   48         SS   1417      75     2.7     1.5
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  91          KK   C0232
  92          KM        COMBINE RUNOFF FROM R0229 AND SUB230
  93          HC       2

  94          KK   R0233
  95          KM        ROUTE C0232 TO CO 236
  96          RM       4    1.62    0.20

  97          KK  SB234B
  98          KM        RUNOFF FROM SUB234B
  99          BA    .513
 100          LS              76
 101          UD    0.98

 102          KK   C0236
 103          KM        COMBINE R0233 AND SUB234B
 104          HC       2

 105          KK  RO 237
 106          KM        ROUTE C0236 TO C0286
 107          RM      16    2.45    0.20

 108          KK  SB234A
 109          KM        RUNOFF FROM SUB 234A
 110          BA     .52
 111          LS              76
 112          UD    0.98

 113          KK  R0237A
 114          KM        ROUTE SUB 234A TO CO 286
 115          RM      16    2.68    0.20

 116          KK  SB238A
 117          KM        RUNOFF FROM SUBBASIN 238A
 118          BA    1.21
 119          LS              75
 120          UD    1.14

 121          KK  SB290
 122          KM        RUNOFF FROM SUBBASIN 290
 123          BA    1.39
 124          LS              79
 125          UD    1.97

 126          KK   C0286
 127          KM        COMBINE RUNOFF FROM R0237 AND SUB238
 128          HC       4

 129          KK   R0287
 130          KM        ROUTE FLOW FROM C0286 TO C0288
 131          RM       4    0.65    0.20
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 132          KK  SUB240
 133          KM       RUNOFF FROM SUBBASIN 240
 134          BA    1.86
 135          LS              77
 136          UD    2.72

 137          KK   RO241
 138          KM       ROUTE SUB240 TO CO244
 139          RM      4    1.63    0.20

 140          KK  SUB242
 141          KM       RUNOFF FROM SUBBASIN 242
 142          BA    0.99
 143          LS              76
 144          UD    1.31

 145          KK   CO244
 146          KM       COMBINE RUNOFF FROM RO241 AND SUB242
 147          HC      2

 148          KK  RO245A
 149          KM       ROUTE CO244 TO CO248A
 150          RM      4    0.90    0.20

 151          KK  SB246A
 152          KM       RUNOFF FROM SUBBASIN 246A
 153          BA    0.25
 154          LS              75
 155          UD    0.67

 156          KK  DB246A
 157          KM       ROUTE THROUGH TAILWATER POND
 158          RS      1    ELEV  1409.5
 159          SV      0    3.70    5.41
 160          SE  1409.5    1414    1416
 161          SS    1414      75     2.7     1.5

 162          KK  CO248A
 163          KM       COMBINE RO245A AND SUBBASIN 246A
 164          HC      2

 165          KK  RO245B
 166          KM       ROUTE DB248A TO CO248
 167          RM      4    0.94    0.20

 168          KK  SB246B
 169          KM       RUNOFF FROM SUBBASIN 246B
 170          BA    0.77
 171          LS              75
 172          UD    1.37
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 173          KK   C0248
 174          KM        COMBINE R0245B & SB246B
 175          HC       2

 176          KK   R0249
 177          KM        ROUTE C0248 TO C0252
 178          RM       4    1.64    0.20

 179          KK  SUB250
 180          KM        RUNOFF FROM SUBBASIN 250
 181          BA    1.10
 182          LS              75
 183          UD    1.39

 184          KK   C0252
 185          KM        COMBINE R0249 AND SUB250
 186          HC       2

 187          KK  R0253A
 188          KM        ROUTE C0252 TO C0256A
 189          RM      12    1.52    0.20

 190          KK  SB254A
 191          KM        RUNOFF FROM SUBBASIN 254A
 192          BA    0.51
 193          LS              77
 194          UD    1.10

 195          KK  C0256A
 196          KM        COMBINE C0256A & SUBBASIN 254A
 197          HC       2

 198          KK  R0253C
 199          KM        ROUTE CO 256A TO CO 256C
 200          RM      12    1.48    0.20

 201          KK  SB254C
 202          KM        RUNOFF FROM SUBBASIN 254C
 203          BA    0.15
 204          LS              77
 205          UD    0.99

 206          KK  C0256C
 207          KM        COMBINE R0256C & SB254C
 208          HC       2

 209          KK  SUB258
 210          KM        RUNOFF FROM SUBBASIN 258
 211          BA    3.68
 212          LS              78
 213          UD    3.87
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 214          KK   R0259
 215          KM        ROUTE SUB256 TO C0262
 216          RM       8    1.47    0.20

 217          KK  SUB260
 218          KM        RUNOFF FROM SUBBASIN 260
 219          BA    0.92
 220          LS              75
 221          UD    1.46

 222          KK   C0262
 223          KM        COMBINE SUB260 AND R0259
 224          HC       2

 225          KK   R0263
 226          KM        ROUTE C0262 TO C0266
 227          RM       4    1.54    0.20

 228          KK  SUB264
 229          KM        RUNOFF FROM SUBBASIN 264
 230          BA     .75
 231          LS              76
 232          UD    1.34

 233          KK   C0266
 234          KM        COMBINE SUB264 AND R0263
 235          HC       2

 236          KK   R0267
 237          KM        ROUTE C0266 TO C0270A
 238          RM       8    1.01    0.20

 239          KK  SB268A
 240          KM        RUNOFF FROM SUBBASIN 268A
 241          BA     .28
 242          LS              76
 243          UD    1.27

 244          KK  C0270A
 245          KM        COMBINE RUNOFF FROM R0267 AND SUB268A
 246          HC       2

 247          KK  R0267A
 248          KM        ROUTE C0270A TO C0270C
 249          RM       4    1.01    0.20

 250          KK  SB268C
 251          KM        RUNOFF FROM SUBBASIN 268C
 252          BA    0.20
 253          LS              76
 254          UD    0.53
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 255          KK  C0270C
 256          KM        COMBINE R0267A &  SB268C
 257          HC       2

 258          KK  R0267C
 259          KM        ROUTE C0270C TO C0270D
 260          RM       4    0.69    0.20

 261          KK  SUB272
 262          KM        RUNOFF FROM SUBBBASIN 272
 263          BA    0.59
 264          LS              75
 265          UD    1.38

 266          KK   R0273
 267          KM        ROUTE SUB272 TO C0276
 268          RM      12    2.35    0.20

 269          KK  SUB274
 270          KM        RUNOFF FROM SUBBASIN 274
 271          BA    1.45
 272          LS              76
 273          UD    2.62

 274          KK   R0275
 275          KM        ROUTE SUB274 TO C0276
 276          RM      12    2.68    0.20

 277          KK  SB278A
 278          KM        RUNOFF FROM SUBBASIN 276A
 279          BA    1.10
 280          LS              75
 281          UD    1.62

 282          KK  C0280A
 283          KM        COMBINE SUB278A AND C0276
 284          HC       3

 285          KK  DB280A
 286          KM        ROUTE THROUGH TAILWATER POND
 287          RS       1    ELEV    1411
 288          SV       0     2.0    5.53
 289          SE    1411    1414    1416
 290          SS    1414      75     2.7     1.5

 291          KK  R0279A
 292          KM        ROUTE DB280A TO C0280C
 293          RM       4    0.64    0.20
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 294          KK  SB278B
 295          KM       RUNOFF FROM SUBBASIN 278B
 296          BA    0.18
 297          LS             75
 298          UD    0.61

 299          KK  RO279B
 300          KM       ROUTE SB278B TO CO280C
 301          RM      8    1.20    0.20

 302          KK  SB278C
 303          KM       RUNOFF FROM SUBBASIN 278C
 304          BA    0.33
 305          LS             75
 306          UD    0.71

 307          KK   CO280
 308          KM       COMBINE RO279A, RO279B &SB278C
 309          HC      3

 310          KK   DF280
 311          KM       DIVERT FLOW TO SOUTH AT DETETION AREA
 312          DT  DIVERT
 313          DI     50      95     130     290     361
 314          DQ     30      78     130     225     225

 315          KK   DB280
 316          KM       ROUTE FLOWS THROUGH DETENTION
 317          RS      1    ELEV  1407.5
 318          SV      0    0.05    5.09   31.43
 319          SE  1407.5    1408    1410    1412
 320          SS  1410.5     100     2.7     1.5

 321          KK   RO281
 322          KM       ROUTE DB280 TO CO270B
 323          RM     14    1.61    0.20

 324          KK  SB268B
 325          KM       RUNOFF FROM SUBBASIN 268B
 326          BA     .30
 327          LS             76
 328          UD    0.96

 329          KK  CO270B
 330          KM       COMBINE SB268B & RO281
 331          HC      2

 332          KK  RO267B
 333          KM       ROUTE CO270B TO CO270D
 334          RM      4    0.51    0.20
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 335          KK  C0270D
 336          KM       COMBINE R0267B & R0267C
 337          HC      2

 338          KK  R0267D
 339          KM       ROUTE C0270D TO C0270E
 340          RM      4    0.50    0.20

 341          KK  SB268D
 342          KM       RUNOFF FROM SUBBASIN 268D
 343          BA   0.14
 344          LS             76
 345          UD   0.82

 346          KK  C0270E
 347          KM       COMBINE  SB268D & R0267D
 348          HC      2

 349          KK  R0253B
 350          KM       ROUTE C0270E TO C0256B
 351          RM      4    0.50    0.20

 352          KK  SB254B
 353          KM       RUNOFF FROM SUBBASIN 254B
 354          BA   0.49
 355          LS             77
 356          UD   1.41

 357          KK  C0256B
 358          KM       COMBINE SB254B &  R0253B
 359          HC      2

 360          KK  R0253D
 361          KM       ROUTE C0256B TO C0256D
 362          RM     12    1.33    0.20

 363          KK  SB254D
 364          KM       RUNOFF FROM SUBBASIN 254D
 365          BA   0.18
 366          LS             77
 367          UD   1.06

 368          KK  C0256D
 369          KM       COMBINE C0256C, R0256B & SB254D
 370          HC      3

 371          KK   R0285
 372          KM       ROUTE FLOW FROM C0284 TO C0288
 373          RM      8    1.86    0.20
```

```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 374        KK  SB238B
 375        KM        RUNOFF FROM SUBBASIN 236B
 376        BA    0.31
 377        LS              75
 378        UD    1.14

 379        KK   C0288
 380        KM        COMBINE R0285 AND R0287 AND SB238B
 381        HC       3

 382        KK   R0293
 383        KM        ROUTE C0288 TO C0294
 384        RM       4    1.01    0.20

 385        KK  SUB292
 386        KM        RUNOFF FROM SUBBASIN 292
 387        BA    0.21
 388        LS              77
 389        UD    0.67

 390        KK   C0294
 391        KM        COMBINE R0293 AND SUBBASIN 292
 392        HC       2
 393        ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   30     SB222A
               V
               V
   35     RO225A
               .
               .
   38          .      SB222B
               .           V
               .           V
   43          .      DB222B
               .           V
               .           V
   49          .      RO225B
               .           .
               .           .
   52          .           .     SB226A
               .           .          V
               .           .          V
   57          .           .     DB226A
               .           .          .
               .           .          .
   63     CO228A.......................
               V
               V
   66      RO225
               .
               .
   69          .      SB226B
               .           V
               .           V
   74          .      DB226B
               .           .
               .           .
   80      CO228............
               V
               V
   83      RO229
               .
               .
   86          .      SUB230
               .           .
               .           .
   91      CO232............
               V
               V
   94      RO233
               .
               .
   97          .      SB234B

               .           .
  102      CO236............
               V
               V
  105     RO 237
               .
               .
  108          .      SB234A
```

```
                .        V
                .        V
113             .    R0237A
                .        .
                .        .
116             .        .     SB238A
                .        .        .
                .        .        .
121             .        .        .      SB290
                .        .        .        .
                .        .        .        .
126         C0286.................................
                V
                V
129         R0287
                .
                .
132             .    SUB240
                .        V
                .        V
137             .     R0241
                .        .
                .        .
140             .        .     SUB242
                .        .        .
                .        .        .
145             .     C0244............
                .        V
                .        V
148             .    R0245A
                .        .
                .        .
151             .        .     SB246A
                .        .        V
                .        .        V
156             .        .     DB246A
                .        .        .
                .        .        .
162             .    C0248A...........
                .        V
                .        V
165             .    R0245B
                .        .
                .        .
168             .        .     SB246B
                .        .        .
                .        .        .
173             .     C0246............
                .        V
                .        .
176             .     R0249
                .        .
                .        .
179             .        .     SUB250
                .        .        .
                .        .        .
184             .     C0252............
                .        V
                .        .
187             .    [illegible]
                .        .
                .        .
190             .        .     SB254A
                .        .        .
                .        .        .
195             .    C0256A...........
                .        V
```

```
                 .          V
                 .          V
198              .     R0253C
                 .          .
                 .          .
201              .          .     SB254C
                 .          .          .
                 .          .          .
206              .     C0256C............
                 .          .
                 .          .
209              .          .     SUB258
                 .          .          V
                 .          .          V
214              .          .      R0259
                 .          .          .
                 .          .          .
217              .          .          .     SUB260
                 .          .          .          .
                 .          .          .          .
222              .          .      C0262............
                 .          .          V
                 .          .          V
225              .          .      R0263
                 .          .          .
                 .          .          .
228              .          .          .     SUB264
                 .          .          .          .
                 .          .          .          .
233              .          .      C0266............
                 .          .          V
                 .          .          V
236              .          .      R0267
                 .          .          .
                 .          .          .
239              .          .          .     SB268A
                 .          .          .          .
                 .          .          .          .
244              .          .     C0270A............
                 .          .          V
                 .          .          V
247              .          .     R0267A
                 .          .          .
                 .          .          .
250              .          .          .     SB268C
                 .          .          .          .
                 .          .          .          .
255              .          .     C0270C............
                 .          .          V
                 .          .          V
258              .          .     R0267C
                 .          .          .
                 .          .          .
261              .          .          .     SUB272
                 .          .          .          V
                 .          .          .          V
266              .          .          .      R0273
                 .          .          .          .
                 .          .          .          .
[illegible]      .          .          .          .     SUB274
                 .          .          .          .          V
                 .          .          .          .          V
274              .          .          .          .      R0275
                 .          .          .          .          .
                 .          .          .          .          .
277              .          .          .          .          .     SB278A
```

```
282                 C0280A.......................
                       V
                       V
285                 DB280A
                       V
                       V
291                 R0279A
                       .
                       .
294                    .      SB278B
                       .          V
                       .          V
299                    .      R0279B
                       .          .
                       .          .
302                    .          .      SB278C
                       .          .          .
                       .          .          .
307                 C0280.......................
                       .
                       .
312                    .-------)  DIVERT
310                 DF280
                       V
                       V
315                 DB280
                       V
                       V
321                 R0281
                       .
                       .
324                    .      SB268B
                       .          .
                       .          .
329                 C0270B............
                       V
                       V
332                 R0267B
                       .
                       .
335              C0270D............
                    V
                    V
338              R0267D
                       .
                       .
341                 SB268D
                       .
                       .
346              C0270E............
                    V
                    V
349              R0253B
                       .
                       .
352                 SB254B
                       .
                       .
357              C0256B............
                    V
                    V
360              R0253D
                       .
                       .
363                 SB254D
```

```
365          .          .          .     SB2340
             .          .          .          .
             .          .          .          .
368          .     CO256D.......................
             .          V
             .          V
371          .      RO285
             .          .
             .          .
374          .          .     SB238B
             .          .          .
             .          .          .
379       CO288........................
             V
             V
382       RO293
             .
             .
385          .     SUB292
             .          .
             .          .
390       CO294............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*           SEPTEMBER 1990             *
*            VERSION 4.0               *
*                                      *
* RUN DATE  06/29/1993  TIME  21:07:51 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
```

QUEEN CREEK AREA DRAINAGE MASTER STUDY - HYDROLOGY
EXISTING CONDITIONS MODEL **QC.DAT**
REVISED: MARCH 1991 100-YEAR RAINFALL EVENT
REVISED AGAIN NOVEMBER 1992 BY FCD TO REPRESENT FLOWS
CONTRIBUTING TO THE SOUTHERN PACIFIC RAILROAD (RITTENHOUSE
ROAD DRAINAGE IMPROVEMENTS ALIGNMENT)
REVISED: GANNETT FLEMING 3-1-93 FOR RITTENHOUSE RD. CHANNEL
FILE NAME = RIT48D.DAT (TRIPLE 48" DIAMETER PIPE @ OCOTILLO)

DIVERSIONS AT RAY RD. (OVER 7000 CFS), CHANDLER RD. (OVER 7000 CFS)

```
13 IO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT        HYDROGRAPH TIME DATA
                   NMIN         10  MINUTES IN COMPUTATION INTERVAL
                  IDATE     1    0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE     3    0  ENDING DATE
                 NDTIME       0150  ENDING TIME
                  ICENT         19  CENTURY MARK

             COMPUTATION INTERVAL     .17 HOURS
                  TOTAL TIME BASE   49.83 HOURS

       ENGLISH UNITS
           DRAINAGE AREA        SQUARE MILES
           PRECIPITATION DEPTH  INCHES
           LENGTH, ELEVATION    FEET
           FLOW                 CUBIC FEET PER SECOND
           STORAGE VOLUME       ACRE-FEET
           SURFACE AREA         ACRES
           TEMPERATURE          DEGREES FAHRENHEIT

15 JD        INDEX STORM NO. 1
                  STRM       3.62  PRECIPITATION DEPTH
                  TRDA        .01  TRANSPOSITION DRAINAGE AREA

16 PI          PRECIPITATION PATTERN
                 .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                 .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                 .00       .00       .00       .01       .00       .00       .01       .00       .00       .00
                 .01       .00       .00       .01       .00       .00       .00       .00       .01       .01
                 .00       .00       .01       .00       .00       .01       .00       .00       .01       .00
                 .00       .01       .01       .01       .00       .00       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01       .01       .01       .01       .07
                 .13       .18       .03       .03       .02       .01       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

26 JD INDEX STORM NO. 2

STRM 3.54 PRECIPITATION DEPTH

TRDA 5.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.01	.00	.00	.00	.00	.01	.00
.00	.00	.01	.00	.00	.00	.00	.01	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.01	.00	.00	.00	.00	.01	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.01	.01	.01	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.07
.13	.18	.03	.03	.02	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

27 JD INDEX STORM NO. 3

STRM 3.44 PRECIPITATION DEPTH

TRDA 10.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.01	.00	.00	.00	.00	.01	.00
.00	.00	.01	.00	.00	.00	.00	.01	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.01	.00	.00	.00	.00	.01	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.01	.01	.01	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.07
.13	.18	.03	.03	.02	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

28 JD INDEX STORM NO. 4

STRM 3.33 PRECIPITATION DEPTH

TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.01	.00	.00	.00	.00	.01	.00
.00	.00	.01	.00	.00	.00	.00	.01	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
.00	.01	.01	.01	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.07
.13	.18	.03	.03	.02	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00

.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

29 JO INDEX STORM NO. 5

STRM 3.26 PRECIPITATION DEPTH

TRDA 30.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.01	.00	.00	.00	.00	.01	.00
.00	.00	.01	.00	.00	.00	.00	.01	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.01	.00	.00	.00	.00	.01	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.01	.01	.01	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.07
.13	.18	.03	.03	.02	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.00	.00	.01	.01	.00	.00	.01	.00	.00	.01
.00	.00	.01	.00	.00	.01	.00	.00	.01	.00
.00	.00	.00	.01	.00	.00	.01	.00	.00	.00
.01	.00	.00	.00	.00	.00	.01	.00	.00	.00
.00	.01	.00	.00	.00	.01	.00	.00	.00	.00
.01									

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SB222A	200.	13.50	94.	30.	15.	.79		
ROUTED TO	R0225A	191.	14.17	94.	30.	15.	.79		
HYDROGRAPH AT	SB222B	72.	12.33	18.	5.	3.	.14		
ROUTED TO	DB222B	67.	12.50	15.	5.	2.	.14		
ROUTED TO	R0225B	42.	13.67	15.	5.	2.	.14		
HYDROGRAPH AT	SB226A	152.	13.33	67.	21.	10.	.51		
ROUTED TO	DB226A	150.	13.50	57.	18.	9.	.51		
3 COMBINED AT	C0228A	350.	13.83	165.	53.	25.	1.45		
ROUTED TO	R0225	331.	14.67	163.	53.	25.	1.45		
HYDROGRAPH AT	SB226B	150.	13.33	67.	21.	10.	.51		
ROUTED TO	DB226B	149.	13.33	63.	20.	9.	.51		
2 COMBINED AT	C0228	408.	14.50	220.	72.	35.	1.96		
ROUTED TO	R0229	351.	16.17	214.	72.	35.	1.96		
HYDROGRAPH AT	SUB230	260.	13.33	114.	36.	17.	1.00		
2 COMBINED AT	C0232	410.	16.17	294.	108.	52.	2.96		
ROUTED TO	R0233	380.	17.67	285.	108.	52.	2.96		
HYDROGRAPH AT	SB234B	168.	13.00	62.	20.	9.	.51		
2 COMBINED AT	C0236	397.	17.67	310.	127.	61.	3.47		
ROUTED TO	R0 237	385.	20.17	307.	127.	61.	3.47		
HYDROGRAPH AT	SB234A	171.	13.00	63.	20.	10.	.52		
ROUTED TO	R0237A	134.	15.67	62.	20.	10.	.52		
HYDROGRAPH AT	SB238A	336.	13.17	138.	44.	21.	1.21		
HYDROGRAPH AT	SB290	319.	14.00	182.	60.	29.	1.39		
4 COMBINED AT	C0286	578.	13.50	499.	244.	117.	6.59		
ROUTED TO	R0287	561.	14.17	497.	244.	117.	6.59		
HYDROGRAPH AT	SUB240	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.86		
ROUTED TO	R0241	280.	16.67	202.	73.	35.	1.86		
HYDROGRAPH AT	SUB242	264.	13.33	118.	38.	18.	.99		
2 COMBINED AT	C0244	336.	16.33	279.	111.	53.	2.85		

ROUTED TO	R0245A	331.	17.33	276.	111.	53.	2.85
HYDROGRAPH AT	SB246A	100.	12.67	29.	9.	4.	.25
ROUTED TO	DB246A	104.	12.83	23.	7.	3.	.25
2 COMBINED AT	C0246A	339.	17.33	288.	118.	57.	3.10
ROUTED TO	R0245B	334.	18.17	286.	118.	57.	3.10
HYDROGRAPH AT	SB246B	187.	13.33	87.	28.	13.	.77
2 COMBINED AT	C0248	361.	18.17	331.	145.	70.	3.87
ROUTED TO	R0249	352.	19.67	326.	145.	70.	3.87
HYDROGRAPH AT	SUB250	264.	13.50	124.	40.	19.	1.10
2 COMBINED AT	C0252	385.	16.50	371.	184.	89.	4.97
ROUTED TO	R0253A	382.	18.00	370.	184.	89.	4.97
HYDROGRAPH AT	SB254A	162.	13.17	65.	20.	10.	.51
2 COMBINED AT	C0256A	396.	18.00	383.	202.	98.	5.48
ROUTED TO	R0253C	394.	19.50	382.	202.	98.	5.48
HYDROGRAPH AT	SB254C	52.	13.00	19.	6.	3.	.15
2 COMBINED AT	C0256C	398.	19.50	385.	207.	100.	5.63
HYDROGRAPH AT	SUB258	476.	16.17	379.	151.	73.	3.68
ROUTED TO	R0259	469.	17.67	376.	151.	73.	3.68
HYDROGRAPH AT	SUB260	214.	13.50	103.	33.	16.	.92
2 COMBINED AT	C0262	506.	17.67	415.	184.	89.	4.60
ROUTED TO	R0263	493.	19.17	411.	184.	89.	4.60
HYDROGRAPH AT	SUB264	197.	13.33	89.	28.	14.	.75
2 COMBINED AT	C0266	513.	19.17	432.	210.	102.	5.35
ROUTED TO	R0267	511.	20.17	432.	210.	102.	5.35
HYDROGRAPH AT	SB268A	77.	13.33	34.	11.	5.	.28
2 COMBINED AT	C0270A	516.	20.17	438.	220.	106.	5.63
ROUTED TO	R0267A	511.	21.17	436.	220.	106.	5.63
HYDROGRAPH AT	SB268C	98.	12.50	25.	8.	4.	.20
2 COMBINED AT	C0270C	512.	21.17	439.	226.	110.	5.83
ROUTED TO	R0267C	511.	21.83	439.	226.	110.	5.83
HYDROGRAPH AT	SUB272	143.	13.33	67.	21.	10.	.59
ROUTED TO	R0273	123.	15.83	65.	21.	10.	.59
HYDROGRAPH AT	SUB274	229.	14.83	155.	55.	26.	1.45

ROUTED TO	R0275	214.	17.67	152.	55.	26.	1.45
HYDROGRAPH AT	SB278A	237.	13.67	122.	40.	19.	1.10
3 COMBINED AT	C0280A	346.	16.67	284.	115.	55.	3.14
ROUTED TO	DB280A	346.	16.67	284.	114.	55.	3.14
ROUTED TO	R0279A	344.	17.33	283.	114.	55.	3.14
HYDROGRAPH AT	SB278B	77.	12.50	21.	7.	3.	.18
ROUTED TO	R0279B	62.	13.83	21.	7.	3.	.18
HYDROGRAPH AT	SB278C	127.	12.67	39.	12.	6.	.33
3 COMBINED AT	C0280	361.	17.33	313.	132.	64.	3.65
DIVERSION TO	DIVERT	225.	14.00	223.	102.	49.	3.65
HYDROGRAPH AT	DF280	136.	17.33	90.	30.	14.	3.65
ROUTED TO	DB280	127.	17.83	75.	24.	12.	3.65
ROUTED TO	R0281	124.	19.50	74.	24.	12.	3.65
HYDROGRAPH AT	SB268B	100.	13.00	37.	11.	6.	.30
2 COMBINED AT	C0270B	132.	19.50	82.	35.	17.	3.95
ROUTED TO	R0267B	131.	20.00	82.	35.	17.	3.95
2 COMBINED AT	C0270D	565.	21.33	487.	248.	120.	9.78
ROUTED TO	R0267D	564.	21.83	486.	248.	120.	9.78
HYDROGRAPH AT	SB268D	52.	12.83	17.	5.	3.	.14
2 COMBINED AT	C0270E	566.	21.83	488.	252.	123.	9.92
ROUTED TO	R0253B	565.	22.33	488.	252.	123.	9.92
HYDROGRAPH AT	SB254B	131.	13.50	61.	20.	9.	.49
2 COMBINED AT	C0256B	572.	22.33	495.	268.	131.	10.41
ROUTED TO	R0253D	569.	23.67	494.	268.	131.	10.41
HYDROGRAPH AT	SE254D	59.	13.00	23.	7.	3.	.18
3 COMBINED AT	C0256D	885.	23.33	785.	451.	220.	16.22
ROUTED TO	R0285	874.	25.17	782.	450.	220.	16.22
HYDROGRAPH AT	SB238B	87.	13.17	36.	11.	5.	.31
3 COMBINED AT	C0288	1054.	21.00	1009.	657.	322.	23.12
ROUTED TO	R0293	1045.	22.00	1007.	656.	322.	23.12
HYDROGRAPH AT	SUB292	93.	12.67	27.	8.	4.	.21
2 COMBINED AT	C0294	1048.	22.00	1009.	659.	326.	23.33

*** NORMAL END OF HEC-1 ***

Appendix D
Alternate A Hand Calculations

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835.081	
	PROJECT Rittenhouse Channel	SHEET 1 OF 1	
	DESIGN FOR W.S. Elev. of EMF	DESIGNER JLK	DATE 3/93
		CHECKER RDS	DATE 6/93

Per County HEC-2 Data For EMF.

Section 595.40 is upstream Face of SPRR Bridge

Section 596.70 is upstream Lt - 70' Rt. - 80' Center - 80'

Section 585.00 is upstream Lt. - 1170' Rt. - 1170' Center - 1170'

W.S. Elev — 596.70 - 1318.69
585.00 - 1319.00

Proposed Channel is 175' (centerline) North of RR centerline

∴ From upstream Face of Bridge Proposed ℄ is

$$175' - 10' = \underline{\underline{165'}}$$

∴ Proposed Centerline is upstream of Section 596.70 by

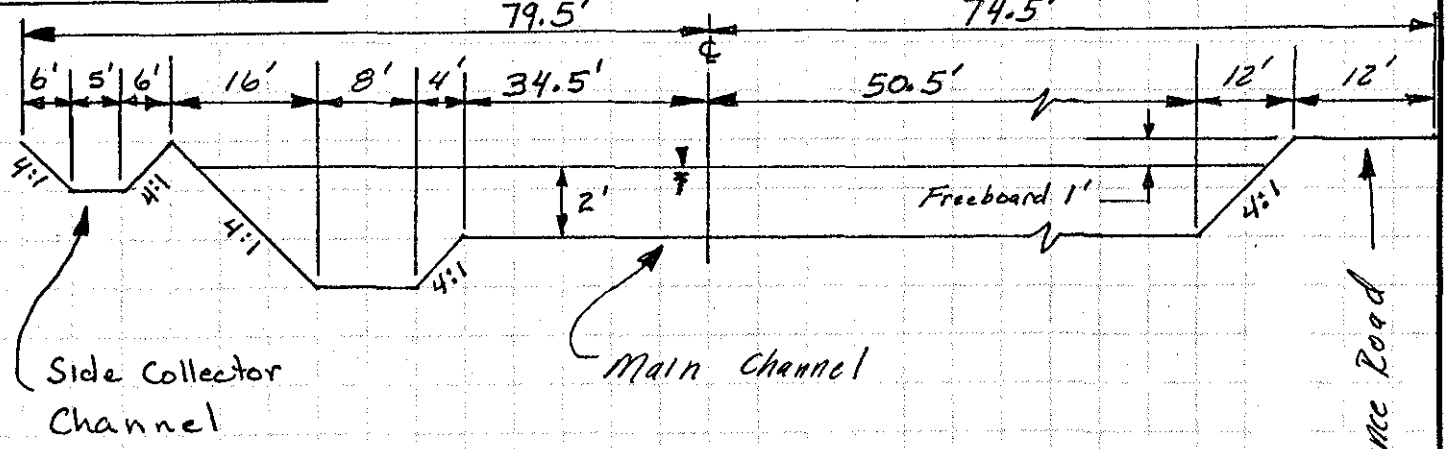
$$165' - 80' = 85'$$

∴ W.S. Elev. at Proposed Centerline =

$$\left(\frac{1319.00 - 1318.69}{1170} \times 85'\right) + 1318.69 = 1318.71$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835.080	
	PROJECT Rittenhouse Road Channel	SHEET 1 OF 7	
	DESIGN FOR Channel Sections Alt. A	DESIGNER JLK	DATE 3/93
		CHECKER RDS	DATE 6/93

Section No. 1 — From EMF to Pump Station



	RO293 - West
$Q = 45$ cfs	$Q = 1047$ cfs
$n = 0.027$	$n = 0.027$
$S = 0.0028$ 1/ft.	$S = 0.0028$ 1/ft.
$A = 16.5$ S.F.	$A = 230$ S.F.
$P = 17.37$ Ft.	$P = 117.74$ Ft.

$$V = \frac{1.49}{0.027}(0.0028)^{1/2}\left(\frac{16.5}{17.37}\right)^{2/3}$$

$$V = \frac{1.49}{0.027}(.0028)^{1/2}\left(\frac{230}{117.74}\right)^{2/3}$$

$V = 2.82$ fps

$V = 4.56$ fps

$Q = 2.82\,(16.5)$

$Q = 4.56\,(230)$

$Q = 46.5$ cfs ∴ OK

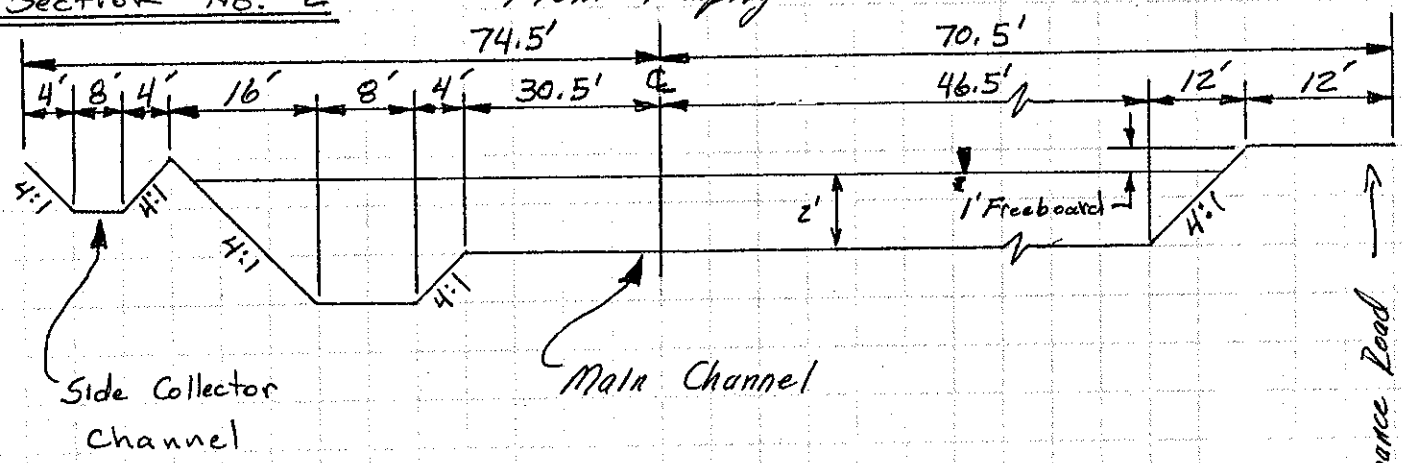
$Q = 1048.8$ cfs ∴ OK

$$F = \frac{V}{(gD)^{0.5}} = \frac{4.56}{(32.2 \times 1.97)^{0.5}} = 0.57 \therefore \text{OK}$$

$$FB = 0.25\left(2 + \frac{4.56^2}{64.4}\right) = 0.5807' \therefore \text{use } 1'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835.080	
	PROJECT Ritter House Road Channel	SHEET 2 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 3/93
	Alt. A	CHECKER RDS	DATE 6/93

Section No. 2 – From Pumping Plant to Power Road.



Q = 30 cfs
n = .027
S = .0032 '/ft.
A = 12.00 S.F.
P = 16.25 Ft.

$$V = \frac{1.49}{.027}(.0032)^{1/2}\left(\frac{12.0}{16.25}\right)^{2/3}$$

V = 2.55 fps

Q = 2.55 (12.0)

Q = 30.6 cfs ∴ OK

R0293 East
Q = 1044 cfs
n = .027
S = .0032 '/ft
A = 214 S.F.
P = 109.74 Ft.

$$V = \frac{1.49}{.027}(.0032)^{1/2}\left(\frac{214}{109.74}\right)^{2/3}$$

V = 4.87 fps

Q = 4.87 (214)

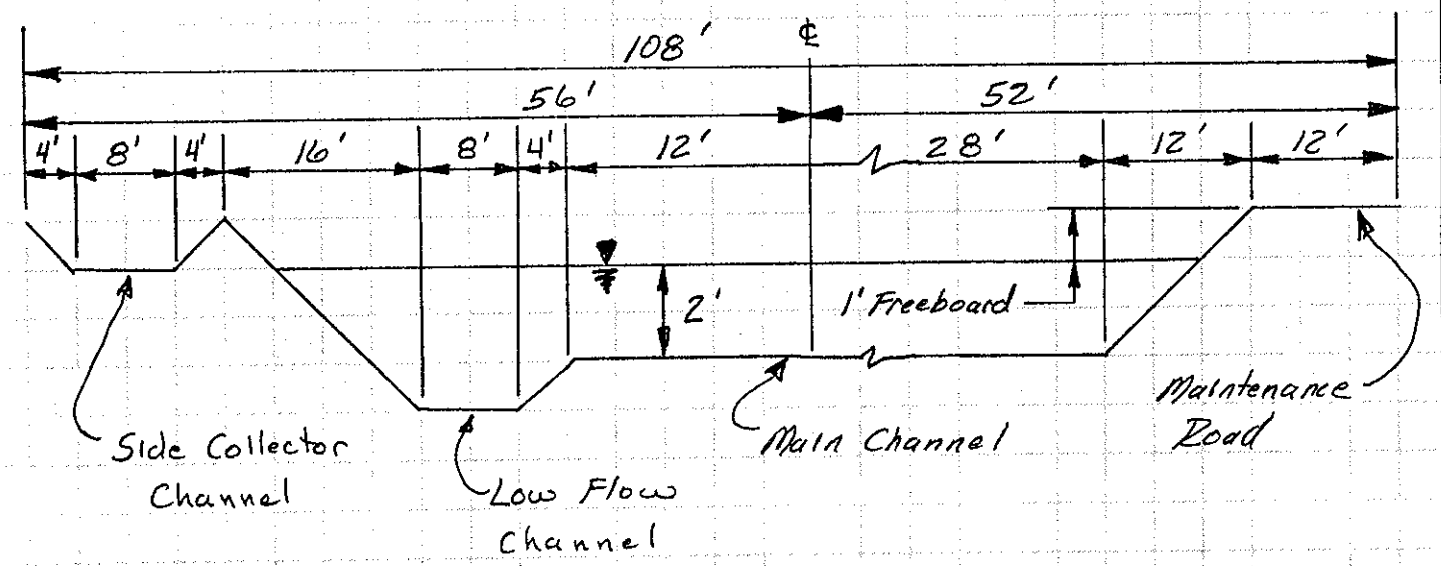
Q = 1042.2 cfs ∴ OK

$$F = \frac{4.87}{(32.2 \times 1.96)^{0.5}} = 0.6130 \therefore OK$$

$$FB = 0.25\left(2 + \frac{4.87^2}{64.4}\right) = 0.5921' \therefore \text{use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835.080	
	PROJECT Rittenhouse Channel	SHEET 3 OF 7	
	DESIGN FOR Channel Sections Alt. A.	DESIGNER JLK	DATE 3/93
		CHECKER RDS	DATE 6/93

Section No. 3 - Future Channel East of Power to W.A.F.B.



$Q = 20$ cfs
$n = .027$
$S = .0022'/ft$
$A = 12.0$ S.F.
$P = 16.25$ Ft.

$$V = \frac{1.49}{.027}(.0022)^{1/2}\left(\frac{12}{16.25}\right)^{2/3}$$

$V = 2.12$ fps

$Q = 2.12(12.0)$

$Q = 25.4$ cfs

$Q = 561$ cfs
$n = .027$
$S = 0.0022'/ft$
$A = 140$ S.F.
$P = 72.74$ Ft.

$$V = \frac{1.49}{.027}(0.0022)^{1/2}\left(\frac{140}{72.74}\right)^{2/3}$$

$V = 4.00$ fps

$Q = 4.00(140)$

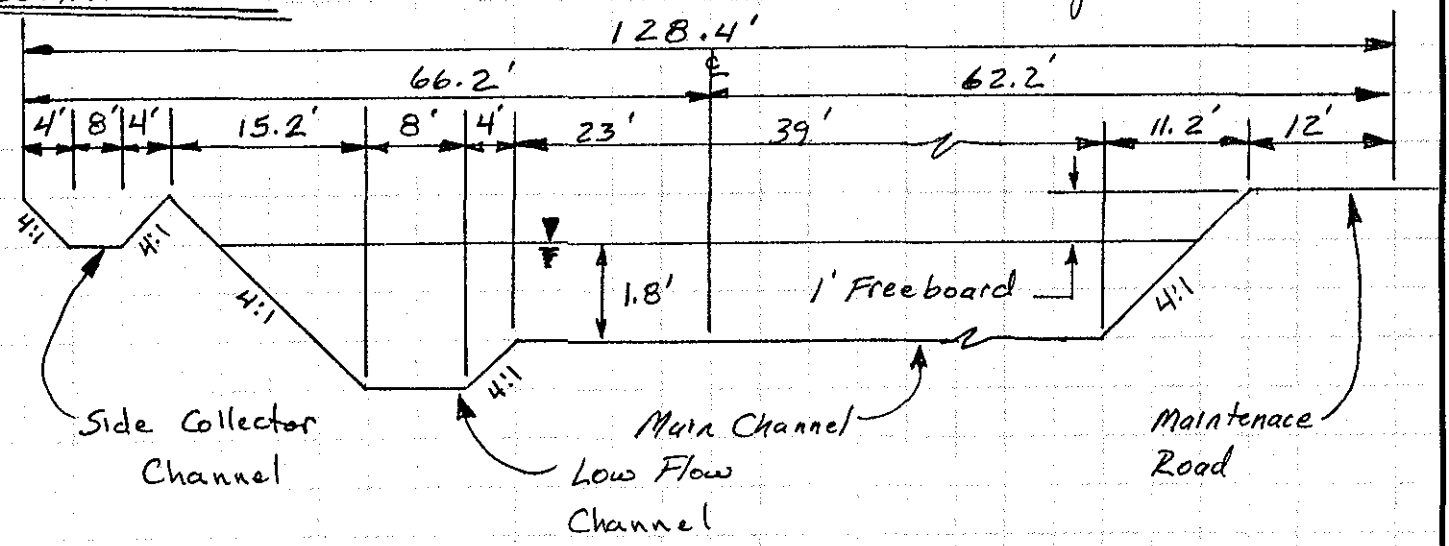
$Q = 560$ cfs ∴ OK

$$F = \frac{4.00}{(32.2 \times 1.94)^{0.5}} = 0.5055 \therefore \text{OK}$$

$$FB = 0.25\left(2 + \frac{4.00^2}{64.4}\right) = 0.5621 \therefore \text{use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Ritten house Rd. Channel	SHEET 4 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 3/93
	Alt. A	CHECKER RDS	DATE 6/93

Section No. 4 - From Power Rd to Sosseman Along RR. R.O.W.



$Q = 30$ cfs
$n = 0.027$
$S = 0.0035$ '/ft
$A = 12.0$ S.F.
$P = 16.25$ Ft.

$$V = \frac{1.49}{.027}(.0035)^{1/2}\left(\frac{12}{16.25}\right)^{2/3}$$

$V = 2.67$ fps

$Q = 2.67\ (12.0)$

$Q = 32.04$ cfs ∴ OK

$Q = 804$ cfs
$n = .027$
$S = .0035$ '/ft.
$A = 165.36$ S.F.
$P = 90.97$ Ft.

$$V = \frac{1.49}{.027}(.0035)^{1/2}\left(\frac{165.36}{90.97}\right)^{2/3}$$

$V = 4.86$ fps

$Q = 4.86\ (165.36)$

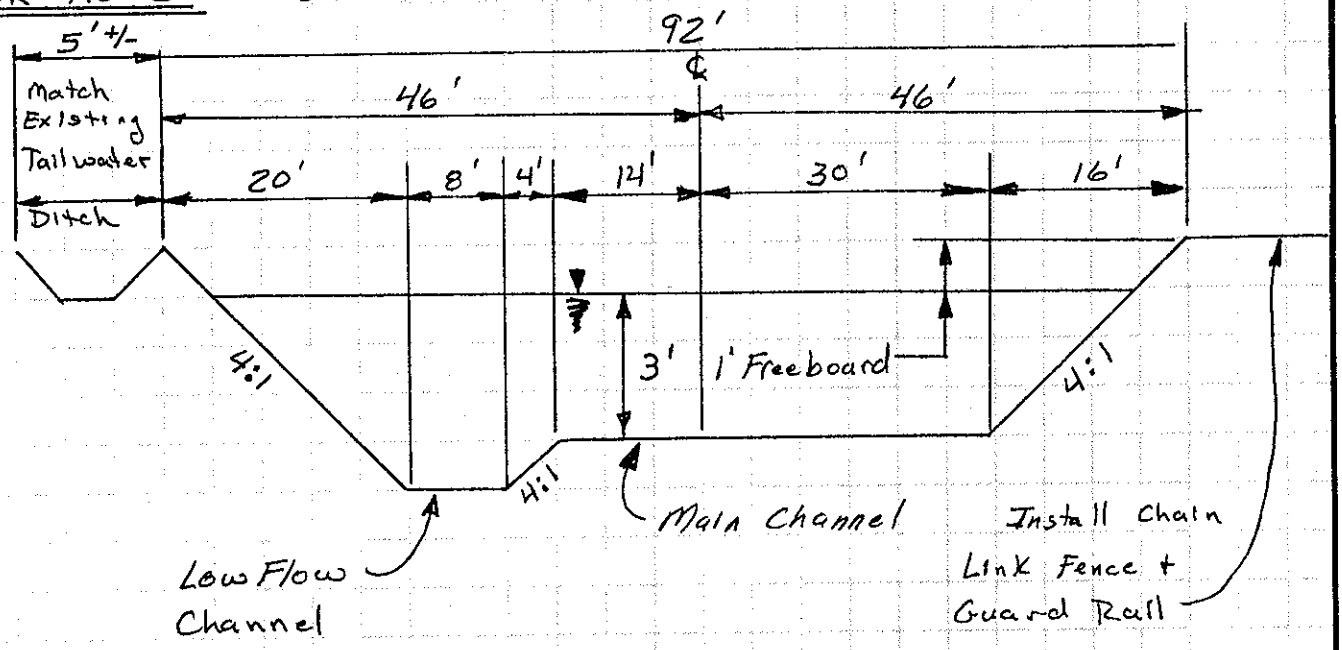
$Q = 803.65$ ∴ OK

$$F = \left(\frac{4.86}{32.2 \times 1.79}\right)^{0.5} = 0.6402 \therefore \text{OK}$$

$$FB = 0.25\left(1.8 + \frac{4.86^2}{64.4}\right) = 0.5417' \therefore \text{use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835.	
	PROJECT Rittenhouse Rd. Channel	SHEET 5 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 3/93
	Alt. A	CHECKER RDG	DATE 6/93

Section No. 5 — Between Sossaman and Germann Rd Boxes



Capacity of Tailwater Ditch will match the existing capacity

$Q = 813$ cfs
$n = .027$
$S = 0.0011$ '/ft
$A = 234$ S.F.
$P = 84.98$

$$V = \frac{1.49}{.027}(0.0011)^{1/2}\left(\frac{234}{84.98}\right)^{2/3}$$

$V = 3.59$ fps

$Q = 3.59 \times 234$

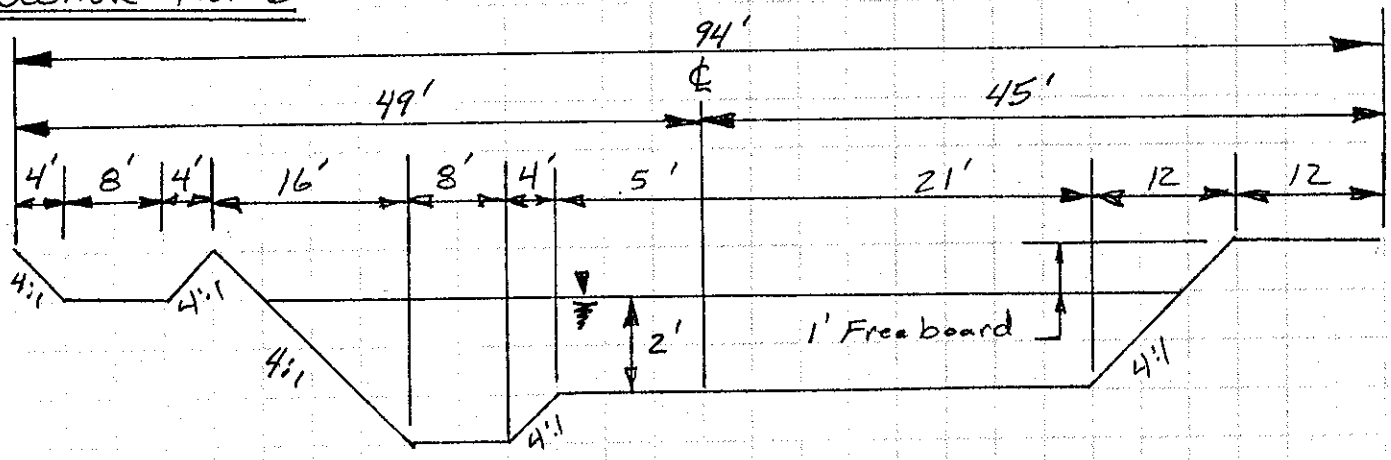
$Q = 840.$ cfs ∴ OK

$$F = \frac{3.59}{(32.2 \times 2.79)^{0.5}} = 0.379 \quad \therefore \text{ OK}$$

$$FB = 0.25\left(3 + \frac{3.59^2}{64.4}\right) = 0.80' \quad \therefore \text{ use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835.080	
	PROJECT Rittenhouse Rd. Channel	SHEET 6 OF 7	
	DESIGN FOR Channel Sections Alt. A.	DESIGNER JLK	DATE 3/93
		CHECKER RDS	DATE 6/93

Section No. 6 — From Germann Road to Queen Creek Rd Extended.



$Q = 30$ cfs
$n = 0.027$
$S = 0.0029$ '/ft
$A = 12$ S.F.
$P = 16.25$ ft.

$$V = \frac{1.49}{.027}(.0029)^{1/2}\left(\frac{12}{16.25}\right)^{2/3}$$

$V = 2.43$ fps

$Q = 2.43 \times 12.0$

$Q = 29.16 \approx 30$ cfs ∴ OK

$Q = 504$ cfs
$n = .027$
$S = .0029$ '/ft.
$A = 112$ S.F.
$P = 58.74$ ft.

$$V = \frac{1.49}{.027}(.0029)^{1/2}\left(\frac{112}{58.74}\right)^{2/3}$$

$V = 4.57$ fps.

$Q = 4.57 \times 112$

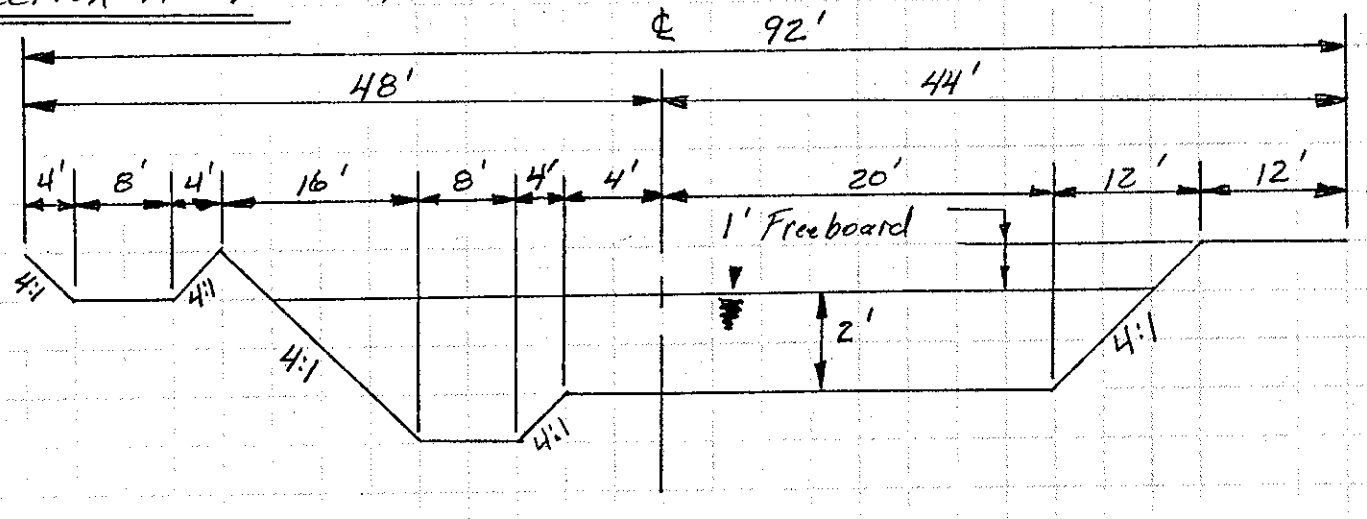
$Q = 512$ cfs ∴ OK

$$F = \frac{4.57}{(32.2 \times 1.697)^{0.5}} = 0.6182 \therefore \text{OK}$$

$$FB = 0.25\left(2 + \frac{4.57^2}{64.4}\right) = 0.5811' \therefore \text{use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Ritterhouse Rd. Channel	SHEET 7 OF 7	
	DESIGN FOR Channel Sections. Alt. A.	DESIGNER JLK	DATE 3/93
		CHECKER RDS	DATE 6/93

Section No. 7 - From Queen Creek Road Extended to Ellsworth Road



$Q = 30$ cfs
$n = .027$
$S = .0033$ '/ft
$A = 12.0$ S.F.
$P = 16.25$ ft.

$$V = \frac{1.49}{.027}(.0033)^{1/2}\left(\frac{12}{16.25}\right)^{2/3}$$

$V = 2.59$ fps

$Q = 2.59 \times 12.0$

$Q = 31.1 \therefore$ OK

$Q = 516$ cfs
$n = .027$
$S = .0033$ '/ft.
$A = 108$ S.F.
$P = 56.74$ ft.

$$V = \frac{1.49}{.027}(.0033)^{1/2}\left(\frac{108}{56.74}\right)^{2/3}$$

$V = 4.87$ fps

$Q = 4.87 \times 108$

$Q = 526$ cfs $\therefore$ OK

$$F = \frac{4.87}{(32.2 \times 1.93)^{0.5}} = 0.6178 \therefore \text{OK}$$

$$FB = 0.25\left(2 + \frac{4.87^2}{64.4}\right) = 0.5921 \therefore \text{use } 1.0'$$

Superelevation - $\Delta Y = \frac{V^2 T}{g\, r_c} = \frac{(4.1)^2\, 56}{32.2\,(50)} = 0.5847$ @ Q.C. School

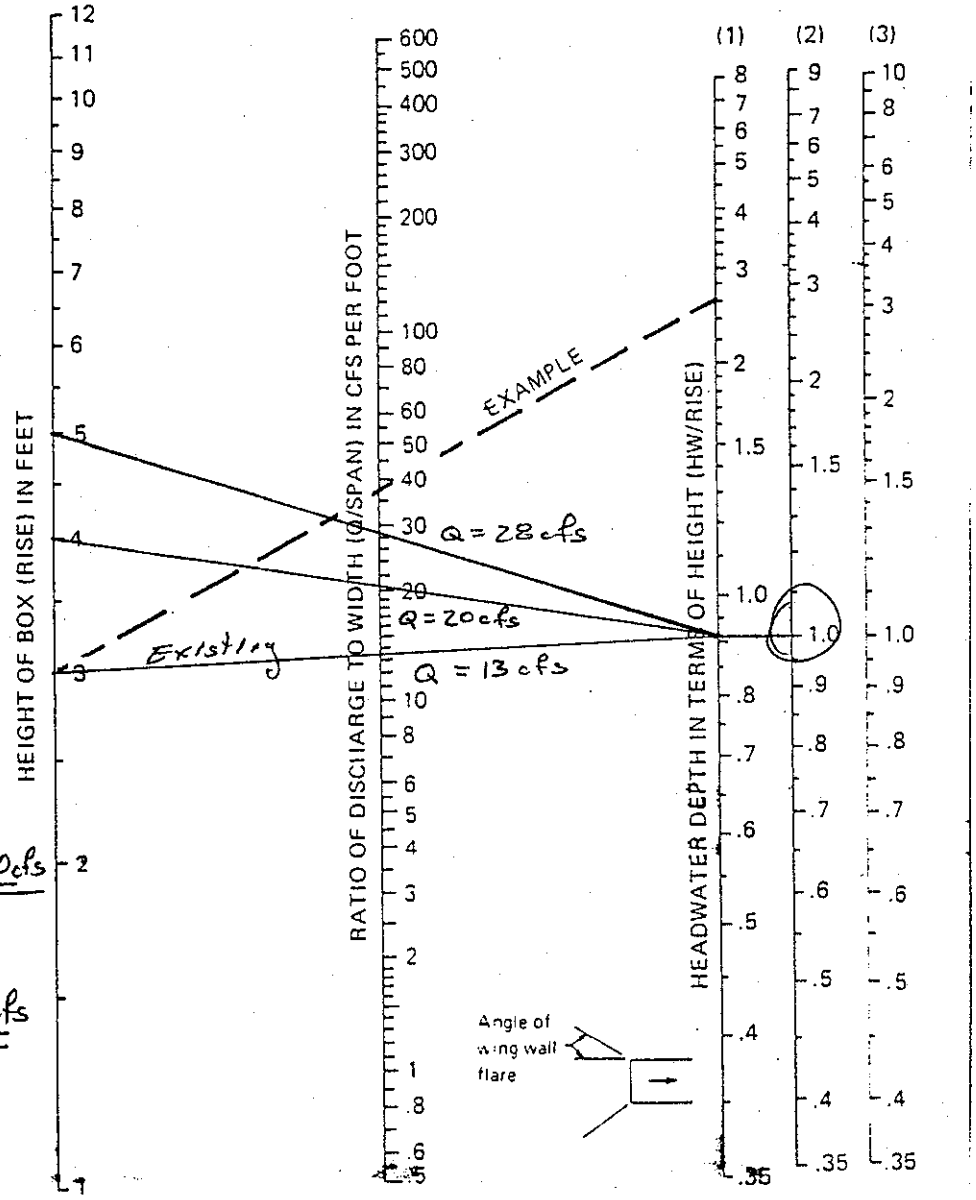
1 of 1

Power Rd. Box Culverts

(Alternate A-1)

FIGURE 37

HEADWATER DEPTH FOR CONCRETE BOX CULVERTS WITH INLET CONTROL



HW/Rise	SCALE WING WALL FLARE
(1)	30° to 75°
(2)	90° and 15°
(3)	0° (extensions of sides)

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through rise and Q scales, or reverse as illustrated.

EXAMPLE

6' x 3' Box Q = 225 cfs
Q/Span = 37.5 cfs/ft

Inlet	HW/Rise	HW ft
(1)	2.6	7.8

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* Power Rd

Existing Capacity

3 - 3'x10'

= 3x10x13 cfs = 390 cfs

* Capacity Required

1047 - 390 = 657 cfs

New Culverts

1 - 10'x5' + 2 - 10'x4'

Q = 10 x 28 cfs = 280

Q = 20 x 20 cfs = 400

Total Q added = 680 cfs

1/1

Sossaman & Germann Road Box Culverts (Alternate A-3)

FIGURE 37

HEADWATER DEPTH FOR CONCRETE BOX CULVERTS WITH INLET CONTROL

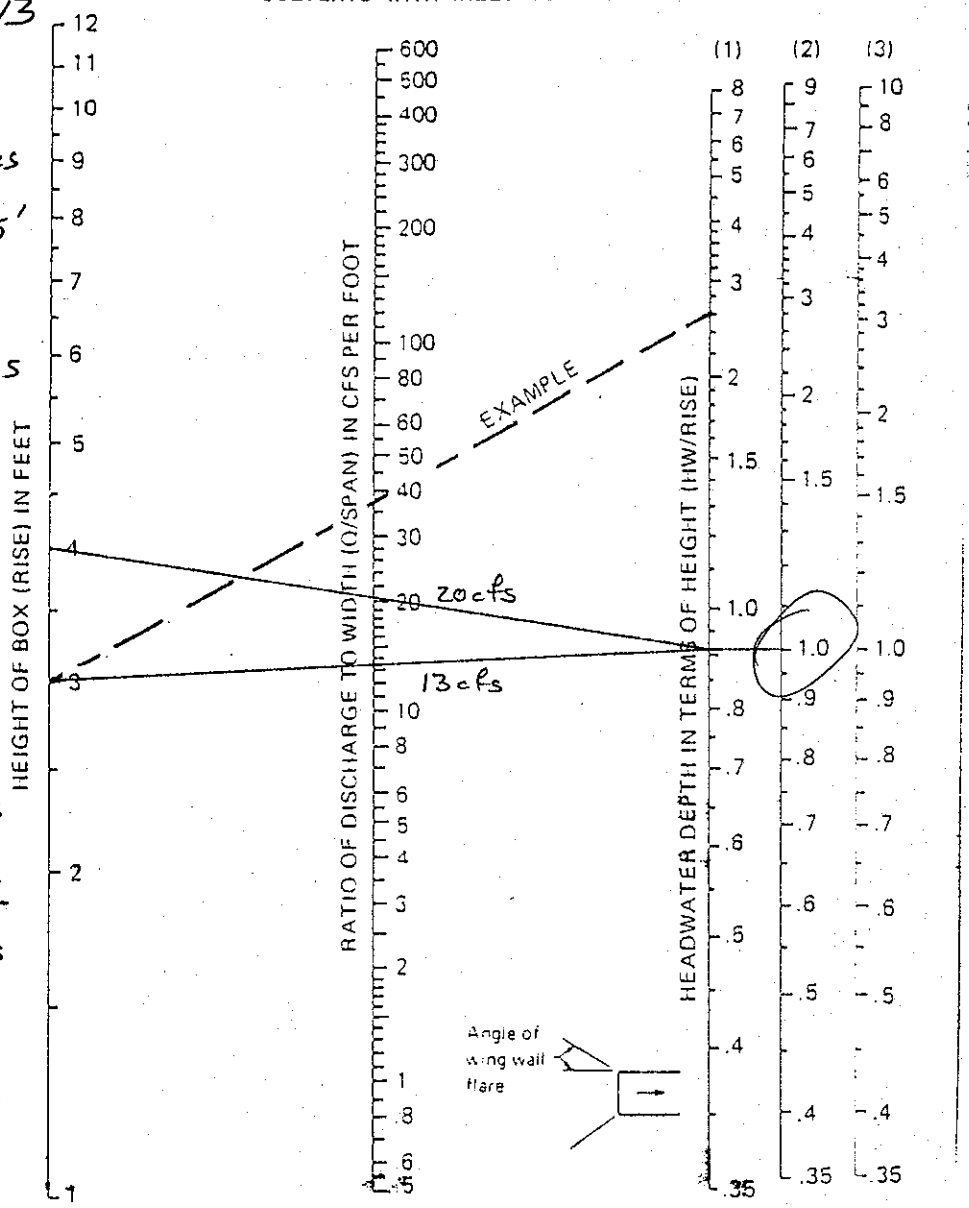
Qrequired = 813

∴ using 3' Boxes
W = 813/13 = 62.5'

∴ using 4' Boxes
W = 813/20 = 40.6'

Use 1-8'x4' +
6-8'x3'

Qprovided
1x8'x20 = 160 cfs
6x8'x13 = 624 cfs
Qprovided = 784 cfs



EXAMPLE
6' x 3' Box Q = 225 cfs
Q/Span = 37.5 cfs/ft

Inlet	HW/Rise	HW ft
(1)	2.6	7.8

HW/Rise SCALE	WING WALL FLARE
(1)	30° to 75°
(2)	90° and 15°
(3)	0° (extensions of sides)

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through rise and Q scales, or reverse as illustrated.

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Ellsworth Road Boxes

1/1

(Alternate A-5)

FIGURE 37

HEADWATER DEPTH FOR CONCRETE BOX CULVERTS WITH INLET CONTROL

$Q_{required}$ = 516 cfs

∴ using 3' Boxes

W = 516/13 = 39.7

Q provided

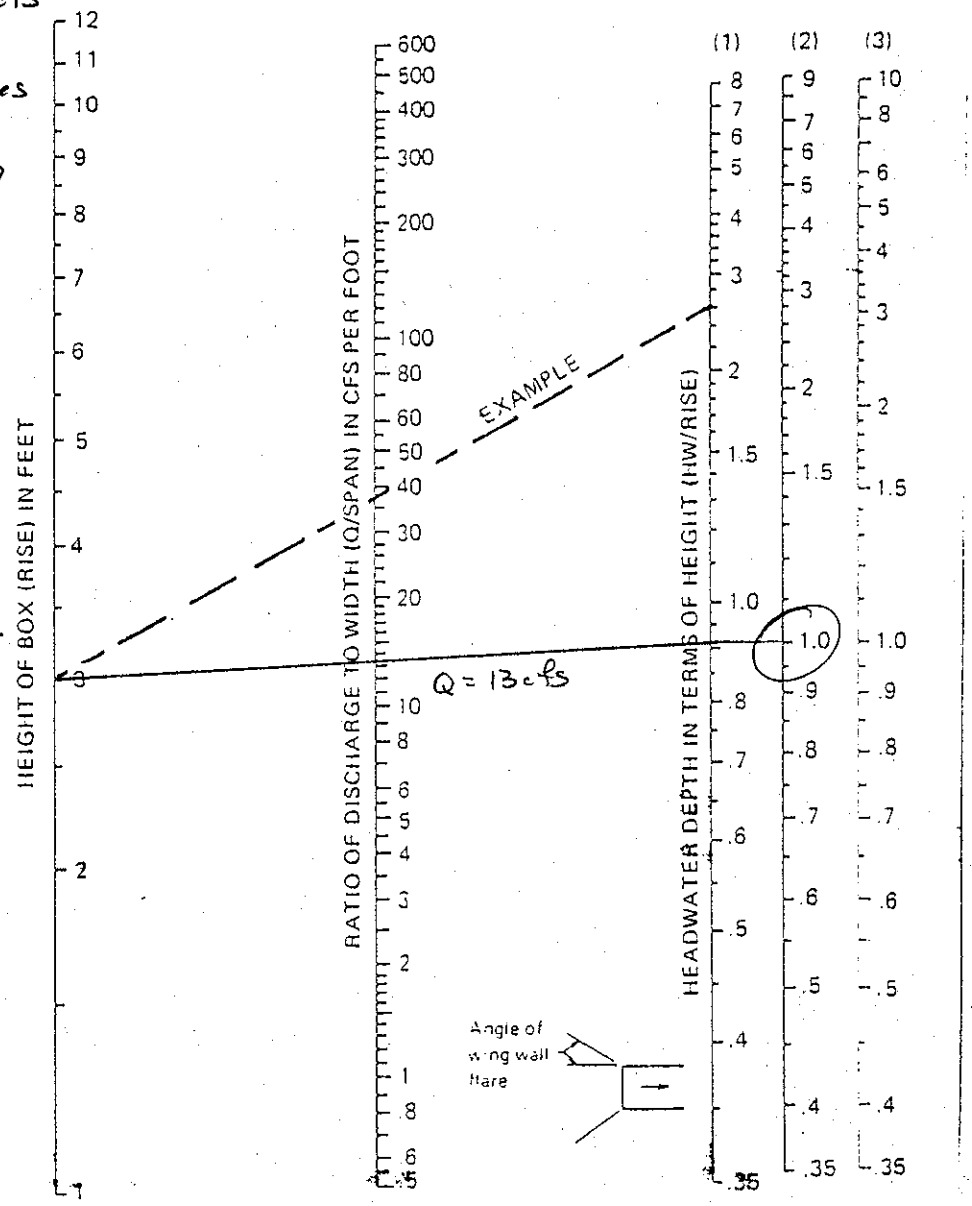
10'x4' Box

1x10'x20 = 200cfs

3-8'x3' Box

3x8'x13 = 312cfs

$Q_{provided}$ = 512cfs



EXAMPLE

6' x 3' Box Q = 225 cfs

Q/Span = 37.5 cfs/ft

Inlet	HW/Rise	HW ft
(1)	2.6	7.8

HW/Rise SCALE	WING WALL FLARE
(1)	30° to 75°
(2)	90° and 15°
(3)	0° (extensions of sides)

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through rise and Q scales, or reverse as illustrated.

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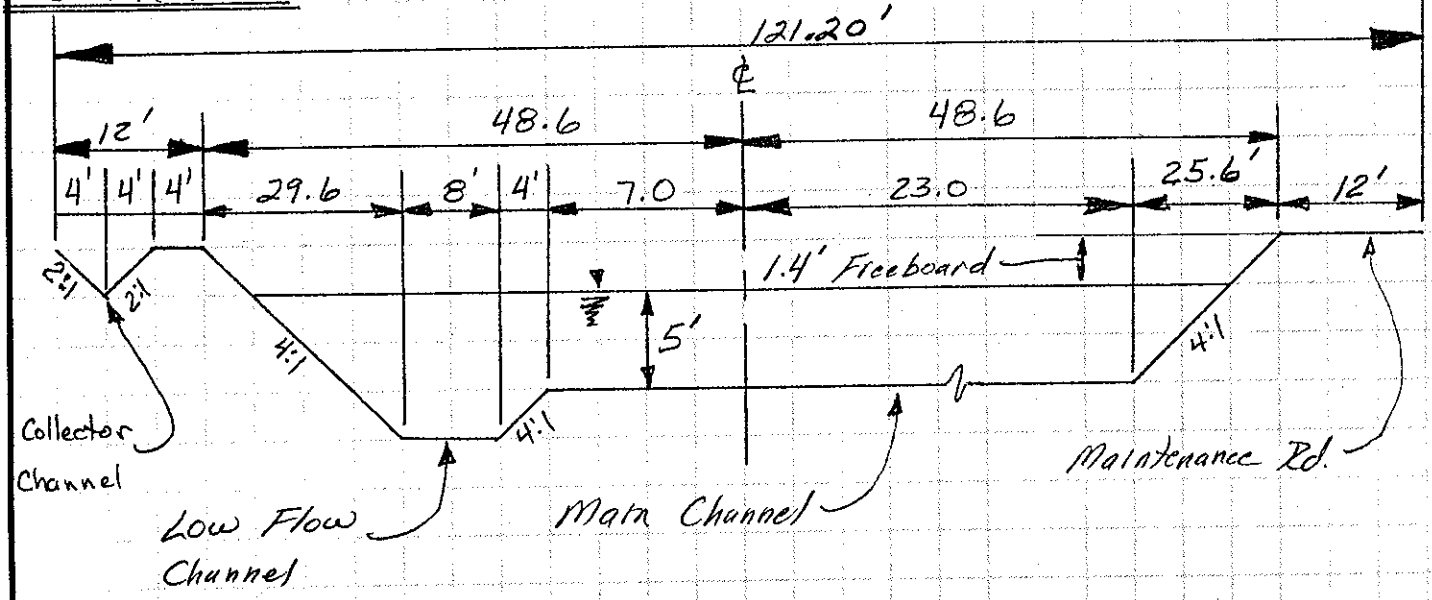
Appendix F
Alternate C Hand Calculation

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Rd. Channel	SHEET 1 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 4/93
	Alternate C	CHECKER RDS	DATE 6/93 8/93

Section No. 1 From EMF to Power Rd.



$n = 0.027$
$S = 0.0005$ '/ft
$A = 8.00$ S.F.
$P = 8.94$ ft.

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{8.00}{8.94}\right)^{2/3}$$

$V = 1.15$ fps

$Q = 1.15 \times 8.00$

$Q = 9.20$ cfs

$Q = 1047$ cfs
$n = 0.027$
$S = 0.0005$ '/ft
$A = 342$ S.F.
$P = 87.48$ ft. 87.25

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{342}{87.48}\right)^{2/3}$$

$V = 3.06$ fps

$Q = 3.06 \times 342$

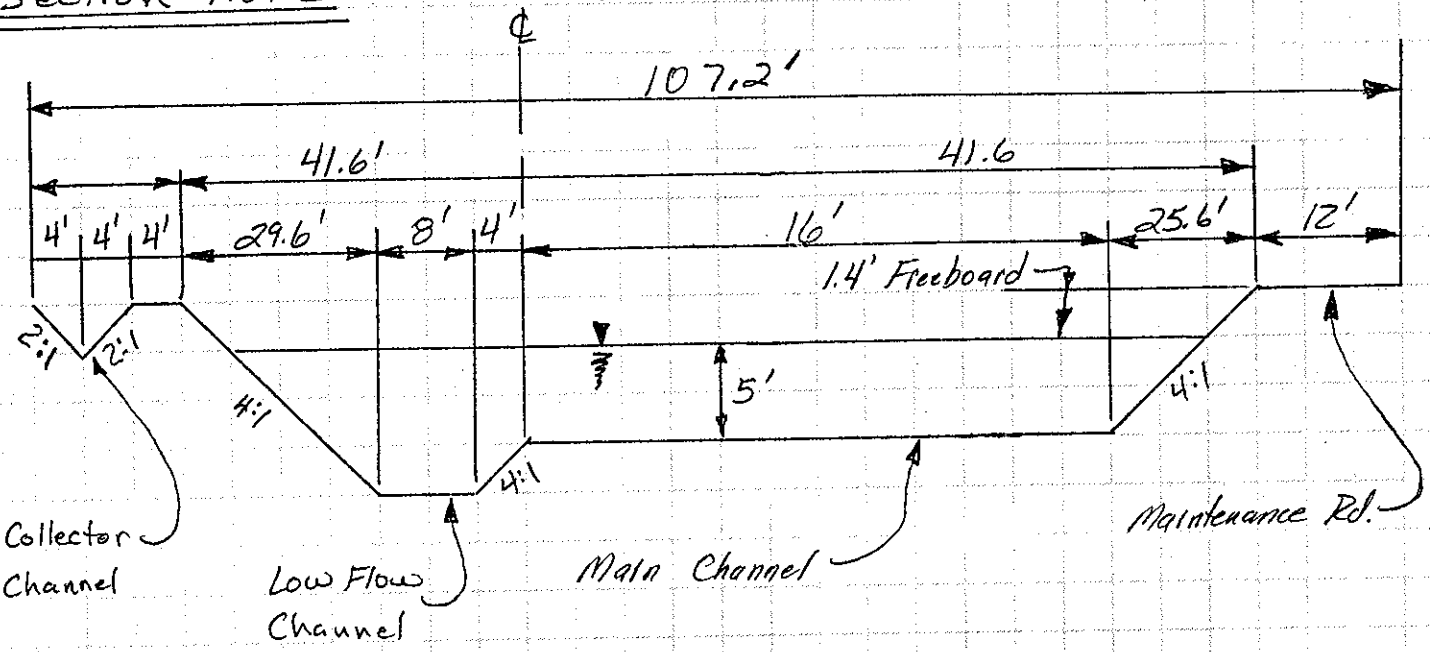
$Q = 1047$ cfs

$$F = \frac{3.06}{(32.2 \times 3.98)^{0.5}} = 0.27 \therefore \text{OK}$$

$$FB = 0.25\left(5 + \frac{3.06^2}{64.4}\right) = 1.29' \therefore \text{use } 1.40'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Rd. Channel	SHEET 2 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 4/93
	Alternate C	CHECKER RDS	DATE 6/93 8/19/93

Section No. 2 – Power Rd. to Germann Rd.



$n = 0.027$
$S = 0.0005$ '/ft
$A = 8.00$ S.F.
$P = 8.94$ ft.

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{8.00}{8.94}\right)^{2/3}$$

$V = 1.15$ fps

$Q = 1.15 \times 8.00$

$Q = 9.20$ cfs

$Q = 804$ cfs
$n = 0.027$
$S = 0.0005$ '/ft.
$A = 272$ S.F.
$P = 73.48$ ft.

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{272}{73.48}\right)^{2/3}$$

$V = 2.95$ fps

$Q = 2.95 \times 272$

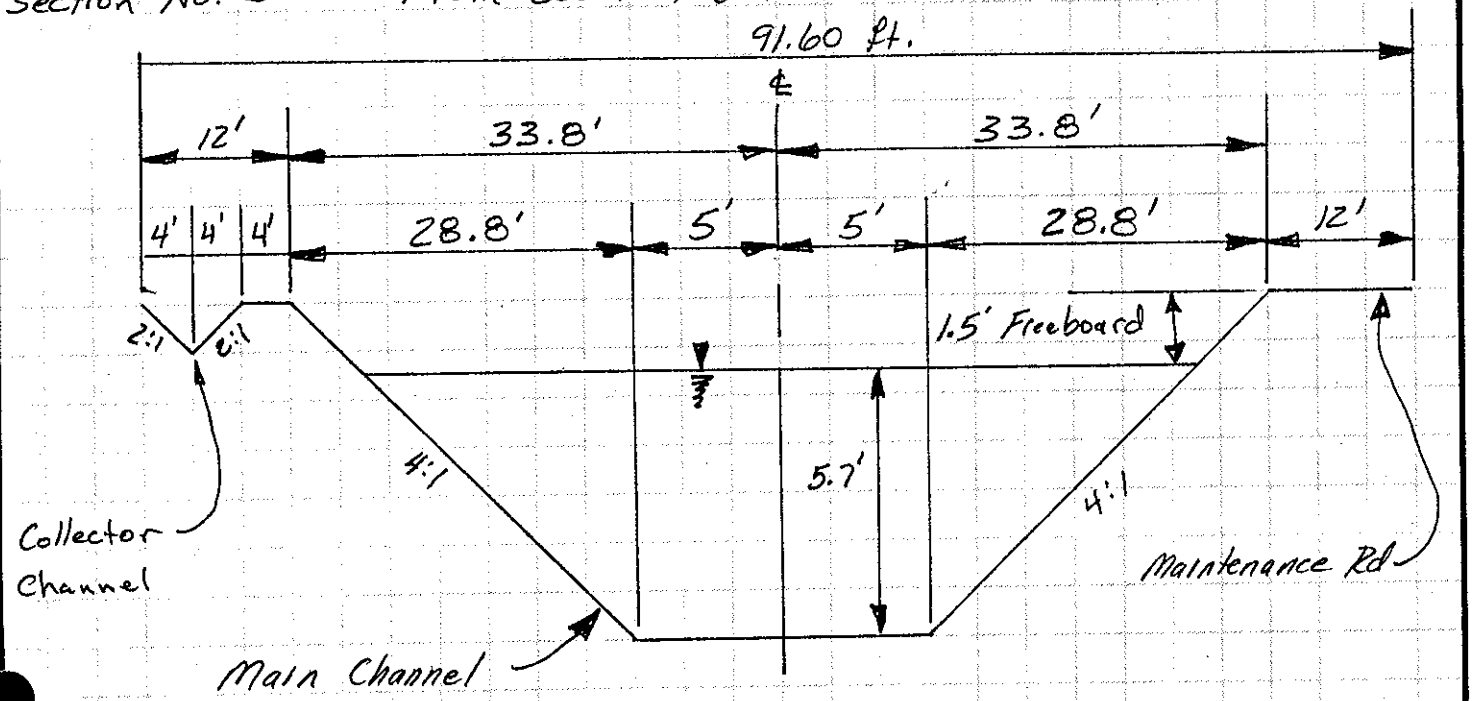
$Q = 802$ cfs

$$F = \frac{2.95}{(32.2 \times 3.78)^{0.5}} = 0.27 \therefore \text{OK}$$

$$F.B. = 0.25\left(5 + \frac{2.95^2}{64.4}\right) = 1.28' \therefore \text{use } 1.40'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 3 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 4/94
	Alternate C	CHECKER RDS	DATE 6/93 8/93

Section No. 3 - From South of Germann Rd to the Queen Creek School



$n = 0.027$
$S = 0.0005$ '/ft
$A = 8.00$
$P = 8.94$

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{8.00}{8.94}\right)^{2/3}$$

$V = 1.15$ fps

$Q = 1.15 \times 8.00$

$Q = 9.20$ cfs

$Q = 504$ cfs
$n = 0.027$
$S = 0.0005$ '/ft.
$A = 186.96$
$P = 57.00$

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{186.96}{57.00}\right)^{2/3}$$

$V = 2.72$ fps

$Q = 2.72 \times 186.96$

$Q = 509$ cfs

$$F = \frac{2.72}{(32.2 \times 3.36)^{0.5}} = 0.261 \therefore \text{OK}$$

$$FB = 0.25\left(5.7 + \frac{2.72^2}{64.4}\right) = 1.45' \therefore \text{use } 1.50'$$

Power Rd Boxes

FIGURE 37

HEADWATER DEPTH FOR CONCRETE BOX CULVERTS WITH INLET CONTROL

Total Q = 1047 cfs

Existing Capacity
= 3 x 13 x 10' = 390cfs

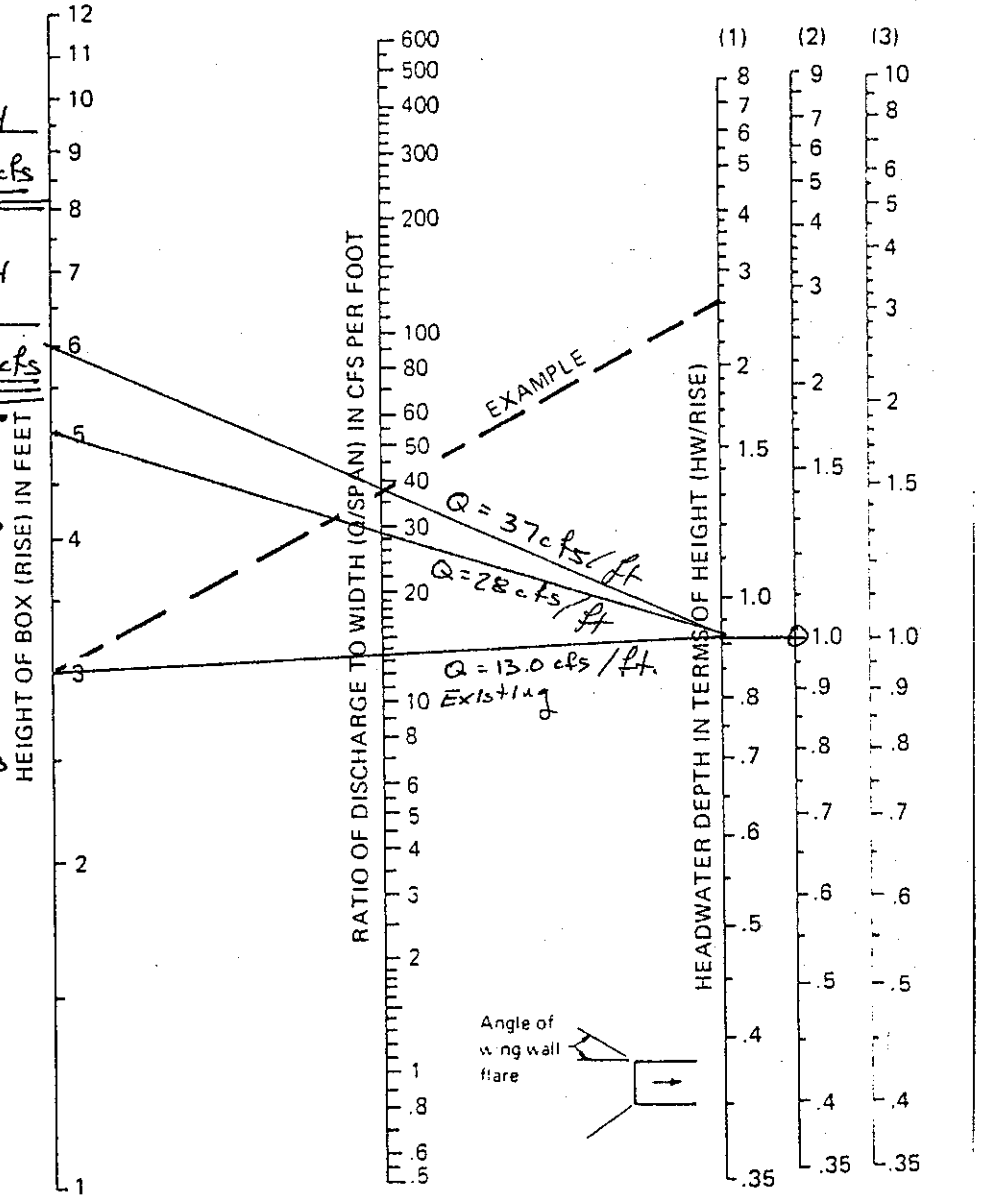
Additional Capacity Required
= 1047 - 390 = 657cfs

6'x8' CBC
Q = 8'x37 = 296cfs

2-5' x 7' CBC
2x7'x28 = 392 cfs

Total Additional Capacity = 688cfs

∴ OK



EXAMPLE

6' x 3' Box Q = 225 cfs
Q/Span = 37.5 cfs/ft

Inlet	HW/Rise	HW ft
(1)	2.6	7.8

HW/Rise SCALE	WING WALL FLARE
(1)	30° to 75°
(2)	90° and 15°
(3)	0° (extensions of sides)

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through rise and Q scales, or reverse as illustrated.

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Sossaman's Germana Boxes

FIGURE 37

HEADWATER DEPTH FOR CONCRETE BOX CULVERTS WITH INLET CONTROL

Total Q = 804 cfs

6'x8' CBC

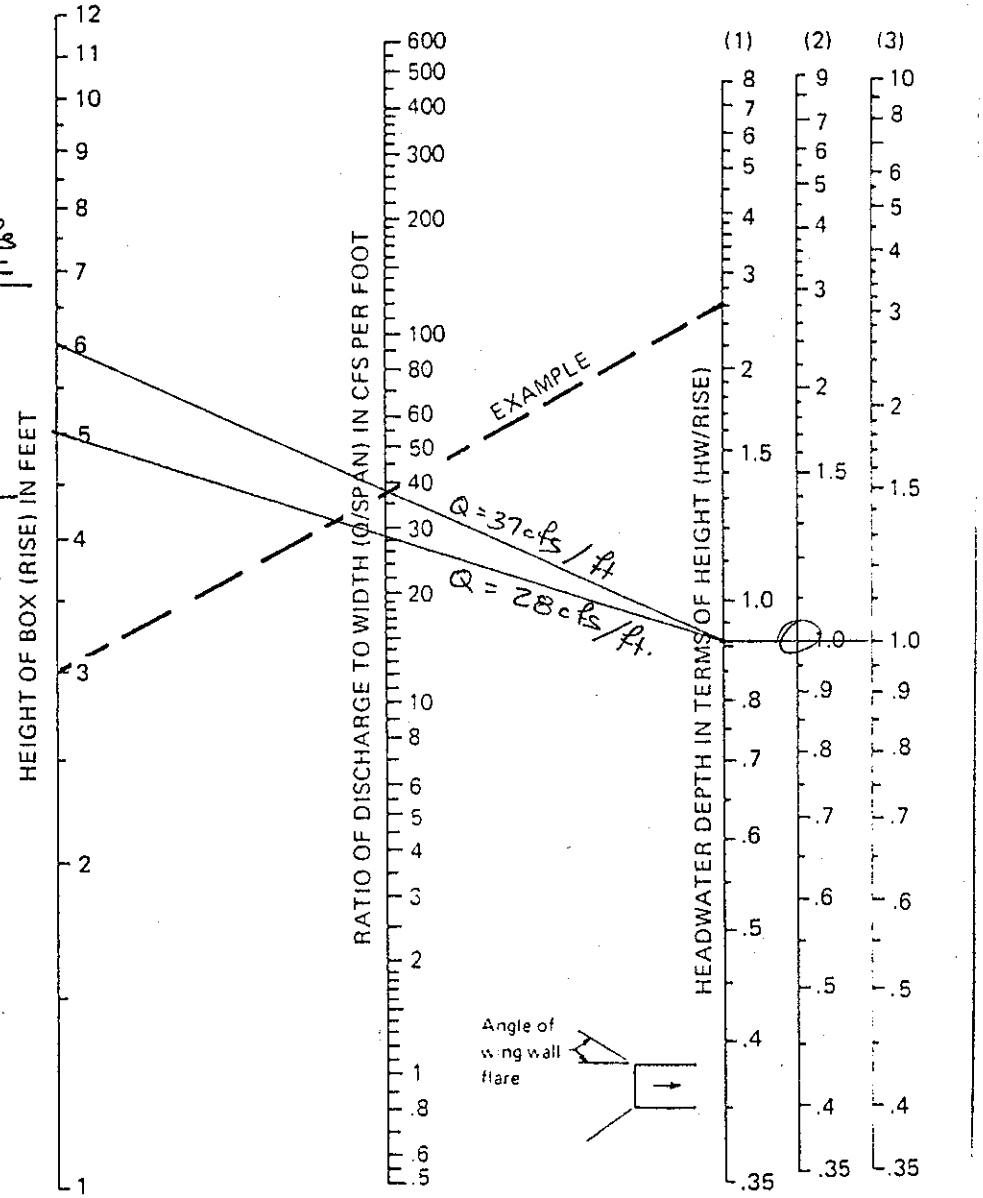
Q = 8 x 37 = 296 cfs

2-5'x9' CBC

Q = 2x9x28 = 504 cfs

Total Capacity = 800 cfs

∴ OK.



EXAMPLE

6' x 3' Box Q = 225 cfs
Q/Span = 37.5 cfs/ft

Inlet	HW/Rise	HW ft
(1)	2.6	7.8

HW/Rise SCALE	WING WALL FLARE
(1)	30° to 75°
(2)	90° and 15°
(3)	0° (extensions of sides)

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through rise and Q scales, or reverse as illustrated.

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Ellsworth & Queen Creek Boxes

FIGURE 37

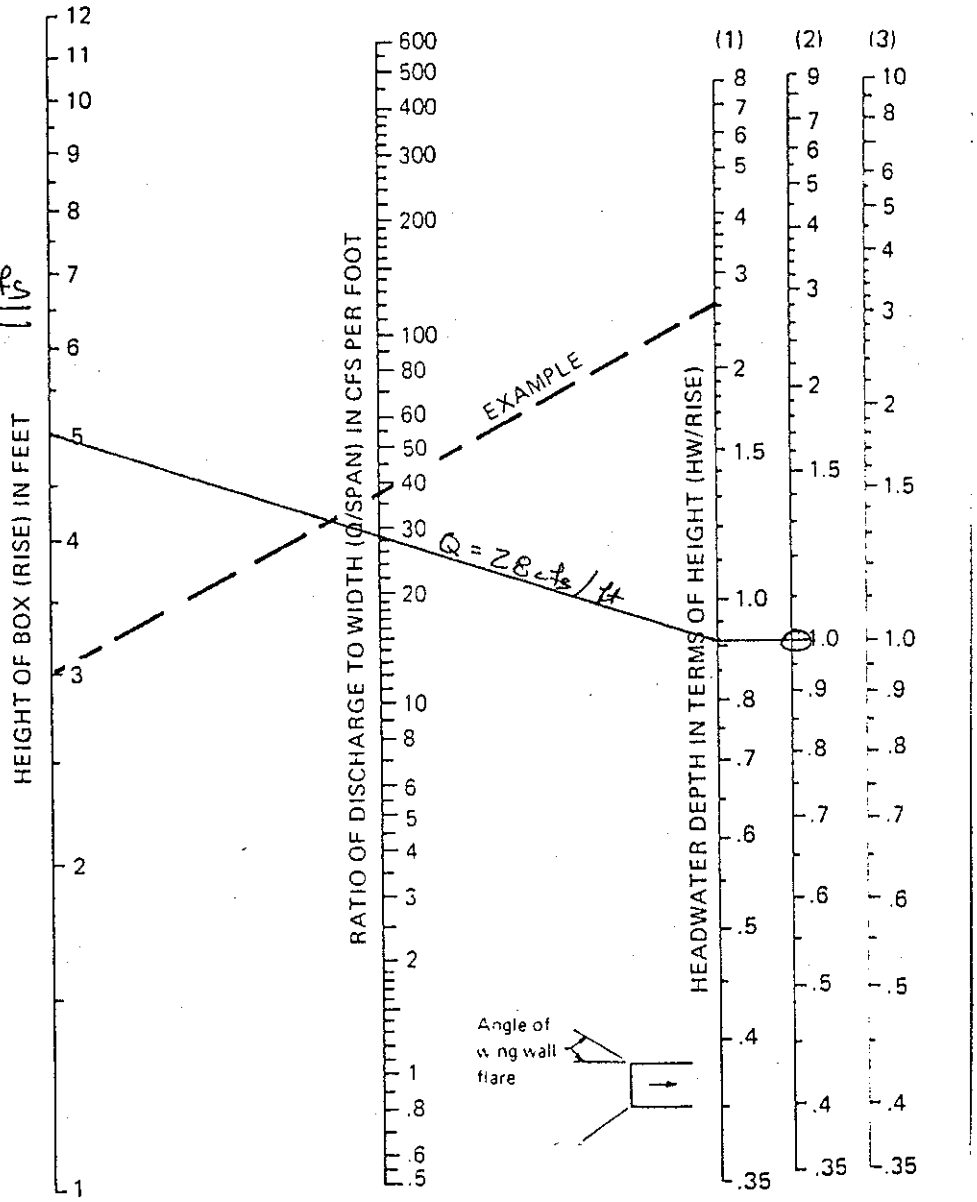
HEADWATER DEPTH FOR CONCRETE BOX CULVERTS WITH INLET CONTROL

Total Q = 504 cfs

2-5'x9' CBC

Q = 2x9x28 = 504 cfs

∴ OK.



EXAMPLE

6' x 3' Box Q = 225 cfs
Q/Span = 37.5 cfs/ft

Inlet	*HW/Rise*	*HW ft*
(1)	*2.6*	*7.8*

HW/Rise SCALE	WING WALL FLARE
(1)	*30° to 75°*
(2)	*90° and 15°*
(3)	*0° (extensions of sides)*

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through rise and Q scales, or reverse as illustrated.

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Low Flow Channel Capacity

$A = 12.00$ S.F.
$P = 16.25$ S.F.

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{12.00}{16.25}\right)^{2/3} = \underline{\underline{1.01 \text{ fps}}} \quad Q = 1.01 \times 12.0 = \underline{\underline{12.1 \text{ cfs}}}$$

Section No. 1 $\quad Q_5 = 325$ cfs (Per QCADMS)

$\therefore d = 2.8'(+/-) \quad A = 162$ S.F. $\quad P = 69.34$ L.F.

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{162}{69.34}\right)^{2/3} = \underline{\underline{2.17 \text{ fps}}} \quad Q = 2.17 \times 162 = \underline{\underline{352 \approx 325 \therefore OK}}$$

Section No. 2 $\quad Q_5 = 284$ cfs (Per QCADMS)

$\therefore d = 3.0'(+/-) \quad A = 132.0$ S.F. $\quad P = 56.98$ L.F.

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{132}{56.98}\right)^{2/3} = \underline{\underline{2.16 \text{ fps}}} \quad Q = 2.16 \times 132.0 = \underline{\underline{285 \approx 284 \therefore OK}}$$

Section No. 3 $\quad Q_5 = 132$ cfs (Per QCADMS)

$\therefore d = 3.0'(+/-) \quad A = 66.0$ S.F. $\quad P = 34.74$ L.F.

$$V = \frac{1.49}{0.027}(0.0005)^{1/2}\left(\frac{66}{34.74}\right)^{2/3} = \underline{\underline{1.89 \text{ fps}}} \quad Q = 1.89 \times 66 = \underline{\underline{125 \text{ cfs} \approx 132 \therefore OK}}$$

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel
Outlet Control Calculations
BY 8/93 DATE [illegible] CHKD. BY [illegible] DATE 8/93

SHEET NO. 1 OF 12
JOB NO. 28835

	Location	Box Culvert Sizes	Drop @ Outlet	Inlet or Outlet Control
	45+00 +/-	8'x6'	Yes	Inlet
		3-7'x5'	Yes	Inlet
*	111+00 +/-	8'x6'	Yes	Assumed Inlet
		2-9'x5'	Yes	Assumed Inlet
**	118+00 +/-	8'x6'	No	Outlet
		2-9'x5'	No	Outlet
	236+00 +/-	2-9'x5'	Yes	Inlet

* Calculations were not completed for this culvert. All box culverts with a drop at the outlet are under Inlet control.

** Calculations indicate that the outlet control water surface elevation will be equivalent to the water surface elevation calculated in the HEC-2 File.

Figure 4.42
Culvert Design Form

Project: Rittenhouse Channel	Station: 45+00 +/-	CULVERT DESIGN FORM
	Sheet ____ of ____	Designer/Date: JLK / 8/93
		Reviewer/Date: eds / 8/93

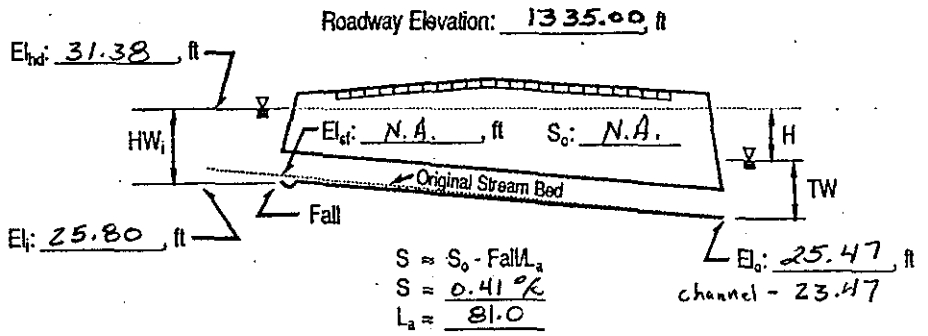
Hydrological Data

See Add'l shts

- ☐ Method: ____
- ☐ Drainage Area: ____ ☐ Stream Slope: ____
- ☐ Channel Shape: ____
- ☐ Routing: ____ ☐ Other: ____

Design Flows/Tailwater

R.I., years	Flow, cfs	TW, ft
100	296	3.60



Culvert Description: Material - Shape - Size - Entrance	Total Flow Q, cfs	Flow Per Barrel Q/N (1)	Headwater Calculations: Inlet Control: HW_i/D (2)	HW_i	Fall (3)	EL_{hi} (4)	Outlet Control: TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	Control Headwater Elevation	Outlet Velocity	Comments
Box Culvert 8'x6'		296	0.93	5.58	5.58	31.38	3.60	3.5	4.75	4.75	0.5	1.53	29.75	31.38	7.79	Inlet Controls

Technical Footnotes:

(1) Use Q/NB for box culverts.
(2) HW_i/D = HW/D or HW_i/D from design charts
(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; Fall is zero for culverts on grade.
(4) $EL_{hi} = HW_i + EL_i$ (invert of inlet control section)
(5) TW based on downstream control or flow depth in channel.
(6) h_o = TW or $(d_c + D)/2$ (whichever is greater).
(7) $H = \left[1 + k_e + (29n^2L)/R^{1.33}\right] V^2/2g$
(8) $EL_{ho} = EL_o + H + h_o$

Subscript Definitions:

a. approximate
f. culvert fact
hd. Design Headwater
hi. Headwater in inlet control
ho. Headwater in outlet control
i. Inlet control section
o. Outlet
sf. Streambed at culvert face
TW. Tailwater

Comments / Discussion:

Culvert Barrel Selected:

Size: 8'x6'
Shape: Box
Material: Concrete n: .012
Entrance: Beveled

2/2

Figure 4.42
Culvert Design Form

Project: Litterhouse Channel	Station: 45+00 +/-	CULVERT DESIGN FORM
	Sheet ____ of ____	Designer/Date: JLK / 8/93
		Reviewer/Date: rds / 8/93

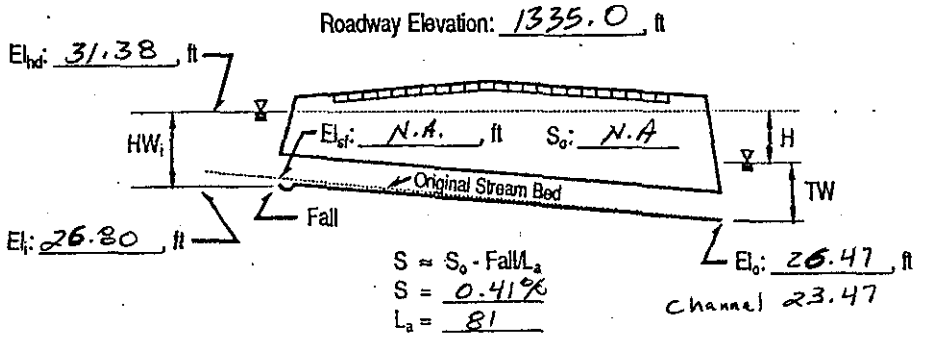
Hydrological Data

See Add'l shts

- ☐ Method: ____
- ☐ Drainage Area: ____ ☐ Stream Slope: ____
- ☐ Channel Shape: ____
- ☐ Routing: ____ ☐ Other: ____

Design Flows/Tailwater

R.I., years	Flow, cfs	TW, ft
100	196	3.60



Culvert Description: Material - Shape - Size - Entrance	Total Flow Q, cfs	Flow Per Barrel Q/N (1)	Headwater Calculations: Inlet Control HW_i/D (2)	HW_i	Fall (3)	EL_{hi} (4)	Outlet Control TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	Control Headwater Elevation	Outlet Velocity	Comments
Box Culvert 7'x 5' (Three)		196	0.92	4.58	4.58	31.38	3.60	2.9	3.95	3.95	0.5	1.27	28.69	31.38	7.09	Inlet Controls.

Technical Footnotes:

(1) Use Q/NB for box culverts.
(2) HW_i/D = HW /D or HW_i/D from design charts
(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; Fall is zero for culverts on grade.
(4) $EL_{hi} = HW_i + EL_i$ (invert of inlet control section)
(5) TW based on downstream control or flow depth in channel.
(6) h_o = TW or $(d_c + D)/2$ (whichever is greater).
(7) $H = \left[1 + k_e + (29n^2L)/R^{1.33}\right] V^2/2g$
(8) $EL_{ho} = EL_o + H + h_o$

Subscript Definitions:

a. approximate
f. culvert fact
hd. Design Headwater
hi. Headwater in inlet control
ho. Headwater in outlet control
i. inlet control section
o. Outlet
sf. Streambed at culvert face
TW. Tailwater

Comments / Discussion:

Culvert Barrel Selected:

Size: 7'x5' (Three)
Shape: Box
Material: Concrete n: 0.012
Entrance: Beveled

3/12

Sta 45+00 - 8'x6' Box
when Flow depth = 4.75'

$A = 38.00$ S.F. $P = 17.5$ L.F.

$R = (38.00/17.50) = 2.17$

$V = Q/A = 296/38.00 = 7.79$ fps

$$H = \left[1 + 0.5 + \frac{29(.012)^2\,81}{2.17^{1.33}}\right]\frac{7.79^2}{64.4} = \underline{\underline{1.53'}}$$

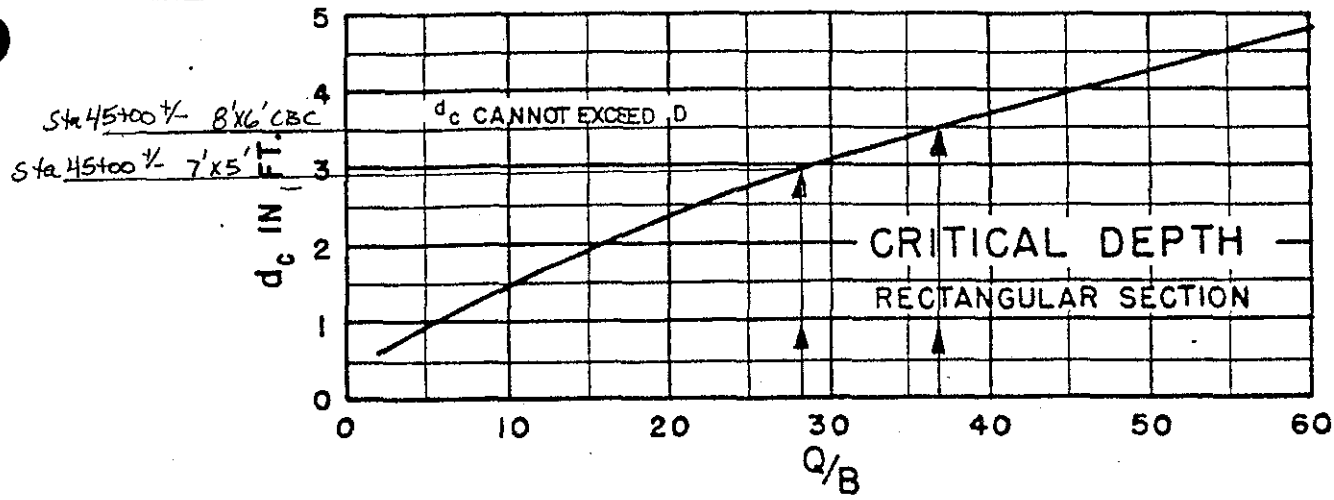
Sta 45+00 - 7'x5' Box
when flow depth = 3.95

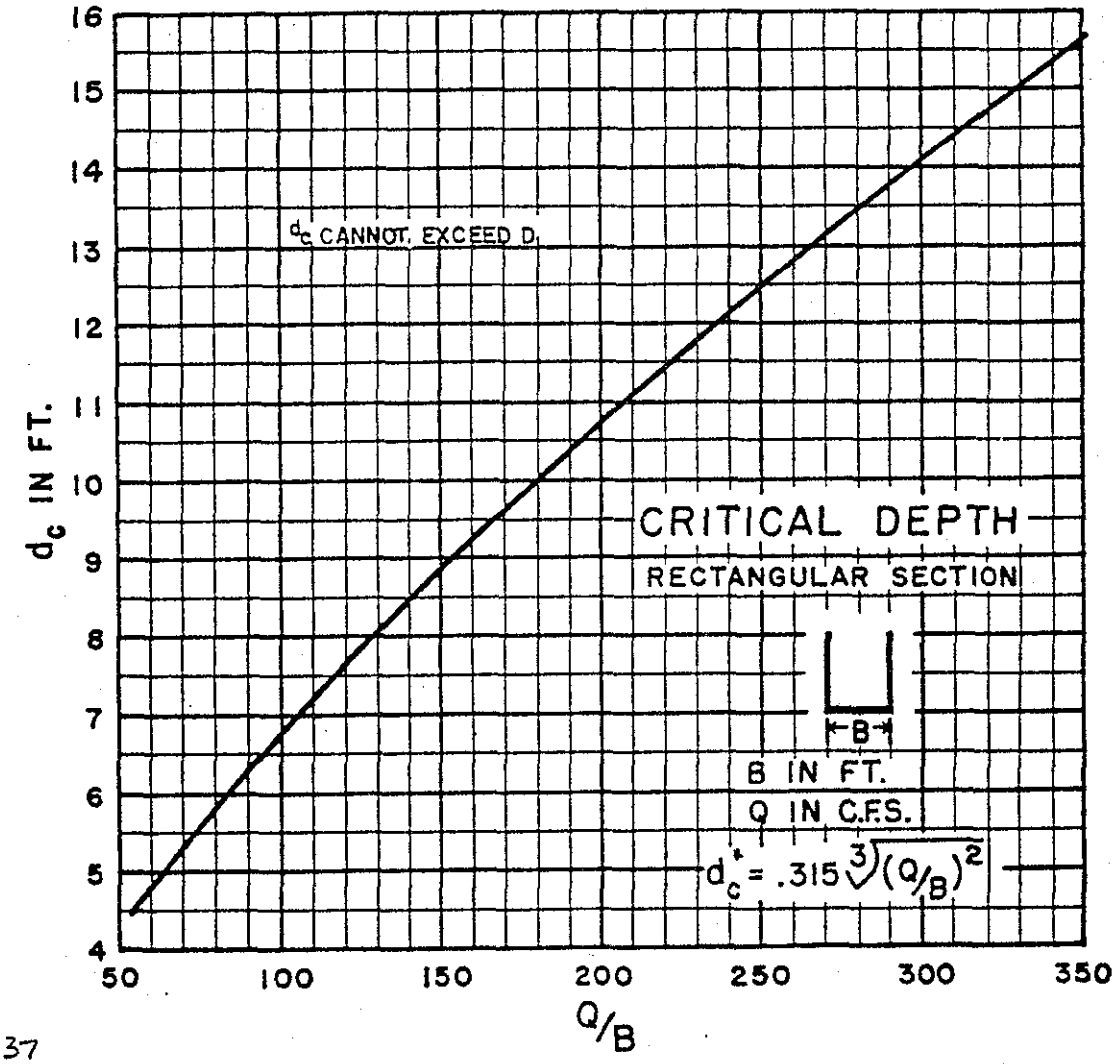
$A = 27.65$ S.F. $P = 14.90$ L.F.

$R = (27.65/14.90) = 1.86$

$V = Q/A = 196/27.65 = 7.09$ fps

$$H = \left[1 + 0.5 + \frac{29(.012)^2(81)}{2.17^{1.33}}\right]\frac{7.09^2}{64.4} = \underline{\underline{1.27'}}$$





$Q/B = \frac{296}{8} = 37$

$Q/B = 196/7 = 28$

Figure 4.62
Critical Depth Rectangular Section
(FHWA, HDS-5, 1985)

Figure 4.42
Culvert Design Form

Project: Rittenhouse Channel	Station: 118+00 +/-	CULVERT DESIGN FORM
	Sheet _____ of _____	Designer/Date: JLK / 8/93
		Reviewer/Date: ads / 8/93

Hydrological Data

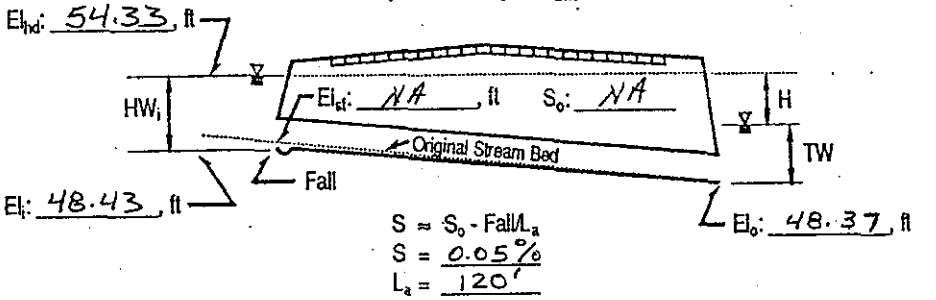
See Add'l shts

- ☐ Method: _____
- ☐ Drainage Area: _____ ☐ Stream Slope: _____
- ☐ Channel Shape: _____
- ☐ Routing: _____ ☐ Other: _____

Design Flows/Tailwater

R.I., years	Flow, cfs	TW, ft
100	296	5.44

Roadway Elevation: 57.50, ft



$S \approx S_o - Fall/L_a$
$S = 0.05\%$
$L_a = 120'$

Culvert Description: Material - Shape - Size - Entrance	Total Flow Q, cfs	Flow Per Barrel Q/N (1)	Headwater Calculations: Inlet Control HW_i/D (2)	HW_i	Fall (3)	EL_{hi} (4)	Outlet Control TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	Control Headwater Elevation	Outlet Velocity	Comments
Concrete Box 8'x6'		296	0.98	5.90	5.90	54.33	5.44	3.5	4.75	4.75	0.20	1.30	54.42	54.42	7.79	outlet Elev.
																= Hec 2
																Elev.

Technical Footnotes:

(1) Use Q/NB for box culverts.
(2) HW_i/D = HW /D or HW_f/D from design charts
(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; Fall is zero for culverts on grade.
(4) $EL_{hi} = HW_i + EL_i$ (invert of inlet control section)
(5) TW based on downstream control or flow depth in channel.
(6) h_o = TW or $(d_c + D)/2$ (whichever is greater).
(7) $H = \left[1 + k_e + (29n^2L)/R^{1.33}\right] V^2/2g$
(8) $EL_{ho} = EL_o + H + h_o$

Subscript Definitions:

a. approximate
f. culvert fact
hd. Design Headwater
hj. Headwater in inlet control
he. Headwater in outlet control
i. inlet control section
o. Outlet
sf. Streambed at culvert face
TW. Tailwater

Comments / Discussion: Since Sta 111+00 has a drop at the outlet these calculations will be sufficient to verify Inlet control for that structure which has the same size & quantity of boxes

Culvert Barrel Selected:

Size: 8'x6'
Shape: Box
Material: Concrete n: 0.012
Entrance: Beveled

6/12

Figure 4.42
Culvert Design Form

Project: Rittenhouse Channel	Station: 118 +00 +/-	CULVERT DESIGN FORM
	Sheet _____ of _____	Designer/Date: JLK / 8/93
		Reviewer/Date: [illegible] / 8/93

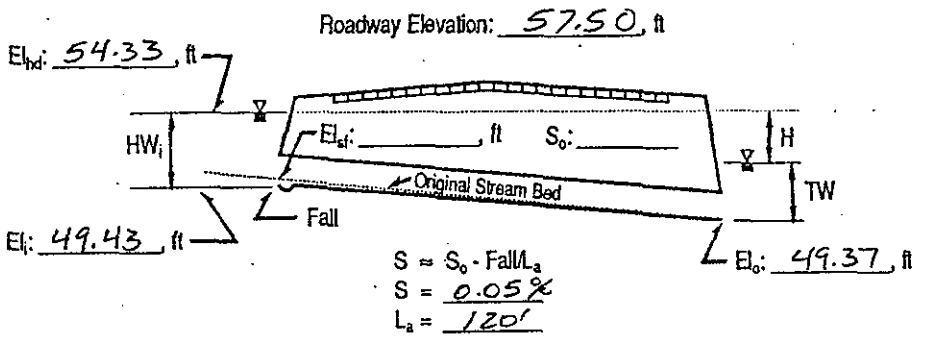
Hydrological Data

See Add'l shts

- ☐ Method: _____
- ☐ Drainage Area: _____ ☐ Stream Slope: _____
- ☐ Channel Shape: _____
- ☐ Routing: _____ ☐ Other: _____

Design Flows/Tailwater

R.I., years	Flow, cfs	TW, ft
100	504	5.44



Culvert Description: Material - Shape - Size - Entrance	Total Flow Q, cfs	Flow Per Barrel Q/N (1)	Headwater Calculations: Inlet Control: HW_i/D (2)	HW_i	Fall (3)	EL_{hi} (4)	Outlet Control: TW (5)	d_c	$\frac{d_c + D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	Control Headwater Elevation	Outlet Velocity	Comments
Box Culverts 2 - 9'x5'	504	252	0.98	4.90	4.90	54.33	4.44	2.90	3.95	3.95	0.20	1.08	54.40	54.40	7.09	Outlet Elev.
																= #EC-2
																Elev.

Technical Footnotes:

(1) Use Q/NB for box culverts.
(2) HW_i/D = HW/D or HW_f/D from design charts
(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; Fall is zero for culverts on grade.
(4) $EL_{hi} = HW_i + EL_i$ (invert of inlet control section)
(5) TW based on downstream control or flow depth in channel.
(6) h_o = TW or $(d_c + D)/2$ (whichever is greater).
(7) $H = \left[1 + k_e + (29n^2L)/R^{1.33}\right] V^2/2g$
(8) $EL_{ho} = EL_o + H + h_o$

Subscript Definitions:

a. approximate
f. culvert fact
hd. Design Headwater
hj. Headwater in inlet control
he. Headwater in outlet control
i. inlet control section
o. Outlet
sf. Streambed at culvert face
TW. Tailwater

Comments / Discussion:

Culvert Barrel Selected:

Size: 9'x5' (Two)
Shape: Box
Material: Concrete n: 0.012
Entrance: Beveled.

7/12

Sta 118+00 8'x6' Box

$A = 38.00$ S.F. $P = 17.50$ L.F.

$R = (38.00/17.50) = 2.17$

$V = Q/A = 296/38.0 = 7.79$ fps

$$H = \left[1 + 0.2 + \frac{29(0.012)^2(120)}{2.17^{1.33}}\right]\frac{7.79^2}{64.4} = \underline{\underline{1.30 \text{ ft}}}$$

Sta 118+00 9'x5' Box

$A = 35.55$ $P = 16.90$

$R = (35.55/16.90) = 2.10$

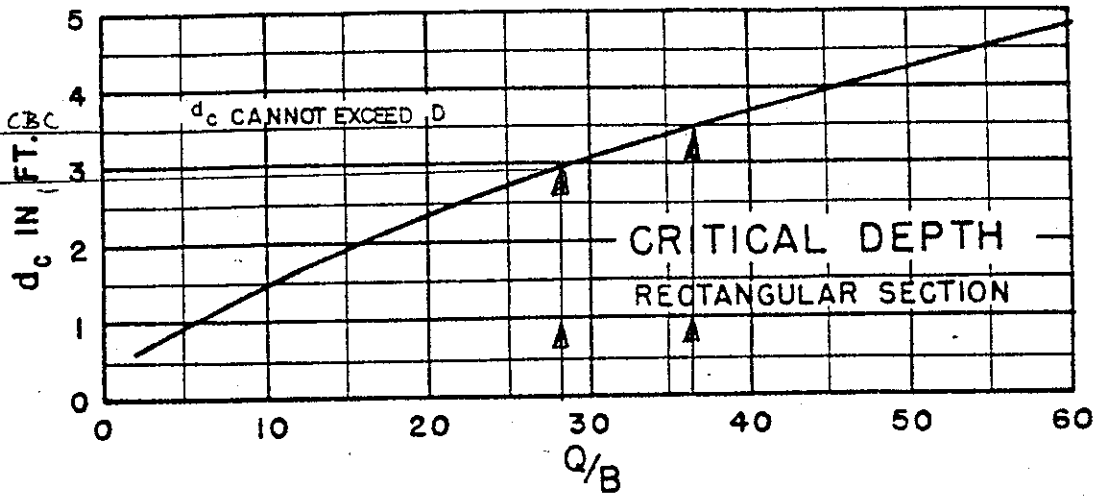
$V = Q/A = 252/35.55 = 7.09$ fps

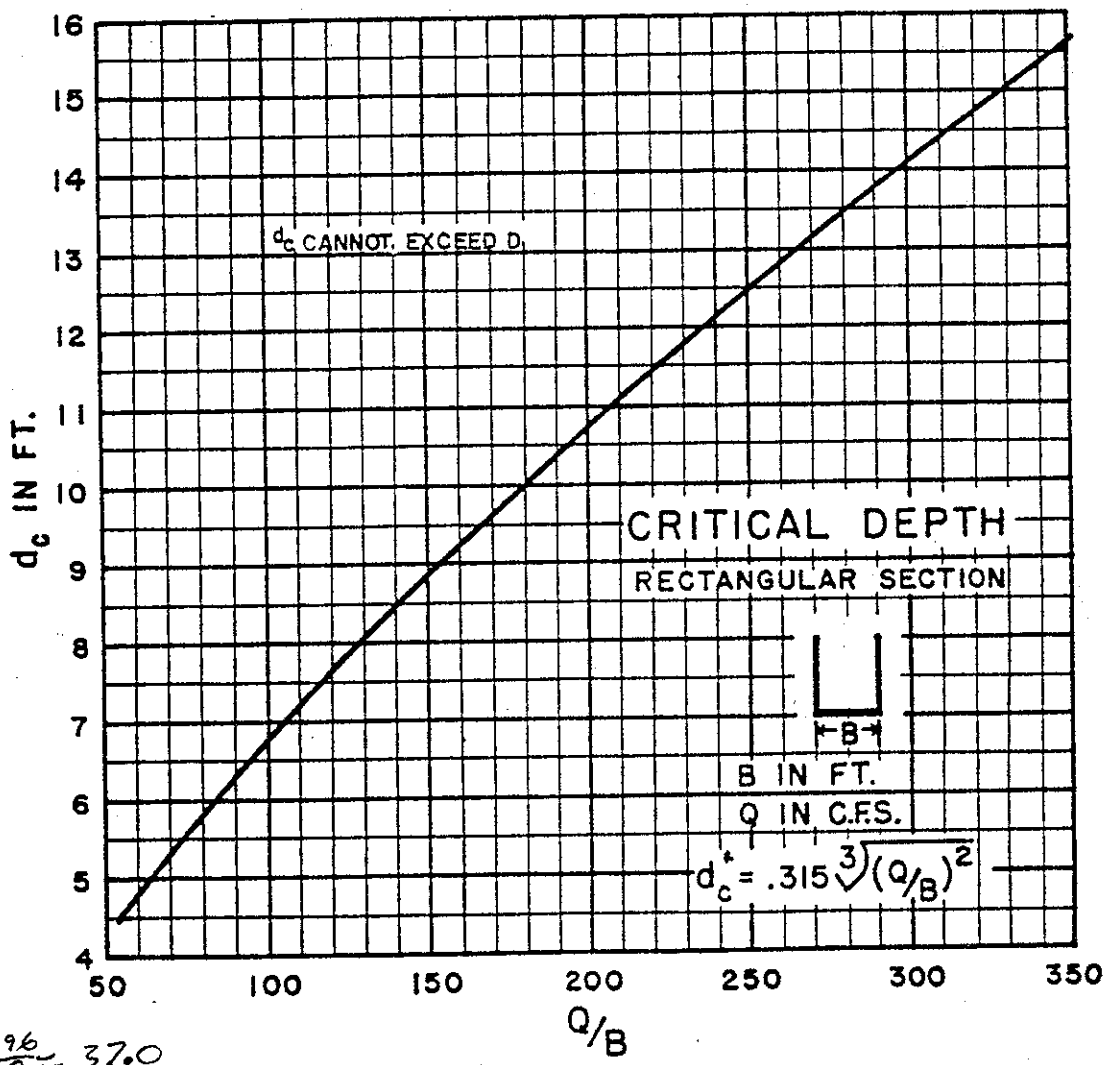
$$H = \left[1 + 0.2 + \frac{29(0.012)^2(120)}{2.10^{1.33}}\right]\frac{7.09^2}{64.4} = \underline{\underline{1.08 \text{ ft.}}}$$

9/12

Sta 118+00 ± 8'x6' CBC

Sta 118+00 ± 9'x5' CBC





$Q/B = \frac{296}{8} = 37.0$

$Q/B = \frac{252}{9} = 28.0$

Figure 4.62
Critical Depth Rectangular Section
(FHWA, HDS-5, 1985)

Figure 4.42
Culvert Design Form

Project: Rittenhouse Channel	Station: Sta 236+00 +/-	CULVERT DESIGN FORM
	Sheet _____ of _____	Designer/Date: JLK / 8/93
		Reviewer/Date: [illegible] / 8/93

Hydrological Data

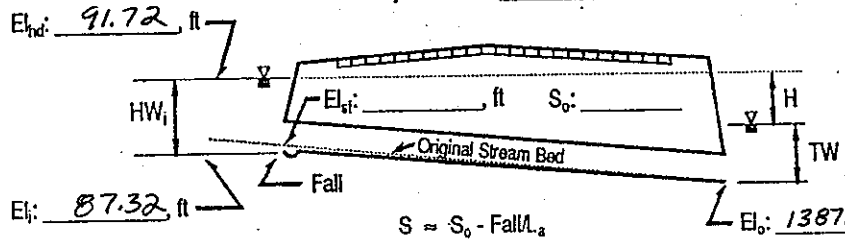
See Add'l shts

- ☐ Method: _____
- ☐ Drainage Area: _____ ☐ Stream Slope: _____
- ☐ Channel Shape: _____
- ☐ Routing: _____ ☐ Other: _____

Design Flows/Tailwater

R.I., years	Flow, cfs	TW, ft
100	504	2.88

Roadway Elevation: 1394.50, ft



$S \approx S_o$ - Fall/L_a
S = _____
L_a = 90

Culvert Description: Material - Shape - Size - Entrance	Total Flow Q, cfs	Flow Per Barrel Q/N (1)	Headwater Calculations: Inlet Control HW_i/D (2)	HW_i	Fall (3)	EL_{hi} (4)	Outlet Control TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	Control Headwater Elevation	Outlet Velocity	Comments
2 Box Culverts 9'x5'	504	252	0.88	4.40	4.40	91.72	2.88	2.9	3.95	3.95	0.2	1.05	89.27	91.72	7.09	

Technical Footnotes:

(1) Use Q/NB for box culverts.
(2) HW_i/D = HW /D or HW_f/D from design charts
(3) FALL = HW_i – (EL_{hd} – EL_{sf}); Fall is zero for culverts on grade.
(4) EL_{hi} = HW_i + EL_i (invert of inlet control section)
(5) TW based on downstream control or flow depth in channel.
(6) h_o = TW or $(d_c + D)/2$ (whichever is greater).
(7) $H = \left[1 + k_e + (29n^2L)/R^{1.33}\right] V^2/2g$
(8) EL_{ho} = EL_o + H + h_o

Subscript Definitions:

a. approximate
f. culvert fact
hd. Design Headwater
hi. Headwater in inlet control
ho. Headwater in outlet control
i. Inlet control section
o. Outlet
sf. Streambed at culvert face
TW. Tailwater

Comments / Discussion:

Culvert Barrel Selected:

Size: 9'x5' (Two)
Shape: Box
Material: Concrete n: 0.012
Entrance: Beveled

10/12

Sta 236+00 +/-

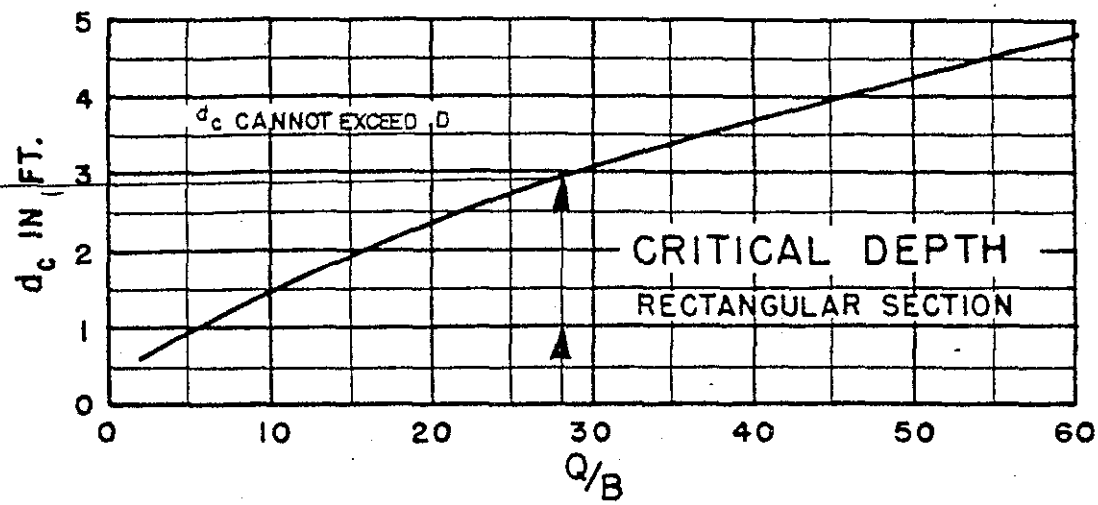
$A = 35.55 \qquad P = 16.90$

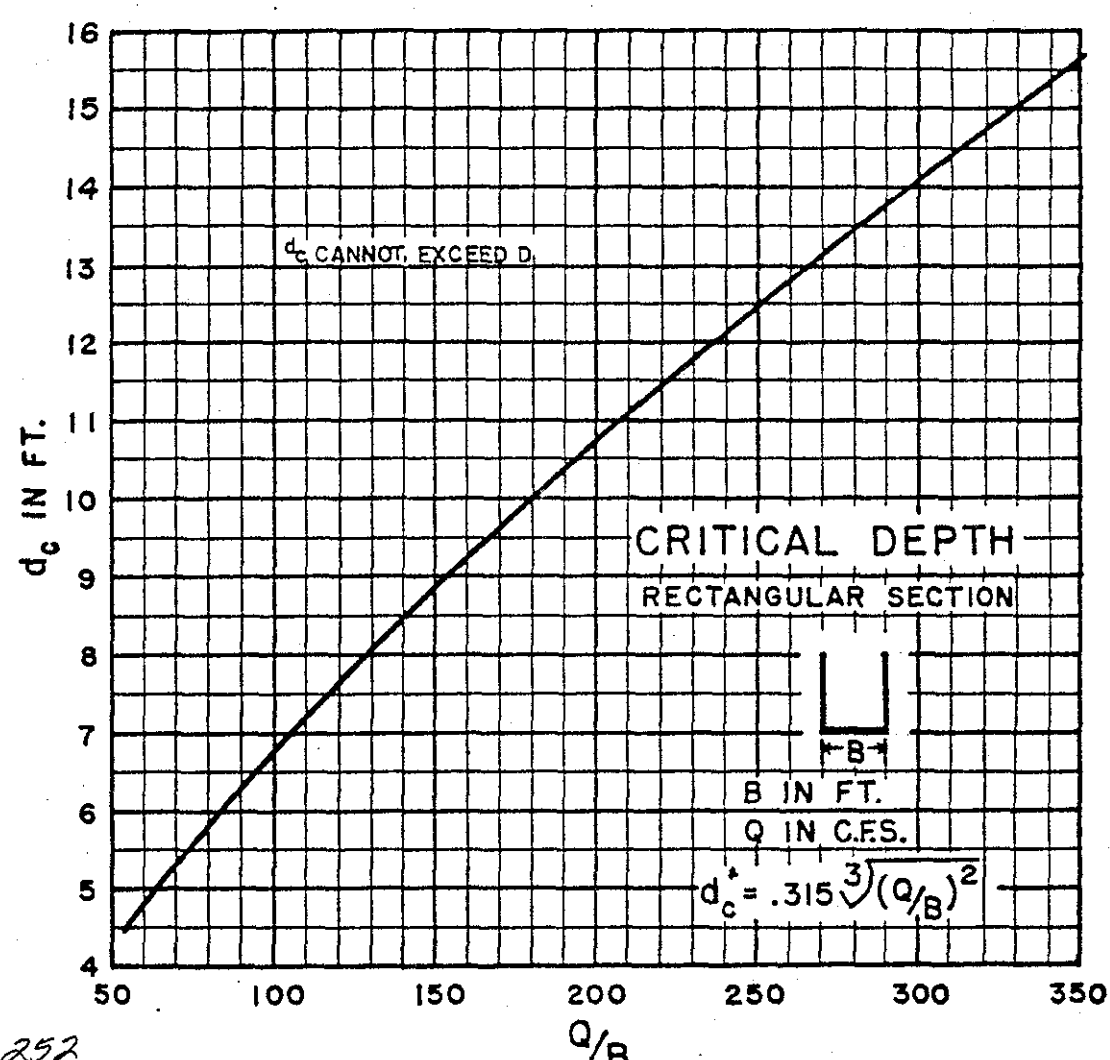
$R = (35.55/16.90) = 2.10$

$V = Q/A = 252/35.55 = 7.09 \text{ fps}$

$$H = \left[1 + 0.2 + \frac{29(0.012)^2 90}{2.10^{1.33}}\right] \frac{7.09^2}{64.4} = \underline{\underline{1.05}}$$

Sta 236+00 +/-
2-9'x5' CBC's





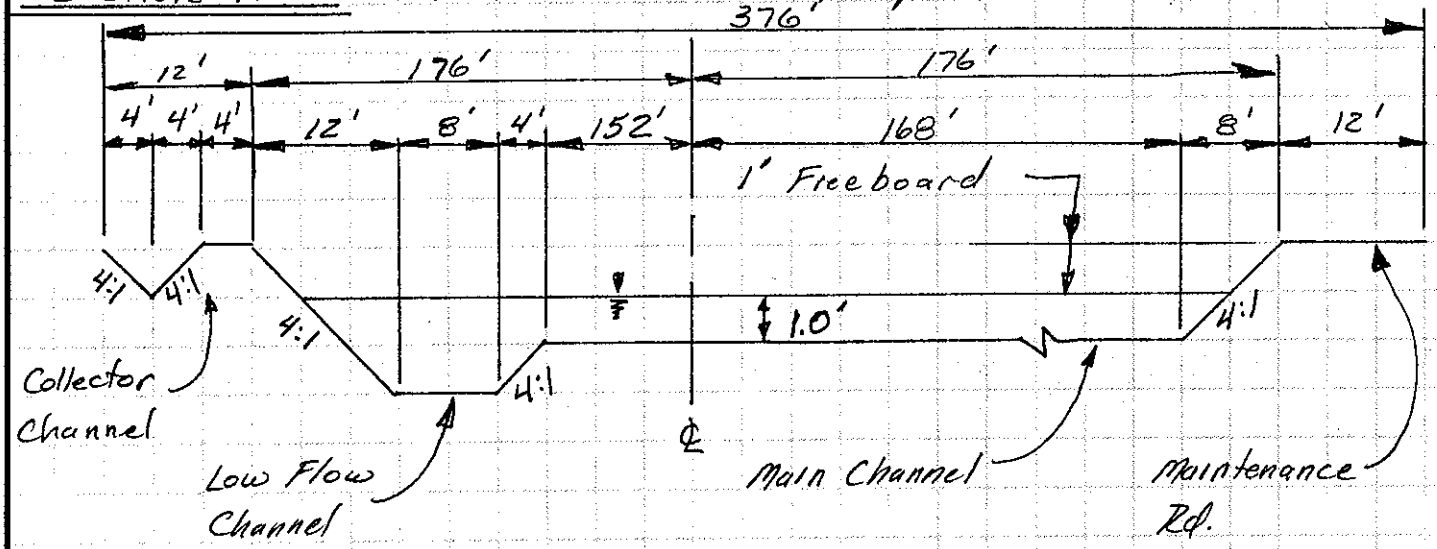
$Q/B = \frac{252}{9} =$

Figure 4.62
Critical Depth Rectangular Section
(FHWA, HDS-5, 1985)

Appendix G
Alternate D Hand Calculation

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835.080	
	PROJECT Rittenhouse Rd. Channel	SHEET 1 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 4/93
	Alternate D	CHECKER RPS	DATE 6/93

Section No. 1 - From EMF to Pump Station



$n = 0.027$
$S = 0.0028'/ft$
$A = 4.00$ S.F.
$P = 8.25$ ft.

$$V = \frac{1.49}{0.027}(.0028)^{1/2}\left(\frac{4.00}{8.25}\right)^{2/3}$$

$V = 1.80$ fps

$Q = 1.80 \times 4.00$

$Q = 7.2$ cfs

$Q = 1047$ cfs
$n = 0.027$
$S = 0.0028'/ft$
$A = 352$ S.F.
$P = 344.49$ ft.

$$V = \frac{1.49}{0.027}(0.0028)^{1/2}\left(\frac{352}{344.49}\right)^{2/3}$$

$V = 2.96$ fps

$Q = 2.96 \times 352$

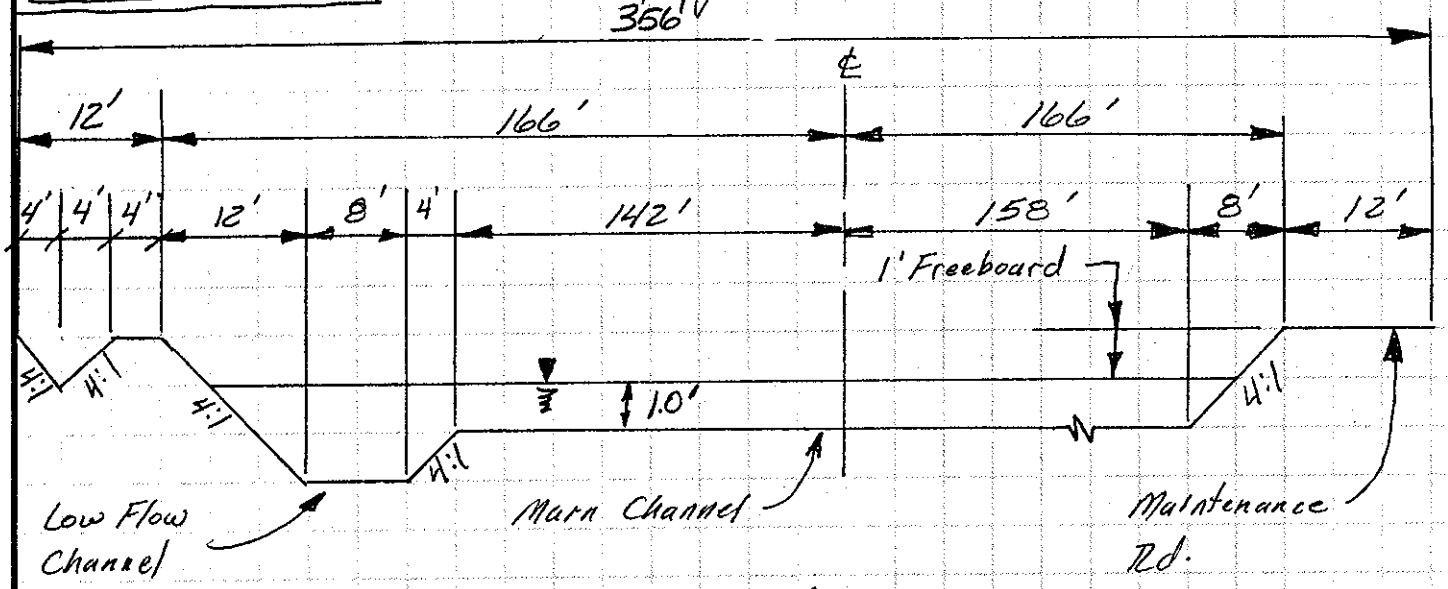
$Q = 1042$ cfs

$$F = \frac{V}{(gD)^{0.5}} = \frac{2.96}{(32.2 \times 1.02)^{0.5}} = 0.52 \therefore OK$$

$$F.B. = 0.25\left(1 + \frac{2.96^2}{64.4}\right) = 0.26 \text{ ft.} \therefore \text{use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCD MC	JOB NO. 28835	
	PROJECT Rittenhouse Rd. Channel	SHEET 2 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 4/93
	Alternate D	CHECKER RDS	DATE 6/93

Section No. 2 – From Pumping Plant to Power Road



$n = 0.027$
$S = 0.0032$ '/ft
$A = 4.00$ S.F.
$P = 8.25$ ft.

$$V = \frac{1.49}{0.027}(0.0032)^{1/2}\left(\frac{4.00}{8.25}\right)^{2/3}$$

$V = 1.93$ fps

$Q = 1.93 \times 4.00$

$Q = 7.7$ cfs

$Q = 1047$ cfs
$n = 0.027$
$S = 0.0032$ '/ft.
$A = 332.0$ S.F.
$P = 324.49$ ft.

$$V = \frac{1.49}{0.027}(0.0032)^{1/2}\left(\frac{332.0}{324.49}\right)^{2/3}$$

$V = 3.17$ fps

$Q = 3.17 \times 332.0$

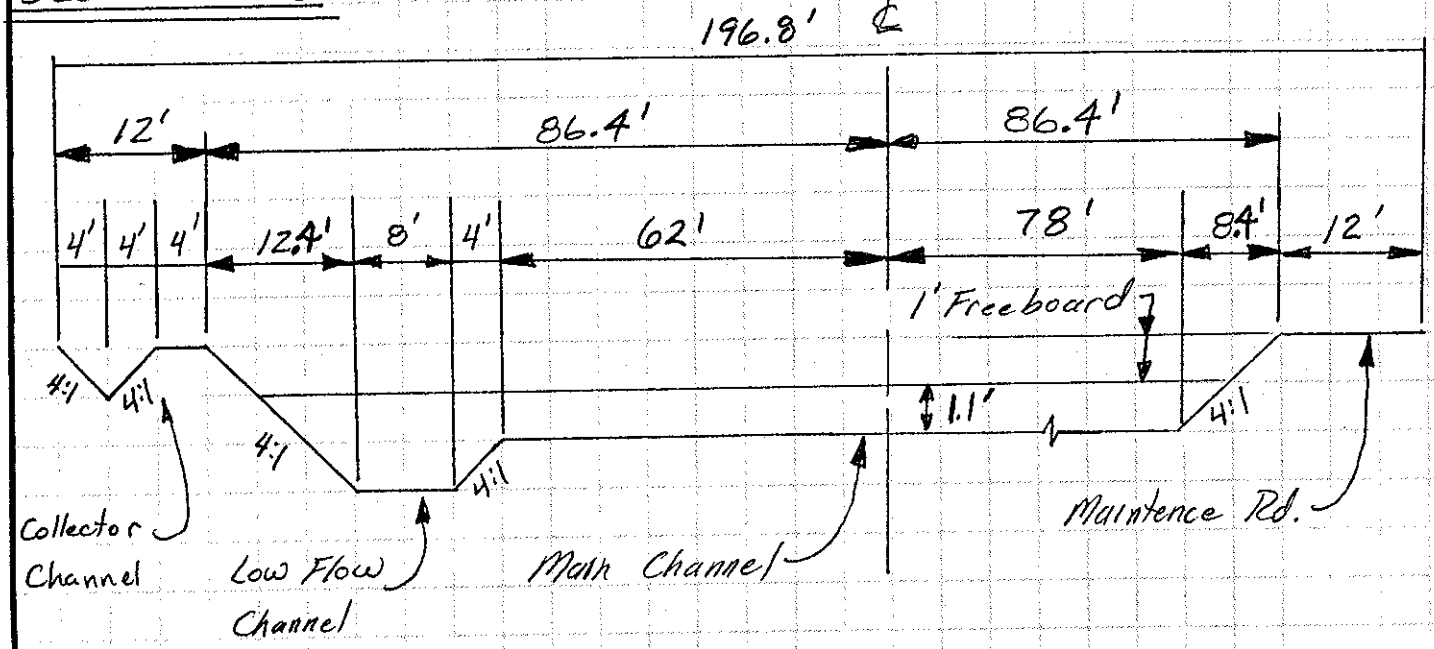
$Q = 1052$ cfs

$$F = \frac{V}{(gD)^{0.5}} = \frac{3.17}{(32.2 \times 1.02)^{0.5}} = 0.553 \therefore OK$$

$$F.B. = 0.25\left(1.0 + \frac{3.17^2}{64.4}\right) = 0.29 \text{ ft.} \therefore \text{use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCD MC	JOB NO. 28835	
	PROJECT Rittenhouse Rd. Channel	SHEET 3 OF 7	
	DESIGN FOR Channel Sections Alternate D	DESIGNER JLK	DATE 4/93
		CHECKER RDS	DATE 6/93

Section No. 3 - Future Channel East of Power to W.A.F.B.



$n = 0.027$
$S = 0.0022'/ft$
$A = 4.00$ S.F.
$P = 8.25$ ft.

$$V = \frac{1.48}{0.027}(0.0022)^{1/2}\left(\frac{4.00}{8.25}\right)^{2/3}$$

$V = 1.60$ fps

$Q = 1.60 \times 4.00$

$Q = 6.4$ cfs

$Q = 561$ cfs
$n = 0.027$
$S = 0.0022'/ft.$
$A = 192.64$ S.F.
$P = 165.32$ ft.

$$V = \frac{1.49}{0.027}(.0022)^{1/2}\left(\frac{192.64}{165.32}\right)^{2/3}$$

$V = 2.87$ fps

$Q = 2.87 \times 192.64$

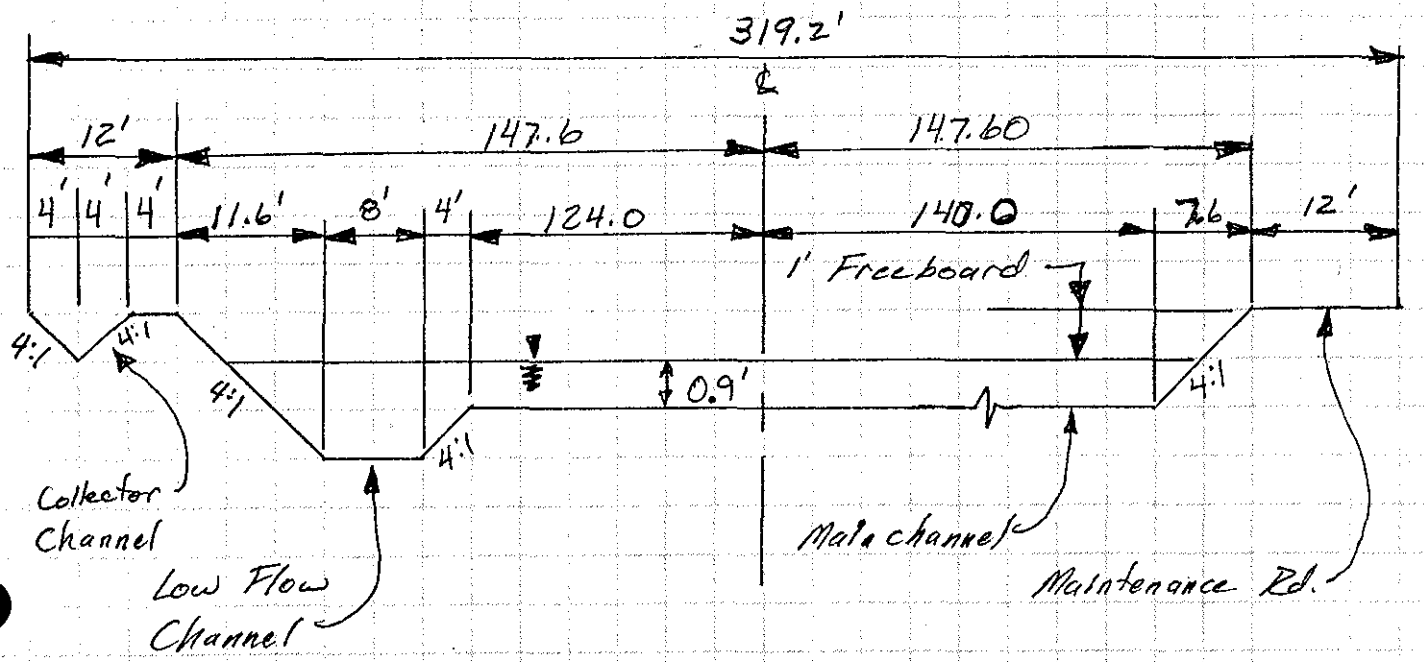
$Q = 553$ cfs

$$F = \frac{2.87}{(32.2 \times 1.17)^{0.5}} = 0.47 \therefore OK$$

$$FB = 0.25\left(1.1 + \frac{2.87^2}{64.4}\right) = 0.30' \therefore \text{use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Rd. Channel	SHEET 4 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 4/93
	Alternate D.	CHECKER RDS	DATE 6/93

Section No. 4 - From Power Rd. to Sossaman Along R.R. R.O.W.



$n = 0.027$
$S = 0.0035'/ft$
$A = 4.00$ S.F.
$P = 8.25$ ft.

$$V = \frac{1.49}{.027}(.0035)^{1/2}\left(\frac{4.00}{8.25}\right)^{2/3}$$

$V = 2.02$ fps

$Q = 2.02 \times 4.00$

$Q = 8.08$ cfs

$Q = 804$ cfs
$n = 0.027$
$S = 0.0035'/ft$
$A = 263.89$
$P = 287.67$

$$V = \frac{1.49}{0.027}(0.0035)^{1/2}\left(\frac{263.89}{287.67}\right)^{2/3}$$

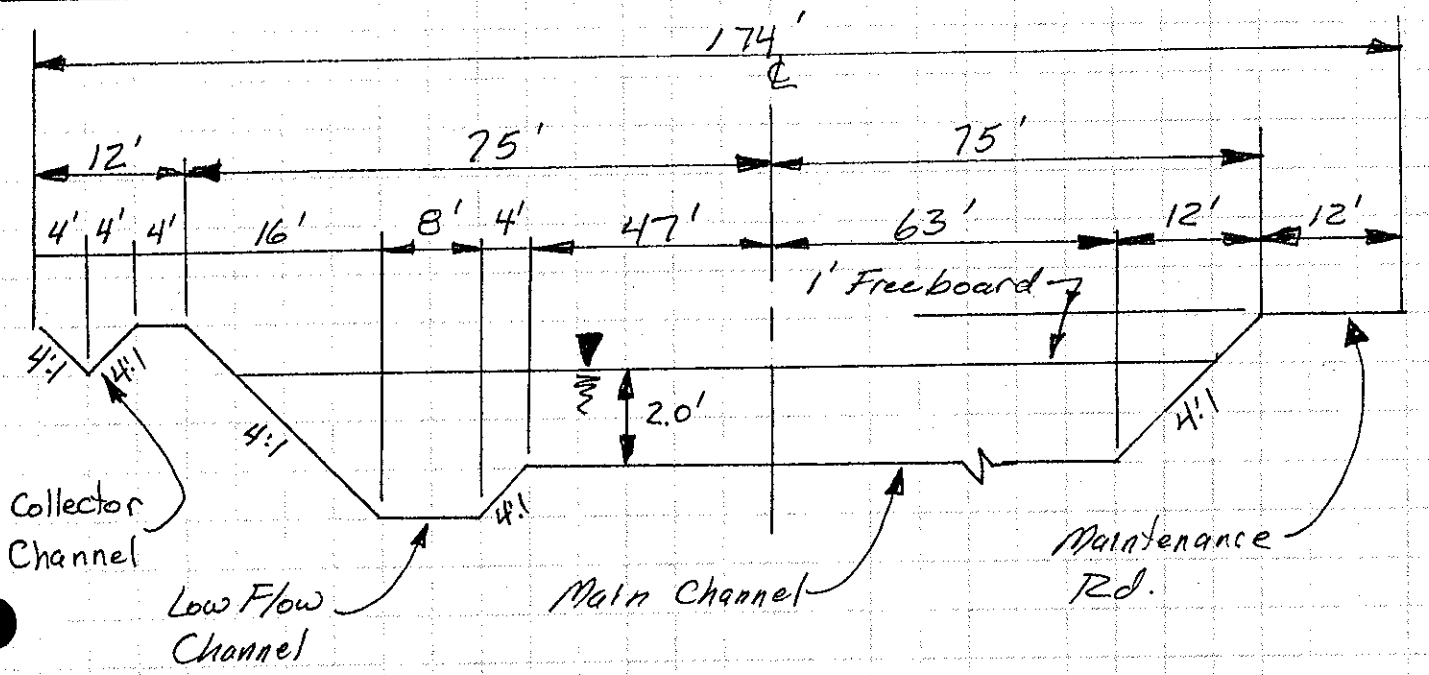
$V = 3.08$ fps

$Q = 3.08 \times 263.89$

$Q = 813$ cfs

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Rd. Channel	SHEET 5 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 4/93
	Alternate D	CHECKER RDS	DATE 6/93

Section No. 5 - Between Sossaman + Germann Rd. Boxes



$n = .027$
$S = .0011$ 1/ft.
$A = 4.00$ S.F.
$P = 8.25$ ft.

$$V = \frac{1.49}{.027}(.0011)^{1/2}\left(\frac{4.00}{8.25}\right)^{2/3}$$

$V = 1.13$ fps

$Q = 1.13 \times 4.00$

$Q = 4.52$ cfs

$Q = 813$
$n = .027$
$S = .0011$ 1/ft.
$A = 280$ S.F.
$P = 142.74$ ft

$$V = \frac{1.49}{.027}(.0011)^{1/2}\left(\frac{280}{142.74}\right)^{2/3}$$

$V = 2.87$ fps

$Q = 2.87 \times 280$

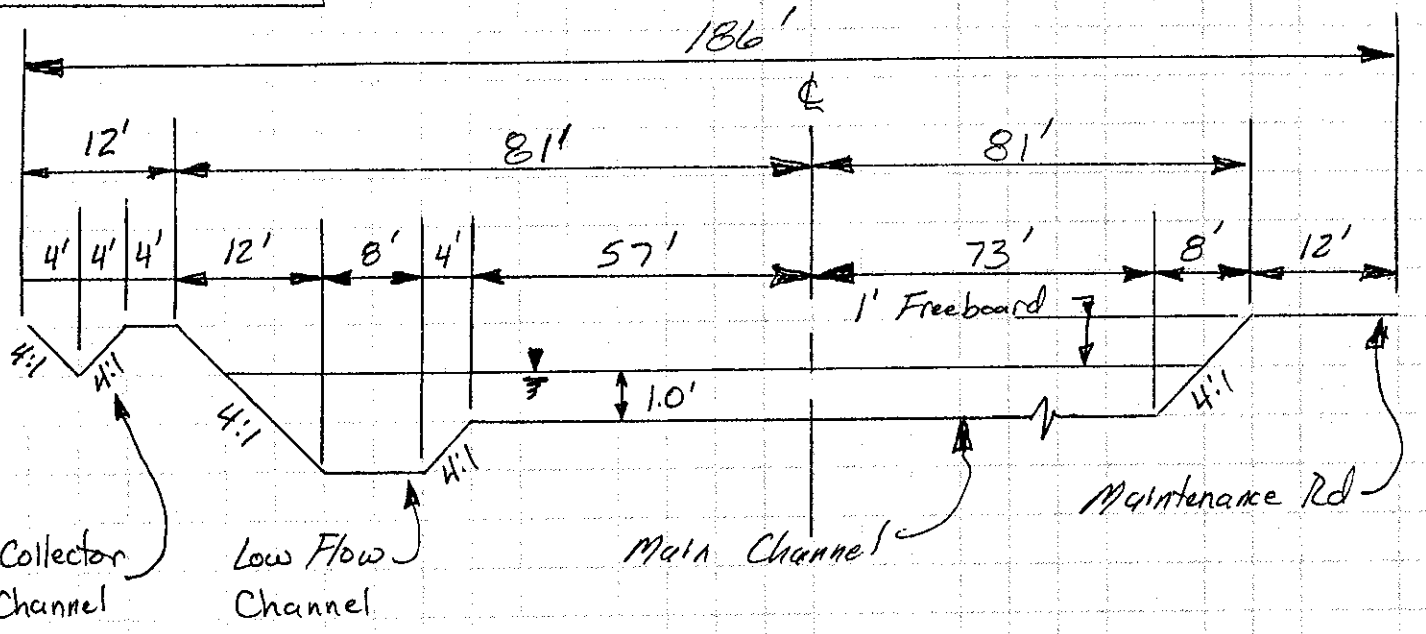
$Q = 804$ cfs

$$F = \frac{2.87}{(32.2 \times 1.97)^{0.5}} = 0.36 \therefore \text{OK}$$

$$FB = 0.25\left(2.0 + \frac{2.87^2}{64.4}\right) = 0.53 \therefore \text{use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Rd. Channel	SHEET 6 OF 7	
	DESIGN FOR Channel Sections Alternate D	DESIGNER JLK	DATE 4/93
		CHECKER RDS	DATE 6/93

Section No. 6 - From Germann Rd. to Queen Creek Rd. Extended



$n = 0.027$
$s = 0.0029\ '/ft$
$A = 4.00$ S.F.
$P = 8.25$ ft.

$$V = \frac{1.49}{.027}(.0029)^{1/2}\left(\frac{4.00}{8.25}\right)^{2/3}$$

$V = 1.84$ fps

$Q = 1.84 \times 4.00$

$Q = 7.36$ cfs

$Q = 504$ cfs
$s = 0.0029\ '/ft$
$n = 0.027$
$A = 162.0$ S.F.
$P = 154.49$

$$V = \frac{1.49}{0.027}(0.0029)^{1/2}\left(\frac{162}{154.49}\right)^{2/3}$$

$V = 3.07$ fps

$Q = 3.07 \times 162$

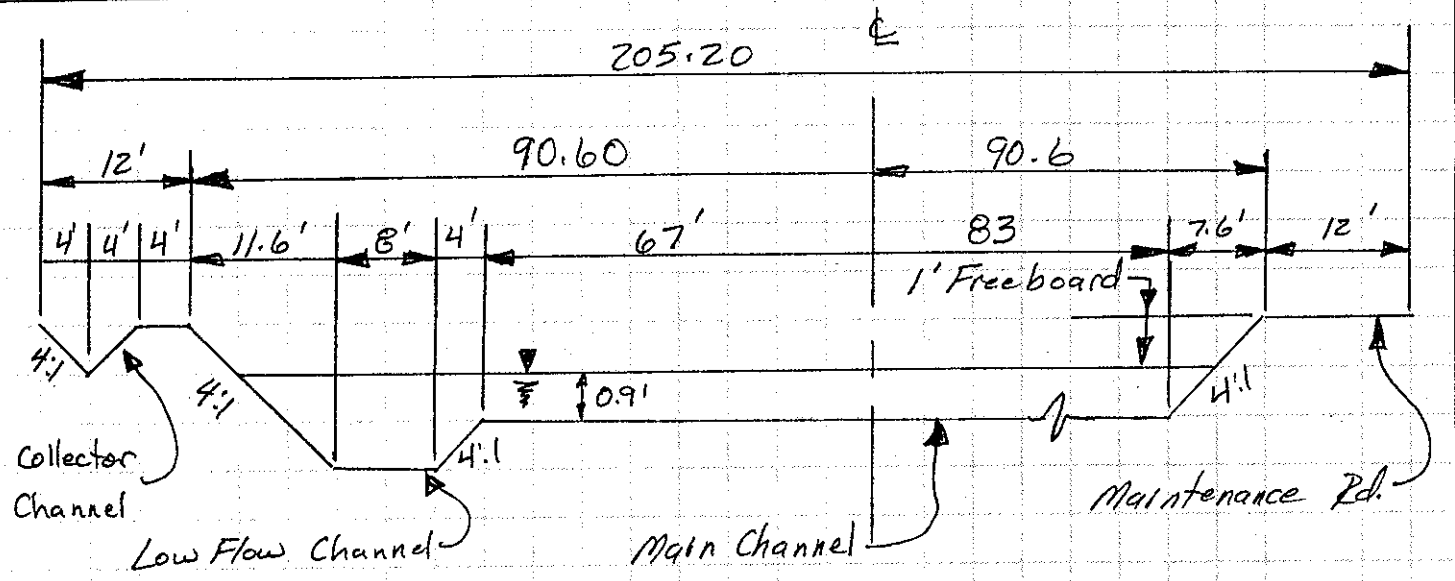
$Q = 497$ cfs

$$F = \frac{3.07}{(32.2 \times 1.05)^{0.5}} = 0.53 \quad \therefore \text{ OK}$$

$$FB = 0.25\left(1.0 + \frac{3.07^2}{64.4}\right) = 0.29' \quad \therefore \text{ use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Rd. Channel	SHEET 7 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 4/93
	Alternate D	CHECKER RDS	DATE 6/93

Section No. 7 - From Queen Creek Rd Extended to Ellsworth Rd.



$n = 0.027$
$S = 0.0033'/ft$
$A = 4.00$ S.F.
$P = 8.25$ ft

$Q = 516$ cfs
$n = 0.027$
$s = 0.0033'/ft$
$A = 164.64$ S.F.
$P = 173.67$ S.F.

$$V = \frac{1.49}{0.027}(0.0033)^{1/2}\left(\frac{4.00}{8.25}\right)^{2/3}$$

$$V = \frac{1.49}{0.027}(0.0033)^{1/2}\left(\frac{164.64}{173.67}\right)^{2/3}$$

$V = 1.96$ fps

$V = 3.06$ fps

$Q = 1.96 \times 4.00$

$Q = 3.06 \times 164.64$

$Q = 7.84$ cfs

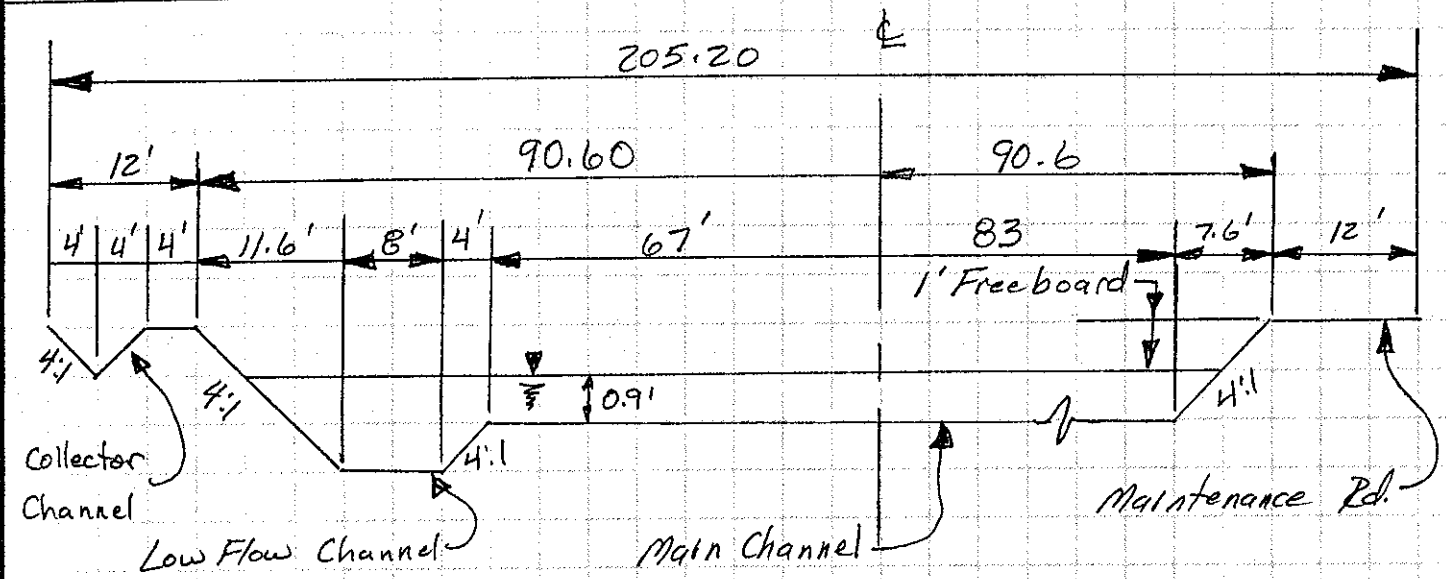
$Q = 504$ cfs

$$F = \frac{3.06}{(32.2 \times 0.91)^{0.5}} = 0.57 \quad \therefore \text{ OK}$$

$$F.B. = 0.25\left(1.0' + \frac{3.06^2}{64.4}\right) = 0.29 \quad \therefore \text{ use } 1.0'$$

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Rd. Channel	SHEET 7 OF 7	
	DESIGN FOR Channel Sections	DESIGNER JLK	DATE 4/93
	Alternate D	CHECKER RDS	DATE 6/93

Section No. 7 - From Queen Creek Rd Extended to Ellsworth Rd.



n = 0.027
S = 0.0033'/ft
A = 4.00 S.F.
P = 8.25 ft

Q = 516 cfs
n = 0.027
s = 0.0033'/ft
A = 164.64 S.F.
P = 173.67 S.F.

$$V = \frac{1.49}{0.027}(0.0033)^{1/2}\left(\frac{4.00}{8.25}\right)^{2/3}$$

$$V = \frac{1.49}{0.027}(0.0033)^{1/2}\left(\frac{164.64}{173.67}\right)^{2/3}$$

V = 1.96 fps

V = 3.06 fps

Q = 1.96 x 4.00

Q = 3.06 x 164.64

Q = 7.84 cfs

Q = 504 cfs

$$F = \frac{3.06}{(32.2 \times 0.91)^{0.5}} = 0.57 \quad \therefore \text{ OK}$$

$$F.B. = 0.25\left(1.0' + \frac{3.06^2}{64.4}\right) = 0.29 \quad \therefore \text{ use } 1.0'$$

Appendix H
Public Meetings Minutes

RITTENHOUSE CHANNEL PUBLIC MEETING
QUEEN CREEK TOWN HALL
Thursday, January 7, 1993
10:00 - 11:00 a.m.

1. Mayor Mark Schnepf

Last couple years asked County to do drainage solution to area along Rittenhouse Road and railroad tracks.

Audience members introduced themselves.

This is preliminary meeting - want input from community.

2. Scott

Presented conceptual Rittenhouse Drainage Design

ADMS completed in 1991 to identify areas of flooding and proposing solutions.

A. San Tan levee and dike
B. Basins along EMF
C. Channelization of QC wash
D. Rittenhouse Channel
E. Pinal County offsite drainage ways (channels along section lines).

Have entered into IGA with Queen Creek and hired consultant to start design.

Concept

A. Channelization on upstream side of railroad tracks
B. Earth-lined channel - 150 feet right-of-way width east of Power Road; 106 feet east of Ellsworth; and 24 foot channel around school

Benefits

A. Reduction of floodplain
B. Positive outfall for future development and waters that currently pond up.
C. Reduce flooding at school

Cost Design $260,000 to be completed October, 1993; construction JN1995 - completed in 1996.

Q: Any railroad right-of-way involved?
A: Have contacted railroad asking joint use of right-of-way for our project. Said would protect railroad and have maintenance road they could use. They have not responded, still trying.

Q: Does FCD have coordination power?
A: Yes

Q: Who determined existing floodplain delineation?
A: 1990 study

Q: County Road caused problems by raising road by school. County should lower area into same natural areas where water went for years.
A: Consultant intends to do specific study.

Q: What about trestles under railroad tracks. Existing drainageway there, why not use it?
A: Will look into it.

Q: No flumes under County Road in front of school causing ponding. Fix that and the problem goes away. A bar ditch and pipe will fix school.

Q: We don't need a massive 150 foot wide channel.

Q: (Bawes) I'm not going to let them put a ditch across my property.

Q: A 36 inch ditch along school would handle the most flows we've ever seen there.

Q: (Barnes) When County Road crews working, I kept asking them to "let me talk to the boss. The County man told me a year ago that they had enough used tile to take care of the school. We can't get the County at corner of Rittenhouse and Germann asking that flume be returned to where it was.

A: This design will help for future development, providing outfall.

Q: Wouldn't it be better to put channel on railroad right-of-way?

Schnepf:

- Engineers need to work with local property owners to take a look at practical and less expensive solutions to problem.

- Would like you to look at detention areas once have specific Q's, instead of placing channel.

Q: What happens next?
A: We take your comments and concerns back and also talk with property owners (in 4 weeks). Decision to go to construction would be in June if it happens. Will refine hydrologic models to determine if accurate.

Q: Contact Dean Griffith of QC Irrigation District.

PLEASE PRINT
MEETING ATTENDANCE ROSTER

MEETING: Rittenhouse Channel Public Mtg LOCATION: Queen Creek

DATE: January 7, 1993

NAME	ADDRESS	PHONE
Jim Phipps (FCD)	2801 W. DURANGO ST, PHX	506-1501
Dick McNamara "	" " " " "	"
Sally Davis	QC Town Council	987-3507
Tom Keda	1252 W. Mountain View Dr. Mesa 85201	964-3865
Jim Kary	Gannett Fleming	553-8817
Ron Schreier	Gannett Fleming	553-8817
Jim Gale	Chandler Gin Co. P.O Box 486	963-6645
Mark Schnepf		
Greg Borne	P.O. Box 169 Q.C.	787-3648
Ralph Jamieson	Queen Creek Schools	987-9600
Dan Kleinman	Queen Creek	988-2136

6910-004 1-92

RITTENHOUSE DRAINAGE IMPROVEMENT PROJECT
PUBLIC MEETING
2/17/93

The District held a second public meeting with the landowners/farmers of Queen Creek on February 17, 1993 at the Town Hall. In attendence were representatives from Tom Rawles office, Mayor Scnhepf, and MCDOT. (see attached attendance roster) The purpose of this meeting was to address concerns raised at the first public meeting. The issues addressed were as follows:

1. The size of proposed channel. 150 feet wide, from Ellsworth to Sossaman, and 100 feet wide, from Ellsworth to Ocotillo.
2. Quantity of runoff. The District indicated that the project was being designed to convey the runoff generated from the 100 year event.
3. Channel location. Various individuals questioned the alignment of the channel, particularly at Ellsworth Road and at Queen Creek School.
4. The use of Southern Pacific Transportation Company (SPTC) right-of-way. The Town was interested in following up with determining the possibility of a joint use of right-of-way with SPTC.

I began the meeting with a recapitulation of the project history, purpose, and, the concept.

In response to the first two concerns, the consultant reviewed his efforts to date to refine the hydraulic model to include all the existing basins, ditches, and pipes. The inclusion of those features into the model was completed in hopes of reducing overall flow rates and therefore the size and required right-of-way for the channel. The resultant change in flow was approximately 5%. This, along with altering the channel section resulted in a reduction of right-of-way required for the project from 150 feet to approximately 100 feet, from Sossaman Road to Ellsworth Road, and from 100 feet to approximately 80 feet, from Ellsworth Road to Ocotillo Road.

There was much discussion about the need to construct a channel of this size. It was explained that the District is designing this project for the 100 year event. A few individuals stated that they had lived there since the 1940's and had seen two or three 100 year events. I responded that our research had indicated that this area had never seen the 100 year event. For the purpose of putting the 100 year event in perspective I stated that the storms of August 1992, which caused washouts of the railroad, street flooding, and damages to properties was an event smaller than the 2 year event. Basically, a few of the landowners/farmers were not happy with the possibility of being asked to donate property for a project they felt was overdesigned.

ACTION REQUIRED: Determine the Districts' and Towns' position on an alternate design for a channel with less than 100 year conveyance capacity. If the District is going to design the improvements for an event smaller than the 100 year determine right-of-way impacts and modify the scope of work with the consultant.

In response to the concern over the alignment the consultant presented two alternatives for both the Queen Creek School and Ellsworth Road. The alignment alternatives for the school are:

1. Continue flows along Queen Creek Road to Ellsworth. Estimated construction cost $318,000.
2. Take flows around the school on the south side. Estimated construction cost $106,000.

The alignment alternatives for Ellsworth Road are:

1. Stay adjacent to SPTC tracks, and construct a double box culvert 580 feet long. Approximate construction costs $588,000.
2. Take the flow north, under the runway, and to the north and east of the commercial area. Approximate construction cost $161,000.

There was discussion over the alternatives presented, but no serious issues were raised or consensus was reached.

ACTION REQUIRED: Continue with both alternatives at both locations for inclusion into the Conceptual Design Report.

In response to the fourth concern, joint use of the SPTC right-of-way, the District stated that we have again attempted to garner a response from SPTC without success.

The landowners/farmers feel that SPTC is responsible for the creation of the floodplain on the upstream side of the tracks. This occurred in the 1970s' when this line became a main line and was improved and raised. They also feel that they should be partly responsible for the solution. Responsible either by a joint use of right-of-way or by taking legal action against SPTC for impeding waters upstream and off Railroad right-of-way and creating the existing floodplain.

ACTION REQUIRED: Copy Supervisors' Rawles office and Mayor Schnepfs' office all previous correspondence and calls to SPTC. Both offices have indicated they will follow up with letters from their offices to SPTC requesting a response to the possibility of a joint right-of-way use. Contact our legal representative to determine if SPTC could be held liable for water impoundments outside their right-of-way.

MEETING ATTENDANCE ROSTER

Meeting: RITTENHOUSE CHANNEL Location: QUEEN CREEK

Date: 2/17/93

Name	Title	Organization	Phone
[illegible]	Landowner	[illegible]	[illegible]
SCOTT CLEVENGER	PROJECT MANAGER	FLOOD CONTROL	506-1501
Joel Lichman	Proj Engr	[illegible]	[illegible]
JIM BEUNIKE	DIRECT SUP	" "	506-8668
[illegible] RILEY	Landowner		987-3648
Jackie [illegible]			899-1195
[illegible]	Landowner	Hawin Cattle Co	988-1587
RON SHAFER	PROJECT MANAGER	Gannett Fleming	553-8817
JIM KAY	PROJECT ASSISTANT	" "	"
Merrill R. Barnes	Land Owner	Barnes Farms	987-3563
Philip Barnes	Landowner		987-3649
JIM [illegible]		[illegible] Farm	963-2727
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	TIC Dev Co	767-[illegible]
RICHARD KLEMENT	LANDOWNER	WCB-Grn	832-3361
MARK SCHNEPH	MAYOR Q.C.		
BARRY MOEHRING	SUPERVISOR PARKS OFFICE		

RITTENHOUSE DRAINAGE IMPROVEMENT PROJECT
PUBLIC MEETING
4/28/93

The District held a third public meeting with the landowners/farmers of Queen Creek on April 28, 1993 at the Town Hall. See attached attendance roster. The purpose of this meeting was to present the recommended alternative to the residents.

The meeting began with an overview of the project and how the project has evolved to a channel extending from the East Maricopa Floodway to east of Ellsworth Road, terminating on the east side of Queen Creek Public School. The recommended alternative was presented to the residents, detailing the right-of-way required for the project. The right-of-way required for the project is as follows:

From the EMF to Power Road - 121 feet
From Power Road to Sossaman - 107 feet
From Sossaman to Germann - 116 feet
From Germann to the school - 91 feet

These widths are what will be required for the construction of the project. The width of right-of-way required through donation could be reduced by up to 25 feet, for the portion of the project adjacent to Southern Pacific Transportation Companys' (SPTC) Tracks, if SPTC concur with our request for a joint use of right-of-way. A letter was sent to SPTC officials on April 8, 1993 requesting such a use. The letter contained a set of plans and a draft joint use agreement. To date, we have not received a response from SPTC.

Three issues were raised:

1. If land is donated, will the individual making the donation be eligible for a tax break, if so how much? Michael McNulty replied that the individual making the donation would be eligible for a tax break, the amount of the tax break would depend on the current tax laws.

2. Representatives from the school, and Town Council expressed concern about the channel on the south side of the school. They stated that placing the channel at this location would make future expansion of the school difficult. They asked if we would consider placing the channel on the north side of Queen Creek Road, from the east side of the school to Ellsworth, and west of Ellsworth place the channel on the section line since there was no road dedication west of Ellsworth. I replied that we will investigate this alignment and meet with them when results are available.

3. Mr. Barnes had concerns about the size of the channel. Specificly the channel from SPTC to the school. In this reach the proposed channel is 91 feet wide. I indicated to him that the width of the channel is dictated by hydraulics and design criteria. I stated that it might be possible to reduce the width of right-of-way required by jointly utilizing a farm road for maintenance road, and, if this section of channel is relocated to the north side of Queen Creek Road, the contributing sub-area would change slightly and could alter the required capacity for this reach of the channel.

Overall the response to the project was positive. I agreed to meet with the residents in approximately four weeks to present the results of our investigation of placing the channel on the north side of Queen Creek Road.

MEETING ATTENDANCE ROSTER

Meeting: Ritterhouse Drainage Improvement Project Location: Queen Creek

Date: 4/20/93

Name	Title	Organization	Phone
Scott Clemmer	Project Manager	FCD	506-4768
Tom Ikeda	Landowner		964-2865/833-2133
A. Douglas	Landowner	Harris Cattle Co	988-1587
Ralph Pomeroy	Supt.	Queen Creek School	987-9600
Linda Passey	Landowner		
Jackie Hale	Landowner		
Philip Barnes	Landowner		987-3648
Jim Mills	Landowner		
Richard [illegible]	Landowner	WES-Geo	[illegible]
[illegible]	Manager	[illegible]	[illegible]
Dan [illegible]	Landowner	WES-Geo	987-9542
[illegible]		[illegible]	

6910-004

Appendix I
Utility Coordination Correspondence

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT Flood Control District	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 1 OF	
	DESIGN FOR Utility Coordination	DESIGNER JLK	DATE 6/8/93
		CHECKER RDS	DATE 6/93

Utility Co.	Response	
	No Facilities In Area	Utilities In Area / Comments
City of Mesa		See attached letter - design comments
Dimension Cable	X	—
SRP Water Service	X	—
Santa Fe Pacific Pipeline Partners, L.P.		Horizontal data appears corrected. Contact Mr. R.R. Spencer @ 602-889-4474 for potholing
SRP Power		Conflicts at Power, Sossaman and Germann - all above ground. Underground or Overhead conflicts may exist at Queen Creek Rd.
Southwest Gas Corp.		See letter from S.W.G to County
U.S. West		Major Conflicts between Sossaman & Power Road. See plans & letters.
Southern Pacific Transport Co.	X	
Queen Creek Water Co.		Just Ellsworth waterline - This is a dead end waterline.

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT Flood Control District	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 2 OF	
	DESIGN FOR Utility Coordination	DESIGNER JLK	DATE 6/8/93
		CHECKER RDS	DATE 6/93

Utility Co.	Response	
	No Facilities In Area	Utilities In Area / Comments
Queen Creek Irrigation Co.		24" Pipe on West Side of Ellsworth
Insight Comm., Cable	X	
U.S. Sprint	X	Closest line on Southside of Rittenhouse Road.
Town of Gilbert	X	
El Paso Natural Gas	X	
Arizona Public Service Co.	X	
MCI Tele.	X	Line South of R.R. - See Plans.
Williams Redevelopment Partnership		- Send to Coffman and Assoc.
Cable America	X	

CITY OF
MESA

APR 1993
RECEIVED
GANNETT FLEMING

April 15, 1993

Gannett Fleming
3001 East Camelback Road, Suite 130
Phoenix, Arizona 85016-4498

Subject: Review of Rittenhouse Road Flood Control Channel

Gentlemen;

We have reviewed the Conceptual Design Layout of the above listed channel and offer the following comments.

1. Depths of underground utilities should be verified to ensure adequate cover after channel is constructed.

2. The "Side Collector Channel" seems to be unnecessary. Why not direct flows directly into the main channel?

3. At approximately station 125 to 126 there is a large depressed area on the north side of the channel which will pond water.

4. The Box Culverts under Power, Germann, and Sossaman should be constructed to the ultimate width of these roadways. With Williams Air Force Base transitioning to a public airport these roads may be widened in the near future.

5. Addition detail should be shown on the rip-rap sections.

6. The plans do not show landscaping. Is there landscaping planned for this channel?

Engineering
20 East Main Street, Suite 400 • P.O. Box 1466 • Mesa, Arizona 85211-1466 • (602) 644-2251

printed on recycled paper

7. The very flat slope of the proposed channel could result in ponding areas and vegitation growth like experienced on the East Maricopa Floodway. We recommend the channel be constructed with a concrete lining to avoid this problem.

We appreciate the opportunity to review these plans and look forward to reviewing the final plans.

Sincerely,

Harry Kent

Harry Kent, P.E.
City Engineer

fleming.prr

DIMENSION
CABLE SERVICES

17602 N. Black Canyon Hwy. Phoenix, AZ 85023 (602) 866-0072

TO: WHOM IT CONCERNS

RE: RITTENHOUSE RD. FLOOD CONTROL CHANNEL
JOB NO. 28835.030

JUN 1993
RECEIVED
GANNETT FLEMING

IN REGARDS TO THE ABOVE MENTIONED ADDRESS/PROJECT, WE HAVE NO CONFLICT IN THIS AREA AT THIS TIME.

IF I CAN BE OF FURTHER ASSISTANCE, PLEASE FEEL FREE TO CALL AT YOUR EARLIEST CONVENIENCE. I CAN BE REACHED AT 352-5860 EXT. 155.

* THIS IS NOT A DIMENSION CABLE SERVICE AREA.

THANK YOU,

6-1-93
DATE

CARL MCKAY
UTILITY LIAISON
ENGINEERING DEPARTMENT
DIMENSION CABLE
115 N. 51ST AVE.
PHOENIX, AZ. 85043

Salt River Project

WE WATER ENGINEERING

Salt River Project
1521 N. Project Drive
Tempe, AZ 85281-1213

Mailing Address:
P.O. Box 52025
Phoenix, AZ
85072-2025

FAX: (602) 236 - 2737

LETTER OF TRANSMITTAL

To:

COMPANY	DATE
GANNETT FLEMING	4-12-93
3001 E. CAMELBACK RD Ste 130	
PHX AZ 85016-4498	
ATTENTION: J.K.	

From:

NAME	PHONE
ROBERT MAURER	236- 2962

Reference:

SUBJECT	JOB/FILE NO.
R. HEARHOUSE RD - FLOOD CHANNEL	28835.030

Transmitted for:

( ) APPROVAL
(X) YOUR INFO & USE
(X) AS REQUESTED
( ) REVIEW AND COMMENT
( ) REQUESTED INFORMATION
RECORD DRAWINGS

( ) RETURNED FOR CORRECTIONS
( ) RESUBMIT _____ COPIES FOR APPROVAL
( ) SUBMIT _____ COPIES FOR DISTRIBUTION
( ) APPROVED
( ) OTHER

Remarks:

OUTSIDE SRP WATER SERVICE AREA - NO CONFLICT.

APR 1993
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GANNETT FLEMING

Santa Fe Pacific Pipeline Partners, L.P.
888 South Figueroa Street, Los Angeles, California 90017
213/486-7780 FAX 213/486-7724

Santa Fe Pacific Pipelines, Inc.
General Partner

SFPP, L.P.
Operating Partnership

Don R. Quinn
Manager
Pipeline Engineering

April 15, 1993

ENG 4-2-1 (38.4, 53)

Gannett Fleming
Engineers and Planners
3001 E. Camelback Rd.
Suite 130
Phoenix, AZ 85016-4498

Gentlemen:

This is in reply to your letter of transmittal dated March 26, 1993, regarding Rittenhouse Road Flood Control Channel.

The conceptual plans appear to conform with our alignment sheets regarding the location of SFPP facilities. Information regarding exact facility location and depth may be obtained through Mr. R. R. Spencer, SFPP District Manager, at (602) 889-4474.

Please keep us informed as the project progresses. Questions or comments may be directed to Mr. G. T. Reed at (213) 486-7736.

Sincerely yours,

D. R. Quinn

GTR/rmm

APR 1993
RECEIVED
GANNETT FLEMING

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835
SPOKE WITH: George Reed	COMPANY NAME: Sante Fe Pacific Pipeline Partners, LP
TELEPHONE NUMBER: 213-486-7736	DATE: 4/20/93 TIME: 9:07 AM

SUBJECT: Utility Locations shown on plans & response letter dated 4-15-93

ITEM(S) DISCUSSED: Mr. Reed stated that only response at this time is (per letter) that the plans appear to be correct. Potholing of the utilities, when required, should be requested through Mr. Spencer who will arrange the potholing.

COPIES TO: RDS	ACTION: Write memo & file.
COPY JOB FILE NUMBER:	

rll:1/22/93

SALT RIVER PROJECT
POST OFFICE BOX 52025
PHOENIX, ARIZONA
85072-2025
(602) 236-5900

June 11, 1993

Jim Karry
Gannett Fleming of Arizona, Inc.
3001 E. Camelback Road, Suite 130
Phoenix, AZ 85016-4498

Dear Mr. Karry:

SUBJECT: Rittenhouse Channel - East Maricopa Floodway to Ellsworth Road, Flood Control District of Maricopa County Project No. 92-13; SRPD Ref. No. TRK71896; PLANS: STORM DRAIN CHANNEL; Location: 35 1/2E-5 7/7S to 39 3/8E-8S.

For locations of SRPD underground power facilities in the field, call Blue Stake Center, 263-1100, four working days prior to excavation.

Existing SRPD overhead and underground power facilities.

Possible conflicts with SRPD overhead power facilities.

For SRPD pole bracing, call 236-6166. See attached SRPD overhead power line bracing recommendations and typical charges to be provided in the contractor job specifications.

See attached Electrical Hazard Exhibits A and B.

Comments:

Attached are the underground and overhead facilities maps for the area you requested in our 6/9/93 phone conversation. This is for the possible route under study as we discussed along Queen Creek Road from the east side of Queen Creek School to Ellsworth Road.

The overhead maps are not necessarily accurate enough for your needs. You will need to field verify the above ground facilities for your design. Also, the plans provided (red lined & highlighted copies attached) appear to indicate a conflict with the proposed channel & box culverts and SRPD pole & down guys at Sossaman Road. However, the scale is so large and the existing poles & guys which appear to be located by means of aerial photograph are inconclusive.

Please provide more detailed information in order to determine if there is indeed a conflict. Project schedule information will be needed to schedule SRPD design and construction if relocations are necessary.

JUN 1993
RECEIVED
GANNETT FLEMING

The conflicts and notes should be considered a guide to, but not an exact location of, our existing power facilities.

Should you have any questions, please contact me at 236-6136.

Sincerely yours,

Larry Neil

Larry Neil - Municipal Project Leader
Distribution Design-EVS107

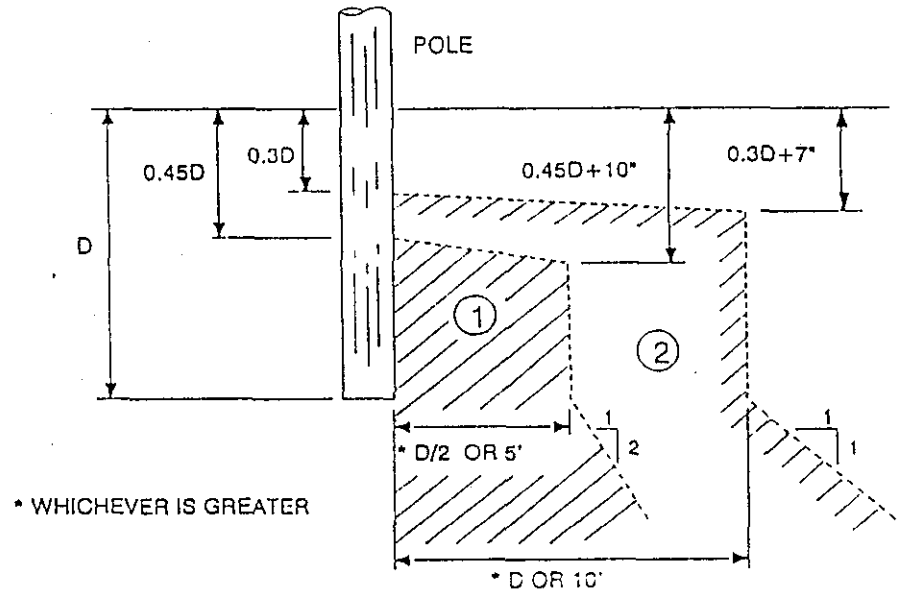
LKN:CLTRFCD
Attachments

cc: Jan Staedicke-FCDMC

TANGENT POLE BRACING REQUIREMENTS

(OSHA SOIL TYPES A & B ONLY)

TOTAL POLE LENGTH, L (FEET)	TYPICAL SETTING DEPTH, D (FEET) (EXCEPT IN ROCK STRATA)
FROM 0 TO 50	D = 0.1L + 2.0
FROM 55 TO 85	D = 0.1L + 1.5
GREATER THAN 85	D = 0.1L + 1.0



* WHICHEVER IS GREATER

(1) ZONE REQUIRES BRACING. IF EXPOSURE IS LESS THAN ONE DAY, A CRANE MAY BE USED TO BRACE POLE.

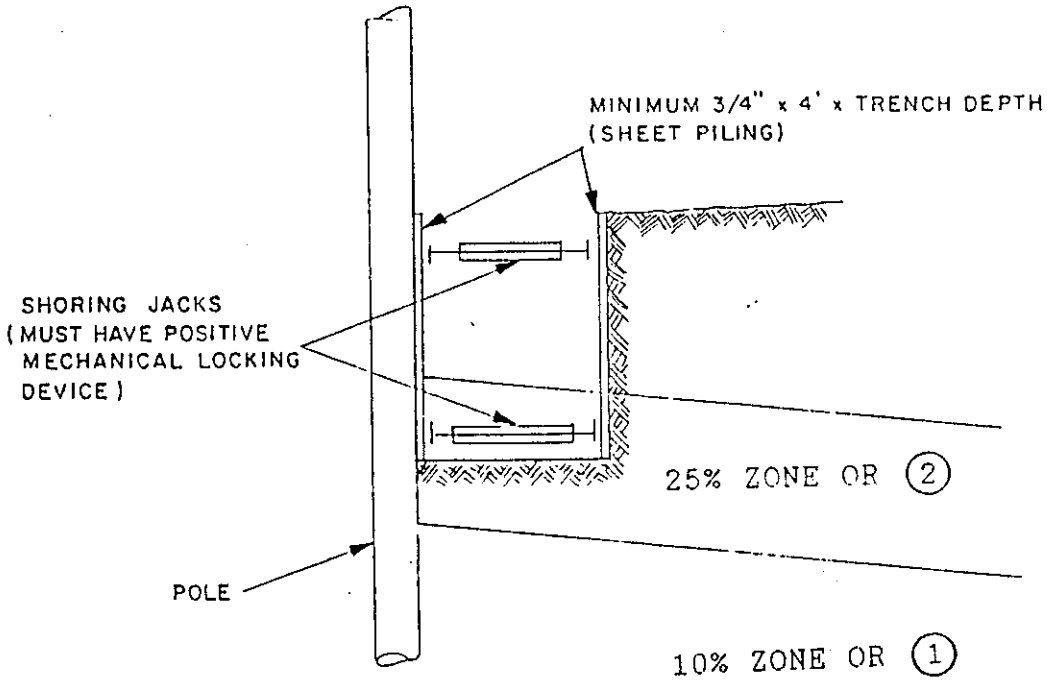
(2) ZONE REQUIRES BRACING IF EXPOSURE IS GREATER THAN ONE WORKDAY. BACKFILL AND COMPACTION MUST COMMENCE IMMEDIATELY AFTER WORK IS COMPLETE. ALL *EXPOSED POLES MUST BE BACKFILLED AND COMPACTED PRIOR TO LEAVING JOBSITE.* COMPACTION SHALL BE PER SRP ELECTRICAL DISTRIBUTION CONSTRUCTION STANDARD 6-303. FOR SINGLE EXPOSED POLE PROJECTS, TRENCH MAY BE LEFT OPEN OVERNIGHT ONLY IF TRENCH IS FULLY SHORED AND SHEETED PER OSHA STANDARDS. SHORING MUST HAVE A POSITIVE MECHANICAL LOCKING DEVICE.

NOTES:
(I) CONTACT SRP DISTRIBUTION LINE DESIGN FOR EXCAVATION NEAR DEAD END OR ANGLE POLES
(II) CONTACT SRP TRANSMISSION LINE DESIGN FOR EXCAVATION NEAR ANY TRANSMISSION LINE POLE
(III) CONTACT SRP CIVIL ENGINEERING IF SOILS ARE TYPE "C"
(IV) THESE REQUIREMENTS ARE FOR PROTECTION OF SRP FACILITIES ONLY. ADDITIONAL SHORING MAY BE REQUIRED FOR PERSONNEL PROTECTION.
(V) ALL POLE BRACING INSTALLED BY SRP SHALL BE AT THE CONTRACTOR'S EXPENSE (PER SRP COMPATIBLE UNITS STANDARDS G30T-G45T).

THE REQUIREMENTS SHOWN ON THIS DRAWING ARE FOR NORMAL TRENCHING TECHNIQUES AND NORMAL DEPTHS ENCOUNTERED. DIFFERENT TECHNIQUES, SOIL CONDITIONS, AND UNUSUAL DEPTHS MAY NECESSITATE MORE OR LESS STRINGENT REQUIREMENTS.

OH1571 Bracing Requirements When Trenching and Excavating Near Power Poles (Cont'd)

SHORING EXAMPLE:



td-ma2705b-0285

ORIG.	RH/MD
APP.	[illegible]
DATE	4-16-86

M E M O R A N D U M
SALT RIVER PROJECT

DATE: May 11, 1993

TO: Those Concerned

FROM: Larry Neil - Distribution Design/EVS107, Ext. 6136

RE: Standard Pole Bracing Charges

The typical charges for the bracing of Salt River Project transmission and distribution poles are as follows:

	TRANSMISSION POLES	DISTRIBUTION POLES
Single Pole	$1631.00/pole	$1250.00/pole
Two Poles	$1631.00/pole	$1250.00/pole
Three or More Poles	$1631.00/pole	$1250.00/pole

The charges have been published in the SRP Administrative Procedures Manual with reference to DOCUMASTER. These changes are base on periodic review of actual cost experience by Technical Services Division. The charges are to be used as follows:

1. Where poles are brace according to the temporary bracing standard G30T-G45T (on back of this page).

2. As a firm quote to contractors requesting information for bidding purposes.

3. For the prepayment of charges in advance of work to be performed by SRP.

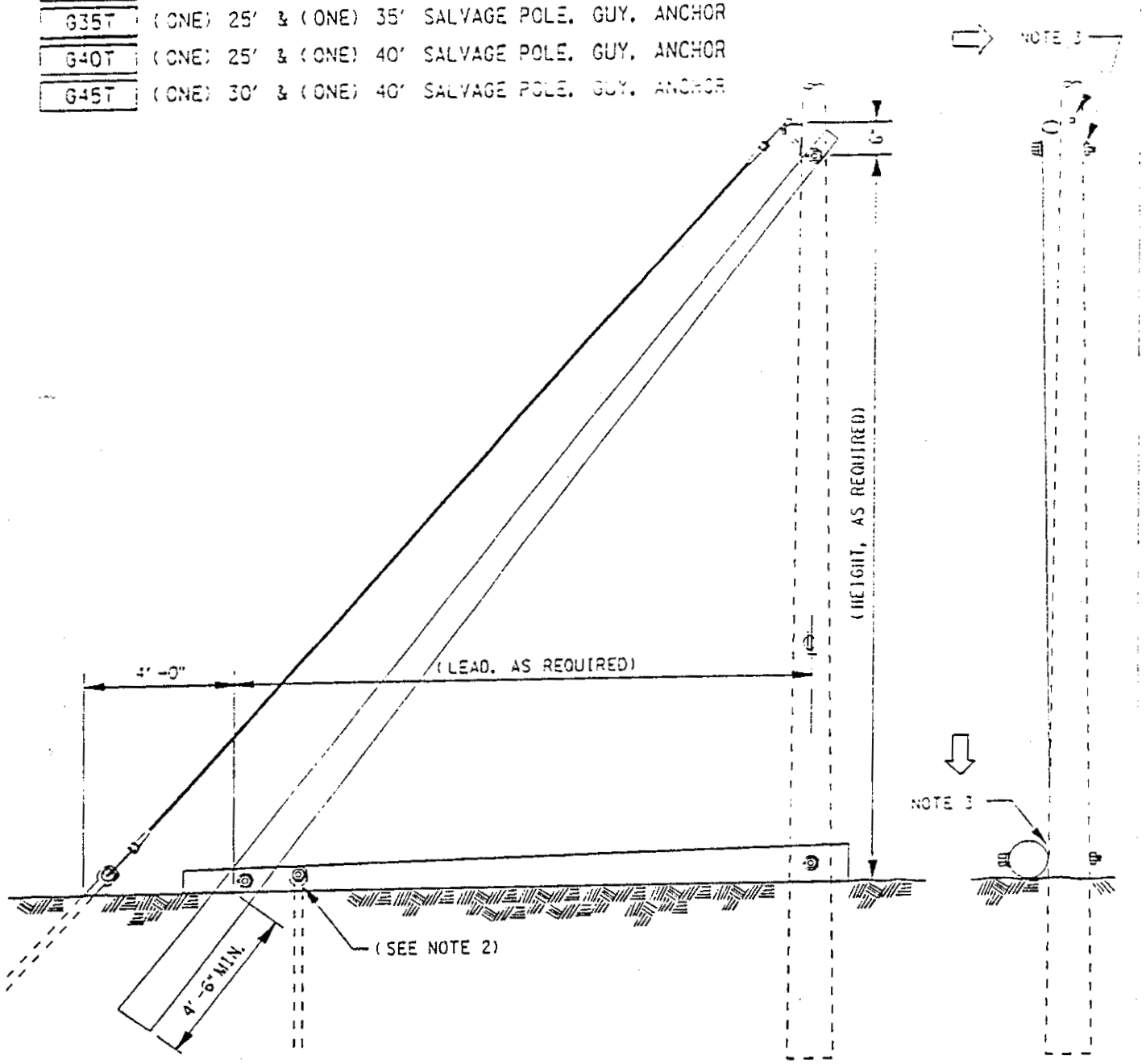
Costs are subject to change based on a review of data at approximately six-month intervals. For further information refer to APM No. 3. 4.1 Attach 6.

Larry Neil

Larry Neil - Distribution Design/EVS107, Ext. 6136

LKN:STDCOST

G30T	(ONE) 20' & (ONE) 30' SALVAGE POLE, GUY, ANCHOR
G35T	(ONE) 25' & (ONE) 35' SALVAGE POLE, GUY, ANCHOR
G40T	(ONE) 25' & (ONE) 40' SALVAGE POLE, GUY, ANCHOR
G45T	(ONE) 30' & (ONE) 40' SALVAGE POLE, GUY, ANCHOR



NOTES:

1. TEMPORARY SUPPORT FOR EXCAVATION IN LOOSE SOIL ADJACENT TO POLE.
2. AS AN ALTERNATIVE TO USING GUY WIRE, ANCHOR MAY BE INSTALLED VERTICALLY AND BOLTED TO HORIZONTAL BRACE.
3. PLUG HOLES IN LINE POLE AFTER REMOVAL OF BRACING WITH PLUGS 53-5130.

REV. 3 | ADDED NOTE 3 & CHANGED TITLE. | 02/15/91 | 05/12/77

DES. ACI
DR. BED/
APP.
DATE

SALT RIVER PROJECT

ELECTRIC DISTRIBUTION CONSTRUCTION STANDARDS

POLE GUYING AND BRACING

TEMPORARY WOOD POLE BRACING

G30T-G45T

515

E X H I B I T A

NOTE: The Salt River Project Agricultural Improvement and Power District (District) maintains energized aerial electrical power lines in the immediate vicinity of this project. Do not consider these lines to be insulated. Construction personnel working in proximity to these lines are exposed to an extreme hazard from electrical shock. Contractors, their employees, and all other construction personnel working on this project must be warned of the danger and instructed to take adequate protective measures, including maintaining following minimum clearances between the lines and all construction equipment and personnel:

1. For persons or any tools or materials used by such persons:
   a. for lines rated 50kV or less, six feet of clearance.
   b. for lines rated over 50kV, six feet plus 4/10 of an inch for each kV over 50kV.
2. For mechanical equipment or hoisting equipment, or any load of such equipment, any part of which is capable of vertical, lateral or swinging motion:
   a. for lines rated 50kV or less, ten (10) feet of clearance.
   b. for lines rated over 50kV, ten (10) feet plus 4/10 of an inch for each kV over 50kV.

See A.R.S. 40-360.42

Contractors must promptly notify the District at 236-8888 to arrange to have the necessary safety precautions undertaken before commencing any work. See A.R.S. 40-360.43. The cost of such arrangements will be borne by the Contractor. The District can often respond to such requests if two (2) days advance notice is given, but some situations may require up to sixty (60) days lead time for relocation or other arrangements.

EXHIBIT B

NOTE: The Salt River Project Agricultural Improvement and Power District (District) maintains certain energized, underground electrical power lines in the immediate vicinity of this project, and these lines have been noted herein as potential conflicts. These power lines represent an extreme hazard from electrical shock to any construction personnel or equipment coming in contact with them. Arizona Law requires all parties planning excavations to contact all utility firms for location of their underground facilities. See A.R.S. 40-360.22. Contractors should call the Blue Stake Center at (263-1100) for such location service. Contractors, their employees, and all other personnel working near any underground power lines must be warned to take adequate protective measures. (See: OSHA Standard 1926-651(a)). As an additional safety precaution, Contractors should also call the Salt River Project at 236-8888 to arrange, if possible, to have these lines de-energized when the work reaches their immediate vicinity. The cost of such temporary arrangements would be borne by the Contractor. If de-energization is feasible, the Contractor must give the Salt River Project at least two (2) days' advance notice of their requirement. Contractors must, after proper location and marking of underground utility lines, make any excavations in a careful, prudent manner. Failure to do so may result in liability for any damages to the utility or third parties. See A.R.S. 40-360.23.

EXHIBITB.DOC

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835
SPOKE WITH: Larry Neal	COMPANY NAME: SRP Power
TELEPHONE NUMBER: 236 - [redacted] 6136	DATE: 6-8-93 TIME: 2:40

SUBJECT: Rittenhouse Road Channel Utilitie

ITEM(S) DISCUSSED: 6-8 message

Called Back 6-8-93 @ 3:19 P.M. - Probably a few minor conflicts at Sossoman, Germann and Ellsworth, All facilities are above ground.

May be utility conflicts in Queen Creek Road.

COPIES TO:	ACTION:

COPY JOB FILE NUMBER:

rli:1/22/93

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
3335 West Durango Street
PHOENIX, ARIZONA 85009

(602) 262-1501

LETTER OF TRANSMITTAL

DATE	JOB NO.
6-14-93	92-13

ATTENTION: Jim Karey

RE: Rittenhouse Channel

TO Gannett Fleming
3001 E Camelback Rd, Suite 130
Phoenix Az 85016-4498

WE ARE SENDING YOU ☑ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☑ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
			Southwest Gas letter of 5-24-93

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☑ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☑ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 19 _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS _____

COPY TO _____

SIGNED: Jan M. Staedicke
506-8610

6910-009 3-90

If enclosures are not as noted, kindly notify us at once.

SOUTHWEST GAS CORPORATION

May 24, 1993

Jan Staedicke
Flood Control District
Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

Dear Ms. Staedicke:

Subject: Rittenhouse Channel - East Maricopa Floodway (EMF) to Ellsworth Road
Project #92-13

Southwest Gas Engineering Technician Terry Hughes has completed preliminary review of the above referenced project plans sent to us on April 16, 1993. Southwest Gas electronic locating equipment data gathered in the field on May 5, 1993, shows conflicts with this proposed canal installation and existing gas mains at three crossings. These are located at the crossings as indicated on your plans at Power Road, Sossman Road and Ellsworth Road. Each of the three conflicts sites will require gas main replacements of approximately 175 linear feet. As you mentioned in your phone conversation with Terry Hughes on May 10, 1993, all costs of required gas main construction will be paid by Maricopa County Flood Control District, based on actual Southwest Gas construction costs.

Thank you for your cooperation on this project, please feel free to contact Terry Hughes at 484-5257, or myself if you have any questions or require additional information.

Sincerely,

Ronald P. Morency

Ronald P. Morency
Distribution Engineer
Mail Station 420-586
(602) 484-5306

hrg

FLOOD CONTROL DISTRICT
RECEIVED
JUN 01 1993
CH ENG | P & PM
DEP
ADMIN
FINANCE
REMARKS

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835
SPOKE WITH: Terry Hughes	COMPANY NAME: S.W. Gas
TELEPHONE NUMBER: 484-5257	DATE: 6-14-93 TIME: 8:45

SUBJECT: Rittenhouse Channel

ITEM(S) DISCUSSED: - Conflict letter was sent to Jan Stadecke at the F.C.D.

He anticipates several vertical realignments.

Contacted Jan Stadecke at FCD and she will send a copy of the S.W. Gas letter

COPIES TO:	ACTION:
COPY JOB FILE NUMBER:	

rll:1/22/93

Tempe, Arizona
April 30, 1993

U S WEST
COMMUNICATIONS

Ms. Jan Staedicke, Utility Coordinator
Flood District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Re Rittenhouse Channel - East Maricopa Floodway to Ellsworth Road
FCD Project No. 92-13
U S WEST Log No. 40921, AUCC Step 12

Dear Ms. Staedicke:

Our Design Manager, Sam Banulis, has reviewed the 30% plan submittal for the project referenced above. Red-lined plans indicating the approximate location of U S WEST's existing copper and fiber optic cable facilities within the project limits were sent to Mr. James Kary of Gannett Fleming. We also noted the proposed location of channel encroaches directly upon U S WEST's private easement which will require a total relocation of our existing facilities.

Enclosed is documentation supporting our claim of prior property rights. Please review this evidence and advise your concurrence Upon your acceptance of our claim, we will prepare cost estimates and billing agreements for reimbursement. In addition, we wish you to consider providing a like private easement for U S WEST's relocated facilities. Securing such easement may be less difficult, less expensive and more timely done during acquisition for right-of-way for the channel. Please advise.

Questions on this matter may be directed to my office at 831-4777 or you may contact Mr. Banulis at 831-4882.

Sincerely,

C.C. Sayer, Manager - Liaison
Public Projects Coordination
Network & Technology Services

Enclosure

cc: S. Banulis - U S WEST
J. [illegible] - U S WEST
J. Kary - Gannet Fleming

Tempe, Arizona
April 30, 1993

U S WEST
COMMUNICATIONS

Mr. James L. Kary,
Gannett Fleming of Arizona, Inc.
3001 East Camelback Road, Suite 130
Phoenix, Arizona 85016

Re: Rittenhouse Road Flood Control Channel
Maricopa County Flood Control District Project 92-13
U S WEST Log No. 40909, AUCC Steps 5-9

Dear Mr. Kary:

The conceptual plan submittal for the project referenced above has been reviewed by our Design Manager, Sam Banulis. U S WEST has direct buried copper and fiber optic cables within the project limits. As proposed, the subject Flood Control Channel encroaches directly upon U S WEST's private easement. This will necessitate a complete relocation of our facilities out of the path of the channel. Our easement constitutes a prior property right for which the Flood Control District will be required to provide 100% reimbursement for relocation costs and provide U S WEST with an in kind private easement for the relocated facilities.

Enclosed is a red lined plan set indicating the approximate location of our facilities as they now exist. Documents providing evidence of our prior rights will be forwarded to the Flood Control District. As soon as the District confirms these rights for reimbursement, we will prepare cost estimates.

Questions on this matter may be directed to my office at 831-4777 or you may contact Mr. Banulis at 831-4882.

Sincerely,

C.C. Sayer, Manager - Liaison
Public Projects Coordination
Network & Technology Services

Enclosure

cc: S. Banulis - U S WEST
J. Sayer - U S WEST
J. Blackstone - MCFCD

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835.
SPOKE WITH: Sam Banulis	COMPANY NAME: U.S. West
TELEPHONE NUMBER: 831-4882	DATE: 4-26-93 TIME: 2:18

SUBJECT: Ritten house Channel

ITEM(S) DISCUSSED:

1. Telephone Line from Power to Germann Rds. may have to be relocated.

2. Line is old but has been upgraded with signal equipment for a special use by SRP.

3. Sam will send "Rough" estimates for relocation.

4. Strongly suggest potholing to determine depth of telephone lines. Probably is 24"-30" deep.

5. Requested a copy of this phone memo.

6. U.S. West has a private easement for the telephone line.

COPIES TO: Sam Banulis	ACTION: Inform RDS & Scott Clement.

COPY JOB FILE NUMBER:

rli:1/22/93

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835
SPOKE WITH: Doug Pfeifer	COMPANY NAME: Southern Pacific Transport Co.
TELEPHONE NUMBER: 602-629-2249	DATE: 6-8-93 TIME: 2:30

SUBJECT: Rittenhouse Channel

ITEM(S) DISCUSSED: Message 6-8-93 Called 6-9-93

To best of Knowledge everything was o.K. on Utility drawing.

COPIES TO:	ACTION:

COPY JOB FILE NUMBER:

rll:1/22/93

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835
SPOKE WITH: Paul Gardner	COMPANY NAME: Queen Creek Water
TELEPHONE NUMBER: 987-3240	DATE: 6-8-93 TIME: 2:45

SUBJECT: Ritten house Channel

ITEM(S) DISCUSSED: 6-8-93 Message

Ellsworth Road West Side 8" Plastic Pipe
21-22' off centerline

Telephone lines must be relocated

May allso be gas line on East Side of Ellsworth.

COPIES TO:	ACTION:

COPY JOB FILE NUMBER:	

rli:1/22/93

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835.030
SPOKE WITH: Roland Faucett	COMPANY NAME: Insight Cable
TELEPHONE NUMBER:	DATE: 4/8/93 TIME: 2:15

SUBJECT: Utilities Conflicts

ITEM(S) DISCUSSED: No conflicts with project. Closet line is at Reckert Ray Road or 1/4 mile North of Williams Air Force Base Tower. (Recieved plans mailed 4/7/93 today)

CABLE AMERICA may have Lines in the area

COPIES TO:	ACTION: File with Utility data
COPY JOB FILE NUMBER:	

rll:1/22/93

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835
SPOKE WITH: Dean Griffiths	COMPANY NAME: Queen Creek Irrigation
TELEPHONE NUMBER: 987-3002	DATE: 6-8-93 TIME: 2:58

SUBJECT: Rittenhouse Channel Utilities

ITEM(S) DISCUSSED:

Only conflict will be existing 24" concrete Irrigation Line on West Side of Ellsworth.

Pipeline belongs to B.O.R. until Irrigation Co. Finalizes Payment.

Call 6-9 For B.O.R. Contact.
Nancy Seale 870-6733 Real Estate Division

COPIES TO:	ACTION:

COPY JOB FILE NUMBER:

rll:1/22/93

SPRINT FIBER OPERATIONS
401 West Harrison St.
Phoenix, Az 85003
(602) 254-3798
April 15, 1993

Gannett Fleming
3001 East Camelback Road
Suite 130
Phoenix AZ 85016-4498

Re: Rittenhouse Rd. Flood Control Channel

Dear Gentlemen,

Thank you for your recent communication regarding the above project. In reviewing your letter I find that Sprint does not have any facilities in the area described. Our cable is placed on the south side of Rittenhouse Road.

If I can be of further assistance to you on this or future projects please contact me at (602)254-3798.

Thank you for your consideration.

Sincerely,

Marvin R. Gibson

Marvin R. Gibson
Fiber Operations Supervisor

MRG/JL
CC: Phoenix file/NCJL.321

APR 1993
GANNETT FLEMING

Gannett Fleming
ENGINEERS AND PLANNERS

Suite 130
3001 East Camelback Road
Phoenix, AZ 85016-4498

Tel: (602) 553-8817
Fax: (602) 553-8816

LETTER OF TRANSMITTAL

DATE	JOB NO. 28835.030
RE: Rittenhouse Rd. Flood Control Channel	

TO El Paso Natural Gas
7815 S 48th St.
Phoenix, Az. 85044

ATTN: Bill Ward

WE ARE SENDING YOU
- ☐ Shop drawings
- ☐ Copy of letter
- ☐ Attached
- ☒ Prints
- ☐ Change order
- ☐ Under separate cover via _____ the following items:
- ☐ Plans ☐ Samples ☐ Specifications
- ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1	3-26-93	12	Conceptual Design layout showing utilities,
			Easement + R.O.W.

APR 1993
RECEIVED
GANNETT FLEMING

THESE ARE TRANSMITTED as checked below:

- ☒ For approval
- ☐ For your use
- ☐ As requested
- ☐ For review and comment
- ☐ FOR BIDS DUE _____ 19 _____
- ☐ Approved as submitted
- ☐ Approved as noted
- ☐ Returned for corrections
- ☐ _____
- ☐ Resubmit _____ copies for approval
- ☐ Submit _____ copies for distribution
- ☐ Return _____ corrected prints
- ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS Please review drawing to determine if all the information shown is correct and if additional data is required. Comments are due to Gannett Fleming by 4-28-93 for incorporation into final design package.

COPY TO

NO CONFLICT
El Paso Natural Gas Company
by
Right of Way Representative
4-16-93

GANNETT FLEMING OF ARIZONA, INC.

FILE:

SIGNED

If enclosures are not as noted, kindly notify us at once.

Orig: E.O. Nich
cc: Sender
Phx RW

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835
SPOKE WITH: Russ Hill	COMPANY NAME: Town of Gilbert
TELEPHONE NUMBER: 892-0800 (Eng.)	DATE: 6-8-93 TIME: 3:03

SUBJECT: Rittenhouse Channel

ITEM(S) DISCUSSED: Message 6-8-93

No. facilities in the area of the project.

COPIES TO:	ACTION:

COPY JOB FILE NUMBER:

rli:1/22/93

El Paso
Natural Gas Company

P. O. BOX 1492
EL PASO, TEXAS 79978
PHONE 915-541-[illegible]

April 23, 1993

APR 1993
RECEIVED
GANNETT FLEMING

Mr. James L. Kary
Engineers And Planners
Gannett Fleming of Arizona, Inc.
3001 East Camelback Road
Suite 130
Phoenix, Arizona 85016-4498

Re: R/W 930000 - Inquiry: Rittenhouse Road
Flood Control Channel (Job No. 28835.030)

Dear Mr. Kary:

El Paso Natural Gas Company has completed its review of the captioned and finds that its facilities will not be involved in this construction project.

Thank you for the opportunity to comment on your proposed project. Should you have any questions, please feel free to call.

Very truly yours,

Edwin O. Nichols
Administrator
Securities Group
Right of Way Department

MTS/142b

APS
Arizona Public Service Company
P. O. Box 53999
Phoenix, Arizona 85072-3999

COPY CENTER
FAX COVER SHEET

Today's Date: 4/8/93
Must be sent no later than: 2:00 pm (TIME)
Courier Box No.: A-1X

☐ **Confidential**

TO: FAX Number: (602) 553-8816 (AREA CODE) (NUMBER)

PLEASE DELIVER THE FOLLOWING FAX TO:

NAME:	FIRM: Gannett Fleming
CITY: Phoenix	STATE: Az

We are sending 1 pages, including this cover letter.

Comments: Your Job # 28835.030 - Rittenhouse Rd. Flood Control Channel -

There are no APS facilities involved in this project.

THIS FAX IS FROM: *(PLEASE COMPLETE **ALL** INFORMATION)*

NAME: Steve Goodman	APS DEPARTMENT: Proj. Eng.
STATION NUMBER: 3260	TELEPHONE NUMBER: 371-6965

If you don't receive all of the pages, please call:

☐ **(602) 250-3804** *(CHQ Fourth Floor)* ☐ **(602) 250-4990** *(411 Second Floor)* as soon as possible.

☐ **(602) 250-3814** *(CHQ Fourteenth Floor)* ☐ **(602) 340-4004** *(411 Fifth Floor)* as soon as possible.

☐ **(602) 371-6610** *(D.V. Copy Center)*

Sent By: _____ *Time Sent:* _____

Our FAX machine's telephone number is:

☐ [illegible] ☐ (602) 250-4999 [illegible] ☐ (602) 371-6612 [illegible]

☐ **(602) 250-3813** *(CHQ Fourteenth Floor)* ☐ **(602) 340-4002** *(411 Fifth Floor)*

WHITE COPY: Transmission Copy *(Copy Center Records)* • **CANARY COPY:** Return Copy *(Shows Time Sent)* • **PINK COPY:** Requestor's File Copy

X211-00GA Rev. 8-91

MCI Telecommunications
Corporation
27826 North 193rd Avenue
Wittmann, Arizona 85361
602 222 1200

April 12, 1993

Gannett Fleming
2001 E. Camelback Road
Phoenix, Arizona 85016-4498

Sirs,

Per ealier conversation, our fiber route is not in conflict with your project.

I have red lined the approximate location of MCI's cable for your information.

Thank You,

Gary Parr
Sr. Field Engineer
Network Operations

vlv

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835
SPOKE WITH: (Lynn Kusy) Art Allan	COMPANY NAME: Williams Redevelopment Partnership
TELEPHONE NUMBER: 988-1013	DATE: 4-26-93 TIME: 2:00 Pm

SUBJECT: Rittenhouse Rd Channel

ITEM(S) DISCUSSED: Plans have been passed to Coffman Associates who will be doing the Airport Master planning

(988-6018)

Should Joe Martin, Air Force Disposal Agency, Site Manager for W.A.F.B. since the Government will own this property until sold, leased, or given away.

COPIES TO:	ACTION: Informed RDS and H. Scott Clement

COPY JOB FILE NUMBER:

rli:1/22/93

Gannett Fleming
ENGINEERS AND PLANNERS

MEMORANDUM OF TELEPHONE CONVERSATION

RECORDED BY: Jim Kary	JOB NO.: 28835.030
SPOKE WITH: Dave Wilhelm	COMPANY NAME: Cable America
TELEPHONE NUMBER: 461-0715	DATE: 4-8-93 TIME: 2:30

SUBJECT: Rittenhouse Channel Utility Conflicts

ITEM(S) DISCUSSED: Does Cable America have utilities in the project Area.

Dave requested a set of plans so that they can confirm the location of the project.

Cable America
350 E. 10th Dr.
Mesa, Az. 85210

Called on 6-8-93, 6-9-93, 6-10-93, 6-14-93

No conflicts with the plans or with alternate D Alignment North of Queen Creek School and along the Queen Creek Rd alignment.

COPIES TO:	ACTION: Sent Plans to Cable America then Inform RDS + HSC.

COPY JOB FILE NUMBER:

rli:1/22/93

Appendix J
HEC-2 Output File for Alternate C
(With C-3B Alignment)

```
*****************************************
* HEC-2 WATER SURFACE PROFILES          *
*                                       *
* Version   4.6.2;  May 1991            *
*                                       *
* RUN DATE    19AUG93    TIME   10:14:45 *
*****************************************
```

```
*************************************
* U.S. ARMY CORPS OF ENGINEERS      *
* HYDROLOGIC ENGINEERING CENTER     *
* 609 SECOND STREET, SUITE D        *
* DAVIS, CALIFORNIA 95616-4687      *
*         (916) 756-1104            *
*************************************
```

```
X     X  XXXXXXX   XXXXX             XXXXX
X     X  X       X     X           X     X
X     X  X       X                       X
XXXXXXX  XXXX     X         XXXXX    XXXXX
X     X  X       X                 X
X     X  X       X     X           X
X     X  XXXXXXX   XXXXX            XXXXXXX
```

THIS RUN EXECUTED 19AUG93 10:14:45

```
************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
************************************


T1      RITTENHOUSE CHANNEL     FCDMC CONTRACT NO. 92-13       GF JOB NO. 28835
T2      FROM QUEEN CREEK SCHOOL TO THE EAST MARICOPA FLOODWAY
T3      RITTENHOUSE CHANNEL NO. 1

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0        0        0        0     1047    18.71        0

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

     -1        0       -1        0        0        0        0        0        0        0


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150                  38        43        26         8         5         1

J5  LPRNT    NUMSEC                  ********REQUESTED SECTION NUMBERS********

    -10      -10

QT       1      1047
NC   0.035     0.035     0.035       0.6       1.0
         SECTION LOCATED IN THE  EMF AT THE OUTLET OF THE PROPOSED CHANNEL
         SECTION NO.'S ARE BY STATION ALONG THE PRELIMINARY BASELINE
X1    1093         4        12     109.2         0         0         0         0         0         0
GR   20.17        12     12.77      37.6     12.77      79.6     20.17     109.2


X1    1119         6        12     109.2        26        26        26         0         0         0
GR   20.18        12     13.78      37.6     13.78      67.6     12.78      71.6     12.78      79.6
GR   20.18     109.2


NC   0.027     0.027     0.027       0.1       0.3
X1    1150         6        12     109.2        31        31        31         0         0         0
GR    20.2        12      13.8      37.6      13.8      67.6      12.8      71.6      12.8      79.6
GR    20.2     109.2


X1    1450         6        12     109.2       300       300       300         0         0         0
GR   20.36        12     13.96      37.6     13.96      67.6     12.96      71.6     12.96      79.6
GR   20.36     109.2

       P.C. OF DOUBLE CUVERS
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X1    1739      6      12     109.2     289      289      289      0      0      0
GR    20.5     12    14.1      37.6    14.1     67.6     13.1     71.6   13.1   79.6
GR    20.5   109.2

      P.R.C. OF DOUBLE CURVES

X1    1887      6      12     109.2   167.38   126.67   147.03      0      0      0
GR   20.57     12   14.17      37.6   14.17     67.6    13.17     71.6  13.17   79.6
GR   20.57   109.2

      P.T. OF DOUBLE CURVES

X1    2034      6      12     109.2   126.67   167.38   147.03      0      0      0
GR   20.65     12   14.25      37.6   14.25     67.6    13.25     71.6  13.25   79.6
GR   20.65   109.2


NC   0.035   0.035   0.035
X1    2048      6      12     109.2       14       14       14      0      0      0
GR   20.66     12   14.26      37.6   14.26     67.6    13.26     71.6  13.26   79.6
GR   20.66   109.2


X1    2099      6      12     109.2       51       51       51      0      0      0
GR   22.62     12   14.28      37.6   14.28     67.6    13.28     71.6  13.28   79.6
GR   22.62   109.2


X1    2100      8      12     109.2        1        1        1      0      0      0
GR   22.68     12   22.68      44.00  16.28     45.6    16.28     59.6  15.28   63.6
GR   15.28   71.6   22.68      73.45  22.68    109.2


X1    2120      6      12     109.2       20       20       20      0      0      0
GR   22.69     12   16.29      37.6   16.29     67.6    15.29     71.6  15.29   79.6
GR   22.69   109.2


X1    2121      6      12     109.2        1        1        1      0      0      0
GR   22.69     12   16.29      37.6   16.29     67.6    15.29     71.6  15.29   79.6
GR   22.69   109.2

      P.C. OF DOUBLE CURVES

X1    2346      6      12     109.2   245.13   245.13   245.13      0      0      0
GR    22.8     12    16.4      37.6    16.4     67.6     15.4     71.6   15.4   79.6
GR    22.8   109.2

      P.R.C. OF DOUBLE CURVES
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X1    2493      6      12     109.2    126.67    167.38    147.03      0       0       0
GR   22.87     12   16.47      37.6     16.47      67.6     15.47   71.6   15.47    79.6
GR   22.87  109.2

      P.T. OF DOUBLE CURVES

X1    2640      6      12     109.2    167.38    126.67    147.03      0       0       0
GR   22.95     12   16.55      37.6     16.55      67.6     15.55   71.6   15.55    79.6
GR   22.95  109.2


X1    2847      6      12     109.2    206.82    206.82    206.82      0       0       0
GR   23.05     12   16.65      37.6     16.65      67.6     16.65   71.6   15.65    79.6
GR   23.05  109.2


NC   0.035  0.035   0.035
X1    2848      6      12     109.2         1         1         1      0       0       0
GR   23.05     12   16.65      37.6     16.65      67.6     16.65   71.6   15.65    79.6
GR   23.05  109.2


X1    2899      6      12     109.2        51        51        51      0       0       0
GR   26.02     12   16.68      37.6     16.68      67.6     15.68   71.6   15.68    79.6
GR   26.02  109.2


X1    2900      8      12     109.2         1         1         1      0       0       0
GR   26.08     12   26.08      44.00    19.68      45.6     19.68   59.6   18.68    63.6
GR   18.28   71.6   26.08     73.45    26.08     109.2


X1    2920      6      12     109.2        20        20        20      0       0       0
GR   26.09     12   19.69      37.6     19.69      67.6     18.69   71.6   18.69    79.6
GR   26.09  109.2


NC   0.027  0.027   0.027
X1    2921      6      12     109.2         1         1         1      0       0       0
GR   26.09     12   19.69      37.6     19.69      67.6     18.69   71.6   18.69    79.6
GR   26.09  109.2


X1    3300      6      12     109.2       379       379       379      0       0       0
GR   26.28     12   19.88      37.6     19.88      67.6     18.88   71.6   18.88    79.6
GR   26.28  109.2
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X1    3700      6      12    109.2     400     400     400       0       0       0
GR   26.48     12   20.08     37.6   20.08    67.6   19.08    71.6   19.08    79.6
GR   26.48  109.2

X1    4047      6      12    109.2     347     347     347       0       0       0
GR   26.65     12   20.25     37.6   20.25    67.6   19.25    71.6   19.25    79.6
GR   26.65  109.2

NC   0.035  0.035   0.035
X1    4048      6      12    109.2       1       1       1       0       0       0
GR   26.65     12   20.25     37.6   20.25    67.6   19.25    71.6   19.25    79.6
GR   26.65  109.2

X1    4099      6      12    109.2      51      51      51       0       0       0
GR   29.62     12   20.28     37.6   20.28    67.6   19.28    71.6   19.28    79.6
GR   29.62  109.2

X1    4100      8      12    109.2       1       1       1       0       0       0
GR   29.68     12   29.68     44.0   23.28    45.6   23.28    59.6   22.28    63.6
GR   22.28   71.6   29.68    73.45   29.68   109.2

X1    4120      6      12    109.2      20      20      20       0       0       0
GR   29.69     12   23.29     37.6   23.29    67.6   22.29    71.6   22.29    79.6
GR   29.69  109.2

NC   0.027  0.027   0.027
X1    4120      6      12    109.2       1       1       1       0       0       0
GR   29.69     12   23.29     37.6   23.29    67.6   22.29    71.6   22.29    79.6
GR   29.69  109.2

     SPEC. CULVERT FOR POWER RD. BOXES

X1    4271      6      12    109.2  150.14  150.14  150.14       0       0       0
GR   29.77     12   23.37     37.6   23.37    67.6   22.37    71.6   22.37    79.6
GR   29.77  109.2

NC   0.012  0.012   0.012     0.3     0.5
X1    4452      6    27.5     79.8   180.8   180.8   180.8       0       0       0
X3      10
GR   33.87   27.5   23.47     27.7   23.47    67.6   22.47    71.6   22.47    79.6
GR   33.87   79.8
```

SC	6.012	0.5	3.0	0	4.0	8.67	112	8.2	27.8	27.47
X1	4564	4	27.6	79.6	127	8.67	112	0	0	0
X2			2	31.8	34.9			0		
X3	10									
BT	-2	27.6	34.9	27.8	79.6	35				
GR	31.8	27.6	27.8	27.65	27.8	79.55	31.8	79.6		
NC	0.027	0.027	0.027	0.3	0.5					
X1	4609	6	12	109.6	38.96	51.52	45.24	0	0	0
GR	33.22	12	26.82	37.9	26.82	67.6	25.82	71.6	25.82	79.6
GR	33.22	109.6								

FIRST SECTION UPSTREAM OF BRIDGE - P.R.C. OF DOUBLE CURVES

QT	1	804								
X1	5041	6	12	95.2	380.22	482.8	431.51	0	0	0
GR	32.44	12	27.04	37.6	27.04	53.6	26.04	57.6	26.04	65.6
GR	32.44	95.2								

P.T. OF DOUBLE CURVES

X1	5266	6	12	95.2	251.52	198.38	223.89	0	0	0
GR	33.55	12	27.15	37.6	27.15	53.6	26.15	57.6	26.15	65.6
GR	33.55	95.2								
X1	5400	6	12	95.2	134.34	134.34	134.34	0	0	0
GR	33.62	12	27.22	37.6	27.22	53.6	26.22	57.6	26.22	65.6
GR	33.62	95.2								
X1	5800	6	12	95.2	400	400	400	0	0	0
GR	33.82	12	27.42	37.6	27.42	53.6	26.42	57.6	26.42	65.6
GR	33.82	95.2								
X1	5997	6	12	95.2	197	197	197	0	0	0
GR	33.92	12	27.52	37.6	27.52	53.6	26.52	57.6	26.52	65.6
GR	33.92	95.2								
NC	0.035	0.035	0.035							
X1	5998	6	12	95.2	1	1	1	0	0	0
GR	33.92	12	27.52	37.6	27.52	53.6	26.52	57.6	26.52	65.6
GR	33.92	95.2								

X1	6049	6	12	95.2	51	51	51	0	0	0
GR	36.89	12	27.55	37.6	27.55	53.6	26.55	57.6	26.55	65.6
GR	36.89	95.2								
X1	6050	8	12	95.2	1	1	1	0	0	0
GR	36.95	12	36.95	40.0	30.55	41.6	30.55	49.6	29.55	53.6
GR	29.55	62.1	36.95	63.95	36.95	95.2				
X1	6070	6	12	95.2	20	20	20	0	0	0
GR	36.96	12	30.56	37.6	30.56	53.6	29.56	57.6	29.56	65.6
GR	39.96	95.2								
NC	0.027	0.027	0.027							
X1	6071	6	12	95.2	1	1	1	0	0	0
GR	36.96	12	30.56	37.6	30.56	53.6	29.56	57.6	29.56	65.6
GR	39.96	95.2								
X1	6600	6	12	95.2	529	529	529	0	0	0
GR	37.23	12	30.83	37.6	30.83	53.6	29.83	57.6	29.83	65.6
GR	37.23	95.2								
X1	7000	6	12	95.2	400	400	400	0	0	0
GR	37.43	12	31.03	37.6	31.03	53.6	30.03	57.6	30.03	65.6
GR	37.43	95.2								
X1	7499	6	12	95.2	499	499	499	0	0	0
GR	37.68	12	31.28	37.6	31.28	53.6	30.28	57.6	30.28	65.6
GR	37.69	95.2								
NC	0.035	0.035	0.035							
X1	7500	6	12	95.2	1	1	1	0	0	0
GR	37.68	12	31.28	37.6	31.28	53.6	30.28	57.6	30.28	65.6
GR	37.68	95.2								
X1	7549	6	12	95.2	49	49	49	0	0	0
GR	40.64	12	31.3	37.6	31.3	53.6	30.3	57.6	30.3	65.6
GR	40.64	95.2								
X1	7550	8	12	95.2	1	1	1	0	0	0
GR	40.7	12	40.7	40.0	34.3	41.6	34.3	49.6	33.3	53.6
GR	33.3	62.1	40.7	63.95	40.7	95.2				

X1	7570	6	12	95.2	20	20	20	0	0	0
GR	40.71	12	34.31	37.6	34.31	53.6	33.31	57.6	33.31	65.6
GR	40.71	95.2								
NC	0.027	0.027	0.027							
X1	7570	6	12	95.2	20	20	20	0	0	0
GR	40.71	12	34.31	37.6	34.31	53.6	33.31	57.6	33.31	65.6
GR	40.71	95.2								
X1	7860	6	12	95.2	289	289	289	0	0	0
GR	40.86	12	34.46	37.6	34.46	53.6	33.46	57.6	33.46	65.6
GR	40.86	95.2								
X1	8147	6	12	95.2	287	287	287	0	0	0
GR	41.00	12	34.6	37.6	34.6	53.6	33.6	57.6	33.6	65.6
GR	41.00	95.2								
NC	0.035	0.035	0.035							
X1	8148	6	12	95.2	1	1	1	0	0	0
GR	41.00	12	34.6	37.6	34.6	53.6	33.6	57.6	33.6	65.6
GR	41.00	95.2								
X1	8199	6	12	95.2	51	51	51	0	0	0
GR	43.96	12	34.62	37.6	34.62	53.6	33.62	57.6	33.62	65.6
GR	43.96	95.2								
X1	8200	8	12	95.2	1	1	1	0	0	0
GR	44.02	12	44.02	40	37.62	41.6	37.62	49.6	36.62	53.6
GR	36.62	62.1	44.02	63.95	44.02	95.2				
X1	8220	6	12	95.2	20	20	20	0	0	0
GR	44.03	12	37.63	37.6	37.63	53.6	36.63	57.6	36.63	65.6
GR	44.03	95.2								
NC	0.027	0.027	0.027							
X1	8221	6	12	95.2	1	1	1	0	0	0
GR	44.03	12	37.63	37.6	37.63	53.6	36.63	57.6	36.63	65.6
GR	44.03	95.2								

X1	8600	6	12	95.2	379	379	379	0	0	0
GR	44.22	12	37.82	37.6	37.82	53.6	36.82	57.6	36.82	65.6
GR	44.22	95.2								
X1	9000	6	12	95.2	400	400	400	0	0	0
GR	44.42	12	38.02	37.6	38.02	53.6	37.02	57.6	37.02	65.6
GR	44.42	95.2								
X1	9247	6	12	95.2	247	247	247	0	0	0
GR	44.45	12	38.15	37.6	38.15	53.6	37.15	57.6	37.15	65.6
GR	44.45	95.2								
NC	.035	.035	.035							
X1	9248	6	12	95.2	1	1	1	0	0	0
GR	44.45	12	38.15	37.6	38.15	53.6	37.15	57.6	37.15	65.6
GR	44.45	95.2								
X1	9299	6	12	95.2	51	51	51	0	0	0
GR	47.51	12	38.17	37.6	38.17	53.6	37.17	57.6	37.17	65.6
GR	47.51	95.2								
X1	9300	8	12	95.2	1	1	1	0	0	0
GR	47.57	12	47.57	40	41.17	41.6	41.17	49.6	40.17	53.6
GR	40.17	62.1	47.57	62.95	47.57	95.2				
X1	9320	6	12	95.2	20	20	20	0	0	0
GR	47.58	12	41.18	37.6	41.18	53.6	40.18	57.6	40.18	65.6
GR	47.58	95.2								
NC	0.027	0.027	0.027							
X1	9321	6	12	95.2	1	1	1	0	0	0
GR	47.58	12	41.18	37.6	41.18	53.6	40.18	57.6	40.18	65.6
GR	47.58	95.2								
X1	9800	6	12	95.2	479	479	479	0	0	0
GR	47.82	12	41.42	37.6	41.42	53.6	40.42	57.6	40.42	65.6
GR	47.82	95.2								
X1	10200	6	12	95.2	400	400	400	0	0	0
GR	48.02	12	41.62	37.6	41.62	53.6	40.62	57.6	40.62	65.6
GR	48.02	95.2								

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X1    10447      6      12     95.2     247     247     247       0       0       0
GR    48.15     12   41.75     37.6   41.75    53.6   40.75    57.6   40.75    65.6
GR    48.15   95.2

NC    0.035  0.035   0.035
X1    10448      6      12     95.2       1       1       1       0       0       0
GR    48.15     12   41.75     37.6   41.75    53.6   40.75    57.6   40.75    65.6
GR    48.15   95.2

X1    10499      6      12     95.2      51      51      51       0       0       0
GR    51.11     12   41.77     37.6   41.77    53.6   40.77    57.6   40.77    65.6
GR    51.11   95.2

X1    10500      8      12     95.2       1       1       1       0       0       0
GR    51.17     12   51.17       40   44.77    41.6   44.77    49.6   43.77    53.6
GR    43.77   62.1   51.17    63.95   51.17    95.2

X1    10520      6      12     95.2      20      20      20       0       0       0
GR    51.18     12   44.78     37.6   44.78    53.6   43.78    57.6   43.78    65.6
GR    51.18   95.2

NC    0.027  0.027   0.027
X1    10521      6      12     95.2      20      20      20       0       0       0
GR    51.18     12   44.78     37.6   44.78    53.6   43.78    57.6   43.78    65.6
GR    51.18   95.2

      SPECIAL CULVERT AT SOSSAMAN RD.

X1    10900      6      12     95.2     379     379     379       0       0       0
GR    51.37     12   44.97     37.6   44.97    53.6   43.97    57.6   43.97    65.6
GR    51.37   95.2

NC    0.012  0.012   0.012      0.3     0.5
X1    11027      6      12     95.2     127     127     127       0       0       0
X3       10
GR    54.03     12   46.03     37.6   46.03    53.6   45.03    57.6   45.03    65.6
GR    54.03   95.2

SC    3.012    0.5     3.0        0    5.31    8.67  157.90     8.2   48.10   48.03

X1    11185      4      31       57   152.9   162.9  157.90       0       0       0
X2                      2    53.41    55.5
X3       10
BT       -2     31    55.0              57      55
GR    55.00   31.0   48.10    31.05   48.10   56.95   55.00   57.00
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```
NC    0.027     0.027     0.027      0.3       0.5
X1    11400         6        12     95.2       215       215       215         0         0         0
GR    55.61        12     49.21     37.6     49.21      53.6     48.21      57.6     48.21      65.6
GR    55.61      95.2

        SPECIAL CULVERT AT GERMANN RD.

X1    11600         6        12     95.2       200       200       200         0         0         0
GR    55.71        12     49.31     37.6     49.31      53.6     48.31      57.6     48.31      65.6
GR    55.71      95.2


NC    0.012     0.012     0.012      0.3       0.5
X1    11675         4        12     95.2     75.31     75.31     75.31         0         0         0
X3       10
GR    55.77        12     48.37     37.6     48.37      65.6     55.77      95.2


SC    3.012       0.5       3.0        0      5.31      8.67    144.09       8.2     48.43     48.37

X1    11819         4        31       57    139.09    149.09    144.09         0         0         0
X2                          2    53.74     57.00
X3       10
BT       -2        31     57.0                 57      57.0
GR    57.00        31     48.43    31.05     48.43     56.95     57.00     57.00


NC    0.027     0.027     0.027      0.3       0.5
X1    11869         6        12     95.2       100       100       100         0         0         0
GR    55.88        12     49.48     37.6     49.48      53.6     48.48      57.6     48.48      65.6
GR    55.88      95.2


QT        1       504
X1    12037         4        12     79.6       168       168       168         0         0         0
GR    55.74        12     48.54     40.8     48.54      50.8     55.74      79.6


NC    0.035     0.035     0.035
X1    12038         4        12     79.6         1         1         1         0         0         0
GR    55.74        12     48.54     40.8     48.54      50.8     55.74      79.6


X1    12089         4        12     79.6        51        51        51         0         0         0
GR    58.71        12     48.57     40.8     48.57      50.8     58.71      79.6


X1    12090         6        12     79.6      1.52      1.52      1.52         0         0         0
GR    58.77        12     58.77     32.8     51.57      40.8     51.57      50.8     58.77      58.8
GR    58.77      79.6
```

X1	12110	4	12	79.6	20	20	20	0	0	0
GR	58.78	12	51.58	40.8	51.58	50.8	58.78	79.6		
X1	12111	4	12	79.6	1	1	1	0	0	0
GR	58.78	12	51.58	40.8	51.58	50.8	58.78	79.6		
X1	12400	4	12	79.6	289	289	289	0	0	0
GR	58.91	12	51.71	40.8	51.71	50.8	58.91	79.6		
X1	12800	4	12	79.6	400	400	400	0	0	0
GR	59.12	12	51.92	40.8	51.92	50.8	59.12	79.6		
X1	13200	4	12	79.6	400	400	400	0	0	0
GR	59.32	12	52.12	40.8	52.12	50.8	59.32	79.6		
X1	13347	4	12	79.6	197	197	197	0	0	0
GR	59.45	12	52.25	40.8	52.25	50.8	59.45	79.6		
NC	0.035	0.035	0.035							
X1	13448	4	12	79.6	1	1	1	0	0	0
GR	59.45	12	52.25	40.8	52.25	50.8	59.45	79.6		
X1	13499	4	12	79.6	51	51	51	0	0	0
GR	62.37	12	52.27	40.8	52.27	50.8	62.37	79.6		
X1	13500	6	12	79.6	1	1	1	0	0	0
GR	62.43	12	62.43	32.8	55.23	40.8	55.23	50.8	62.43	58.8
GR	62.43	79.6								
X1	13520	4	12	79.6	20	20	20	0	0	0
GR	62.44	12	55.24	40.8	55.24	50.8	62.44	79.6		
NC	0.027	0.027	0.027							
X1	13521	4	12	79.6	1	1	1	0	0	0
GR	62.44	12	55.24	40.8	55.24	50.8	62.44	79.6		
X1	13800	4	12	79.6	279	279	279	0	0	0
GR	62.58	12	55.38	40.8	55.38	50.8	62.58	79.6		

X1	14200	4	12	79.6	400	400	400	0	0	0
GR	62.78	12	55.58	40.8	55.58	50.8	62.78	79.6		
X1	14647	4	12	79.6	447	447	447	0	0	0
GR	63.01	12	55.81	40.8	55.81	50.8	63.01	79.6		
NC	0.035	0.035	0.035							
X1	14648	4	12	79.6	1	1	1	0	0	0
GR	63.01	12	55.81	40.8	55.81	50.8	63.01	79.6		
X1	14699	4	12	79.6	51	51	51	0	0	0
GR	65.97	12	55.83	40.8	55.83	50.8	65.97	79.6		
X1	14700	6	12	79.6	1	1	1	0	0	0
GR	66.03	12	66.03	32.8	58.83	40.8	58.83	50.8	66.03	58.8
GR	66.03	79.6								
X1	14720	4	12	79.6	20	20	20	0	0	0
GR	66.04	12	58.84	40.8	58.84	50.8	66.04	79.6		
NC	0.027	0.027	0.027							
X1	14721	4	12	79.6	1	1	1	0	0	0
GR	66.04	12	58.84	40.8	58.84	50.8	66.04	79.6		
X1	15200	4	12	79.6	479	479	479	0	0	0
GR	66.28	12	59.08	40.8	59.08	50.8	66.28	79.6		
X1	15600	4	12	79.6	400	400	400	0	0	0
GR	66.48	12	59.28	40.8	59.28	50.8	66.48	79.6		
X1	16000	4	12	79.6	400	400	400	0	0	0
GR	66.68	12	59.48	40.8	59.48	50.8	66.68	79.6		
X1	16400	4	12	79.6	400	400	400	0	0	0
GR	66.88	12	59.68	40.8	59.68	50.8	66.88	79.6		
X1	16800	4	12	79.6	400	400	400	0	0	0
GR	67.08	12	59.88	40.8	59.88	50.8	67.08	79.6		

X1	17047	4	12	79.6	247	247	247	0	0	0
GR	67.21	12	59.81	40.8	59.81	50.8	67.21	79.6		
NC	0.035	0.035	0.035							
X1	17048	4	12	79.6	1	1	1	0	0	0
GR	67.21	12	59.81	40.8	59.81	50.8	67.21	79.6		
X1	17099	4	12	79.6	51	51	51	0	0	0
GR	70.17	12	60.03	40.8	60.03	50.8	70.17	79.6		
X1	17100	6	12	79.6	1	1	1	0	0	0
GR	70.23	12	70.23	32.8	63.03	40.8	63.03	50.8	70.23	58.8
GR	70.23	79.6								
X1	17120	4	12	79.6	20	20	20	0	0	0
GR	70.24	12	63.04	40.8	63.04	50.8	70.27	79.6		
NC	0.027	0.027	0.027							
X1	17121	4	12	79.6	1	1	1	0	0	0
GR	70.24	12	63.04	40.8	63.04	50.8	70.27	79.6		
X1	17400	4	12	79.6	279	279	279	0	0	0
GR	70.38	12	63.18	40.8	63.18	50.8	70.38	79.6		
X1	17697	4	12	79.6	297	297	297	0	0	0
GR	70.53	12	63.33	40.8	63.33	50.8	70.53	79.6		
NC	0.035	0.035	0.035							
X1	17698	4	12	79.6	1	1	1	0	0	0
GR	70.53	12	63.33	40.8	63.33	50.8	70.53	79.6		
X1	17749	4	12	79.6	51	51	51	0	0	0
GR	73.5	12	63.36	40.8	63.33	50.8	73.50	79.6		
X1	17750	6	12	79.6	1	1	1	0	0	0
GR	73.56	12	73.56	32.8	66.36	40.8	66.36	50.8	73.56	58.8
GR	73.56	79.6								

X1	17770	4	12	79.6	20	20	20	0	0	0
GR	73.57	12	66.37	40.8	66.37	50.8	73.57	79.6		
NC	0.027	0.027	0.027							
X1	17771	4	12	79.6	1	1	1	0	0	0
GR	73.57	12	66.37	40.8	66.37	50.8	73.57	79.6		
X1	18100	4	12	79.6	329	329	329	0	0	0
GR	73.74	12	66.54	40.8	66.54	50.8	73.74	79.6		
X1	18500	4	12	79.6	400	400	400	0	0	0
GR	73.94	12	66.74	40.8	66.74	50.8	73.94	79.6		
X1	18947	4	12	79.6	447	447	447	0	0	0
GR	74.16	12	66.96	40.8	66.96	50.8	74.16	79.6		
NC	0.035	0.035	0.035							
X1	18948	4	12	79.6	1	1	1	0	0	0
GR	74.16	12	66.96	40.8	66.96	50.8	74.16	79.6		
X1	18999	4	12	79.6	51	51	51	0	0	0
GR	77.12	12	66.98	40.8	66.98	50.8	77.12	79.6		
X1	19000	6	12	79.6	1	1	1	0	0	0
GR	77.18	12	77.18	32.8	69.98	40.8	69.98	50.8	77.18	58.8
GR	77.18	79.6								
X1	19020	4	12	79.6	20	20	20	0	0	0
GR	77.19	12	69.99	40.8	69.99	50.8	77.18	79.6		
NC	0.027	0.027	0.027							
X1	19021	4	12	79.6	1	1	1	0	0	0
GR	77.19	12	69.99	40.8	69.99	50.8	77.18	79.6		
X1	19500	4	12	79.6	479	479	479	0	0	0
GR	77.43	12	70.23	40.8	70.23	50.8	77.43	79.6		

X1	19947	4	12	79.6	447	447	447	0	0	0
GR	77.65	12	70.45	40.8	70.45	50.8	77.65	79.6		
NC	0.035	0.035	0.035							
X1	19948	4	12	79.6	1	1	1	0	0	0
GR	77.65	12	70.45	40.8	70.45	50.8	77.65	79.6		
X1	19999	4	12	79.6	51	51	51	0	0	0
GR	80.62	12	70.48	40.8	70.48	50.8	80.62	79.6		
X1	20000	6	12	79.6	1	1	1	0	0	0
GR	80.68	12	80.68	32.8	73.48	40.8	73.48	50.8	80.68	58.8
GR	80.68	79.6								
X1	20020	4	12	79.6	20	20	20	0	0	0
GR	80.69	12	73.49	40.8	73.49	50.8	80.69	79.6		
NC	0.027	0.027	0.027							
X1	20021	4	12	79.6	1	1	1	0	0	0
GR	80.69	12	73.49	40.8	73.49	50.8	80.69	79.6		
X1	20400	4	12	79.6	379	379	379	0	0	0
GR	80.88	12	73.68	40.8	73.68	50.8	80.88	79.6		
X1	20800	4	12	79.6	388	415	400	0	0	0
GR	81.08	12	73.88	40.8	73.88	50.8	81.08	79.6		
X1	21047	4	12	79.6	247	247	247	0	0	0
GR	81.2	12	74.0	40.8	74.0	50.8	81.2	79.6		
NC	0.035	0.035	0.035							
X1	21048	4	12	79.6	1	1	1	0	0	0
GR	81.2	12	74.0	40.8	74.0	50.8	81.2	79.6		
X1	21099	4	12	79.6	51	51	51	0	0	0
GR	84.17	12	74.03	40.8	74.03	50.8	84.17	79.6		

X1	21100	6	12	79.6	1	1	1	0	0	0
GR	84.23	12	84.23	33.8	77.03	40.8	77.03	50.8	84.23	57.8
GR	84.23	79.6								
X1	21120	4	12	79.6	20	20	20	0	0	0
GR	84.24	12	77.04	40.8	77.04	50.8	84.24	79.6		
NC	0.027	0.027	0.027							
X1	21121	4	12	79.6	1	1	1	0	0	0
GR	84.24	12	77.04	40.8	77.04	50.8	84.24	79.6		
X1	22047	4	12	79.6	447	447	447	0	0	0
GR	84.71	12	77.51	40.8	77.51	50.8	84.71	79.6		
NC	0.035	0.035	0.035							
X1	22048	4	12	79.6	1	1	1	0	0	0
GR	84.71	12	77.51	40.8	77.51	50.8	84.71	79.6		
X1	22099	4	12	79.6	51	51	51	0	0	0
GR	87.67	12	77.53	40.8	77.53	50.8	87.67	79.6		
X1	22100	6	12	79.6	1	1	1	0	0	0
GR	87.73	12	87.73	32.8	80.53	40.8	80.53	50.8	87.73	58.8
GR	87.73	79.6								
X1	22120	4	12	79.6	20	20	20	0	0	0
GR	87.74	12	80.54	40.8	80.54	50.8	87.74	79.6		
NC	0.027	0.027	0.027							
X1	22121	4	12	79.6	1	1	1	0	0	0
GR	87.74	12	80.54	40.8	80.54	50.8	87.74	79.6		
X1	22600	4	12	79.6	479	479	479	0	0	0
GR	87.98	12	80.78	40.8	80.78	50.8	87.98	79.6		
X1	23047	4	12	79.6	447	447	447	0	0	0
GR	88.21	12	81.01	40.8	81.01	50.8	88.21	79.6		

NC	0.035	0.035	0.035							
X1	23048	4	12	79.6	1	1	1	0	0	0
GR	88.21	12	81.01	40.8	81.01	50.8	88.21	79.6		
X1	23099	4	12	79.6	51	51	51	0	0	0
GR	91.17	12	81.03	40.8	81.03	50.8	91.17	79.6		
X1	23100	6	12	79.6	1	1	1	0	0	0
GR	91.23	12	91.23	32.8	84.03	40.8	84.03	50.8	91.23	58.8
GR	91.23	79.6								
X1	23120	4	12	79.6	20	20	20	0	0	0
GR	91.24	12	84.04	40.8	84.04	50.8	91.24	79.6		
NC	0.027	0.027	0.027							
X1	23120	4	12	79.6	1	1	1	0	0	0
GR	91.24	12	84.04	40.8	84.04	50.8	91.24	79.6		

SPECIAL CULVERT AT ELLSWORTH ROAD

X1	23506	4	12	79.6	386.27	376.27	386.27	0	0	0
GR	91.45	12	84.25	40.8	84.25	50.8	91.45	79.6		
NC	0.012	0.012	0.012	0.3	0.5					
X1	23556	4	12	79.6	50.29	50.29	50.29	0	0	0
X3	10									
GR	94.27	12	84.27	40.8	84.27	50.8	94.27	79.6		
SC	2.012	0.5	3.0	0	5	9	120	8.2	87.33	87.27
X1	23686	4	36.75	54.85	120	120	120	0	0	0
X2			2	87.27	92.27					
X3	10									
BT	-2	36.8	94.27		54.8	94.27				
GR	94.27	36.75	87.27	36.80	87.27	54.80	94.27	54.85		
NC	0.027	0.027	0.027	0.1	0.3					
X1	23720	4	12	79.6	34	34	34	0	0	0
GR	94.55	12	87.35	40.8	87.35	50.8	94.55	79.6		

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X1    24200      4      12     79.6     480     480     480      0      0      0
GR    94.77     12   87.57     40.8   87.57    50.8   94.77   79.6

X1    24650      4      12     79.6     450     450     450      0      0      0
GR    95.01     12   87.81     40.8   87.81    50.8   95.01   79.6

X1    25147      4      12     79.6     497     497     497      0      0      0
GR    95.21     12   88.01     40.8   88.01    50.8   95.21   79.6

NC    0.035  0.035   0.035
X1    25148      4      12     79.6       1       1       1      0      0      0
GR    95.26     12   88.06     40.8   88.06    50.8   95.26   79.6

X1    25199      4      12     79.6      51      51      51      0      0      0
GR    98.22     12   88.08     40.8   88.08    50.8   98.22   79.6

X1    25200      6      12     79.6       1       1       1      0      0      0
GR    98.28     12   98.28     34.8   91.08    40.8   91.08    50.8  98.28   56.8
GR    98.28   79.6

X1    25220      4      12     79.6      20      20      20      0      0      0
GR    98.29     12   91.09     40.8   91.09    50.8   98.29   79.6

NC     .027  0.027   0.027
X1    25221      4      12     79.6       1       1       1      0      0      0
GR    98.29     12   91.09     40.8   91.09    50.8   98.29   79.6

      SPECIAL CULVERT AT QUEEN CREEK ROAD

X1    25650      4      12     79.6     429     429     429      0      0      0
GR    98.51     12   91.31     40.8   91.31    50.8   98.51   79.6

NC    0.012  0.012   0.012      0.3     0.5
X1    25700      4      12     79.6      50      50      50      0      0      0
X3       10
GR   102.33     12   91.33     40.8   91.33    50.8  102.33   79.6

SC    2.012    0.5     3.0        0       5       9  303.18    8.2  95.27  95.14

X1    26003      4   36.75    54.85  303.18  303.18  303.18      0      0      0
X2                     2    95.27  102.33
X3       10
BT       -2   36.8  102.33           54.8  102.33
GR   102.33  36.75   95.27    36.80   95.27   54.80  102.33  54.85
```

NC	0.035	0.035	0.035	0.1	0.3					
X1	26103	4	12	79.6	100	100	100	0	0	0
GR	102.52	12	95.32	40.8	95.32	50.8	102.52	79.6		
X1	26203	4	12	79.6	100	100	100	0	0	0
GR	102.52	12	100.00	18	100.00	73.6	102.52	79.6		

THIS RUN EXECUTED 19AUG93 10:14:55

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

RITTENHOUSE CHANNEL NO.

SUMMARY PRINTOUT

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	1093.000	1047.00	2.75	5.94	5.92	18.71
	1119.000	1047.00	3.10	5.95	8.78	18.73
	1150.000	1047.00	3.10	5.95	5.20	18.75
	1450.000	1047.00	3.10	5.95	5.22	18.91
	1739.000	1047.00	3.10	5.96	5.18	19.06
	1887.000	1047.00	3.09	5.96	5.16	19.13
	2034.000	1047.00	3.09	5.96	5.17	19.21
	2048.000	1047.00	3.10	5.96	8.71	19.22
	2099.000	1047.00	3.34	5.97	9.70	19.25
*	2100.000	1047.00	10.71	4.24	154.65	19.52
*	2120.000	1047.00	3.00	6.08	8.00	21.37
	2121.000	1047.00	3.00	6.08	7.95	21.37
	2346.000	1047.00	2.94	6.16	7.53	21.56
	2493.000	1047.00	2.91	6.21	7.30	21.68
	2640.000	1047.00	2.89	6.23	7.17	21.78
	2847.000	1047.00	2.90	6.28	7.32	21.93
	2848.000	1047.00	2.90	6.28	7.32	21.93

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	2899.000	1047.00	3.21	6.27	8.25	21.95
*	2900.000	1047.00	10.72	4.57	156.67	22.85
*	2920.000	1047.00	3.06	6.00	8.42	24.69
	2921.000	1047.00	3.05	6.01	4.98	24.70
	3300.000	1047.00	3.06	6.00	5.01	24.88
	3700.000	1047.00	3.06	6.00	5.01	25.06
	4047.000	1047.00	3.05	6.01	4.99	25.26
	4048.000	1047.00	3.05	6.01	8.39	25.26
	4099.000	1047.00	3.42	6.00	9.92	25.28
*	4100.000	1047.00	10.71	4.24	154.65	26.52
*	4120.000	1047.00	3.00	6.08	8.00	28.37
	4120.000	1047.00	3.00	6.08	4.73	28.37
	4271.000	1047.00	3.01	6.07	4.79	28.44
*	4452.000	1047.00	3.90	5.96	1.44	28.43
*	4564.000	1047.00	5.63	3.58	4.49	31.38
	4609.000	1047.00	3.03	6.03	4.90	31.85
	5041.000	804.00	2.71	6.05	4.32	32.09
	5266.000	804.00	2.93	6.03	4.89	32.18
	5400.000	804.00	2.94	6.03	4.94	32.25
	5800.000	804.00	2.94	6.03	4.94	32.45
	5997.000	804.00	2.94	6.02	4.95	32.54
	5998.000	804.00	2.94	6.03	8.31	32.55
	6049.000	804.00	3.39	6.02	10.39	32.57
*	6050.000	804.00	10.55	4.05	162.03	33.60
*	6070.000	804.00	3.09	6.14	8.83	35.70
	6071.000	804.00	3.08	6.14	5.21	35.70

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	6600.000	804.00	2.84	6.16	4.50	35.99
	7000.000	804.00	2.85	6.14	4.54	36.17
	7499.000	804.00	2.87	6.11	4.65	36.39
	7500.000	804.00	2.87	6.12	7.79	36.40
	7549.000	804.00	3.31	6.12	9.72	36.42
*	7550.000	804.00	10.56	4.05	162.28	37.35
*	7570.000	804.00	2.83	6.16	7.53	39.47
	7570.000	804.00	2.82	6.18	4.43	39.49
	7860.000	804.00	2.84	6.16	4.50	39.62
	8147.000	804.00	2.85	6.15	4.54	39.75
	8148.000	804.00	2.85	6.15	7.62	39.75
	8199.000	804.00	3.28	6.15	9.52	39.77
*	8200.000	804.00	10.56	4.05	162.35	40.67
*	8220.000	804.00	2.83	6.16	7.53	42.79
	8221.000	804.00	2.82	6.17	4.44	42.80
	8600.000	804.00	2.85	6.15	4.54	42.97
	9000.000	804.00	2.86	6.13	4.60	43.15
	9247.000	804.00	2.85	6.11	4.60	43.26
	9248.000	804.00	2.85	6.11	7.72	43.26
	9299.000	804.00	3.31	6.12	9.73	43.29
*	9300.000	804.00	10.64	4.07	166.24	44.24
*	9320.000	804.00	2.79	6.23	7.20	46.41
	9321.000	804.00	2.78	6.23	4.25	46.41
	9800.000	804.00	2.81	6.19	4.38	46.61
	10200.000	804.00	2.83	6.17	4.46	46.79
	10447.000	804.00	2.84	6.15	4.52	46.90

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	10448.000	804.00	2.84	6.15	7.58	46.90
	10499.000	804.00	3.28	6.15	9.48	46.92
*	10500.000	804.00	10.56	4.05	162.37	47.82
*	10520.000	804.00	2.83	6.16	7.53	49.94
	10521.000	804.00	2.82	6.18	4.43	49.96
	10900.000	804.00	2.84	6.16	4.50	50.13
	11027.000	804.00	4.18	5.06	2.36	50.09
*	11185.000	804.00	6.62	4.68	5.49	52.78
	11400.000	804.00	3.55	5.35	8.35	53.56
	11600.000	804.00	3.47	5.42	7.87	53.73
*	11675.000	804.00	3.08	5.43	1.06	53.80
*	11819.000	804.00	5.26	5.89	2.79	54.32
	11869.000	804.00	2.75	6.28	4.10	54.76
	12037.000	504.00	2.25	6.33	3.04	54.87
	12038.000	504.00	2.25	6.33	5.10	54.87
	12089.000	504.00	2.85	6.31	7.97	54.88
*	12090.000	504.00	9.62	3.71	152.39	55.28
*	12110.000	504.00	2.91	5.45	10.19	57.03
	12111.000	504.00	2.90	5.45	10.09	57.03
	12400.000	504.00	2.77	5.61	8.87	57.32
	12800.000	504.00	2.66	5.75	7.97	57.67
	13200.000	504.00	2.57	5.86	7.29	57.98
	13347.000	504.00	2.56	5.87	7.17	58.12
	13448.000	504.00	2.56	5.88	7.21	58.13
	13499.000	504.00	3.21	5.87	10.96	58.14
*	13500.000	504.00	9.67	3.70	154.69	58.93

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
*	13520.000	504.00	2.91	5.45	10.14	60.69
	13521.000	504.00	2.90	5.45	5.98	60.69
	13800.000	504.00	2.88	5.48	5.87	60.86
	14200.000	504.00	2.85	5.52	5.70	61.10
	14647.000	504.00	2.82	5.54	5.57	61.35
	14648.000	504.00	2.83	5.54	9.39	61.35
	14699.000	504.00	3.52	5.55	14.03	61.38
*	14700.000	504.00	9.66	3.70	154.30	62.53
*	14720.000	504.00	2.91	5.45	10.15	64.29
	14721.000	504.00	2.90	5.45	5.98	64.29
	15200.000	504.00	2.86	5.50	5.79	64.58
	15600.000	504.00	2.83	5.53	5.62	64.81
	16000.000	504.00	2.81	5.56	5.51	65.04
	16400.000	504.00	2.79	5.58	5.42	65.26
	16800.000	504.00	2.78	5.59	5.35	65.47
	17047.000	504.00	2.67	5.80	4.72	65.61
	17048.000	504.00	2.67	5.80	7.91	65.61
	17099.000	504.00	3.47	5.60	13.48	65.63
*	17100.000	504.00	9.66	3.70	154.41	66.73
*	17120.000	504.00	2.91	5.45	10.18	68.49
	17121.000	504.00	2.90	5.45	6.00	68.49
	17400.000	504.00	2.88	5.48	5.87	68.66
	17697.000	504.00	2.86	5.51	5.75	68.84
	17698.000	504.00	2.86	5.51	9.66	68.84
	17749.000	504.00	3.55	5.53	14.37	68.86
*	17750.000	504.00	9.66	3.70	154.28	70.06

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
*	17770.000	504.00	2.91	5.45	10.15	71.82
	17771.000	504.00	2.90	5.45	5.98	71.82
	18100.000	504.00	2.88	5.48	5.88	72.02
	18500.000	504.00	2.85	5.52	5.70	72.26
	18947.000	504.00	2.82	5.55	5.53	72.51
	18948.000	504.00	2.82	5.55	9.32	72.51
	18999.000	504.00	3.51	5.56	13.93	72.54
*	19000.000	504.00	9.66	3.70	154.32	73.68
*	19020.000	504.00	2.91	5.45	10.14	75.44
	19021.000	504.00	2.90	5.45	5.98	75.44
	19500.000	504.00	2.86	5.50	5.79	75.73
	19947.000	504.00	2.83	5.54	5.59	75.99
	19948.000	504.00	2.83	5.54	9.42	75.99
	19999.000	504.00	3.53	5.53	14.18	76.01
*	20000.000	504.00	9.66	3.70	154.28	77.18
*	20020.000	504.00	2.91	5.45	10.15	78.94
	20021.000	504.00	2.90	5.45	5.98	78.94
	20400.000	504.00	2.87	5.49	5.83	79.17
	20800.000	504.00	2.84	5.52	5.66	79.40
	21047.000	504.00	2.82	5.55	5.57	79.55
	21048.000	504.00	2.82	5.55	9.37	79.55
	21099.000	504.00	3.53	5.54	14.11	79.57
*	21100.000	504.00	9.82	3.76	157.19	80.79
*	21120.000	504.00	2.79	5.59	9.10	82.63
	21121.000	504.00	2.78	5.59	5.36	82.63
	22047.000	504.00	2.98	5.37	6.45	82.88

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	22048.000	504.00	2.98	5.37	10.83	82.88
	22099.000	504.00	3.70	5.36	15.99	82.91
*	22100.000	504.00	9.67	3.70	154.71	84.23
*	22120.000	504.00	2.91	5.45	10.14	85.99
	22121.000	504.00	2.90	5.46	5.98	86.00
	22600.000	504.00	2.86	5.50	5.79	86.28
	23047.000	504.00	2.83	5.53	5.63	86.54
	23048.000	504.00	2.84	5.53	9.49	86.54
	23099.000	504.00	3.53	5.53	14.16	86.56
*	23100.000	504.00	9.66	3.70	154.28	87.73
*	23120.000	504.00	2.91	5.45	10.15	89.49
	23120.000	504.00	2.90	5.45	5.98	89.49
	23506.000	504.00	2.89	5.48	5.91	89.73
*	23556.000	504.00	3.62	5.43	1.79	89.70
*	23686.000	504.00	6.28	4.45	6.00	91.72
	23720.000	504.00	3.53	4.85	10.15	92.20
	24200.000	504.00	3.25	5.10	8.13	92.67
	24650.000	504.00	3.12	5.22	7.32	93.03
	25147.000	504.00	2.97	5.38	6.41	93.39
	25148.000	504.00	3.02	5.33	11.23	93.39
	25199.000	504.00	3.77	5.32	16.91	93.40
*	25200.000	504.00	9.97	3.83	159.93	94.91
*	25220.000	504.00	2.93	5.43	10.36	96.52
	25221.000	504.00	2.92	5.43	6.12	96.52
	25650.000	504.00	2.89	5.47	5.94	96.78
*	25700.000	504.00	3.85	5.41	2.01	96.74

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
*	26003.000	504.00	6.20	4.51	5.78	99.78
*	26103.000	504.00	3.35	5.01	14.84	100.33
*	26203.000	504.00	6.42	1.34	168.86	101.34

RITTENHOUSE CHANNEL NO.

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1093.000	.00	.00	.00	12.77	1047.00	18.71	.00	18.83	5.92	2.75	381.08	430.26
	1119.000	26.00	.00	.00	12.78	1047.00	18.73	.00	18.88	8.78	3.10	337.32	353.40
	1150.000	31.00	.00	.00	12.80	1047.00	18.75	.00	18.90	5.20	3.10	337.83	459.09
	1450.000	300.00	.00	.00	12.96	1047.00	18.91	.00	19.06	5.22	3.10	337.33	458.13
	1739.000	289.00	.00	.00	13.10	1047.00	19.06	.00	19.21	5.18	3.10	338.25	459.91
	1887.000	147.03	.00	.00	13.17	1047.00	19.13	.00	19.28	5.16	3.09	338.86	461.09
	2034.000	147.03	.00	.00	13.25	1047.00	19.21	.00	19.36	5.17	3.09	338.53	460.44
	2048.000	14.00	.00	.00	13.26	1047.00	19.22	.00	19.37	8.71	3.10	338.27	354.81
	2099.000	51.00	.00	.00	13.28	1047.00	19.25	.00	19.42	9.70	3.34	313.41	336.24
*	2100.000	1.00	.00	.00	15.28	1047.00	19.52	19.52	21.30	154.65	10.71	97.75	84.19
*	2120.000	20.00	.00	.00	15.29	1047.00	21.37	.00	21.51	8.00	3.00	348.48	370.08
	2121.000	1.00	.00	.00	15.29	1047.00	21.37	.00	21.51	7.95	3.00	349.28	371.28
	2346.000	245.13	.00	.00	15.40	1047.00	21.56	.00	21.70	7.53	2.94	356.14	381.64
	2493.000	147.03	.00	.00	15.47	1047.00	21.68	.00	21.81	7.30	2.91	359.96	387.45
	2640.000	147.03	.00	.00	15.55	1047.00	21.78	.00	21.91	7.17	2.89	362.36	391.10
	2847.000	206.82	.00	.00	15.65	1047.00	21.93	.00	22.06	7.32	2.90	360.67	387.07
	2848.000	1.00	.00	.00	15.65	1047.00	21.93	.00	22.06	7.32	2.90	360.67	387.07
	2899.000	51.00	.00	.00	15.68	1047.00	21.95	.00	22.11	8.25	3.21	326.54	364.57
*	2900.000	1.00	.00	.00	18.28	1047.00	22.85	22.85	24.63	156.67	10.72	97.67	83.65
*	2920.000	20.00	.00	.00	18.69	1047.00	24.69	.00	24.84	8.42	3.06	342.28	360.79
	2921.000	1.00	.00	.00	18.69	1047.00	24.70	.00	24.84	4.98	3.05	343.09	469.26
	3300.000	379.00	.00	.00	18.88	1047.00	24.88	.00	25.03	5.01	3.06	342.38	467.88
	3700.000	400.00	.00	.00	19.08	1047.00	25.08	.00	25.23	5.01	3.06	342.37	467.87
	4047.000	347.00	.00	.00	19.25	1047.00	25.26	.00	25.40	4.99	3.05	342.75	468.59

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	4048.000	1.00	.00	.00	19.25	1047.00	25.26	.00	25.40	8.39	3.05	342.80	361.56
	4099.000	51.00	.00	.00	19.28	1047.00	25.28	.00	25.46	9.92	3.42	306.30	332.45
*	4100.000	1.00	.00	.00	22.28	1047.00	26.52	26.52	28.30	154.65	10.71	97.75	84.19
*	4120.000	20.00	.00	.00	22.29	1047.00	28.37	.00	28.51	8.00	3.00	348.48	370.08
	4120.000	1.00	.00	.00	22.29	1047.00	28.37	.00	28.51	4.73	3.00	349.28	481.28
	4271.000	150.14	.00	.00	22.37	1047.00	28.44	.00	28.58	4.79	3.01	347.85	478.51
*	4452.000	180.80	.00	.00	22.47	1047.00	28.43	.00	28.67	1.44	3.90	268.16	872.64
*	4564.000	112.00	34.90	31.80	27.80	1047.00	31.38	.00	31.87	4.49	5.63	185.84	494.23
	4609.000	45.24	.00	.00	25.82	1047.00	31.85	.00	32.00	4.90	3.03	345.35	472.77
	5041.000	431.51	.00	.00	26.04	804.00	32.09	.00	32.20	4.32	2.71	296.56	387.01
	5266.000	223.89	.00	.00	26.15	804.00	32.18	.00	32.32	4.89	2.93	274.83	363.42
	5400.000	134.34	.00	.00	26.22	804.00	32.25	.00	32.38	4.94	2.94	273.88	361.68
	5800.000	400.00	.00	.00	26.42	804.00	32.45	.00	32.58	4.94	2.94	273.91	361.74
	5997.000	197.00	.00	.00	26.52	804.00	32.54	.00	32.68	4.95	2.94	273.79	361.51
	5998.000	1.00	.00	.00	26.52	804.00	32.55	.00	32.68	8.31	2.94	273.82	278.93
	6049.000	51.00	.00	.00	26.55	804.00	32.57	.00	32.75	10.39	3.39	237.51	249.38
*	6050.000	1.00	.00	.00	29.55	804.00	33.60	33.60	35.33	162.03	10.55	76.20	63.16
*	6070.000	20.00	.00	.00	29.56	804.00	35.70	.00	35.85	8.83	3.09	260.04	270.54
	6071.000	1.00	.00	.00	29.56	804.00	35.70	.00	35.85	5.21	3.08	260.91	352.32
	6600.000	529.00	.00	.00	29.83	804.00	35.99	.00	36.11	4.50	2.84	283.32	379.03
	7000.000	400.00	.00	.00	30.03	804.00	36.17	.00	36.29	4.54	2.85	282.37	377.29
	7499.000	499.00	.00	.00	30.28	804.00	36.39	.00	36.52	4.65	2.87	279.99	372.97
	7500.000	1.00	.00	.00	30.28	804.00	36.40	.00	36.52	7.79	2.87	280.32	288.12
	7549.000	49.00	.00	.00	30.30	804.00	36.42	.00	36.59	9.72	3.31	243.24	257.86
*	7550.000	1.00	.00	.00	33.30	804.00	37.35	37.35	39.08	162.28	10.56	76.17	63.11
*	7570.000	20.00	.00	.00	33.31	804.00	39.47	.00	39.60	7.53	2.83	283.74	292.99

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	7570.000	20.00	.00	.00	33.31	804.00	39.49	.00	39.61	4.43	2.82	284.93	382.01
	7860.000	289.00	.00	.00	33.46	804.00	39.62	.00	39.74	4.50	2.84	283.23	378.87
	8147.000	287.00	.00	.00	33.60	804.00	39.75	.00	39.87	4.54	2.85	282.45	377.42
	8148.000	1.00	.00	.00	33.60	804.00	39.75	.00	39.87	7.62	2.85	282.57	291.33
	8199.000	51.00	.00	.00	33.62	804.00	39.77	.00	39.94	9.52	3.28	245.10	260.63
*	8200.000	1.00	.00	.00	36.62	804.00	40.67	40.67	42.40	162.35	10.56	76.15	63.10
*	8220.000	20.00	.00	.00	36.63	804.00	42.79	.00	42.92	7.53	2.83	283.75	293.01
	8221.000	1.00	.00	.00	36.63	804.00	42.80	.00	42.92	4.44	2.82	284.61	381.42
	8600.000	379.00	.00	.00	36.82	804.00	42.97	.00	43.09	4.54	2.85	282.47	377.46
	9000.000	400.00	.00	.00	37.02	804.00	43.15	.00	43.27	4.60	2.86	281.08	374.91
	9247.000	247.00	.00	.00	37.15	804.00	43.26	.00	43.39	4.60	2.85	281.86	374.91
	9248.000	1.00	.00	.00	37.15	804.00	43.26	.00	43.39	7.72	2.85	282.02	289.44
	9299.000	51.00	.00	.00	37.17	804.00	43.29	.00	43.46	9.73	3.31	243.16	257.75
*	9300.000	1.00	.00	.00	40.17	804.00	44.24	44.24	46.00	166.24	10.64	75.56	62.36
*	9320.000	20.00	.00	.00	40.18	804.00	46.41	.00	46.53	7.20	2.79	288.40	299.66
	9321.000	1.00	.00	.00	40.18	804.00	46.41	.00	46.53	4.25	2.78	289.25	390.05
	9800.000	479.00	.00	.00	40.42	804.00	46.61	.00	46.74	4.38	2.81	286.07	384.13
	10200.000	400.00	.00	.00	40.62	804.00	46.79	.00	46.91	4.46	2.83	284.15	380.57
	10447.000	247.00	.00	.00	40.75	804.00	46.90	.00	47.03	4.52	2.84	282.88	378.23
	10448.000	1.00	.00	.00	40.75	804.00	46.90	.00	47.03	7.58	2.84	283.00	291.94
	10499.000	51.00	.00	.00	40.77	804.00	46.92	.00	47.09	9.48	3.28	245.44	261.14
*	10500.000	1.00	.00	.00	43.77	804.00	47.82	47.82	49.55	162.37	10.56	76.15	63.10
*	10520.000	20.00	.00	.00	43.78	804.00	49.94	.00	50.07	7.53	2.83	283.75	293.02
	10521.000	20.00	.00	.00	43.78	804.00	49.96	.00	50.08	4.43	2.82	284.94	382.04
	10900.000	379.00	.00	.00	43.97	804.00	50.13	.00	50.25	4.50	2.84	283.26	378.92
	11027.000	127.00	.00	.00	45.03	804.00	50.09	.00	50.36	2.36	4.18	192.36	522.89

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	11185.000	157.90	55.50	53.41	48.10	804.00	52.78	.00	53.46	5.49	6.62	121.47	343.06
	11400.000	215.00	.00	.00	48.21	804.00	53.56	.00	53.75	8.35	3.55	226.68	278.16
	11600.000	200.00	.00	.00	48.31	804.00	53.73	.00	53.92	7.87	3.47	231.60	286.60
*	11675.000	75.31	.00	.00	48.37	804.00	53.80	.00	53.95	1.06	3.08	261.41	780.17
*	11819.000	144.09	57.00	53.74	48.43	804.00	54.32	.00	54.75	2.79	5.26	152.93	481.76
	11869.000	100.00	.00	.00	48.48	804.00	54.76	.00	54.88	4.10	2.75	292.89	396.84
	12037.000	168.00	.00	.00	48.54	504.00	54.87	.00	54.95	3.04	2.25	223.80	269.14
	12038.000	1.00	.00	.00	48.54	504.00	54.87	.00	54.95	5.10	2.25	223.82	223.08
	12089.000	51.00	.00	.00	48.57	504.00	54.88	.00	55.01	7.97	2.85	176.58	178.54
*	12090.000	1.52	.00	.00	51.57	504.00	55.28	55.28	56.72	152.39	9.62	52.42	40.83
*	12110.000	20.00	.00	.00	51.58	504.00	57.03	.00	57.16	10.19	2.91	173.00	157.90
	12111.000	1.00	.00	.00	51.58	504.00	57.03	.00	57.16	10.09	2.90	173.62	158.66
	12400.000	289.00	.00	.00	51.71	504.00	57.32	.00	57.44	8.87	2.77	182.15	169.21
	12800.000	400.00	.00	.00	51.92	504.00	57.67	.00	57.78	7.97	2.66	189.56	178.51
	13200.000	400.00	.00	.00	52.12	504.00	57.98	.00	58.08	7.29	2.57	195.99	186.69
	13347.000	197.00	.00	.00	52.25	504.00	58.12	.00	58.23	7.17	2.56	197.15	188.17
	13448.000	1.00	.00	.00	52.25	504.00	58.13	.00	58.23	7.21	2.56	196.83	187.76
	13499.000	51.00	.00	.00	52.27	504.00	58.14	.00	58.30	10.96	3.21	156.99	152.24
*	13500.000	1.00	.00	.00	55.23	504.00	58.93	58.93	60.38	154.69	9.67	52.14	40.52
*	13520.000	20.00	.00	.00	55.24	504.00	60.69	.00	60.82	10.14	2.91	173.28	158.24
	13521.000	1.00	.00	.00	55.24	504.00	60.69	.00	60.83	5.98	2.90	173.91	206.13
	13800.000	279.00	.00	.00	55.38	504.00	60.86	.00	60.99	5.87	2.88	175.06	207.96
	14200.000	400.00	.00	.00	55.58	504.00	61.10	.00	61.22	5.70	2.85	177.06	211.15
	14647.000	447.00	.00	.00	55.81	504.00	61.35	.00	61.48	5.57	2.82	178.51	213.47
	14648.000	1.00	.00	.00	55.81	504.00	61.35	.00	61.48	9.39	2.83	178.32	164.44
	14699.000	51.00	.00	.00	55.83	504.00	61.38	.00	61.57	14.03	3.52	143.15	134.58

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	14700.000	1.00	.00	.00	58.83	504.00	62.53	62.53	63.98	154.30	9.66	52.18	40.57
*	14720.000	20.00	.00	.00	58.84	504.00	64.29	.00	64.42	10.15	2.91	173.23	158.18
	14721.000	1.00	.00	.00	58.84	504.00	64.29	.00	64.42	5.98	2.90	173.86	206.05
	15200.000	479.00	.00	.00	59.08	504.00	64.58	.00	64.71	5.79	2.86	176.01	209.47
	15600.000	400.00	.00	.00	59.28	504.00	64.81	.00	64.94	5.62	2.83	177.92	212.53
	16000.000	400.00	.00	.00	59.48	504.00	65.04	.00	65.16	5.51	2.81	179.26	214.68
	16400.000	400.00	.00	.00	59.68	504.00	65.26	.00	65.38	5.42	2.79	180.32	216.40
	16800.000	400.00	.00	.00	59.88	504.00	65.47	.00	65.59	5.35	2.78	181.23	217.86
	17047.000	247.00	.00	.00	59.81	504.00	65.61	.00	65.72	4.72	2.67	188.80	232.00
	17048.000	1.00	.00	.00	59.81	504.00	65.61	.00	65.72	7.91	2.67	189.00	179.23
	17099.000	51.00	.00	.00	60.03	504.00	65.63	.00	65.81	13.48	3.47	145.27	137.27
*	17100.000	1.00	.00	.00	63.03	504.00	66.73	66.73	68.18	154.41	9.66	52.17	40.56
*	17120.000	20.00	.00	.00	63.04	504.00	68.49	.00	68.62	10.18	2.91	172.98	157.96
	17121.000	1.00	.00	.00	63.04	504.00	68.49	.00	68.62	6.00	2.90	173.61	205.76
	17400.000	279.00	.00	.00	63.18	504.00	68.66	.00	68.79	5.87	2.88	175.05	207.94
	17697.000	297.00	.00	.00	63.33	504.00	68.84	.00	68.96	5.75	2.86	176.47	210.20
	17698.000	1.00	.00	.00	63.33	504.00	68.84	.00	68.97	9.66	2.86	176.44	162.13
	17749.000	51.00	.00	.00	63.33	504.00	68.86	.00	69.06	14.37	3.55	141.84	132.98
*	17750.000	1.00	.00	.00	66.36	504.00	70.06	70.06	71.51	154.28	9.66	52.19	40.58
*	17770.000	20.00	.00	.00	66.37	504.00	71.82	.00	71.95	10.15	2.91	173.23	158.18
	17771.000	1.00	.00	.00	66.37	504.00	71.82	.00	71.95	5.98	2.90	173.86	206.04
	18100.000	329.00	.00	.00	66.54	504.00	72.02	.00	72.15	5.88	2.88	175.00	207.86
	18500.000	400.00	.00	.00	66.74	504.00	72.26	.00	72.38	5.70	2.85	177.01	211.06
	18947.000	447.00	.00	.00	66.96	504.00	72.51	.00	72.63	5.53	2.82	179.01	214.28
	18948.000	1.00	.00	.00	66.96	504.00	72.51	.00	72.64	9.32	2.82	178.82	165.06
	18999.000	51.00	.00	.00	66.98	504.00	72.54	.00	72.73	13.93	3.51	143.52	135.04

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	19000.000	1.00	.00	.00	69.98	504.00	73.68	73.68	75.13	154.32	9.66	52.18	40.57
*	19020.000	20.00	.00	.00	69.99	504.00	75.44	.00	75.57	10.14	2.91	173.33	158.26
	19021.000	1.00	.00	.00	69.99	504.00	75.44	.00	75.57	5.98	2.90	173.96	206.15
	19500.000	479.00	.00	.00	70.23	504.00	75.73	.00	75.86	5.79	2.86	176.00	209.46
	19947.000	447.00	.00	.00	70.45	504.00	75.99	.00	76.11	5.59	2.83	178.32	213.18
	19948.000	1.00	.00	.00	70.45	504.00	75.99	.00	76.11	9.42	2.83	178.12	164.19
	19999.000	51.00	.00	.00	70.48	504.00	76.01	.00	76.21	14.18	3.53	142.57	133.85
*	20000.000	1.00	.00	.00	73.48	504.00	77.18	77.18	78.63	154.28	9.66	52.19	40.58
*	20020.000	20.00	.00	.00	73.49	504.00	78.94	.00	79.07	10.15	2.91	173.23	158.17
	20021.000	1.00	.00	.00	73.49	504.00	78.94	.00	79.07	5.98	2.90	173.86	206.04
	20400.000	379.00	.00	.00	73.68	504.00	79.17	.00	79.30	5.83	2.87	175.52	208.70
	20800.000	400.00	.00	.00	73.88	504.00	79.40	.00	79.53	5.66	2.84	177.51	211.88
	21047.000	247.00	.00	.00	74.00	504.00	79.55	.00	79.67	5.57	2.82	178.52	213.49
	21048.000	1.00	.00	.00	74.00	504.00	79.55	.00	79.67	9.37	2.82	178.47	164.64
	21099.000	51.00	.00	.00	74.03	504.00	79.57	.00	79.76	14.11	3.53	142.85	134.19
*	21100.000	1.00	.00	.00	77.03	504.00	80.79	80.79	82.29	157.19	9.82	51.32	40.20
*	21120.000	20.00	.00	.00	77.04	504.00	82.63	.00	82.75	9.10	2.79	180.47	167.11
	21121.000	1.00	.00	.00	77.04	504.00	82.63	.00	82.75	5.36	2.78	181.09	217.62
	22047.000	447.00	.00	.00	77.51	504.00	82.88	.00	83.02	6.45	2.98	169.07	198.46
	22048.000	1.00	.00	.00	77.51	504.00	82.88	.00	83.02	10.83	2.98	169.10	153.13
	22099.000	51.00	.00	.00	77.53	504.00	82.91	.00	83.12	15.99	3.70	136.34	126.02
*	22100.000	1.00	.00	.00	80.53	504.00	84.23	84.23	85.68	154.71	9.67	52.13	40.52
*	22120.000	20.00	.00	.00	80.54	504.00	85.99	.00	86.12	10.14	2.91	173.28	158.24
	22121.000	1.00	.00	.00	80.54	504.00	86.00	.00	86.13	5.98	2.90	173.91	206.13
	22600.000	479.00	.00	.00	80.78	504.00	86.28	.00	86.41	5.79	2.86	176.05	209.53
	23047.000	447.00	.00	.00	81.01	504.00	86.54	.00	86.66	5.63	2.83	177.82	212.38

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	23048.000	1.00	.00	.00	81.01	504.00	86.54	.00	86.66	9.49	2.84	177.61	163.57
	23099.000	51.00	.00	.00	81.03	504.00	86.56	.00	86.76	14.16	3.53	142.62	133.91
*	23100.000	1.00	.00	.00	84.03	504.00	87.73	87.73	89.18	154.28	9.66	52.19	40.58
*	23120.000	20.00	.00	.00	84.04	504.00	89.49	.00	89.62	10.15	2.91	173.23	158.17
	23120.000	1.00	.00	.00	84.04	504.00	89.49	.00	89.62	5.98	2.90	173.86	206.04
	23506.000	386.27	.00	.00	84.25	504.00	89.73	.00	89.85	5.91	2.89	174.67	207.33
*	23556.000	50.29	.00	.00	84.27	504.00	89.70	.00	89.91	1.79	3.62	139.35	377.18
*	23686.000	120.00	94.27	87.27	87.27	504.00	91.72	.00	92.33	6.00	6.28	80.20	205.75
	23720.000	34.00	.00	.00	87.35	504.00	92.20	.00	92.40	10.15	3.53	142.82	158.18
	24200.000	480.00	.00	.00	87.57	504.00	92.67	.00	92.84	8.13	3.25	155.15	176.81
	24650.000	450.00	.00	.00	87.81	504.00	93.03	.00	93.18	7.32	3.12	161.31	186.32
	25147.000	497.00	.00	.00	88.01	504.00	93.39	.00	93.53	6.41	2.97	169.47	199.08
	25148.000	1.00	.00	.00	88.06	504.00	93.39	.00	93.53	11.23	3.02	166.86	150.42
	25199.000	51.00	.00	.00	88.08	504.00	93.40	.00	93.62	16.91	3.77	133.57	122.58
*	25200.000	1.00	.00	.00	91.08	504.00	94.91	94.91	96.46	159.93	9.97	50.55	39.85
*	25220.000	20.00	.00	.00	91.09	504.00	96.52	.00	96.65	10.36	2.93	171.94	156.59
	25221.000	1.00	.00	.00	91.09	504.00	96.52	.00	96.65	6.12	2.92	172.45	203.80
	25650.000	429.00	.00	.00	91.31	504.00	96.78	.00	96.91	5.94	2.89	174.32	206.78
*	25700.000	50.00	.00	.00	91.33	504.00	96.74	.00	96.97	2.01	3.85	130.91	355.28
*	26003.000	303.18	102.33	95.27	95.27	504.00	99.78	.00	100.37	5.78	6.20	81.25	209.67
*	26103.000	100.00	.00	.00	95.32	504.00	100.33	.00	100.50	14.84	3.35	150.42	130.84
*	26203.000	100.00	.00	.00	100.00	504.00	101.34	101.34	101.98	168.86	6.42	78.48	38.79

RITTENHOUSE CHANNEL NO.

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	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1093.000	1047.00	18.71	.00	.00	.00	86.31	.00
	1119.000	1047.00	18.73	.00	.02	.00	85.56	26.00
	1150.000	1047.00	18.75	.00	.02	.00	85.61	31.00
	1450.000	1047.00	18.91	.00	.16	.00	85.56	300.00
	1739.000	1047.00	19.06	.00	.15	.00	85.65	289.00
	1887.000	1047.00	19.13	.00	.08	.00	85.71	147.03
	2034.000	1047.00	19.21	.00	.08	.00	85.68	147.03
	2048.000	1047.00	19.22	.00	.01	.00	85.65	14.00
	2099.000	1047.00	19.25	.00	.03	.00	76.20	51.00
*	2100.000	1047.00	19.52	.00	.27	.00	27.87	1.00
*	2120.000	1047.00	21.37	.00	1.85	.00	86.60	20.00
	2121.000	1047.00	21.37	.00	.00	.00	86.67	1.00
	2346.000	1047.00	21.56	.00	.20	.00	87.31	245.13
	2493.000	1047.00	21.68	.00	.11	.00	87.66	147.03
	2640.000	1047.00	21.78	.00	.11	.00	87.87	147.03
	2847.000	1047.00	21.93	.00	.15	.00	88.26	206.82
	2848.000	1047.00	21.93	.00	.00	.00	88.26	1.00
	2899.000	1047.00	21.95	.00	.02	.00	74.46	51.00
*	2900.000	1047.00	22.85	.00	.89	.00	27.87	1.00
*	2920.000	1047.00	24.69	.00	1.85	.00	86.03	20.00
	2921.000	1047.00	24.70	.00	.00	.00	86.10	1.00
	3300.000	1047.00	24.88	.00	.19	.00	86.04	379.00
	3700.000	1047.00	25.08	.00	.20	.00	86.03	400.00
	4047.000	1047.00	25.26	.00	.17	.00	86.07	347.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	4048.000	1047.00	25.26	.00	.00	.00	86.07	1.00
	4099.000	1047.00	25.28	.00	.02	.00	72.92	51.00
*	4100.000	1047.00	26.52	.00	1.24	.00	27.87	1.00
*	4120.000	1047.00	28.37	.00	1.85	.00	86.60	20.00
	4120.000	1047.00	28.37	.00	.00	.00	86.67	1.00
	4271.000	1047.00	28.44	.00	.07	.00	86.54	150.14
*	4452.000	1047.00	28.43	.00	.00	.00	52.10	180.80
*	4564.000	1047.00	31.38	.00	2.94	.00	51.99	112.00
	4609.000	1047.00	31.85	.00	.48	.00	86.57	45.24
	5041.000	804.00	32.09	.00	.24	.00	79.93	431.51
	5266.000	804.00	32.18	.00	.09	.00	72.31	223.89
	5400.000	804.00	32.25	.00	.07	.00	72.21	134.34
	5800.000	804.00	32.45	.00	.20	.00	72.21	400.00
	5997.000	804.00	32.54	.00	.10	.00	72.20	197.00
	5998.000	804.00	32.55	.00	.00	.00	72.20	1.00
	6049.000	804.00	32.57	.00	.03	.00	59.04	51.00
*	6050.000	804.00	33.60	.00	1.03	.00	22.27	1.00
*	6070.000	804.00	35.70	.00	2.10	.00	66.00	20.00
	6071.000	804.00	35.70	.00	.00	.00	66.09	1.00
	6600.000	804.00	35.99	.00	.28	.00	73.25	529.00
	7000.000	804.00	36.17	.00	.18	.00	73.14	400.00
	7499.000	804.00	36.39	.00	.23	.00	72.86	499.00
	7500.000	804.00	36.40	.00	.00	.00	72.92	1.00
	7549.000	804.00	36.42	.00	.02	.00	59.59	49.00
*	7550.000	804.00	37.35	.00	.93	.00	22.27	1.00
*	7570.000	804.00	39.47	.00	2.13	.00	73.29	20.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	7570.000	804.00	39.49	.00	.01	.00	73.42	20.00
	7860.000	804.00	39.62	.00	.13	.00	73.24	289.00
	8147.000	804.00	39.75	.00	.13	.00	73.15	287.00
	8148.000	804.00	39.75	.00	.00	.00	73.17	1.00
	8199.000	804.00	39.77	.00	.02	.00	59.76	51.00
*	8200.000	804.00	40.67	.00	.90	.00	22.27	1.00
*	8220.000	804.00	42.79	.00	2.13	.00	73.29	20.00
	8221.000	804.00	42.80	.00	.00	.00	73.39	1.00
	8600.000	804.00	42.97	.00	.17	.00	73.15	379.00
	9000.000	804.00	43.15	.00	.18	.00	73.00	400.00
	9247.000	804.00	43.26	.00	.11	.00	73.54	247.00
	9248.000	804.00	43.26	.00	.00	.00	73.56	1.00
	9299.000	804.00	43.29	.00	.02	.00	59.58	51.00
*	9300.000	804.00	44.24	.00	.95	.00	21.73	1.00
*	9320.000	804.00	46.41	.00	2.17	.00	73.80	20.00
	9321.000	804.00	46.41	.00	.00	.00	73.89	1.00
	9800.000	804.00	46.61	.00	.21	.00	73.55	479.00
	10200.000	804.00	46.79	.00	.18	.00	73.34	400.00
	10447.000	804.00	46.90	.00	.11	.00	73.20	247.00
	10448.000	804.00	46.90	.00	.00	.00	73.21	1.00
	10499.000	804.00	46.92	.00	.02	.00	59.79	51.00
*	10500.000	804.00	47.82	.00	.89	.00	22.27	1.00
*	10520.000	804.00	49.94	.00	2.13	.00	73.29	20.00
	10521.000	804.00	49.96	.00	.01	.00	73.42	20.00
	10900.000	804.00	50.13	.00	.17	.00	73.24	379.00
	11027.000	804.00	50.09	.00	-.03	.00	57.66	127.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	11185.000	804.00	52.78	.00	2.69	.00	25.97	157.90
	11400.000	804.00	53.56	.00	.77	.00	66.77	215.00
	11600.000	804.00	53.73	.00	.17	.00	67.36	200.00
*	11675.000	804.00	53.80	.00	.07	.00	68.44	75.31
*	11819.000	804.00	54.32	.00	.52	.00	25.97	144.09
	11869.000	804.00	54.76	.00	.44	.00	74.29	100.00
	12037.000	504.00	54.87	.00	.11	.00	60.67	168.00
	12038.000	504.00	54.87	.00	.00	.00	60.67	1.00
	12089.000	504.00	54.88	.00	.01	.00	45.89	51.00
*	12090.000	504.00	55.28	.00	.40	.00	18.25	1.52
*	12110.000	504.00	57.03	.00	1.75	.00	53.55	20.00
	12111.000	504.00	57.03	.00	.00	.00	53.65	1.00
	12400.000	504.00	57.32	.00	.29	.00	54.90	289.00
	12800.000	504.00	57.67	.00	.35	.00	55.97	400.00
	13200.000	504.00	57.98	.00	.31	.00	56.88	400.00
	13347.000	504.00	58.12	.00	.14	.00	57.05	197.00
	13448.000	504.00	58.13	.00	.00	.00	57.00	1.00
	13499.000	504.00	58.14	.00	.02	.00	43.48	51.00
*	13500.000	504.00	58.93	.00	.78	.00	18.21	1.00
*	13520.000	504.00	60.69	.00	1.77	.00	53.60	20.00
	13521.000	504.00	60.69	.00	.00	.00	53.69	1.00
	13800.000	504.00	60.86	.00	.17	.00	53.86	279.00
	14200.000	504.00	61.10	.00	.24	.00	54.16	400.00
	14647.000	504.00	61.35	.00	.25	.00	54.37	447.00
	14648.000	504.00	61.35	.00	.00	.00	54.34	1.00
	14699.000	504.00	61.38	.00	.02	.00	41.55	51.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	14700.000	504.00	62.53	.00	1.15	.00	18.22	1.00
*	14720.000	504.00	64.29	.00	1.76	.00	53.59	20.00
	14721.000	504.00	64.29	.00	.00	.00	53.68	1.00
	15200.000	504.00	64.58	.00	.29	.00	54.00	479.00
	15600.000	504.00	64.81	.00	.23	.00	54.28	400.00
	16000.000	504.00	65.04	.00	.23	.00	54.48	400.00
	16400.000	504.00	65.26	.00	.22	.00	54.64	400.00
	16800.000	504.00	65.47	.00	.22	.00	54.77	400.00
	17047.000	504.00	65.61	.00	.14	.00	55.13	247.00
	17048.000	504.00	65.61	.00	.00	.00	55.16	1.00
	17099.000	504.00	65.63	.00	.01	.00	41.84	51.00
*	17100.000	504.00	66.73	.00	1.10	.00	18.22	1.00
*	17120.000	504.00	68.49	.00	1.76	.00	53.50	20.00
	17121.000	504.00	68.49	.00	.00	.00	53.59	1.00
	17400.000	504.00	68.66	.00	.17	.00	53.86	279.00
	17697.000	504.00	68.84	.00	.18	.00	54.07	297.00
	17698.000	504.00	68.84	.00	.00	.00	54.07	1.00
	17749.000	504.00	68.86	.00	.02	.00	41.34	51.00
*	17750.000	504.00	70.06	.00	1.20	.00	18.22	1.00
*	17770.000	504.00	71.82	.00	1.76	.00	53.59	20.00
	17771.000	504.00	71.82	.00	.00	.00	53.68	1.00
	18100.000	504.00	72.02	.00	.20	.00	53.85	329.00
	18500.000	504.00	72.26	.00	.24	.00	54.15	400.00
	18947.000	504.00	72.51	.00	.25	.00	54.44	447.00
	18948.000	504.00	72.51	.00	.00	.00	54.42	1.00
	18999.000	504.00	72.54	.00	.02	.00	41.60	51.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	19000.000	504.00	73.68	.00	1.14	.00	18.22	1.00
*	19020.000	504.00	75.44	.00	1.76	.00	53.62	20.00
	19021.000	504.00	75.44	.00	.00	.00	53.71	1.00
	19500.000	504.00	75.73	.00	.29	.00	54.00	479.00
	19947.000	504.00	75.99	.00	.26	.00	54.34	447.00
	19948.000	504.00	75.99	.00	.00	.00	54.31	1.00
	19999.000	504.00	76.01	.00	.02	.00	41.47	51.00
*	20000.000	504.00	77.18	.00	1.17	.00	18.22	1.00
*	20020.000	504.00	78.94	.00	1.76	.00	53.59	20.00
	20021.000	504.00	78.94	.00	.00	.00	53.68	1.00
	20400.000	504.00	79.17	.00	.23	.00	53.93	379.00
	20800.000	504.00	79.40	.00	.23	.00	54.22	400.00
	21047.000	504.00	79.55	.00	.14	.00	54.37	247.00
	21048.000	504.00	79.55	.00	.00	.00	54.37	1.00
	21099.000	504.00	79.57	.00	.02	.00	41.51	51.00
*	21100.000	504.00	80.79	.00	1.22	.00	17.31	1.00
*	21120.000	504.00	82.63	.00	1.84	.00	54.66	20.00
	21121.000	504.00	82.63	.00	.00	.00	54.75	1.00
	22047.000	504.00	82.88	.00	.25	.00	52.96	447.00
	22048.000	504.00	82.88	.00	.00	.00	52.97	1.00
	22099.000	504.00	82.91	.00	.03	.00	40.61	51.00
*	22100.000	504.00	84.23	.00	1.32	.00	18.21	1.00
*	22120.000	504.00	85.99	.00	1.77	.00	53.60	20.00
	22121.000	504.00	86.00	.00	.00	.00	53.69	1.00
	22600.000	504.00	86.28	.00	.29	.00	54.01	479.00
	23047.000	504.00	86.54	.00	.26	.00	54.27	447.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	23048.000	504.00	86.54	.00	.00	.00	54.24	1.00
	23099.000	504.00	86.56	.00	.02	.00	41.48	51.00
*	23100.000	504.00	87.73	.00	1.16	.00	18.22	1.00
*	23120.000	504.00	89.49	.00	1.76	.00	53.59	20.00
	23120.000	504.00	89.49	.00	.00	.00	53.66	1.00
	23506.000	504.00	89.73	.00	.23	.00	53.80	386.27
*	23556.000	504.00	89.70	.00	-.02	.00	41.30	50.29
*	23686.000	504.00	91.72	.00	2.01	.00	18.06	120.00
	23720.000	504.00	92.20	.00	.49	.00	48.84	34.00
	24200.000	504.00	92.67	.00	.47	.00	50.82	480.00
	24650.000	504.00	93.03	.00	.36	.00	51.78	450.00
	25147.000	504.00	93.39	.00	.36	.00	53.02	497.00
	25148.000	504.00	93.39	.00	.00	.00	52.63	1.00
	25199.000	504.00	93.40	.00	.01	.00	40.22	51.00
*	25200.000	504.00	94.91	.00	1.51	.00	16.39	1.00
*	25220.000	504.00	96.52	.00	1.60	.00	53.39	20.00
	25221.000	504.00	96.52	.00	.00	.00	53.47	1.00
	25650.000	504.00	96.78	.00	.26	.00	53.75	429.00
*	25700.000	504.00	96.74	.00	-.03	.00	38.35	50.00
*	26003.000	504.00	99.78	.00	3.03	.00	18.06	303.18
*	26103.000	504.00	100.33	.00	.55	.00	50.07	100.00
*	26203.000	504.00	101.34	.00	1.01	.00	61.96	100.00

SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION SECNO=   2100.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2100.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2100.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=   2120.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=   2900.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2900.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2900.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

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CAUTION SECNO=   4100.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

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WARNING SECNO=   4452.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   4564.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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WARNING SECNO=   6070.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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WARNING SECNO=  10520.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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CAUTION SECNO=  19000.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
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CAUTION SECNO=  19000.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

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CAUTION SECNO=  20000.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

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CAUTION SECNO=  21100.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=  21120.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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CAUTION SECNO=  22100.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

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CAUTION SECNO=  23100.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
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CAUTION SECNO=  23100.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

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CAUTION SECNO=  25200.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

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CAUTION SECNO=  26203.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
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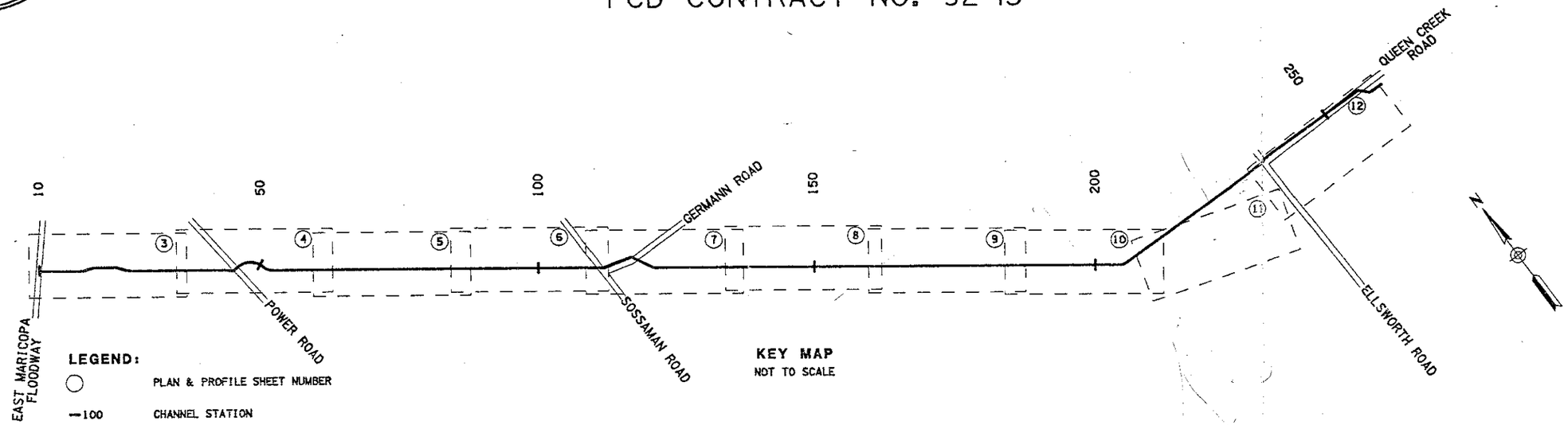
Appendix K
Construction Plans
(Alternate C with C-3B Alignment)

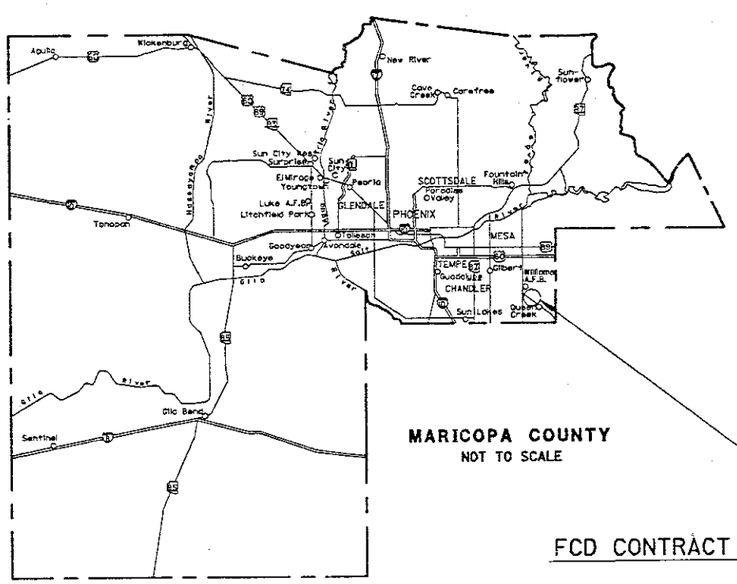
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CONCEPTUAL PLANS FOR THE CONSTRUCTION OF:

RITTENHOUSE CHANNEL - EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD

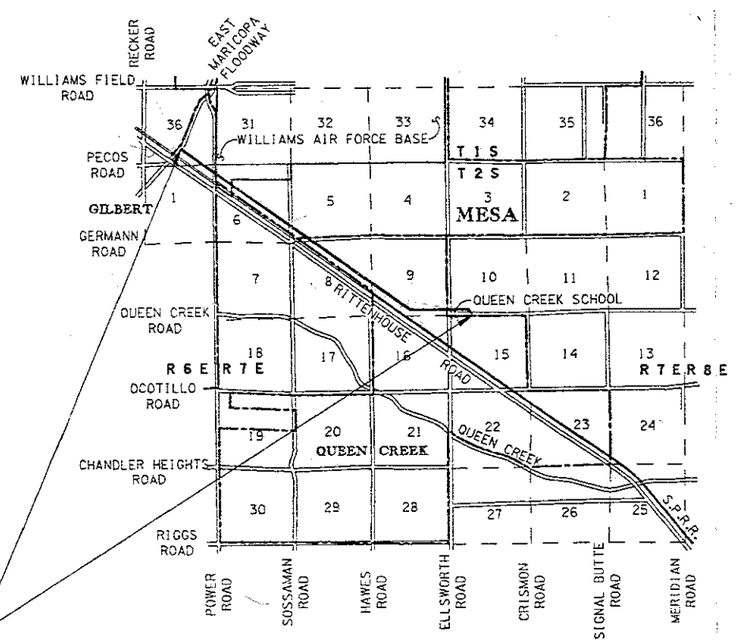
FCD CONTRACT NO. 92-13





MARICOPA COUNTY
NOT TO SCALE

FCD CONTRACT NO. 92-13



VICINITY MAP
NOT TO SCALE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

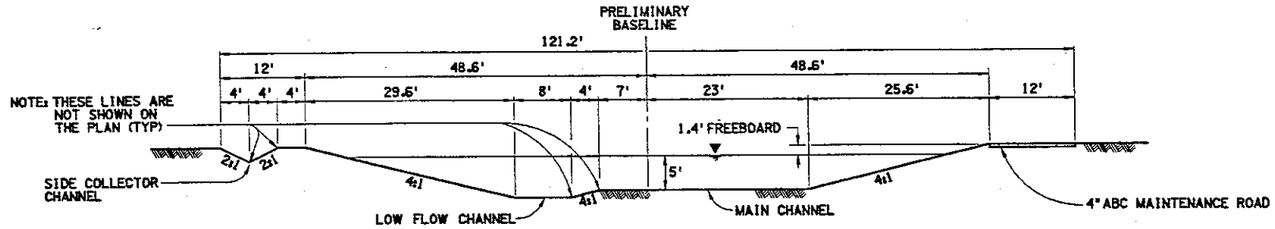
ISSUED FOR PUBLIC BIDDING BY:

CHIEF ENGINEER AND GENERAL MANAGER — DATE

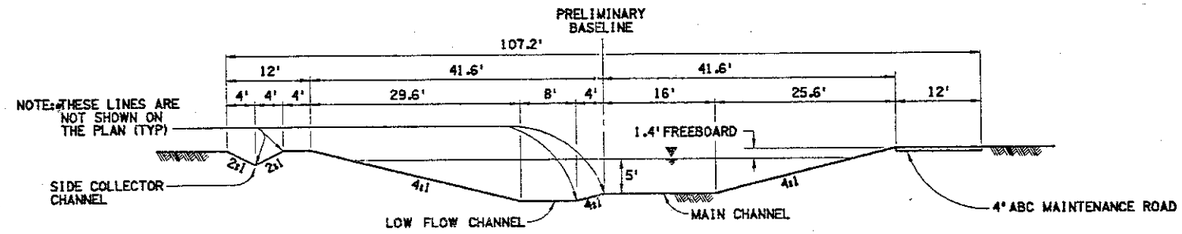
BOARD OF DIRECTORS

JIM BRUNER - CHAIRMAN

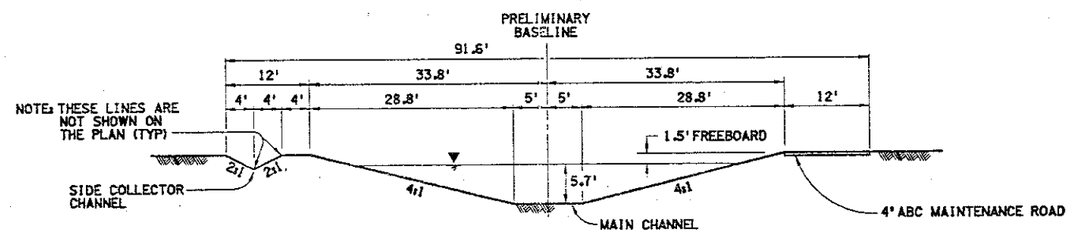
DISTRICT 1	TOM RAWLES
DISTRICT 2	JIM BRUNER
DISTRICT 3	BETSEY BAYLESS
DISTRICT 4	EDWARD KING
DISTRICT 5	MARY ROSE WILCOX



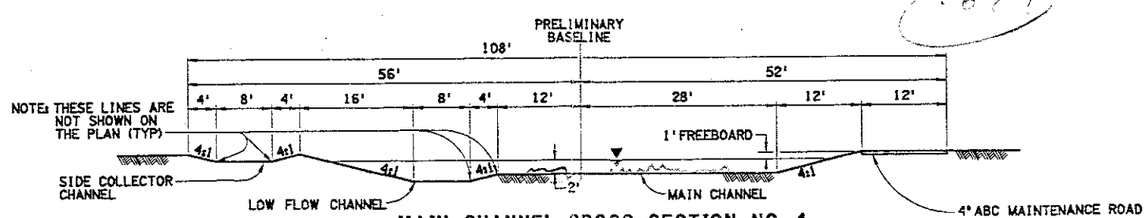
MAIN CHANNEL CROSS SECTION NO. 1
STA 10+00.00 TO STA 44+51.94
NOT TO SCALE



MAIN CHANNEL CROSS SECTION NO. 2
STA 50+40.71 TO STA 110+27.34
STA 111+85.34 TO STA 116+75.31
NOT TO SCALE



MAIN CHANNEL CROSS SECTION NO. 3
STA 120+90.52 TO STA 235+56.56
STA 236+86.27 TO STA 257+00.00
STA 260+03.18 TO STA 261+03.18
NOT TO SCALE



MAIN CHANNEL CROSS SECTION NO. 4
FUTURE CHANNEL EAST OF POWER ROAD TO WILLIAMS AIR FORCE BASE
NOT TO SCALE

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGNED	JLK	06/93
DRAWN	FDD/JCC	06/93
CHECKED	RDS	06/93

Cannett Fleming
ENGINEERS AND PLANNERS

SHEET 02 OF 12

PRELIMINARY BASELINE CURVE DATA

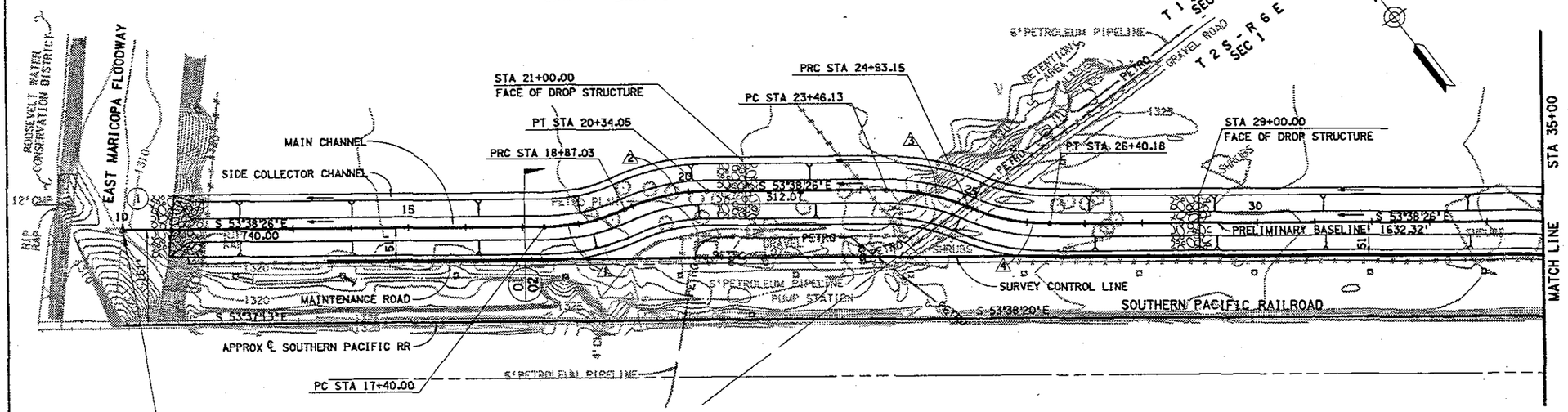
NO	Δ	D	R	T	L
1	24°00'00"	16°19'25"	351.00'	74.61'	147.03'
2	24°00'00"	16°19'25"	351.00'	74.61'	147.03'
3	24°00'00"	16°19'25"	351.00'	74.61'	147.03'
4	24°00'00"	16°19'25"	351.00'	74.61'	147.03'

LEGEND:

CROSS SECTION NUMBER

SHEET NUMBER

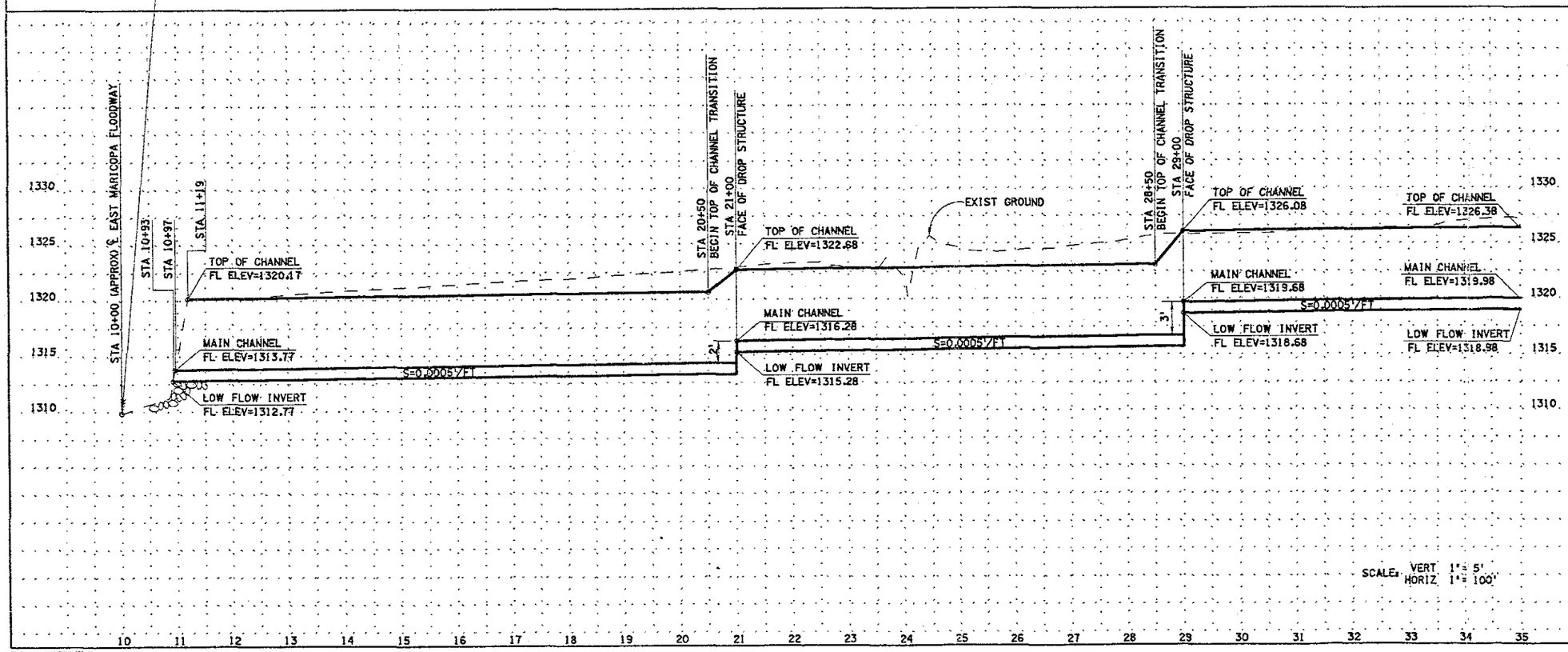
—PETRO— EXIST PETROLEUM PIPELINE



STA 10+00 BEGIN
FCD CONTRACT NO. 92-13

BM
BRASS CAP @ INTERSECTION OF PECOS RD
ELEV 1315.16

100 0 100 200
SCALE IN FEET



SCALE: VERT 1" = 5'
HORIZ 1" = 100'

☐ REMOVE ☐

◯ CONSTRUCT ◯

(1) CONSTRUCT GROUTED RIPRAP DOWNDRAIN FROM STA 10+50 TO STA 11+50.

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	JLK	06/93
	DRAWN	FDD	06/93
	CHECKED	RDS	06/93

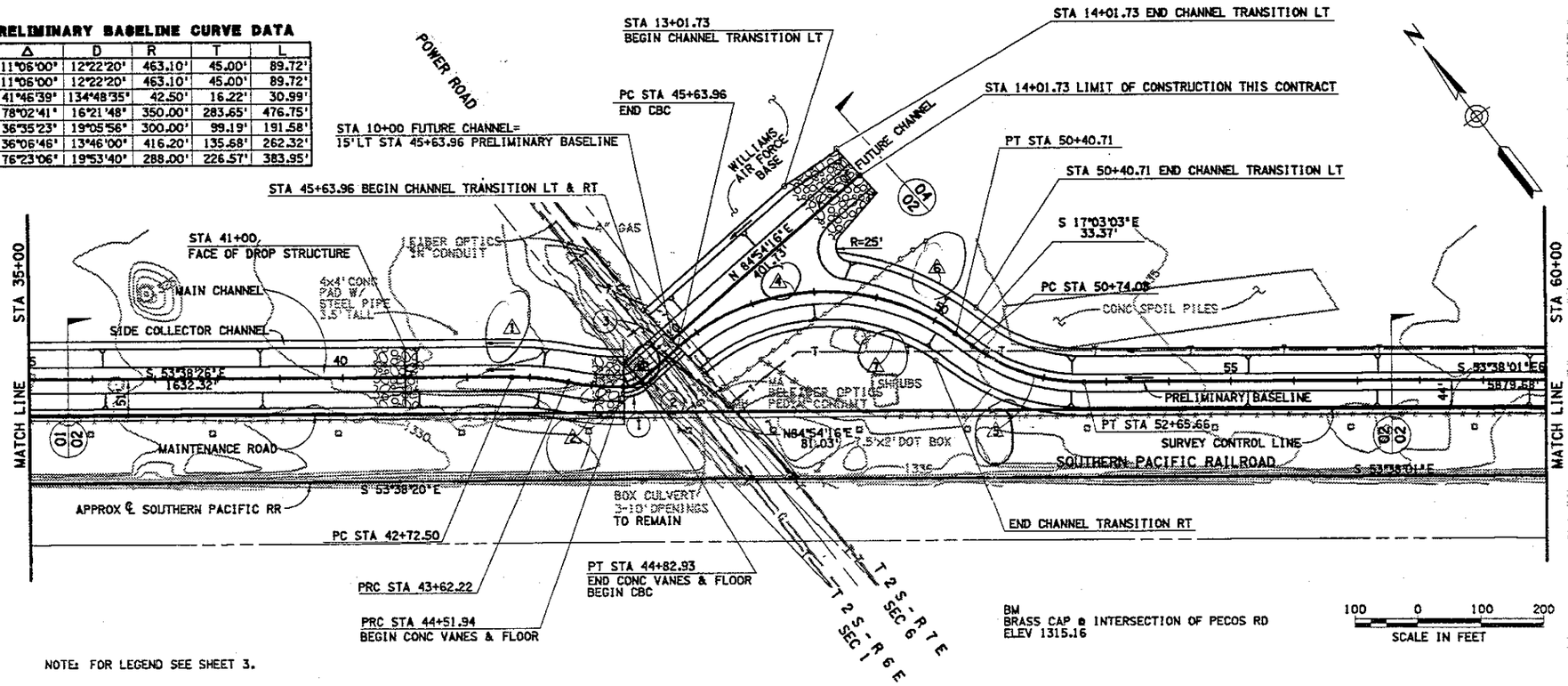
Cannett Fleming
ENGINEERS AND PLANNERS

PLAN/PROFILE
STA 10+00.00 TO 35+00.00

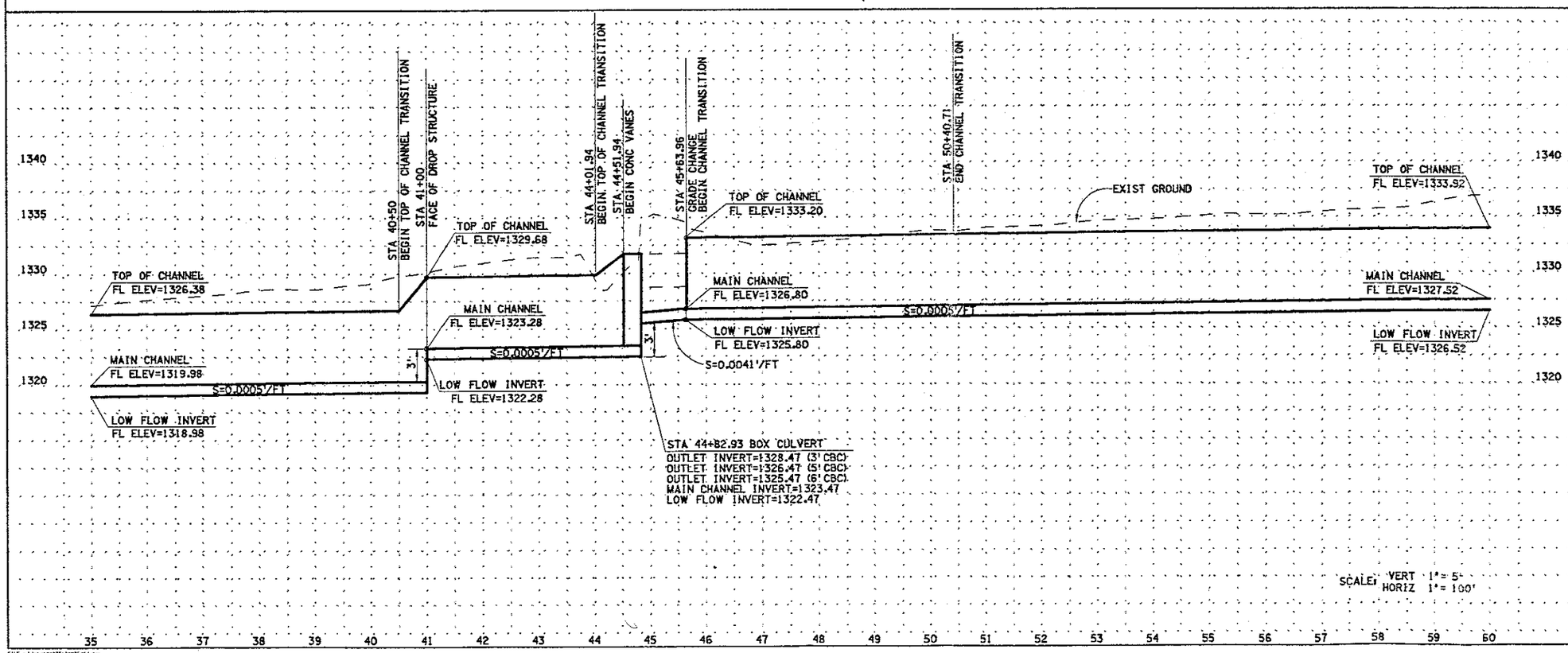
SHEET 03 OF 12

PRELIMINARY BASELINE CURVE DATA

NO	Δ	D	R	T	L
1	11°06'00"	12°22'20"	463.10'	45.00'	89.72'
2	11°06'00"	12°22'20"	463.10'	45.00'	89.72'
3	41°46'39"	134°48'35"	42.50'	16.22'	30.99'
4	78°02'41"	16°21'48"	350.00'	283.65'	476.75'
5	36°35'23"	19°05'56"	300.00'	99.19'	191.58'
6	36°06'46"	13°46'00"	416.20'	135.68'	262.32'
7	76°23'06"	19°53'40"	288.00'	226.57'	383.95'



NOTE: FOR LEGEND SEE SHEET 3.



☐ REMOVE ☐

○ CONSTRUCT ○

1. CONSTRUCT CONCRETE OUTLET VANES & FLOOR.
2. CONSTRUCT 2-7'x5' CBC.
3. CONSTRUCT 8'x6' CBC.

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

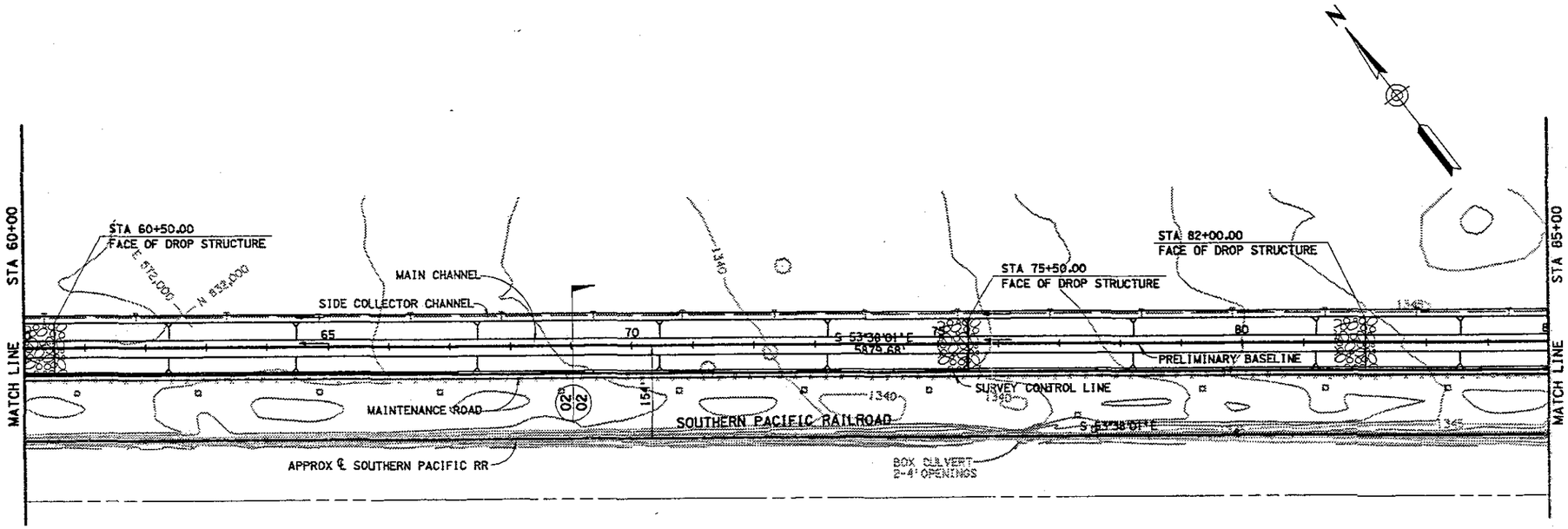
PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGNED	JLK	06/93
DRAWN	FDD	06/93
CHECKED	RDS	06/93

Connell Fleming
ENGINEERS AND PLANNERS

PLAN/PROFILE
STA 35+00.00 TO 60+00.00

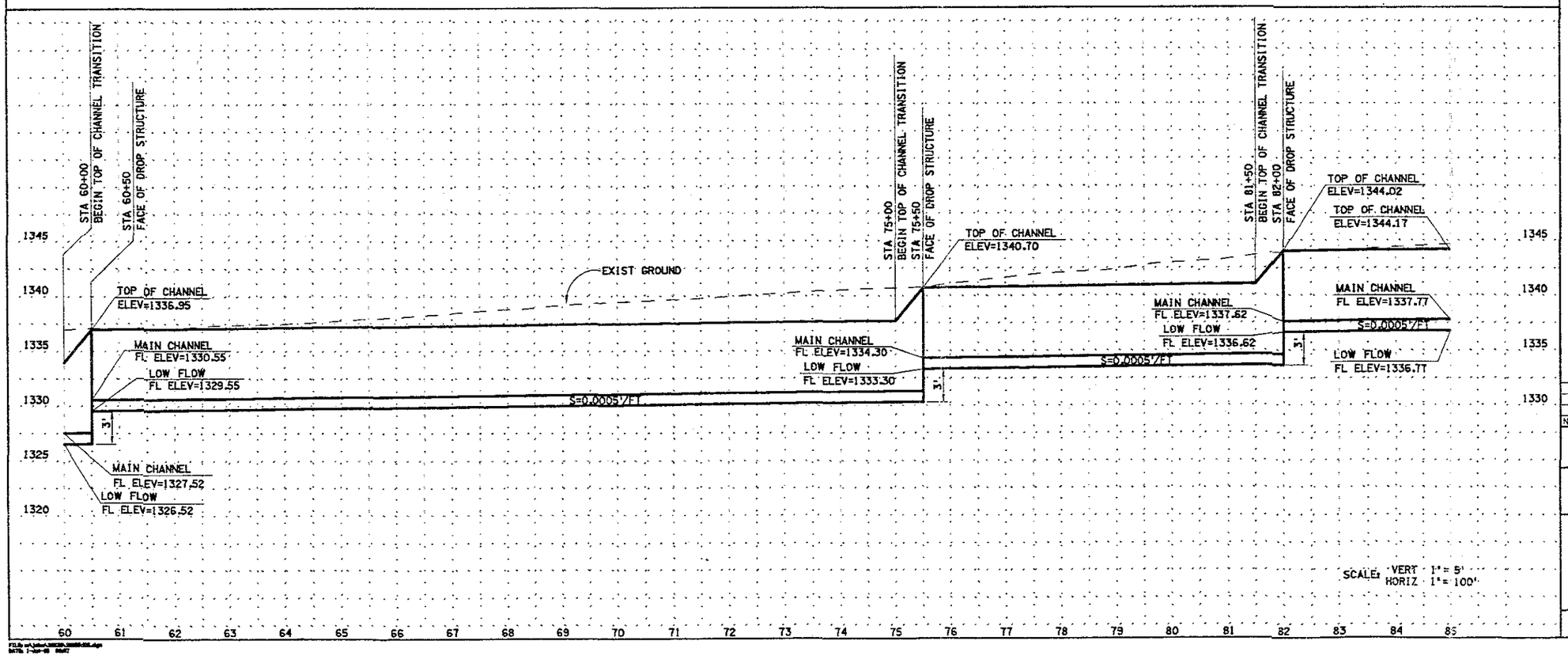
SHEET 04 OF 12



BM
BRASS CAP @ INTERSECTION OF PECOS RD
ELEV 1315.16

100 0 100 200
SCALE IN FEET

NOTE: FOR LEGEND SEE SHEET 3.



SCALE: VERT 1" = 5'
HORIZ 1" = 100'

REMOVE

CONSTRUCT

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

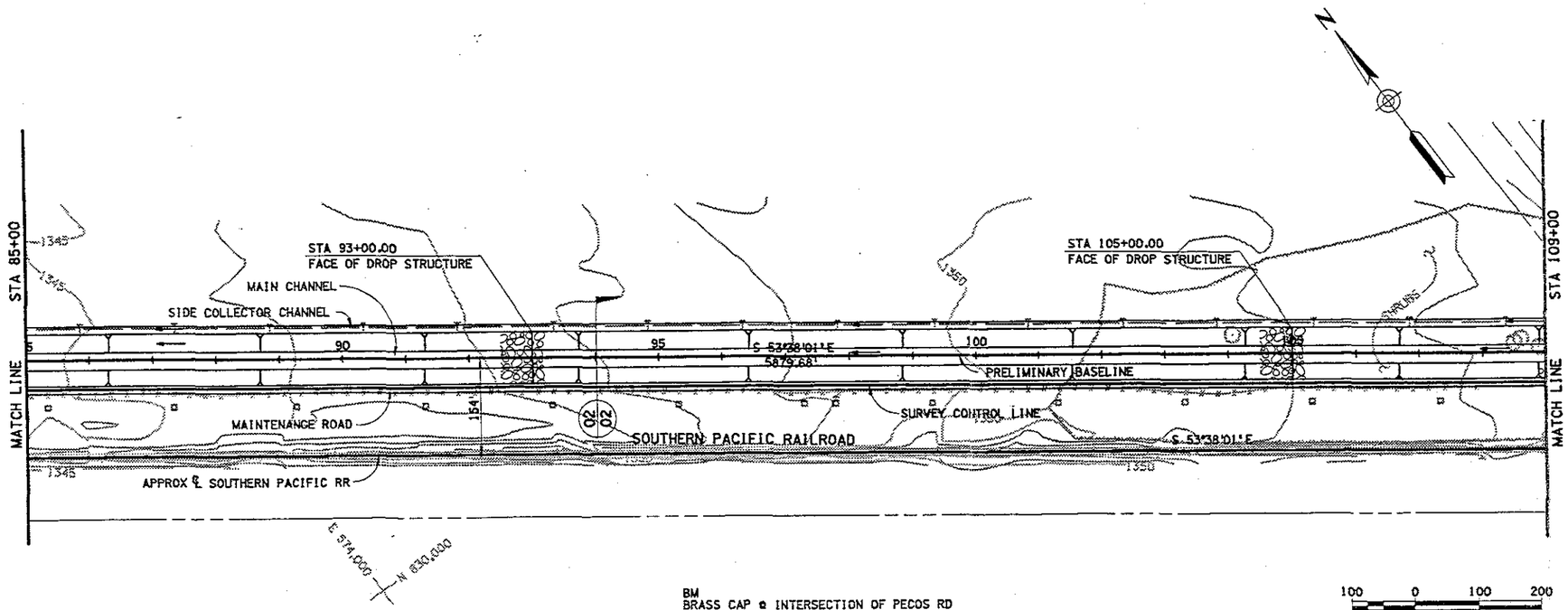
PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGNED	JLK	06/93
DRAWN	FDD	06/93
CHECKED	RDS	06/93

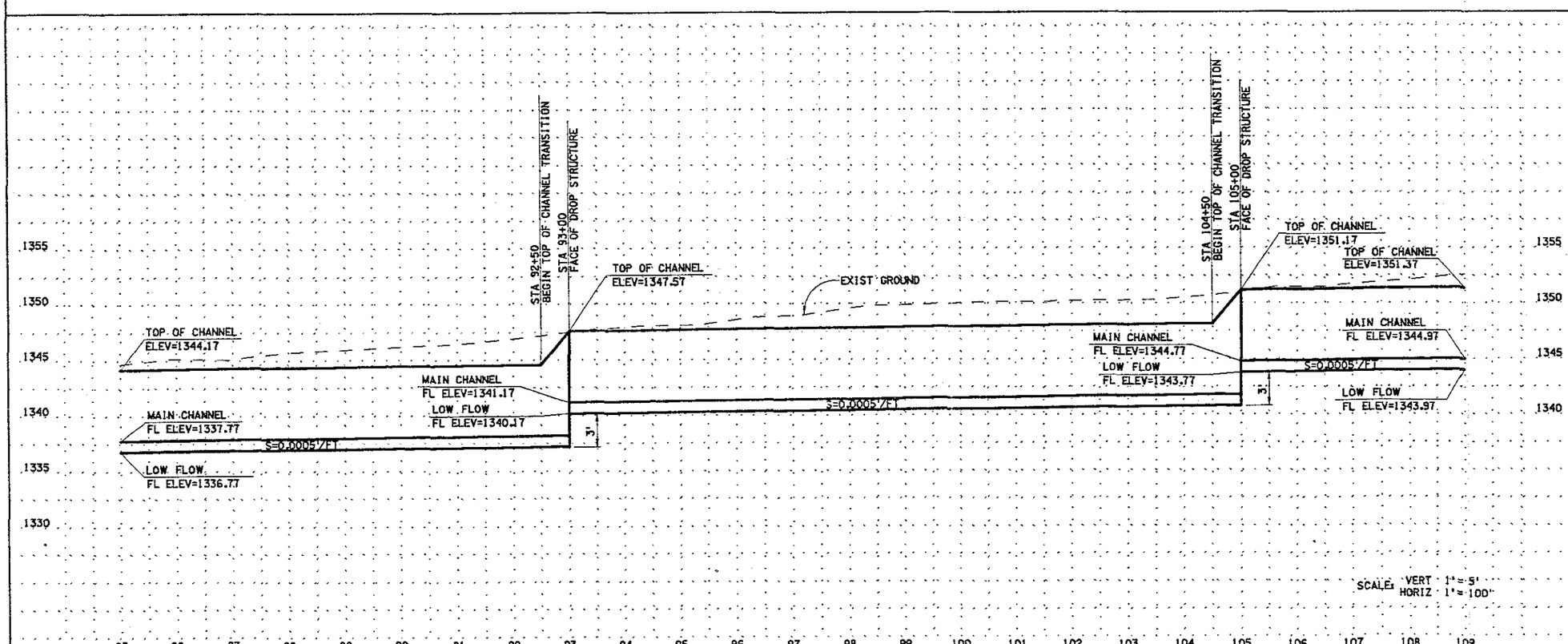
Connett Fleming
ENGINEERS AND PLANNERS

PLAN/PROFILE
STA 60+00.00 TO 85+00.00

SHEET 05 OF 12



NOTE: FOR LEGEND SEE SHEET 3.



☐ REMOVE ☐

○ CONSTRUCT ○

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	JLK	06/93
	DRAWN	FDD	06/93
	CHECKED	RDS	06/93

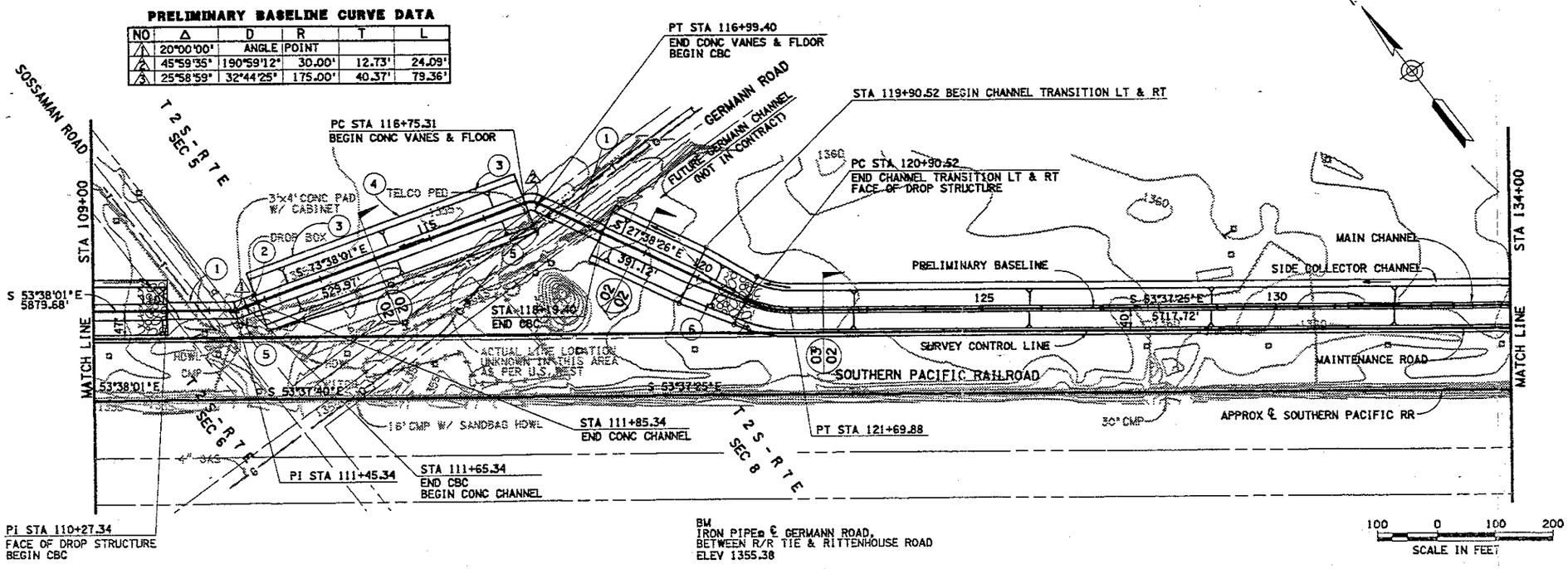
Gannett Fleming
ENGINEERS AND PLANNERS

PLAN/PROFILE
STA 85+00.00 TO 109+00.00

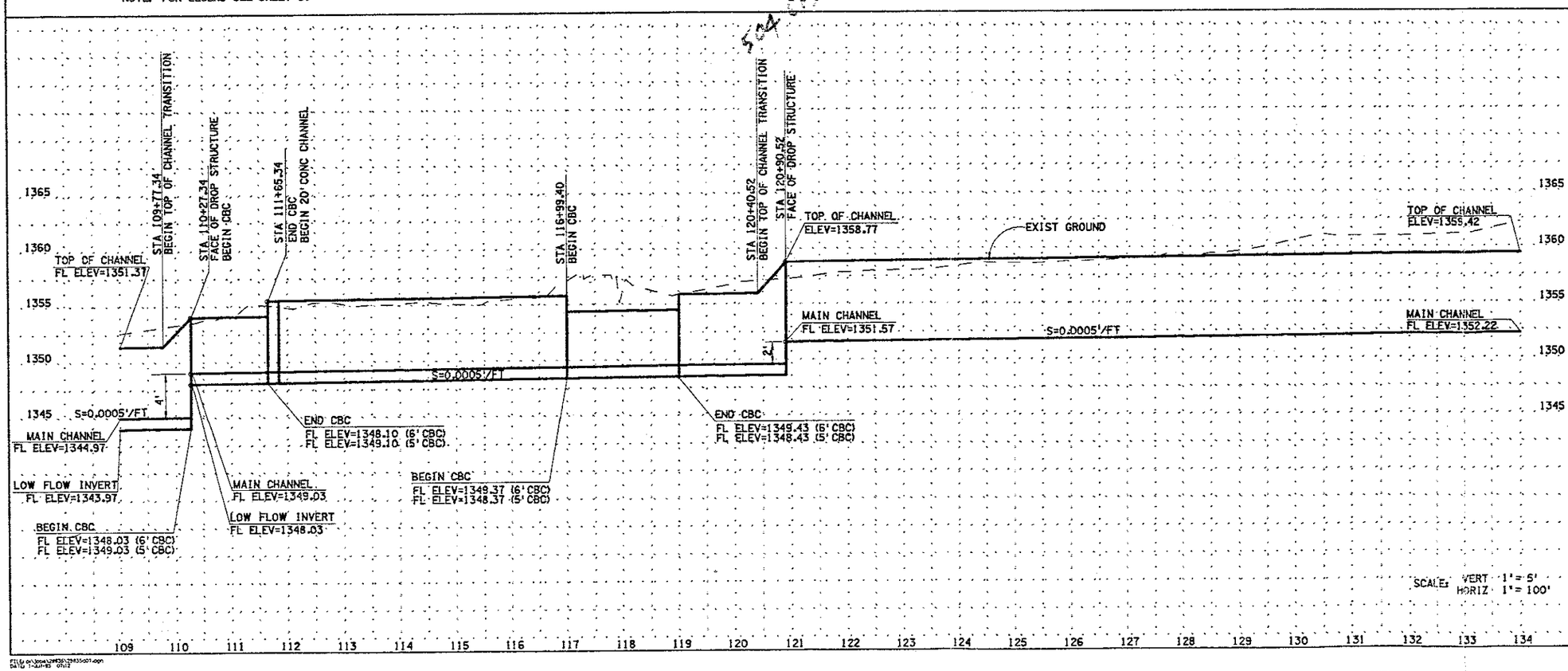
SHEET 06 OF 12

PRELIMINARY BASELINE CURVE DATA

NO	Δ	D	R	T	L
1	20°00'00"	ANGLE	POINT		
2	45°59'35"	190°59'12"	30.00'	12.73'	24.09'
3	25°58'59"	32°44'25"	175.00'	40.37'	79.36'



NOTE: FOR LEGEND SEE SHEET 3.



☐ REMOVE ☐

◯ CONSTRUCT ◯

1. INSTALL 2-9'x5' CBC & 1-8'x6' CBC.
2. CONSTRUCT 20' LONG CONCRETE TRANSITION
3. RECONSTRUCT EXISTING TAILWATER DITCH.
4. ENCLOSE CHANNEL WITH CHAIN LINK FENCE.
5. INSTALL GUARDRAIL BETWEEN ROAD AND CHANNEL.
6. CONSTRUCT 1' DROP STRUCTURE.

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

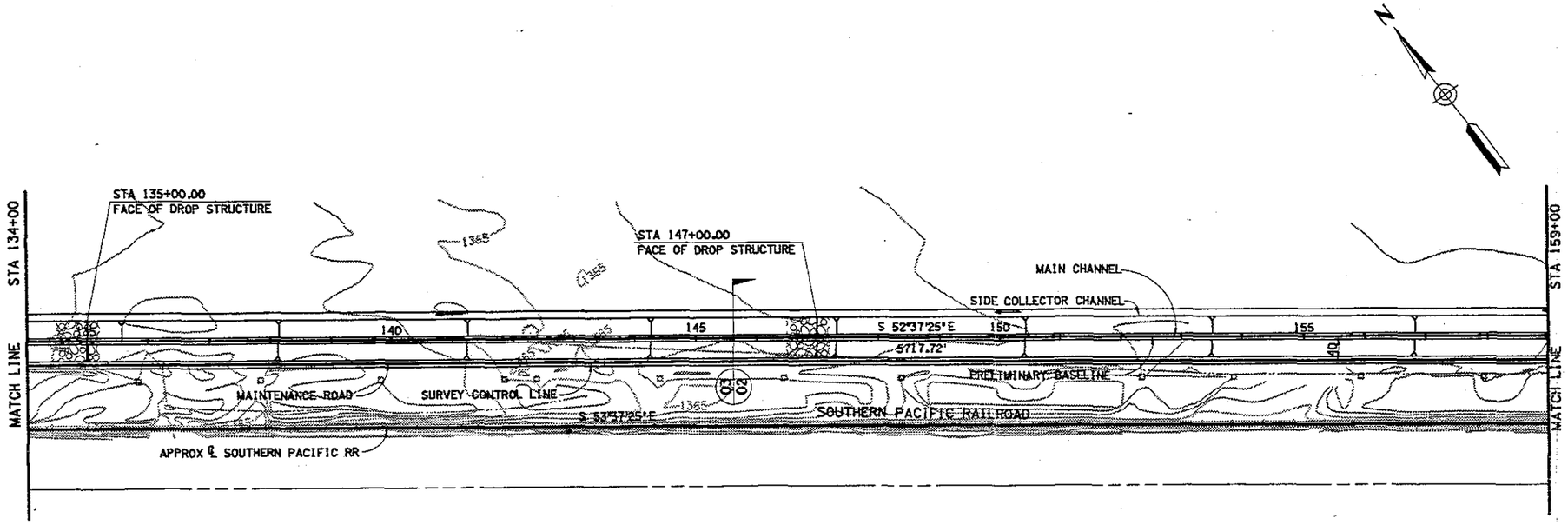
PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGNED	JLK	06/93
DRAWN	FDD	06/93
CHECKED	RDS	06/93

Cannett Fleming
ENGINEERS AND PLANNERS

PLAN/PROFILE
STA 109+00.00 TO 134+00.00

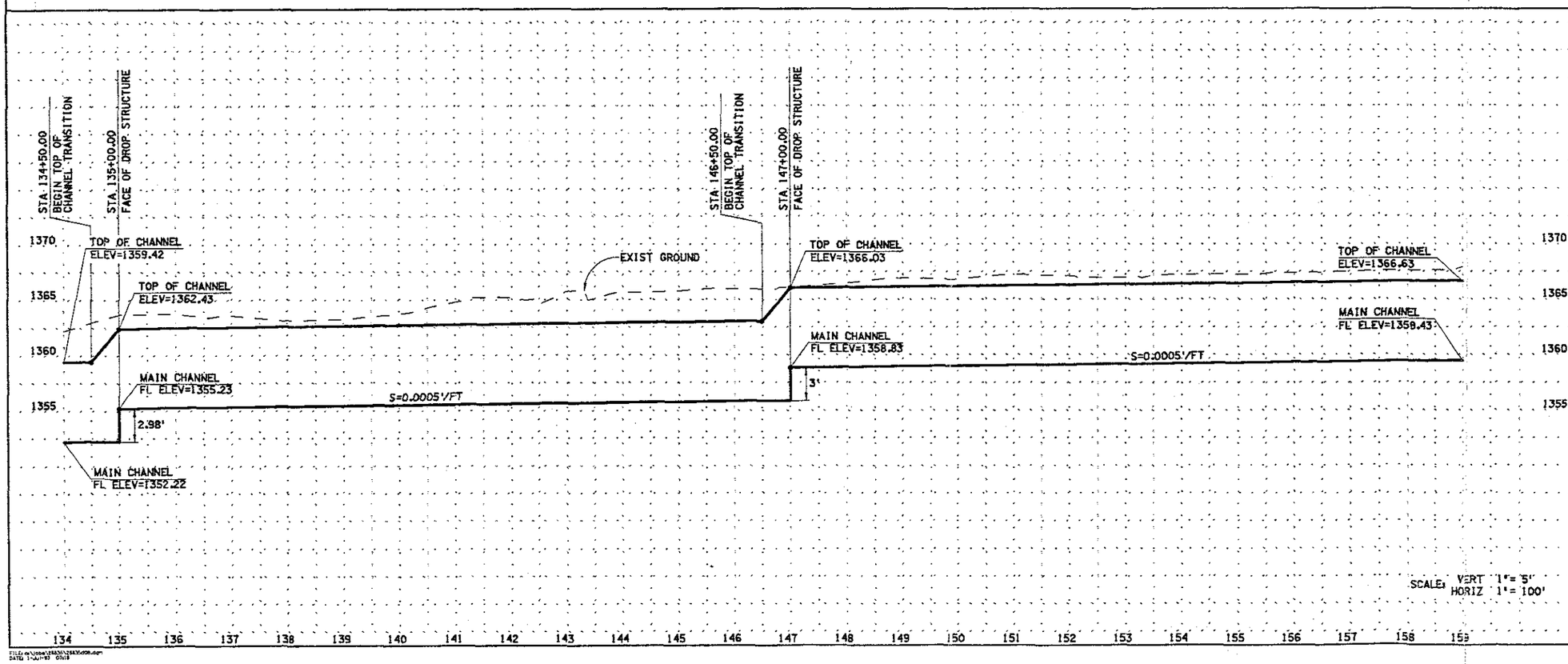
SHEET 07 OF 12



NOTE: FOR LEGEND SEE SHEET 3.

BM
IRON PIPE@ ℄ GERMANN ROAD,
BETWEEN R/R TIE & RITTENHOUSE ROAD
ELEV 1355.38

100 0 100 200
SCALE IN FEET



REMOVE

CONSTRUCT

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

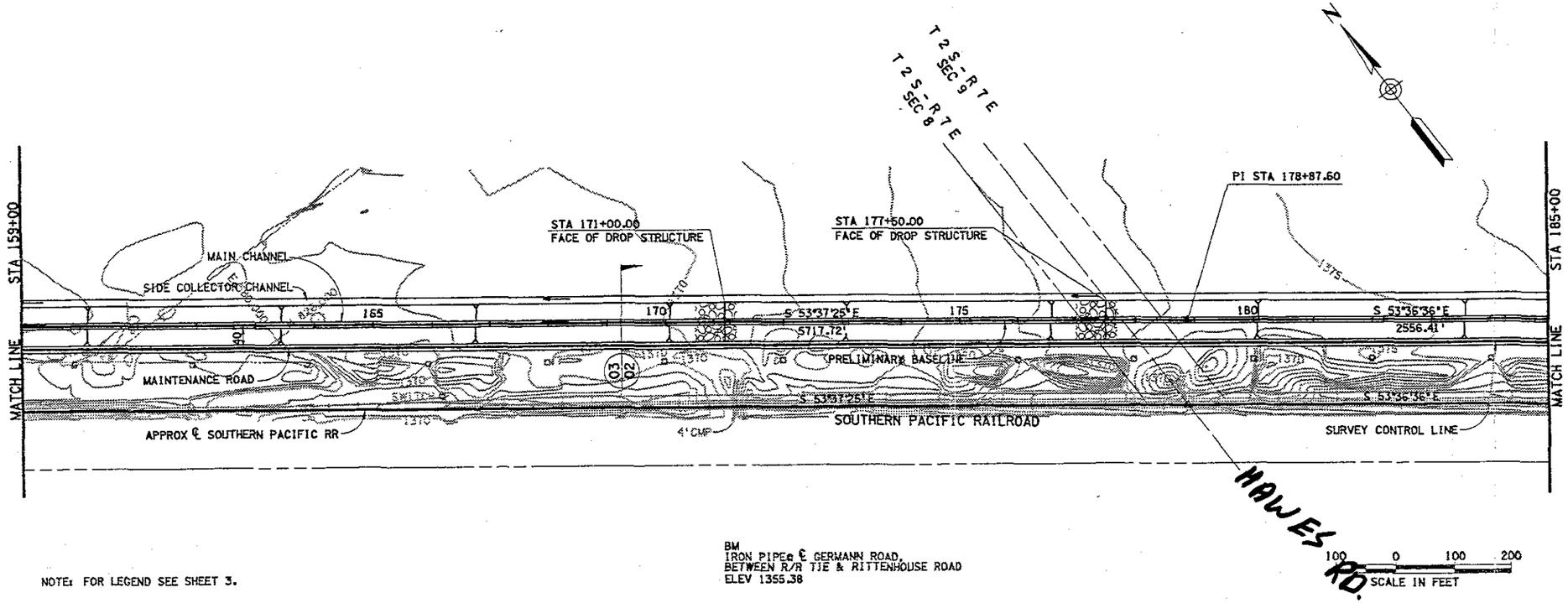
PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGNED	JLK	06/93
DRAWN	FDD	06/93
CHECKED	RDS	06/93

Cornell Fleming
ENGINEERS AND PLANNERS

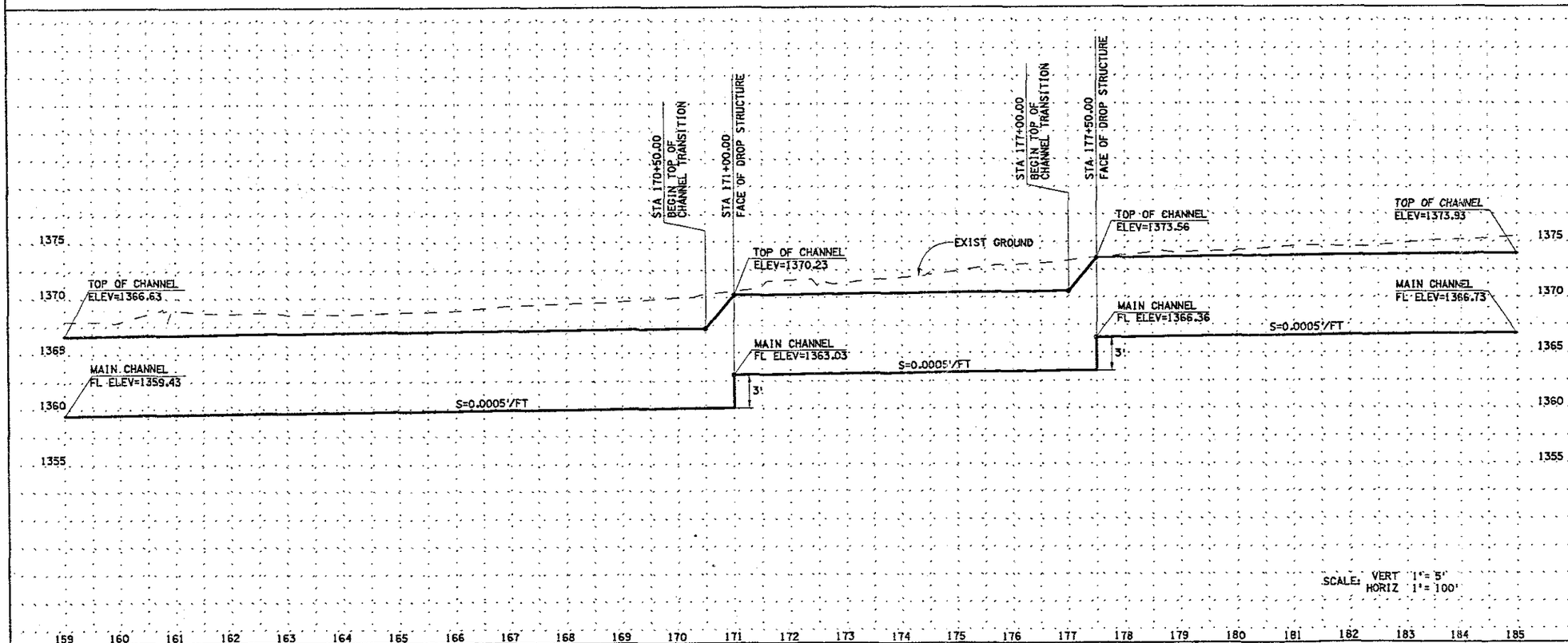
PLAN/PROFILE
STA 134+00.00 TO 159+00.00

SHEET 08 OF 12



NOTE: FOR LEGEND SEE SHEET 3.

BM
IRON PIPE @ ℄ GERMANN ROAD,
BETWEEN R/R TIE & RITTENHOUSE ROAD
ELEV 1355.38



☐ REMOVE ☐

○ CONSTRUCT ○

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	JLK	06/93
	DRAWN	FDD	06/93
	CHECKED	RDS	06/93

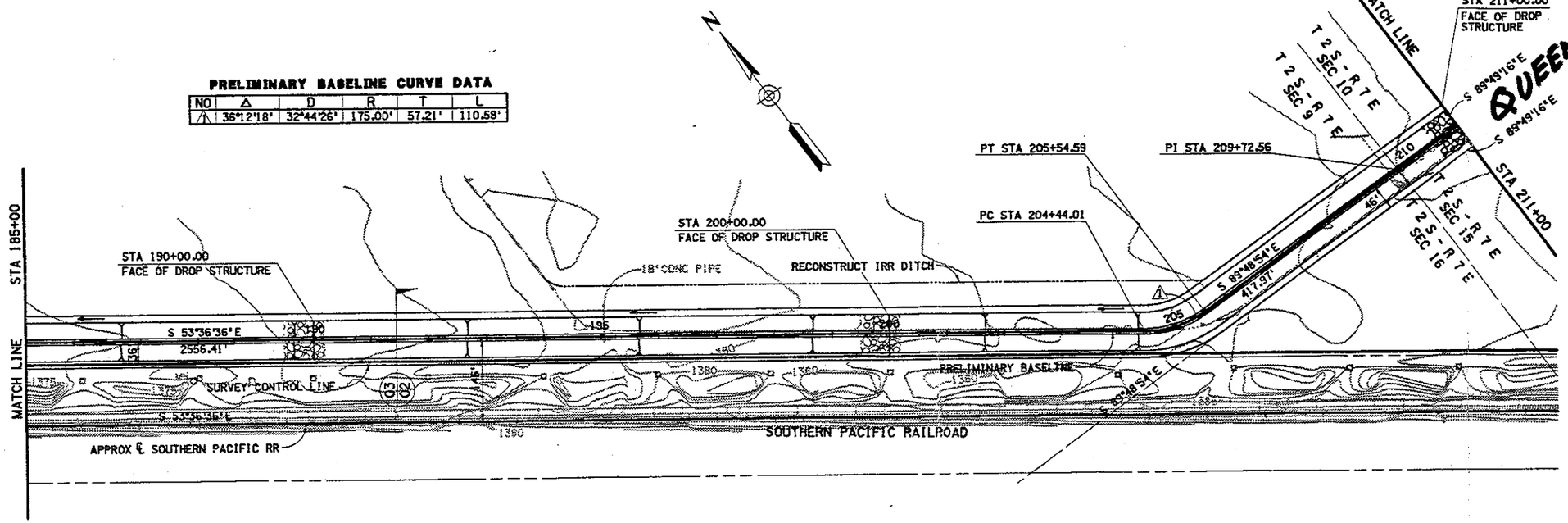
Gannett Fleming
ENGINEERS AND PLANNERS

PLAN/PROFILE
STA 159+00.00 TO 185+00.00

SHEET 09 OF 12

PRELIMINARY BASELINE CURVE DATA

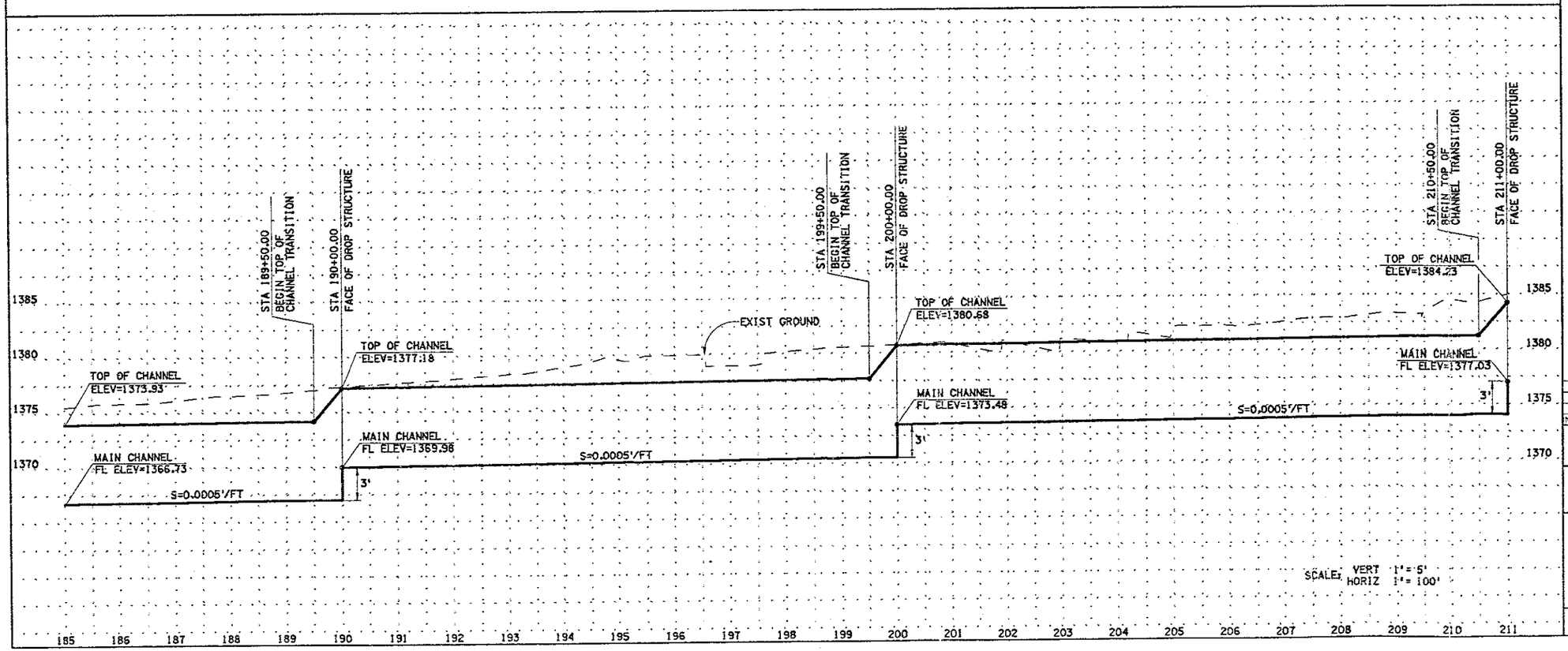
NO	Δ	D	R	T	L
1	36°12'18"	32°44'26"	175.00'	57.21'	110.58'



BM
BRASS CAP IN HAND HOLE,
MC @ INTERSECTION OF
HAWES & RITTENHOUSE RD
ELEV 1375.38

100 0 100 200
SCALE IN FEET

NOTE: FOR LEGEND SEE SHEET 3.



SCALE: VERT 1" = 5'
HORIZ 1" = 100'

☐ REMOVE ☐

○ CONSTRUCT ○

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

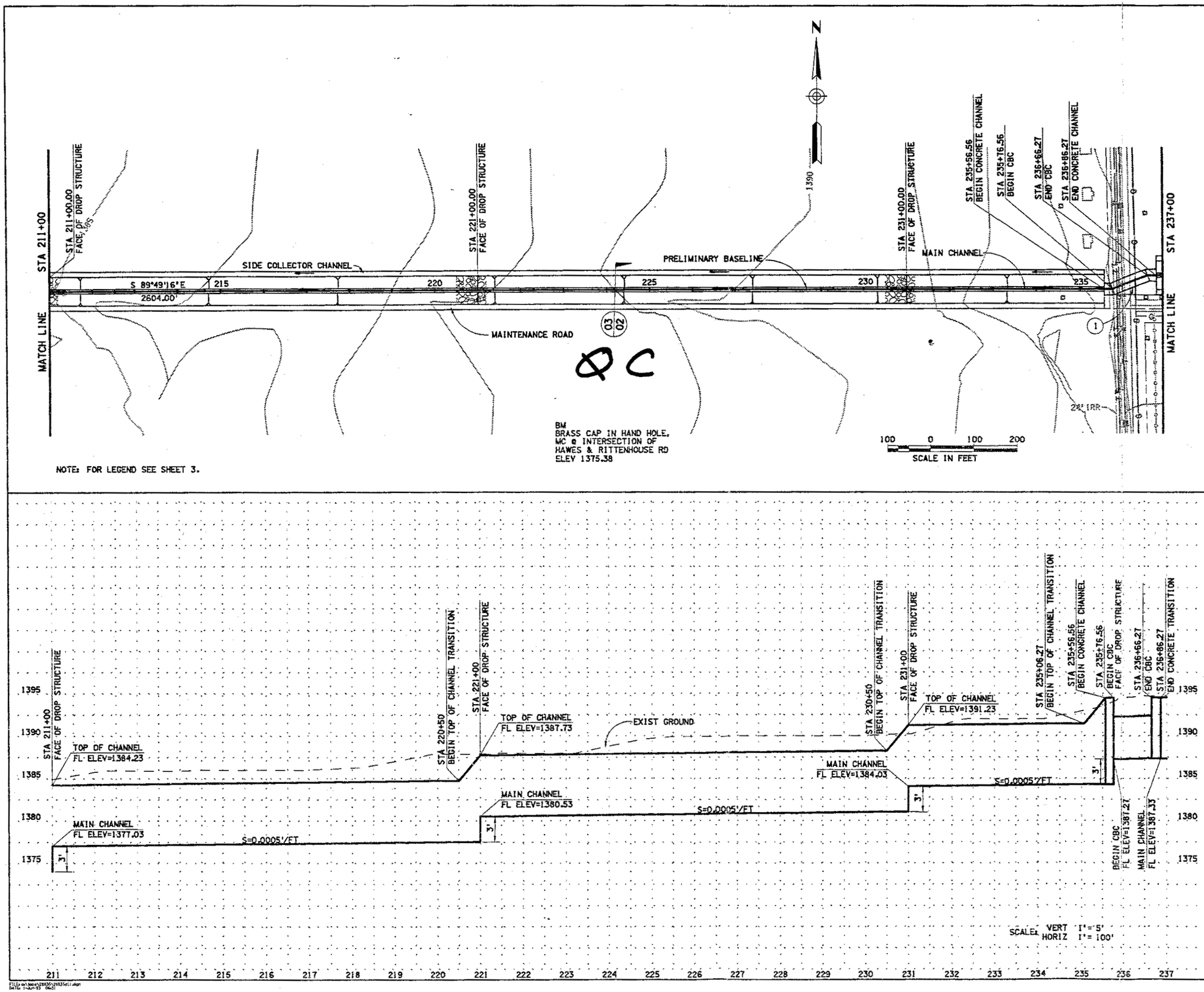
	BY	DATE
DESIGNED	JLK	06/93
DRAWN	FDD	06/93
CHECKED	RDS	06/93

PRELIMINARY
NOT FOR
CONSTRUCTION

Connett Fleming
ENGINEERS AND PLANNERS

PLAN/PROFILE
STA 185+00.00 TO 211+00.00

SHEET 10 OF 12



NOTE: FOR LEGEND SEE SHEET 3.

REMOVE

4564
23636
26003

CONSTRUCT

(1) CONSTRUCT 2-9'x5' CBC

PT 1 304

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

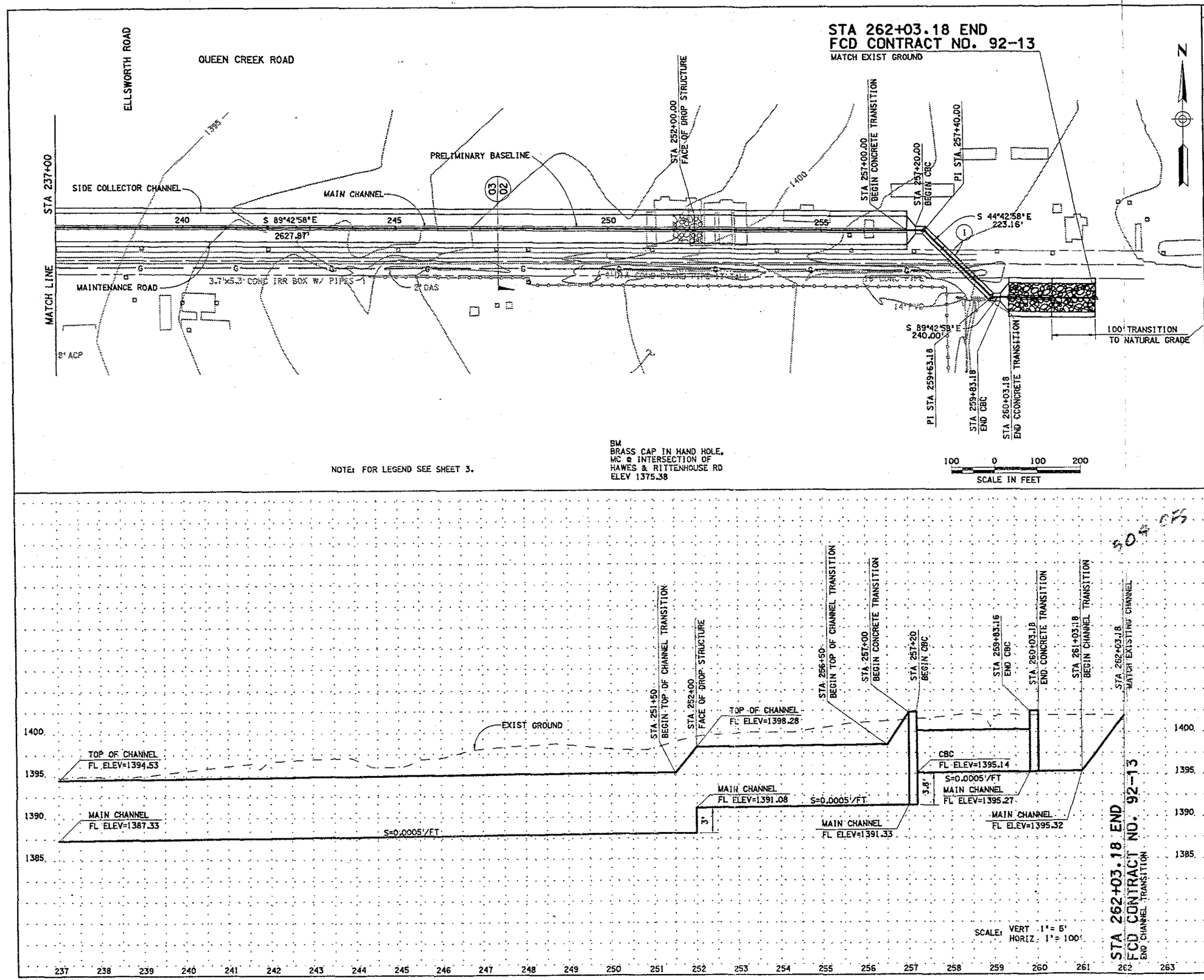
PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGNED	JLK	06/93
DRAWN	FDD	06/93
CHECKED	RDS	06/93

Connett Fleming
ENGINEERS AND PLANNERS

PLAN/PROFILE
STA 211+00.00 TO 237+00.00

SHEET 11 OF 12



☐ REMOVE ☐

○ CONSTRUCT ○

(1) INSTALL 2-9'x5' CBC

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

RITTENHOUSE CHANNEL
EAST MARICOPA FLOODWAY TO ELLSWORTH ROAD
FCD CONTRACT NO. 92-13

PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGNED	JLK	06/93
DRAWN	FDD	06/93
CHECKED	RDS	06/93

Connell Fleming
ENGINEERS AND PLANNERS

PLAN/PROFILE
STA 237+00.00 TO 262+03.18

SHEET 12 OF 12

Appendix L
Quantity Calculations

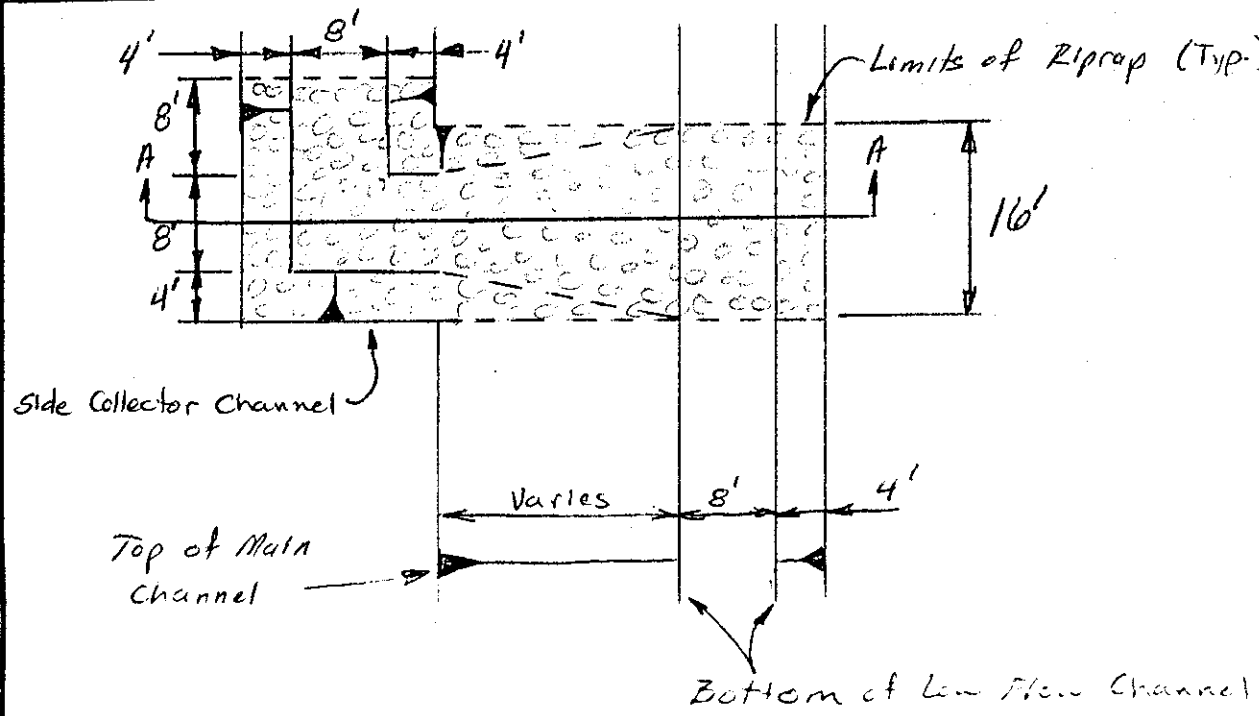
Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 1 OF 13	
	DESIGN FOR Quantities	DESIGNER R	DATE 3/93
		CHECKER RDS	DATE 6/93

Clearing And Grubbing (For Estimates Only, Not a Bid Item)

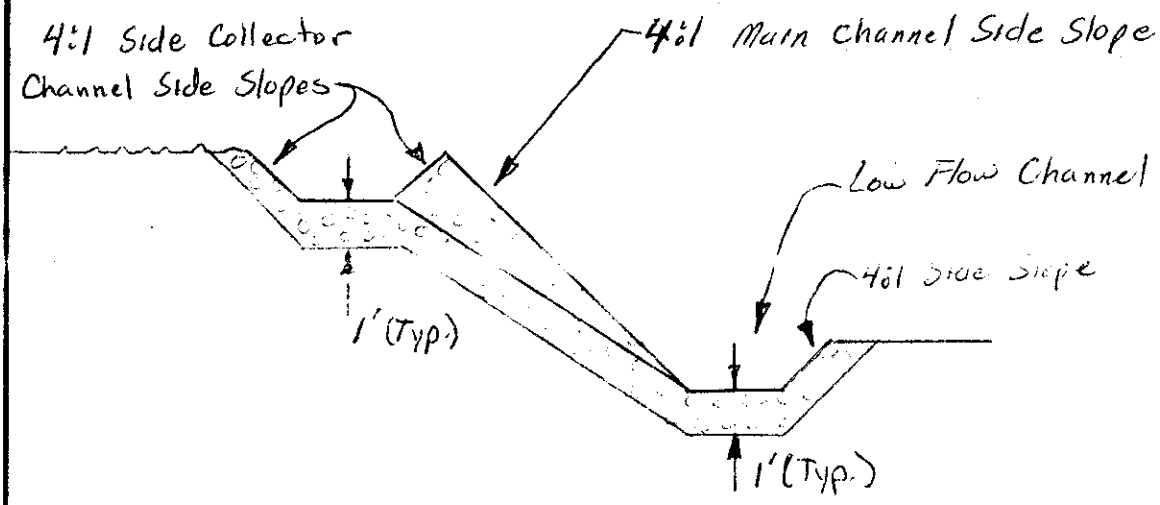
			S.F.	Acres
Alternate A -	Section 1	= 909.05' x 164'	= 149,084 =	3.42
	Section 2	= 2417.95' x 155'	= 374,782 =	8.60
	Section 3	= 401.73' x 118'	= 47,404 =	1.09
	Section 4	= 6449.66' x 138.4'	= 892,633 =	20.49
	Section 5	= 420' x 107'	= 44,940 =	1.03
	Section 6	= 8790.16' x 104'	= 914,176 =	20.99
	Section 7	= 3235.33' x 102'	= 330,004 =	7.58
	Section 8	= 2846.67' x 90'	= 256,200 =	5.88
Alternate B -	Section 1	= 3327' x 118.6'	= 394,582 =	9.06
	Section 2	= 6,341.66' x 104.6'	= 663,338 =	15.23
	Section 3	= 777' x 102'	= 79,254 =	1.82
	Section 4	= 8790.16 x 95.6'	= 840,339 =	19.29
	Section 5	= 6082 x 93.6'	= 569,275 =	13.07

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCD MC	JOB NO. 28835.	
	PROJECT Rittenhouse Channel	SHEET 2 OF 13	
	DESIGN FOR Quantities	DESIGNER JLK	DATE 3/93
		CHECKER RMS	DATE 3/93

Grouted Rip Rap Down Drain - (For side collector channel)



Plan View



Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 3 OF 13	
	DESIGN FOR Quantities	DESIGNER A	DATE 3/93
		CHECKER RDS	DATE 6/93

Grouted Riprap Downdrains (Continued)

		Unit Area (S.Y.)	Total Area S.Y.
Alternate A	Section 1	88.3	265
	Section 2,3,6,7,8	85.1	② ③ ⑥ ⑦ 0, 255, 426, 170 ⑧ 255.30
	Section 4	84.6	84.6
	Section 5	59.9	59.9
Alternate B	Section 1	102	306
	Section 2	101.2	506
	Section 3	59.9	60
	Section 4 + 5	93.9	657

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Rd Channel	SHEET 4 OF 13	
	DESIGN FOR Quantities	DESIGNER R	DATE 3/93
		CHECKER RDS	DATE 6/93

Grouted Riprap (Drop Structures or Bank Protection)

		S.F.		S.Y.
Alternate A - Section 1	100' x 142' =	14,200	=	1578
Section 2	50' x 117.99 =	5,899	=	655
Section 4	50' x 99.22 =	4,961	=	551
Section 5	50 x 93.23 =	4,661	=	518
Section 6	70 x 66.99 =	4689	=	521
Section 7	50 x 65.99 =	3299	=	367
Section 8	154.22 x 65.99 =	10,022	=	1,114

Alternate B - Section 1	100' x 79.47 =	7947		
	50' x 79.47 =	3974		
	2 x 70 x 79.47 =	11,126	=	2,561
Section 2	50' x 65.48 =	3274		
	4 x 70 x 65.48 =	18,334	=	2,401
Section 3	50' x 93.23 =	4661	=	518
Section 4	70' x 58.88 =	4121		
	5 x 70' x 58.88 =	20,608	=	2,748
Section 5	50' x 56.88 =	2844		
	154.22 x 56.88 =	8772		
	[illegible]	[illegible]	=	[illegible]

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 5 OF	
	DESIGN FOR Quantities	DESIGNER JK	DATE 3/93
		CHECKER RNS	DATE 6/93

4" ABC (Maintenance Rd)

		Volume C.F.		C.Y
Alternate A	Section 1 - 909.05 x 12 x 4/12	= 3636	=	135
	Section 2 - 2417.95 x 12 x 4/12	= 9672	=	358
	Section 3 - 401.73 x 12 x 4/12	= 1607	=	60
	Section 4 - 6449.66 x 12 x 4/12	= 25,799	=	956
	Section 5 - No Maint. Road	= —	=	—
	Section 6 - 8790.16 x 12 x 4/12	= 35,161	=	1302
	Section 7 - 3235.33 x 12 x 4/12	= 12,941	=	479
	Section 8 - No Maint. Road	= —	=	—
Alternate B	Section 1 - 3327 x 12 x 4/12	= 13,308	=	493
	Section 2 - 6341 x 12 x 4/12	= 25,364	=	939
	Section 3 - 777 x 12 x 4/12	= 3108	=	115
	Section 4 - 8790.16 x 12 x 4/12	= 35,161	=	1302
	[illegible]			—

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 6 OF 13	
	DESIGN FOR Quantities	DESIGNER R	DATE 6/93
		CHECKER RMS	DATE 6/93

Soil Cement

		C.Y.
Alternate A -	Section 1 = (118 x 909.5 x 1) ÷ 27 =	3975
	Section 2 = (110 x 2417.95 x 1) ÷ 27 =	9851
	Section 3 = (73 x 401.73 x 1) ÷ 27 =	1087
	Section 4 = (91 x 6449.66 x 1) ÷ 27 =	21,740
	Section 5 = (85 x 420 x 1) ÷ 27 =	1,322
	Section 6 = (59 x 8790.16 x 1) ÷ 27 =	19,208
	Section 7 = (57 x 3235.33 x 1) ÷ 27 =	6,829
	Section 8 = (57 x 2846.67 x 1) ÷ 27 =	6010
Alternate B -	Section 1 = (71 x 3327 x 1) ÷ 27 =	8,749
	Section 2 = (57 x 6341.66 x 1) ÷ 27 =	13,388
	Section 3 = (85 x 777 x 1) ÷ 27 =	2,446
	Section 4 = (51 x 6790 x 1) ÷ 27 =	16,603
	Section 5 = (49 x 6082 x 1) ÷ 27 =	11,038

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 7 OF 13	
	DESIGN FOR Quantities	DESIGNER R	DATE 3/93
		CHECKER RDG	DATE 6/93

Pavement Replacement (2"AC/4"ABC)

			Area S.F.		Area S.Y.
Alternate A					
Power Rd.	50' x 40'	=	2000	=	222
Sossaman Rd.	73' x 0	=	—	=	—
Germann Rd.	73 x 30'	=	2100	=	233
Ellsworth Rd.	48 x 30'	=	1440	=	160
Alternate B					
Power Rd.	65 x 45'	=	2925	=	325
Sossaman Rd.	73 x 0	=	—	=	—
Germann Rd	73 x 25'	=	1825	=	203
Ellsworth Rd.	48 x 30'	=	1440	=	160

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 8 OF 13	
	DESIGN FOR Quantities	DESIGNER R	DATE 3/93
		CHECKER RDS	DATE 6/93

Chain Link Fence (6')	Chain Link Fence Gates	
Alternate A.	Fence (ft)	Gates (Ea)
Power Rd.	450	2
Sossaman Rd.	650	2
Germann Rd.	650	1
Ellsworth Rd.	400	2
Queen Creek Rd.	200	1
Alternate B		
Power Rd	450	2
Sossaman Rd.	400	2
Germann Rd	400	2
Ellsworth Rd	400	2
Queen Creek Rd.	200	1

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 9 OF 13	
	DESIGN FOR Quantities	DESIGNER R	DATE 3/93
		CHECKER RDS	DATE 6/93

Box Culverts

Location	Quantity + Size	Length (ft)	Concrete (C.Y.)	Rebar (lbs)
Alternate A				
Power Road	1 - 10'x5'	83	98	13,695
	2 - 10'x4'	83	172	25,730
Sossaman Rd.	6 - 8'x3'	120'	494	81,528
	1 - 8'x4'	120'	109	16,656
Germann Rd	6 - 8'x3'	120'	494	81,528
	1 - 8'x4'	120'	109	16,656
Ellsworth Rd.	3 - 8'x3'	80'	171	28,648
	1 - 10'x4'	80'	88	12,832
Alternate B				
Power Rd.	1 - 10'x5'	150'	177	24,750
	4 - 10'x4'	150'	586	84,225
Sossaman Rd.	6 - 8'x3'	80'	329	54,352
	1 - 8'x4'	80'	73	11,104
Germann Rd.	6 8'x3'	80'	329	54,352
	1 - 8'x4'	80'	73	11,104
Ellsworth Rd.	3 - 8'x3'	80'	171	28,648
	1 - 10'x4'	80'	88	12,832

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 10 OF 13	
	DESIGN FOR Quantities	DESIGNER R	DATE 3/93
		CHECKER RDS	DATE 6/93

Structural Concrete (Headwalls / Outlet Weirs)

Location	Opening	Concrete (C.Y.)	Rebar (lbs)
Alternate A			
Power Road	66' x 4.0'	32	2620
Sossaman Rd.	63' x 3.0'	20	1620
Germann Rd.	63' x 3.0'	18	1458
Ellsworth Rd	38' x 3.0'	11	900
Alternate B			
Power Rd	55' x 4.0'	28	2092
Sossaman Rd	63' x 3.0'	20	1620
Germann Rd	63' x 3.0'	18	1458
Ellsworth Rd	38 x 3.0'	11	900

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 11 OF 13	
	DESIGN FOR Quantities	DESIGNER K	DATE 3/93
		CHECKER RDS	DATE 6/93

Guard Rail

Alternate A - Sossaman to Germann (Only Section) = 450 LF.

Waterline Relocation

Alternate A + B - Ellsworth Road - 120 L.F.

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 12 OF 13	
	DESIGN FOR Quantities	DESIGNER [illegible]	DATE 3/93
		CHECKER RDS	DATE 6/93

Replace Irrigation Ditches (Concrete)

Alternate A

	L.F.
Section 5	450
Section 6	1300
Section 8	750

Alternate B.

Section 3	950
Section 4	1300
Section 5	750

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCD MC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 13 OF 13	
	DESIGN FOR Quantities	DESIGNER K	DATE 6/93
		CHECKER RDS	DATE 6/93

R.O.W Required

Alternate A - Section 1 = 909.05 x 164 = 3.42 acres

Section 2 = 2417.95 x 155 = 8.60 acres

Section 3 = 401.73 x 118 = 1.09 acres

Section 4 = 6449.66 x 138.4 = 20.49 acres

Section 5 = 420' x 107' = 44 940 S.F. = 1.03 acres

Section 6 = 8790.16 x 104 = 20.99 acres

Section 7 = 3235.33' x 102 = 7.58 acres

Section 8 = 2846.67 x 90' = 5.88 acres

Alternate B - Section 1 = 3327' x 118.6 = 9.06 acres

Section 2 = 6341.66 x 104.6 = 15.23 acres

Section 3 = 777' x 102' = 1.82 acres

Section 4 = 8790.16 x 95.6 = 19.29 acres

Section 5 = 6082 x 93.6 = 13.07 acres.

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCD MC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 1 OF 4	
	DESIGN FOR Quantities	DESIGNER JLK	DATE 6/93
		CHECKER RMS	DATE 6/93

Alternate C

Clearing + Grubbing (For Estimates Only, Not a Bid Item)

Section 1 = 131.20 x 3,451.94 = 10.40 acres

Section 2 = 117.20 x 6,475.54 = 17.42 acres

Section 3B = 101.6 x 13,479.77 = 31.44 acres
Section 3A = 101.6 x 14,872 = 34.70 acres

Grouted Riprap Downdrains - (100 sy per downdrain)

Section No. 1 = 9 x 100 S.Y = 900 S.Y.

Section No. 2 = 18 x 100 S.Y = 1800 S.Y.

Section No. 3B+3A = 27 x 100 S.Y = 2700 S.Y.

Grouted Riprap Drop Structures - (70' long for outlet or channel drops)

Section No. 1 = $\frac{88' \times 4 \times 70'}{9}$ = 2738 S.Y.

Section No. 2 = $\frac{74' \times 6 \times 70'}{9}$ = 3453 S.Y.

Section No. 3A+3B = $\frac{57' \times 14 \times 70'}{9}$ = 6207 S.Y.

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 1 OF 4	
	DESIGN FOR Quantities	DESIGNER R	DATE 6/93
		CHECKER RDG	DATE 6/93

Alternate C

4" ABC Maintenance Rd.

Section No. 1 = 12' x 3451.94' ÷ 27 = 1534 C.Y.

Section No. 2 = 12' x 6475.54' ÷ 27 = 2878 C.Y.

Section No. 3B = 12' x 13,479.77' ÷ 27 = 5991 C.Y.
Section No. 3A = 12' x 14,872.0 ÷ 27 = 6610 C.Y.

Pavement (2"AC/2"ABC)

Section No. 1 = 65' x 45' = 325 S.Y. (Power Rd.)

Section No. 2 = 73' x 25' = 203 S.Y (Germann Rd)

Section No. 3B = 48' x 30' x 2 = 320 S.Y (Ellsworth + Queen Creek)
Section No. 3A = 48' x 30' x 1 = 160 S.Y (Ellsworth Rd only)

Guard Rail

Section No. 2 = 450 L.F. (at Sossaman + Germann)

Chain Link Fence + Gates

Section No. 1 - 450 ft 2 gates

Section No. 2 - 1300 ft. 3 gates

Section No. 3A+3B - 800 ft 4 gates

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Ritter House Channel	SHEET 1 OF 4	
	DESIGN FOR Quantities	DESIGNER JLK	DATE 6/93
		CHECKER RDS	DATE 6/93

Alternate C

Box Culverts		(C.Y.) Concrete	(lbs) Rebar
Section No. 1	1 - 6'x8' CBC x 82'	85.60	12 571
	2 - 5'x7 CBC x 82'	121.40	19,512
Section No. 2	2 x [1-6'x8' CBC] x 82'	171.2	25,142
	2 x [2-5'x9' CBC] x 82'	312.4	50,430
Section No. 3B	2 x [2-5'x9' CBC] x 82'	312.4	50,430
Section No. 3A	1 x [2-5'x9' CBC] x 82'	156.2	25,215

Structural Work, Misc - Headwalls etc.

		Concrete	Steel
Section No. 1	Headwall	20 C.Y	1544 lbs
	Drop Structures (4)	72 C.Y.	5547 lbs
Section No. 2	Headwall	20 C.Y	1544 lbs
	Drop Structures (6)	92 C.Y	7120 lbs.
Section No 3B + 3A	Headwall	8 C.Y.	630 lbs.
	Drop Structures (14)	175 C.Y.	13,530 lbs

Replace Irrigation Ditches

Section No. 1 = 0 L.F.

Section No. 2 = 450 L.F.

Section No. 3A + 3B = 1300 L.F.

Gannett Fleming OF ARIZONA ENGINEERS & PLANNERS	CLIENT FCDMC	JOB NO. 28835	
	PROJECT Rittenhouse Channel	SHEET 1 OF 4	
	DESIGN FOR Quantities	DESIGNER JLK	DATE 6/93
		CHECKER RDS	DATE 6/93

Alternate C

Relocate Waterline (8" PVC)

Section No. 3A+3B – 120 ft. (at Ellsworth)

R.O.W Required

Section No. 1 = 141 x 3452 = 11.2 acres

Section No. 2 = 127 x 6476 = 18.9 acres

Section No. 3B = 112 x 13480 = 34.7 acres
Section No. 3A = 112 x 14872 = 38.2 acres

Gannett Fleming
ENGINEERS AND PLANNERS

Suite 130
3001 East Camelback Road
Phoenix, AZ 85016-4498
Tel: (602) 553-8817
Fax: (602) 553-8816

LETTER OF TRANSMITTAL

DATE 7-13-93	JOB NO. 28835.130
RE: Rittenhouse Channel	

TO Flood Control District of Maricopa County
2801 W. Durango
Phoenix, AZ. 85009
ATTN: Kofi Awumah

WE ARE SENDING YOU
- ☐ Shop drawings
- ☐ Copy of letter
- ☐ Attached
- ☐ Prints
- ☐ Change order
- ☐ Under separate cover via _____ the following items:
- ☐ Plans ☐ Samples ☐ Specifications
- ☒ Disk

COPIES	DATE	NO.	DESCRIPTION
1	7-1-93		Copy of Rittenhouse Channel HEC-2 input and output files on 3½ in Disk.

THESE ARE TRANSMITTED as checked below:

- ☒ For approval
- ☒ For your use
- ☒ As requested
- ☐ For review and comment
- ☐ FOR BIDS DUE _____ 19 _____
- ☐ Approved as submitted
- ☐ Approved as noted
- ☐ Returned for corrections
- ☐ _____
- ☐ Resubmit _____ copies for approval
- ☐ Submit _____ copies for distribution
- ☐ Return _____ corrected prints
- ☐ PRINTS RETURNED AFTER LOAN TO US

FLOOD CONTROL DISTRICT
RECEIVED
JUL 13 '93

CHSNG		P & PM	
DEP		HYDRO	
ADMIN		LMGT	
FINANCE		FILE	
C & O		KA	
ENGR			
REMARKS			

REMARKS _____

COPY TO _____

FILE:

GANNETT FLEMING OF ARIZONA, INC.

SIGNED _____

If enclosures are not as noted, kindly notify us at once.

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT

BY DATE CHKD. BY DATE

SHEET NO. OF

JOB NO. BKH

90%

Rittenhouse Road Channel

FCD Contract No. 92-13

Quantity Calculations

~~GMF Document Deleted~~

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24407
JAMES L.
KARY
Date Signed 7/17/94
ARIZONA, U.S.A.

1/21

Item # 215-1

Earthwork For Open Channels
(Including Haul For Disposal)

Quantity (C.Y.) Sheet #

emplate Volumetrics Summary

Page 1

Section: [illegible]
Alignment: [illegible]
Station: [illegible]
[illegible] 12 08:38:25 1994

tion	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
[illegible]	457.3		42.4		
	1181.9	1181.9	39.3	39.3	-1142.6
[illegible]	819.2		0.0		
	1213.6	2395.5	21.0	60.3	-2335.2
[illegible]	491.5		22.7		
	922.0	3317.5	38.3	98.6	-3218.9
[illegible]	504.3		18.7		
	951.6	4269.1	33.0	131.6	-4137.5
[illegible]	523.4		16.9		
	941.0	5210.1	40.5	172.1	-5038.0
[illegible]	492.9		26.8		
	926.3	6136.4	52.9	225.0	-5911.4
[illegible]	507.6		33.3		
	991.7	7128.1	43.0	268.1	-6860.1
[illegible]	583.5		19.2		
	1053.5	8181.7	29.5	297.5	-7884.1
[illegible]	574.3		15.7		
	1023.2	9204.9	34.8	332.3	-8872.5
[illegible]	886.7		21.9		
	1012.1	10216.9	42.9	375.2	-9841.7
[illegible]	882.3		24.4		
	1087.5	11304.4	34.2	409.4	-10895.0
[illegible]	912.1		12.5		
	1150.8	12455.2	21.8	431.2	-12024.0
[illegible]	830.7		21.1		
	834.5	12789.5	5.4	436.6	-12352.9
[illegible]	814.8		9.8		
	783.5	13573.0	21.5	458.1	-13114.9
[illegible]	877.1		23.8		
	1106.9	14679.9	22.0	480.1	-14199.7
[illegible]	818.0		0.0		
	1189.1	15869.0	0.0	480.1	-15388.8
[illegible]	866.0		0.0		
	274.3	16143.3	0.0	480.1	-15663.2
[illegible]	868.2		0.0		
	839.7	16983.0	0.0	480.1	-16502.9
[illegible]	878.8		0.0		
	131.8	17114.8	0.0	480.1	-16634.7
[illegible]	880.8		0.0		
	1282.8	18397.6	0.0	480.1	-17917.5
[illegible]	734.0		0.0		
	1318.0	19715.6	0.0	480.1	-19235.4
[illegible]	718.8		0.0		
	1113.8	20829.4	0.0	480.1	-20349.2
[illegible]	734.3		0.0		
	255.3	21084.7	0.0	480.1	-20604.6

21,065 7 ✓

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Ground sections: [illegible]
Design sections: [illegible]

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
17+00.00	733.2		0.0		
	1391.2	22455.9	0.0	480.1	-21975.8
17+50.00	764.4		0.0		
	1454.8	23890.6	0.0	480.1	-23410.6
18+00.00	785.2		0.0		
	1460.0	25350.6	0.0	480.1	-24870.7
18+50.00	791.6		0.0		
	1482.3	26833.1	0.0	480.1	-26353.0
19+00.00	809.2		0.0		
	1445.3	28278.4	0.0	480.1	-27798.3
19+50.00	751.7		0.0		
	1044.0	29322.4	0.0	480.1	-28842.3
19+67.97	733.1		0.0		
	341.5	29663.9	0.0	480.1	-29183.8
20+00.00	799.7		0.0		
	1162.0	30825.9	0.0	480.1	-30345.7
20+50.00	455.2		0.0		
	1102.3	31928.2	0.0	480.1	-31448.1
21+00.00	735.3		0.0		
	917.7	32845.9	0.0	480.1	-32365.7
21+34.57	697.9		0.0		
	394.3	33240.2	0.0	480.1	-32760.0
21+50.00	682.5		0.0		
	455.2	33695.4	0.0	480.1	-33215.2
21+68.24	665.4		0.0		
	771.1	34466.4	0.0	480.1	-33986.3
22+00.00	645.5		0.0		
	1215.0	35681.4	0.0	480.1	-35201.3
22+50.00	666.7		0.0		
	1261.1	36942.5	0.0	480.1	-36462.4
23+00.00	695.2		0.0		
	384.7	37327.2	0.0	480.1	-36847.0
23+14.54	704.1		0.0		
	929.6	38256.8	0.0	480.1	-37776.7
23+50.00	723.8		0.0		
	1365.1	39621.9	0.0	480.1	-39141.8
24+00.00	750.8		0.0		
	1399.5	41021.5	0.0	480.1	-40541.4
24+50.00	781.0		0.0		
	1447.5	42469.0	0.0	480.1	-41988.9
25+00.00	802.3		0.0		
	1502.1	43971.1	0.0	480.1	-43491.0
25+50.00	820.0		0.0		
	1533.0	45504.1	0.0	480.1	-45025.[illegible]
[illegible].00	835.5		0.0		
	1548.6	47030.7	0.0	480.1	-46[illegible]

Template Volumetrics Summary

3/21

Ground Xsections: rlct.gsc
Design Xsections: rlct.dsc

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
26+50.00	684.7		0.0		
	1549.0	48599.7	0.0	460.1	-48139.5
27+00.00	638.2		0.0		
	1220.7	49820.4	5.1	465.2	-49355.2
27+50.00	460.2		5.5		
	903.0	50723.4	9.1	494.3	-50229.1
28+00.00	495.1		4.3		
	922.1	51645.5	8.0	502.3	-51143.2
28+50.00	500.8		4.4		
	935.8	52581.1	5.6	507.9	-52073.2
29+00.00	509.7		1.7		
	949.0	53530.1	2.3	510.2	-53019.9
29+50.00	515.2		0.7		
	977.3	54507.4	1.0	511.2	-53996.2
30+00.00	540.3		0.3		
	1021.9	55529.4	0.8	512.0	-55017.4
30+50.00	563.4		0.5		
	1057.0	56586.3	0.9	512.9	-56073.4
31+00.00	573.1		0.5		
	1099.3	57685.7	0.4	513.3	-57172.3
31+50.00	609.2		0.0		
	1149.9	58835.6	0.0	513.3	-58322.3
32+00.00	632.7		0.0		
	1171.7	60007.3	0.0	513.3	-59493.9
32+50.00	632.7		0.0		
	1208.8	61216.1	0.0	513.3	-60702.8
33+00.00	672.9		0.0		
	1280.3	62479.4	0.0	513.3	-61966.1
33+50.00	691.5		0.0		
	1300.6	63780.0	0.0	513.3	-63266.7
34+00.00	713.1		0.0		
	1340.2	65120.2	0.0	513.3	-64606.9
34+50.00	734.3		0.0		
	1378.2	66498.4	0.0	513.3	-65985.1
35+00.00	754.1		0.0		
	1407.7	67906.1	0.0	513.3	-67392.8
35+50.00	766.2		0.0		
	1441.7	69347.8	0.0	513.3	-68834.5
36+00.00	790.8		0.0		
	1125.3	70473.1	13.7	527.1	-69946.1
36+50.00	424.8		14.8		
	812.5	71285.6	16.6	543.7	-70741.9
37+00.00	452.9		3.1		
	841.4	72127.0	5.6	549.3	-71577.7
37+50.00	455.8		2.9		
	861.2	72988.2	5.1	554.3	-72434.0

27,535 ✓ 8

22,686 ✓ 9

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Ground Xsections: pilot.gsc
Design Xsections: pilot.dsc

Units: English (cu. yds.)

Sat Mar 12 09:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
38+00.00	474.3		2.4		
	925.6	73914.0	6.3	560.5	-73353.5
38+50.00	525.5		4.3		
	990.6	74904.6	4.0	564.5	-74340.1
39+00.00	544.4		0.0		
	772.5	75677.2	0.0	564.5	-75112.7
39+37.66	557.4		0.0		
	251.4	75928.5	0.0	564.5	-75364.0
39+50.00	560.9		0.0		
	1049.5	76978.0	4.2	568.7	-76409.3
40+00.00	572.5		4.5		
	1070.4	78048.5	13.1	581.8	-77466.7
40+50.00	583.5		9.6		
	781.3	78829.7	6.1	587.9	-78241.8
40+84.47	640.4		0.0		
	395.3	79225.1	0.0	587.9	-78637.2
41+00.00	734.4		0.0		
	78.6	79303.7	0.0	587.9	-78715.8
41+05.78	0.1		0.0		
	0.1	79303.8	0.0	587.9	-78715.9
41+50.00	0.1		0.0		
	0.1	79303.9	0.0	587.9	-78716.0
41+85.24	0.1		0.0		
	38.0	79342.0	0.6	588.5	-78753.4
41+89.78	451.8		7.5		
	170.8	79512.7	2.9	591.5	-78921.3
42+00.00	450.9		8.0		
	649.4	80162.1	26.8	618.3	-79543.8
42+50.00	466.4		20.9		
	781.6	81113.7	37.2	655.5	-80458.2
43+00.00	345.3		19.0		
	665.1	81778.8	25.1	680.6	-81098.2
43+50.00	373.0		7.8		
	699.7	82478.5	47.9	728.5	-81750.0
44+00.00	382.8		48.9		
	766.5	83245.0	48.0	776.5	-82468.5
44+50.00	445.2		8.0		
	822.3	84067.3	16.9	793.4	-83273.9
45+00.00	442.8		10.3		
	805.5	84872.8	28.7	822.1	-84050.6
45+50.00	427.1		20.7		
	195.3	85068.1	7.7	829.9	-84238.2
45+83.85	381.2		11.4		
	0.1	85068.2	0.0	829.9	-84238.3
45+83.86	381.2		11.4		
	316.7	85385.0	12.4	842.2	-84542.8

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Ground Sections: fill.gsc
Design Sections: fill.dsc

Units: English (cu. yds.)

Sat Mar 12 08:36:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
46+00.00	433.5		6.7		
	736.2	86363.0	12.4	854.7	-85508.6
46+50.00	415.4		6.7		
	771.9	87136.2	10.5	865.2	-86271.0
47+00.00	419.3		4.6		
	795.9	87932.0	7.0	872.2	-87059.8
47+50.00	440.2		3.0		
	289.6	88221.7	1.7	873.9	-87347.7
47+67.69	443.8		2.2		
	534.3	88756.2	2.1	876.0	-87880.2
48+00.00	449.7		1.2		
	647.2	89603.4	1.6	877.5	-88725.8
48+50.00	465.2		0.4		
	873.6	90477.0	0.4	878.0	-89599.0
49+00.00	478.3		0.0		
	21.5	90498.4	0.0	878.0	-89620.0
49+01.21	476.8		0.0		
	880.6	91379.2	0.0	878.0	-90501.2
49+50.00	493.0		0.0		
	927.8	92307.0	0.0	878.0	-91429.0
50+00.00	505.7		0.0		
	945.9	93252.9	0.0	878.0	-92374.9
50+50.00	515.9		0.0		
	966.2	94219.0	0.0	878.0	-93341.0
51+00.00	527.6		0.0		
	991.8	95210.8	0.0	878.0	-94332.8
51+50.00	543.6		0.0		
	1012.7	96223.6	0.0	878.0	-95345.6
52+00.00	550.2		0.0		
	1021.2	97244.8	0.0	878.0	-96366.8
52+50.00	552.7		0.0		
	1042.6	98287.4	0.0	878.0	-97409.4
53+00.00	573.2		0.0		
	1088.0	99375.3	0.0	878.0	-98497.3
53+50.00	601.7		0.0		
	1111.9	100487.2	0.0	878.0	-99609.2
54+00.00	599.1		0.0		
	1114.4	101601.5	0.0	878.0	-100723.5
54+50.00	604.4		0.0		
	1132.6	102734.1	0.0	878.0	-101856.1
55+00.00	618.0		0.0		
	1182.9	103917.0	0.0	878.0	-103039.0
55+50.00	658.7		0.0		
	963.7	104877.8	6.5	884.5	-103993.3
56+00.00	378.8		7.4		
	756.0	105583.8	10.6	895.1	-104688.6

15,850 10 ✓

6/21

Ground Sections: rlst.gsc
Design Sections: rlst.dsc

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance		
56+50.00	383.7		4.4				
	716.1	106299.8	7.8	903.0	-105396.8	19,164	12 ✓
57+00.00	389.7		4.1				
	724.6	107024.5	8.6	912.6	-106111.9		
57+50.00	392.9		3.1				
	728.0	107752.5	8.7	921.3	-106831.1		
58+00.00	393.3		3.2				
	739.5	108492.0	4.4	925.8	-107566.2		
58+50.00	405.3		1.8				
	763.7	109255.7	1.6	927.3	-108328.3		
59+00.00	419.5		0.1				
	792.3	110047.9	0.1	927.4	-109120.5		
59+50.00	436.1		0.0				
	811.3	110859.3	0.0	927.4	-109931.9		
60+00.00	440.1		0.0				
	815.5	111674.7	0.0	927.4	-110747.3		
60+50.00	440.6		0.0				
	822.1	112496.9	0.0	927.4	-111569.4		
61+00.00	447.3		0.3				
	829.7	113326.6	0.3	927.7	-112398.9		
61+50.00	448.8		0.3				
	839.5	114166.1	0.5	928.2	-113237.9		
62+00.00	457.9		0.2				
	857.6	115023.7	0.6	928.8	-114094.9		
62+50.00	468.3		0.4				
	879.1	115902.8	0.8	929.5	-114973.3		
63+00.00	481.1		0.4				
	913.6	116816.5	0.5	930.0	-115886.4		
63+50.00	505.6		0.1				
	953.3	117769.7	0.3	930.3	-116839.4		
64+00.00	524.0		0.2				
	979.5	118749.2	0.2	930.5	-117818.6		
64+50.00	533.9		0.0				
	1000.1	119749.3	0.0	930.5	-118818.8		
65+00.00	546.3		0.0				
	1033.6	120782.9	0.0	930.5	-119852.4		
65+50.00	570.0		0.0				
	1063.7	121846.7	0.0	930.5	-120916.1		
66+00.00	578.8		0.0				
	1084.3	122931.0	0.0	930.5	-122000.4		
66+50.00	592.2		0.0				
	1106.0	124039.0	0.0	930.5	-123108.4	17,739	13 ✓
67+00.00	604.4		0.0				
	1128.0	125167.0	0.0	930.5	-124236.5		
67+50.00	613.9		0.0				
	1146.6	126313.6	0.0	930.5	-125383.1		

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Ground Sections: rlcc.dgn
Design Sections: rlcc.dgn

Units: English (cu. yds.)

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Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
68+00.00	626.6		0.0		
	1174.2	127490.0	0.0	930.5	-126559.5
68+50.00	641.4		0.0		
	1204.7	128694.7	0.0	930.5	-127764.1
69+00.00	659.7		0.0		
	1238.6	129933.2	0.0	930.5	-129002.7
69+50.00	678.0		0.0		
	1270.6	131203.8	0.0	930.5	-130273.3
70+00.00	694.2		0.0		
	1292.7	132496.5	0.0	930.5	-131565.9
70+50.00	701.8		0.0		
	1309.7	133806.2	0.0	930.5	-132875.6
71+00.00	712.6		0.0		
	1021.4	134827.6	5.4	935.9	-133891.7
71+50.00	390.5		5.8		
	732.0	135559.6	10.9	946.6	-134612.7
72+00.00	400.0		5.3		
	761.9	136321.5	10.5	957.4	-135364.1
72+50.00	422.8		5.3		
	806.2	137127.7	8.0	965.4	-136162.3
73+00.00	447.9		3.3		
	850.5	137978.2	3.4	968.8	-137009.4
73+50.00	470.7		0.4		
	895.2	138873.4	0.4	969.2	-137904.2
74+00.00	496.1		0.0		
	935.1	139808.4	0.3	969.5	-138838.9
74+50.00	513.7		0.4		
	962.3	140770.7	0.4	969.9	-139800.8
75+00.00	525.5		0.1		
	989.2	141759.9	0.1	970.0	-140789.9
75+50.00	542.8		0.0		
	1030.5	142793.4	0.0	970.0	-141823.4
76+00.00	573.4		0.0		
	1093.2	143866.6	0.0	970.0	-142916.6
76+50.00	607.2		0.0		
	1140.9	145027.5	0.0	970.0	-144057.5
77+00.00	624.9		0.0		
	1173.5	146201.0	0.0	970.0	-145231.0
77+50.00	642.4		0.0		
	1217.2	147418.2	0.0	970.0	-146448.2
78+00.00	672.1		0.0		
	1265.5	148683.7	0.0	970.0	-147713.7
78+50.00	694.7		0.0		
	1297.7	149981.4	0.0	970.0	-149011.4
[illegible]+00.00	706.9		0.0		
	1302.[illegible]	151315.4	0.0	970.0	-150345.4

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Template Volumetrics Summary

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Ground Sections: [illegible].gsc
Design Sections: [illegible].dsc

Units: English (cu. yds.)

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Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
79+50.00	731.7		0.0		
	1047.8	152361.2	6.5	976.5	-151384.6
80+00.00	399.9		7.0		
	761.1	153122.2	9.5	986.0	-152136.3
80+50.00	422.1		3.2		
	787.5	153909.7	6.6	992.5	-152917.2
81+00.00	428.4		3.9		
	797.0	154706.7	7.8	1000.3	-153706.4
81+50.00	432.3		4.5		
	822.5	155529.2	5.1	1005.4	-154523.8
82+00.00	455.9		1.0		
	864.7	156393.9	1.7	1007.1	-155386.9
82+50.00	478.0		0.8		
	864.7	157278.6	1.4	1008.4	-156270.2
83+00.00	477.5		0.7		
	883.8	158162.4	1.0	1009.4	-157153.0
83+50.00	477.0		0.4		
	903.3	159065.7	0.3	1009.7	-158055.9
84+00.00	498.5		0.0		
	949.0	160014.6	0.0	1009.7	-159004.9
84+50.00	526.3		0.0		
	964.6	160999.2	0.0	1009.7	-159989.5
85+00.00	537.0		0.0		
	1005.1	162004.3	0.0	1009.7	-160994.6
85+50.00	548.5		0.0		
	1031.2	163035.5	0.0	1009.7	-162025.8
86+00.00	565.2		0.0		
	1060.9	164096.5	0.0	1009.7	-163086.7
86+50.00	580.6		0.0		
	1085.2	165181.7	0.0	1009.7	-164171.9
87+00.00	591.4		0.0		
	1102.5	166284.2	0.0	1009.7	-165274.5
87+50.00	599.3		0.0		
	1125.5	167409.7	0.0	1009.7	-166400.0
88+00.00	616.2		0.0		
	1159.7	168569.5	0.0	1009.7	-167559.7
88+50.00	636.3		0.0		
	1203.5	169773.0	0.0	1009.7	-168763.3
89+00.00	663.6		0.0		
	1266.5	171039.5	0.0	1009.7	-170029.8
89+50.00	704.3		0.0		
	1028.1	172067.6	8.5	1018.2	-171049.4
90+00.00	406.0		9.2		
	763.8	172831.5	15.0	1033.3	-171798.1
90+50.00	416.9		7.1		
	763.9	173615.4	17.7	1044.8	-172[illegible]

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Ground Section: [illegible]
Design Section: [illegible]

Units: English (cu. yds.)

Sat Mar 12 08:08:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
91+00.00	427.7		4.5		
	796.5	174411.9	6.8	1050.8	-173361.1
91+50.00	432.6		2.3		
	805.7	175217.6	3.4	1054.1	-174163.5
92+00.00	437.5		0.6		
	837.1	176054.7	1.8	1055.9	-174998.8
92+50.00	466.5		1.1		
	887.3	176942.0	1.2	1057.1	-175884.9
93+00.00	491.7		0.1		
	928.8	177870.8	0.1	1057.2	-176813.5
93+50.00	511.4		0.0		
	962.0	178833.4	0.0	1057.2	-177776.2
94+00.00	528.2		0.0		
	1009.4	179842.8	0.0	1057.2	-178785.5
94+50.00	561.9		0.0		
	1076.5	180919.2	0.0	1057.2	-179862.0
95+00.00	600.7		0.0		
	1111.4	182030.6	0.0	1057.2	-180973.4
95+50.00	599.6		0.0		
	1115.5	183146.1	0.0	1057.2	-182088.9
96+00.00	605.2		0.0		
	1126.9	184275.1	0.0	1057.2	-183217.8
96+50.00	614.6		0.0		
	1145.7	185420.8	0.0	1057.2	-184363.6
97+00.00	623.4		0.0		
	1149.6	186570.4	0.0	1057.2	-185513.1
97+50.00	618.2		0.0		
	1143.7	187714.1	0.0	1057.2	-186656.9
98+00.00	617.1		0.0		
	1154.5	188868.6	0.0	1057.2	-187811.4
98+50.00	629.8		0.0		
	1169.4	190038.0	0.0	1057.2	-188980.8
99+00.00	633.1		0.0		
	1165.4	191203.4	0.0	1057.2	-190146.2
99+50.00	625.5		0.0		
	1153.5	192356.9	0.0	1057.2	-191300.7
100+00.00	631.1		0.0		
	1167.0	193554.0	0.0	1057.2	-192496.7
100+50.00	650.9		0.0		
	1222.4	194776.3	0.0	1057.2	-193719.1
101+00.00	669.2		0.0		
	1263.9	196040.3	0.0	1057.2	-194983.0
101+50.00	595.6		0.0		
	1015.9	197056.2	3.9	1061.1	-195995.1
102+00.00	401.4		4.2		
	758.6	197814.8	6.1	1067.1	-196747.[illegible]

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Shrink Associated: [illegible]
Swell Associated: [illegible]

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
102+50.00	417.9		2.8		
	777.1	198591.6	5.3	1072.5	-197519.0
103+00.00	421.4		3.2		
	789.4	199381.2	5.9	1078.5	-198302.7
103+50.00	431.1		3.2		
	814.7	200195.9	4.1	1082.5	-199113.3
104+00.00	448.7		1.2		
	855.0	201050.9	1.2	1083.7	-199967.2
104+50.00	474.7		0.1		
	897.6	201948.5	0.1	1083.8	-200864.7
105+00.00	494.6		0.0		
	935.6	202884.1	0.0	1083.8	-201800.3
105+50.00	515.3		0.0		
	979.3	203863.4	0.0	1083.8	-202779.6
106+00.00	541.8		0.0		
	249.1	204112.5	0.0	1083.8	-203028.8
106+12.28	553.4		0.0		
	607.8	204920.3	0.0	1083.8	-203836.5
106+50.00	603.1		0.0		
	852.9	205773.2	0.0	1083.8	-204689.5
106+87.41	628.1		0.0		
	0.1	205773.4	0.0	1083.8	-204689.6
106+87.42	0.1		0.0		
	0.0	205773.4	0.0	1083.8	-204689.6
107+00.00	0.1		0.0		
	0.1	205773.5	0.0	1083.8	-204689.7
107+50.00	0.1		0.0		
	0.1	205773.6	0.0	1083.8	-204689.8
107+77.41	0.1		0.0		
	225.4	205999.0	0.0	1083.8	-204915.2
108+00.00	538.7		0.0		
	976.3	206975.2	0.0	1083.8	-205891.5
108+50.00	515.7		0.0		
	942.2	207917.4	0.0	1083.8	-206833.6
109+00.00	501.8		0.0		
	954.9	208872.3	0.0	1083.8	-207788.5
109+50.00	529.5		0.0		
	954.4	209826.8	0.0	1083.8	-208743.0
110+00.00	501.0		0.0		
	965.8	210792.6	0.0	1083.8	-209708.8
110+50.00	541.8		0.0		
	992.0	211784.5	0.0	1083.8	-210700.6
111+00.00	529.5		0.0		
	974.7	212759.2	0.0	1083.8	-211675.4
111+50.00	523.1		0.0		
	979.8	213739.0	0.0	1083.8	-212655.2

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Ground Association: rlsb.gsc
Design Association: rlsc.dsc

Units: English (cu. yds.)

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Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
112+00.00	535.1		0.0		
	996.3	214737.3	0.0	1083.8	-213653.5
112+50.00	540.0		0.0		
	1035.0	215772.3	0.0	1083.8	-214688.5
113+00.00	574.7		0.0		
	1054.4	216826.7	0.0	1083.8	-215742.9
113+46.23	656.9		0.0		
	0.1	216826.7	0.0	1083.8	-215742.9
113+46.24	0.1		0.0		
	0.0	216826.7	0.0	1083.8	-215742.9
113+50.00	0.1		0.0		
	0.1	216826.8	0.0	1083.8	-215743.0
113+72.86	0.1		0.0		
	0.1	216826.9	0.0	1083.8	-215743.1
114+00.00	0.1		0.0		
	0.2	216827.1	0.0	1083.8	-215743.3
114+50.00	0.1		0.0		
	0.0	216827.2	0.0	1083.8	-215743.4
114+60.67	0.1		0.0		
	500.6	217327.8	0.0	1083.8	-216244.0
115+00.00	690.7		0.0		
	1210.8	218538.6	0.0	1083.8	-217454.8
115+50.00	617.0		0.0		
	1170.0	219708.6	0.0	1083.8	-218624.8
116+00.00	646.7		0.0		
	20.8	219729.4	0.0	1083.8	-218645.6
116+00.87	646.8		0.0		
	979.8	220709.2	0.0	1083.8	-219625.4
116+50.00	430.1		0.0		
	798.6	221507.8	0.0	1083.8	-220424.0
117+00.00	432.4		0.0		
	669.6	222177.4	0.0	1083.8	-221093.6
117+41.61	436.5		0.0		
	135.5	222312.9	0.0	1083.8	-221229.1
117+50.00	436.4		0.0		
	813.6	223126.7	0.0	1083.8	-222042.9
118+00.00	442.4		0.0		
	782.0	223908.7	0.0	1083.8	-222824.9
118+46.38	469.0		0.0		
	63.7	223972.4	0.0	1083.8	-222888.6
118+50.00	470.1		0.0		
	877.4	224849.8	0.0	1083.8	-223766.0
119+00.00	477.5		0.0		
	887.1	225736.9	0.0	1083.8	-224653.1
119+50.00	480.6		0.0		
	896.8	226630.7	0.0	1083.8	-225546.9

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Ground Xsections: rlct.gso
Design Xsections: rlct.dsn

Units: English (cu. yds.)

Sat Mar 12 08:08:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
120+00.00	484.8		0.0		
	919.2	227549.9	0.0	1083.8	-226466.1
120+50.00	508.0		0.0		
	959.0	228508.9	0.0	1083.8	-227425.1
121+00.00	527.7		0.0		
	978.1	229487.0	0.0	1083.8	-228403.2
121+50.00	528.6		0.0		
	976.9	230463.9	0.0	1083.8	-229380.1
122+00.00	526.5		0.0		
	985.6	231449.5	0.0	1083.8	-230365.7
122+50.00	538.0		0.0		
	1001.9	232451.3	0.0	1083.8	-231367.5
123+00.00	544.0		0.0		
	1011.6	233462.9	0.0	1083.8	-232379.1
123+50.00	548.4		0.0		
	1024.4	234487.3	0.0	1083.8	-233403.5
124+00.00	557.9		0.0		
	810.4	235297.6	4.4	1088.2	-234209.4
124+50.00	317.3		4.8		
	575.2	235872.8	11.8	1100.0	-234772.8
125+00.00	303.9		8.0		
	574.6	236447.5	10.4	1110.4	-235337.0
125+50.00	316.7		3.2		
	613.0	237060.5	4.3	1114.7	-235945.8
126+00.00	345.4		1.4		
	667.2	237727.7	4.2	1118.9	-236608.8
126+50.00	375.1		3.1		
	708.8	238436.5	6.1	1125.0	-237311.5
127+00.00	390.4		3.8		
	723.6	239160.1	4.8	1129.7	-238030.4
127+50.00	391.1		1.6		
	727.3	239887.4	1.5	1131.3	-238756.1
128+00.00	394.3		0.0		
	729.4	240616.8	0.0	1131.3	-239485.5
128+50.00	393.4		0.0		
	740.7	241357.5	0.4	1131.7	-240225.8
129+00.00	406.5		0.4		
	761.4	242118.9	2.3	1134.0	-240984.9
129+50.00	415.8		2.1		
	807.2	242926.1	1.9	1135.9	-241790.2
130+00.00	456.1		0.0		
	891.6	243817.7	0.0	1135.9	-242681.8
130+50.00	508.8		0.0		
	749.0	244566.7	37.6	1173.5	-243393.2
131+00.00	302.1		40.6		
	613.0	245171.8	74.1	1247.6	-243924.2

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Ground Sections: fill.geo
Design Sections: fill.des

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
131+50.00	351.3		39.4		
	661.0	245632.8	47.3	1294.9	-244557.9
132+00.00	384.2		11.6		
	706.0	246558.8	12.7	1307.6	-245251.2
132+50.00	378.3		2.1		
	672.0	247230.8	19.4	1326.9	-245903.9
133+00.00	347.4		18.8		
	654.3	247885.1	38.7	1363.7	-246521.5
133+50.00	359.2		20.8		
	654.9	248540.0	24.6	1388.2	-247151.8
134+00.00	345.1		5.7		
	634.6	249174.7	8.5	1394.7	-247779.9
134+50.00	337.3		1.4		
	611.3	249786.0	12.6	1407.4	-248378.6
135+00.00	322.9		12.3		
	593.8	250379.7	25.1	1432.4	-248947.3
135+50.00	318.4		14.8		
	607.1	250986.9	23.3	1455.7	-249531.2
136+00.00	337.3		10.3		
	644.2	251631.0	11.8	1467.5	-250163.6
136+50.00	358.4		2.4		
	681.9	252312.9	4.0	1471.5	-250841.5
137+00.00	376.0		1.9		
	733.9	253046.8	1.9	1473.4	-251573.5
137+50.00	414.6		0.1		
	801.0	253847.9	0.1	1473.5	-252374.3
138+00.00	450.5		0.0		
	875.8	254723.4	0.0	1473.5	-253249.9
138+50.00	495.2		0.0		
	951.5	255655.0	0.0	1473.5	-254181.4
139+00.00	510.9		0.0		
	960.5	256615.5	0.0	1473.5	-255142.0
139+50.00	526.4		0.0		
	978.7	257594.2	0.0	1473.5	-256120.6
140+00.00	530.5		0.0		
	991.0	258585.1	0.0	1473.5	-257111.6
140+50.00	539.7		0.0		
	1015.3	259600.4	0.0	1473.5	-258126.8
141+00.00	556.7		0.0		
	1046.0	260646.4	0.0	1473.5	-259172.9
141+50.00	573.1		0.0		
	1067.2	261713.6	0.0	1473.5	-260240.1
142+00.00	579.6		0.0		
	1072.3	262785.9	0.0	1473.5	-261312.4
142+50.00	573.4		0.0		
	1055.8	263841.7	0.0	1473.5	-262368.2

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Ground Sections: fill.gsc
Design Sections: fill.dsc

Units: English (cu. yds.)

Sat Mar 12 08:38:23 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
143+00.00	561.8		0.0		
	802.1	264643.8	0.4	1473.9	-263169.9
143+50.00	304.4		0.4		
	574.0	265217.8	0.4	1474.3	-263743.4
144+00.00	315.5		0.0		
	597.3	265815.1	0.0	1474.3	-264340.7
144+50.00	329.6		0.0		
	637.4	266452.4	0.0	1474.3	-264976.1
145+00.00	358.8		0.0		
	669.2	267121.6	0.0	1474.3	-265647.3
145+50.00	360.9		0.0		
	673.1	267794.7	0.0	1474.3	-266320.3
146+00.00	363.0		0.0		
	673.6	268468.3	0.0	1474.3	-266993.9
146+50.00	364.5		0.0		
	682.3	269150.6	0.0	1474.3	-267676.2
147+00.00	372.3		0.0		
	697.1	269847.7	0.0	1474.3	-268373.3
147+50.00	380.6		0.0		
	706.2	270553.9	0.0	1474.3	-269079.6
148+00.00	382.1		0.0		
	699.5	271253.4	0.0	1474.3	-269779.1
148+50.00	373.4		0.0		
	657.5	271911.0	1.3	1475.6	-270435.4
149+00.00	336.8		1.4		
	629.4	272540.3	1.3	1476.9	-271063.5
149+50.00	342.9		0.0		
	646.4	273186.8	0.0	1476.9	-271709.9
150+00.00	358.2		0.0		
	664.8	273841.6	1.0	1477.6	-272363.7
150+50.00	362.9		1.1		
	651.9	274493.4	1.4	1479.2	-273014.2
151+00.00	352.1		0.4		
	656.8	275150.3	0.4	1479.6	-273670.6
151+50.00	367.3		1.0		
	675.7	275826.0	0.0	1479.6	-274346.4
152+00.00	372.5		0.0		
	685.8	276511.6	0.0	1479.6	-275032.1
152+50.00	366.2		0.0		
	688.0	277197.6	0.0	1479.6	-275718.1
153+00.00	372.7		0.0		
	691.1	277888.9	0.0	1480.3	-276408.7
153+50.00	373.8		0.7		
	697.1	278586.0	0.8	1481.1	-277104.9
154+00.00	379.0		0.2		
	702.4	279288.4	0.2	1481.2	-277807.2

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Ground Sections: [illegible]
Design Sections: [illegible]

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
154+50.00	379.6		0.0		
	705.3	279993.8	0.0	1461.2	-278532.6
155+00.00	382.2		0.0		
	706.8	280700.6	0.0	1462.1	-279238.5
155+50.00	381.2		0.0		
	742.2	281442.8	0.0	1463.0	-279959.8
156+00.00	420.4		0.0		
	761.5	282204.3	0.0	1463.0	-280721.3
156+50.00	402.0		0.0		
	810.7	283015.0	0.0	1463.0	-281532.0
157+00.00	473.6		0.0		
	852.5	283867.5	0.0	1463.0	-282384.5
157+50.00	447.2		0.0		
	820.5	284688.0	0.0	1463.0	-283205.1
158+00.00	439.0		0.0		
	832.5	285520.5	0.0	1463.0	-284037.6
158+50.00	460.1		0.0		
	847.4	286367.9	0.0	1463.0	-284885.0
159+00.00	455.1		0.0		
	828.5	287196.4	0.0	1463.0	-285713.5
159+50.00	439.7		0.0		
	807.0	288003.4	0.0	1463.0	-286520.4
160+00.00	431.9		0.0		
	820.0	288826.4	0.0	1463.0	-287343.5
160+50.00	457.0		0.0		
	839.0	289665.4	0.0	1463.0	-288182.5
161+00.00	449.1		0.0		
	846.7	290512.1	0.0	1463.0	-289029.2
161+50.00	465.3		0.0		
	870.3	291382.4	0.0	1463.0	-289899.3
162+00.00	474.6		0.0		
	881.3	292263.8	0.0	1463.0	-290781.8
162+50.00	477.2		0.0		
	881.3	293145.0	0.0	1463.0	-291662.1
163+00.00	474.5		0.0		
	887.2	294032.3	0.0	1463.0	-292549.3
163+50.00	483.7		0.0		
	930.1	294962.3	0.0	1463.0	-293479.3
164+00.00	520.6		0.0		
	956.7	295919.0	0.0	1463.0	-294436.1
164+50.00	512.4		0.0		
	969.2	296888.2	0.0	1463.0	-295405.2
165+00.00	534.2		0.0		
	982.7	297870.9	0.0	1463.0	-296387.9
165+50.00	527.0		0.0		
	940.1	298861.1	0.0	1463.0	-297378.1

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Ground Sections: vlct.gsc
Design Sections: vlct.dsc

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
166+00.00	542.4		0.0		
	1018.7	299879.8	0.0	1483.0	-298396.3
166+50.00	557.9		0.0		
	1060.5	300940.3	0.0	1483.0	-299457.3
167+00.00	567.5		0.0		
	641.6	301781.3	8.0	1491.0	-300290.3
167+50.00	321.4		6.7		
	601.3	302383.1	10.0	1501.0	-300882.1
168+00.00	328.3		2.2		
	727.2	303110.4	2.0	1503.0	-301607.3
168+50.00	457.5		0.0		
	771.2	303881.6	2.0	1505.0	-302376.6
169+00.00	375.5		2.2		
	722.3	304603.9	2.1	1507.1	-303096.9
169+50.00	404.7		0.1		
	770.7	305374.7	0.1	1507.1	-303867.5
170+00.00	427.7		0.0		
	781.0	306155.7	0.0	1507.1	-304648.6
170+50.00	415.3		0.0		
	806.8	306964.5	0.0	1507.1	-305457.4
171+00.00	457.7		0.0		
	838.8	307803.3	4.5	1511.7	-306291.7
171+50.00	446.2		4.9		
	827.6	308630.9	5.3	1517.6	-307113.3
172+00.00	445.6		1.5		
	870.4	309501.3	1.4	1519.0	-307982.3
172+50.00	494.4		0.0		
	926.1	310427.4	0.0	1519.0	-308908.4
173+00.00	505.8		0.0		
	960.9	311388.3	0.0	1519.0	-309869.3
173+50.00	531.9		0.0		
	1004.2	312392.5	0.0	1519.0	-310873.5
174+00.00	552.7		0.0		
	781.9	313174.4	2.3	1521.3	-311653.1
174+50.00	291.8		2.4		
	552.9	313727.3	4.0	1525.2	-312202.1
175+00.00	305.3		1.6		
	558.9	314286.1	7.6	1533.0	-312753.1
175+50.00	296.3		8.6		
	560.0	314846.1	49.5	1582.6	-313263.6
176+00.00	306.6		46.9		
	574.4	315420.6	47.2	1629.8	-313790.8
176+50.00	313.8		4.1		
	586.9	315987.4	79.9	1709.7	-314277.6
177+00.00	296.4		82.2		
	568.0	316554.1	166.5	1876.3	-314717.8

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15,047 24 ✓

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Ground Xsections: rlto.dat
Design Xsections: rlto.dat

Units: English (cu. yds.)

Sat Mar 12 08:36:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
177+50.00	313.6		54.5		
	619.4	317173.5	51.1	1667.6	-315285.9
178+00.00	355.4		0.5		
	666.1	317839.6	0.4	1888.0	-315951.5
178+50.00	364.0		0.0		
	675.2	318515.8	0.0	1888.0	-316627.7
179+00.00	366.3		0.0		
	691.9	319207.7	0.0	1888.0	-317319.7
179+50.00	381.0		0.0		
	717.6	319925.3	0.0	1888.0	-318037.3
180+00.00	394.0		0.0		
	744.8	320670.2	0.0	1888.0	-318782.1
180+50.00	410.4		0.0		
	763.3	321433.5	0.0	1888.0	-319545.4
181+00.00	414.0		0.0		
	777.9	322211.3	0.0	1888.0	-320323.3
181+50.00	426.2		0.0		
	802.4	323013.7	0.0	1888.0	-321125.7
182+00.00	440.4		0.0		
	832.6	323846.3	0.0	1888.0	-321958.3
182+50.00	458.8		0.0		
	857.2	324703.5	0.0	1888.0	-322815.5
183+00.00	467.0		0.0		
	879.0	325582.5	0.0	1888.0	-323694.5
183+50.00	482.3		0.0		
	912.4	326494.9	0.0	1888.0	-324606.9
184+00.00	503.2		0.0		
	940.7	327435.7	0.0	1888.0	-325547.6
184+50.00	512.8		0.0		
	954.6	328390.3	0.0	1888.0	-326502.2
185+00.00	518.1		0.0		
	967.5	329357.8	0.0	1888.0	-327469.7
185+50.00	526.8		0.0		
	988.6	330346.4	0.0	1888.0	-328458.3
186+00.00	540.9		0.0		
	769.9	331116.3	7.5	1895.6	-329220.7
186+50.00	290.5		8.1		
	546.1	331664.4	13.6	1909.4	-329755.0
187+00.00	301.5		8.3		
	556.6	332223.2	11.1	1920.5	-330302.7
187+50.00	302.1		5.2		
	579.6	332802.8	8.6	1929.1	-330873.7
188+00.00	324.0		4.2		
	596.2	333399.0	6.6	1936.0	-331463.0
188+50.00	319.9		3.2		
	632.1	334031.1	4.9	1940.8	-332090.3

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Ground Associations: rlsc.gsi
Design Associations: rlsc.dsi

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
189+00.00	362.8		2.1		
	671.0	334702.1	1.9	1942.8	-332759.4
189+50.00	361.9		0.0		
	680.0	335382.1	0.0	1942.8	-333439.3
190+00.00	372.4		0.0		
	709.9	336092.0	0.0	1942.8	-334149.3
190+50.00	394.3		0.0		
	779.1	336871.1	0.0	1942.8	-334928.3
191+00.00	447.1		0.0		
	838.1	337709.2	0.0	1942.8	-335766.5
191+50.00	458.0		0.0		
	871.2	338580.4	0.0	1942.8	-336637.7
192+00.00	482.9		0.0		
	909.0	339489.4	0.0	1942.8	-337546.7
192+50.00	495.8		0.0		
	913.9	340403.4	0.0	1942.8	-338460.6
193+00.00	488.2		0.0		
	905.0	341306.4	0.0	1942.8	-339363.7
193+50.00	489.2		0.0		
	919.4	342227.8	0.0	1942.8	-340285.1
194+00.00	503.8		0.0		
	952.6	343180.4	0.0	1942.8	-341237.7
194+50.00	525.1		0.0		
	986.9	344167.3	0.0	1942.8	-342224.5
195+00.00	540.7		0.0		
	1013.7	345181.0	0.0	1942.8	-343238.2
195+50.00	554.1		0.0		
	1033.7	346214.7	0.0	1942.8	-344271.9
196+00.00	562.4		0.0		
	1064.1	347278.8	0.0	1942.8	-345336.0
196+50.00	586.8		0.0		
	821.3	348100.0	1.8	1944.6	-346155.4
197+00.00	308.2		2.0		
	553.7	348653.7	5.1	1949.7	-346704.1
197+50.00	297.8		3.5		
	546.6	349200.3	3.8	1953.5	-347247.1
198+00.00	292.7		0.4		
	541.8	349742.4	0.6	1954.2	-347788.2
198+50.00	292.4		0.2		
	554.4	350296.7	0.6	1954.8	-348341.9
199+00.00	298.3		0.4		
	555.7	350852.4	0.4	1955.2	-348897.2
199+50.00	293.8		0.0		
	570.4	351423.8	0.0	1955.2	-349470.6
200+00.00	325.4		0.0		
	600.0	352028.8	0.0	1955.2	350073.6

16,436 26 ✓

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Ground Association: [illegible]
Design Association: [illegible]

Units: English (cu. yds.)

Sat Mar 12 08:08:20 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
200+50.00	385.8		0.0		
	640.0	352671.8	0.0	1955.2	-350716.6
201+00.00	368.6		0.0		
	712.4	353384.2	0.0	1955.2	-351429.0
201+50.00	400.7		0.0		
	795.5	354179.6	0.0	1955.2	-352224.5
202+00.00	438.4		0.0		
	828.4	355008.2	0.0	1955.2	-353052.9
202+50.00	436.2		0.0		
	841.1	355849.3	0.0	1955.2	-353894.1
202+70.61	457.4		0.0		
	825.2	356674.4	0.0	1955.2	-353919.2
203+00.00	507.6		0.0		
	927.3	357601.8	0.0	1955.2	-354846.5
203+50.00	493.9		0.0		
	926.1	358527.8	0.0	1955.2	-355372.6
203+60.00	453.0		0.0		
	926.8	359454.6	0.0	1955.2	-355899.4
204+00.00	429.3		0.0		
	496.5	360153.1	0.0	1955.2	-356197.9
204+31.69	420.1		0.0		
	287.0	360440.1	0.0	1955.2	-356484.9
204+50.00	426.4		0.0		
	615.3	361055.5	0.0	1955.2	-357100.3
205+00.00	434.1		0.0		
	845.6	361101.0	0.0	1955.2	-358145.8
205+50.00	459.1		0.0		
	851.3	362952.4	0.0	1955.2	-358997.2
206+00.00	460.4		0.0		
	844.9	363797.3	0.0	1955.2	-359842.1
206+50.00	452.1		0.0		
	833.8	364631.1	0.0	1955.2	-360675.8
207+00.00	470.0		0.0		
	903.3	365534.3	0.0	1955.2	-361599.1
207+50.00	505.6		0.0		
	947.0	366481.3	0.0	1955.2	-362546.1
208+00.00	517.2		0.0		
	950.5	367431.8	0.0	1955.2	-363496.6
208+50.00	509.3		0.0		
	985.2	368438.0	0.0	1955.2	-364482.8
209+00.00	555.6		0.0		
	985.4	369423.4	0.0	1955.2	-365468.2
209+50.00	508.3		0.0		
	947.3	370370.7	0.0	1955.2	-366415.4
210+00.00	514.5		0.0		
	964.3	371335.0	0.0	1955.2	-367384.7

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Cross Sections: [illegible]
Design Sections: [illegible]

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance
210+50.00	502.2		0.0		
	997.8	370337.7	0.0	1965.2	-368382.5
211+00.00	543.3		0.0		
	1016.5	371354.2	0.0	1955.2	-369398.9
211+50.00	552.5		0.0		
	1007.4	372391.6	0.0	1955.2	-370436.4
212+00.00	568.0		0.0		
	813.1	373204.7	3.6	1958.8	-371245.8
212+50.00	310.2		3.9		
	597.6	373802.3	5.5	1964.1	-371838.1
213+00.00	335.2		1.6		
	636.0	374439.2	2.0	1966.1	-372473.0
213+50.00	352.7		0.4		
	657.8	375097.0	0.4	1966.6	-373130.4
214+00.00	357.8		0.0		
	680.4	375777.4	0.0	1966.6	-373810.8
214+50.00	377.1		0.0		
	686.8	376464.2	0.0	1966.6	-374497.7
215+00.00	364.7		0.0		
	683.4	377147.6	0.0	1966.6	-375181.0
215+50.00	373.4		0.0		
	711.2	377858.8	0.0	1966.6	-375892.2
216+00.00	394.7		0.0		
	720.7	378579.4	0.0	1966.6	-376612.9
216+50.00	383.6		0.0		
	725.3	379304.7	0.0	1966.6	-377338.2
217+00.00	399.7		0.0		
	757.5	380062.2	0.0	1966.6	-378095.6
217+50.00	418.4		0.0		
	776.8	380839.0	0.0	1966.6	-378872.4
218+00.00	420.5		0.0		
	789.1	381628.0	0.0	1966.6	-379661.5
218+50.00	431.7		0.0		
	812.0	382440.1	0.0	1966.6	-380473.5
219+00.00	445.3		0.0		
	838.9	383279.0	0.0	1966.6	-381312.4
219+50.00	460.7		0.0		
	871.6	384170.0	0.0	1966.6	-382204.0
220+00.00	502.2		0.0		
	928.2	385098.8	0.0	1966.6	-383132.2
220+50.00	500.3		0.0		
	937.9	386036.7	0.0	1966.6	-384070.1
221+00.00	512.7		0.0		
	974.5	387011.2	0.0	1966.6	-385044.6
221+50.00	539.7		0.0		
	991.1	388002.3	0.0	1966.6	-386035.8

16,654 28 ✓

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Ground Sections: rlct.geo
Design Sections: rlct.dec

Units: English (cu. yds.)

Sat Mar 12 08:38:25 1994

Station	Sta_cut_area	Acc_cut	Sta_fill_area	Acc_fill	Balance		
222+00.00	536.7		0.0				
	967.9	386990.0	0.0	1966.6	-387023.7		
222+50.00	536.3		0.0				
	1019.5	390009.7	0.0	1966.6	-388043.2		
223+00.00	564.8		0.0				
	786.2	390795.9	5.0	1971.6	-388824.3		
223+50.00	284.3		5.4				
	549.4	391345.3	7.2	1976.8	-389366.4		
224+00.00	309.0		2.4				
	603.1	391948.3	2.7	1981.5	-389966.8		
224+50.00	342.0		0.5				
	650.0	392598.3	0.4	1981.9	-390616.3		
225+00.00	359.7		0.0				
	670.4	393266.7	0.0	1981.9	-391286.7		
225+50.00	364.0		0.0				
	674.5	393943.2	0.0	1981.9	-391961.3		
226+00.00	364.2		0.0				
	671.4	394614.6	0.0	1981.9	-392632.7		
226+50.00	361.0		0.0				
	672.4	395287.0	0.0	1981.9	-393305.1	15,982	29
227+00.00	365.2		0.0				
	665.9	395972.9	0.0	1981.9	-393991.0		
227+50.00	375.6		0.0				
	708.5	396681.4	0.0	1981.9	-394699.5		
228+00.00	339.5		0.0				
	738.3	397419.7	0.0	1981.9	-395437.8		
228+50.00	407.8		0.0				
	780.4	398200.2	0.0	1981.9	-396218.3		
229+00.00	435.0		0.0				
	831.0	399031.2	0.0	1981.9	-397049.2		
229+50.00	462.4		0.0				
	856.7	399867.8	0.0	1981.9	-397905.9		
230+00.00	462.8		0.0				
	879.1	400766.9	0.0	1981.9	-398785.0		
230+50.00	486.6		0.0				
	793.0	401559.9	3.3	1985.2	-399574.8		
231+00.00	369.9		3.6				
	700.4	402260.3	4.2	1987.4	-400270.9		
231+50.00	366.5		1.0				
	731.2	402991.5	0.9	1990.3	-401001.2		
232+00.00	403.1		0.0				
	793.7	403785.2	0.0	1990.3	-401794.9	8,499	30
232+50.00	454.1		0.0				

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel Quantities
BY JLK DATE 3-15 CHKD. BY RDS DATE 3/16/94

SHEET NO. 1 OF 1
JOB NO. 28835

Item 220-1 Grouted Rip Rap (For Downdrains) S.Y.

Sheet #	Quanity S.Y.			DD No
7	2 x 73.7	=	147.4	2, 3
8	2 x 73.7	=	147.4	4, 6
9	2 x 73.7	=	147.4	8, 9
10	3 x 73.7	=	221.1	11, 13, 17
12	1 x 73.7	=	73.7	18
13	2 x 73.7	=	147.4	20, 21
14	1 x 73.7	=	73.7	23
15	1 x 73.7	=	73.7	25
16	1 x 73.7	=	73.7	27
17	—			
18	2 x 73.7	=	147.4	31, 34
19	1 x 74.9	=	74.9	35
20	2 x 74.9	=	149.8	37 & 39
21	1 x 74.9	=	74.9	40
22	2 x 74.9	=	149.8	42, 43
23	3 x 74.9	=	224.7	44, 45, 46
24	2 x 74.9	=	149.8	48, 49
25	3 x 74.9	=	224.7	51, 52, 53
26	3 x 74.9	=	224.7	55, 56, 57
27	(2 x 74.9)+(1 x 12)	=	161.8	59, 60, 62
28	4 x 12	=	48.0	63, 64, 66, 67
29	3 x 12	=	36.0	68, 70, 71
30	1 x 12	=	12.0	72

Total 2784 S.Y.

Downdrains = 73.7 S.Y from EMF to German
= 74.9 S.Y. From Germann to Queen Creek Rd. Alignment
= 12.0 S.Y from Queen Creek Rd. Align. to Ellsworth

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel Quantities
BY JLK DATE 3-15 CHKD. BY ds DATE 3/16/94

SHEET NO. 1 OF
JOB NO. 28835

Item No. 220-2 Grouted RipRap (Drop Structures + Bank Protection)

Sheet #	Calculation	D/S No.	Quantity	S.V.
7	930 (Drop Structure)	1	930	✓
8	2(760) = 1520 (2-Drop Structures)	5, 7	1520	✓
9	760 (Drop)	10 only	~~760~~ 770 same as for Sht 2	
10	369.4 + 205 + ~~27.22~~ + 1175.2 = ~~2021~~ 2069 (outlet, Inlet, channel Protection 1495)	2069	~~2021~~	✓
11	—		—	
12	770	19	770	✓
13	—		—	
14	770	22	770	✓
15	770	24	770	✓
16	770	26	770	✓
17	770 + 400 = 1170 (Drop + Outlet)	28	1170	✓
18	187 + 478 + 661 = (Inlet, Outlet + Inlet w/Channel)	✓	1326	✓
19	500	36	500	✓
20	500	38	500	✓
21	500	41	500	✓
22	—			
23	—			
24	1000 (2-Drops)	47 & 52	1000	✓
25	500	54	500	✓
26	500	58	500	✓
27	730 (Side Channel)	61	730	✓
28	500	61	500	✓
29	500	70	500	✓
30	500	73	500	

Total = 16,537 S.V.

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel Quantities
BY GSJ DATE 3/14 CHKD. BY JLK DATE 3-15-94

SHEET NO. 1 OF 2
JOB NO. 28835

Item # 310-1 4" ABC Maintenance Rd.

Sheet #	Calculation	Quantity (C.Y.)
7	$\frac{[(12' \times 865') + (28' \times 20') + (20/2 \times 14') + (45/2 \times 6')] \times 4''/12''}{27} =$	138.5 ✓
8	$\frac{[(12' \times 680') + (12' \times 245') + (15/2 \times 12)]\ 4''/12''}{27} =$	138.1 ✓
9	$\frac{[(12' \times 1000') + (8' \times 20')]\ 4''/12''}{27} =$	150.1 ✓
10	$\frac{[(12' \times 445') \times 2]\ 4''/12''}{27} =$	131.9 ✓
12	$\frac{[(12 \times 1010) + (20 \times 15/2)]\ 4''/12''}{27} =$	151.5 ✓
13	$\frac{[(12 \times 1000)]\ 4''/12''}{27} =$	148.1 ✓
14, 15 & 16	$\frac{[(12 \times 1000) + (20 \times 15/2)]\ 4''/12''}{27} = 150 \times 3$ sheets	= 450.0 ✓
17	$\frac{[(12 \times 1012) + (20 \times 15/2)]\ 4''/12''}{27} =$	= 151.8 ✓
18	$\frac{(12 \times 255)\ 4''/12''}{27} =$	= 37.8 ✓
19	$\frac{[(12 \times 1020) + (20 \times 15/2)]\ 4''/12''}{27} =$	= 153.0 ✓
20, 21, 25, & 26,	(Same as 14, 15 & 16) = 150 × 4	= 600.00 ✓

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Road Quantities
BY DATE 3-14 CHKD. BY JLK DATE 3-15-94

SHEET NO. 2 OF 2
JOB NO. 28835

Item # 310-1 (Continued)

Sheet #	Calculations	Quantity (C.Y.)
22, 23	(Same as 13) = 148.1 x 2	= 296.2 ✓
24	$\frac{[(1000' \times 12') + 2(20 \times 15/2)]}{27} \; 4''/12''$	= 151.9 ✓
27	$\frac{(12 \times 920) \; 4''/12''}{27}$	= 136.3 ✓
28 + 29	(Same as 14, 15 + 16) = 150 x 2	= 300.0 ✓
30	$\frac{[(585 \times 12) + (\quad \times 15/2)] \; 4''/12''}{27}$	= 88.5 ✓
	Total	= 3,224

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel
Quantities
BY GJS DATE 3/14 CHKD. BY JLK DATE 3-15-94

SHEET NO. 1 OF 1
JOB NO. 28835

Item 336-1 Pavement (2" AC / 4" ABC)

Sheet #	Calculation		Quanty (S.Y.)
10	$\frac{30' \times 33'}{9}$	=	110 ✓
18	$\frac{40' \times 27'}{9}$	=	120 ✓

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SUBJECT Rittenhouse Channel
Quantities
BY JLK DATE 3/14 CHKD. BY [illegible] DATE 3/16/94

SHEET NO. 1 OF 1
JOB NO. 28835

Item 415-1 Guard Rail

Sheet #	Calculation		Quantity L.F.
10	2 (2 x 37.6')	=	150.40 * ✓
17	1 (2 x 37.6')	=	75.20 * ✓
18	3 (2 x 37.6')	=	225.60 ✓✓
30	1 (2 x 37.6')	=	75.20 *
		Total	526.40

* These do not appear on these sheets as items to be constructed.

Done

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel Quantities
BY GSJ DATE 3/14 CHKD. BY JLK DATE 3-15-94

SHEET NO. 1 OF 1
JOB NO. 28835

Item 420-1 Chain Link Fence (6')

Sheet #	Quantity (Ft.) ✓
10	610

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel Quantities
BY GSS DATE 3/14 CHKD. BY JLK DATE 3-15-94

SHEET NO. 1 OF 1
JOB NO. 28835

Item 420-2 12' Chain Link Fence Gates (2-6' Gates)

Sheet #	Quantity (Each)
10	2 ✓
17	1 ✓
18	3 ✓
30	1 * Not shown on plan. Done
Total	7

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel
Quantities
BY GSJ DATE 3/14 CHKD. BY JLK DATE 3-15-94

SHEET NO. 1 OF 1
JOB NO. 28835

Item # 421-1 4 Strand Barbless Wire Fence (L.F.)

Sheet #	Quantity (L.F.)	
07	905	
08	1000	
09	1000	
10	1120	
12	970	
13-16	4000	= (4x1000)
17	1085	
18	2400	
19	1030	
20-26	7000	= (7x1000)
27	1280	
28-29	4000	= (2x2000)
30	1280	1200 — NO 1280 is correct

Grand Total
27,070

Calculations for Item # 505-1 Structural Concrete (For Box Culverts)
Item # 505-2 Rebar (For Box Culverts)

Job: Rittenhouse Channel

Address: East Maricopa Floodway to Ellsworth Rd

Maricopa County, Arizona

(These calculations apply to the job at this address only)

Client: Gannett Fleming

Index to Calculations

Sheet:	Item:
1 - 7	Sossaman Road Quantity Estimate
8 - 13	Germann Road Quantity Estimate
14 - 19	Power Road Quantity Estimate

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ALAGIA ENGINEERING GROUP, INC.
PHOENIX, ARIZONA

Sossaman Road - Concrete

I. Box Culvert Barrel

Length
107+77.41
- 106+87.41
90.00 ft

From ADOT Std No. B-02.30
for S=8', H=6', Triple Barrel, Table 1

Concrete = 2.468 cu.yd./ft x 90 ft = 222.1 cu yds
Steel = 403#/ft x 90 ft = 36,270# = 18.14 tons

II. Wing Walls & Footings

Height above Bottom of Culvert
6.0' + 9½" + 3" + 6" = 7.54'

A. Outlet Wing Walls

Height at Culvert
1354.62
- 1344.08
10.54

Height at End
1351.62
- 1344.08
7.54

Volume = $\left(\frac{10.54+7.54}{2}\text{ Height}\right) \times (42.88\text{ Left} + 38.0\text{ Right Length})$
x (1 ft width)
= 731 cu ft.
= 27.1 cu yds.

B. Inlet Wing Walls

Height at Culvert
1354.65
- 1347.11
7.54'

Volume = $\overset{\text{Height}}{7.54} \times \left[\left(\overset{2}{2}\right)\left(\overset{\text{Length}}{39.75}\right)\right] \times \left(\overset{\text{width}}{\frac{1}{12}}\right)$
= 449.6
= 16.7 cu yds.

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JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 1

ALAGIA ENGINEERING GROUP, INC.

C. Outlet Footing

Volume = (6' width)(1.5 depth)(42.88 + 38 Length)
= 727.9 cuft
= 27.0 cu yds

D. Inlet Footing

Volume = (4' width)(1.25 depth) (2 × 39.75 Length)
= 397.5 cu ft
= 14.7 cu yds

E. Outlet Footing Cutoff Wall

Max Height = 1344.08
− 1343.58 Ftg
− 1343.08 Bottom
1.50 ft

Volume = $\left(\frac{1.5}{2}\text{ Height}\right)$ (42.88 + 38 Length) (1.0 wide)
= 60.7 cuft
= 2.3 cu yds

F. Inlet Footing Cutoff Wall

Max Height = 1'-9"

Volume = $\left(\frac{1.75}{2}\right)$ (2)(39.75) (1.0 wide)
= 69.6 cuft
= 2.6 cu yds

Total = 27.1 A
16.3 B
27.0 C
14.3 D
2.3 E
2.6 F
90.4 cu yds.

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

JOB: Rittenhouse Channel DATE: 2/94 BY: MSP JOB NO.: 94006 SH.:

2

ALAGIA ENGINEERING GROUP, INC.

III Inlet & Outlet Cutoff Walls

Inlet Wall

Volume = 3' deep × 1' wide × 27' long

= 81 cu ft

= 3.0 cu yd.

Outlet Wall

Volume = 6' deep × 1' wide × 27' long

= 6.0 cu. yd.

Total = 3.0 + 6.0 = 9.0 cu. yd

IV Curb

Volume = (2 ends)(27' long) $\left(\frac{3}{12} \times \frac{9}{12} + \frac{6}{12} \times \frac{12}{12}\right)$ (Height width, Height width)

= 37.1 cu. ft

= 1.4 cu. yd.

Total:

222.1	I
90.4	II
9.0	III
1.4	IV
323.0 cu yd.	

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

JOB: Ritter house Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 3

ALAGIA ENGINEERING GROUP, INC.

Sossaman Road - Rebar

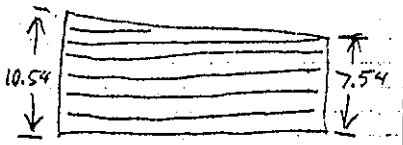
I. Box Culvert

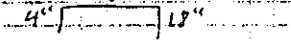
Steel = 36,240 #

II. Wing Walls & Footings

A. Outlet Wing Wall

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight (#)
Horiz. at Top 2#6	#6	1.502	80.88	2	243
Horiz 2#4 @ 18					
Full Length	#4	0.668	80.88	10	540
Partial Length	#4	0.668	40.44	2	54
Vertical					
Outside #4@18	#4	0.668	9.0+1.5	54	379
Inside #5@12	#5	1.043	9.0+2.5	81	922
#6@12	#6	1.502	4.3+1.5	81	705
Top Stirrups #4@6	#4	0.668	2.5	81 x 2	270
					3,163 #





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JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 4

ALAGIA ENGINEERING GROUP, INC.

B. Inlet Wall

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight (#)
Horiz at Top 2#6	#6	1.502	79.5	2	239
Horiz 2#4@18	#4	0.668	79.5	10	531
Vertical Outside #4@18	#4	0.668	7.5+1.5	53	319
Inside #5@12	#5	1.043	7.5+2.5	79	824
#6@12	#6	1.502	4.3+1.5	79	688
Top Stirrup #4@6 (5, 4", 1'-6")	#4	0.668	2.25	79 x 2	237
					3,838

C. Outlet Footing & Cutoff Wall

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight
Horiz Transverse Top #6@12	#6	1.502	6	81	730
Bot #4@12	#4	0.668	6	54	216
Parallel 11#4	#4	0.668	81	11	595
Vert 2#4@18 (1.5, 1.5, (ave) 0.75)	#4	0.668	3.75	108	271
					1,812

D. Inlet Footing & Cutoff Wall

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight
Horiz Transverse Top #6@12	#6	1.502	4	79	475
Bot #4@18	#4	0.668	4	52	139
Parallel 11#4	#4	0.668	79	11	580
Vert 2#4@18	#4	0.668	3.75	105	263
					1,457

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE

Total = 3,163 A
2,238 B
1,812 C
1,457 D
9,270 #

III Inlet & Outlet Cutoff Wall

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight
Outlet Wall					
Horiz. 12 #4	#4	0.668	27	12	216
Vert. #4 @18 Pair	#4	0.668	18	18	216
Inlet Wall					
Horiz 6 #4	#4	0.668	27	6	108
Vert #4@18 Pair	#4	0.668	12	18	144
					684

IV Curbs

Type	Size	Unit Wt (#/ft)	Length (ft)	Number	Weight
Horiz 4 #6	#6	1.502	27	4 x 2 ends	324
Vert U #4@18	#4	0.668	46.5/12	18 x 2 ends	94
					418

V Wingwall Footing to Culvert Transition

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight
Vertical #5	#5	1.043	7	12	88
Number: 6 long bars x 2 Transitions					

JOB: Michael Puhlmann DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 6

ALAGIA ENGINEERING GROUP, INC.

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

Total

36,240 I
9,378 II
884 III
418 IV
88 V

46,700 #
23.4 Tons

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

JOB: Michael Puhlmann DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 7

ALAGIA ENGINEERING GROUP, INC.

Germann Road Concrete

I. Box Culvert Barrel

Length
11480.87
− 11372.87
108.00

From ADOT Std No. B-02.30
for S = 8', H = 6', Triple Barrel, Table 1

Concrete: 2.468 cu.yd/ft × 108 = 266.5 cu yds
Steel = 403#/ft × 108 = 43,524 = 21.76 tons

II Wing Wall & Footings

A. Outlet Wing Walls

Height:
1354.95
− 1347.41
7.54'

Volume = (7.54' Height) × (79.75 + 18.88 + 72 Length) × ($\frac{9}{12}$ width)
170.63
= 964.9 cuft.
= 35.7 cu yds

B. Inlet Wing Wall

Height:
1355.00
− 1347.46
7.54'

Volume = (7.54 Height) (2 × 39.75 Length) × ($\frac{9}{12}$ width)
79.5
= 449.6 cuft
= 16.7 cu yds

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 8

ALAGIA ENGINEERING GROUP, INC.

C. Outlet Footing

Volume = (4ft wide) (1.25 deep) (170.63 long)
= 853.2 cuft
= 31.6 cu yd.

D. Inlet Footing

Volume = (4' wide) (1.25 deep) (79.5 long)
= 397.5 cuft
= 14.7 cu yd.

E. Outlet Fig. Cutoff Wall

Volume = $\left(\frac{1.75}{2}\right)$ Height) (170.63 long) (1.0 wide)
= 149.3 cuft
= 5.5 cu yd

F. Inlet footing Cut of Wall

Volume = $\left(\frac{1.75}{2}\right)$ (79.5) (1.0 wide)
= 69.6 cuft
= 2.6 cu yd.

Total	35.7	A
	16.7	B
	31.6	C
	14.7	D
	5.5	E
	2.6	F
	106.8	cu. yds

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 9

ALAGIA ENGINEERING GROUP, INC.

III Inlet & Outlet Cutoff Walls

Volume = (2walls)(3' deep)(1' wide)(27' Long)
= 162 cu ft.
= 6 cu yds

IV Curb

Volume = (2ends)(27' long) $\left(\frac{3}{12} \times \frac{9}{12} + \frac{6}{12} \times \frac{12}{12}\right)$
= 37.1 cu ft.
= 1.4 cu yds.

Total

266.5	I
106.8	II
6.0	III
1.4	IV
380.7 cu yds.	

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 10

ALAGIA ENGINEERING GROUP, INC.

Germann Road - Rebar

Type	Size	Unit Wt (#/ft)	Length (ft)	Number	Weight (#)
I. Box Culvert					
Steel = 43,524#					43,524
II. Wingwalls & Footings					
A. Outlet Wingwall					
Horiz at Top 2#6	#6	1.502	170.63	2	513
Horiz 2#4@18	#4	0.668	170.63	10	1,140
Vertical					
Outside #4@18	#4	0.668	8.25+1.1	114	712
Inside #5@12	#5	1.043	8.25+1.1	170	1,658
#5@12	#6	1.043	3+1.1	170	727
Top Stirrup					
#4@12"	#4	0.668	2.5	179	299
4" 8" 1'-6"					
					5,049
B. Inlet Wall					
Horiz at Top 2#6	#6	1.502	79.5	2	238
Hor. 2 2#4@18	#4	0.668	79.5	10	531
Vertical					
Outside #4@18	#4	0.668	8.25+1.1	53	331
Inside #5@12	#5	1.043	8.25+1.1	79	778
#5@12	#6	1.043	3+1.1	79	338
Top Stirrup					
#4@12	#4	0.668	2.5	79	132
4" 8" 1'-6"					
					2,340

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 11

ALAGIA ENGINEERING GROUP, INC.

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight (#)
C. Outlet Footing & Cutoff Wall					
Horiz Transverse					
Top #6 @ 12"	#6	1.502	4	170	1021
Bot #4 @ 1'-6"	#4	0.668	4	113	302
Parallel 11#4	#4	0.668	170	11	1,249
Vert 2#4@18	#4	0.668	3.75	226	566
1.5 / 1.5 / Ave. 0.75					3,138
D. Inlet Footing & Cutoff Wall					
Horiz. Transverse					
Top #6 @ 12"	#6	1.502	4	79	474
Bot #4 @ 1'-6"	#4	0.668	4	53	141
Parallel 11#4	#4	0.668	79.5	11	584
Vert 2#4@18	#4	0.668	3.75	106	265
1.5 / 1.5 / Ave 0.75					1,965
Total 5,049 A					
2,340 B					
3,138 C					
1,965 D					
12,492					
III. Inlet & Outlet Cutoff Wall					
Horiz 6#4	#4	0.668	27	6 x 2	216
Vert #4@18 Pair	#4	0.668	12	18 x 2	288
					504

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 12

ALAGIA ENGINEERING GROUP, INC.

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

Type	Size	Unit Wt (#/ft)	Length (ft)	Number	Weight
IV. Curbs					
Horiz 4#6	#6	1.502	27	4 x 2 ends	324
Vert @ #4@18	#4	0.668	46.5/12	18 x 2 ends	94
					418

Total

43,524	I
12,492	II
504	III
418	IV
56,938 #	
28.2 tons	

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

JOB: Rittenhouse Channel DATE: 3/14 BY: MSP JOB NO.: 9400; SH.: 13

ALAGIA ENGINEERING GROUP, INC.

Power Road - Concrete

I - Box Culvert Barrel

Length 4185.24
- 4105.78
79.46 ft

From ADOT Std. No. B-02.20
For S = 6', H = 6' Triple Barrel, Table No. 1

Concrete = 1.984 cu.yd./ft × 79.46 ft = 157.7 cu yds
Extension of Top Slab at Existing Box $\left(\frac{2}{12}\right)\left(\frac{9.5}{12}\right)(79.46)\frac{1}{27} = 1.6$
Total = 157.7 + 1.6 = 159.3 cu yds

II - Wing Walls & Footings

Height Above Bottom of Culvert
6.0' Clear + 9½" Top Slab + 2" Clear + 6" Curb = 7.54'

A. ~~Outlet~~ Inlet Wing Walls
1. Left

Height at Culvert 1334.67
- 1325.82
8.85 Section C-C

Height at End 1333.32
- 1325.82
7.50

Volume = $\left(\frac{8.85+7.50}{2}\text{ Height}\right)$ (38.58 Length) × (1.0 Wide)
= 315 cu ft

2. Right View E-E

Height at Culvert 1334.64
- 1325.80
8.84

Height at End 1333.32
- 1325.80
7.52

Volume = $\left(\frac{8.84+7.52}{2}\text{ Height}\right)$ (28 Length) (1.0 Wide)
= 229 cu ft

Total = 315 + 229 = 544 cu.ft

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 14

ALAGIA ENGINEERING GROUP, INC.

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE

View D-D

B. ~~Inlet~~ Outlet Wing Walls

1. Right

Height at Culvert
$$\begin{array}{r} 1334.60 \\ -1325.00 \\ \hline 9.60 \end{array}$$

Height at End
$$\begin{array}{r} 1330.00 \\ 1322.25 \\ \hline 7.75 \end{array}$$

Elevation at 8'-5½" from Culvert $= \frac{59.75}{68.21}(1334.60-1330)+1330$

$= 1334.03$

Height at 8'-5½" (Left)
$$\begin{array}{r} 1334.03 \\ -1325.00 \\ \hline 9.03 \end{array}$$

Height at 8'-5½" (Right
$$\begin{array}{r} 1334.03 \\ -1322.25 \\ \hline 11.78 \end{array}$$

Volume (Left) $= \left(\frac{9.6+9.03}{2}\right)(8'-5\tfrac{1}{2})(1.0)$

$= 79$ cu ft

Volume (Right) $= \left(\frac{11.78+7.75}{2}\right)(59.75)(1.0)$

$= 583$ cu ft

Total $= 79+583 = 662$

2. Left Height at Culvert = $\begin{array}{r} 1334.60 \\ -1325.62 \\ \hline 8.98 \end{array}$ View B-B

Height at End $\begin{array}{r} 1,330.81 \\ -1,322.41 \\ \hline 7.59 \end{array}$

Volume $= \left(\frac{8.98+7.59}{2}\right) 50.2 \ (1)$

$= 416$

Total $= 662+416 = 1,078$

JOB: Rittenhouse Channel DATE: 3/14 BY: MSP JOB NO.: 94006 SH.: 15

ALAGIA ENGINEERING GROUP, INC.

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

C, D, Outlet & Inlet Footings

	Width	depth	Length	Volume
Inlet, Left	5.58	1.5	38.58	323
Inlet, Right	5.58	1.5	28.0	234
Outlet, Left	5.75 (ave)	1.5	50.17	433
Outlet, Right	5.25 (ave)	1.5	58.92	464
Total				1,454

E, F Footing Cutoff walls

	Width	Depth	Length	Volume
Inlet, Left	1.0	1.5/2	38.58	29
Inlet, Right	1.0	0	28.0	0
Outlet, Left	1.0	1.5/2	50.17	38
Outlet, Right	1.0	0	58.92	0
				67

A 544
B 1,078
C, D 1,454
E, F 67

3,143 cu ft.
116 cu. yd.

III Inlet & Outlet Cutoff walls

	Width	Depth	Length	Volume
Inlet Wall	1.0	3	21.33	64
Outlet Wall	1.0	6	21.33	128
Total				192
				7 cu yds

IV Curb

Volume = (2 ends)(21.33 Length)$\left(1.1 \times \frac{9}{12} + \frac{12}{12} \times \frac{12}{12}\right)$
= 77
3 cu yd.

Total
I 159
II 116
III 7
IV 3
285 cu yds.

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94005 SH.: 16

ALAGIA ENGINEERING GROUP, INC.

Power Road - Rebar

Type	Size	Unit Wt (#/ft)	Length (ft)	Number	Weight (#)
I Box Culvert					
277.8 x 79.46ft = 22,074					22,074
II Wingwall & Footings					
A Inlet					
(1) Left					
Horizont top 2#6	#6	1.502	28.58	2	116
Horiz 2#4@18	#4	0.668	32.58	12	309
Vertical					
Outside #4@18	#4	0.668	2.2+1.1	26	162
Inside #6@12	#6	1.502	2.2+1.1	77	1,076
Top Stirrup					
#4@6	#4	0.668	2.5	77	129
4" 8" 1'-6"					1,792
(2) Right					
Horiz @Top 2#6	#6	1.502	28	2	84
Horiz 2#4@18	#4	0.668	28	12	224
Vertical					
Outside #4@18	#4	0.668	8.2+1.1	19	118
Inside #6@6	#6	1.502	8.2+1.1	56	782
Top Stirrup					
#4@12	#4	0.668	2.5	56	94
4" 8" 1'-6"					1,302
B Outlet					
(1) Left					
Horizont Top 2#6	#6	1.502	50.2	2	151
Horiz. 2#4@18	#4	0.668	50.2	12	402
Vertical					
Outside #4@18	#4	0.668	8.3+1.1	34	213
Inside #6@12	#6	1.502	8.3+1.1	50	706
#7@12	#7	2.044	8.3+1.1	50	961
Top Stirrup #4@6	#4	0.668	2.5	100	167
					2,047

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

JOB: Rittenhouse Channel DATE: 2/14 BY: MSP JOB NO.: 94006 SH.: 17

ALAGIA ENGINEERING GROUP, INC.

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight (#)
(2) Right					
Horiz @ Top 2#6	#6	1.502	68	2	204
Horiz 2# 4@18	#4	0.668	68	12	545
Vertical					
Outside #4@18	#4	0.668	8.3+1.1	45	283
Inside #5@12	#5	1.043	8.3+1.1	68	657
#7@12	#7	2.044	8.3+1.1	68	1,307
Top Stirrup #4@6	#4	0.668	2.5	136	227
					3,223
C. Outlet Footing & Cutoff Wall					
Horiz					
Transverse					
Top #6@6"	#6	1.502	5.58	133	1,114
Bot #4@18"	#4	0.668	5.58	44	164
Parrallel ‖ #4	#4	0.668	66.52	11	489
Vert 2#4@18	#4	0.668	3.75	26	65
1.5 / 1.5 / Ave 0.75					1,832
D Inlet Footing & Cutoff Wall					
Horiz					
Transverse					
Top #6@6	#6	1.502	5.5	218	1,800
Bot #4@18	#4	0.668	5.5	73	268
Parrallel ‖ #4	#4	0.668	109	9	655
Vert 2#4@18	#4	0.668	3.75	33	83
1.5 / 1.5 / Ave 0.75					2,806
					13,002
III Inlet & Outlet Cutoff Wall					
Horiz 6#4	#4	0.668	27	6×2	216
Vert #4@18 Pair	#4	0.668	12	18×2	288
					504
IV Curbs					
Horiz 4#6	#6	1.502	42.6	4	255
2#4	#4	0.668	42.6	2	57
Vert #4@18" Pair	#4	0.668	5.4	28	101
					413

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 18

ALAGIA ENGINEERING GROUP, INC.

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

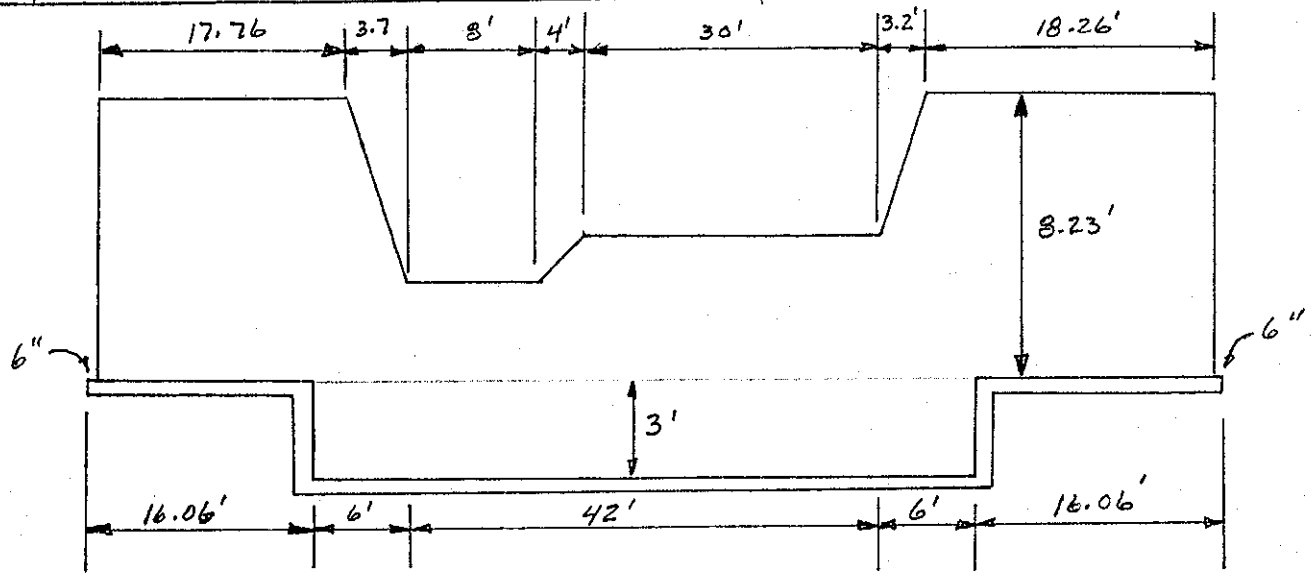
Total	I	22,074
	II	13,002
	III	504
	IV	413
		35,993

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 19

ALAGIA ENGINEERING GROUP, INC.

Item No. 505-3 Structural Concrete (For Drop Structures)
Item No. 505-4 Structural Concrete (For Drop Structures)



Drainage Structure No. 1. Sta 8+00

Crest Wall

$$\text{Wall Area} = (3' \times 54') + \left[(84.92 \times 8.23) - \left(\tfrac{3.2}{2} \times 6.4\right) - (34 \times 6.4) - \left(\tfrac{4}{2} \times 1\right) - (8 \times 7.4) - \left(\tfrac{3.7}{2} \times 7.4\right)\right]$$

$$= 558.16 \text{ S.F.} \checkmark$$

$$\text{Footing Length} = (15.06' + 3' + 54' + 3' + 15.06') = 90.12 \text{ Ft.} \checkmark$$

$$\text{Concrete} = \frac{\overbrace{(558.16 \text{ S.F.} \times 1 \text{ Ft.})}^{\text{Wall}} + \overbrace{90.12' (4.5' \times 1')}^{\text{Footing}}}{27} = \underline{\underline{35.7 \text{ cubic yards}}} \checkmark$$

$$\text{Rebar} = \left[\overbrace{\left(558.16 \text{ S.F} \times 4'/\text{S.F} \times 0.668 \tfrac{\text{lbs}}{\text{ft}}\right)}^{\text{Wall } (\#4 \text{ at } 12'')} + \overbrace{(8 \times 89.62' \times 0.668 \text{ lb/ft})}^{\text{Footing } 8\#4\text{s}} + \overbrace{\left(\tfrac{90.12}{1.5} \times 4' \times 1.043 \text{ lb/ft}\right)}^{\#5 \text{ @ } 18''}\right] \times \overbrace{1.05}^{\text{Lap}}$$

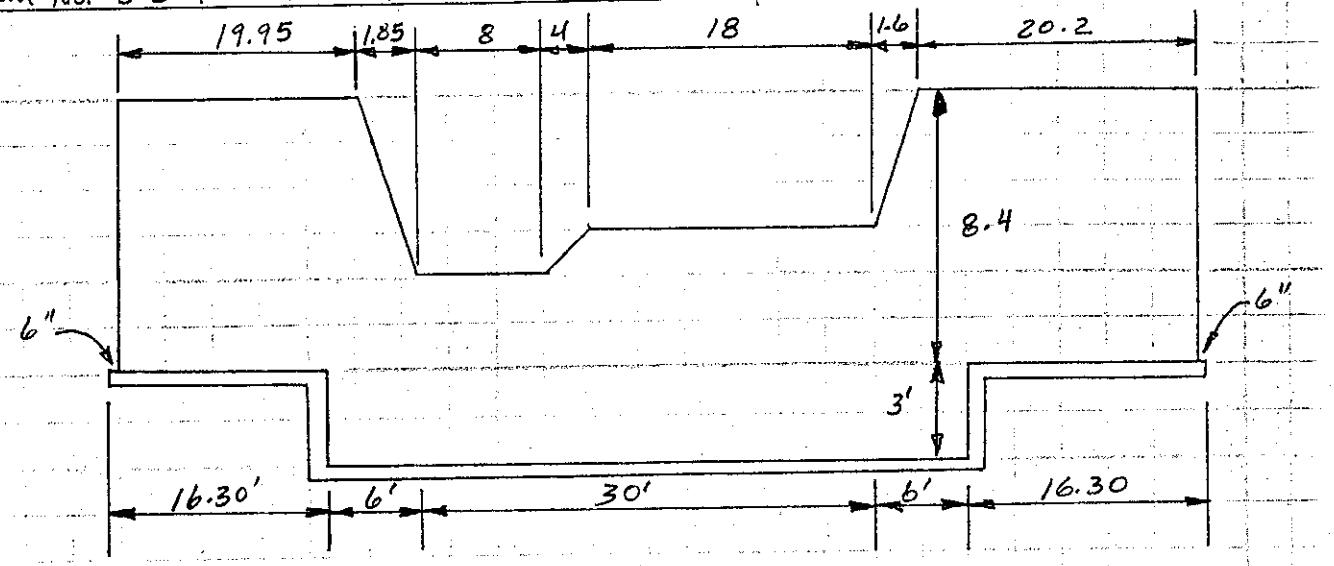
$$= \underline{\underline{2332 \text{ lbs}}}$$

Sill Wall

$$\text{Concrete} = \frac{\overbrace{(60 \times 3 \times 1)}^{\text{Wall}} + \overbrace{(60 \times 3 \times 1)}^{\text{Footing}} - \overbrace{(1 \times 12 \times 1)}^{\text{Deduct}}}{27} = \underline{\underline{12.9 \text{ C.Y.}}} \checkmark$$

$$\text{Rebar} \quad [(180 - 12) \times 4' \times 0.668] + (3 \times 59.5' \times 0.668) = \underline{\underline{568 \text{ lbs}}}$$

Item No. 505-3 Structural Concrete (For Drop Structures)
Item No. 505-4 Structural Concrete (For Drop Structures)



Drainage Structure No. 5 Sta 20+00

Crest Wall

Wall Area = $(3' \times 42') + [(73.6' \times 8.4') - (\frac{1.6}{2} \times 6.4) - (22 \times 6.4) - (4/2 \times 1) - (8 \times 7.4) - (\frac{1.85}{2} \times 7.4)]$

530.28 S.F.

Footing Length = $(15.3 + 3 + 42 + 3 + 15.30) = 78.6$ ft.

Concrete = $\frac{(530.28 \times 1') + 78.6(4.5 \times 1)}{27} = \underline{\underline{32.7 \text{ C.Y.}}}$

Rebar = $[(530.28 \times 4 \times 0.668) + (8 \times 78.6 \times 0.668) + (\frac{78.6}{1.5} \times 4 \times 1.043)] \times 1.05$

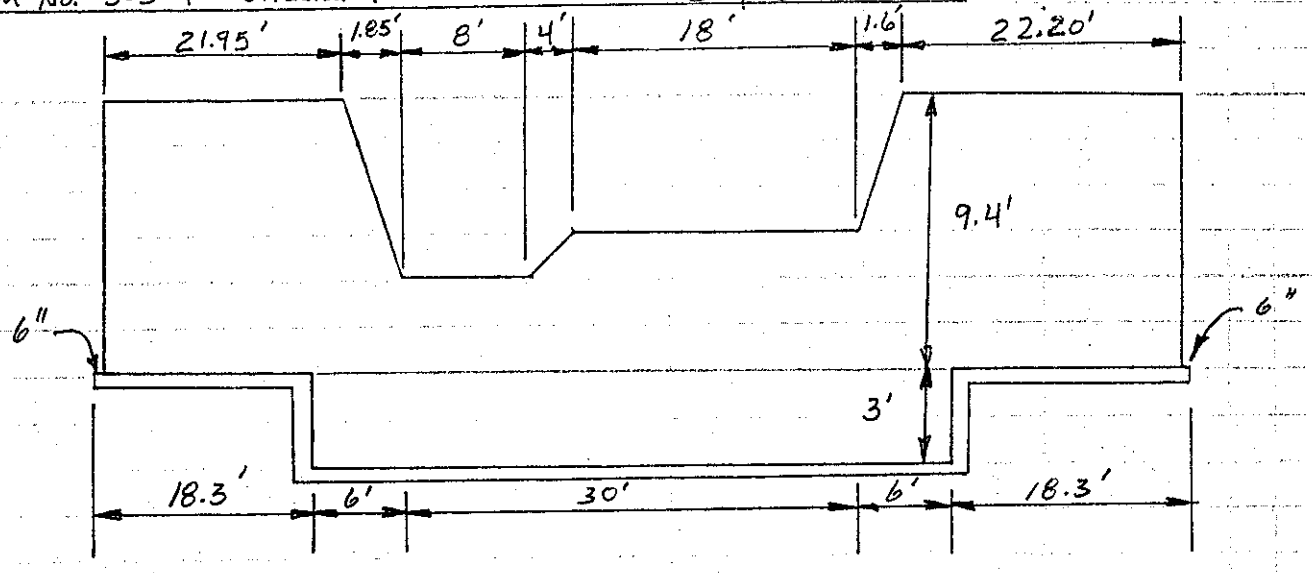
$= \underline{\underline{2158 \text{ lbs}}}$

Sill Wall - Also For Drainage Structures 7+10

Concrete = $\frac{\overbrace{[(66.8 \times 3) - (12 \times 1)] \times 1}^{\text{Wall Area}} + \overbrace{(66.8 \times 3 \times 1)}^{\text{Footing}}}{27} = \underline{\underline{14.40 \text{ C.Y.}}}$

Rebar = $(200.4 - 12) \times 4' \times 0.668 + (3 \times 66.3 \times 0.668) = \underline{\underline{636 \text{ lbs}}}$

Item No. 505-3 Structural Concrete (For Drop Structures)
Item No. 505-4 Structural Concrete (For Drop Structures)



Drainage Structure No.s 7, 10, 19, 22, 24, 26 & 28
Sta 27+00, 36+40, 55+80, 71+00, 79+60, 89+60 & 101+60

Crest Wall

Wall Area $= (3 \times 42) + \left[(77.6 \times 9.4) - \left(\frac{1.6}{2} \times 6.4\right) - (22 \times 6.4) - \left(\frac{1.85}{2} \times 7.4\right) - (8 \times 7.4)\right]$

$= 643.5$ S.F.

Footing Length $= (17.3 + 3 + 42 + 3 + 17.3) = 82.60$ Ft.

Concrete $= \frac{(643.5 \times 1) + 82.6\,(4.5 \times 1)}{27} = \underline{\underline{37.6 \text{ C.Y.}}}$

Rebar $= \left[(643.5 \times 4 \times 0.668) + (8 \times 82.1 \times 0.668) + \left(\frac{82.6}{2} \times 4' \times 1.043\right)\right] 1.05$

$= \underline{\underline{2447 \text{ lbs}}}$

Sill Wall - For Drainage Structure No. 7 + 10 use Sill Wall For Drainage Structure 5

Concrete $\frac{[(52.8 \times 3) - 12] \times 1 + (52.8 \times 3 \times 1)}{27} = \underline{\underline{11.3 \text{ C.Y.}}}$

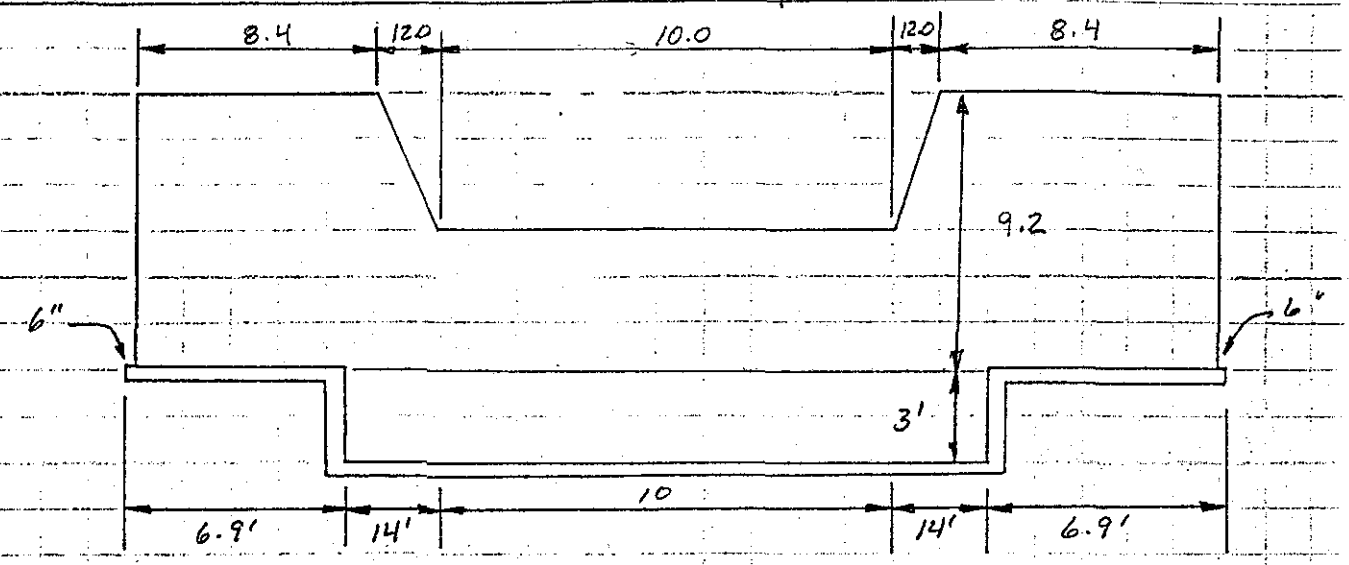
Rebar $(146.4 \times 4 \times 0.668) + (3 \times 52.8 \times 0.668) = \underline{\underline{497 \text{ lbs}}}$

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel Quantities
BY JRK DATE 3-15 CHKD. BY [illegible] DATE 3/16/94

SHEET NO. 4 OF 4
JOB NO. 28835

Item No. 505-3 Structural Concrete (For Drop Structures)
Item No. 505-4 Structural Concrete (For Drop Structures)



Drainage Structure No.'s 36, 38, 41, 47, 50, 54, 58, 65, 70, 73
Sta 124+20, 130+80, 143+40, 167+20, 174+40, 186+40, 196+80
212+00, 223+00 & 230+60

Wall Area = $(3 \times 38') + [(50.8 \times 9.2) - 2(1\frac{1}{2} \times 7.2) - (10 \times 7.2)]$ = 422.96 S.F.

Footing Length = $(5.9 + 3 + 38 + 3 + 5.9)$ = 55.8 ft.

Concrete = $\frac{(422.96 \times 1) + (55.8 \times 4.5 \times 1)}{27}$ = **25 C.Y.**

Rebar = $[(422.96 \times 4 \times 0.668) + (8 \times 55.3 \times 0.668) + (\frac{55.8}{2} \times 4 \times 1.043)]\ 1.05$
= **1619 lbs.**

No Sill Wall

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel Quantities
SHEET NO. 1 OF 1
JOB NO. 28835
BY JLK DATE 3-15 CHKD. BY [illegible] DATE 3/16/94

Item 505-5 Catch Basin, MAG Std. Det. 535, Type F (Ea.)
(Including Frame & Grate)

Sheet # 18 - 1 Each

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel Quantities
BY JLK DATE 3-15 CHKD. BY [illegible] DATE 3/16/94
SHEET NO. 1 OF 1
JOB NO. 28835

505-6 Replace Irrigation Ditches (Concrete) (L.F.)
(May be completed by others)

Sheet #	Quantity (L.F.)
18	695
26	610
27	600
Total	1905

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT Rittenhouse Channel
Quantities
BY JLK DATE 3-15 CHKD. BY [illegible] DATE 3/16/94

SHEET NO. 1 OF 1
JOB NO. 28835

Item # 618-3 24" CMP (L.F.)

Sheet #	Quantity (L.F.)
18	58
27	49
28	196 = (4x49')
29	147 = (3x49)
30	49

Total = 499 L.F. ✓

Calculations for

Job: Rittenhouse Channel

Address: East Maricopa Floodway to Ellsworth Rd

Maricopa County, Arizona

(These calculations apply to the job at this address only)

Client: Gannett Fleming

Index to Calculations

Sheet:	Item:
1 - 7	Sossaman Road Quantity Estimate
8 - 13	Germann Road Quantity Estimate
14 - 19	Power Road Quantity Estimate
20	Summary of Standard Design
21	Non Standard Headwall
22 - 25	Non Standard Sossaman Road Wingwall & Footing
26 - 29	Non Standard Power Road Wingwall & Footing
30 - 32	Non Standard Germann Road Wingwall & Footing

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ALAGIA ENGINEERING GROUP, INC.
PHOENIX, ARIZONA

Sossaman Road - Concrete

I. Box Culvert Barrel

Length
107 + 77.41
- 106 + 87.41
90.00 ft

From ADOT Std No. B-02.30
for S=8', H=6', Triple Barrel, Table 1

Concrete = 2.468 cu.yd./ft x 90 ft = 222.1 cu yds
Steel = 403 #/ft x 90 ft = 36,270# = 18.14 tons

II. Wing Walls & Footings

Height above Bottom of Culvert
6.0' + 9½" + 3" + 6" = 7.54'

A. Outlet Wing Walls

Height at Culvert
1354.62
1344.08
10.54

Height at End
1351.62
- 1344.08
7.54

Volume = $\left(\frac{10.54 + 7.54}{2} \text{ Height}\right) \times (42.88 \text{ Left} + 38.0 \text{ Right Length})$
x (1 Ft Width)
= 731 cu ft.
= 27.1 cu yds.

B. Inlet Wing Walls

Height at Culvert
1354.65
- 1347.11
7.54'

Volume = Height 7.54 x [(2 Length)(39.75)] x (width $\frac{1}{12}$)
= 449.6
= 16.7 cu yds.

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JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.:

ALAGIA ENGINEERING GROUP, INC.

C. Outlet Footing

Volume = (7' width)(1.5 depth)(42.88 + 38 Length)
= 849 cuft
= 31.5 cu yds

D. Inlet Footing

Volume = (4' width)(1.25 depth)(2 × 39.75 Length)
= 397.5 cu ft
= 14.7 cu yds

E. Outlet Footing Cutoff Wall

Max Height = 1344.08
− 1347.58 Ftg Bottom
1.50 ft

Volume = $\left(\frac{1.5}{2}\text{ Height}\right)$(42.88 + 38 Length)(1.0 wide)
= 60.7 cuft
= 2.3 cu yds

F. Inlet Footing Cutoff Wall

Max Height = 1'-9"

Volume = $\left(\frac{1.75}{2}\right)$(2)(39.75)(1.0 wide)
= 69.6 cuft
= 2.6 cu yds

Total =	27.1	A
	16.7	B
	31.5	C
	14.7	D
	2.3	E
	2.6	F
	94.9 cu yds.	

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 2

ALAGIA ENGINEERING GROUP, INC.

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III Inlet & Outlet Cutoff walls

Inlet Wall

Volume = 3' deep x 1' wide x 27' long

= 81 cu ft

= 3.0 cu yd.

Outlet Wall

Volume = 6' deep x 1' wide x 27' long

= 6.0 cu. yd.

Total = 3.0 + 6.0 = 9.0 cu. yd

IV Curb

Volume = (2 ends)(27' long) $\left(\overset{\text{Height}}{\frac{3}{12}} \times \overset{\text{width}}{\frac{9}{12}} + \overset{\text{Height}}{\frac{6}{12}} \times \overset{\text{width}}{\frac{12}{12}}\right)$

= 37.1 cu. ft

= 1.4 cu. yd.

Total :

222.1	I
94.9	II
9.0	III
1.4	IV
327.4 cu yd.	

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE

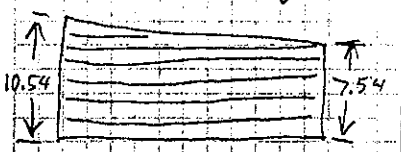
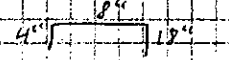
Sossaman Road - Rebar

I. Box Culvert

Steel = 36,240#

II. Wing Walls & Footings

A. Outlet Wing Wall

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight (#)
Horiz. at Top 2#6	#6	1.502	80.88	2	243
Horiz 2#4 @ 18					
Full Length	#4	0.668	80.88	10	540
Partial Length	#4	0.668	40.44	2	54
					
Vertical					
Outside #4@18	#4	0.668	9.0+1.5	54	379
Inside #5@12	#5	1.043	9.0+2.5	81	972
#6@12	#6	1.502	4.3+1.5	81	705
Top Stirrups #4@6 	#4	0.668	2.5	81 x 2	220
					3,163#

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

B. Inlet Wall

Type	Size	Unit wt. (#/ft)	Length (ft)	Number	Weight (#)
Horiz at Top 2#6	#6	1.502	79.5	2	239
Horiz 2#4@18	#4	0.668	79.5	10	531
Vertical Outside #4@18	#4	0.668	7.5+1.5	53	319
Inside #5@12	#5	1.043	7.5+2.5	79	824
#6@12	#6	1.502	4.3+1.5	79	688
Top Stirrup #4@6 (4" 5 1'-6")	#4	0.668	2.25	79 x 2	237
					3,838

C. Outlet Footing & Cutoff Wall

Type	Size	Unit wt. (#/ft)	Length (ft)	Number	Weight
Horiz Transverse Top #6@8	#6	1.502	7	120	1,262
Bot #4@1'-6"	#4	0.668	7	54	252
Parallel ‖#4	#4	0.668	81	11	595
Vert 2#4@18 (1.5 1.5 (ave) 0.75)	#4	0.668	3.75	108	271
					2,380

D. Inlet Footing & Cutoff Wall

Type	Size	Unit wt. (#/ft)	Length (ft)	Number	Weight
Horiz Transverse Top #6@12	#6	1.502	4	79	475
Bot #4@18	#4	0.668	4	52	139
Parallel ‖#4	#4	0.668	79	11	580
Vert 2#4@18	#4	0.668	3.75	105	263
					1,457

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE

Total = 3,163 A
3,838 B
2,380 C
1,457 D
9,838 #

III Inlet & Outlet Cutoff Wall

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight
Outlet Wall					
Horiz. 12 #4	#4	0.668	27	12	216
Vert. #4 @ 18 Pair	#4	0.668	18	18	216
Inlet Wall					
Horiz 6 #4	#4	0.668	27	6	108
Vert #4 @ 18 Pair	#4	0.668	12	18	144
					684

IV Curbs

Type	Size	Unit Wt (#/ft)	Length (ft)	Number	Weight
Horiz 4 #6	#6	1.502	27	4 x 2 ends	324
Vert U #4 @ 18	#4	0.668	46.5/12	18 x 2 ends	94
					418

V Wingwall Footing to Culvert Transition

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight
Vertical #5	#5	1.043	7	12	88
Number: 6 long bars x 2 Transitions					

JOB: Michael Puhlmann DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 6

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Total

36,240	I
9,837	II
684	III
418	IV
88	V

47,268 #

23.6 Tons

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JOB: Michael Puhlmann DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 7

ALAGIA ENGINEERING GROUP, INC.

Germann Road: Concrete

I. Box Culvert Barrel

Length 11480.87
− 11372.87
108.00

From ADOT Std No. B-02.30
for S = 8', H = 6', Triple Barrel, Table 1

Concrete: 2.468 cu. yd/ft × 108 = 266.5 cu yds
Steel = 403#/ft × 108 = 43,524 = 21.76 tons

II Wing Wall & Footings

A. Outlet Wing Walls

Height: 1354.95
− 1347.41
7.54'

170.63 Total Length

Volume = [(9.29)(72 ft) + (7.54' Height) × (79.75 + 18.88)] × (a/12 width)
= 1059 cuft
= 39.2 cu yds

B. Inlet Wing Wall

Height: 1355.00
− 1347.46
7.54'

Volume = (7.54 Height)(2 × 39.75 Length) × (a/12 Width)
= 449.6 cuft
= 16.7 cu yds

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 8

ALAGIA ENGINEERING GROUP, INC.

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C. Outlet Footing

Volume = (4 ft wide) (1.25 deep) (170.63 long)
= 853.2 cuft
= 31.6 cu yd.

D. Inlet Footing

Volume = (4' wide) (1.25 deep) (79.5 long)
= 397.5 cuft
= 14.7 cu yd.

E. Outlet Ftg. Cutoff Wall

Volume = $\left(\frac{1.75}{2}\right.$ Height) (170.63 long) (1.0 wide)
= 149.3 cuft
= 5.5 cu yd

F. Inlet footing Cut of Wall

Volume = $\left(\frac{1.75}{2}\right)$ (79.5) (1.0 wide)
= 69.6 cuft
= 2.6 cu yd.

Total	39.2	A
	16.7	B
	31.6	C
	14.7	D
	5.5	E
	2.6	F
	110.3	cu. yds

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JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 9

ALAGIA ENGINEERING GROUP, INC.

III Inlet & Outlet Cutoff Walls

Volume = (2walls)(3' deep)(1' wide)(27' Long)
= 162 cu ft.
= 6 cu yds

IV Curb

Volume = (2ends)(27' long) $\left(\frac{3}{12} \times \frac{6}{12} + 2.5 \times \frac{9}{12}\right)$
= 108 cuft.
= 4.0 cu yds.

Total	266.5	I
	110.3	II
	6.0	III
	4.0	IV
	386.8 cu yds.	

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JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 10

ALAGIA ENGINEERING GROUP, INC.

Germana Road - Rebar

Type	Size	Unit Wt (#/ft)	Length (ft)	Number	Weight (#)
I. Box Culvert					
Steel = 43,524#					43,524
II Wingwalls & Footings					
A. Outlet Wingwall					
Horiz at Top 2#6	#6	1.502	170.63	2	513
Horiz 2#4@18	#4	0.668	170.63	12	1,368
Vertical					
Outside #4@18	#4	0.668	8.25+1.1	57	356
	#4	0.668	10.75+1.1	57	458
Inside #5@12	#5	1.043	8.25+1.1	85	828
#5@12	#5	1.043	3+1.1	85	363
	#5	1.043	10.75+1.1	85	1,051
Top Stirrup	#5	1.043	3+1.1	85	363
#4@12"	#4	0.668	2.5	179	299
4" 8" 1'-6"					
					5,591
B. Inlet Wall					
Horiz at Top 2#6	#6	1.502	79.5	2	238
Horiz 2#4@18	#4	0.668	79.5	10	531
Vertical					
Outside #4@18	#4	0.668	8.25+1.1	53	331
Inside #5@12	#5	1.043	8.25+1.1	79	778
#5@12	#6	1.043	3+1.1	79	338
Top Stirrup					
#4@12	#4	0.668	2.5	79	132
4" 8" 1'-6"					
					2,340

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JOB: Rittenhouse Channel DATE: 3/04 BY: MSP JOB NO.: 94006 SH.: 17

ALAGIA ENGINEERING GROUP, INC.

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight (#)
C. Outlet Footing & Cutoff Wall					
Horiz. Transverse					
Top #6 @ 12"	#6	1.502	4	170	1021
Bot #4 @ 1'-6"	#4	0.668	4	113	302
Parallel 11 #4	#4	0.668	170	11	1,249
Vert 2 #4 @ 18	#4	0.668	3.75	226	566
					3,138
1.5 / 1.5 / Ave 0.75					
D. Inlet Footing & Cutoff Wall					
Horiz. Transverse					
Top #6 @ 12"	#6	1.502	4	79	474
Bot #4 @ 1'-6"	#4	0.668	4	53	141
Parallel 11 #4	#4	0.668	79.5	11	584
Vert 2 #4 @ 18	#4	0.668	3.75	106	265
					1,965
1.5 / 1.5 / Ave 0.75					
Total 5,591 A					
3,340 B					
3,138 C					
1,965 D					
13,034					
III. Inlet & Outlet Cutoff Wall					
Horiz 6 #4	#4	0.668	27	6 x 2	216
Vert #4 @ 18 Pair	#4	0.668	12	18 x 2	288
					504

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JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 12

ALAGIA ENGINEERING GROUP, INC.

Type	Size	Unit wt (#/ft)	Length (ft)	Number	Weight
IV Curbs					
Horiz 4#6	#6	1.50	27	4	162
6#6		1.50	27	6	243
Vert @ #4@18	#4	0.668	3.88	18	47
		0.668	6.88	18	82
					534

Total

43,524 I
13,034 II
504 III
534 IV

57,596 #
28.8 tons

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JOB: Rittenhouse Channel DATE: 3/14 BY: MSP JOB NO.: 94006 SH.: 13

ALAGIA ENGINEERING GROUP, INC.

Power Road - Concrete

I - Box Culvert Barrel

Length 4185.24
- 4105.78
79.46 ft

From ADOT Std. No. B-02.30
For S = 6", H = 6' Triple Barrel, Table No. 1

Concrete = 1.984 cu.yd./ft × 79.46 ft = 157.7 cu yds
Extrusion of Top Slab at Existing Box $\left(\frac{8}{12}\right)\left(\frac{9.5}{12}\right)(79.46)\frac{1}{27} = 1.6$
Total = 157.7 + 1.6 = 159.3 cu yds

II - Wing Walls & Footings

Height Above Bottom of Culvert
6.0' Clear + 9½" Top Slab + 3" Clear + 6" Curb = 7.54'

A. ~~Outlet~~ Inlet Wing Walls
1. Left

Height at Culvert 1334.67
- 1325.82
8.85 Section C-C

Height at End 1333.32
- 1325.82
7.50

Volume = $\left(\frac{8.85+7.50}{2}\text{ Height}\right)$ (38.58 Length) × (1.0 Wide)
= 315 cu ft

2. Right View E-E

Height at Culvert 1334.64
- 1325.80
8.84

Height at End 1333.32
- 1325.80
7.52

Volume = $\left(\frac{8.84+7.52}{2}\text{ Height}\right)$ (28 Length) (1.0 Wide)
= 229 cu ft

Total = 315 + 229 = 544 cu ft

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 14

ALAGIA ENGINEERING GROUP, INC.

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View D-D

B. ~~Inlet~~ Outlet Wing Walls

1. Right

Height at Culvert
$$\begin{array}{r} 1334.60 \\ -1325.00 \\ \hline 9.60 \end{array}$$

Height at End
$$\begin{array}{r} 1330.00 \\ 1322.25 \\ \hline 7.75 \end{array}$$

Elevation at 8'-5½" from Culvert $= \frac{59.75}{68.21}(1334.60-1330)+1330$

$= 1334.03$

Height at 8'-5½" (Left)
$$\begin{array}{r} 1334.03 \\ -1325.00 \\ \hline 9.03 \end{array}$$

Height at 8'-5½" (Right
$$\begin{array}{r} 1334.03 \\ -1322.25 \\ \hline 11.78 \end{array}$$

Volume (Left) $= \left(\frac{9.6+9.03}{2}\right)(8'-5\tfrac{1}{2})(1.0)$

$= 79$ cu ft

Volume (Right) $= \left(\frac{11.78+7.75}{2}\right)(59.75)(1.0)$

$= 583$ cu ft

Total $= 79+583 = 662$

2. Left

Height at Culvert = $\begin{array}{r} 1334.60 \\ -1325.62 \\ \hline 8.98 \end{array}$ View B-B

Height at End $\begin{array}{r} 1,330.00 \\ -1,322.41 \\ \hline 7.59 \end{array}$

Volume $= \left(\frac{8.98+7.59}{2}\right) 50.2\ (1)$

$= 416$

Total $= 662+416 = 1,078$

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C.D. Outlet & Inlet Footings

	Width	depth	Length	Volume
Inlet, Left	6.25	1.5	38.58	361
Inlet, Right	6.25	1.5	28.0	262
Outlet, Left	5.13 (ave)	1.5	50.17	385
Outlet, Right	5.25 (ave	1.5	58.92	464
Total				1,472

E, F Footing Cutoff Walls

	Width	Depth	Length	Volume
Inlet, Left	1.0	1.5/2	38.58	29
Inlet, Right	1.0	0	28.0	0
Outlet, Left	1.0	1.5/2	50.17	38
Outlet, Right	1.0	0	58.92	0
				67

A 544
B 1,078
C,D 1,472
E,F 67

3,161 cu ft.
117 cu. yds

III Inlet & Outlet Cutoff Walls

	Width	Depth	Length	Volume
Inlet Wall	1.0	3	21.33	64
Outlet Wall	1.0	6	21.33	128
Total				192
				7 cu. yds

IV Curb

Volume = (2 ends)(21.33 Length)$\left(1.1 \times \frac{9}{12} + \frac{12}{12} \times \frac{12}{12}\right)$
= 77
3 cu. yd.

Total I 159
II 117
III 7
IV 3
286 cu yds.

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JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94005 SH.: 16

ALAGIA ENGINEERING GROUP, INC.

Power Road - Rebar

Type	Size	Unit Wt (#/ft	Length (ft)	Number	Weight (#)
I Box Culvert					
277.8 x 79.46ft = 22,074					22,074
II Wingwall & Footings					
A Inlet					
(1) Left					
Horizont top 2#6	#6	1.502	38.58	2	116
Horiz 2#4@18	#4	0.668	38.58	12	309
Vertical					
Outside #4@18	#4	0.668	8.2+1.1	26	162
Inside #6@12	#6	1.502	8.2+1.1	77	1,076
Top Stirrup					
#4@6	#4	0.668	2.5	77	129
4' 8" 1'-6"					1,792
(2) Right					
Horiz @Top 2#6	#6	1.502	28	2	84
Horiz 2#4@18	#4	0.668	28	12	224
Vertical					
Outside #4@18	#4	0.668	8.2+1.1	19	118
Inside #6@6	#6	1.502	8.2+1.1	56	782
Top Stirrup					
#4@12	#4	0.668	2.5	56	94
4' 8" 1'-6"					1,302
B Outlet					
(1) Left					
Horizont Top 2#6	#6	1.502	50.2	2	151
Horiz. 2#4@18	#4	0.668	50.2	12	402
Vertical					
Outside #4@18	#4	0.668	8.3+1.1	34	213
Inside #6@12	#6	1.502	8.3+1.1	50	706
#7@12	#7	2.044	8.3+1.1	50	961
Top Stirrup #4@6	#4	0.668	2.5	100	167
					2,047

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JOB: Rittenhouse Channel DATE: 3/14 BY: MSP JOB NO.: 94006 SH.: 17

ALAGIA ENGINEERING GROUP, INC.

Type	Size	Unit Wt. (#/ft)	Length (ft)	Number	Weight (#)
(2) Right					
Horiz @ Top 2#6	#6	1.502	68	2	204
Horiz 2#4 @ 18	#4	0.668	68	12	545
Vertical					
Outside #4 @ 18	#4	0.668	8.3+1.1	45	283
Inside #5 @ 12	#5	1.043	8.3+1.1	68	657
#7 @ 12	#7	2.044	8.3+1.1	68	1,307
Top Stirrup #4 @ 6	#4	0.668	2.5	136	227
					3,223
C. Outlet Footing & Cutoff Wall					
Horiz Transverse					
Top #6 @ 6"	#6	1.502	5.58	133	1,114
Bot #4 @ 18"	#4	0.668	5.58	44	164
Parrallel ‖ #4	#4	0.668	66.58	11	489
Vert 2#4 @ 18	#4	0.668	3.75	26	65
1.5 / 1.5 / Ave 0.75					1,832
D Inlet Footing & Cutoff Wall					
Horiz Transverse					
Top #6 @ 6	#6	1.502	5.5	218	1,800
Bot #4 @ 18	#4	0.668	5.5	73	268
Parrallel ‖ #4	#4	0.668	109	9	655
Vert 2#4 @ 18	#4	0.668	3.75	33	83
1.5 / 1.5 / Ave 0.75					2,806
					13,002
III Inlet & Outlet Cutoff Wall					
Horiz 6#4	#4	0.668	27	6×2	216
Vert #4 @ 18 Pair	#4	0.668	12	18×2	288
					504
IV Curbs					
Horiz 4#6	#6	1.502	42.6	4	255
2#4	#4	0.668	42.6	2	57
Vert #4 @ 18" Pair	#4	0.668	5.4	28	101
					413

JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 18

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Total	I	22,074
	II	13,002
	III	504
	IV	413
		35,993

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JOB: Rittenhouse Channel DATE: 3/94 BY: MSP JOB NO.: 94006 SH.: 19

ALAGIA ENGINEERING GROUP, INC.

Summary of Standard Designs

	Power Road	Sossaman Road	Gemann Road
1. Box Culvert	Std.	Std.	Std.
2. Headwall & Curb	2'-2¼" Ht. - Non Std	Std.	2'-6" Ht. - Non Std.
3. Cutoff Walls	Std.	Std.	Std.
4. Inlet Wingwall & Footing	8'-10" - Non Std	Std.	Std.
5. Outlet Wingwall & Footing	North 8'-11¾" Non Std South 11'-8⅜" Non Std 11.7	10'-6½" Non Std	East - Std. West - 9'-3½" Non Std.

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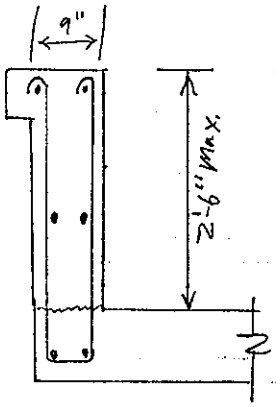
ALAGIA ENGINEERING GROUP, INC.

Non - Standard Headwall

Power Road - 2'-2¼" Height , Section A-A Sht 54
Germann Road - 2'-6" Height , Section A-A Sht 60



← 10,000 # over 5' longitudinal length
AASHTO 2.7

$$m = \frac{10{,}000\ \#\ (2.5\text{ft height})}{5\text{ft Length}}$$

$= 5.0\ \text{kft/ft}$

use $f'_c = 1{,}200$ psi
use $f_s = 24{,}000$ psi

$$\frac{x}{d} = \frac{n f_c}{f_s + n f_c} = \frac{8(1.2)}{24 + 8(1.2)} = 0.29$$

$$j = 1 - \frac{k}{3} = 1 - \frac{0.29}{3} = 0.90$$

$$R = \tfrac{1}{2} f_c b k j$$
$$= (\tfrac{1}{2})(1.2)(12)(0.29)(0.9)$$
$$= 1.89$$

$$m = R d^2$$
$$5.0\ \text{kft}(12) = 1.89\, d^2$$
$$d = 5.63$$

$$\text{Actual } d = \frac{9'' - 5\tfrac{1}{2}}{2} + 5\tfrac{1}{2} = 7.25''$$

$$m = A_s f_s j d$$
$$5.0(12) = A_s(24)(0.9)(7.25)$$
$$A_s = 0.38\ \text{in}^2/\text{ft}$$

use #4 @ 6" O.C.

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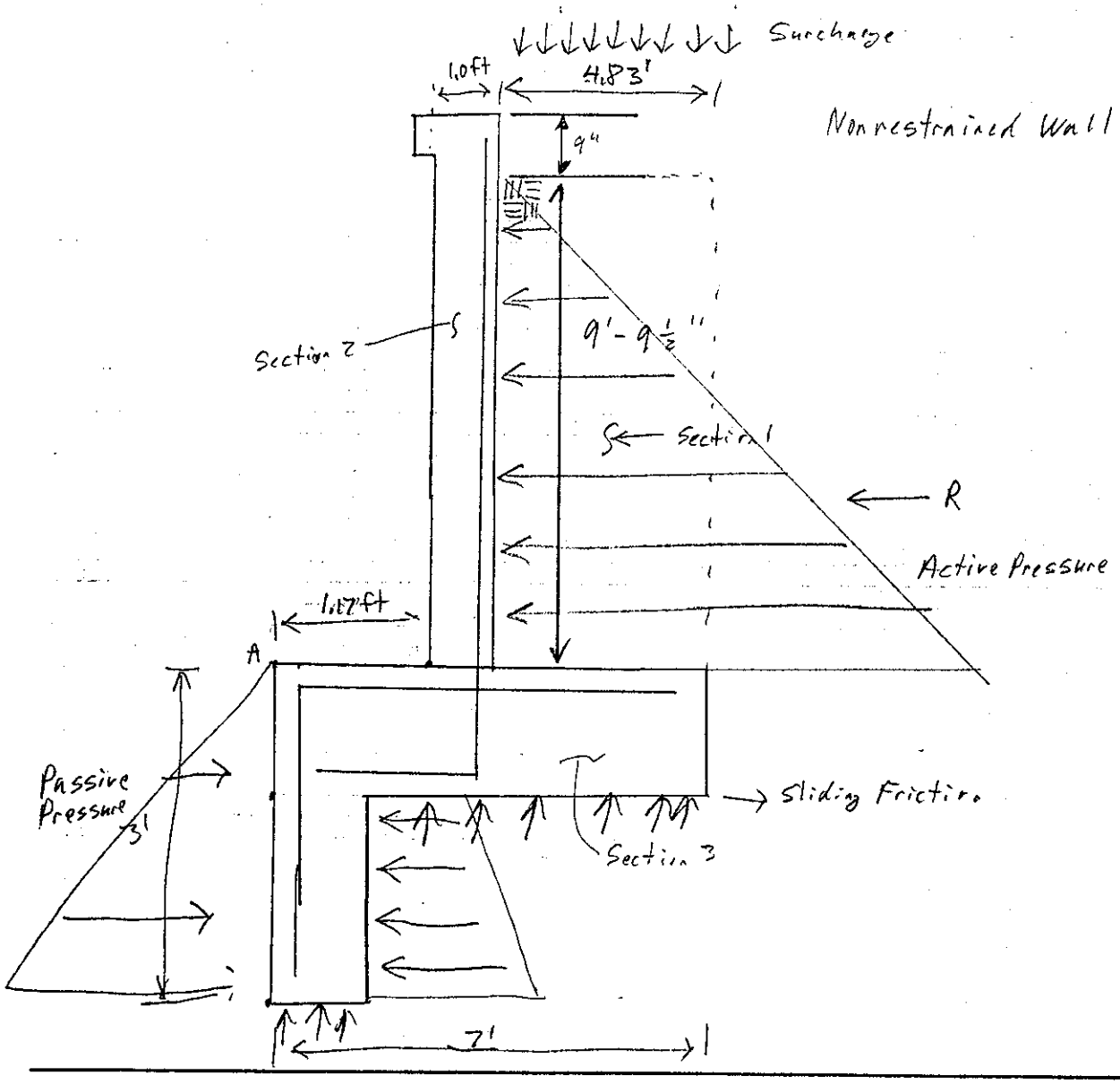
Non - Standard Wingwalls

Sossaman Road



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Soil Parameters per ATL Inc.

Bearing Capacity = 2,500 psf
Internal Friction = 38°
Active Pressure = 29 pcf equivalent fluid pressure
Passive Pressure = 504 pcf " " "
At Rest Pressure = 46 pcf " " "
Friction Coefficient = 0.55 "

Minimum Active Pressure = 30 pcf AASHTO 3.20.1
Possible Future Surcharge if Road is widened.
use 2 ft of Earth Surcharge AASHTO 3.2.3
use H = 9.79 ft + 2 ft (Surcharge) = 11.79

$$R = \left[\frac{0.03\ k/ft/ft}{2}(11.79\ ft)^2\right]$$

$$= 2.09\ k$$

$$M_A = 2.09k\left(\frac{11.79}{3}\right)$$

$$= 8.19\ kft$$

Resisting Moment

Section	weight	L	Moment
1	4.83 (9.79) (0.110 kcf) = 5.2 k/ft	4.59	23.87
2	(0.75)(10.5)(0.15) = 1.2 k/ft	1.67	1.97
3	(7)(1.5)(0.15) = 1.6	3.5	5.51
	8.0 k		31.35 kft

$$F.S. = \frac{31.35}{8.19} = 3.83 > 1.5 \quad \underline{OK}$$

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Check Wall Steel

$M_A = 8.19$ kft

use $f'_c = 1{,}200$ psi
use $f_s = 24{,}000$ psi
$k = \frac{x}{d} = 0.29$
$j = 0.90$
$R = 1.89$
$M = Rd^2$
$8.19(12) = 1.89\,d^2$
$d = 7.21$

Actual $d = 12'' - 2''$ cover $- \frac{0.75}{2}$ half bar dia.
$= 9.63''$

$M = A_s f_s j d$
$8.19(12) = A_s(24)(0.9)(9.63)$
$A_s = 0.47$ in²/ft

use #5@12" $A_s = 0.31$
& #6@12" $A_s = 0.44$
0.75 in² > 0.47 ok

Check Sliding

$F = 2.09$ K

Passive Pressure $= \frac{1}{2}(0.504\text{pcf/ft})(3\text{ft})^2$
$= 2.27$ K

Sliding Friction $= 0.55(8.0\text{K})$
$= 4.40$

Resistance $= 2.27 + 4.40$
$= 6.7$

F.S. $= \frac{6.7}{2.09} = 3.19 > 1.5$ ok

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

Check Soil Pressure

$$e = \frac{M_A}{P} = \frac{8.19 kft}{8.0K} = 1.02 ft$$

$$\frac{L}{6} = \frac{7ft}{6} = 1.17 ft$$

$$q = \frac{V}{BL}\left(1 + \frac{6e}{L}\right)$$

$$= \frac{8.0}{(1)(7)}\left(1 + \frac{6(1.02)}{7}\right)$$

$$q_{max} = 2.14 \text{ ksf} < 2.5 \quad \underline{OK}$$

Toe Reinforcing

$$q_{min} = \frac{8}{(1)(7)}\left(1 - \frac{6(1.02)}{7}\right)$$

$$= 0.14 \text{ ksf}$$

$$\text{Slope} = \frac{2.14 - 0.14}{7} = 0.29$$

$$M_{Toe} = \left[\frac{(2)(2.14) - 4.83(0.29)}{2}\right] \frac{4.83^2}{2}$$

$$= 16.8 \text{ kft/ft}$$

$$M = Rd^2$$

$$16.8(12) = 1.89d^2$$

$$d = 10.33$$

Actual $d = 18" - 3"$ Cover $- \frac{0.75}{2}$ half bar dia.

$= 14.63$

$$M = A_s f_s jd$$

$$16.8(12) = A_s(24)(0.9)(14.63)$$

$$A_s = 0.64 \text{ in}^2/\text{ft}$$

use #6 @ 8" o.c. $A_s = 0.66 \text{ in}^2/\text{ft}$

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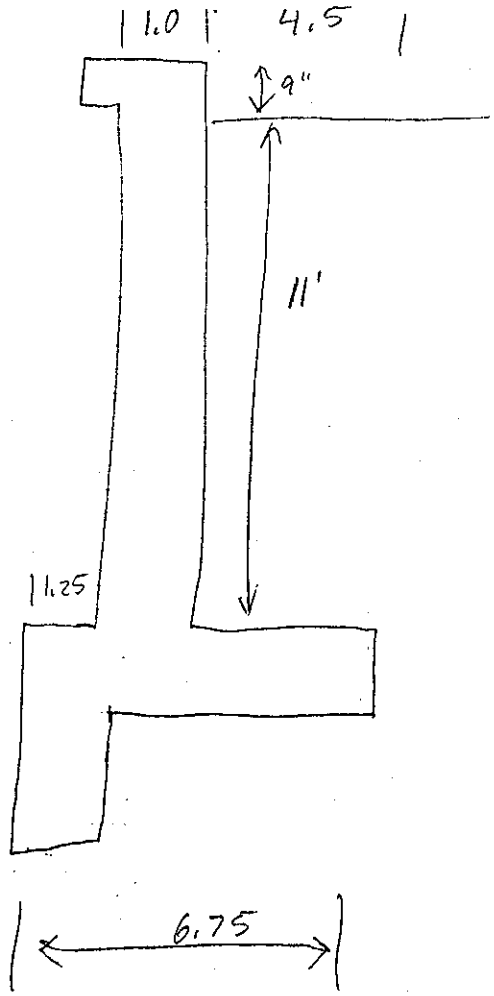
Power Road - Outlet wingwall - South



Wall is Perpendicular to Road & 8' from the Road
No surcharge

$H = 11.0$ ft

$R = \frac{0.03\ (11)^2}{2}$

$= 1.82$

$M_A = 1.82\left(\frac{11}{3}\right)$

$= 6.66$ Kft

Use Moment & Reaction less than Sossaman Road.
Same as Sossaman Road

JOB: Rittenhouse Channel DATE: 5/94 BY: MSP JOB NO.: 94006 SH.: 26

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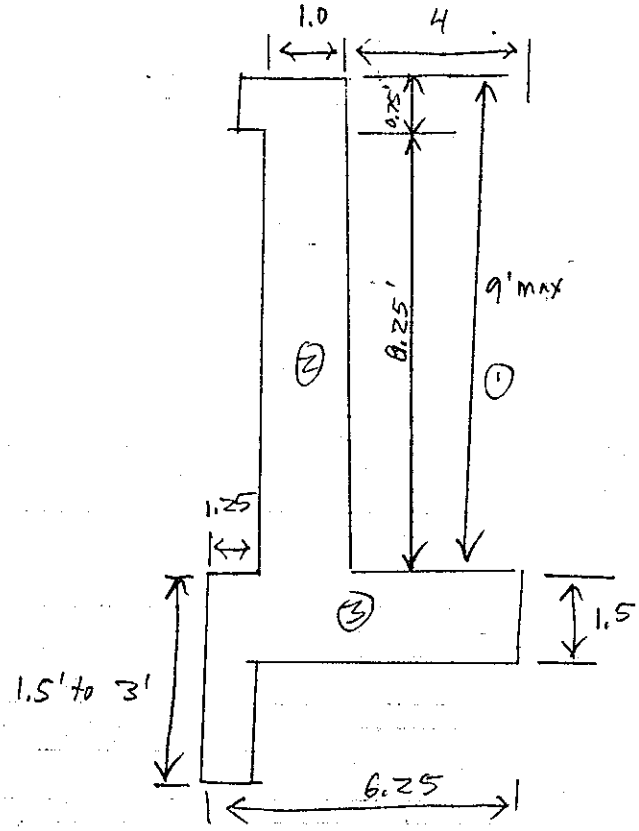
Power Road - Inlet Wing wall Both
Outlet Wing wall North



$H = 9' + 2'$ Surcharge $= 11'$

$R = \frac{0.03(11)^2}{2}$

$= 1.82\ k$

$M = 1.82\ (\frac{11}{3})$

$= 6.66\ kft$

Section	Weight		L	M
1	(4.0)(8.25)(0.11) =	3.63	4.25	15.4
2	(1)(9)(0.15) =	1.35	1.75	2.4
3	(1.5)(6.25)(0.15) =	1.41	3.13	4.4
		6.4		22.2

$F.S. = \frac{22.2\ kft}{6.66} = 3.33 > 1.5$ OK

JOB: Rittenhouse Channel DATE: 5/94 BY: MSP JOB NO.: 94006 SH.: 27

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PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

Check Wall Steel

$M = Rd^2$

$6.66(12) = 1.89\,d^2$

$d = 6.5$

Actual $d = 12 - 2 - \frac{0.75}{2}$

$= 9.63$

$M = A_s f_s jd$

$6.66(12) = A_s(24)(0.9)(9.63)$

$A_s = 0.37\,in^2$

use #5@12" $A_s = 0.31\,in^2$

& #6@12 $A_s = 0.44\,in^2$

0.75 OK

Check Sliding

$F = 1.82\,k$

Passive Pressure $= \frac{1}{2}(0.504)(1.5)$

$= 0.38\,k$

Sliding Friction $= 0.55(6.4\,k)$

$= 3.52\,k$

Total $= 3.52 + 0.38 = 3.90\,k$

$F.S. = \frac{3.90\,k}{1.82} = 2.14 > 1.5$ OK

Check Soil Pressure

$e = \frac{M}{P} = \frac{6.66}{6.4} = 1.04$

$\frac{L}{6} = \frac{6.25}{6} = 1.04$

$q = \frac{2V}{3B(\frac{1}{2}-e)}$

$= \frac{2(6.4)}{3(1)(\frac{6.25}{2} - 1.04)}$

$= 2.05 < 2.5$ OK

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

Toe Reinforcing

$$\text{Slope} = \frac{2.05}{6.25} = 0.33$$

$$M_{Toe} = \frac{2(2.05) - 6.25(0.33)}{2} \left(\frac{4^2}{2}\right)$$

$$= 8.15 \text{ k-ft}$$

$$M = Rd^2$$

$$8.15(12) = 1.89 d^2$$

$$d = 7.19$$

$$\text{Actual } d = 18 - 3'' - \frac{0.75}{2} = 14.63$$

$$M = A_s f_s j d$$

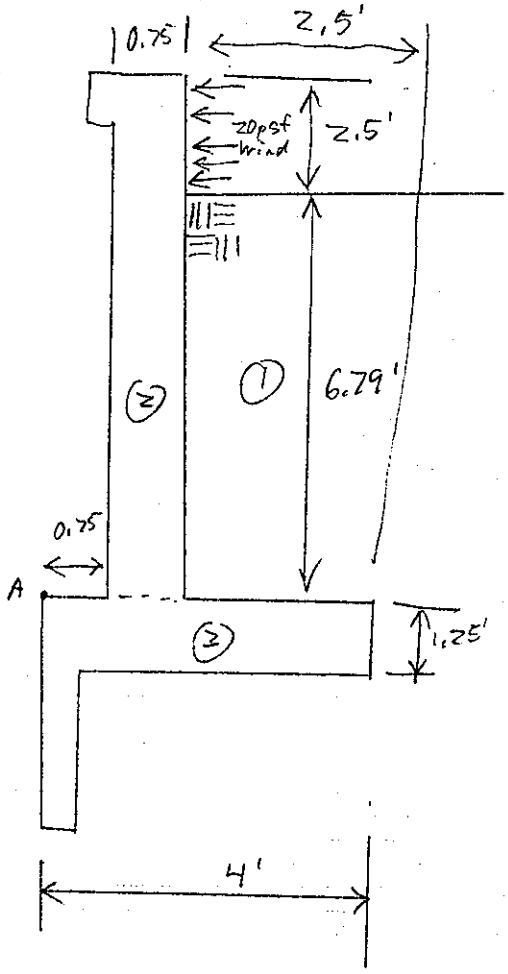
$$8.15(12) = A_s(24)(0.9)(14.63)$$

$$A_s = 0.31$$

use #6@6" $A_s = 0.88$ OK

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

Germann Road



$H = 6.79 + 2'$ surcharge $= 8.79'$

$R = \left[\frac{0.03\ (8.79)^2}{2}\right] + [2.5ft(0.02)]$ wind

$= 1.16K + 0.05 = 1.21\ kft$

$M_A = 1.16\left(\frac{8.79}{3}\right) + 0.05\left(6.79 + \frac{2.5}{2}\right)$

$= 3.4kft + 0.4$

$= 3.8\ kft$

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

Section	Weight		L	M
1	(2.5)(6.29)(0.11)	= 1.9	2.75	5.1
2	(0.75)(9.29)(0.15)	= 1.05	1.13	1.2
3	(1.25)(4)(0.15)	= 0.75	0.375	0.3
		3.7 K		6.6 kft

$$F.S. = \frac{6.6}{3.8} = 1.74 > 1.5 \text{ ok}$$

Check Wall Steel

$$M = Rd^2$$
$$3.8(12) = 1.89d^2$$
$$d = 4.9$$
$$\text{Actual } d = 9'' - 2'' - \frac{0.75}{2}$$
$$= 6.63$$
$$M = A_s f_s j d$$
$$3.8(12) = A_s(24)(0.9)(6.63)$$
$$A_s = 0.32 \text{ in}^2/\text{ft}$$
$$\#5@6'' = 0.62 \text{ in}^2 > A_s \text{ required } \underline{\underline{\text{ok}}}$$

Check Sliding

$$F = 1.21 \text{ K}$$
$$\text{Passive Pressure} = \tfrac{1}{2}(0.504)(1.25)^2$$
$$= 0.39 \text{ k}$$
$$\text{Sliding Friction} = 0.55\ (3.7 \text{ k})$$
$$= 2.04$$
$$\text{Total} = 0.39 + 2.04 = 2.43$$
$$F.S. = \frac{2.43}{1.21} = 2.0 > 1.5 \ \underline{\underline{\text{ok}}}$$

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.

Check Soil Pressure

$$e = \frac{M}{P} = \frac{3.8\,kft}{3.7K} = 1.03\,ft$$

$$\frac{L}{6} = \frac{4}{6} = 0.67\,ft$$

$$q = \frac{2V}{3B\left(\frac{L}{2} - e\right)}$$

$$= \frac{2(3.7)}{3(1)\left(\frac{4}{2} - 1.03\right)}$$

$$= 2.54\,ksf \approx 2.5 \text{ max} \quad \underline{OK}$$

If $\frac{1}{3}$ increase for Wind used then it is clearly adequate

Toe Reinforcing

$$L' = 3\left(\frac{L}{2} - e\right)$$
$$= 3\left(\frac{4}{2} - 1.03\right)$$
$$= 2.91'$$

Slope $\frac{2.54}{2.91} = 0.87$

$$M_{TOE} = \frac{2(2.54) - 2.5(0.87)}{2}\left(\frac{2.5}{2}\right)^2$$

$$= 4.54\,kft$$

$$M = Rd^2$$

$$4.54(12) = 1.89\,d^2$$

$$d = 5.37$$

Actual $d = 15'' - 3'' - \frac{0.75}{2} = 11.63$

$$M = A_s f_s jd$$

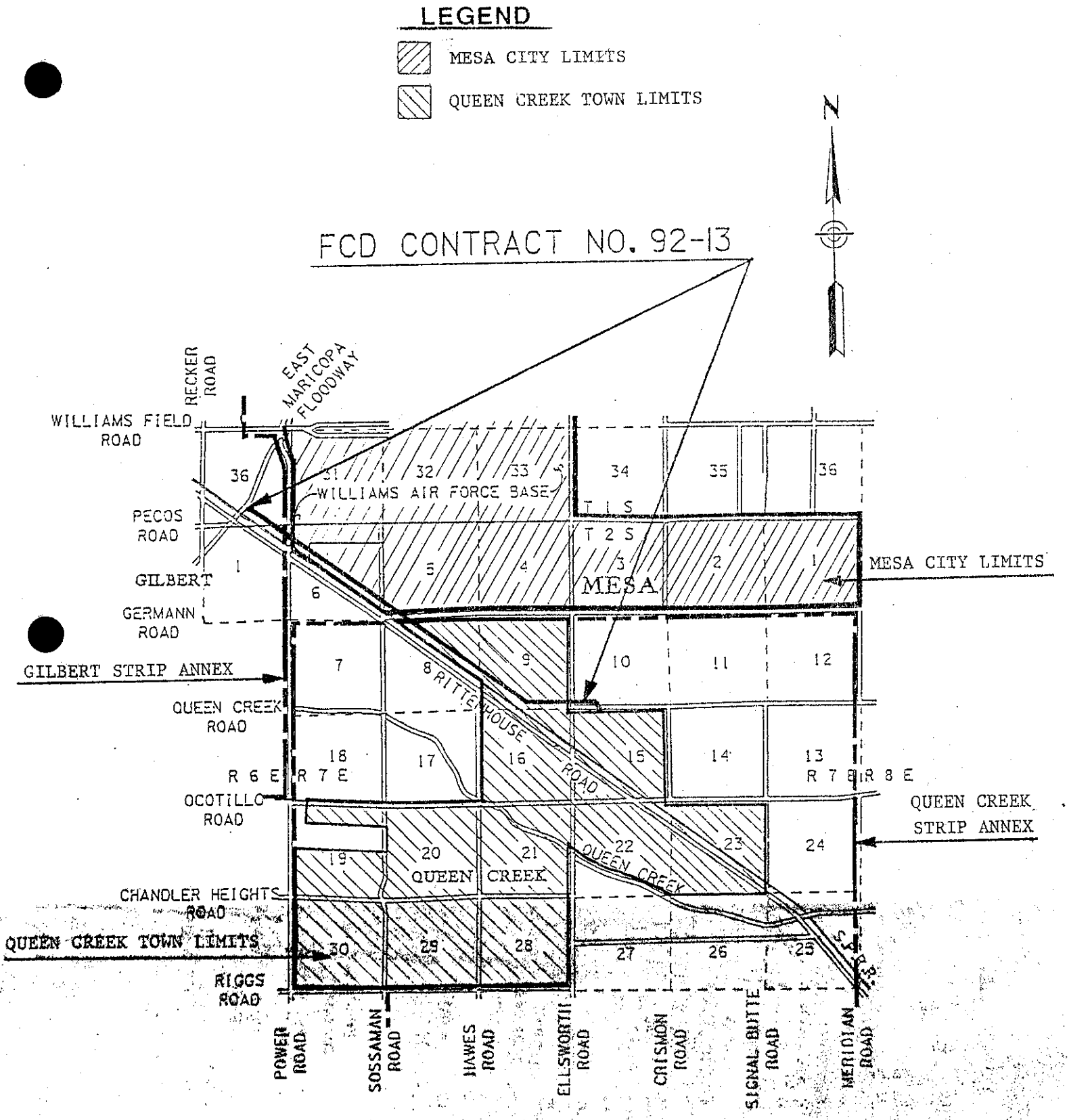
$$(4.54)(12) = A_s\,(24)(0.9)(11.63)$$

$A_s = 0.22\,in^2/ft$ use #6@12 $A_s = 0.44$ OK

JOB: Rittenhouse Channel DATE: 5/94 BY: MSP JOB NO.: 94006 SH.: 32

ALAGIA ENGINEERING GROUP, INC.

PRELIMINARY UNLESS SEALED ON EACH SHEET OR ON COVER PAGE.



VICINITY MAP
NOT TO SCALE

FIGURE NO. 1

II. *Drainage Area and Hydrology*

A. Description of Drainage Area:

The contributing drainage area of Rittenhouse Channel encompasses approximately twenty-three (23) square miles of mostly desert and agricultural land. Small pockets of residential, commercial and industrial development exist in the drainage area but these have little effect on the overall volume of runoff. The drainage area is bordered on the east by the CAP canal, on the north by the GM Proving Grounds and the Williams Air Force Base flood channels, on the south by the Southern Pacific Railroad track embankment and on the west by the EMF. This area slopes towards the west at approximately 0.36 percent and outfalls to the EMF. Existing drainage systems in this area consist of small roadside channels, culverts and storm drains which transport water to the EMF (see Table No. 1). These existing systems do not have capacity for the 100-year runoff and flooding has occurred for storms smaller than the 100-year event.

Table No. 1
Existing Culverts Along Proposed Alignment

Location	Type	Number and Size
Power Road	Concrete Box Culverts	3 - 3' x 10'
Sossaman Road	Corrugated Metal Pipe	36"
Germann Road	Corrugated Metal Pipe	36"
Ellsworth Road at Queen Creek School	Concrete Culvert with Inlets	24"

B. Drainage Area Characteristics and HEC-1 Parameters:

This area had been previously subdivided into subbasin areas in the QCADMS. Field reviews and 200-scale contour maps were used to make minor adjustments in the drainage area boundaries and routing patterns. All of the parameters used in the HEC-1 files for the QCADMS were used for the HEC-1 files for this study. Therefore, lag times and total runoff developed will remain relatively unchanged (see Table 2). The FCD has adopted the use of the 100-year 6-hour storm for design of flood control structures. However, the 100-year, 24-hour storm has been used in this study so that the study will be compatible with the QCADMS. The original analysis of this site did not incorporate detention areas or some of the existing culverts. Existing tailwater ponds were used as detention basins but only one-half of the total capacity of the basins were assumed available for storm runoff retention. A large depressed area at the intersection of Ocotillo Road and the SPRR was also used as a detention basin. Three existing culverts under the SPRR, located east of the Ocotillo Road intersection carry flow south under the SPRR to Queen Creek. The culverts (71"x47" CMPA) have a 60-inch equivalent diameter. An equivalent diameter indicates the size of a circular pipe which will have the same flow characteristics as an arched pipe. The equivalent "circular" diameter of the pipes has been used in the HEC-1 model to determine the capacity of the culverts. In conjunction with the previously mentioned detention area, the three culverts have adequate capacity to pass all 100-year runoff reaching the Ocotillo Road and SPRR intersection to the south.

The first file used 60-inch diameter culverts to determine the effect of the culverts if they were properly maintained (see Appendix B). The second file used 48-inch diameter culverts to approximate the existing capacity of the clogged culverts (see Appendix C). After reviewing the existing field conditions, and meeting with the Town of Queen Creek, SPRR representatives and Maricopa County Department of Transportation representatives, the FCD determined that modeling the culverts as 60-inch diameter, unclogged pipes would provide an accurate model for determining the peak discharges for the channel design.

The final HEC-1 design file (Appendix B) indicates that no runoff will flow from Ocotillo Road and the SPRR to the west. Therefore, since no runoff needs to be carried from Ocotillo Road to Ellsworth Road this portion of the channel design has been eliminated from the report. However, the HEC-1 design file also indicated a large volume of runoff concentrated at the northeast corner of the Queen Creek School site. Table 3 lists the runoff volumes and routes at various points in the drainage basin. Due to the volume of runoff and the concerns of the Town of Queen Creek and the School District, it was determined by the FCD that it would be appropriate to extend the main channel to the Queen Creek School to capture this flow and eliminate historical flooding at the school.

Table 3
Existing Runoff Data

Concentration Point	Q_{100} (cfs)	Discharge Route
Ocotillo Road and SPRR	361	Under SPRR to Queen Creek
Intersection of Signal Butte and Queen Creek Roads	506	NE Corner of Queen Creek School
NE Corner of Queen Creek School	516	West to Germann and Sossaman Roads
Intersection of Germann and Sossaman Roads	813	Existing Power Road Boxes North of SPRR
Power Road at Existing Box Culverts	1,053	East Maricopa Floodway North of SPRR
East Maricopa Floodway North of SPRR	1,047	East Maricopa Floodway

collect the sheet flow and minor concentration point runoff and convey it to the bottom of the main channel in riprap-lined downdrains. Riprap will also be used at the entrance and exit of all box culverts and drop structures. Calculations for the protection at drop structures are included in Appendix B. Similar protection will be used at the outlets of box culverts.

Box culverts were sized by three methods. The first method was the use of inlet control nomographs prepared by the FHWA. The second method was to insert the box culvert sizes from the FHWA charts into the HEC-2 model (see Appendix J). The results of the model indicated that the proposed box culverts will function adequately. At the request of the FCD, the box culverts shown on the plans and used in the HEC-2 model were manually checked for outlet control. Of the four box culvert locations, three will have a drop at the outlet. These three box culvert installations will function under inlet control according to the manual calculations. The fourth box culvert location (Sta. 118+00 +/-) does not have a drop at the outlet and will function under outlet control (see Appendix C for calculation). It is interesting to note that the water surface elevation calculated by manual methods (54.42) is only 0.09' greater than the water surface elevation calculated by the HEC-2 program (54.33). Since the computer model accounts for upstream and downstream effects on the flow, we believe that the HEC-2 evaluation of the box is more reliable. Since most of the culverts will have drop structures at the outlet, the protection provided at the outlets will be the same as that for the drop structures.

Although a sedimentaion analysis was not included in the scope of work, a review of the available data indicates that sedimentation should not be problematic. Table 2 indicates that the overland velocities of the runoff will be approximately 1.0 fps. With a non-erosive velocity of approximately 3.0 fps the sediment transported to the channel at a velocity of 1.0 fps should remain in suspension. During minor storms flow may enter the channel with sediment then infiltrate into the ground before exiting the channel. In this instance, sedimentation will occur. For this reason, the low flow channel was designed at a width that would be easy to maintain.

The side collector channel was sized to approximate the tailwater ditches located in this area. The velocity in the side collector channel must be kept above 1.0 fps to keep sediment in suspension and below 3 fps to prevent erosion. The downdrains for the side collector channel will be located at points where the contributing area will produce approximately 9 cfs of runoff during the 100 year storm. The "County Hydraulics" manual (Item 1 above) states that low flow channel should have capacity for the base flows which are less than the 5-year or 10-year storm. Since most of the frequent discharges to this channel will be tailwater discharges, the low flow channel was sized to carry small volumes of runoff (12 cfs) at a velocity equal to or greater than the natural overland velocity of the runoff (1.0 fps). Calculations for the low flow, the side collector channel, and the 5-year storm flow in the channel are included in Appendix F.

B. <u>Alternate A-1 and Alternate B-1: EMF to Power</u>:

This section will run from the EMF to Power Road and will be centered approximately 175 feet north of the SPRR centerline. The channel will be routed around a gas pumping plant which is near the EMF. Since the access road for the gas facility will be blocked by the proposed channel, access to the facility will have to be by the channel maintenance road. (See sheet 3 of the Construction Plans, Appendix K.) A grouted riprap down drain will be used to prevent erosion at the confluence of the Rittenhouse channel and the EMF.

TABLE 5

HEC-2 CHANNEL DATA

SECNO	Q	VCH	DEPTH	10*KS	CWSEL	BOTTOM WIDTH	SIDE SLOPE Z
1093.000	1047.00	2.75	5.94	5.92	18.71	42	4
1119.000	1047.00	3.10	5.95	8.78	18.73	42	4
1150.000	1047.00	3.10	5.95	5.20	18.75	42	4
1739.000	1047.00	3.10	5.96	5.18	19.06	42	4
1887.000	1047.00	3.09	5.96	5.16	19.13	42	4
2034.000	1047.00	3.09	5.96	5.17	19.21	42	4
2048.000	1047.00	3.10	5.96	8.71	19.22	42	4
2099.000	1047.00	3.34	5.97	9.70	19.25	42	4
2100.000	1047.00	10.71	4.24	154.65	19.52	26	0.26
2120.000	1047.00	3.00	6.08	8.00	21.37	42	4
2121.000	1047.00	3.00	6.08	7.95	21.37	42	4
2346.000	1047.00	2.94	6.16	7.53	21.56	42	4
2493.000	1047.00	2.91	6.21	7.30	21.68	42	4
2640.000	1047.00	2.89	6.23	7.17	21.78	42	4
2848.000	1047.00	2.90	6.28	7.32	21.93	42	4
2899.000	1047.00	3.21	6.27	8.25	21.95	42	4
2900.000	1047.00	10.72	4.57	156.67	22.85	26	0.26
2920.000	1047.00	3.06	6.00	8.42	24.69	42	4
2921.000	1047.00	3.05	6.01	4.98	24.70	42	4
4048.000	1047.00	3.05	6.01	8.39	25.26	42	4
4099.000	1047.00	3.42	6.00	9.92	25.28	42	4
4100.000	1047.00	10.71	4.24	154.65	26.52	26	0.26
4120.000	1047.00	3.00	6.08	8.00	28.37	42	4
4121.000	1047.00	3.00	6.08	4.73	28.37	42	4
4271.000	1047.00	3.01	6.07	4.79	28.44	42	4
4452.000	1047.00	3.90	5.96	1.44	28.43	BOX	0
4564.000	1047.00	5.63	3.58	4.49	31.38	BOX	0
4609.000	1047.00	3.03	6.03	4.90	31.85	42	4
5041.000	804.00	2.71	6.05	4.32	32.09	28	4
5266.000	804.00	2.93	6.03	4.89	32.18	28	4
5998.000	804.00	2.94	6.03	8.31	32.55	28	4
6049.000	804.00	3.39	6.02	10.39	32.57	28	4
6050.000	804.00	10.55	4.05	162.03	33.60	20.5	0.25
6070.000	804.00	3.09	6.14	8.83	35.70	28	4
6071.000	804.00	3.08	6.14	5.21	35.70	28	4
7500.000	804.00	2.87	6.12	7.79	36.40	28	4
7549.000	804.00	3.31	6.12	9.72	36.42	28	4
7550.000	804.00	10.56	4.05	162.28	37.35	20.5	0.25
7570.000	804.00	2.83	6.16	7.53	39.47	28	4
7571.000	804.00	2.82	6.18	4.43	39.49	28	4
8148.000	804.00	2.85	6.15	7.62	39.75	28	4
8199.000	804.00	3.28	6.15	9.52	39.77	28	4
8200.000	804.00	10.56	4.05	162.35	40.67	20.5	0.25
8220.000	804.00	2.83	6.16	7.53	42.79	28	4
8221.000	804.00	2.82	6.17	4.44	42.80	28	4
8248.000	804.00	2.85	6.11	7.72	43.26	28	4

TABLE 5

HEC-2 CHANNEL DATA

SECNO	Q	VCH	DEPTH	10*KS	CWSEL	BOTTOM WIDTH	SIDE SLOPE Z
9299.000	804.00	3.31	6.12	9.73	43.29	28	4
9300.000	804.00	10.64	4.07	166.24	44.24	20.5	0.25
9320.000	804.00	2.79	6.23	7.20	46.41	28	4
9321.000	804.00	2.78	6.23	4.25	46.41	28	4
10448.000	804.00	2.84	6.15	7.58	46.90	28	4
10499.000	804.00	3.28	6.15	9.48	46.92	28	4
10500.000	804.00	10.56	4.05	162.37	47.82	20.5	0.25
10520.000	804.00	2.83	6.16	7.53	49.94	28	4
10521.000	804.00	2.82	6.18	4.43	49.96	28	4
11027.000	804.00	4.18	5.06	2.36	50.09	BOX	0
11185.000	804.00	6.62	4.68	5.49	52.78	BOX	0
11400.000	804.00	3.55	5.35	8.35	53.56	28	4
11600.000	804.00	3.47	5.42	7.87	53.73	28	4
11675.000	804.00	3.08	5.43	1.06	53.80	BOX	0
11819.000	804.00	5.26	5.89	2.79	54.32	BOX	0
11869.000	804.00	2.75	6.28	4.10	54.76	28	4
12037.000	504.00	2.25	6.33	3.04	54.87	19	4
12038.000	504.00	2.25	6.33	5.10	54.87	19	4
12039.000	504.00	2.85	6.31	7.97	54.88	10	4
12090.000	504.00	9.62	3.71	152.39	55.28	10	1.11
12110.000	504.00	2.91	5.45	10.19	57.03	10	4
12111.000	504.00	2.90	5.45	10.09	57.03	10	4
13448.000	504.00	2.56	5.88	7.21	58.13	10	4
13499.000	504.00	3.21	5.87	10.96	58.14	10	4
13500.000	504.00	9.67	3.70	154.69	58.93	10	1.11
13520.000	504.00	2.91	5.45	10.14	60.69	10	4
13521.000	504.00	2.90	5.45	5.98	60.69	10	4
14648.000	504.00	2.83	5.54	9.39	61.35	10	4
14699.000	504.00	3.52	5.55	14.03	61.38	10	4
14700.000	504.00	9.66	3.70	154.30	62.53	10	1.11
14720.000	504.00	2.91	5.45	10.15	64.29	10	4
14721.000	504.00	2.90	5.45	5.98	64.29	10	4
17048.000	504.00	2.67	5.80	7.91	65.61	10	4
17099.000	504.00	3.47	5.60	13.48	65.63	10	4
17100.000	504.00	9.66	3.70	154.41	66.73	10	1.11
17120.000	504.00	2.91	5.45	10.18	68.49	10	4
17121.000	504.00	2.90	5.45	6.00	68.49	10	4
17698.000	504.00	2.86	5.51	9.66	68.84	10	4
17749.000	504.00	3.55	5.53	14.37	68.86	10	4
17750.000	504.00	9.66	3.70	154.28	70.06	10	1.11
17770.000	504.00	2.91	5.45	10.15	71.82	10	4
17771.000	504.00	2.90	5.45	5.98	71.82	10	4
18948.000	504.00	2.82	5.55	9.32	72.51	10	4
18999.000	504.00	3.51	5.56	13.93	72.54	10	4
19000.000	504.00	9.66	3.70	154.32	73.68	10	1.11

TABLE 5

HEC-2 CHANNEL DATA

SECNO	Q	VCH	DEPTH	10*KS	CWSEL	BOTTOM WIDTH	SIDE SLOPE Z
19020.000	504.00	2.91	5.45	10.14	75.44	10	4
19021.000	504.00	2.90	5.45	5.98	75.44	10	4
19948.000	504.00	2.83	5.54	9.42	75.99	10	4
19999.000	504.00	3.53	5.53	14.18	76.01	10	4
20000.000	504.00	9.66	3.70	154.28	77.18	10	1.11
20020.000	504.00	2.91	5.45	10.15	78.94	10	4
20021.000	504.00	2.90	5.45	5.98	78.94	10	4
21048.000	504.00	2.82	5.55	9.37	79.55	10	4
21099.000	504.00	3.53	5.54	14.11	79.57	10	4
21100.000	504.00	9.82	3.76	157.19	80.79	10	0.97
21120.000	504.00	2.79	5.59	9.10	82.63	10	4
21121.000	504.00	2.78	5.59	5.36	82.63	10	4
22048.000	504.00	2.98	5.37	10.83	82.88	10	4
22099.000	504.00	3.70	5.38	15.99	82.91	10	4
22100.000	504.00	9.67	3.70	154.71	84.23	10	1.11
22120.000	504.00	2.91	5.45	10.14	85.99	10	4
22121.000	504.00	2.90	5.46	5.98	86.00	10	4
23048.000	504.00	2.84	5.53	9.49	86.54	10	4
23099.000	504.00	3.53	5.53	14.16	86.56	10	4
23100.000	504.00	9.66	3.70	154.28	87.73	10	1.11
23120.000	504.00	2.91	5.45	10.15	89.49	10	4
23121.000	504.00	2.90	5.45	5.98	89.49	10	4
23506.000	504.00	2.89	5.48	5.91	89.73	10	4
23556.000	504.00	3.62	5.43	1.79	89.70	BOX	0
23686.000	504.00	6.28	4.45	6.00	91.72	BOX	0
23720.000	504.00	3.53	4.85	10.15	92.20	10	4
24200.000	504.00	3.25	5.10	8.13	92.67	10	4
24650.000	504.00	3.12	5.22	7.32	93.03	10	4
25147.000	504.00	2.97	5.38	6.41	93.39	10	4
25148.000	504.00	3.02	5.33	11.23	93.39	10	4
25199.000	504.00	3.77	5.32	16.91	93.40	10	4
25200.000	504.00	9.97	3.83	159.93	94.91	10	0.83
25220.000	504.00	2.93	5.43	10.36	96.52	10	4
25221.000	504.00	2.92	5.43	6.12	96.52	10	4
25650.000	504.00	2.89	5.47	5.94	96.78	10	4
25700.000	504.00	3.85	5.41	2.01	96.74	BOX	0
26003.000	504.00	6.20	4.51	5.78	99.78	BOX	0
26103.000	504.00	3.35	5.01	14.84	100.33	10	4
26203.000	504.00	6.42	1.34	168.86	101.34	01	4

VI. Construction Considerations and Cost Estimates

A. Constructibility:

The construction of Alternate A, Alternate B or Alternate C will not involve any difficult construction methods. While a majority of the work will involve excavating, hauling, and grading, there will be other trades involved. Construction of the box culverts at Power, Sossaman, Germann, Ellsworth and Queen Creek Roads can be accomplished using a paved traffic detour. This will allow the contractor full access to the work area and reduce construction time and inconvenience to the public. Drop structures which may be required should be located early in the construction period and be built before the channel excavation is completed to reduce the possibility of damage from runoff.

B. Maintenance:

Maintenance of this channel will mainly involve weed control. Although the Mannings "n" value for this channel assumed some vegetation, a periodic mowing schedule should be developed to prevent trees or large amounts of brush from developing. Removal of sediment will be required after heavy storms until the drainage area has lost its predominantly agricultural characteristic. Although the inlets and outlets to the box culverts will be protected from erosion, a yearly inspection should be made to confirm that the systems are functioning, as required.

C. Cost Estimates:

Unit prices used for the cost estimates were obtained from Means, ADOT and previous construction projects designed by Gannett Fleming. When cost data was not available, engineering judgement was used. Unit prices for 15 items were previously submitted to FCD for review and requested changes have been incorporated into the estimates. Maintenance costs have been calculated based on the present value for 20 years of maintenance at an interest rate of 3.5%. The unit price for maintenance was corrected based on formulas and interest tables in the "Civil Engineering Reference Manual", by Michael R. Lindeburg, P.E. Table 2 lists the project cost for each alternate section and a total for each channel alternate. The cost estimates corresponding to the various alternates follow.

TABLE 6

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

COST ESTIMATE SUMMARY
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ALTERNATE A-1	$980,238.61	ALTERNATE B-1	$1,015,798.61	ALTERNATE C-1	$948,629.32	ALTERNATE C-1	$948,629.32
ALTERNATE A-2	$1,485,502.77	ALTERNATE B-2	$1,324,691.16	* ALTERNATE C-2	$1,496,888.22	* ALTERNATE C-2	$1,496,888.22
ALTERNATE A-3	$555,907.80	ALTERNATE B-3	$512,638.05				
ALTERNATE A-4	$1,522,019.98	ALTERNATE B-4	$1,708,444.98	** ALTERNATE C-3A	$2,570,651.17	** ALTERNATE C-3B	$2,453,443.09
ALTERNATE A-5	$1,162,258.89	ALTERNATE B-5	$1,279,046.39				
TOTAL	$5,705,928.05	TOTAL	$5,840,619.19	TOTAL	$5,016,168.71	TOTAL	$4,898,960.63

* - ALTERNATE C-2 INCLUDES THE ENTIRE CHANNEL LENGTH OF ALTERNATES A-2 & A-3 OR B-2 & B-3.

** - ALTERNATE C-3 INCLUDES THE ENTIRE CHANNEL LENGTH OF ALTERNATES A-4 & A-5 OR B-4 & B-5.

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-1
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	12	1000.00	$12,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	42200	4.00	$168,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	270	30.00	$8,100.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2300	30.00	$69,000.00
310-1	4" ABC MAINTENANCE ROAD	CY	500	18.00	$9,000.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	13826	20.00	$276,520.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	225	8.00	$1,800.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	450	12.00	$5,400.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	2	800.00	$1,600.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	270	165.00	$44,550.00
505-2	REBAR (FOR BOX CUVERTS)	LB	39500	0.35	$13,825.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	32	165.00	$5,280.00
505-4	REBAR (FOR MISC. ITEMS)	LB	2620	0.35	$917.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	12	10000.00	$120,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	3330	14.2339	$47,398.89

SUBTOTAL	$784,190.89
CONTINGENCIES (25%)	$196,047.72
TOTAL	$980,238.61

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-2
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	21.5	1000.00	$21,500.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	88200	4.00	$352,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	340	30.00	$10,200.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	550	30.00	$16,500.00
310-1	4" ABC MAINTENANCE ROAD	CY	1020	18.00	$18,360.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	22827	20.00	$456,540.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	0	8.00	$0.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	0	12.00	$0.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	0	800.00	$0.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	0	165.00	$0.00
505-2	REBAR (FOR BOX CUVERTS)	LB	0	0.35	$0.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	0	165.00	$0.00
505-4	REBAR (FOR MISC. ITEMS)	LB	0	0.35	$0.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	21.5	10000.00	$215,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6850	14.2339	$97,502.22

SUBTOTAL	$1,188,402.22
CONTINGENCIES (25%)	$297,100.55
TOTAL	$1,485,502.77

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-3
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	1	1000.00	$1,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	18000	4.00	$72,000.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	60	30.00	$1,800.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	520	30.00	$15,600.00
310-1	4" ABC MAINTENANCE ROAD	CY	0	18.00	$0.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	1322	20.00	$26,440.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	235	8.00	$1,880.00
415-1	GUARD RAIL	LF	450	15.00	$6,750.00
420-1	CHAIN LINK FENCE (6')	LF	1300	12.00	$15,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	3	800.00	$2,400.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	1210	165.00	$199,650.00
505-2	REBAR (FOR BOX CUVERTS)	LB	197000	0.35	$68,950.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	40	165.00	$6,600.00
505-4	REBAR (FOR MISC. ITEMS)	LB	3080	0.35	$1,078.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	450	20.00	$9,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	1	10000.00	$10,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	420	14.2339	$5,978.24

SUBTOTAL	$444,726.24
CONTINGENCIES (25%)	$111,181.56
TOTAL	$555,907.80

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-4
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	21	1000.00	$21,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	99800	4.00	$399,200.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	430	30.00	$12,900.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	525	30.00	$15,750.00
310-1	4" ABC MAINTENANCE ROAD	CY	1305	18.00	$23,490.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	19208	20.00	$384,160.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	0	8.00	$0.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	0	12.00	$0.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	0	800.00	$0.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	0	165.00	$0.00
505-2	REBAR (FOR BOX CUVERTS)	LB	0	0.35	$0.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	0	165.00	$0.00
505-4	REBAR (FOR MISC. ITEMS)	LB	0	0.35	$0.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	1300	20.00	$26,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	21	10000.00	$210,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	8790	14.2339	$125,115.98

SUBTOTAL	$1,217,615.98
CONTINGENCIES (25%)	$304,404.00
TOTAL	$1,522,019.98

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE A-5
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	13.5	1000.00	$13,500.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	71200	4.00	$284,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	425	30.00	$12,750.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	1500	30.00	$45,000.00
310-1	4" ABC MAINTENANCE ROAD	CY	160	18.00	$2,880.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	12839	20.00	$256,780.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	600	8.00	$4,800.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	600	12.00	$7,200.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	3	800.00	$2,400.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	260	165.00	$42,900.00
505-2	REBAR (FOR BOX CUVERTS)	LB	41500	0.35	$14,525.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	11	165.00	$1,815.00
505-4	REBAR (FOR MISC. ITEMS)	LB	900	0.35	$315.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	750	20.00	$15,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	120	30.00	$3,600.00
	PURCHASE ROW	Ac	13.5	10000.00	$135,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6080	14.2339	$86,542.11

SUBTOTAL	$929,807.11
CONTINGENCIES (25%)	$232,451.78
TOTAL	$1,162,258.89

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-1
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	9	1000.00	$9,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	54200	4.00	$216,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	310	30.00	$9,300.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2561	30.00	$76,830.00
310-1	4" ABC MAINTENANCE ROAD	CY	500	18.00	$9,000.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	8749	20.00	$174,980.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	325	8.00	$2,600.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	450	12.00	$5,400.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	2	800.00	$1,600.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	765	165.00	$126,225.00
505-2	REBAR (FOR BOX CUVERTS)	LB	109000	0.35	$38,150.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	28	165.00	$4,620.00
505-4	REBAR (FOR MISC. ITEMS)	LB	2100	0.35	$735.00
505-5	REPLACE IRRIGATION DITCHES	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	9	10000.00	$90,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	3330	14.2339	$47,398.89

SUBTOTAL	$812,638.89
CONTINGENCIES (25%)	$203,159.72
TOTAL	$1,015,798.61

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-2
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	16	1000.00	$16,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	104700	4.00	$418,800.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	600	30.00	$18,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2401	30.00	$72,030.00
310-1	4" ABC MAINTENANCE ROAD	CY	940	18.00	$16,920.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	13388	20.00	$267,760.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	0	8.00	$0.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	0	12.00	$0.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	0	800.00	$0.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	0	165.00	$0.00
505-2	REBAR (FOR BOX CUVERTS)	LB	0	0.35	$0.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	0	165.00	$0.00
505-4	REBAR (FOR MISC. ITEMS)	LB	0	0.35	$0.00
505-5	REPLACE IRRIGATION DITCHES	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	16	10000.00	$160,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6340	14.2339	$90,242.93

SUBTOTAL	$1,059,752.93
CONTINGENCIES (25%)	$264,938.23
TOTAL	$1,324,691.16

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-3
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	2	1000.00	$2,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	22000	4.00	$88,000.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	60	30.00	$1,800.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	520	30.00	$15,600.00
310-1	4" ABC MAINTENANCE ROAD	CY	115	18.00	$2,070.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	2446	20.00	$48,920.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	205	8.00	$1,640.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	800	12.00	$9,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	4	800.00	$3,200.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	810	165.00	$133,650.00
505-2	REBAR (FOR BOX CUVERTS)	LB	131000	0.35	$45,850.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	40	165.00	$6,600.00
505-4	REBAR (FOR MISC. ITEMS)	LB	3080	0.35	$1,078.00
505-5	REPLACE IRRIGATION DITCHES	LF	950	20.00	$19,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	2	10000.00	$20,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	780	14.2339	$11,102.44

SUBTOTAL	$410,110.44
CONTINGENCIES (25%)	$102,527.61
TOTAL	$512,638.05

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-4
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	19.5	1000.00	$19,500.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	135800	4.00	$543,200.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	660	30.00	$19,800.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2750	30.00	$82,500.00
310-1	4" ABC MAINTENANCE ROAD	CY	1310	18.00	$23,580.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	16603	20.00	$332,060.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	0	8.00	$0.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	0	12.00	$0.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	0	800.00	$0.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	0	165.00	$0.00
505-2	REBAR (FOR BOX CUVERTS)	LB	0	0.35	$0.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	0	165.00	$0.00
505-4	REBAR (FOR MISC. ITEMS)	LB	0	0.35	$0.00
505-5	REPLACE IRRIGATION DITCHES	LF	1300	20.00	$26,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	19.5	10000.00	$195,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	8790	14.2339	$125,115.98

SUBTOTAL	$1,366,755.98
CONTINGENCIES (25%)	$341,689.00
TOTAL	$1,708,444.98

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE B-5
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	13.1	1000.00	$13,100.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	92800	4.00	$371,200.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	660	30.00	$19,800.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	3060	30.00	$91,800.00
310-1	4" ABC MAINTENANCE ROAD	CY	0	18.00	$0.00
312-1	SOIL CEMENT LINING (1.0 ')	CY	11038	20.00	$220,760.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	160	8.00	$1,280.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	600	12.00	$7,200.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	3	800.00	$2,400.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	260	165.00	$42,900.00
505-2	REBAR (FOR BOX CUVERTS)	LB	41500	0.35	$14,525.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	11	165.00	$1,815.00
505-4	REBAR (FOR MISC. ITEMS)	LB	900	0.35	$315.00
505-5	REPLACE IRRIGATION DITCHES	LF	750	20.00	$15,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	120	30.00	$3,600.00
	PURCHASE ROW	Ac	13.1	10000.00	$131,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6080	14.2339	$86,542.11

SUBTOTAL	$1,023,237.11
CONTINGENCIES (25%)	$255,809.28
TOTAL	$1,279,046.39

FILE = ALTBCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE C-1
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	10	1000.00	$10,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	95100	4.00	$380,400.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	900	30.00	$27,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	2738	30.00	$82,140.00
310-1	4" ABC MAINTENANCE ROAD	CY	1534	18.00	$27,612.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	325	8.00	$2,600.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	450	12.00	$5,400.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	2	800.00	$1,600.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	207	165.00	$34,155.00
505-2	REBAR (FOR BOX CUVERTS)	LB	32080	0.35	$11,228.00
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	92	165.00	$15,180.00
505-4	REBAR (FOR MISC. ITEMS)	LB	7090	0.35	$2,481.50
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	0	20.00	$0.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	11	10000.00	$110,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	3450	14.2339	$49,106.96

SUBTOTAL	$758,903.46
CONTINGENCIES (25%)	$189,725.86
TOTAL	$948,629.32

FILE = ALTACOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE C-2
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	17	1000.00	$17,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	136000	4.00	$544,000.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	1800	30.00	$54,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	3453	30.00	$103,590.00
310-1	4" ABC MAINTENANCE ROAD	CY	2878	18.00	$51,804.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	203	8.00	$1,624.00
415-1	GUARD RAIL	LF	450	15.00	$6,750.00
420-1	CHAIN LINK FENCE (6')	LF	1300	12.00	$15,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	3	800.00	$2,400.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	383	165.00	$63,195.00
505-2	REBAR (FOR BOX CUVERTS)	LB	75570	0.35	$26,449.50
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	102	165.00	$16,830.00
505-4	REBAR (FOR MISC. ITEMS)	LB	8664	0.35	$3,032.40
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	450	20.00	$9,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	0	30.00	$0.00
	PURCHASE ROW	Ac	19	10000.00	$190,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	6480	14.2339	$92,235.67

SUBTOTAL	$1,197,510.57
CONTINGENCIES (25%)	$299,377.64
TOTAL	$1,496,888.22

FILE = ALTCCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE C-3A
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	35	1000.00	$35,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	232534	4.00	$930,136.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	2700	30.00	$81,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	6207	30.00	$186,210.00
310-1	4" ABC MAINTENANCE ROAD	CY	6610	18.00	$118,980.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	160	8.00	$1,280.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	800	12.00	$9,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	4	800.00	$3,200.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	156	165.00	$25,740.00
505-2	REBAR (FOR BOX CUVERTS)	LB	25210	0.35	$8,823.50
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	183	165.00	$30,195.00
505-4	REBAR (FOR MISC. ITEMS)	LB	14160	0.35	$4,956.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	1300	20.00	$26,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	120	30.00	$3,600.00
	PURCHASE ROW	Ac	38	10000.00	$380,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	14880	14.2339	$211,800.43

SUBTOTAL	$2,056,520.93
CONTINGENCIES (25%)	$514,130.23
TOTAL	$2,570,651.17

FILE = ALTCCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

AUGUST 30, 1993

ALTERNATE C-3B
RITTENHOUSE ROAD CHANNEL
DESIGN STUDY
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
201-1	CLEARING AND GRUBBING (FOR ESTIMATES ONLY, NOT A BID ITEM)	AC	31	1000.00	$31,000.00
215-1	EXCAVATION (INCLUDING HAUL FOR DISPOSAL)	CY	216398	4.00	$865,592.00
220-1	GROUTED RIPRAP DOWN DRAINS	SY	2700	30.00	$81,000.00
220-2	GROUTED RIPRAP (DROP STRUCTURES OR BANK PROTECTION)	SY	6207	30.00	$186,210.00
310-1	4" ABC MAINTENANCE ROAD	CY	5991	18.00	$107,838.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	320	8.00	$2,560.00
415-1	GUARD RAIL	LF	0	15.00	$0.00
420-1	CHAIN LINK FENCE (6')	LF	800	12.00	$9,600.00
420-2	CHAIN LINK FENCE GATES (UP TO 18')	EA	4	800.00	$3,200.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	312	165.00	$51,480.00
505-2	REBAR (FOR BOX CUVERTS)	LB	50430	0.35	$17,650.50
505-3	STRUCTURAL CONCRETE (FOR MISC. ITEMS)	CY	183	165.00	$30,195.00
505-4	REBAR (FOR MISC. ITEMS)	LB	14160	0.35	$4,956.00
505-5	REPLACE IRRIGATION DITCHES (CONCRETE)	LF	1300	20.00	$26,000.00
610-1	WATERLINE RELOCATION (8" PVC)	LF	120	30.00	$3,600.00
	PURCHASE ROW	Ac	35	10000.00	$350,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	13480	14.2339	$191,872.97

SUBTOTAL	$1,962,754.47
CONTINGENCIES (25%)	$490,688.62
TOTAL	$2,453,443.09

FILE = ALTCCOST

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

MARCH 16,1994

BKH

90%

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24407
JAMES L.
KARY
Date Signed 3/17/94
ARIZONA, U.S.A.

90% ENGINEERS ESTIMATE
RITTENHOUSE ROAD CHANNEL
Sta 6+75.00 to Sta 232+81.81
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
215-1	EARTHWORK FOR OPEN CHANNELS (INCLUDING HAUL FOR DISPOSAL)	CY	403,786	4.00	$1,615,144.00
220-1	GROUTED RIP RAP (FOR DOWNDRAINS)	SY	2,784	30.00	$83,520.00
220-2	GROUTED RIPRAP (DROP STRCTURES OR CHANNEL PROTECTION)	SY	16,537	30.00	$496,110.00
310-1	4" ABC MAINTENANCE ROAD	CY	3,224	18.00	$58,032.00
336-1	PAVEMENT (2"AC/4"ABC)	SY	230	8.00	$1,840.00
415-1	GUARD RAIL	LF	526.4	15.00	$7,896.00
420-1	CHAIN LINK FENCE (6')	LF	610	12.00	$7,320.00
420-2	12' CHAIN LINK FENCE GATES (2 - 6' GATES)	EA	7	800.00	$5,600.00
421-1	4 STRAND BARBLESS WIRE FENCE	LF	27,070	3.00	$81,210.00
505-1	STRUCTURAL CONCRETE (FOR BOX CULVERTS)	CY	989	175.00	$173,075.00
505-2	REBAR (FOR BOX CUVERTS)	LB	139,631	0.40	$55,852.40
505-3	STRUCTURAL CONCRETE (FOR DROP STRUCTURES)	CY	694.2	175.00	$121,485.00
505-4	REBAR (FOR DROP STRUCTURES)	LB	42,770	0.40	$17,108.00
505-5	CATCH BASIN, MAG STD. DET. 535, TYPE F (INCLUDING FRAME & GRATE)	EA	1	1000.00	$1,000.00
505-6	REPLACE IRRIGATION DITCHES (CONCRETE)(MAY BE COMPLETED BY OTHERS)	LF	1,905	20.00	$38,100.00

FILE = RIT90EST.WK1

GANNETT FLEMING
3001 E. CAMELBACK ROAD
SUITE 130
PHOENIX, AZ. 85016-4498

MARCH 16,1994

Registered Professional Engineer (Civil)
CERTIFICATE NO. 24407
JAMES L. KARY
Date Signed 3/17/94
ARIZONA, U.S.A.

90% ENGINEERS ESTIMATE
RITTENHOUSE ROAD CHANNEL
Sta 6+75.00 to Sta 232+81.81
FCDMC CONTRACT NO. 92-13

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
610-1	WATERLINE RELOCATION (8" PVC)	LF	52	30.00	$1,560.00
618-1	12" RGRCP IRRIGATION LINE	LF	? 0	0.00	$0.00
618-2	24" RGRCP IRRIGATION LINE	LF	? 0	0	$0.00
618-3	24" CMP	LF	499	25.00	$12,475.00

SUBTOTAL	$2,777,327.40
CONTINGENCIES (10%)	$277,732.74
CONSTRUCTION TOTAL	$3,055,060.14

ADDITIONAL CHANNEL COSTS

	PURCHASE ROW	Ac	59	10000.00	$590,000.00
	MAINTENANCE (PRESENT VALUE FOR 20 YEARS OF MAINTENANCE)	LF	22,607	14.2339	$321,785.78

GRAND TOTAL	$3,966,845.92

NOTE – THIS ESTIMATE DOES NOT INCLUDE THE AREA EAST OF ELLSWORTH RD.

FILE = RIT90EST

100 %

Hydraulic Calculations: Revisions to Final Conceptual Design Report For Rittenhouse Road Channel From Signal Butte Road to the East Maricopa Floodway

FCDMC Contract No. 92-13

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24407
JAMES L.
KARY
Date Signed 3/17/94
ARIZONA, U.S.A.

Prepared and Submitted By:

Gannett Fleming, Inc.
3001 East Camelback Road, Suite 130
Phoenix, Az 85016-4498

GF Job No. 28835
March 1994

Two categories of revisions have been made to the Final Conceptual Design Report at the 90% plan submittal stage: (1) those requested by the Flood Control District (FCD) and (2) those intended to improve the constructability and operation of the channel. The revisions are as listed and described below.

Stationing

The stationing was revised so that Sta. 10+00 Construction Centerline would be opposite of Sta. 10+00 Project Control Line. Therefore the stations used for the section numbers in the HEC-2 file have been revised.

Intersection of the Rittenhouse Channel and the East Maricopa Floodway

A drop structure has been added at Sta. 8+00 to reduce the energy of the Rittenhouse Channel flows and to increase the available flow area. This will develop a slower velocity in the Rittenhouse Channel as it enters the East Maricopa Floodway and therefore reduce turbulence in the area.

Drop Structures

Each of the drop structures was reviewed for location and hydraulic design. The drop structures were revised as necessary to maintain a steady velocity that was at or below 3.0 fps in unlined portions of the channel. The drop structures were also revised to have a basin depression that encompassed the entire channel bottom and was at the same grade as the low flow channel. An access road was added at the downstream side of each drop structure sill wall.

Box Culverts

The box culverts were revised to have a common rise and flowline elevation as requested. The low flow channel expands to enter all boxes at the inlet then transitions to its normal width after exiting the boxes. The box size was verified by checking the inlet and outlet capacity of the boxes (calculations attached). The boxes were also analyzed using the HEC-2 program. Because of the configuration of existing and proposed boxes at Power Road this area was analyzed using the Normal Bridge Method of HEC-2.

Box Culvert Inlets & Outlets

Every box culvert inlet and outlet wing wall and riprap configuration was revised. After reviewing the 30% designs with KPFF Alagia (Structural Subconsultant) it was determined that revisions could be incorporated into the design that would improve constructability and channel hydraulics. Each

inlet was designed to provide smooth transition of the low flow channel and the main channel into the box culverts. Outlets were designed to control the flows, prevent erosion and transition quickly to the normal channel sections.

A revised HEC-2 output file and manual box culvert calculations are attached to this report.

Gannett Fleming
ENGINEERS AND PLANNERS

SUBJECT FCD - Rittenhouse Channel
Resize Boxes
BY JLK DATE 1-18/94 CHKD. BY [illegible] DATE 3/94

SHEET NO. 1 OF 6
JOB NO. 28835

Power Road

Design Q_{100} = 1047 cfs
(3-10'x4' CBC's) Existing Capacity (3/4 Full) = 390 cfs

Required Additional Capacity = 657 cfs

Required Span (6' Rise) = $\frac{657 \text{ cfs}}{37 \text{ cfs/ft.}}$ = 17.76 ft.

∴ Span will be 18' either Double 9'x6' or Triple 6'x6'

Q = 18' x 37 cfs/ft = 666 cfs

Total Q = (Existing Capacity) + (New Capacity)

= 390 cfs + 666 cfs = 1056 cfs ≥ 1047 cfs ∴ OK

Sossaman Road
Germann Road

Design Q_{100} = 804 cfs

Required Span (6' Rise) = $\frac{804 \text{ cfs}}{37 \text{ cfs}}$ = 21.73 ft.

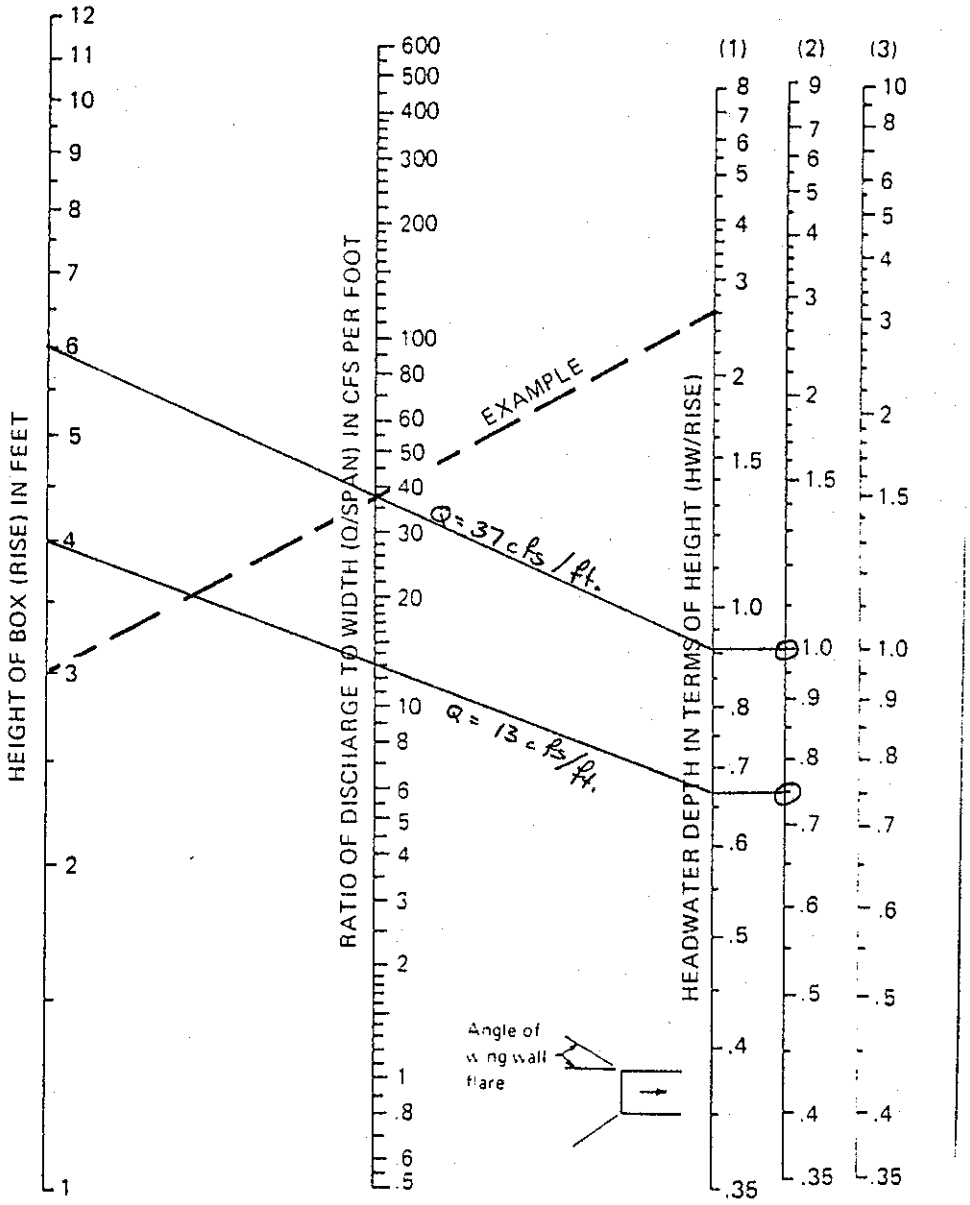
∴ Span will be 22 feet with 2 - 11'x6'
or 24 feet with 3 - 8'x6'

Total Q = 22' x 37 cfs = 814 cfs ≥ 804 cfs ∴ OK
or
Total Q = 24' x 37 cfs = 888 cfs ≥ 804 cfs ∴ OK.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24407
JAMES L.
KARY
Date Signed 3/17/94
ARIZONA, U.S.A.

FIGURE 37

HEADWATER DEPTH FOR CONCRETE BOX CULVERTS WITH INLET CONTROL



EXAMPLE

6' x 3' Box Q = 225 cfs
Q/Span = 37.5 cfs/ft

Inlet	HW/Rise	HW ft
(1)	2.6	7.8

HW/Rise SCALE	WING WALL FLARE
(1)	30° to 75°
(2)	90° and 15°
(3)	0° (extensions of sides)

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through rise and Q scales, or reverse as illustrated.

BUREAU OF PUBLIC ROADS - JAN 1963

Figure 4.42
Culvert Design Form

Project: Rittenhouse Channel

Station: 41+50 +/-

Sheet _____ of _____

CULVERT DESIGN FORM
Designer/Date: JLK / 1-19-94
Reviewer/Date: [illegible] / 3/94

Hydrological Data

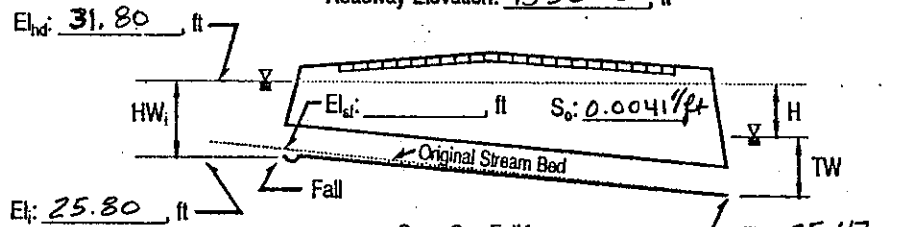
See Add'l shts

- ☐ Method: HEC-1
- ☐ Drainage Area: _____ ☐ Stream Slope: _____
- ☐ Channel Shape: Trapazoidal
- ☐ Routing: HEC-2 ☐ Other: _____

Design Flows/Tailwater

R.I., years	Flow, cfs	TW, ft
100	222	3.60 *
100	333	3.60 *

Roadway Elevation: 1335.00, ft



$S = S_o - Fall/L_a$
$S = 0.0041$ ft/ft
$L_a = 80$ ft

Culvert Description: Material - Shape - Size - Entrance	Total Flow Q, cfs	Flow Per Barrel Q/N (1)	Headwater Calculations: Inlet Control HWi/D (2)	HWi	Fall (3)	ELhi (4)	Outlet Control TW* (5)	dc	(dc+D)/2	ho (6)	ke	H (7)	ELho (8)	Control Headwater Elevation	Outlet Velocity	Comments
Box Culvert 6'x6'		222	1.0	6.0	6.0	31.80	3.6	3.5	4.75	4.75	0.5	1.00	31.22	31.80	6.17	Inlet Control
Box Culvert 9'x6'		333	1.0	6.0	6.0	31.80	3.6	3.5	4.75	4.75	0.5	0.98	31.20	31.80	6.17	Inlet Control

Technical Footnotes:

(1) Use Q/NB for box culverts.
(2) HW_i/D = HW/D or HW_f/D from design charts
(3) FALL = $HW_i - (El_{hd} - El_{sf})$; Fall is zero for culverts on grade.
(4) $El_{hi} = HW_i + El_i$ (invert of inlet control section)
(5) TW based on downstream control or flow depth in channel.
(6) h_o = TW or $(d_c + D)/2$ (whichever is greater).
(7) $H = \left[1 + k_e + (29n^2L)/R^{1.33}\right] V^2/2g$
(8) $El_{ho} = El_o + H + h_o$

L = 80 ft.

Subscript Definitions:

a. approximate
f. culvert fact
hd. Design Headwater
hi. Headwater in inlet control
ho. Headwater in outlet control
i. Inlet control section
o. Outlet
sf. Streambed at culvert face
TW. Tailwater

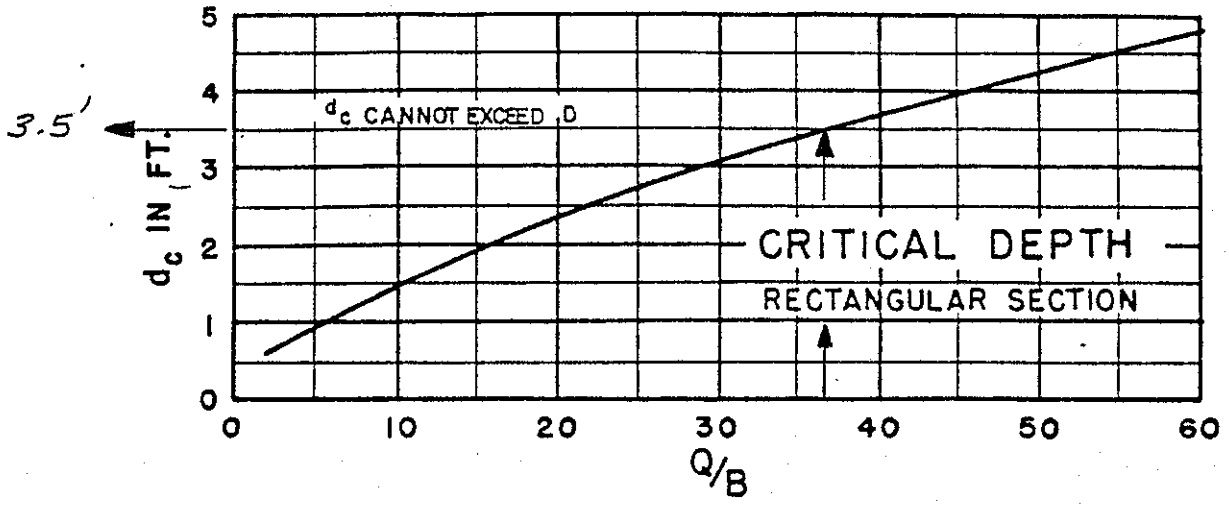
Comments / Discussion:

*Tailwater depth is low due to drop at outlet.

Culvert Barrel Selected:

Size: 6'x6' or 9'x6
Shape: Box
Material: Concrete n: 0.012
Entrance: Beveled

3/6



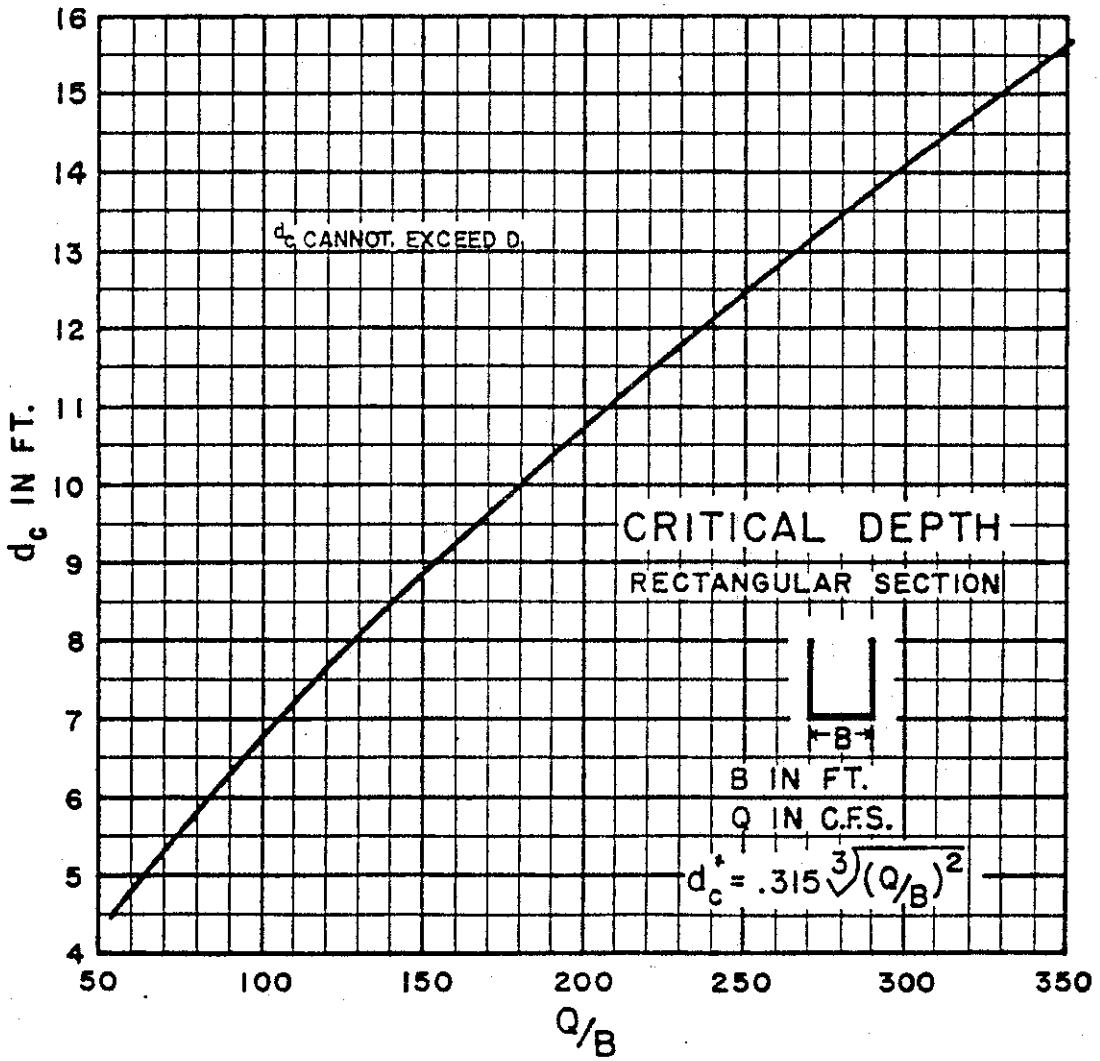


Figure 4.62
Critical Depth Rectangular Section
(FHWA, HDS-5, 1985)

Figure 4.42
Culvert Design Form

Project: Rittenhouse Channel	Station: 114+00 +/- Sheet ____ of ____	CULVERT DESIGN FORM Designer/Date: JLK / 6-19-94 Reviewer/Date: [illegible] / 3/93

Hydrological Data

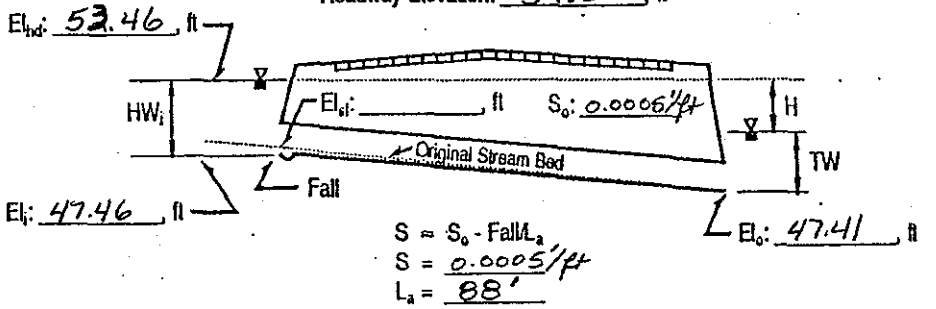
See Add'l shts

- ☐ Method: Hec-1
- ☐ Drainage Area: ____ ☐ Stream Slope: ____
- ☐ Channel Shape: Trapezoidal
- ☐ Routing: HEC-2 ☐ Other: ____

Design Flows/Tailwater

R.I., years	Flow, cfs	TW, ft
100	407	6.0
100	296	6.0

Roadway Elevation: 57.50 ft



$S = S_o - Fall/L_a$
$S = 0.0005'/ft$
$L_a = 88'$

Culvert Description: Material - Shape - Size - Entrance	Total Flow Q, cfs	Flow Per Barrel Q/N (1)	Headwater Calculations: Inlet Control HW_i/D (2)	HW_i	Fall (3)	EL_{hi} (4)	Outlet Control TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	Control Headwater Elevation	Outlet Velocity	Comments
Box Culvert 11'x6'		407	1.0	6.0	6.0	53.46	6.0	3.5	4.75	4.75	0.5	0.98	53.14	53.46	6.17	Inlet Control
Box Culvert 8'x6'		296	1.0	6.0	6.0	53.46	6.0	3.5	4.75	4.75	0.5	0.99	53.15	53.46	6.17	Inlet Control

Technical Footnotes:

(1) Use Q/NB for box culverts.
(2) HW_i/D = HW/D or HW_i/D from design charts
(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; Fall is zero for culverts on grade.
(4) $EL_{hi} = HW_i + EL_i$ (invert of inlet control section)
(5) TW based on downstream control or flow depth in channel.
(6) h_o = TW or $(d_c + D)/2$ (whichever is greater).
(7) $H = \left[1 + k_e + (29n^2L)/R^{1.33}\right] V^2/2g$
(8) $EL_{ho} = EL_o + H + h_o$

Subscript Definitions:

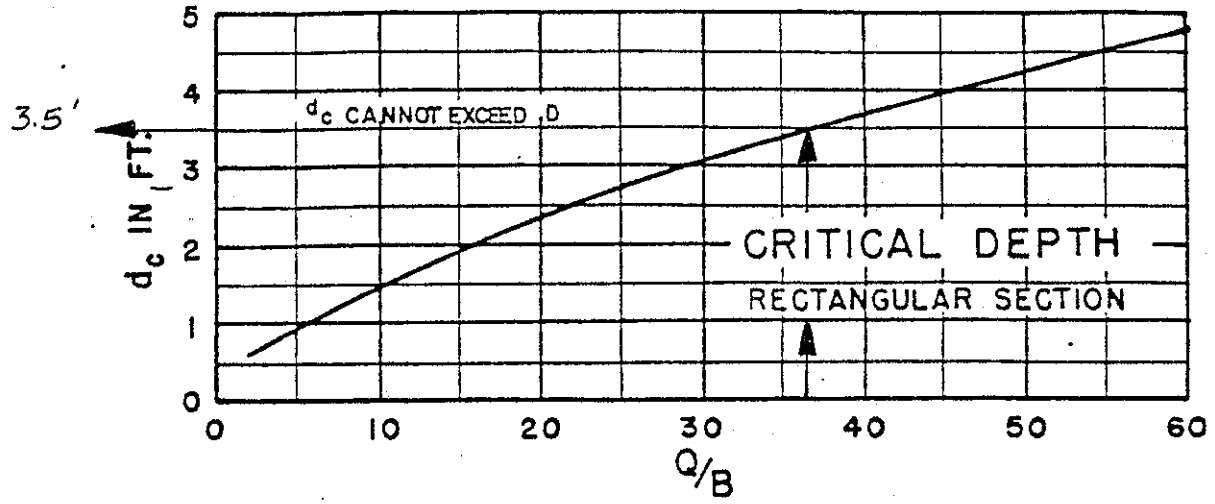
a. approximate
f. culvert fact
hd. Design Headwater
hi. Headwater in inlet control
ho. Headwater in outlet control
i. Inlet control section
o. Outlet
sf. Streambed at culvert face
TW. Tailwater

Comments / Discussion:

Since Sta 117+00 +/- has a drop at the outlet these calculations are sufficient to verify Inlet Control for that identical structure.

Culvert Barrel Selected:

Size: 11'x6' or 8'x6'
Shape: Box Culvert
Material: Concrete n: 0.012
Entrance: Beveled



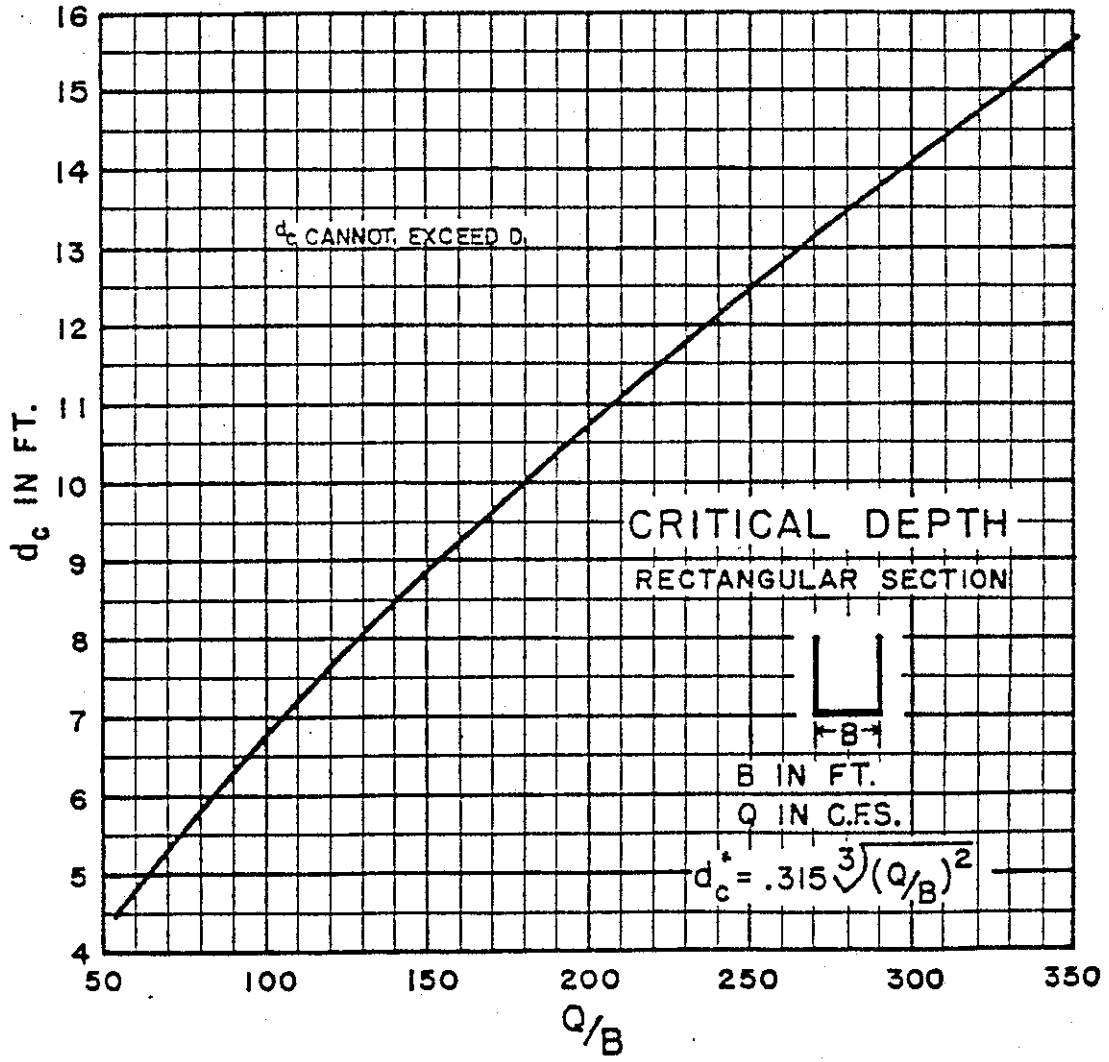


Figure 4.62
Critical Depth Rectangular Section
(FHWA, HDS-5, 1985)

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24407
JAMES L.
KARY
Date Signed 3/17/94
ARIZONA, U.S.A.

```
****************************************
* HEC-2 WATER SURFACE PROFILES         *
*                                      *
* Version   4.6.2;  May 1991           *
*                                      *
* RUN DATE    11MAR94    TIME   03:19:30 *
****************************************
```

```
*********************************
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET, SUITE D
* DAVIS, CALIFORNIA 95616-4687
*         (916) 756-1104
*********************************
```

```
X     X  XXXXXXX   XXXXX             XXXXX
X     X  X        X    X            X    X
X     X  X        X                      X
XXXXXXX  XXXX     X         XXXXX    XXXXX
X     X  X        X                 X
X     X  X        X    X            X
X     X  XXXXXXX   XXXXX            XXXXXXX
```

THIS RUN EXECUTED 11MAR94 03:19:30

```
************************************
 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
************************************


T1      RITTENHOUSE CHANNEL     FCDMC CONTRACT NO. 92-13       GF JOB NO. 28835
T2      FROM QUEEN CREEK SCHOOL TO THE EAST MARICOPA FLOODWAY
T3      RITTENHOUSE CHANNEL NO. 1       FILE NAME = RIT1.DAT    UPDATED 3-2-94

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0        0        0        0     1047     18.71     0

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

     -1        0       -1        0        0        0        0        0        0        0


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150                  38       43       26        8        5        1

J5  LPRNT    NUMSEC                  ********REQUESTED SECTION NUMBERS********

    -10      -10

QT       1      1047
NC   0.035     0.035     0.035       0.6       1.0
         SECTION LOCATED IN THE  EMF AT THE OUTLET OF THE PROPOSED CHANNEL
         SECTION NO.'S ARE BY STATION ALONG THE CONSTRUCTION CENTERLINE
X1     725        4        12     109.2         0         0         0         0         0         0
GR   20.17       12     10.95      37.6     10.95      79.6     20.17     109.2


X1     799        6        12     109.2        74        74        74         0         0         0
GR   20.16       12     20.16     19.14     10.93      37.6     10.93      79.6     20.16     98.06
GR   20.16     109.2


X1     800        8        12     109.2         1         1         1         0         0         0
GR   20.16       12     20.16      34.4     13.76      37.6     13.76      67.6     12.76      71.6
GR   12.76     79.6     20.16      83.3     20.16     109.2


X1     820        6        12     109.2        20        20        20         0         0         0
GR   20.17       12     13.77      37.6     13.77      67.6     12.77      71.6     12.77      79.6
GR   20.17     109.2
```

```
NC   0.027    0.027    0.027     0.1      0.3
X1    821        6       12    109.2        1        1        1        0        0        0
GR   20.17       12    13.77     37.6    13.77     67.6    12.77     71.6    12.77     79.6
GR   20.17    109.2

X1   1100        6       12    109.2      279      279      279        0        0        0
GR   20.31       12    13.91     37.6    13.91     67.6    12.91     71.6    12.91     79.6
GR   20.31    109.2

     P.C. OF   CURVE

X1   1364        6       12    109.2   264.49   264.49   264.49        0        0        0
GR   20.44       12    14.04     37.6    14.04     67.6    13.04     71.6    13.04     79.6
GR   20.44    109.2

     P.T. OF   CURVE

X1   1511        6       12    109.2   166.96   126.25   147.61        0        0        0
GR   20.52       12    14.12     37.6    14.12     67.6    13.12     71.6    13.12     79.6
GR   20.52    109.2

     P.C. OF   CURVE

X1   1545        6       12    109.2    33.66    33.66    33.66        0        0        0
GR   20.53       12    14.13     37.6    14.13     67.6    13.13     71.6    13.13     79.6
GR   20.53    109.2

     P.T. OF   CURVE

X1   1691        6       12    109.2   126.25   166.96   147.61        0        0        0
GR   20.61       12    14.21     37.6    14.21     67.6    13.21     71.6    13.21     79.6
GR   20.61    109.2

X1   1935        6       12    109.2   243.63   243.63   243.63        0        0        0
GR   20.72       12    14.32     37.6    14.32     67.6    13.32     71.6    13.32     79.6
GR   20.72    109.2

NC   0.035    0.035    0.035     0.6      1.0
X1   1945        6       12    109.2       10       10       10        0        0        0
GR   20.73       12    14.33     24.8    14.33     67.6    13.33     71.6    13.33     79.6
GR   20.73    109.2

     P.C. OF CURVE @ STA. 19+87.96

X1   1999        6       12    109.2    52.45    55.78    54.10        0        0        0
GR   22.76       12    22.76     24.8    13.36     43.6    13.36     73.6    22.76     92.4
GR   22.76    109.2
```

X1	2000	8	12	109.2	1	1	1	0	0	0
GR	22.76	12	22.76	42.00	16.36	43.60	16.36	61.6	15.36	65.6
GR	15.36	73.6	22.76	75.45	22.76	109.2				
X1	2020	6	12	109.2	17.22	22.78	20	0	0	0
GR	22.77	12	16.37	37.6	16.37	67.6	15.37	71.6	15.37	79.6
GR	22.77	109.2								
NC	0.027	0.027	0.027	0.1	0.3					
X1	2021	6	12	109.2	1	1	1	0	0	0
GR	22.77	12	16.37	37.6	16.37	67.6	15.37	71.6	15.37	79.6
GR	22.77	109.2								
P.T. OF CURVE										
X1	2135	6	12	109.2	97.57	129.36	113.47	0	0	0
GR	22.83	12	16.43	37.6	16.43	67.6	15.43	71.6	15.43	79.6
GR	22.83	109.2								
P.C. OF CURVE										
X1	2168	6	12	109.2	33.66	33.66	33.66	0	0	0
GR	22.86	12	16.46	37.6	16.46	67.6	15.46	71.6	15.46	79.6
GR	22.86	109.2								
P.T. OF CURVE										
X1	2315	6	12	109.2	166.36	126.25	147.61	0	0	0
GR	22.93	12	16.53	37.6	16.53	67.6	15.53	71.6	15.53	79.6
GR	22.93	109.2								
X1	2634	6	12	109.2	319.16	319.16	319.16	0	0	0
GR	23.08	12	16.68	37.6	16.68	67.6	15.68	71.6	15.68	79.6
GR	23.08	109.2								
NC	0.035	0.035	0.035	0.6	1.0					
X1	2645	6	12	109.2	11	11	11	0	0	0
GR	23.08	12	16.68	24.8	16.68	67.6	15.68	71.6	15.68	79.6
GR	23.08	109.2								
X1	2699	6	12	109.2	54	54	54	0	0	0
GR	26.11	12	26.11	22.8	15.71	43.6	15.71	73.6	26.11	34.4
GR	26.11	109.2								

```
X1    2700      8      12     109.2      1       1       1       0       0       0
GR   26.11     12   26.11     42.00  19.71    43.6   19.71    61.6   18.71    65.6
GR   18.71   73.6   26.11     75.45  26.11   109.2

X1    2720      6      12     109.2     20      20      20       0       0       0
GR   26.12     12   19.72      37.6  19.72    67.6   18.72    71.6   18.72    79.6
GR   26.12  109.2

NC   0.027  0.027   0.027       0.1    0.3
X1    2721      6      12     109.2      1       1       1       0       0       0
GR   26.12     12   19.72      37.6  19.72    67.6   18.72    71.6   18.72    79.6
GR   26.12  109.2

X1    3150      6      12     109.2    429     429     429       0       0       0
GR   26.34     12   19.94      37.6  19.94    67.6   18.84    71.6   18.84    79.6
GR   26.34  109.2

X1    3580      6      12     109.2    430     430     430       0       0       0
GR   26.55     12   20.15      37.6  20.15    67.6   19.15    71.6   19.15    79.6
GR   26.55  109.2

NC   0.035  0.035   0.035       0.6    1.0
X1    3590      6      12     109.2     10      10      10       0       0       0
GR   26.56     12   20.16      24.8  20.16    67.6   19.16    71.6   19.16    79.6
GR   26.56  109.2

X1    3639      6      12     109.2     49      49      49       0       0       0
GR   29.58     12   29.58      22.8  19.18    43.6   19.18    73.6   29.58    94.4
GR   29.58  109.2

X1    3640      8      12     109.2      1       1       1       0       0       0
GR   29.58     12   29.58      42    23.18    43.6   23.18    61.6   22.18    65.6
GR   22.18   73.6   29.58     75.45  29.58   109.2

X1    3660      6      12     109.2     20      20      20       0       0       0
GR   29.59     12   23.19      37.6  23.19    67.6   22.19    71.6   22.19    79.6
GR   29.59  109.2

NC   0.027  0.027   0.027       0.1    0.3
X1    3661      6      12     109.2      1       1       1       0       0       0
GR   29.59     12   23.19      37.6  23.19    67.6   22.19    71.6   22.19    79.6
GR   29.59  109.2
```

NORMAL BRIDGE METHOD FOR POWER ROAD

X1	3934	6	12	109.2	273	273	273	0	0	0
GR	29.73	12	23.33	37.6	23.33	67.6	22.33	71.6	22.33	79.6
GR	29.73	109.2								

NC	0.035	0.035	0.035	0.1	0.3					
X1	4100	4	20.9	80.3	182.63	157.75	166.0	0	0	0
X3	10	0	0	0	0	0	0	0	0	0
GR	31.62	20.9	22.41	20.91	22.41	80.2	31.62	80.3		

NC	0.012	0.012	0.012	0.3	0.5					
X1	4106	24	20.79	73.57	5.78	5.78	5.78	0	0	0
BT	-24	20.79	35.5	28.6	20.8	35.5	32.6	30.8	35.5	32.6
BT		30.81	35.5	28.6	31.72	35.5	28.6	31.73	35.5	32.6
BT		41.72	35.5	32.6	41.73	35.5	28.6	42.62	35.5	28.6
BT		42.63	35.5	32.6	52.63	35.5	32.6	52.64	35.5	28.6
BT		54.21	35.5	25.62	54.22	35.5	31.62	60.22	35.5	31.62
BT		60.23	35.5	25.62	60.88	35.5	25.62	60.89	35.5	31.62
BT		66.88	35.5	31.62	66.89	35.5	25.62	67.55	35.5	25.62
BT		67.56	35.5	31.62	73.56	35.5	31.62	73.57	35.5	25.62
GR	28.6	20.79	28.6	20.8	28.6	30.8	28.6	30.81	28.6	31.72
GR	28.6	31.73	28.6	41.72	28.6	41.73	28.6	42.62	28.6	42.63
GR	28.6	52.63	28.6	52.64	25.62	54.21	25.62	54.22	25.62	60.22
GR	25.62	60.23	25.62	60.88	25.62	60.89	25.62	66.88	25.62	66.89
GR	25.62	67.55	25.62	67.56	25.62	73.56	25.62	73.57		

X1	4185	24	20.8	73.57	79.46	79.46	79.46	0	0	0
BT	-24	20.79	35.5	28.8	20.8	35.5	32.8	30.8	35.5	32.8
BT		30.81	35.5	28.8	31.72	35.5	28.8	31.73	35.5	32.8
BT		41.72	35.5	32.8	41.73	35.5	28.8	42.62	35.5	28.8
BT		42.63	35.5	32.8	52.63	35.5	32.8	52.64	35.5	28.8
BT		54.21	35.5	25.82	54.22	35.5	31.82	60.22	35.5	31.82
BT		60.23	35.5	25.82	60.88	35.5	25.82	60.89	35.5	31.82
BT		66.88	35.5	31.82	66.89	35.5	25.82	67.55	35.5	25.82
BT		67.56	35.5	31.82	73.56	35.5	31.82	73.57	35.5	25.82
GR	28.8	20.79	28.8	20.8	28.8	30.8	28.8	30.81	28.8	31.72
GR	28.8	31.73	28.8	41.72	28.8	41.73	28.8	42.62	28.8	42.63
GR	28.8	52.63	28.8	52.64	25.82	54.21	25.82	54.22	25.82	60.22
GR	25.82	60.23	25.82	60.88	25.82	60.89	25.82	66.88	25.82	66.89
GR	25.82	67.55	25.82	67.56	25.82	73.56	25.82	73.57		

NC	0.035	0.035	0.035	0.6	1.0					
X1	4190	6	15.8	78.6	5	5	5	0	0	0
GR	32.8	15.8	28.8	15.81	26.83	48.81	25.83	49	25.83	78.59
GR	32.8	78.6								

```
NC    0.027     0.027     0.027       0.1       0.3        35
X1     4250         6        12    109.92        40        40        40         0         0         0
GR    33.26        12     26.86      37.9     26.86      67.6     25.86      71.6     25.86      79.6
GR    33.26    109.92

        PT STATION 45+63.03 START SECTION NO. 3

QT        1       804
X1     4563         6        12      95.2    372.37    332.81    431.51         0         0         0
GR    33.41        12     27.01      37.6     27.01      53.6     26.01      57.6     26.01      65.6
GR    33.41      95.2

        PC OF CURVE

X1     4768         6        12      95.2    204.64    204.64    204.64         0         0         0
GR    33.51        12     27.11      37.6     27.11      53.6     26.11      57.6     26.11      65.6
GR    33.51      95.2


X1     4901         6        12      95.2    154.99    112.05    133.51         0         0         0
GR    33.53        12     27.13      37.6     27.13      53.6     26.13      57.6     26.13      65.6
GR    33.53      95.2


X1     5200         6        12      95.2       299       299       299         0         0         0
GR    33.73        12     27.33      37.6     27.33      53.6     26.33      57.6     26.33      65.6
GR    33.73      95.2


X1     5520         6        12      95.2       320       320       320         0         0         0
GR    33.89        12     27.49      37.6     27.49      53.6     26.49      57.6     26.49      65.6
GR    33.89      95.2


NC    0.035     0.035     0.035       0.6       1.0
X1     5530         6        12      95.2        10        10        10         0         0         0
GR    33.90        12      27.5      24.8      27.5      53.6      26.5      57.6      26.5      65.6
GR    33.90      95.2


X1     5579         6        12      95.2        49        49        49         0         0         0
GR    36.92        12     36.92      20.8     26.52      41.6     26.52      65.6     36.92      86.4
GR    36.92      95.2


X1     5580         8        12      95.2         1         1         1         0         0         0
GR    36.92        12     36.92      40.0     30.52      41.6     30.52      53.6     29.52      57.6
GR    29.55      65.6     36.92     67.45     36.92      95.2
```

X1	5600	6	12	95.2	20	20	20	0	0	0
GR	36.93	12	30.53	37.6	30.53	53.6	29.53	57.6	29.53	65.6
GR	36.93	95.2								
NC	0.027	0.027	0.027	0.1	0.3					
X1	5601	6	12	95.2	1	1	1	0	0	0
GR	36.93	12	30.53	37.6	30.53	53.6	29.53	57.6	29.53	65.6
GR	36.93	95.2								
X1	6000	6	12	95.2	399	399	399	0	0	0
GR	37.13	12	30.73	37.6	30.73	53.6	29.73	57.6	29.73	65.6
GR	37.13	95.2								
X1	6400	6	12	95.2	400	400	400	0	0	0
GR	37.33	12	30.93	37.6	30.93	53.6	29.93	57.6	29.93	65.6
GR	37.33	95.2								
X1	6800	6	12	95.2	400	400	400	0	0	0
GR	37.53	12	31.13	37.6	31.13	53.6	30.13	57.6	30.13	65.6
GR	37.53	95.2								
X1	7040	6	12	95.2	240	240	240	0	0	0
GR	37.65	12	31.25	37.6	31.25	53.6	30.25	57.6	30.25	65.6
GR	37.65	95.2								
NC	0.035	0.035	0.035	0.6	1.0					
X1	7050	6	12	95.2	10	10	10	0	0	0
GR	37.66	12	31.26	24.8	31.26	53.6	30.26	57.6	30.26	65.6
GR	37.66	95.2								
X1	7099	6	12	95.2	49	49	49	0	0	0
GR	40.68	12	40.68	20.8	30.28	41.6	30.28	65.6	40.68	86.4
GR	40.68	95.2								
X1	7100	8	12	95.2	1	1	1	0	0	0
GR	40.68	12	40.68	40.0	34.28	41.6	34.28	53.6	33.28	57.6
GR	33.28	65.6	40.68	67.45	40.68	95.2				
X1	7120	6	12	95.2	20	20	20	0	0	0
GR	40.69	12	34.29	37.6	34.29	53.6	33.29	57.6	33.29	65.6
GR	40.69	95.2								

NC	0.027	0.027	0.027	0.1	0.3					
X1	7121	6	12	95.2	1	1	1	0	0	0
GR	40.69	12	34.29	37.6	34.29	53.6	33.29	57.6	33.29	65.6
GR	40.69	95.2								
X1	7500	6	12	95.2	379	379	379	0	0	0
GR	40.88	12	34.48	37.6	34.48	53.6	33.48	57.6	33.48	65.6
GR	40.88	95.2								
X1	7900	6	12	95.2	400	400	400	0	0	0
GR	41.08	12	34.68	37.6	34.68	53.6	33.68	57.6	33.68	65.6
GR	41.08	95.2								
NC	0.035	0.035	0.035	0.6	1.0					
X1	7910	6	12	95.2	10	10	10	0	0	0
GR	41.09	12	34.69	24.8	34.69	53.6	33.69	57.6	33.69	65.6
GR	41.09	95.2								
X1	7959	6	12	95.2	49	49	49	0	0	0
GR	44.11	12	44.11	20.8	33.71	41.6	33.71	65.6	44.11	86.4
GR	44.11	95.2								
X1	7960	8	12	95.2	1	1	1	0	0	0
GR	44.11	12	44.11	40	37.71	41.6	37.71	53.6	36.71	57.6
GR	36.71	65.6	44.11	67.45	44.11	95.2				
X1	7980	6	12	95.2	20	20	20	0	0	0
GR	44.12	12	37.72	37.6	37.72	53.6	36.72	57.6	36.72	65.6
GR	44.12	95.2								
NC	0.027	0.027	0.027	0.1	0.3					
X1	7981	6	12	95.2	1	1	1	0	0	0
GR	44.12	12	37.72	37.6	37.72	53.6	36.72	57.6	36.72	65.6
GR	44.12	95.2								
X1	8450	6	12	95.2	469	469	469	0	0	0
GR	44.36	12	37.96	37.6	37.96	53.6	36.96	57.6	36.96	65.6
GR	44.36	95.2								

X1	8900	6	12	95.2	450	450	450	0	0	0
GR	44.58	12	38.18	37.6	38.18	53.6	37.18	57.6	37.18	65.6
GR	44.58	95.2								
NC	.035	.035	.035	0.6	1.0					
X1	8910	6	12	95.2	10	10	10	0	0	0
GR	44.59	12	38.19	24.8	38.19	53.6	37.19	57.6	37.19	65.6
GR	44.59	95.2								
X1	8959	6	12	95.2	49	49	49	0	0	0
GR	47.61	12	47.61	20.8	37.21	41.6	37.21	65.6	44.61	86.4
GR	47.61	95.2								
X1	8960	8	12	95.2	1	1	1	0	0	0
GR	47.61	12	47.61	40	41.21	41.6	41.21	53.6	40.21	57.6
GR	40.21	65.6	47.61	67.45	47.61	95.2				
X1	8980	6	12	95.2	20	20	20	0	0	0
GR	47.62	12	41.22	37.6	41.22	53.6	40.22	57.6	40.22	65.6
GR	47.62	95.2								
NC	0.027	0.027	0.027	0.1	0.3					
X1	8981	6	12	95.2	1	1	1	0	0	0
GR	47.62	12	41.22	37.6	41.22	53.6	40.22	57.6	40.22	65.6
GR	47.62	95.2								
X1	9350	6	12	95.2	369	369	369	0	0	0
GR	47.81	12	41.41	37.6	41.41	53.6	40.41	57.6	40.41	65.6
GR	47.81	95.2								
X1	9725	6	12	95.2	375	375	375	0	0	0
GR	47.99	12	41.59	37.6	41.59	53.6	40.59	57.6	40.59	65.6
GR	47.99	95.2								
X1	10100	6	12	95.2	375	375	375	0	0	0
GR	48.18	12	41.78	37.6	41.78	53.6	40.78	57.6	40.78	65.6
GR	48.18	95.2								
NC	0.035	0.035	0.035	0.6	1.0					
X1	10110	6	12	95.2	10	10	10	0	0	0
GR	48.19	12	41.79	24.8	41.79	53.6	40.79	57.6	40.79	65.6
GR	48.19	95.2								

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X1    10159      6      12     95.2      49      49      49       0       0       0
GR    51.21     12   51.21     20.8   40.81    41.6   40.81    65.6   51.21    86.4
GR    51.21   95.2

X1    10160      8      12     95.2       1       1       1       0       0       0
GR    51.21     12   51.21       40   44.81    41.6   44.81    53.6   43.81    57.6
GR    43.81   65.6   51.21    67.45   51.21    95.2

X1    10180      6      12     95.2      20      20      20       0       0       0
GR    51.22     12   44.82     37.6   44.82    53.6   43.82    57.6   43.82    65.6
GR    51.22   95.2

NC    0.027  0.027   0.027      0.1     0.3
X1    10181      6      12     95.2       1       1       1       0       0       0
GR    51.22     12   44.82     37.6   44.82    53.6   43.82    57.6   43.82    65.6
GR    51.22   95.2

      SPECIAL CULVERT AT SOSSAMAN RD.

X1    10462      6      12     95.2     281     281     281       0       0       0
GR    51.36     12   44.96     37.6   44.96    53.6   43.96    57.6   43.96    65.6
GR    51.36   95.2

NC    0.012  0.012   0.012      0.3     0.5
X1    10687      6      12     95.2     225     225     225       0       0       0
X3       10
GR    54.47     12   54.47    28.10   45.07    28.11   45.07   55.09   54.47   55.10
GR    54.47   95.2

SC    3.012    0.5     3.0        0    6.00    8.00    90.0     8.1   47.11   47.07

X1    10777      6      12     95.2      90      90      90       0       0       0
X2                    2    53.07   54.51
X3       10
BT       -2     12   54.51           95.2   54.51
GR    54.51     12   54.51    28.10   47.11    28.11   47.11   55.09   54.51   55.10
GR    54.51   95.2

NC    0.035  0.035   0.035      0.6     1.0
X1    10834      6      12     95.2   56.59   56.59   56.59       0       0       0
GR    54.54     12   48.14     37.6   48.14    53.6   47.14    57.6   47.14    65.6
GR    54.54   95.2

      SPECIAL CULVERT AT GERMANN RD.
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NC	0.027	0.027	0.027	0.1	0.3					
X1	11148	6	12	95.2	314	314	314	0	0	0
GR	54.70	12	48.29	37.6	48.29	53.6	47.29	57.6	47.29	65.6
GR	54.70	95.2								
NC	0.012	0.012	0.012	0.3	0.5					
X1	11373	6	12	95.2	211.69	226.52	224.87	0	0	0
X3	10									
GR	55.77	12	55.77	28.10	47.41	28.11	47.41	55.09	55.77	55.10
GR	55.77	95.2								
SC	3.012	0.5	3.0	0	6.00	8.00	108.07	8.1	47.46	47.40
X1	11481	6	12	95.2	108.07	108.07	108.07	0	0	0
X2			2	53.41	55.77					
X3	10									
BT	-2	12	55.77		95.2	55.77				
GR	55.77	12	55.77	28.10	47.46	28.11	47.46	55.09	55.77	55.10
GR	55.77	95.2								
NC	0.035	0.035	0.035	0.6	1.0					
X1	11509	6	12	95.2	28	28	28	0	0	0
GR	55.77	12	48.47	37.6	48.48	53.6	47.47	57.6	47.47	65.6
GR	55.77	95.2								
NC	0.027	0.027	0.027	0.1	0.3					
X1	11581	6	12	95.2	72	72	72	0	0	0
GR	54.92	12	48.52	37.6	48.52	53.6	47.52	57.6	47.52	65.6
GR	54.92	95.2								
QT	1	504								
X1	11681	4	12	79.6	100	100	100	0	0	0
GR	55.77	12	48.57	40.8	48.57	50.8	55.77	79.6		
X1	12020	4	12	79.6	356.76	356.76	356.76	0	0	0
GR	55.94	12	48.74	40.8	48.74	50.8	55.94	79.6		
NC	0.035	0.035	0.035	0.6	1.0					
X1	12370	4	12	79.6	350	350	350	0	0	0
GR	56.12	12	48.92	40.8	48.92	50.8	56.12	79.6		

X1	12419	6	12	79.6	49	49	49	0	0	0
GR	59.14	12	59.14	20.4	48.94	40.8	48.94	50.8	59.14	71.6
GR	59.14	79.6								
X1	12420	6	12	79.6	1	1	1	0	0	0
GR	59.14	12	59.14	28.8	51.94	40.8	51.94	50.8	59.14	62.8
GR	59.14	79.6								
X1	12440	4	12	79.6	20	20	20	0	0	0
GR	59.15	12	51.95	40.8	51.95	50.8	59.15	79.6		
NC	0.027	0.027	0.027	0.1	0.3					
X1	12441	4	12	79.6	1	1	1	0	0	0
GR	59.15	12	51.95	40.8	51.95	50.8	59.15	79.6		
X1	12730	4	12	79.6	289	289	289	0	0	0
GR	59.30	12	52.10	40.8	52.10	50.8	59.30	79.6		
NC	0.035	0.035	0.035	0.6	1.0					
X1	13030	4	12	79.6	300	300	300	0	0	0
GR	59.45	12	52.25	40.8	52.25	50.8	59.45	79.6		
X1	13079	6	12	79.6	49	49	49	0	0	0
GR	62.47	12	62.47	20.4	52.27	40.8	52.27	50.8	62.47	71.6
GR	62.47	79.6								
X1	13080	6	12	79.6	1	1	1	0	0	0
GR	62.47	12	62.47	28.8	55.27	40.8	55.27	50.8	62.47	62.8
GR	62.47	79.6								
X1	13100	4	12	79.6	20	20	20	0	0	0
GR	62.48	12	55.25	40.8	55.25	50.8	62.48	79.6		
NC	0.027	0.027	0.027	0.1	0.3					
X1	13101	4	12	79.6	1	1	1	0	0	0
GR	62.48	12	55.25	40.8	55.25	50.8	62.48	79.6		
X1	13480	4	12	79.6	379	379	379	0	0	0
GR	62.67	12	55.47	40.8	55.47	50.8	62.67	79.6		

X1	13880	4	12	79.6	400	400	400	0	0	0
GR	62.87	12	55.67	40.8	55.67	50.8	62.87	79.6		
NC	0.035	0.035	0.035	0.6	1.0					
X1	14290	4	12	79.6	410	410	410	0	0	0
GR	63.08	12	55.88	40.8	55.88	50.8	63.08	79.6		
X1	14339	6	12	79.6	49	49	49	0	0	0
GR	66.10	12	66.10	20.4	55.9	40.8	55.90	50.8	66.10	71.6
GR	66.10	79.6								
X1	14340	6	12	79.6	1	1	1	0	0	0
GR	66.10	12	66.10	28.8	58.9	40.8	58.9	50.8	66.10	62.8
GR	66.10	79.6								
X1	14360	4	12	79.6	20	20	20	0	0	0
GR	66.11	12	58.91	40.8	58.91	50.8	66.11	79.6		
NC	0.027	0.027	0.027	0.1	0.3					
X1	14361	4	12	79.6	1	1	1	0	0	0
GR	66.11	12	58.91	40.8	58.91	50.8	66.11	79.6		
X1	14700	4	12	79.6	339	339	339	0	0	0
GR	66.28	12	59.08	40.8	59.08	50.8	66.28	79.6		
X1	15100	4	12	79.6	400	400	400	0	0	0
GR	66.48	12	59.28	40.8	59.28	50.8	66.48	79.6		
X1	15500	4	12	79.6	400	400	400	0	0	0
GR	66.68	12	59.48	40.8	59.48	50.8	66.68	79.6		
X1	15900	4	12	79.6	400	400	400	0	0	0
GR	66.88	12	59.68	40.8	59.68	50.8	66.88	79.6		
X1	16300	4	12	79.6	400	400	400	0	0	0
GR	67.08	12	59.88	40.8	59.88	50.8	67.08	79.6		

NC	0.035	0.035	0.035	0.6	1.0					
X1	16670	4	12	79.6	370	370	370	0	0	0
GR	67.27	12	60.07	40.8	60.07	50.8	67.27	79.6		
X1	16719	6	12	79.6	49	49	49	0	0	0
GR	70.29	12	70.29	20.4	60.09	40.8	60.09	50.8	70.29	71.6
GR	70.29	79.6								
X1	16720	6	12	79.6	1	1	1	0	0	0
GR	70.29	12	70.29	28.8	63.09	40.8	63.09	50.8	70.29	62.8
GR	70.29	79.6								
X1	16740	4	12	79.6	20	20	20	0	0	0
GR	70.30	12	63.10	40.8	63.10	50.8	70.30	79.6		
NC	0.027	0.027	0.027	0.1	0.3					
X1	16741	4	12	79.6	1	1	1	0	0	0
GR	70.30	12	63.10	40.8	63.10	50.8	70.30	79.6		
X1	17180	4	12	79.6	439	439	439	0	0	0
GR	70.52	12	63.32	40.8	63.32	50.8	70.52	79.6		
NC	0.035	0.035	0.035	0.6	1.0					
X1	17390	4	12	79.6	210	210	210	0	0	0
GR	70.63	12	63.43	40.8	63.43	50.8	70.63	79.6		
X1	17439	6	12	79.6	49	49	49	0	0	0
GR	73.65	12	73.65	20.4	63.45	40.8	63.45	50.8	73.65	71.6
GR	73.65	79.6								
X1	17440	6	12	79.6	1	1	1	0	0	0
GR	73.65	12	73.65	28.8	66.45	40.8	66.45	50.8	73.65	62.8
GR	73.65	79.6								
X1	17460	4	12	79.6	20	20	20	0	0	0
GR	73.66	12	66.46	40.8	66.46	50.8	73.66	79.6		
NC	0.027	0.027	0.027	0.1	0.3					
X1	17461	4	12	79.6	1	1	1	0	0	0
GR	73.66	12	66.46	40.8	66.46	50.8	73.66	79.6		

X1	17780	4	12	79.6	319	319	319	0	0	0
GR	73.82	12	66.62	40.8	66.62	50.8	73.82	79.6		
X1	18180	4	12	79.6	400	400	400	0	0	0
GR	74.02	12	66.92	40.8	66.92	50.8	74.02	79.6		
NC	0.035	0.035	0.035	0.6	1.0					
X1	18590	4	12	79.6	410	410	410	0	0	0
GR	74.23	12	67.03	40.8	67.03	50.8	74.23	79.6		
X1	18639	6	12	79.6	49	49	49	0	0	0
GR	77.25	12	77.25	20.4	67.05	40.8	67.05	50.8	77.25	71.6
GR	77.25	79.6								
X1	18640	6	12	79.6	1	1	1	0	0	0
GR	77.25	12	77.25	28.8	70.05	40.8	70.05	50.8	77.25	62.8
GR	77.25	79.6								
X1	18660	4	12	79.6	20	20	20	0	0	0
GR	77.26	12	70.06	40.8	70.06	50.8	77.26	79.6		
NC	0.027	0.027	0.027	0.1	0.3					
X1	18661	4	12	79.6	1	1	1	0	0	0
GR	77.26	12	70.06	40.8	70.06	50.8	77.26	79.6		
X1	18920	4	12	79.6	259	259	259	0	0	0
GR	77.39	12	70.19	40.8	70.19	50.8	77.39	79.6		
X1	19270	4	12	79.6	350	350	350	0	0	0
GR	77.57	12	70.37	40.8	70.37	50.8	77.57	79.6		
NC	0.035	0.035	0.035	0.6	1.0					
X1	19630	4	12	79.6	360	360	360	0	0	0
GR	77.75	12	70.55	40.8	70.55	50.8	77.75	79.6		
X1	19679	6	12	79.6	49	49	49	0	0	0
GR	80.77	12	80.77	20.4	70.57	40.8	70.57	50.8	80.77	71.6
GR	80.77	79.6								

X1	19680	6	12	79.6	1	1	1	0	0	0
GR	80.77	12	80.77	28.8	73.57	40.8	73.57	50.8	80.77	62.8
GR	80.77	79.6								
X1	19700	4	12	79.6	20	20	20	0	0	0
GR	80.78	12	73.58	40.8	73.58	50.8	80.78	79.6		
NC	0.027	0.027	0.027	0.1	0.3					
X1	19701	4	12	79.6	1	1	1	0	0	0
GR	80.78	12	73.58	40.8	73.58	50.8	80.78	79.6		
X1	20050	4	12	79.6	367.19	330.81	349	0	0	0
GR	80.96	12	73.76	40.8	73.76	50.8	80.96	79.6		
X1	20450	4	12	79.6	400	400	400	0	0	0
GR	81.16	12	73.96	40.8	73.96	50.8	81.16	79.6		
X1	20850	4	12	79.6	400	400	400	0	0	0
GR	81.36	12	74.16	40.8	74.16	50.8	81.36	79.6		
NC	0.035	0.035	0.035	0.6	1.0					
X1	21150	4	12	79.6	400	400	400	0	0	0
GR	81.50	12	74.30	40.8	74.30	50.8	81.50	79.6		
X1	21199	6	12	79.6	49	49	49	0	0	0
GR	84.53	12	84.53	20.4	74.33	40.8	74.33	50.8	84.53	73.6
GR	84.53	79.6								
X1	21200	6	12	79.6	1	1	1	0	0	0
GR	84.53	12	84.53	28.8	77.33	40.8	77.33	50.8	84.53	62.8
GR	84.53	79.6								
X1	21220	4	12	79.6	20	20	20	0	0	0
GR	84.54	12	77.34	40.8	77.34	50.8	84.54	79.6		
NC	0.027	0.027	0.027	0.1	0.3					
X1	21221	4	12	79.6	1	1	1	0	0	0
GR	84.54	12	77.34	40.8	77.34	50.8	84.54	79.6		

X1	21550	4	12	79.6	329	329	329	0	0	0
GR	84.71	12	77.51	40.8	77.51	50.8	84.71	79.6		
X1	21950	4	12	79.6	400	400	400	0	0	0
GR	84.91	12	77.71	40.8	77.71	50.8	84.91	79.6		
NC	0.035	0.035	0.035	0.6	1.0					
X1	22250	4	12	79.6	300	300	300	0	0	0
GR	85.05	12	77.85	40.8	77.85	50.8	85.05	79.6		
X1	22299	6	12	79.6	49	49	49	0	0	0
GR	88.08	12	88.08	20.4	77.88	40.8	77.88	50.8	88.08	73.6
GR	88.08	79.6								
X1	22300	6	12	79.6	1	1	1	0	0	0
GR	88.08	12	88.08	28.8	80.88	40.8	80.88	50.8	88.08	62.8
GR	88.08	79.6								
X1	22320	4	12	79.6	20	20	20	0	0	0
GR	88.09	12	80.89	40.8	80.89	50.8	88.09	79.6		
NC	0.027	0.027	0.027	0.1	0.3					
X1	22321	4	12	79.6	1	1	1	0	0	0
GR	88.09	12	80.89	40.8	80.89	50.8	88.09	79.6		
X1	22710	4	12	79.6	389	389	389	0	0	0
GR	88.29	12	81.09	40.8	81.09	50.8	88.29	79.6		
NC	0.035	0.035	0.035	0.6	1.0					
X1	23010	4	12	79.6	300	300	300	0	0	0
GR	88.43	12	81.23	40.8	81.23	50.8	88.43	79.6		
X1	23059	6	12	79.6	49	49	49	0	0	0
GR	91.46	12	91.46	20.4	81.26	40.8	81.26	50.8	91.46	71.6
GR	91.46	79.6								
X1	23060	6	12	79.6	1	1	1	0	0	0
GR	91.46	12	91.46	28.8	84.26	40.8	84.26	50.8	91.46	62.2
GR	91.46	79.6								

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X1    23080      4      12     79.6      20      20      20       0       0       0
GR    91.47     12   84.27     40.8   84.27    50.8   91.47    79.6

NC    0.027  0.027   0.027      0.1     0.3
X1    23081      4      12     79.6       1       1       1       0       0       0
GR    91.47     12   84.27     40.8   84.27    50.8   91.47    79.6

X1    23181      4      12     79.6     100     100     100       0       0       0
GR    91.52     12   84.32     40.8   84.32    50.8   91.52    79.6
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STOP REVISIONS

SPECIAL CULVERT AT ELLSWORTH ROAD

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X1    23282      4      12     79.6     101     101     101       0       0       0
GR    91.57     12   84.37     40.8   84.37    50.8   91.57    79.6

NC    0.012  0.012   0.012      0.3     0.5
X1    23556      4      12     79.6   50.29   50.29   50.29       0       0       0
X3       10
GR    94.27     12   84.27     40.8   84.27    50.8   94.27    79.6

SC    2.012    0.5     3.0        0       5       9     120     8.2   87.33   87.27

X1    23686      4   36.75    54.85     120     120     120       0       0       0
X2                      2    87.27   92.27
X3       10
BT       -2   36.8   94.27           54.8   94.27
GR    94.27  36.75   87.27    36.80   87.27   54.80   94.27   54.85

NC    0.027  0.027   0.027      0.1     0.3
X1    23720      4      12     79.6      34      34      34       0       0       0
GR    94.55     12   87.35     40.8   87.35    50.8   94.55    79.6

X1    24200      4      12     79.6     480     480     480       0       0       0
GR    94.77     12   87.57     40.8   87.57    50.8   94.77    79.6

X1    24650      4      12     79.6     450     450     450       0       0       0
GR    95.01     12   87.81     40.8   87.81    50.8   95.01    79.6
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X1    25147       4       12     79.6      497      497      497        0        0        0
GR    95.21      12    88.01     40.8    88.01     50.8    95.21     79.6

NC    0.035   0.035    0.035
X1    25148       4       12     79.6        1        1        1        0        0        0
GR    95.26      12    88.06     40.8    88.06     50.8    95.26     79.6

X1    25199       4       12     79.6       51       51       51        0        0        0
GR    98.22      12    88.08     40.8    88.08     50.8    98.22     79.6

X1    25200       6       12     79.6        1        1        1        0        0        0
GR    98.28      12    98.28     34.8    91.08     40.8    91.08     50.8    98.28     56.8
GR    98.28    79.6

X1    25220       4       12     79.6       20       20       20        0        0        0
GR    98.29      12    91.09     40.8    91.09     50.8    98.29     79.6

NC     .027   0.027    0.027
X1    25221       4       12     79.6        1        1        1        0        0        0
GR    98.29      12    91.09     40.8    91.09     50.8    98.29     79.6
```

SPECIAL CULVERT AT QUEEN CREEK ROAD

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X1    25650       4       12     79.6      429      429      429        0        0        0
GR    98.51      12    91.31     40.8    91.31     50.8    98.51     79.6

NC    0.012   0.012    0.012      0.3      0.5
X1    25700       4       12     79.6       50       50       50        0        0        0
X3       10
GR   102.33      12    91.33     40.8    91.33     50.8   102.33     79.6

SC    2.012     0.5      3.0        0        5        9   303.18      8.2    95.27    95.14

X1    26003       4    36.75    54.85   303.18   303.18   303.18        0        0        0
X2                        2    95.27   102.33
X3       10
BT       -2    36.8   102.33             54.8   102.33
GR   102.33   36.75    95.27    36.80    95.27    54.80   102.33    54.85

NC    0.035   0.035    0.035      0.1      0.3
X1    26103       4       12     79.6      100      100      100        0        0        0
GR   102.52      12    95.32     40.8    95.32     50.8   102.52     79.6
```

X1	26203	4	12	79.6	100	100	100	0	0	0
GR	102.52	12	100.00	18	100.00	73.6	102.52	79.6		

THIS RUN EXECUTED 11MAR94 03:19:47

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

RITTENHOUSE CHANNEL NO.

SUMMARY PRINTOUT

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	725.000	1047.00	2.07	7.76	2.41	18.71
	799.000	1047.00	2.33	7.80	2.86	18.73
*	800.000	1047.00	4.48	5.97	15.90	18.73
*	820.000	1047.00	2.86	6.28	6.96	19.05
	821.000	1047.00	2.86	6.28	4.14	19.05
	1100.000	1047.00	2.88	6.25	4.22	19.16
	1364.000	1047.00	2.89	6.23	4.27	19.27
	1511.000	1047.00	2.90	6.22	4.32	19.34
	1545.000	1047.00	2.90	6.22	4.31	19.35
	1691.000	1047.00	2.91	6.20	4.36	19.41
	1935.000	1047.00	2.91	6.20	4.37	19.52
	1945.000	1047.00	2.60	6.24	5.28	19.57
*	1999.000	1047.00	3.95	6.25	11.38	19.61
*	2000.000	1047.00	9.43	4.25	117.50	19.61
*	2020.000	1047.00	2.86	6.28	6.97	21.65
	2021.000	1047.00	2.85	6.28	4.11	21.65
	2135.000	1047.00	2.86	6.27	4.14	21.70

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	2168.000	1047.00	2.88	6.25	4.21	21.71
	2315.000	1047.00	2.88	6.25	4.24	21.78
	2634.000	1047.00	2.89	6.23	4.28	21.91
	2645.000	1047.00	2.58	6.28	5.14	21.96
*	2699.000	1047.00	3.92	6.29	11.12	22.00
*	2700.000	1047.00	10.26	3.97	152.38	22.68
*	2720.000	1047.00	2.77	6.42	6.38	25.14
	2721.000	1047.00	2.76	6.42	3.75	25.14
	3150.000	1047.00	2.79	6.46	3.84	25.30
	3580.000	1047.00	2.84	6.31	4.05	25.46
	3590.000	1047.00	2.54	6.35	4.91	25.51
*	3639.000	1047.00	3.86	6.36	10.64	25.54
*	3640.000	1047.00	10.26	3.97	152.44	26.15
*	3660.000	1047.00	2.77	6.42	6.38	28.61
	3661.000	1047.00	2.76	6.42	3.75	28.61
	3934.000	1047.00	2.79	6.38	3.87	28.71
	4100.000	1047.00	2.77	6.37	4.68	28.78
*	4106.000	1047.00	8.99	4.28	16.23	29.90
*	4185.000	1047.00	8.99	4.28	16.23	30.10
	4190.000	1047.00	3.36	6.01	9.00	31.84
	4250.000	1047.00	3.03	6.04	4.90	31.90
	4563.000	804.00	2.87	6.11	4.64	32.12
	4768.000	804.00	2.87	6.11	4.65	32.22
	4901.000	804.00	2.84	6.15	4.52	32.28
	5200.000	804.00	2.89	6.09	4.72	32.42
	5520.000	804.00	2.90	6.08	4.77	32.57

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	5530.000	804.00	2.51	6.12	5.28	32.62
	5579.000	804.00	3.61	6.14	10.27	32.66
*	5580.000	804.00	10.09	3.79	159.39	33.31
*	5600.000	804.00	2.84	6.15	7.58	35.68
	5601.000	804.00	2.83	6.15	4.48	35.68
	6000.000	804.00	2.85	6.13	4.57	35.86
	6400.000	804.00	2.87	6.12	4.63	36.05
	6800.000	804.00	2.88	6.10	4.68	36.23
	7040.000	804.00	2.88	6.09	4.70	36.34
	7050.000	804.00	2.50	6.14	5.22	36.40
	7099.000	804.00	3.60	6.16	10.18	36.44
*	7100.000	804.00	10.09	3.79	159.50	37.07
*	7120.000	804.00	2.84	6.15	7.61	39.44
	7121.000	804.00	2.84	6.15	4.50	39.44
	7500.000	804.00	2.86	6.13	4.59	39.61
	7900.000	804.00	2.87	6.11	4.65	39.79
	7910.000	804.00	2.49	6.16	5.16	39.85
	7959.000	804.00	3.59	6.17	10.07	39.88
*	7960.000	804.00	10.09	3.79	159.50	40.50
*	7980.000	804.00	2.84	6.15	7.61	42.87
	7981.000	804.00	2.84	6.15	4.50	42.87
	8450.000	804.00	2.86	6.12	4.62	43.08
	8900.000	804.00	2.88	6.11	4.67	43.29
	8910.000	804.00	2.49	6.15	5.17	43.34
	8959.000	804.00	3.36	6.17	9.09	43.38
*	8960.000	804.00	10.09	3.79	159.50	44.00

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
*	8980.000	804.00	2.84	6.15	7.61	46.37
	8981.000	804.00	2.84	6.15	4.50	46.37
	9350.000	804.00	2.86	6.12	4.60	46.53
	9725.000	804.00	2.87	6.12	4.63	46.71
	10100.000	804.00	2.88	6.10	4.68	46.88
	10110.000	804.00	2.50	6.15	5.20	46.94
	10159.000	804.00	3.60	6.16	10.14	46.97
*	10160.000	804.00	10.09	3.79	159.51	47.60
*	10180.000	804.00	2.84	6.15	7.61	49.97
	10181.000	804.00	2.84	6.15	4.50	49.97
	10462.000	804.00	2.85	6.13	4.57	50.09
	10687.000	804.00	6.08	4.90	4.37	49.97
	10777.000	804.00	5.84	5.09	3.88	52.20
*	10834.000	804.00	3.22	5.69	10.71	52.83
	11148.000	804.00	3.13	5.79	5.89	53.08
*	11373.000	804.00	5.30	5.62	2.92	53.03
	11481.000	804.00	4.88	6.10	2.29	53.56
*	11509.000	804.00	2.74	6.51	6.47	53.98
	11581.000	804.00	2.60	6.50	3.55	54.02
*	11681.000	504.00	2.88	5.48	5.89	54.05
	12020.000	504.00	2.85	5.52	5.70	54.26
	12370.000	504.00	2.78	5.60	9.00	54.52
*	12419.000	504.00	4.18	5.64	18.92	54.58
*	12420.000	504.00	9.13	3.49	148.73	55.43
*	12440.000	504.00	2.97	5.39	10.70	57.34
	12441.000	504.00	2.96	5.39	6.32	57.34

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	12730.000	504.00	2.93	5.42	6.18	57.52
	13030.000	504.00	2.85	5.51	9.64	57.76
*	13079.000	504.00	4.27	5.56	20.09	57.83
*	13080.000	504.00	9.13	3.49	148.72	58.76
*	13100.000	504.00	2.95	5.42	10.47	60.67
	13101.000	504.00	2.94	5.42	6.19	60.67
	13480.000	504.00	2.92	5.43	6.11	60.90
	13880.000	504.00	2.88	5.48	5.88	61.15
	14290.000	504.00	2.80	5.58	9.13	61.46
*	14339.000	504.00	4.20	5.62	19.17	61.52
*	14340.000	504.00	9.13	3.49	148.73	62.39
*	14360.000	504.00	2.97	5.39	10.70	64.30
	14361.000	504.00	2.96	5.39	6.32	64.30
	14700.000	504.00	2.92	5.43	6.13	64.51
	15100.000	504.00	2.88	5.48	5.88	64.76
	15500.000	504.00	2.85	5.51	5.71	64.99
	15900.000	504.00	2.83	5.54	5.59	65.22
	16300.000	504.00	2.81	5.56	5.49	65.44
	16670.000	504.00	2.75	5.63	8.73	65.70
*	16719.000	504.00	4.14	5.67	18.43	65.76
*	16720.000	504.00	9.13	3.49	148.74	66.58
*	16740.000	504.00	2.97	5.39	10.70	68.49
	16741.000	504.00	2.96	5.39	6.32	68.49
	17180.000	504.00	2.91	5.44	6.06	68.76
	17390.000	504.00	2.86	5.50	9.73	68.93
*	17439.000	504.00	4.29	5.55	20.24	69.00

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
*	17440.000	504.00	9.13	3.49	148.72	69.94
*	17460.000	504.00	2.97	5.39	10.70	71.85
	17461.000	504.00	2.96	5.39	6.32	71.85
	17780.000	504.00	2.93	5.43	6.14	72.05
	18180.000	504.00	2.94	5.38	6.29	72.30
	18590.000	504.00	2.78	5.60	8.99	72.63
*	18639.000	504.00	4.18	5.64	18.92	72.69
*	18640.000	504.00	9.13	3.49	148.74	73.54
*	18660.000	504.00	2.97	5.39	10.70	75.45
	18661.000	504.00	2.96	5.39	6.32	75.45
	18920.000	504.00	2.93	5.42	6.18	75.61
	19270.000	504.00	2.30	5.46	5.98	75.83
	19630.000	504.00	2.82	5.56	9.30	76.11
*	19679.000	504.00	4.22	5.60	19.47	76.17
*	19680.000	504.00	9.13	3.49	148.73	77.06
*	19700.000	504.00	2.97	5.39	10.70	78.97
	19701.000	504.00	2.96	5.39	6.32	78.97
	20050.000	504.00	2.93	5.43	6.14	79.19
	20450.000	504.00	2.88	5.47	5.90	79.43
	20850.000	504.00	2.85	5.51	5.72	79.67
	21150.000	504.00	2.73	5.66	8.52	79.96
	21199.000	504.00	4.02	5.69	17.35	80.02
*	21200.000	504.00	9.13	3.49	148.73	80.82
*	21220.000	504.00	2.97	5.39	10.70	82.73
	21221.000	504.00	2.96	5.39	6.32	82.73
	21550.000	504.00	2.93	5.43	6.16	82.94

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
	21950.000	504.00	2.89	5.47	5.91	83.18
	22250.000	504.00	2.81	5.56	9.25	83.41
	22299.000	504.00	4.12	5.59	18.64	83.47
*	22300.000	504.00	9.13	3.49	148.74	84.37
*	22320.000	504.00	2.97	5.39	10.70	86.28
	22321.000	504.00	2.96	5.39	6.32	86.28
	22710.000	504.00	2.92	5.43	6.12	86.52
	23010.000	504.00	2.84	5.53	9.48	86.76
*	23059.000	504.00	4.26	5.57	19.95	86.83
*	23060.000	504.00	9.17	3.50	148.96	87.76
*	23080.000	504.00	2.94	5.42	10.41	89.69
	23081.000	504.00	2.93	5.42	6.15	89.69
	23181.000	504.00	2.92	5.43	6.12	89.75
	23282.000	504.00	2.91	5.45	6.06	89.82
*	23556.000	504.00	3.52	5.53	1.65	89.80
*	23686.000	504.00	6.28	4.45	6.00	91.72
	23720.000	504.00	3.53	4.85	10.15	92.20
	24200.000	504.00	3.25	5.10	8.13	92.67
	24650.000	504.00	3.12	5.22	7.32	93.03
	25147.000	504.00	2.97	5.38	6.41	93.39
	25148.000	504.00	3.02	5.33	11.23	93.39
	25199.000	504.00	3.77	5.32	16.91	93.40
*	25200.000	504.00	9.97	3.83	159.93	94.91
*	25220.000	504.00	2.93	5.43	10.36	96.52
	25221.000	504.00	2.92	5.43	6.12	96.52
	25650.000	504.00	2.89	5.47	5.94	96.78

	SECNO	Q	VCH	DEPTH	10*KS	CWSEL
*	25700.000	504.00	3.85	5.41	2.01	96.74
*	26003.000	504.00	6.20	4.51	5.78	99.78
*	26103.000	504.00	3.35	5.01	14.34	100.33
*	26203.000	504.00	6.42	1.34	168.86	101.34

RITTENHOUSE CHANNEL NO.

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01
	725.000	.00	.00	.00	10.95	1047.00	18.71	.00	18.78	2.41	2.07	506.18	674.
	799.000	74.00	.00	.00	10.93	1047.00	18.73	.00	18.81	2.86	2.33	449.12	618.
*	800.000	1.00	.00	.00	12.76	1047.00	18.73	.00	19.04	15.90	4.48	233.81	262.
*	820.000	20.00	.00	.00	12.77	1047.00	19.05	.00	19.17	6.96	2.86	366.11	396.
	821.000	1.00	.00	.00	12.77	1047.00	19.05	.00	19.17	4.14	2.86	366.07	514.
	1100.000	279.00	.00	.00	12.91	1047.00	19.16	.00	19.29	4.22	2.88	363.82	509.
	1364.000	264.49	.00	.00	13.04	1047.00	19.27	.00	19.40	4.27	2.89	362.14	506.
	1511.000	147.61	.00	.00	13.12	1047.00	19.34	.00	19.47	4.32	2.90	360.67	503
	1545.000	33.66	.00	.00	13.13	1047.00	19.35	.00	19.48	4.31	2.90	361.09	504
	1691.000	147.61	.00	.00	13.21	1047.00	19.41	.00	19.54	4.36	2.91	359.67	501
	1935.000	243.63	.00	.00	13.32	1047.00	19.52	.00	19.65	4.37	2.91	359.26	500
	1945.000	10.00	.00	.00	13.33	1047.00	19.57	.00	19.67	5.28	2.60	402.21	455
*	1999.000	54.10	.00	.00	13.36	1047.00	19.61	.00	19.85	11.38	3.95	265.09	310.
*	2000.000	1.00	.00	.00	15.36	1047.00	19.61	.00	20.99	117.50	9.43	111.02	96
*	2020.000	20.00	.00	.00	15.37	1047.00	21.65	.00	21.78	6.97	2.86	365.97	396.
	2021.000	1.00	.00	.00	15.37	1047.00	21.65	.00	21.78	4.11	2.85	367.15	516
	2135.000	113.47	.00	.00	15.43	1047.00	21.70	.00	21.83	4.14	2.86	366.26	514
	2168.000	33.66	.00	.00	15.46	1047.00	21.71	.00	21.84	4.21	2.88	364.10	510
	2315.000	147.61	.00	.00	15.53	1047.00	21.78	.00	21.90	4.24	2.88	363.26	508
	2634.000	319.16	.00	.00	15.68	1047.00	21.91	.00	22.04	4.28	2.89	361.97	506
	2645.000	11.00	.00	.00	15.68	1047.00	21.96	.00	22.06	5.14	2.58	405.92	461
*	2699.000	54.00	.00	.00	15.71	1047.00	22.00	.00	22.24	11.12	3.92	267.30	313
*	2700.000	1.00	.00	.00	18.71	1047.00	22.68	22.68	24.31	152.38	10.26	102.06	84
*	2720.000	20.00	.00	.00	18.72	1047.00	25.14	.00	25.25	6.38	2.77	377.58	414

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.0
	2721.000	1.00	.00	.00	18.72	1047.00	25.14	.00	25.26	3.75	2.76	379.11	540
	3150.000	429.00	.00	.00	18.84	1047.00	25.30	.00	25.42	3.84	2.79	375.74	534
	3580.000	430.00	.00	.00	19.15	1047.00	25.46	.00	25.59	4.05	2.84	369.18	520
	3590.000	10.00	.00	.00	19.16	1047.00	25.51	.00	25.61	4.91	2.54	412.34	472
*	3639.000	49.00	.00	.00	19.18	1047.00	25.54	.00	25.77	10.64	3.86	271.53	321
*	3640.000	1.00	.00	.00	22.18	1047.00	26.15	26.15	27.78	152.44	10.26	102.05	84
*	3660.000	20.00	.00	.00	22.19	1047.00	28.61	.00	28.72	6.38	2.77	377.61	414
	3661.000	1.00	.00	.00	22.19	1047.00	28.61	.00	28.73	3.75	2.76	379.14	540
	3934.000	273.00	.00	.00	22.33	1047.00	28.71	.00	28.83	3.87	2.79	375.20	532
	4100.000	166.00	.00	.00	22.41	1047.00	28.78	.00	28.90	4.68	2.77	377.54	483
*	4106.000	5.78	35.50	32.60	25.62	1047.00	29.90	29.90	31.16	16.23	8.99	116.42	259
*	4185.000	79.46	35.50	32.80	25.82	1047.00	30.10	30.10	31.36	16.23	8.99	116.42	259
	4190.000	5.00	.00	.00	25.83	1047.00	31.84	.00	32.01	9.00	3.36	311.57	343
	4250.000	40.00	.00	.00	25.86	1047.00	31.90	.00	32.04	4.90	3.03	345.73	472
	4563.000	431.51	.00	.00	26.01	804.00	32.12	.00	32.25	4.64	2.87	280.11	373
	4768.000	204.64	.00	.00	26.11	804.00	32.22	.00	32.35	4.65	2.87	279.94	372
	4901.000	133.51	.00	.00	26.13	804.00	32.28	.00	32.41	4.52	2.84	282.82	378
	5200.000	299.00	.00	.00	26.33	804.00	32.42	.00	32.55	4.72	2.89	278.38	363
	5520.000	320.00	.00	.00	26.49	804.00	32.57	.00	32.70	4.77	2.90	277.37	368
	5530.000	10.00	.00	.00	26.50	804.00	32.62	.00	32.72	5.28	2.51	320.40	350
	5579.000	49.00	.00	.00	26.52	804.00	32.66	.00	32.86	10.27	3.61	222.51	250
*	5580.000	1.00	.00	.00	29.52	804.00	33.31	33.31	34.89	159.39	10.09	79.72	63
*	5600.000	20.00	.00	.00	29.53	804.00	35.68	.00	35.81	7.58	2.84	283.08	299
	5601.000	1.00	.00	.00	29.53	804.00	35.68	.00	35.81	4.48	2.83	283.70	373
	6000.000	399.00	.00	.00	29.73	804.00	35.86	.00	35.99	4.57	2.85	281.62	373
	6400.000	400.00	.00	.00	29.93	804.00	36.05	.00	36.17	4.63	2.87	280.29	373

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.0
	6800.000	400.00	.00	.00	30.13	804.00	36.23	.00	36.36	4.68	2.88	279.30	371.
	7040.000	240.00	.00	.00	30.25	804.00	36.34	.00	36.47	4.70	2.88	278.81	370.
	7050.000	10.00	.00	.00	30.26	804.00	36.40	.00	36.50	5.22	2.50	321.60	351.
	7099.000	49.00	.00	.00	30.28	804.00	36.44	.00	36.64	10.18	3.60	223.27	252.
*	7100.000	1.00	.00	.00	33.28	804.00	37.07	37.07	38.65	159.50	10.09	79.72	63.
*	7120.000	20.00	.00	.00	33.29	804.00	39.44	.00	39.56	7.61	2.84	282.64	291.
	7121.000	1.00	.00	.00	33.29	804.00	39.44	.00	39.56	4.50	2.84	283.26	378.
	7500.000	379.00	.00	.00	33.48	804.00	39.61	.00	39.74	4.59	2.86	281.30	375.
	7900.000	400.00	.00	.00	33.68	804.00	39.79	.00	39.92	4.65	2.87	280.02	372.
	7910.000	10.00	.00	.00	33.69	804.00	39.85	.00	39.94	5.16	2.49	322.94	353.
	7959.000	49.00	.00	.00	33.71	804.00	39.88	.00	40.08	10.07	3.59	224.11	253.
*	7960.000	1.00	.00	.00	36.71	804.00	40.50	40.50	42.08	159.50	10.09	79.72	63.
*	7980.000	20.00	.00	.00	36.72	804.00	42.87	.00	42.99	7.61	2.84	282.64	291.
	7981.000	1.00	.00	.00	36.72	804.00	42.87	.00	42.99	4.50	2.84	283.26	378.
	8450.000	469.00	.00	.00	36.96	804.00	43.08	.00	43.21	4.62	2.86	280.64	374.
	8900.000	450.00	.00	.00	37.18	804.00	43.29	.00	43.42	4.67	2.88	279.63	372.
	8910.000	10.00	.00	.00	37.19	804.00	43.34	.00	43.44	5.17	2.49	322.62	353.
	8959.000	49.00	.00	.00	37.21	804.00	43.38	.00	43.55	9.09	3.36	239.03	266.
*	8960.000	1.00	.00	.00	40.21	804.00	44.00	44.00	45.58	159.50	10.09	79.72	63.
*	8980.000	20.00	.00	.00	40.22	804.00	46.37	.00	46.49	7.61	2.84	282.64	291.
	8981.000	1.00	.00	.00	40.22	804.00	46.37	.00	46.49	4.50	2.84	283.26	378
	9350.000	369.00	.00	.00	40.41	804.00	46.53	.00	46.66	4.60	2.86	280.97	374.
	9725.000	375.00	.00	.00	40.59	804.00	46.71	.00	46.83	4.63	2.87	280.35	373
	10100.000	375.00	.00	.00	40.78	804.00	46.88	.00	47.01	4.68	2.88	279.27	371
	10110.000	10.00	.00	.00	40.79	804.00	46.94	.00	47.03	5.20	2.50	322.08	352
	10159.000	49.00	.00	.00	40.81	804.00	46.97	.00	47.17	10.14	3.60	223.57	252

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.0
*	10160.000	1.00	.00	.00	43.81	804.00	47.60	47.60	49.18	159.51	10.09	79.72	63
*	10180.000	20.00	.00	.00	43.82	804.00	49.97	.00	50.09	7.61	2.84	282.64	291.
	10181.000	1.00	.00	.00	43.82	804.00	49.97	.00	50.09	4.50	2.84	283.26	378.
	10462.000	281.00	.00	.00	43.96	804.00	50.09	.00	50.22	4.57	2.85	281.71	376.
	10687.000	225.00	.00	.00	45.07	804.00	49.97	.00	50.55	4.37	6.08	132.29	384.
	10777.000	90.00	54.51	53.07	47.11	804.00	52.20	.00	52.73	3.88	5.84	137.66	408.
*	10834.000	56.53	.00	.00	47.14	804.00	52.83	.00	52.99	10.71	3.22	249.88	245
	11148.000	314.00	.00	.00	47.29	804.00	53.08	.00	53.23	5.89	3.13	256.98	331
*	11373.000	224.87	.00	.00	47.41	804.00	53.03	.00	53.47	2.92	5.30	151.66	470
	11481.000	108.07	55.77	53.41	47.46	804.00	53.56	.00	53.93	2.29	4.88	164.73	531
*	11509.000	28.00	.00	.00	47.47	804.00	53.98	.00	54.09	6.47	2.74	292.97	316
	11581.000	72.00	.00	.00	47.52	804.00	54.02	.00	54.13	3.55	2.60	308.66	426
*	11681.000	100.00	.00	.00	48.57	504.00	54.05	.00	54.18	5.89	2.88	174.88	207
	12020.000	356.76	.00	.00	48.74	504.00	54.26	.00	54.39	5.70	2.85	177.04	211
	12370.000	350.00	.00	.00	48.92	504.00	54.52	.00	54.64	9.00	2.78	181.22	168.
*	12419.000	49.00	.00	.00	48.94	504.00	54.58	.00	54.85	18.32	4.18	120.57	115
*	12420.000	1.00	.00	.00	51.94	504.00	55.43	55.43	56.72	148.73	9.13	55.19	41
*	12440.000	20.00	.00	.00	51.95	504.00	57.34	.00	57.47	10.70	2.97	169.88	154
	12441.000	1.00	.00	.00	51.95	504.00	57.34	.00	57.47	6.32	2.96	170.32	200
	12730.000	289.00	.00	.00	52.10	504.00	57.52	.00	57.65	6.18	2.93	171.75	202
	13030.000	300.00	.00	.00	52.25	504.00	57.76	.00	57.89	9.64	2.85	176.60	162
*	13079.000	49.00	.00	.00	52.27	504.00	57.83	.00	58.11	20.09	4.27	117.94	112
*	13080.000	1.00	.00	.00	55.27	504.00	58.76	58.76	60.05	148.72	9.13	55.19	41
*	13100.000	20.00	.00	.00	55.25	504.00	60.67	.00	60.80	10.47	2.95	171.11	155
	13101.000	1.00	.00	.00	55.25	504.00	60.67	.00	60.80	6.19	2.94	171.54	202
	13480.000	379.00	.00	.00	55.47	504.00	60.90	.00	61.04	6.11	2.92	172.48	203

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.0
	13880.000	400.00	.00	.00	55.87	504.00	61.15	.00	61.28	5.88	2.88	174.94	207
	14290.000	410.00	.00	.00	55.88	504.00	61.46	.00	61.58	9.13	2.80	180.19	166
*	14339.000	49.00	.00	.00	55.90	504.00	61.52	.00	61.79	19.17	4.20	119.98	115
*	14340.000	1.00	.00	.00	58.90	504.00	62.39	62.39	63.68	148.73	9.13	55.19	41
*	14360.000	20.00	.00	.00	58.91	504.00	64.30	.00	64.43	10.70	2.97	169.89	154
	14361.000	1.00	.00	.00	58.91	504.00	64.30	.00	64.43	6.32	2.96	170.32	200
	14700.000	339.00	.00	.00	59.08	504.00	64.51	.00	64.64	6.13	2.92	172.35	203
	15100.000	400.00	.00	.00	59.28	504.00	64.76	.00	64.89	5.88	2.88	174.97	207
	15500.000	400.00	.00	.00	59.48	504.00	64.99	.00	65.12	5.71	2.85	176.89	210
	15900.000	400.00	.00	.00	59.68	504.00	65.22	.00	65.34	5.59	2.83	178.34	213
	16300.000	400.00	.00	.00	59.88	504.00	65.44	.00	65.57	5.49	2.81	179.55	215
	16670.000	370.00	.00	.00	60.07	504.00	65.70	.00	65.82	8.73	2.75	183.28	176
*	16719.000	49.00	.00	.00	60.09	504.00	65.76	.00	66.03	18.43	4.14	121.74	117
*	16720.000	1.00	.00	.00	63.09	504.00	66.58	66.58	67.87	148.74	9.13	55.19	41
*	16740.000	20.00	.00	.00	63.10	504.00	68.49	.00	68.62	10.70	2.97	169.89	154
	16741.000	1.00	.00	.00	63.10	504.00	68.49	.00	68.62	6.32	2.96	170.32	200
	17180.000	439.00	.00	.00	63.32	504.00	68.76	.00	68.90	6.06	2.91	172.99	204
	17390.000	210.00	.00	.00	63.43	504.00	68.93	.00	69.06	9.73	2.86	176.01	161
*	17439.000	49.00	.00	.00	63.45	504.00	69.00	.00	69.28	20.24	4.29	117.60	112
*	17440.000	1.00	.00	.00	66.45	504.00	69.94	69.94	71.23	148.72	9.13	55.19	41
*	17460.000	20.00	.00	.00	66.46	504.00	71.85	.00	71.98	10.70	2.97	169.88	154
	17461.000	1.00	.00	.00	66.46	504.00	71.85	.00	71.98	6.32	2.96	170.31	200
	17780.000	319.00	.00	.00	66.62	504.00	72.05	.00	72.18	6.14	2.93	172.22	203
	18180.000	400.00	.00	.00	66.82	504.00	72.30	.00	72.43	6.29	2.94	171.14	200
	18590.000	410.00	.00	.00	67.03	504.00	72.63	.00	72.75	8.99	2.78	181.24	166
*	18639.000	49.00	.00	.00	67.05	504.00	72.69	.00	72.96	18.92	4.18	120.58	113

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01
*	18640.000	1.00	.00	.00	70.05	504.00	73.54	73.54	74.83	148.74	9.13	55.19	41.
*	18660.000	20.00	.00	.00	70.06	504.00	75.45	.00	75.58	10.70	2.97	169.89	154.
	18661.000	1.00	.00	.00	70.06	504.00	75.45	.00	75.58	6.32	2.96	170.32	200.
	18920.000	259.00	.00	.00	70.19	504.00	75.61	.00	75.75	6.18	2.93	171.82	202.
	19270.000	350.00	.00	.00	70.37	504.00	75.83	.00	75.96	5.98	2.90	173.89	206.
	19630.000	360.00	.00	.00	70.55	504.00	76.11	.00	76.23	9.30	2.82	179.00	165.
*	19679.000	49.00	.00	.00	70.57	504.00	76.17	.00	76.45	19.47	4.22	119.30	114.
*	19680.000	1.00	.00	.00	73.57	504.00	77.06	77.06	78.35	148.73	9.13	55.19	41.
*	19700.000	20.00	.00	.00	73.58	504.00	78.97	.00	79.10	10.70	2.97	169.89	154.
	19701.000	1.00	.00	.00	73.58	504.00	78.97	.00	79.10	6.32	2.96	170.32	200.
	20050.000	349.00	.00	.00	73.76	504.00	79.19	.00	79.32	6.14	2.93	172.15	203.
	20450.000	400.00	.00	.00	73.96	504.00	79.43	.00	79.56	5.90	2.88	174.79	207.
	20850.000	400.00	.00	.00	74.16	504.00	79.67	.00	79.80	5.72	2.85	176.77	210.
	21150.000	400.00	.00	.00	74.30	504.00	79.36	.00	80.08	8.52	2.73	184.91	172.
	21199.000	49.00	.00	.00	74.33	504.00	80.02	.00	80.27	17.35	4.02	125.48	121.
*	21200.000	1.00	.00	.00	77.33	504.00	80.82	80.82	82.11	148.73	9.13	55.19	41.
*	21220.000	20.00	.00	.00	77.34	504.00	82.73	.00	82.86	10.70	2.97	169.89	154.
	21221.000	1.00	.00	.00	77.34	504.00	82.73	.00	82.86	6.32	2.96	170.32	200.
	21550.000	329.00	.00	.00	77.51	504.00	82.94	.00	83.07	6.16	2.93	172.02	203.
	21950.000	400.00	.00	.00	77.71	504.00	83.18	.00	83.31	5.91	2.89	174.67	207.
	22250.000	300.00	.00	.00	77.86	504.00	83.41	.00	83.53	9.25	2.81	179.32	165.
	22299.000	49.00	.00	.00	77.88	504.00	83.47	.00	83.74	18.84	4.12	122.19	116.
*	22300.000	1.00	.00	.00	80.88	504.00	84.37	84.37	85.66	148.74	9.13	55.19	41
*	22320.000	20.00	.00	.00	80.89	504.00	86.28	.00	86.41	10.70	2.97	169.89	154
	22321.000	1.00	.00	.00	80.89	504.00	86.28	.00	86.41	6.32	2.96	170.32	200.
	22710.000	389.00	.00	.00	81.09	504.00	86.52	.00	86.66	6.12	2.92	172.41	203.

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.0
	23010.000	300.00	.00	.00	81.23	504.00	86.76	.00	86.89	9.48	2.84	177.70	163.
*	23059.000	49.00	.00	.00	81.26	504.00	86.83	.00	87.11	19.95	4.26	118.24	112.
*	23060.000	1.00	.00	.00	84.26	504.00	87.76	87.76	89.07	148.96	9.17	54.98	41.
*	23080.000	20.00	.00	.00	84.27	504.00	89.69	.00	89.82	10.41	2.94	171.64	156.
	23081.000	1.00	.00	.00	84.27	504.00	89.69	.00	89.82	6.15	2.93	172.08	203.
	23181.000	100.00	.00	.00	84.32	504.00	89.75	.00	89.89	6.12	2.92	172.37	203.
	23282.000	101.00	.00	.00	84.37	504.00	89.82	.00	89.95	6.06	2.91	173.01	204.
*	23556.000	50.29	.00	.00	84.27	504.00	89.80	.00	89.99	1.65	3.52	143.34	391.
*	23686.000	120.00	94.27	87.27	87.27	504.00	91.72	.00	92.33	6.00	6.28	80.20	205.
	23720.000	34.00	.00	.00	87.35	504.00	92.20	.00	92.40	10.15	3.53	142.82	158.
	24200.000	480.00	.00	.00	87.57	504.00	92.67	.00	92.84	8.13	3.25	155.15	176
	24650.000	450.00	.00	.00	87.81	504.00	93.03	.00	93.18	7.32	3.12	161.31	186.
	25147.000	497.00	.00	.00	88.01	504.00	93.39	.00	93.53	6.41	2.97	169.47	199.
	25148.000	1.00	.00	.00	88.06	504.00	93.39	.00	93.53	11.23	3.02	166.86	150.
	25199.000	51.00	.00	.00	88.08	504.00	93.40	.00	93.62	16.91	3.77	133.57	122.
*	25200.000	1.00	.00	.00	91.08	504.00	94.91	94.91	96.46	159.93	9.97	50.55	39.
*	25220.000	20.00	.00	.00	91.09	504.00	96.52	.00	96.65	10.36	2.93	171.94	156
	25221.000	1.00	.00	.00	91.09	504.00	96.52	.00	96.65	6.12	2.92	172.45	203.
	25650.000	429.00	.00	.00	91.31	504.00	96.78	.00	96.91	5.94	2.89	174.32	206.
*	25700.000	50.00	.00	.00	91.33	504.00	96.74	.00	96.97	2.01	3.85	130.91	355
*	26003.000	303.18	102.33	95.27	95.27	504.00	99.78	.00	100.37	5.78	6.20	81.25	209
*	26103.000	100.00	.00	.00	95.32	504.00	100.33	.00	100.50	14.84	3.35	150.42	130
*	26203.000	100.00	.00	.00	100.00	504.00	101.34	101.34	101.98	168.86	6.42	78.48	33

RITTENHOUSE CHANNEL NO.

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	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	725.000	1047.00	18.71	.00	.00	.00	88.46	.00
	799.000	1047.00	18.73	.00	.02	.00	73.19	74.00
*	800.000	1047.00	18.73	.00	.00	.00	47.47	1.00
*	820.000	1047.00	19.05	.00	.32	.00	88.21	20.00
	821.000	1047.00	19.05	.00	.00	.00	88.21	1.00
	1100.000	1047.00	19.16	.00	.12	.00	88.01	279.00
	1364.000	1047.00	19.27	.00	.11	.00	87.85	264.49
	1511.000	1047.00	19.34	.00	.06	.00	87.72	147.61
	1545.000	1047.00	19.35	.00	.01	.00	87.76	33.66
	1691.000	1047.00	19.41	.00	.06	.00	87.63	147.61
	1935.000	1047.00	19.52	.00	.11	.00	87.59	243.63
	1945.000	1047.00	19.57	.00	.05	.00	90.22	10.00
*	1999.000	1047.00	19.61	.00	.04	.00	54.96	54.10
*	2000.000	1047.00	19.61	.00	.00	.00	31.87	1.00
*	2020.000	1047.00	21.65	.00	2.04	.00	88.20	20.00
	2021.000	1047.00	21.65	.00	.00	.00	88.31	1.00
	2135.000	1047.00	21.70	.00	.05	.00	88.23	113.47
	2168.000	1047.00	21.71	.00	.01	.00	88.03	33.66
	2315.000	1047.00	21.78	.00	.06	.00	87.96	147.61
	2634.000	1047.00	21.91	.00	.14	.00	87.84	319.16
	2645.000	1047.00	21.96	.00	.05	.00	90.47	11.00
*	2699.000	1047.00	22.00	.00	.04	.00	55.12	54.00
*	2700.000	1047.00	22.68	.00	.68	.00	31.73	1.00
*	2720.000	1047.00	25.14	.00	2.46	.00	89.25	20.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	2721.000	1047.00	25.14	.00	.00	.00	89.39	1.00
	3150.000	1047.00	25.30	.00	.16	.00	88.92	429.00
	3580.000	1047.00	25.46	.00	.17	.00	88.49	430.00
	3590.000	1047.00	25.51	.00	.04	.00	90.89	10.00
*	3639.000	1047.00	25.54	.00	.03	.00	55.43	49.00
*	3640.000	1047.00	26.15	.00	.60	.00	31.73	1.00
*	3660.000	1047.00	28.61	.00	2.46	.00	89.25	20.00
	3661.000	1047.00	28.61	.00	.00	.00	89.39	1.00
	3934.000	1047.00	28.71	.00	.10	.00	89.03	273.00
	4100.000	1047.00	28.78	.00	.07	.00	59.37	166.00
*	4106.000	1047.00	29.90	.00	1.12	.00	52.78	5.78
*	4185.000	1047.00	30.10	.00	.20	.00	52.78	79.46
	4190.000	1047.00	31.84	.00	1.74	.00	62.80	5.00
	4250.000	1047.00	31.90	.00	.06	.00	86.79	40.00
	4563.000	804.00	32.12	.00	.22	.00	72.90	431.51
	4768.000	804.00	32.22	.00	.09	.00	72.88	204.64
	4901.000	804.00	32.28	.00	.06	.00	73.19	133.51
	5200.000	804.00	32.42	.00	.14	.00	72.71	299.00
	5520.000	804.00	32.57	.00	.15	.00	72.59	320.00
	5530.000	804.00	32.62	.00	.06	.00	75.55	10.00
	5579.000	804.00	32.66	.00	.04	.00	48.54	49.00
*	5580.000	804.00	33.31	.00	.65	.00	25.64	1.00
*	5600.000	804.00	35.68	.00	2.37	.00	73.22	20.00
	5601.000	804.00	35.68	.00	.00	.00	73.29	1.00
	6000.000	804.00	35.86	.00	.18	.00	73.06	399.00
	6400.000	804.00	36.05	.00	.18	.00	72.92	400.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	6800.000	804.00	36.23	.00	.19	.00	72.81	400.00
	7040.000	804.00	36.34	.00	.11	.00	72.75	240.00
	7050.000	804.00	36.40	.00	.06	.00	75.65	10.00
	7099.000	804.00	36.44	.00	.03	.00	48.60	49.00
*	7100.000	804.00	37.07	.00	.63	.00	25.64	1.00
*	7120.000	804.00	39.44	.00	2.37	.00	73.17	20.00
	7121.000	804.00	39.44	.00	.00	.00	73.24	1.00
	7500.000	804.00	39.61	.00	.17	.00	73.03	379.00
	7900.000	804.00	39.79	.00	.18	.00	72.89	400.00
	7910.000	804.00	39.85	.00	.06	.00	75.75	10.00
	7959.000	804.00	39.88	.00	.03	.00	48.67	49.00
*	7960.000	804.00	40.50	.00	.62	.00	25.64	1.00
*	7980.000	804.00	42.87	.00	2.37	.00	73.17	20.00
	7981.000	804.00	42.87	.00	.00	.00	73.24	1.00
	8450.000	804.00	43.08	.00	.21	.00	72.95	469.00
	8900.000	804.00	43.29	.00	.21	.00	72.84	450.00
	8910.000	804.00	43.34	.00	.06	.00	75.73	10.00
	8959.000	804.00	43.38	.00	.03	.00	53.63	49.00
*	8960.000	804.00	44.00	.00	.62	.00	25.64	1.00
*	8980.000	804.00	46.37	.00	2.37	.00	73.17	20.00
	8981.000	804.00	46.37	.00	.00	.00	73.24	1.00
	9350.000	804.00	46.53	.00	.17	.00	72.99	369.00
	9725.000	804.00	46.71	.00	.17	.00	72.92	375.00
	10100.000	804.00	46.88	.00	.17	.00	72.80	375.00
	10110.000	804.00	46.94	.00	.06	.00	75.68	10.00
	10159.000	804.00	46.97	.00	.03	.00	48.83	49.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	10160.000	804.00	47.80	.00	.63	.00	25.64	1.00
*	10180.000	804.00	49.97	.00	2.37	.00	73.17	20.00
	10181.000	804.00	49.97	.00	.00	.00	73.24	1.00
	10462.000	804.00	50.09	.00	.13	.00	73.07	281.00
	10687.000	804.00	49.97	.00	-.12	.00	26.99	225.00
	10777.000	804.00	52.20	.00	2.23	.00	26.99	90.00
*	10834.000	804.00	52.83	.00	.62	.00	69.50	56.53
	11148.000	804.00	53.08	.00	.25	.00	70.27	314.00
*	11373.000	804.00	53.03	.00	-.05	.00	26.99	224.87
	11481.000	804.00	53.56	.00	.53	.00	26.99	108.07
*	11509.000	804.00	53.98	.00	.41	.00	70.54	28.00
	11581.000	804.00	54.02	.00	.05	.00	75.36	72.00
*	11681.000	504.00	54.05	.00	.03	.00	53.83	100.00
	12020.000	504.00	54.26	.00	.21	.00	54.15	356.76
	12370.000	504.00	54.52	.00	.26	.00	54.77	350.00
*	12419.000	504.00	54.58	.00	.06	.00	32.77	49.00
*	12420.000	504.00	55.43	.00	.85	.00	21.63	1.00
*	12440.000	504.00	57.34	.00	1.91	.00	53.09	20.00
	12441.000	504.00	57.34	.00	.00	.00	53.15	1.00
	12730.000	504.00	57.52	.00	.18	.00	53.37	289.00
	13030.000	504.00	57.76	.00	.24	.00	54.03	300.00
*	13079.000	504.00	57.83	.00	.07	.00	32.45	49.00
*	13080.000	504.00	58.76	.00	.93	.00	21.63	1.00
*	13100.000	504.00	60.67	.00	1.91	.00	53.16	20.00
	13101.000	504.00	60.67	.00	.00	.00	53.23	1.00
	13480.000	504.00	60.90	.00	.23	.00	53.48	379.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	13880.000	504.00	61.15	.00	.24	.00	53.84	400.00
	14290.000	504.00	61.46	.00	.31	.00	54.62	410.00
*	14339.000	504.00	61.52	.00	.06	.00	32.70	49.00
*	14340.000	504.00	62.39	.00	.87	.00	21.63	1.00
*	14360.000	504.00	64.30	.00	1.91	.00	53.09	20.00
	14361.000	504.00	64.30	.00	.00	.00	53.15	1.00
	14700.000	504.00	64.51	.00	.21	.00	53.46	339.00
	15100.000	504.00	64.76	.00	.24	.00	53.85	400.00
	15500.000	504.00	64.99	.00	.23	.00	54.13	400.00
	15900.000	504.00	65.22	.00	.23	.00	54.35	400.00
	16300.000	504.00	65.44	.00	.22	.00	54.52	400.00
	16670.000	504.00	65.70	.00	.26	.00	55.07	370.00
*	16719.000	504.00	65.76	.00	.06	.00	32.92	49.00
*	16720.000	504.00	66.58	.00	.82	.00	21.63	1.00
*	16740.000	504.00	68.49	.00	1.91	.00	53.09	20.00
	16741.000	504.00	68.49	.00	.00	.00	53.15	1.00
	17180.000	504.00	68.76	.00	.28	.00	53.55	439.00
	17390.000	504.00	68.93	.00	.17	.00	54.00	210.00
*	17439.000	504.00	69.00	.00	.07	.00	32.40	49.00
*	17440.000	504.00	69.94	.00	.94	.00	21.63	1.00
*	17460.000	504.00	71.85	.00	1.91	.00	53.09	20.00
	17461.000	504.00	71.85	.00	.00	.00	53.15	1.00
	17780.000	504.00	72.05	.00	.20	.00	53.44	319.00
	18180.000	504.00	72.30	.00	.25	.00	53.84	400.00
	18590.000	504.00	72.63	.00	.33	.00	54.77	410.00
*	18639.000	504.00	72.69	.00	.06	.00	32.77	49.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	18640.000	504.00	73.54	.00	.85	.00	21.63	1.00
*	18660.000	504.00	75.45	.00	1.91	.00	53.09	20.00
	18661.000	504.00	75.45	.00	.00	.00	53.15	1.00
	18920.000	504.00	75.61	.00	.16	.00	53.38	259.00
	19270.000	504.00	75.83	.00	.22	.00	53.69	350.00
	19630.000	504.00	76.11	.00	.28	.00	54.44	360.00
*	19679.000	504.00	76.17	.00	.06	.00	32.62	49.00
*	19680.000	504.00	77.06	.00	.89	.00	21.63	1.00
*	19700.000	504.00	78.97	.00	1.91	.00	53.09	20.00
	19701.000	504.00	78.97	.00	.00	.00	53.15	1.00
	20050.000	504.00	79.19	.00	.22	.00	53.43	349.00
	20450.000	504.00	79.43	.00	.25	.00	53.82	400.00
	20850.000	504.00	79.67	.00	.24	.00	54.11	400.00
	21150.000	504.00	79.86	.00	.29	.00	55.30	400.00
	21199.000	504.00	80.02	.00	.06	.00	34.10	49.00
*	21200.000	504.00	80.82	.00	.80	.00	21.63	1.00
*	21220.000	504.00	82.73	.00	1.91	.00	53.09	20.00
	21221.000	504.00	82.73	.00	.00	.00	53.15	1.00
	21550.000	504.00	82.94	.00	.21	.00	53.41	329.00
	21950.000	504.00	83.18	.00	.25	.00	53.80	400.00
	22250.000	504.00	83.41	.00	.23	.00	54.49	300.00
	22299.000	504.00	83.47	.00	.06	.00	33.69	49.00
*	22300.000	504.00	84.37	.00	.90	.00	21.63	1.00
*	22320.000	504.00	86.28	.00	1.91	.00	53.09	20.00
	22321.000	504.00	86.28	.00	.00	.00	53.15	1.00
	22710.000	504.00	86.52	.00	.25	.00	53.47	389.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	23010.000	504.00	86.76	.00	.24	.00	54.85	300.00
*	23059.000	504.00	86.83	.00	.07	.00	32.48	49.00
*	23060.000	504.00	87.76	.00	.94	.00	21.39	1.00
*	23080.000	504.00	89.69	.00	1.33	.00	53.35	20.00
	23081.000	504.00	89.69	.00	.00	.00	53.42	1.00
	23181.000	504.00	89.75	.00	.06	.00	53.46	100.00
	23282.000	504.00	89.82	.00	.06	.00	53.55	101.00
*	23556.000	504.00	89.80	.00	-.02	.00	41.85	50.29
*	23686.000	504.00	91.72	.00	1.92	.00	18.06	120.00
	23720.000	504.00	92.20	.00	.49	.00	48.84	34.00
	24200.000	504.00	92.67	.00	.47	.00	50.82	480.00
	24650.000	504.00	93.03	.00	.36	.00	51.78	450.00
	25147.000	504.00	93.39	.00	.36	.00	53.02	497.00
	25148.000	504.00	93.39	.00	.00	.00	52.63	1.00
	25199.000	504.00	93.40	.00	.01	.00	40.22	51.00
*	25200.000	504.00	94.91	.00	1.51	.00	16.39	1.00
*	25220.000	504.00	96.52	.00	1.60	.00	53.39	20.00
	25221.000	504.00	96.52	.00	.00	.00	53.47	1.00
	25650.000	504.00	96.78	.00	.26	.00	53.75	429.00
*	25700.000	504.00	96.74	.00	-.03	.00	38.35	50.00
*	26003.000	504.00	99.78	.00	3.03	.00	18.06	303.18
*	26103.000	504.00	100.33	.00	.55	.00	50.07	100.00
*	26203.000	504.00	101.34	.00	1.01	.00	61.96	100.00

SUMMARY OF ERRORS AND SPECIAL NOTES

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WARNING SECNO=   800.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   820.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  1999.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  2000.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  2020.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  2699.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  2700.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  2700.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  2720.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  3633.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  3640.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  3640.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  3660.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  4106.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  4106.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=  4106.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=  4185.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  4185.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=  5580.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  5580.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  5600.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  7100.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  7100.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  7120.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  7960.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  7960.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  7980.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  8960.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  8960.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  8980.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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CAUTION SECNO=  10160.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  10160.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  10180.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  10834.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  11373.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  11509.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  11681.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  12419.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  12420.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  12420.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  12440.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  13079.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  13080.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  13080.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  13100.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  14339.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  14340.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  14340.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  14360.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  16719.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  16720.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  16720.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  16740.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  17439.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  17440.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  17440.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  17460.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  18639.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  18640.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  18640.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  18660.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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WARNING SECNO=  19679.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  19680.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  19680.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  19700.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  21200.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  21200.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  21220.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  22300.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  22300.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  22320.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  23059.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  23060.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  23060.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=  23080.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  23556.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  23666.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  25200.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  25200.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=  25200.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=  25220.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  25700.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  26003.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  26103.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  26203.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  26203.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=  26203.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
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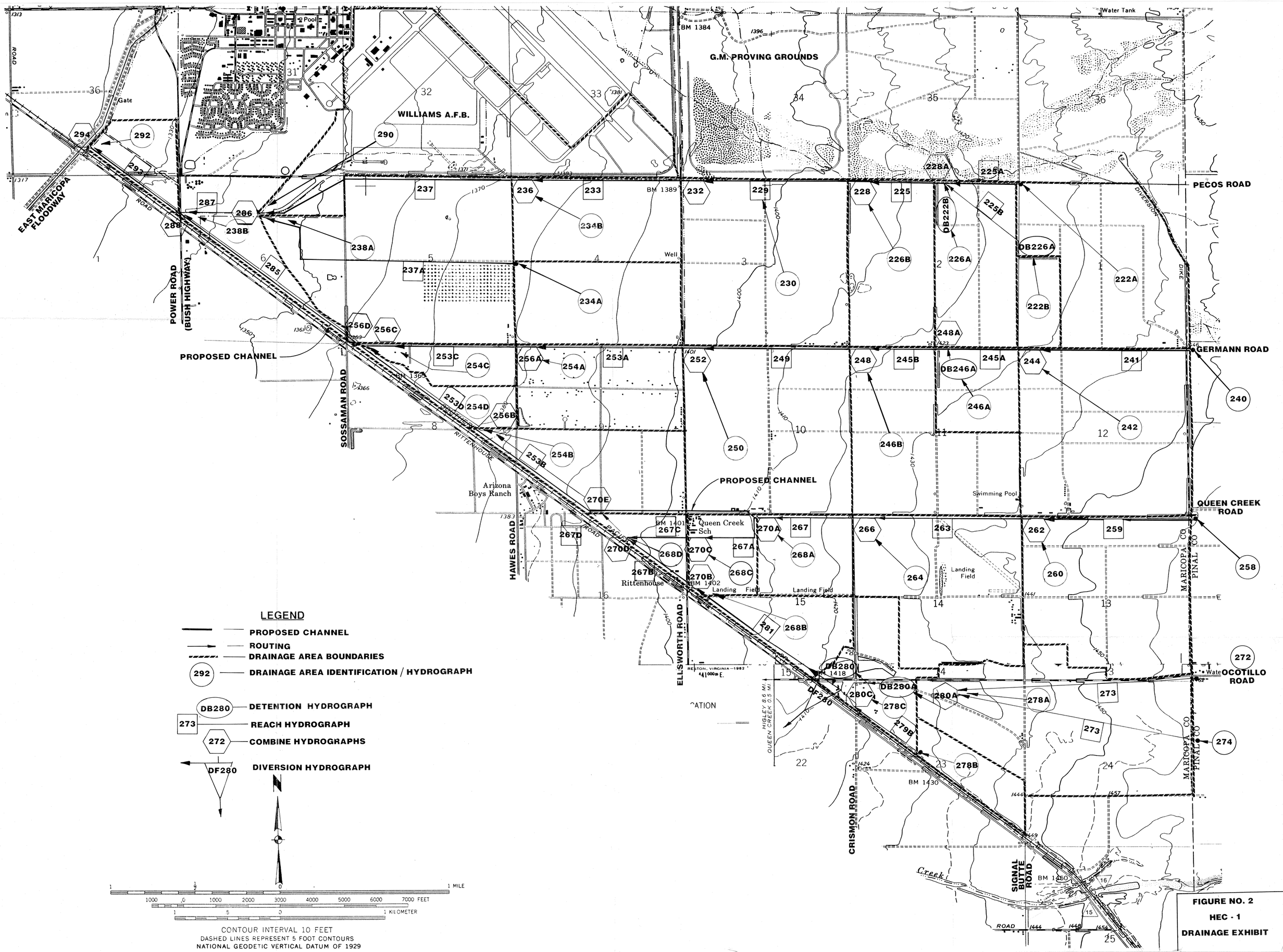

LEGEND

- PROPOSED CHANNEL
- ROUTING
- DRAINAGE AREA BOUNDARIES
- 292 — DRAINAGE AREA IDENTIFICATION / HYDROGRAPH
- DB280 — DETENTION HYDROGRAPH
- 273 — REACH HYDROGRAPH
- 272 — COMBINE HYDROGRAPHS
- DF280 — DIVERSION HYDROGRAPH

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT 5 FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

FIGURE NO. 2
HEC - 1
DRAINAGE EXHIBIT