Delineation of Spillway Flows for Dreamy Draw Dam FCD 98-16

Flood Control District of Maricopa County

Kimley-Horn and Associates, Inc.
June, 1999
KHA Project No. 091131.01

Kimley-Horn
and Associates, Inc.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24767
ROBERT A.
EICHINGER
DATE SIGNED June 3, 1999
ARIZONA U.S.A.

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Registered Professional Engineer (Civil) CERTIFICATE NO. 24767 ROBERT A. EICHINGER DATE SIGNED June 3, 1999 ARIZONA, U.S.A.

1.0 Introduction

In September, 1998, the Flood Control District of Maricopa County (FCD) contracted with Kimley-Horn and Associates, Inc., under FCD 98-16, to provide a spillway flow inundation study pertinent to the Dreamy Draw Dam. Dreamy Draw Dam was constructed by the U.S. Army Corps of Engineers in 1973 and is owned, operated, and maintained by the District. The Dam is located in the Dreamy Draw Dam Recreational Area in the Phoenix Mountain Preserve. Figure 1 is a Vicinity Map that provides the location of Dreamy Draw Dam, the principal and emergency spillway, reservoir pool area, and the approximate study limits.

The study consists of the following flow scenarios:

1. Full probable maximum flood discharge through the emergency spillway of 6,000 cfs;
2. Two-thirds probable maximum flood discharge through the emergency spillway of 4,000 cfs;
3. One-third probable maximum flood discharge through the emergency spillway of 2,000 cfs;

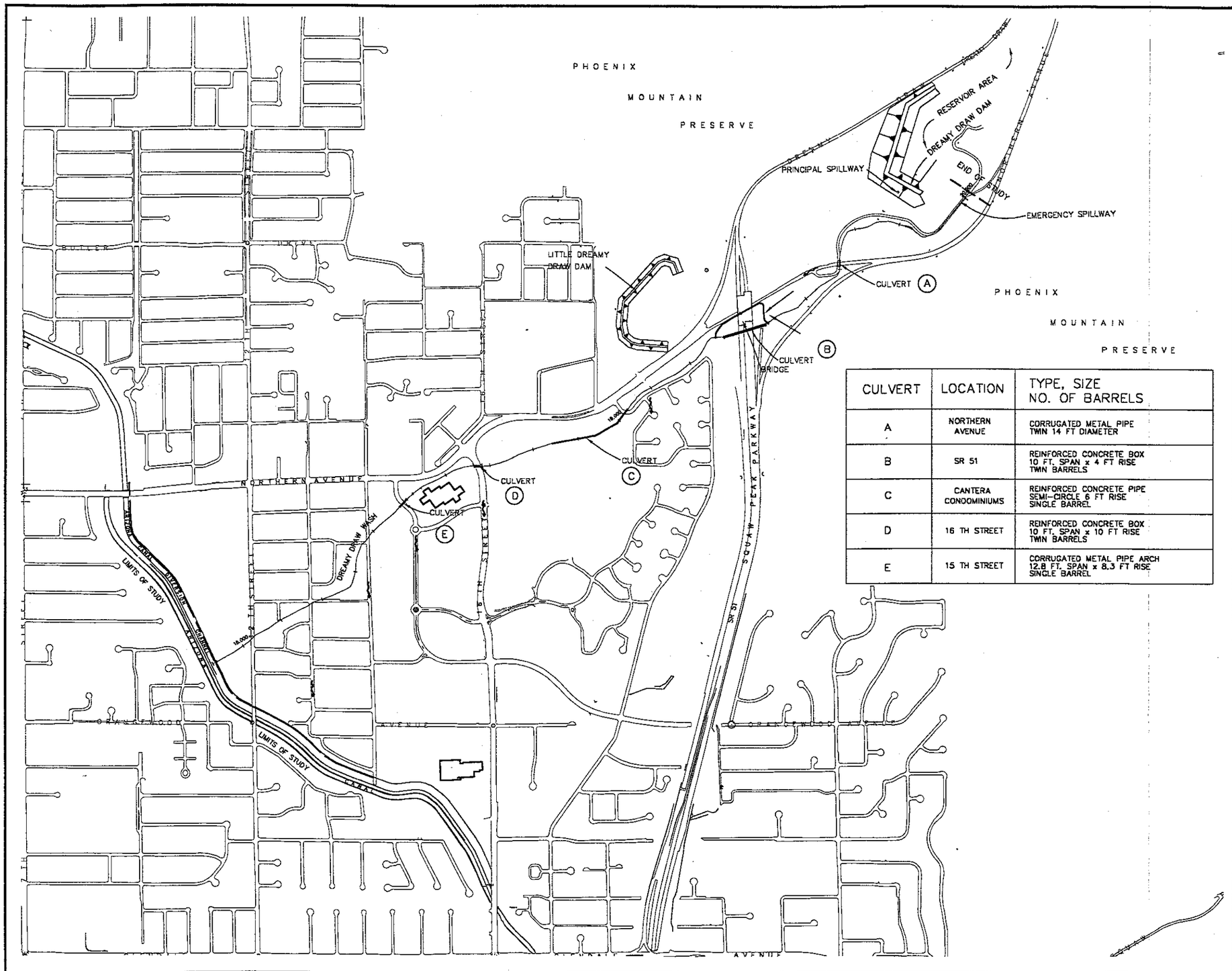
2.0 Purpose

The primary purpose of the analyses was to determine the inundation limits of various emergency spillway discharges at Dreamy Draw Dam. The study results will provide information on velocities, depths of flow, and travel time for the various discharges. The data will provide useful planning information for emergency management services, flood warning, and floodplain management.

3.0 Data Collection

Data was collected from several sources including the District, City of Phoenix, Arizona Department of Transportation (ADOT), and from a field reconnaissance trip. The data collected from these sources provided the base of information needed to conduct this study. The majority of the data regarding the dam was collected from the District. Information regarding State Route 51 bridge over Northern Avenue was collected from field surveys and obtaining record drawings of the bridge from ADOT. Northern Avenue record drawings were obtained from the City of Phoenix. A complete record inventory of the data collected for this study is provided in Appendix A.

The field reconnaissance provided a project site overview and the base data used to develop Manning's roughness coefficients ("n" values) for the main channel of Dreamy Draw wash and the overbank areas. Photographs representing the site conditions and vegetation are provided in Appendix B.



CULVERT	LOCATION	TYPE, SIZE NO. OF BARRELS
A	NORTHERN AVENUE	CORRUGATED METAL PIPE TWIN 14 FT DIAMETER
B	SR 51	REINFORCED CONCRETE BOX 10 FT. SPAN x 4 FT RISE TWIN BARRELS
C	CANTERA CONDOMINIUMS	REINFORCED CONCRETE PIPE SEMI-CIRCLE 6 FT RISE SINGLE BARREL
D	16 TH STREET	REINFORCED CONCRETE BOX 10 FT. SPAN x 10 FT RISE TWIN BARRELS
E	15 TH STREET	CORRUGATED METAL PIPE ARCH 12.8 FT. SPAN x 8.3 FT RISE SINGLE BARREL

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FOR

DREAMY DRAW DAM

F.C.D. CONTRACT NO. **98-16**

LEGEND

NOTES

Kimley-Horn and Associates, Inc.

	BY	DATE
DESIGN	JTA	6/2/99
DESIGN CHK.	RAE	6/2/99
PLANS	JTA	6/2/99
PLANS CHK.		

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

FIGURE 1

TOPOGRAPHY PROVIDED BY:
KAMINSKI, HUBBARD ENGINEERING, INC.
DATE FLOWN: 11/15/1990

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1"= 400' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY KAMINSKI, HUBBARD ENGINEERING, INC.

The District conducted a review of KHA's draft field reconnaissance report and initial Manning's roughness coefficients. The District's comments were reviewed with KHA and incorporate into the final field reconnaissance report contained in Appendix B.

4.0 Mapping

Mapping was provided for this study by the FCD in the form of AutoCad Format digital files. The original source of this mapping was the 1991 Arizona Canal Diversion Channel (ACDC) Area Drainage Master Study conducted by Kaminski-Hubbard under contract FCD 90-19. The original data was developed at a scale of 1-inch equals 400-feet with a contour interval of 2-feet.

5.0 Flow Discharges

The District provided flow discharges used in the analyses. The full probable maximum flood spillway discharge is 5,900 cubic feet per second (cfs). For the purposes of this study and development of inundation limits, the District and KHA rounded the full PMF outflow to 6,000 cfs. The two other flow discharges modeled in this study were the two-thirds PMF and the one-third PMF, which is 4,000 cfs an 2,000 cfs, respectively.

6.0 Study Reach

The study reach is essentially Dreamy Draw Wash from the crest of the Dreamy Draw Dam emergency spillway crest to the ACDC. Figure 1 show the location of Dreamy Draw Wash from the dam to the ACDC.

7.0 Description of Inundation Area

The inundation area can be divided into two reaches. The upstream reach is the portion of Dreamy Draw Wash upstream from the Squaw Peak Parkway. The downstream reach is the portion of Dreamy Draw Wash downstream from the Squaw Peak Parkway. The upstream reach is within the Phoenix Mountain Preserve. This area is fairly mountainous, consisting of rocky slopes vegetated with desert shrubs and cacti. The wash channel within this reach is fairly well defined.

The downstream reach is within a totally urbanized area that consists of local arterial streets, private residences, apartments, condominiums, nursing home, office complexes, and strip malls. A major resort, the Pointe at Squaw Peak, is located near the study area.

Located just northwest of the SR 51 interchange at Northern Avenue is a small earthen fill dam called the Little Dreamy Draw Dam. The dam, reservoir, and emergency spillway are located within the Phoenix Mountain Preserve. Discussions with the Parks and Recreation Department of the City of Phoenix indicate that the Soils Conservation Service (now the Natural Resources

Conservation Service) probably constructed the dam. The Parks Department owns and maintains the dam and they do not have design/record drawings of the structure. The dam appears not to be an ADWR jurisdictional dam.

Dreamy Draw Wash generally parallels Northern Avenue until it reaches 15th Street where it turns southwest and discharges in to the ACDC. A major channel improvement has been constructed on the wash after the date of the aerial mapping for this project. This modification was the construction a large reinforced concrete pipe arch culvert installed as part of the development of the Cantera condominiums. Another significant improvement conducted within the study area since the date of the aerial mapping was the completion of the ACDC between Dreamy Draw Wash to 16th Street.

8.0 Hydraulic Analyses

The U. S. Army Corps of Engineers HEC-RAS, Version 2.2, with SNET 2.2.1,was used to conduct the hydraulic modeling.

The version of HEC-RAS used for this project supports one-dimensional, steady flow, water surface profile calculations. This version also supports only fixed channel bed conditions and does not have sediment transport capabilities.

8.1 Calibration

Calibration of the HEC-RAS model with historical data is an important part of the model development. The procedure involves adjusting the model parameters until a satisfactory system simulating the observed physical process is obtained which also produces reliable results. A common way in which HEC-RAS model can be calibrated is to use high water marks as a control section for an observed event and adjust the Manning's "n" values to simulate the event. There has been no flow over the spillway since the dam has been constructed and there are no high water marks for such events to calibrate with.

8.2 Cross Section Layout

Cross sections were oriented perpendicular to the anticipated flow paths. Spacing of the cross sections was approximately every 500 feet except where topographical features warranted a deviation of spacing and where bridge/culvert routines are applied. Cross-sections where cut using BOSS-RMS.

8.3 Roughness Characteristics

Manning's 'n' values were determined based on field observations using the "Estimated Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona" manual developed by the U. S. Geological Survey for the District. A separate Manning's 'n' value report is contained in Appendix B.

Characteristic vegetation in the floodplain in the upstream reach includes palo verde, mesquite, and iron wood trees, creosote, and other annual grasses and forbs. Representative photographs of the channel and vegetation for both the upstream and downstream reaches are included in the Manning's 'n' value report.

It is likely in the upstream reach that flow events such as modeled in this study could wash out some of the channel vegetation and carry the debris downstream to the culvert crossing of SR 51 or the Northern Avenue bridge. No investigation of the impacts of debris blockage on the culvert was included as part of this study.

8.4 Main Channel Station Selection

Dreamy Draw Wash within the upstream reach is fairly well defined. In the downstream reach, Dreamy Draw Wash is also well defined even through the lower portions toward the ACDC. Main channel stationing was started at the crest of the emergency spillway of Dreamy Draw Dam with a Station of 20.0 (in river miles). Stationing decreased in the downstream direction toward the sill of the ACDC. Dreamy Draw Wash intercepts the ACDC at Station 17.929. Channel stations were the same for all three flow discharges modeled.

8.5 Ineffective Flow Areas

Horizontal ineffective flow areas were coded using the ineffective flow area option in HEC-RAS. This option was used to eliminate isolated low areas and to model the 1:1 contraction and 4:1 expansion of flows in the vicinity of culverts or bridges.

A vertical ineffective flow area was identified for the small dam at the northwest corner of the SR 51 Interchange. It is KHA's opinion that any storm event that causes flow to discharge from the emergency spillway of Dreamy Draw Dam will also cause the reservoir of this other dam to be full. The watershed area of the smaller dam is adjacent to the watershed for Dream Draw Dam. Therefore, we assumed that the reservoir of the small dam to be full under all three modeling scenarios. The ineffective flow area option of HEC-RAS was used to eliminate vertical ineffective flow areas from the cross-sectional data.

8.6 Split Flow

A split flow condition occurs, under project conditions, at the location of Dreamy Draw Wash just upstream of the State Route 51, or the Squaw Peak Parkway. The Arizona Department of Transportation constructed a twin-barreled box culvert to cross flows in Dreamy Draw Wash under the highway. This box culvert was analyzed and designed by ADOT for the 100-year storm event. The culvert is not capable of handling the entire discharge flow modeled in this study. Consequently, flow splits from Dreamy Draw Wash on the upstream side of the culvert. The split flow breaks north toward the Northern Avenue bridge, turns west under the bridge, passes under the bridge, and then spreads downstream of the bridge. A portion of the split rejoins the main channel of the wash and the other portion flows toward the Little Dreamy Draw Dam.

The split flow was modeled using the HEC-RAS stream junction/looped flow procedure. Junctions were located just upstream and downstream of the ADOT culvert. Creating a separate flowpath for flows that pass under the bridge formed the loop. The loop starts at the upstream junction and connects back to the mainstream of Dreamy Draw Wash at the downstream junction. Cross-sections were developed for the loop using BOSS-RMS and a bridge routine incorporated for the Northern Avenue bridge.

The procedure required numerous iterations of HEC-RAS. These iterations were based on determination of the quantity of the flow that is split from the wash to pass under the bridge. For each iteration, the upstream energy grade line (EGL) was reviewed to check if the EGL of the split closely matched. In this fashion the flowrate of the split or looped flow could be determined. This procedure was utilized for all three project discharges at this location. For the purposes, assumptions, and limitations of this study, this procedure is valid.

The above modeling approach assumes that the ADOT SR 51 culvert remains unclogged and the inlet free of debris during the passage of the study flow discharges. This assumption was also made for the other culverts within the study reach (e.g., Old Northern Avenue culvert, Cantera culvert, 16th Street culvert, and the 15th Street culvert). This impacts of this assumption is discussed furthered in Section 10 of this report.

8.7 Dreamy Draw Wash Culverts

Five culverts are located along the study reach for Dreamy Draw Wash. Discounting the principal spillway for Dreamy Draw Dam, these five culverts are listed in Table 1 below.

Table 1. Dreamy Draw Wash Culverts.

Culvert	Location	Type, Size, No. Barrels
A	Old Northern Avenue	Corrugated Metal Pipe Twin 14-ft diameter
B	SR51	Reinforced Concrete Box 10-ft span x 4-ft rise Twin barrels
C	Cantera Condominiums	Reinforced Concrete Pipe Semi-Circular 6-ft rise Single barrel
D	16th Street	Reinforced Concrete Box 10-ft span x 10-ft rise Twin barrels
E	15th Street	Corrugated Metal Pipe Arch 12.8-ft span x 8.3-ft rise Single barrel

9.0 Arizona Canal Diversion Channel

The ACDC is the downstream limit of this study. Dreamy Draw Wash discharges into the ACDC approximately 450-feet southwest of the wash crossing with 12th Street. A discharge structure consisting of a low flow dip section at the ACDC wall accommodates Dreamy Draw Wash discharges.

The scope of this study did not require hydrographs to be routed through the system. Therefore storage conditions behind (north of) the ACDC were not taken into account nor were any taken into account for all the residential block walls adjacent and parallel to the ACDC for the flows modeled in this study.

10.0 Conclusions

Under all three flow discharges modeled, the inundation limits for the upstream portion of the project is very well defined. Flows are fairly well contained within the wash. A split flow condition occurs at SR51 as discussed in Section 8.6 above.

As flow continues past the SR51 bridge and culvert, the ground slope flattens out and the inundation area widens relative to the upstream reach. It is noteworthy to point out that for the one-third spillway discharge the computed water surface elevation just downstream of SR51 is at the same elevation as the local ground topography for the south-to-west ramp of SR51. This is important to state in that the profile of the ramp reflects a break-over point for flow to cross Northern Avenue and continue into the Little Dreamy Draw Dam area. KHA mapped the inundation limits, under this discharge scenario, to include portions of the Little Dreamy Draw Dam and the downstream reach as though the flooding could occur in this area, even though the modeling results indicate this may not occur. The justification for widening the mapping limits is based on the fact that the field conditions modeled in the study reflect a point in time and does not account for changes in hydraulic conditions in Dreamy Draw Wash over time or during flood flow events (i.e., changes in Manning's roughness values; effects of debris buildup on the upstream face of the SR51 culvert, etc.). A sensitivity analysis based on varying Manning's coefficients was not conducted for this discharge scenario since the computed water surface elevations were so close to the break over elevations that any incremental increases in Manning's roughness coefficients would increase the computed water surface. Since the purpose of the study is to map the inundation limits and to use the results for emergency planning purposes it was prudent and conservative to take this approach.

The hydraulic modeling approach for this study assumes that the culverts listed in Section 8.7 above are free of any type of debris and would not become partially or completely blocked with debris during the release of emergency spillway discharges. It is likely, however, that some degree of blockage to the culverts could occur during emergency spillway discharges. It is not possible to predict the amount of blockage for each culvert during each flow event studied. It is, however, qualitatively and quantitatively possible to predict the impact that blockage has on flow patterns/paths, direction of flow, diversions, split flow, flow spreads, and water surface elevations.

A qualitative review of some of the potential consequences and impacts due to debris blockage of culverts was conducted for the flow discharges studied. This review did not discern or predict as to the degree of blockage at each culvert, only what the impacts would be if some degree of blockage were to occur. This review was conducted by increasing the roughness coefficient for each culvert, one at a time, except for the Old Northern Avenue culvert, and then examining the resulting inundation limits for each discharge. For example, the roughness coefficient for the 15th Street culvert was increased to 0.1 (to simulate blockage), the HEC-RAS model run for each of the three discharges, and the resulting inundation limits compared against the original inundation HEC-RAS limits. In general, the inundation limits did widen and spread on the upstream side of the culverts. The widening tapered back to the original limits within 2 to 3 cross sections upstream of the culvert under examination.

Two culverts are located in the upstream reach of this study – Old Northern Avenue culvert and the SR51 culvert. Section 7.0 briefly described the watershed characteristics for this upstream reach. What is noteworthy is that the upper reach of Dreamy Draw Wash is lined, along it's banks, with live and dead stands of medium sized trees and shrubs. Along with wash sediment, this vegetation would be the primary type of debris that could cause these two culverts to become partially blocked to the passage of flow. The SR51 culvert would be more susceptible to debris blockage than the Old Northern Avenue culvert given the differences in sizes of the culverts and the type of debris anticipated. It is not likely that total blockage would occur for both culverts, especially the Old Northern Avenue culvert.

The hydraulic results indicate that overtopping of the Old Northern Avenue culvert occurs for the two-thirds and full spillway discharges (under non-blocked conditions). Some of the overtopping flow, from examination of the local topography and computed water surfaces, has the potential to break out from the wash and flow west on Northern Avenue toward the Squaw Peak Parkway. The amount of flow split out from the overtopped flow was not determined as part of this study. If the Old Northern Avenue culvert were to become partially blocked during a spillway release, a greater amount of flow could be diverted from the overtopped conditions. Depending on the degree of blockage and the amount of backwater, the one-third spillway discharge flow may overtop the Old Northern Avenue culvert. In any result and condition regarding overtopping, the diverted flow would rejoin with flows from Dreamy Draw Wash at the upstream side of SR51.

The more likely culvert to become partially blocked with debris is the SR51 culvert. The reach of Dreamy Draw Wash between SR51 and the Old Northern Avenue has a relatively higher density of vegetation. Given the smaller size opening of the SR51 culvert and the size of the vegetation, the potential exists for some degree of debris blockage to this culvert. The impact would be to divert a greater amount of flow to the SR51/Northern Avenue bridge under the blocked conditions than under the non-blocked flow conditions. The inundation limits would increase as a result, depths of flow under the bridge would increase, and the amount of flow through the culvert would decrease. The potential exists, on the downstream side of SR51, that a greater amount of flow would cross over Northern Avenue and flow toward the Little Dreamy Draw Dam and move the mapped inundation limits northward.

The impact of blockage to the Cantera culvert would depend on the degree of blockage, the discharge, and the resulting backwater effects. Should the resulting backwater be significant enough, under the two-thirds and full spillway discharges, there is a potential for flow to break out of the wash between cross sections 19.174 to 19.643. The flow that breaks out could be diverted south most likely as shallow sheet flow. The quantity of flow that breaks out was not determined as part of this study.

The impacts of debris blockage on the 16th and 15th Street culverts are similar in effect. The potential exists that for the flows that overtop these culverts, a portion could be diverted south along the streets. The depths of flow would most likely be shallow and the spread of flow would broaden the further south the flow goes toward the ACDC.

The potential and possibility exists that the street system, between 12th Street and 16th Street, could divert some flow to the south toward the ACDC. The street system for 12th, 13th, 14th, 15th, and 16th streets is such that these streets are oriented north-south and are sloped generally southward. Discharges that cross these streets in Dreamy Draw Wash could potentially have some diverted flows. The quantity of these diverted flows were not determined as part of this study. Flow arrows indicating potential diversions have been provided on the Exhibits in Appendix D.

It is important to reiterate an important modeling assumption to clarify what the distribution of flow reflects in the field. The study assumes that a single storm event produces the flow discharges used on Dreamy Draw Wash also produces flow in the Little Dreamy Draw Dam watershed because of the close proximity of the two watersheds to each other and the similar watershed sizes and hydrologic characteristics. Although this study is not evaluating or examining emergency spillway discharges from Little Dreamy Draw Dam and it's impacts, the study assumes that the reservoir of this dam is full of stormwater to the level of the dam crest and there is no discharge from either the principal or emergency spillway. This assumption is valid and conservative in that storage is being made unavailable in Little Dreamy Dam reservoir and making the reservoir area ineffective to flow for hydraulic modeling purposes. Hence, for the purposes of this study, there is more than likely to be some flow contributing to the project area from the Little Dreamy Draw watershed and some flows to occur in the Little Dreamy Draw Wash and it's overbank areas. The study did not conduct, nor does the scope require, an investigation of coincident events, peaks, or discharges from both watersheds.

An examination of the flow as it passes west under the SR 51 bridge indicates that the discharge spreads out and flows (northwesterly) toward the Little Dreamy Draw Dam and flows (southwesterly) back toward Dreamy Draw Wash. A high point in Northern Avenue west of the bridge and the low exit ramp profile provide for this flow distribution. The field reconnaissance walk confirmed the possibility of this flow distribution.

The cross section limits includes both the Little Dreamy Draw Wash and Little Dreamy Draw Dam. Because of the flow spread of the spillway discharges from Dreamy Draw Dam and the likelihood of contributing, but unknown quantity or distribution of, flow from Little Dreamy Draw Dam, that the northern boundary of the study inundation limits to be Little Dreamy Draw wash. The southern boundary of the study inundation limits is approximately Dreamy Draw

wash. Each and every building structure and/or obstruction were not modeled as part of this study. This approach is beyond the capabilities of the HEC-RAS model, nor would it gain much more in accuracy regarding the hydraulic results.

During the initial hydraulic modeling of Dreamy Draw Wash, an observation of the HEC-RAS output for the 15th Street culvert revealed that as discharge increased in the wash (from the one-third, two-thirds, and full PMF), the flow discharge through the culvert decreased. The flow through the culvert decreased to zero under the full PMF discharge. The expectation would be that the discharge through the culvert would increase as the discharge in the wash, or the head on the culvert, increased. Upon discussions with the District and a review of the cross-section on the upstream side of the culvert under all three flow conditions, more flow was being carried in the cross-section overbanks as the total flow increased, thus reducing the remaining flow to the culvert. KHA revised the cross-section upstream of the 15th Street culvert to reduce flow in the left overbank at cross-section 18.503. This revision resulted in flow through the 15th Street culvert of 1179 cfs, 940 cfs, and 773 cfs for the one-third, two-thirds, and full PMF discharge, respectively. Although flow in the culvert occurs under all three study discharges, the pattern as explained above, still remains. This may indicate that flow is being carried in the right overbank as discharge increases, as opposed to being carried in Dreamy Draw Wash proper.

The inundation limits for all of the flow scenarios have been plotted on Exhibits 1 through 3 in Appendix D.

11.0 References

Chow, Ven Te. Open Channel Flow, McGraw-Hill Book Company, New York, NY, 1959.

Flood Control District of Maricopa County. "Dam-Break Analysis of Dreamy Draw Dam on Dreamy Draw Wash." March 1987.

Kaminski-Hubbard Engineering, Inc. "Arizona Canal Diversion Channel Area Drainage Master Plan, Phase I." Prepared for Flood Control District of Maricopa County.

King, H. W. and E. F. Brater. Handbook of Hydraulics, Sixth Edition. McGraw-Hill Book Company, New York, NY, 1982.

U.S. Army Corps of Engineers, Los Angeles District. "Arizona Canal Diversion Channel (Dreamy Draw to Cave Creek) Reach 3."

U.S. Army Corps of Engineers, Los Angeles District. "Dreamy Draw, Delineation of Flood Boundaries and Floodway, Preliminary." May 1978.

U.S. Army Corps of Engineers, Los Angeles District. "Dreamy Draw Detention Basin, Reservoir and Outlet Structure Detail." January 15, 1964.

U.S. Army Corps of Engineers, Hydrologic Engineering Center. HEC-RAS River Analysis System, Hydraulic Reference Manual, Version 2.2. Davis, CA. September 1998.

U.S. Army Corps of Engineers, Hydrologic Engineering Center. HEC-RAS River Analysis System, User's Manual, Version 2.2. September 1998.

U.S. Geological Survey, Water Resources Division for the Flood Control District of Maricopa County, "Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona." Tucson, AZ. April 1991.

APPENDIX A

DATA COLLECTION

Kimley-Horn
and Associates, Inc.

Delineation of Spillway Flows for Dreamy Draw Dam
FCD 98-16

Data Collection Summary Sheet

Data Number	Title	Description	Author	Source	Format	Date Collected
1	Dreamy Draw Dam, Gila River Basin, Arizona, Dreamy Draw, Dam, Outlet Works and Spillway, Periodic Inspection Report No.4, December 1976	Inspection Report	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Report	9/30/98
2	Dreamy Draw Dam, Gila River Basin, Arizona, Dreamy Draw, Dam, Outlet Works and Spillway, Periodic Inspection Report No.3, October 1975	Inspection Report	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Report	9/30/98
3	Dreamy Draw Dam, Gila River Basin, Arizona, Dreamy Draw, Dam, Outlet Works and Spillway, Periodic Inspection Report No.2, November 1974	Inspection Report	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Report	9/30/98
4	Dreamy Draw Dam, Gila River Basin, Arizona, Dreamy Draw, Dam, Outlet Works and Spillway, Periodic Inspection Report No.1, February 1974	Inspection Report	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Report	9/30/98
5	Operation and Maintenance Manual for Gila River Basin, Dreamy Draw Dam, Flood Control Improvement, Dreamy Draw Wash, Phoenix Arizona, June 1977	Operation and Maintenance Manual	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Report	9/30/98
6	Gila River Basin, New River and Phoenix City Streams, Arizona, Final Environment Statement, Dreamy Draw Dam, Maricopa county, Arizona, March 1972	Final Environment Statement,	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Report	9/30/98
7	Delineation of Spillway Flows for Cave Butes Dam, Two-Thirds Spillway Design Discharge (67,067 cfs), October 1996	Example of Inundation map	Michael Baker Jr., Inc.	Flood Control District of Maricopa County	Plan (1 of 1)	9/17/98
8	Squaw Peak Highway Salvage Plan, August 1990	Vegetation Salvage Plan	Shuler Inc.	Flood Control District of Maricopa County	Plan (5-12 of 13)	9/17/98
9	Arizona department of Transportation, Highways Division, Structures Section, Sta. 85+, Northern Ave. T. I. O. P. General Plan, August 1989	Northern Overpass Bridge Plan	?	Flood Control District of Maricopa County	Plan (1,5,14 of 20)	9/17/98
10	Squaw Peak Hwy Northern Crossing, July 1989	Conduit Crossings	Arizona Public Service	Flood Control District of Maricopa County	Plan (276-279 of 295)	9/17/98

Data Number	Title	Description	Author	Source	Format	Date Collected
11	Paradise Valley Access Relief Road	East leg of the old Northern Avenue	Yost and Gardner Engineers	Flood Control District of Maricopa County	Plan Set (1–13 of 13)	9/17/98
12	Dreamy Draw Dam, Record Drawing, July 1974	Dreamy Draw Dam As-Builts	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Plan (1-15 ,20 of 20)	9/17/98
13	Dreamy Draw Detention Basin, Reservoir and Outlet Structure Detail, January 15,1964	Reservoir and Outlet Structure Detail	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Plan , Appendix 2 Plate 7	9/17/98
14	Dreamy Draw Dam, Planting and Seeding	Seeding Plans Dam Area	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Plan (1-4 of 4)	9/17/98
15	Squaw Peak Freeway, Northern to Shea Blvd, December 1990	Ramp Profiles, Box Culvert Length	Arizona Department of Transportation	KHA	Plan (55, 56, 65, 66, 142, and 143)	10/1/98
16	Plan and Profile of Proposed State Highway, Squaw Peak HWY. (SR 51), February 1992	Plan view SR 51 north of Northern Avenue	Arizona Department of Transportation	KHA	Plan (179 and 180)	10/1/98
17	Canterra at Squaw Peak, Grading and Drainage, November 1995	Grading and Drainage for apartments located at 17th street and Northern	Watson Engineering	Miramar Development	Plan (11 sheets)	10/9/98
18	Supplemental Report, Floodway Delineation for Dreamy Draw, Dreamy Draw Dam to Arizona Canal, July 1979	Floodway Report with profiles.	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Report (10 pages and 2 11x17's)	
19	Future Design for Dreamy Draw Dam, January 1972	Report not included, sheets contain some watersurface profiles	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Report(16 pages)	
20	FIRM, September 30,1995	FIRM	Federal Emergency Management Agency	KHA	Report (5 pages)	
21	Design Memorandum No.1, Feature Design for Dreamy Draw Dam, January 1972	Some original design numbers	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Report (3pages)	
22	Flood Control District of Maricopa County, Dam-Break Analysis of Dreamy Draw Dam on Dreamy Draw Wash, March 1987	Report on Dam Break Analysis with inundation maps	Timothy E. Sutko and Thomas J. LaMarche	Flood Control District of Maricopa County	Report (18 pages)	
23	Squaw Peak Hwy Northern Crossing, August 1989	Electrical duct bank under 16th street and SR 51	Arizona Public Service	ADOT	Plan (276-279 of 295	
24	Phoenix Urbanized Area, Squaw Peak Hwy (SR 51) As-built ,1992	Profile along Northern under SR 51 to culvert over old DDD park entrance, culvert info under SR 51, some bridge info SR 51	Arizona Department of Transportation	ADOT	Plan (1,86,88,88A,89, 90,92A,93,95A,134,134A,134B,237,241,250 of 295	

Data Number	Title	Description	Author	Source	Format	Date Collected
25	State Highway, Squaw Peak Hwy. (SR 51), Northern Ave. – Shea Blvd.	Curve Data ramps north of Northern Avenue Bridge	Arizona Department of Transportation	ADOT	Plan (1,179,180 of 504)	
26	State Highway, Squaw Peak Hwy., Northern Ave. – Shea Blvd., 95% Submittal	Curve data ramp areas Northern Avenue overpass	Arizona Department of Transportation	ADOT	Plan (1,55,56,65,66,142,143 of ?)	
27	Flood Control District of Maricopa County, Arizona Canal Diversion Channel Area Drainage Master Study, Phase 1	Topo and photo maps of study area	Kaminski Hubbard Engineering, Inc.	Flood Control District of Maricopa County	Plan (Sheet Index, 75-77 of 111	
28	Canterra at Squaw Peak, May 1995	Culvert and Grading plans for new condo complex west of 18th street	D.N.A. Inc., Civil Engineering, Land Surveying		Cut up plan set	
29	Grading and Drainage Pointe Corridor Centre IV, 1989	Grading and drainage plans for office building west of 16th street	Gosnell Builders	City of Phoenix	Plan (1-3 of 3)	
30	14th St. and Northern Ave. Apartments, July 1994	Grading and Drainage Plans for apartment complex east of 14th street	Rick Engineering Company	City of Phoenix	Plan (1,4-7 of 7)	
31	Northern Avenue 16th Street to Squaw Peak, Record Drawings October 1995	Plan and Profile of Northern Avenue	City of Phoenix	City of Phoenix	Plan (1,3-8 of 14)	
32	Dreamy Draw, Delineation of Flood Boundaries and Floodway, Preliminary, May 1978	Plan and Profile of 100yr boundaries from 1500 ft upstream of 16th Street to the Arizona Canal	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Plan (2sheets)	
33	Arizona Canal Diversion Channel (Cubia City Wash to Dreamy Draw Dam, Including Cudia City Wash Sediment Basin) Reach 4, 1990, As-Built	Plan and Profile ACDC from Squaw Peak (SR 51) to 12th Street	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Plan (1,27-32,76-77 of 90	
34	Arizona Canal Diversion Channel (Dreamy Draw to Cave Creek) Reach 3, As-Built	Plan and Profile ACDC from12th Street to Northern Avenue	U. S. Army Corps of Engineers, Los Angeles	Flood Control District of Maricopa County	Plan (1,,8-10,35 of 142	

APPENDIX B

FIELD RECONNAISANCE REPORT

Kimley-Horn
and Associates, Inc.

FIELD RECONNAISANCE REPORT

DELINEATION OF SPILLWAY FLOWS FOR DREAMY DRAW DAM

FCD 98-16

Prepared for:

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009-6399
(620) 506-4692

Prepared by:

KIMLEY-HORN & ASSOCIATES, INC
7600 N. 15TH Street, Suite 250
Phoenix, Arizona 85020
(602) 944-5500

KHA Project No. 091131.01

January, 1999

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1. Introduction 3

2. Derivation of Manning's Roughness Coefficients 4

3. References 12

1. Introduction

Kimley-Horn and Associates, Inc. and the Flood Control District of Maricopa County conducted a reconnaissance field trip to Dreamy Draw Dam and to Dreamy Draw Wash downstream of the dam to the Arizona Canal Diversion Channel. The field trip was conducted on Wednesday, September 30, 1998. The purpose of the field trip was to review the existing field conditions of the spillway and wash to assist in the evaluation of Manning's roughness coefficients for spillway and wash. KHA photo-documented the spillway, main channel of the wash, overbank areas, and bridge and culvert crossings.

In general, Dreamy Draw Wash may be divided into two basic reaches. The first reach is from the dam spillway to State Route 51. The second reach is from State Route 51 downstream to the Arizona Canal Diversion Channel. The reason for the distinction between these two basic reaches is solely based on the primary land use existing within these limits. The upstream portion of Dreamy Draw Wash is within the City of Phoenix Dreamy Draw Park recreational area. This area is a city park and consists of mountainous open space with native desert vegetation. The downstream reach is primarily broad and flat that is urbanized with office complexes, apartments, and private residences. Based on this land use, the channel and overbank conditions within each basic reach are distinctively different.

The upstream reach has relatively defined channel banks with a channel bottom consisting of bedrock at the spillway, to sandy-gravelly-cobbley bottom materials. The channel sides exhibit a fairly good growth of palo verde and mesquite trees and low shrubs. This vegetation type also extends, to a degree, into the channel within this reach.

The downstream reach of Dream Draw Wash is fairly defined until it reaches a culvert at 18th street. Here the wash completely disappears under an condominium complex. The wash reappears downstream of the complex as a fairly defined but somewhat improved channel. Downstream of 16th Street the wash is channeled along office buildings, apartments, and through the downstream neighborhood.

The following section of this report derives the Manning's roughness coefficients for sub-reaches of Dreamy Draw Wash. The method is based on the USGS report titled " Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona" (April, 1991).

2. Derivation of Manning's Roughness Coefficients

Manning's roughness coefficients (n values) were derived based on the visual inspection conducted in September, 1998 and from the procedure given in the USGS document described above.

Location: Dreamy Draw Dam Emergency Spillway

Applicable Cross Sections: Sections 19.829 to 20.00

Cross Section Description: Bed material consists of sand and gravel along sides of roadway. Overall section trapezoidal in shape. Sparse vegetation along slopes.

"N" value calculation for spillway discharges:

Left Overbank	Channel	Right Overbank
	Components	
n = 0.045	n_b = 0.0280	n = 0.045
	n_1 = 0.000	
	n_2 = 0.000	
	n_3 = 0.000	
n = 0.045	Composite = 0.028	n = 0.045

Photo 1 Looking west from crest of emergency spillway.

Location: 900 feet upstream of culvert crossing for Dreamy Draw Dam Recreational Area

Applicable Cross Sections: Sections 19.725 to 19.829

Cross Section Description: Gunite lined channel invert. Bank material sand, gravel with some cobbles. Moderate vegetation with small clumping of desert trees, mesquite and palo verde.

"N" value calculation for spillway discharges:

Left Overbank	Channel		Right Overbank
		Components	
n = 0.045	n_b =	0.028	n = 0.045
	n_1 =	0.000	
	n_2 =	0.002	
	n_3 =	0.000	
n = 0.045	Composite =	0.03	n = 0.045

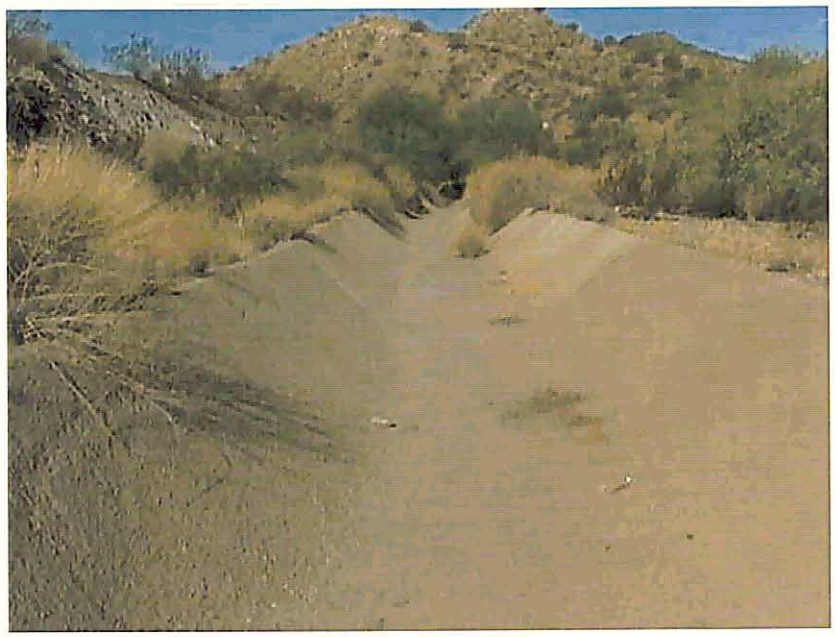

Photo 2 Looking west along gunite lined channel

Location: 600 feet upstream of culvert crossing for Dreamy Draw Dam Recreational Area

Applicable Cross Sections: Sections 19.395 to 19.752

Cross Section Description: Channel invert material sand, gravel, and medium cobble. Sparse vegetation in channel invert. Channel banks lined with spares shrubs and some desert trees. Overbanks natural desert with sparse shrubs and desert trees.

"N" value calculation for spillway discharges:

Left Overbank	Channel		Right Overbank
		Components	
n = 0.065	n_b =	0.035	n = 0.065
	n_1 =	0.002	
	n_2 =	0.001	
	n_3 =	0.002	
n = 0.065	Composite =	0.04	n = 0.065

Photo 3 Looking west along main channel, west of main outlet to Dreamy Draw Dam.

Location: 150 feet west of Ramp A North SR 51

Applicable Cross Sections: Sections 19.043 to 19.395

Cross Section Description: Channel bed material sand, gravel with some cobbles. Moderate vegetation with some desert trees located in channel bottom. Slopes of channel lined with desert trees and shrubs. Channel located in an urban setting with overbank areas consisting of streets, houses and other buildings.

"N" value calculation for spillway discharges:

Left Overbank	Channel		Right Overbank
		Components	
n = 0.065	n_b =	0.035	n = 0.065
	n_1 =	0.005	
	n_2 =	0.008	
	n_3 =	0.002	
n = 0.065	Composite =	0.05	n = 0.065

Photo 4 Looking west along main channel. Heavy vegetation along banks.

Location: 300 ft upstream of 16th Street Bridge

Applicable Cross Sections: Sections 18.685 to 19.043

Cross Section Description: Channel bed material sand, gravel and some small cobbles. Channel bottom contains large shrubs and clumps of desert trees. Channel banks are heavily vegetated with clumps of desert trees. Channel located in an urban setting with overbank areas consisting of streets, houses and other buildings.

"N" value calculation for spillway discharges:

Left Overbank	Channel		Right Overbank
		Components	
n = 0.065	n_b =	0.030	n = 0.065
	n_1 =	0.005	
	n_2 =	0.007	
	n_3 =	0.008	
n = 0.065	Composite =	0.05	n = 0.065

Photo 5 Looking east along main channel. New apartment complex in background

Location: From sidewalk along west side of 16th Street Bridge

Applicable Cross Sections: Sections 18.503 to 18.685

Cross Section Description: Channel bed material sand gravel and some cobbles. Channel bed and banks sparsely and landscaped with small desert shrubs and trees. Some weed growth in channel bottom. Right bank protected with riprap. Channel located in an urban setting with overbank areas consisting of streets, houses and other buildings.

"N" value calculation for spillway discharges:

Left Overbank	Channel	Right Overbank
	Components	
n = 0.065	n_b = 0.030	n = 0.065
	n_1 = 0.005	
	n_2 = 0.002	
	n_3 = 0.003	
n = 0.065	Composite = 0.04	n = 0.065

Photo 6 From 16th Street bridge looking west

Location: Along shoulder of Belmont Avenue Street

Applicable Cross Sections: Sections 18.162 to 18.503

Cross Section Description: Channel bed material sand, gravel, and medium cobbles. Channel bed clear of vegetation. Channel banks heavily vegetated with desert trees that overhang the main channel. Channel located in an urban setting with overbank areas consisting of streets, houses and other buildings.

"N" value calculation for spillway discharges:

Left Overbank	Channel		Right Overbank
		Components	
n = 0.065	n_b =	0.030	n = 0.065
	n_1 =	0.004	
	n_2 =	0.003	
	n_3 =	0.006	
n = 0.065	Composite =	0.043	n = 0.065

Photo 7 From roadway looking Northeast along main channel.

Location: 30 feet from edge of the Arizona Diversion Canal (ACDC).

Applicable Cross Sections: Sections 17.929 to 18.162

Cross Section Description: Channel bed material sand and gravel. Grass lined Channel bed and banks. Channel located in an urban setting with overbank areas consisting of streets, houses and other buildings.

"N" value calculation for spillway discharges:

Left Overbank	Channel	Right Overbank
	Components	
n = 0.065	n_b = 0.030	n = 0.065
	n_1 = 0.003	
	n_2 = 0.000	
	n_3 = 0.000	
n = 0.065	Composite = 0.033	n = 0.065

Photo 8 From Service road along ACDC looking Northeast.

3. References

1) U.S. Geological Survey, Water Resources Division, "Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona" (April, 1991).

APPENDIX C

HEC-RAS OUTPUT FOR FULL, TWO-THIRDS, AND ONE-THIRD SPILLWAY DISCHARGE

Kimley-Horn
and Associates, Inc.

```
HEC-RAS September 1998 Version 2.2
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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

PROJECT DATA
Project Title: Dreamy Draw Dam Spillway Study FCD 98-16
Project File : DDD.prj
Run Date and Time: 4/7/99 1:49:42 PM

Project in English units

Project Description:
Delineation of Spillway Flows for Dreamy Draw Dam
FCD 98-16

Model Created
4/99

FCD Contact: Tim Murphy

Kimley-Horn and Associates Inc.
7600 N.
15th Street, Suite 250
Phoenix, Arizona 85020

Kimley-Horn Team: Project
Manager - Doug Plasencia
Project Engineer - Bob Eichinger
Analyst - Jon
Ahern

HEC-RAS
River Analysis System
Version 2.2, September 1998

Purpose
of Study: The purpose of the study is to delineate the inundation limits for
the 1/3, 2/3, and full spillway discharge values for Dreamy Draw Dam.

Base
Mapping: Base Mapping supplied by The Flood Control District of Maricopa
County
Kenny Aerial Mapping Inc.
Date Flown: 11/15/1990 and 11/28/1990

PLAN DATA

Plan Title: Delineation of Spillway Flows for Dreamy Draw Dam
Plan File : D:\Projects\DDD\Final\ras\DDD.P01

Geometry Title: Base Conditions Geometry
Geometry File : D:\Projects\DDD\Final\ras\DDD.G01

```
          Flow Title     : 3 Flow Profiles
          Flow File      : D:\Projects\DDD\Final\ras\DDD.F01

Plan Summary Information:
Number of:  Cross Sections =   39    Mulitple Openings =    0
            Culverts       =    5    Inline Weirs      =    0
            Bridges        =    1

Computational Information
    Water surface calculation tolerance =  0.01
    Critical depth calculaton tolerance =  0.01
    Maximum number of interations       =  20
    Maximum difference tolerance        =  0.3
    Flow tolerance factor               =  0.001

Computation Options
    Critical depth computed at all cross sections
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Mixed Flow
```

FLOW DATA

Flow Title: 3 Flow Profiles
Flow File : D:\Projects\DDD\Final\ras\DDD.F01

Flow Data (cfs)

River	Reach	RS	1/3 Spillway	2/3 Spillway	Full Spillway
Bridge	SR51 Bridge	0.1687	930	2960	4955
Culvert	SR51 Culvert	19.395	1070	1040	1045
Dreamy Draw	Upper Wash	20	2000	4000	6000
Dreamy Draw	Lower Wash	19.262	2000	4000	6000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Dreamy Draw	Upper Wash	1/3 Spillway	Normal S = .02	
Dreamy Draw	Upper Wash	2/3 Spillway	Normal S = .02	
Dreamy Draw	Upper Wash	Full Spillway	Normal S = .02	
Dreamy Draw	Lower Wash	1/3 Spillway		Critical
Dreamy Draw	Lower Wash	2/3 Spillway		Critical
Dreamy Draw	Lower Wash	Full Spillway		Critical

GEOMETRY DATA

Geometry Title: Base Conditions Geometry
Geometry File : D:\Projects\DDD\Final\ras\DDD.G01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
Dreamy Draw	Upper Wash		Upstream
Dreamy Draw	Lower Wash	Downstream	
Bridge	SR51 Bridge	Upstream	Downstream
Culvert	SR51 Culvert	Upstream	Downstream

JUNCTION INFORMATION

Name: Upstream

Description: Junction Upstream of Culvert under SR 51
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
Dreamy Draw	Upper Wash	to Culvert	SR51 Culvert	411	
Dreamy Draw	Upper Wash	to Bridge	SR51 Bridge	415	0

Name: Downstream
Description: Downstream of culvert under SR 51
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
Culvert	SR51 Culvert	to Dreamy Draw	Lower Wash	189	
Bridge	SR51 Bridge	to Dreamy Draw	Lower Wash	147	

CROSS SECTION RIVER: Dreamy Draw
REACH: Upper Wash RS: 20

INPUT
Description: Upper Wash Reach
Spillway Elevation Set From AS-Built Survey
Information
Cross Section Data Digitized from Topo Map Supplied
by the FCD using BOSS-RMS
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9698.1	1434	9705.06	1432	9708.46	1430	9713.46	1428	9784.36	1428
9791.36	1426	9797.86	1424	9812.46	1424	9820.56	1426	9826.06	1428
9839.16	1428	9846.36	1428	9898.86	1428	9911.8	1426	9916.86	1424
9928.36	1420	9943.56	1410	9961.6	1405	9984	1405	10009	1405
10055.8	1405	10067.6	1410	10088.76	1420	10113.2	1430	10145.06	1440
10173.86	1450	10211.26	1460	10246.8	1470				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9698.1	.045	9911.8	.028	10113.2	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9911.8	10113.2	270.5	270	265.1	.1	.3

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1408.68	Element			
Vel Head (ft)	1.83	Wt. n-Val.		0.028	
W.S. Elev (ft)	1406.85	Reach Len. (ft)	270.50	270.00	265.10
Crit W.S. (ft)	1407.34	Flow Area (sq ft)		184.13	
E.G. Slope (ft/ft)	0.020022	Area (sq ft)		184.13	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	105.22	Top Width (ft)		105.22	
Vel Total (ft/s)	10.86	Avg. Vel. (ft/s)		10.86	
Max Chl Dpth (ft)	1.85	Hydr. Depth (ft)		1.75	
Conv. Total (cfs)	14134.2	Conv. (cfs)		14134.2	
Length Wtd. (ft)	270.00	Wetted Per. (ft)		105.85	
Min Ch El (ft)	1405.00	Shear (lb/sq ft)		2.17	
Alpha	1.00	Stream Power (lb/ft s)		23.62	
Frctn Loss (ft)		Cum Volume (acre-ft)	1.17	17.82	1.64
C & E Loss (ft)		Cum SA (acres)	0.14	4.37	0.38

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1410.84	Element			
Vel Head (ft)	3.05	Wt. n-Val.		0.028	

W.S. Elev (ft)	1407.78	Reach Len. (ft)	270.50	270.00	265.10
Crit W.S. (ft)	1408.66	Flow Area (sq ft)		285.28	
E.G. Slope (ft/ft)	0.020009	Area (sq ft)		285.28	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	110.81	Top Width (ft)		110.81	
Vel Total (ft/s)	14.02	Avg. Vel. (ft/s)		14.02	
Max Chl Dpth (ft)	2.78	Hydr. Depth (ft)		2.57	
Conv. Total (cfs)	28277.9	Conv. (cfs)		28277.9	
Length Wtd. (ft)	270.00	Wetted Per. (ft)		111.75	
Min Ch El (ft)	1405.00	Shear (lb/sq ft)		3.19	
Alpha	1.00	Stream Power (lb/ft s)		44.71	
Frctn Loss (ft)		Cum Volume (acre-ft)	2.90	28.06	5.29
C & E Loss (ft)		Cum SA (acres)	0.53	4.90	1.24

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1412.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.09	Wt. n-Val.		0.028	
W.S. Elev (ft)	1408.53	Reach Len. (ft)	270.50	270.00	265.10
Crit W.S. (ft)	1409.75	Flow Area (sq ft)		369.77	
E.G. Slope (ft/ft)	0.020035	Area (sq ft)		369.77	
Q Total (cfs)	6000.00	Flow (cfs)		6000.00	
Top Width (ft)	115.27	Top Width (ft)		115.27	
Vel Total (ft/s)	16.23	Avg. Vel. (ft/s)		16.23	
Max Chl Dpth (ft)	3.53	Hydr. Depth (ft)		3.21	
Conv. Total (cfs)	42388.8	Conv. (cfs)		42388.8	
Length Wtd. (ft)	270.00	Wetted Per. (ft)		116.47	
Min Ch El (ft)	1405.00	Shear (lb/sq ft)		3.97	
Alpha	1.00	Stream Power (lb/ft s)		64.44	
Frctn Loss (ft)		Cum Volume (acre-ft)	4.99	35.60	8.12
C & E Loss (ft)		Cum SA (acres)	1.10	5.11	1.51

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9911.80	9978.93	386.30	38.16	24.25	19.32	1.59	10.12
9978.93	10046.07	1396.07	123.97	67.13	69.80	1.85	11.26
10046.07	RB 10113.20	217.63	22.00	14.47	10.88	1.56	9.89

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9911.80	9978.93	794.45	62.21	27.75	19.86	2.27	12.77
9978.93	10046.07	2755.92	186.84	67.13	68.90	2.78	14.75
10046.07	RB 10113.20	449.62	36.23	16.87	11.24	2.22	12.41

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9911.80	9978.93	1218.85	83.68	30.55	20.31	2.78	14.56
9978.93	10046.07	4088.59	237.01	67.13	68.14	3.53	17.25
10046.07	RB 10113.20	692.56	49.07	18.78	11.54	2.72	14.11

CROSS SECTION RIVER: Dreamy Draw
REACH: Upper Wash RS: 19.949

INPUT
Description: Upper Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 114

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9602.2	1432	9642.55	1430	9662.55	1428	9670.35	1426	9681.75	1426

9697.05	1427.4	9697.85	1427.4	9718.65	1426	9735.15	1426	9749.95	1426
9761.25	1424.9	9763.75	1424.6	9768.25	1424	9769.95	1423.8	9773.65	1423.6
9777.45	1423.5	9786.25	1423	9800.45	1422	9804.95	1421.4	9808.65	1420.8
9814.25	1420	9816.35	1419.8	9824.25	1419.2	9831.75	1418.6	9836.95	1418.3
9839.55	1418	9839.85	1417.9	9843.75	1416	9848.45	1414.8	9852.05	1414
9854.35	1412.6	9855.45	1412	9856.65	1411.3	9857.45	1411.2	9858.75	1410.6
9859.95	1410.4	9861.65	1410.8	9862.05	1410.9	9863.95	1411.1	9867.55	1412
9869.65	1413.2	9869.95	1413.3	9871.25	1414	9872.45	1414.3	9881.15	1415.8
9882.55	1416	9884.15	1416.1	9889.85	1416.4	9894.75	1416.5	9906.15	1416.1
9906.55	1416	9907.25	1415.8	9914.9	1414	9916.75	1413.1	9921.45	1412
9927.45	1410.2	9928.15	1410	9930.45	1408.5	9931.05	1408	9932.55	1406.4
9933.85	1406	9934.85	1406	9936.85	1405.3	9939.55	1404	9941.15	1403.3
9943.65	1402	9949.55	1401.5	9949.65	1401	9952.05	1400	9957.75	1399.9
9969.65	1399.7	9977.45	1399.7	9977.5	1399.7	9980.1	1399.7	10000.1	1399.7
10001	1399.6	10003.15	1399.7	10004.15	1399.7	10005.05	1399.7	10007.05	1399.6
10008.25	1399.6	10013.05	1399.6	10016.65	1399.5	10022.85	1399.3	10025.75	1399.2
10027.95	1399.1	10028.85	1399.1	10030.55	1399.1	10033.35	1399.2	10036.55	1399.3
10040.05	1399.5	10043.45	1399.7	10043.95	1399.7	10046.35	1400	10047.95	1400.6
10052.45	1402	10054.75	1403.1	10057.05	1404	10060.15	1405.4	10061.55	1406
10064.95	1408	10065.05	1408	10067.85	1410	10089.1	1415.6	10099.45	1418.4
10104.85	1420	10107.95	1420.7	10116.35	1422.6	10117.25	1422.8	10148.35	1430
10151.85	1431.3	10175.95	1440	10204.05	1450	10240.8	1460		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9602.2	.045	9930.45	.028	10067.85	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9930.4	10067.85	343	306	251.8	.1	.3

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1403.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.85	Wt. n-Val.		0.028	
W.S. Elev (ft)	1401.49	Reach Len. (ft)	343.00	306.00	251.80
Crit W.S. (ft)	1402.00	Flow Area (sq ft)		183.02	
E.G. Slope (ft/ft)	0.019486	Area (sq ft)		183.02	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	101.26	Top Width (ft)		101.26	
Vel Total (ft/s)	10.93	Avg. Vel. (ft/s)		10.93	
Max Chl Dpth (ft)	2.39	Hydr. Depth (ft)		1.81	
Conv. Total (cfs)	14327.5	Conv. (cfs)		14327.5	
Length Wtd. (ft)	306.00	Wetted Per. (ft)		102.16	
Min Ch El (ft)	1399.10	Shear (lb/sq ft)		2.18	
Alpha	1.00	Stream Power (lb/ft s)		23.82	
Frctn Loss (ft)	5.33	Cum Volume (acre-ft)	1.17	16.68	1.64
C & E Loss (ft)	0.00	Cum SA (acres)	0.14	3.73	0.38

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1405.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.04	Wt. n-Val.		0.028	
W.S. Elev (ft)	1402.45	Reach Len. (ft)	343.00	306.00	251.80
Crit W.S. (ft)	1403.31	Flow Area (sq ft)		285.70	
E.G. Slope (ft/ft)	0.019926	Area (sq ft)		285.70	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	110.60	Top Width (ft)		110.60	
Vel Total (ft/s)	14.00	Avg. Vel. (ft/s)		14.00	
Max Chl Dpth (ft)	3.35	Hydr. Depth (ft)		2.58	
Conv. Total (cfs)	28337.0	Conv. (cfs)		28337.0	
Length Wtd. (ft)	306.00	Wetted Per. (ft)		111.81	
Min Ch El (ft)	1399.10	Shear (lb/sq ft)		3.18	
Alpha	1.00	Stream Power (lb/ft s)		44.50	
Frctn Loss (ft)	5.36	Cum Volume (acre-ft)	2.90	26.29	5.29
C & E Loss (ft)	0.01	Cum SA (acres)	0.53	4.22	1.24

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1407.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.09	Wt. n-Val.		0.028	
W.S. Elev (ft)	1403.20	Reach Len. (ft)	343.00	306.00	251.80
Crit W.S. (ft)	1404.39	Flow Area (sq ft)		369.83	
E.G. Slope (ft/ft)	0.019739	Area (sq ft)		369.83	
Q Total (cfs)	6000.00	Flow (cfs)		6000.00	
Top Width (ft)	113.65	Top Width (ft)		113.65	
Vel Total (ft/s)	16.22	Avg. Vel. (ft/s)		16.22	
Max Chl Dpth (ft)	4.10	Hydr. Depth (ft)		3.25	
Conv. Total (cfs)	42706.0	Conv. (cfs)		42706.0	
Length Wtd. (ft)	306.00	Wetted Per. (ft)		115.22	
Min Ch El (ft)	1399.10	Shear (lb/sq ft)		3.96	
Alpha	1.00	Stream Power (lb/ft s)		64.17	
Frctn Loss (ft)	5.35	Cum Volume (acre-ft)	4.99	33.31	8.12
C & E Loss (ft)	0.01	Cum SA (acres)	1.10	4.41	1.51

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9930.45	9976.25	431.33	43.08	27.30	21.57	1.61	10.01
9976.25	10022.05	945.92	84.89	45.81	47.30	1.85	11.14
10022.05	RB 10067.85	622.75	55.05	29.04	31.14	1.91	11.31

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9930.45	9976.25	899.43	72.97	34.20	22.49	2.18	12.33
9976.25	10022.05	1907.51	128.77	45.81	47.69	2.81	14.81
10022.05	RB 10067.85	1193.06	83.96	31.80	29.83	2.68	14.21

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9930.45	9976.25	1435.32	98.62	35.83	23.92	2.83	14.55
9976.25	10022.05	2819.00	163.14	45.81	46.98	3.56	17.28
10022.05	RB 10067.85	1745.68	108.07	33.58	29.09	3.28	16.15

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Upper Wash RS: 19.891

INPUT
Description: Upper Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 78

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9828.1	1416	9834.64	1414.9	9838.54	1414	9861.24	1412.4	9865.44	1412

9867.94	1411.8	9873.84	1411.5	9878.94	1411.3	9884.74	1411	9896.04	1410.8
9910.74	1410.1	9911.04	1410.1	9912.94	1410	9915.64	1409.2	9917.64	1408
9924.44	1406.4	9925.14	1406.2	9925.64	1406	9926.24	1405.8	9930.04	1404
9933.24	1402.7	9935.44	1402	9938.34	1400.7	9939.64	1400.1	9940.04	1400
9940.74	1399.6	9944.6	1398	9945.84	1397.3	9948.54	1396	9950.34	1394.9
9952.64	1394	9955.54	1392.9	9960.44	1392.2	9962.14	1392	9967.04	1391.9
9967.44	1391.9	9967.54	1391.9	9968.54	1391.9	9968.74	1391.9	9969.7	1391.9
9987.7	1391.9	10011.34	1391.5	10012.64	1391.5	10014.4	1391.6	10026.14	1391.5
10027.34	1391.5	10039.14	1391.5	10044.84	1391.6	10045.94	1391.6	10053.84	1391.8
10059.74	1392	10061.54	1392.1	10063.84	1392.3	10067.24	1392.8	10070.94	1394
10072.54	1394.7	10075.74	1396	10077.74	1397.1	10079.04	1398	10080.44	1399.2
10081.2	1400	10086.54	1402.9	10094.54	1406.9	10100.24	1410	10112.94	1417.8
10118.54	1420	10122.24	1421.5	10130.44	1424.5	10143.34	1430	10154.64	1433.5
10163.84	1436	10177.44	1440	10182.74	1441.8	10192.74	1444.9	10210.84	1450
10222.54	1455.5	10233.74	1460	10254.1	1470				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9828.1	.045	9944.6	.028	10081.2	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9944.6	10081.2	356.2	326	250.8	.1	.3

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1395.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.35	Wt. n-Val.		0.028	
W.S. Elev (ft)	1393.24	Reach Len. (ft)	356.20	326.00	250.80
Crit W.S. (ft)	1393.94	Flow Area (sq ft)		162.43	
E.G. Slope (ft/ft)	0.033661	Area (sq ft)		162.43	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	113.96	Top Width (ft)		113.96	
Vel Total (ft/s)	12.31	Avg. Vel. (ft/s)		12.31	
Max Chl Dpth (ft)	1.74	Hydr. Depth (ft)		1.43	
Conv. Total (cfs)	10901.0	Conv. (cfs)		10901.0	
Length Wtd. (ft)	326.00	Wetted Per. (ft)		114.22	
Min Ch El (ft)	1391.50	Shear (lb/sq ft)		2.99	
Alpha	1.00	Stream Power (lb/ft s)		36.80	
Frctn Loss (ft)	7.70	Cum Volume (acre-ft)	1.17	15.47	1.64
C & E Loss (ft)	0.05	Cum SA (acres)	0.14	2.98	0.38

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1397.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.80	Wt. n-Val.		0.028	
W.S. Elev (ft)	1394.04	Reach Len. (ft)	356.20	326.00	250.80
Crit W.S. (ft)	1395.19	Flow Area (sq ft)		255.57	
E.G. Slope (ft/ft)	0.031406	Area (sq ft)		255.57	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	118.51	Top Width (ft)		118.51	
Vel Total (ft/s)	15.65	Avg. Vel. (ft/s)		15.65	
Max Chl Dpth (ft)	2.54	Hydr. Depth (ft)		2.16	
Conv. Total (cfs)	22571.0	Conv. (cfs)		22571.0	
Length Wtd. (ft)	324.78	Wetted Per. (ft)		119.04	
Min Ch El (ft)	1391.50	Shear (lb/sq ft)		4.21	
Alpha	1.00	Stream Power (lb/ft s)		65.88	
Frctn Loss (ft)	7.56	Cum Volume (acre-ft)	2.90	24.39	5.29
C & E Loss (ft)	0.08	Cum SA (acres)	0.53	3.41	1.24

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1399.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.07	Wt. n-Val.		0.028	
W.S. Elev (ft)	1394.68	Reach Len. (ft)	356.20	326.00	250.80
Crit W.S. (ft)	1396.21	Flow Area (sq ft)		331.94	
E.G. Slope (ft/ft)	0.030666	Area (sq ft)		331.94	
Q Total (cfs)	6000.00	Flow (cfs)		6000.00	
Top Width (ft)	121.59	Top Width (ft)		121.59	
Vel Total (ft/s)	18.08	Avg. Vel. (ft/s)		18.08	
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)		2.73	
Conv. Total (cfs)	34262.9	Conv. (cfs)		34262.9	
Length Wtd. (ft)	322.78	Wetted Per. (ft)		122.37	
Min Ch El (ft)	1391.50	Shear (lb/sq ft)		5.19	
Alpha	1.00	Stream Power (lb/ft s)		93.87	
Frctn Loss (ft)	7.44	Cum Volume (acre-ft)	4.99	30.85	8.12
C & E Loss (ft)	0.10	Cum SA (acres)	1.10	3.58	1.51

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9944.60	9990.13	467.11	42.84	35.62	23.36	1.21	10.90
9990.13	10035.67	1004.35	74.82	45.54	50.22	1.64	13.42
10035.67	RB 10081.20	528.54	44.78	33.06	26.43	1.36	11.80

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9944.60	9990.13	1034.93	72.12	37.87	25.87	1.92	14.35
9990.13	10035.67	1886.18	111.30	45.54	47.15	2.44	16.95
10035.67	RB 10081.20	1078.88	72.15	35.62	26.97	2.04	14.95

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9944.60	9990.13	1615.13	96.56	39.62	26.92	2.46	16.73
9990.13	10035.67	2742.47	140.27	45.54	45.71	3.08	19.55
10035.67	RB 10081.20	1642.41	95.12	37.21	27.37	2.58	17.27

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Upper Wash RS: 19.829

INPUT
Description: Upper Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 70

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

9817.8	1402	9854.2	1400.2	9890.7	1398.4	9931.7	1396.3	9960.5	1394.8
9965.3	1394.6	9973.6	1394.2	9976.1	1394	9976.7	1393.7	9979.2	1392
9979.8	1391.6	9982.5	1390	9983.3	1388.3	9989.8	1382.8	9991	1382
9994.1	1380.1	9994.3	1380	9998.9	1378.6	9999.7	1378.3	9999.9	1378.3
10000	1378.3	10000.1	1378.3	10000.3	1378.3	10000.4	1378.3	10004.7	1380
10005.3	1380.5	10006.5	1381	10009.2	1382	10014.4	1383.2	10015.8	1384
10019.4	1385.9	10019.5	1385.9	10020.5	1386.3	10020.7	1386.3	10024.9	1387.4
10025.6	1387.4	10026.2	1387.4	10028	1387.4	10029.6	1387.4	10030.7	1387.3
10034.4	1386.9	10035	1386.8	10043	1386.9	10053.5	1388	10056.5	1389.3
10057.9	1390	10058.6	1390.2	10063	1391.5	10064.2	1392	10068.2	1393.7
10069.5	1394	10073	1395.3	10074.9	1395.7	10076.4	1396	10082.8	1396.9
10091.9	1398	10092.4	1398.1	10102.5	1400	10157.3	1418.5	10161.9	1420
10168.5	1423	10184.6	1430	10190.3	1433	10194.3	1435	10205.6	1440
10229.4	1450	10248.1	1460	10261.9	1470	10273.9	1480	10316	1490

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9817.8	.045	9982.5	.028	10025.6	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9982.5	10025.6	488.2	550	584.3	.1	.3

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1389.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.31	Wt. n-Val.		0.028	
W.S. Elev (ft)	1385.75	Reach Len. (ft)	488.20	550.00	584.30
Crit W.S. (ft)	1386.56	Flow Area (sq ft)		136.91	
E.G. Slope (ft/ft)	0.013001	Area (sq ft)		136.91	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	32.79	Top Width (ft)		32.79	
Vel Total (ft/s)	14.61	Avg. Vel. (ft/s)		14.61	
Max Chl Dpth (ft)	7.45	Hydr. Depth (ft)		4.18	
Conv. Total (cfs)	17540.2	Conv. (cfs)		17540.2	
Length Wtd. (ft)	550.00	Wetted Per. (ft)		36.50	
Min Ch El (ft)	1378.30	Shear (lb/sq ft)		3.04	
Alpha	1.00	Stream Power (lb/ft s)		44.48	
Frctn Loss (ft)	6.44	Cum Volume (acre-ft)	1.17	14.35	1.64
C & E Loss (ft)	0.10	Cum SA (acres)	0.14	2.43	0.38

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1392.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.91	Wt. n-Val.		0.028	0.045
W.S. Elev (ft)	1388.43	Reach Len. (ft)	488.20	550.00	584.30
Crit W.S. (ft)	1389.45	Flow Area (sq ft)		240.19	34.24
E.G. Slope (ft/ft)	0.010575	Area (sq ft)		240.19	34.24
Q Total (cfs)	4000.00	Flow (cfs)		3870.29	129.71
Top Width (ft)	71.25	Top Width (ft)		42.36	28.89
Vel Total (ft/s)	14.58	Avg. Vel. (ft/s)		16.11	3.79
Max Chl Dpth (ft)	10.13	Hydr. Depth (ft)		5.67	1.19
Conv. Total (cfs)	38896.6	Conv. (cfs)		37635.3	1261.3
Length Wtd. (ft)	550.56	Wetted Per. (ft)		47.34	29.07
Min Ch El (ft)	1378.30	Shear (lb/sq ft)		3.35	0.78
Alpha	1.18	Stream Power (lb/ft s)		53.97	2.95
Frctn Loss (ft)	5.50	Cum Volume (acre-ft)	2.90	22.53	5.19
C & E Loss (ft)	0.01	Cum SA (acres)	0.53	2.81	1.15

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1394.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.46	Wt. n-Val.	0.045	0.028	0.045
W.S. Elev (ft)	1390.09	Reach Len. (ft)	488.20	550.00	584.30
Crit W.S. (ft)	1391.09	Flow Area (sq ft)	0.01	311.14	85.27
E.G. Slope (ft/ft)	0.009413	Area (sq ft)	0.01	311.14	85.27
Q Total (cfs)	6000.00	Flow (cfs)	0.00	5487.07	512.93
Top Width (ft)	75.85	Top Width (ft)	0.15	43.10	32.61
Vel Total (ft/s)	15.14	Avg. Vel. (ft/s)	0.36	17.64	6.02
Max Chl Dpth (ft)	11.79	Hydr. Depth (ft)	0.04	7.22	2.62
Conv. Total (cfs)	61844.0	Conv. (cfs)	0.0	56557.0	5287.0
Length Wtd. (ft)	551.47	Wetted Per. (ft)	0.17	49.08	33.14
Min Ch El (ft)	1378.30	Shear (lb/sq ft)	0.02	3.73	1.51
Alpha	1.26	Stream Power (lb/ft s)	0.01	65.70	9.09
Frctn Loss (ft)	5.02	Cum Volume (acre-ft)	4.99	28.44	7.87
C & E Loss (ft)	0.19	Cum SA (acres)	1.10	2.96	1.41

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9982.50	9996.87	496.91	40.59	12.54	24.85	3.85	12.24
9996.87	10011.23	1379.97	81.21	15.35	69.00	5.65	16.99
10011.23	RB 10025.60	123.12	15.11	8.60	6.16	1.92	8.15

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9982.50	9996.87	989.32	73.11	16.64	24.73	5.37	13.53
9996.87	10011.23	2375.17	119.74	15.35	59.38	8.33	19.84
10011.23	RB 10025.60	505.80	47.34	15.35	12.65	3.30	10.69
10025.60	10067.08	129.71	34.24	29.07	3.24	1.19	3.79

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9927.60	9982.50	0.00	0.01	0.17	0.00	0.04	0.36
LB 9982.50	9996.87	1417.33	96.38	18.38	23.62	6.71	14.71
9996.87	10011.23	3105.42	143.58	15.35	51.76	9.99	21.63
10011.23	RB 10025.60	964.32	71.18	15.35	16.07	4.95	13.55
10025.60	10067.08	512.93	85.27	33.14	8.55	2.62	6.02

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Upper Wash RS: 19.725

INPUT
Description: Upper Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 103

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9683.3	1382	9728.1	1380	9741.8	1378	9779.1	1376	9794.7	1376
9831.1	1377.5	9832.4	1377.5	9834.3	1377.4	9836.7	1377.3	9844.4	1377
9852.8	1376.8	9856.9	1376.7	9865.4	1376.6	9876.8	1376	9887.2	1375.4
9887.6	1375.4	9893.5	1375	9895.6	1375	9896.4	1374.9	9897.6	1375
9903.4	1375.4	9909.6	1375.7	9910	1375.8	9914.3	1375.9	9914.6	1375.9
9915.1	1375.9	9915.4	1376	9915.5	1376	9915.6	1376	9915.8	1376
9915.9	1375.9	9922.4	1374	9922.7	1373.8	9926.9	1372	9928.4	1370.6
9929.4	1370	9931.1	1369.2	9933.5	1368.3	9934.1	1368	9941.6	1366.4
9943.8	1366	9944.9	1365.7	9952	1364	9955.9	1363.3	9961.9	1362
9966.1	1360.9	9968.2	1360	9974.8	1359.8	9999.6	1359.5	10000.6	1359.7
10003.6	1360	10010.3	1360.9	10018.6	1362	10028.2	1363.2	10034.8	1363.9
10035.2	1363.9	10035.5	1364	10035.8	1364.1	10040.4	1364.8	10047.7	1366
10048.2	1366.1	10055.8	1368	10060.6	1368.7	10062.6	1369	10065.2	1369.5
10066.6	1370	10067.9	1370.3	10069.5	1372	10078.3	1373	10087.1	1372.4
10088.8	1372.2	10091	1372	10091.8	1372	10091.9	1372	10092	1372
10092.2	1372	10092.4	1372	10092.5	1372	10093.2	1372.1	10094.3	1372.1
10100.3	1372.3	10120.3	1373	10147.8	1374	10161.5	1376	10169.8	1378
10182.8	1380	10188.5	1382	10198.4	1384	10207.2	1386	10215.6	1388
10224.3	1390	10236	1392	10240.8	1394	10249.8	1396	10257.9	1398
10271.2	1400	10295.8	1400	10309.2	1398	10323.7	1396	10333.6	1394
10350.1	1392	10354.5	1390	10363	1390				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9683.3	.045	9922.4	.03	10078.3	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9922.4	10078.3	294.6	355	389.5	.1	.3

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1371.33	Element			
Vel Head (ft)	9.73	Wt. n-Val.		0.030	
W.S. Elev (ft)	1361.60	Reach Len. (ft)	294.60	355.00	389.50
Crit W.S. (ft)	1363.66	Flow Area (sq ft)		79.90	
E.G. Slope (ft/ft)	0.146290	Area (sq ft)		79.90	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	52.19	Top Width (ft)		52.19	
Vel Total (ft/s)	25.03	Avg. Vel. (ft/s)		25.03	
Max Chl Dpth (ft)	2.10	Hydr. Depth (ft)		1.53	
Conv. Total (cfs)	5229.1	Conv. (cfs)		5229.1	
Length Wtd. (ft)	354.62	Wetted Per. (ft)		52.61	
Min Ch El (ft)	1359.50	Shear (lb/sq ft)		13.87	
Alpha	1.00	Stream Power (lb/ft s)		347.17	
Frctn Loss (ft)	17.01	Cum Volume (acre-ft)	1.17	12.98	1.64
C & E Loss (ft)	0.65	Cum SA (acres)	0.14	1.89	0.38

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1376.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	14.37	Wt. n-Val.		0.030	
W.S. Elev (ft)	1362.50	Reach Len. (ft)	294.60	355.00	389.50
Crit W.S. (ft)	1365.36	Flow Area (sq ft)		131.51	
E.G. Slope (ft/ft)	0.143177	Area (sq ft)		131.51	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	63.02	Top Width (ft)		63.02	
Vel Total (ft/s)	30.42	Avg. Vel. (ft/s)		30.42	
Max Chl Dpth (ft)	3.00	Hydr. Depth (ft)		2.09	
Conv. Total (cfs)	10571.2	Conv. (cfs)		10571.2	
Length Wtd. (ft)	355.11	Wetted Per. (ft)		63.61	
Min Ch El (ft)	1359.50	Shear (lb/sq ft)		18.48	
Alpha	1.00	Stream Power (lb/ft s)		562.12	
Frctn Loss (ft)	14.40	Cum Volume (acre-ft)	2.90	20.18	4.96
C & E Loss (ft)	1.05	Cum SA (acres)	0.53	2.15	0.96

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1380.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	17.00	Wt. n-Val.		0.030	
W.S. Elev (ft)	1363.24	Reach Len. (ft)	294.60	355.00	389.50
Crit W.S. (ft)	1366.64	Flow Area (sq ft)		181.35	
E.G. Slope (ft/ft)	0.132799	Area (sq ft)		181.35	
Q Total (cfs)	6000.00	Flow (cfs)		6000.00	
Top Width (ft)	72.37	Top Width (ft)		72.37	
Vel Total (ft/s)	33.08	Avg. Vel. (ft/s)		33.08	
Max Chl Dpth (ft)	3.74	Hydr. Depth (ft)		2.51	
Conv. Total (cfs)	16464.7	Conv. (cfs)		16464.7	
Length Wtd. (ft)	354.82	Wetted Per. (ft)		73.08	
Min Ch El (ft)	1359.50	Shear (lb/sq ft)		20.57	
Alpha	1.00	Stream Power (lb/ft s)		680.70	
Frctn Loss (ft)	12.97	Cum Volume (acre-ft)	4.99	25.33	7.30
C & E Loss (ft)	1.26	Cum SA (acres)	1.10	2.23	1.19

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9922.40	9974.37	299.38	13.83	11.23	14.97	1.26	21.65
9974.37	10026.33	1700.62	66.07	41.38	85.03	1.60	25.74

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9922.40	9974.37	662.86	25.30	15.16	16.57	1.71	26.20
9974.37	10026.33	3337.14	106.20	48.44	83.43	2.20	31.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9922.40	9974.37	1046.72	37.44	18.64	17.45	2.06	27.96
9974.37	10026.33	4951.94	143.61	52.20	82.53	2.76	34.48
10026.33	RB 10078.30	1.34	0.30	2.24	0.02	0.13	4.55

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Upper Wash RS: 19.658

INPUT
Description: Upper Wash Reach
Approach Section Phoenix Mountain Preserve
Culvert
Cross Section Data Digitized from Topo Map Supplied by
the FCD using BOSS-RMS
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1374	60.9	1372	62.6	1371.9	63.2	1371.8	70.8	1371.2
79.3	1370.3	79.9	1370.2	85.6	1370	89.9	1369.9	112.3	1369.6
113.2	1369.6	116.8	1369.5	119.4	1369.4	136.2	1368.5	140.6	1368.2
143.8	1368	149.3	1367.4	153	1367.1	153.1	1367.1	157.5	1367.1
164.6	1366.9	167	1366.9	174.1	1366.3	176.9	1366	185.3	1364.6
188.5	1364	189.2	1363.9	191.1	1363.2	194	1362	194.1	1362
194.8	1361.5	198.8	1360	200.6	1359.3	202.5	1358	207.5	1356.4
208.6	1356	209.2	1355.9	211.1	1355.2	211.5	1354.7	212	1354.5
215.1	1354.5	219.7	1354.8	223.1	1355.1	230.1	1356	231.6	1356.9
233	1358	233.8	1358.6	236.1	1360	237.8	1360.7	241	1362
242.6	1362.9	248.5	1363.6	251.4	1363.8	265.5	1364	276.2	1364.9
282.8	1366	285.8	1366.6	290.7	1368	292.8	1369	294	1369.6
294.1	1369.7	294.7	1370	298.9	1371.8	298.9	1372	301.3	1372.8
304.5	1374	308.4	1375.5	309.8	1376	310.6	1376.3	315.6	1378
319.8	1379	323.9	1380	326.4	1380.9	328.3	1382	329.7	1382.9
331.2	1384	332	1384.4	334.9	1386	338.1	1387.4	340.2	1388
342.9	1388.5	345.2	1389	349.8	1389.6	351.5	1390	385.1	1399
388	1400	420.7	1407.9	427.7	1410	473.4	1420	509	1430

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.065	200.6	.045	236.1	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
200.6	236.1	184.9	188	190.1	.3	.5

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1363.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.	0.065	0.045	0.065
W.S. Elev (ft)	1362.76	Reach Len. (ft)	184.90	188.00	190.10
Crit W.S. (ft)	1360.78	Flow Area (sq ft)	15.14	236.25	9.14
E.G. Slope (ft/ft)	0.005430	Area (sq ft)	15.14	236.25	9.14
Q Total (cfs)	2000.00	Flow (cfs)	35.65	1945.70	18.65
Top Width (ft)	50.20	Top Width (ft)	8.44	35.50	6.25

Vel Total (ft/s)	7.68	Avg. Vel. (ft/s)	2.36	8.24	2.04
Max Chl Dpth (ft)	8.26	Hydr. Depth (ft)	1.79	6.65	1.46
Conv. Total (cfs)	27142.0	Conv. (cfs)	483.8	26405.1	253.1
Length Wtd. (ft)	187.99	Wetted Per. (ft)	9.16	37.94	6.85
Min Ch El (ft)	1354.50	Shear (lb/sq ft)	0.56	2.11	0.45
Alpha	1.12	Stream Power (lb/ft s)	1.32	17.39	0.92
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	1.12	11.69	1.59
C & E Loss (ft)	0.47	Cum SA (acres)	0.11	1.53	0.35

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1368.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.	0.065	0.045	0.065
W.S. Elev (ft)	1368.10	Reach Len. (ft)	184.90	188.00	190.10
Crit W.S. (ft)	1363.54	Flow Area (sq ft)	149.43	425.66	210.16
E.G. Slope (ft/ft)	0.002049	Area (sq ft)	149.43	425.66	210.16
Q Total (cfs)	4000.00	Flow (cfs)	285.51	3188.65	525.85
Top Width (ft)	148.67	Top Width (ft)	58.36	35.50	54.81
Vel Total (ft/s)	5.09	Avg. Vel. (ft/s)	1.91	7.49	2.50
Max Chl Dpth (ft)	13.60	Hydr. Depth (ft)	2.56	11.99	3.83
Conv. Total (cfs)	88368.9	Conv. (cfs)	6307.5	70444.3	11617.2
Length Wtd. (ft)	188.08	Wetted Per. (ft)	59.56	37.94	55.89
Min Ch El (ft)	1354.50	Shear (lb/sq ft)	0.32	1.44	0.48
Alpha	1.77	Stream Power (lb/ft s)	0.61	10.75	1.20
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	2.40	17.91	4.02
C & E Loss (ft)	0.32	Cum SA (acres)	0.33	1.75	0.72

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1370.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.02	Wt. n-Val.	0.065	0.045	0.065
W.S. Elev (ft)	1369.49	Reach Len. (ft)	184.90	188.00	190.10
Crit W.S. (ft)	1366.17	Flow Area (sq ft)	247.11	475.10	288.51
E.G. Slope (ft/ft)	0.002717	Area (sq ft)	247.11	475.10	288.51
Q Total (cfs)	6000.00	Flow (cfs)	600.79	4409.76	989.45
Top Width (ft)	176.73	Top Width (ft)	83.55	35.50	57.68
Vel Total (ft/s)	5.94	Avg. Vel. (ft/s)	2.43	9.28	3.43
Max Chl Dpth (ft)	14.99	Hydr. Depth (ft)	2.96	13.38	5.00
Conv. Total (cfs)	115111.9	Conv. (cfs)	11526.3	84602.6	18982.9
Length Wtd. (ft)	188.08	Wetted Per. (ft)	84.79	37.94	59.08
Min Ch El (ft)	1354.50	Shear (lb/sq ft)	0.49	2.12	0.83
Alpha	1.87	Stream Power (lb/ft s)	1.20	19.72	2.84
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	4.16	22.66	6.01
C & E Loss (ft)	0.44	Cum SA (acres)	0.82	1.79	0.94

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
133.73	200.60	35.65	15.14	9.16	1.78	1.79	2.36

LB 200.60	212.43	531.34	71.42	12.97	26.57	6.04	7.44
212.43	224.27	903.19	94.76	11.87	45.16	8.01	9.53
224.27	RB 236.10	511.17	70.07	13.10	25.56	5.92	7.30
236.10	275.09	18.65	9.14	6.85	0.93	1.46	2.04

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
133.73	200.60	285.51	149.43	59.56	7.14	2.56	1.91
LB 200.60	212.43	948.52	134.56	12.97	23.71	11.37	7.05
212.43	224.27	1313.85	157.90	11.87	32.85	13.34	8.32
224.27	RB 236.10	926.28	133.21	13.10	23.16	11.26	6.95
236.10	275.09	480.65	179.76	39.70	12.02	4.61	2.67
275.09	314.07	45.20	30.40	16.19	1.13	1.92	1.49

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
66.87	133.73	4.11	6.90	16.70	0.07	0.41	0.59
133.73	200.60	596.68	240.21	68.08	9.94	3.59	2.48
LB 200.60	212.43	1325.66	151.04	12.97	22.09	12.76	8.78
212.43	224.27	1787.15	174.38	11.87	29.79	14.74	10.25
224.27	RB 236.10	1296.96	149.69	13.10	21.62	12.65	8.66
236.10	275.09	866.47	234.05	39.70	14.44	6.00	3.70
275.09	314.07	122.98	54.46	19.39	2.05	2.91	2.26

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: Dreamy Draw
REACH: Upper Wash RS: 19.622

INPUT
Description: Upper Wash Reach
Upstream Face Phoenix Mountain Preserve
Culvert
Cross Section Data Digitized from Topo Map Supplied by
the FCD using BOSS-RMS
Station Elevation Data num= 123

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9676.2	1382	9683.45	1381.7	9685.45	1381.5	9686.15	1381.5	9686.75	1381.4
9693.95	1380	9711.75	1379	9713.15	1378.9	9733.75	1378	9740.55	1377.5
9740.95	1377.5	9755.35	1376	9757.95	1375.7	9760.75	1375.2	9768.75	1374
9772.85	1373.7	9779.65	1373.3	9781.65	1373.3	9787.35	1373.5	9794.55	1373.6
9803.55	1373.5	9804.15	1373.5	9807.65	1373.4	9814.45	1373.5	9830.35	1373
9836.05	1373	9840.65	1372.9	9849.05	1372.7	9858.95	1372.2	9859.95	1372.2
9872.65	1372.1	9873.55	1372.1	9881.15	1372	9881.85	1372	9885.55	1371.8
9886.45	1371.8	9887.15	1371.8	9888.05	1371.7	9893.15	1371.2	9898.85	1370.8
9901.25	1370.6	9906.15	1370	9909.35	1369.2	9914.4	1368	9916.95	1367.2
9918.45	1366.7	9920.25	1366	9921.35	1364.9	9922.55	1364	9923.15	1363.6
9923.95	1362.6	9924.55	1362	9925.95	1361.4	9929.55	1360	9929.75	1359.8

```
 9942.25    1358 9943.05  1357.5 9943.35  1357.1 9944.65  1356.7 9946.85    1356
  9954.2    1354 9963.22    135210024.52    135210029.35    1354 10030.9  1354.9
10032.75    135610034.25  1357.710034.45    135810048.25  1359.210056.85    1360
10057.05    136010081.95    136210086.45  1362.910094.85    136410101.05  1365.1
10104.55    136610105.75  1366.310107.65  1366.8 10113.3    136810121.05  1369.4
10123.55  1369.810125.25    137010128.55  1370.210163.45    137210173.75  1372.9
10186.05    137410193.05    137510202.05    137610208.65  1377.310212.65    1378
10220.85  1379.510224.25    138010226.85  1380.910229.95    138210232.45  1382.3
10240.05  1383.110249.15    138410258.35  1385.710260.15    138610261.05  1386.1
10261.35  1386.110267.65  1386.610271.25  1386.810274.95  1386.810281.65  1386.4
10282.95  1386.310287.05    138610288.95  1385.710290.15  1385.610303.55    1384
10309.55  1383.310321.15    138210326.05  1380.610329.35    138010345.85    1378
10403.75    137810423.65    138010455.25    138210480.05    138410488.95    1386
10500.85    138810514.05    1390   10524    1390

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  9676.2    .065 9942.25     .0410034.45    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9942.2510034.45            118.6      98   106.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  9676.2    9958    1367 10036.7   10524    1367
```

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1363.22	Element			
Vel Head (ft)	0.09	Wt. n-Val.		0.040	0.065
W.S. Elev (ft)	1363.13	Reach Len. (ft)	118.60	98.00	106.70
Crit W.S. (ft)	1355.01	Flow Area (sq ft)		824.54	11.33
E.G. Slope (ft/ft)	0.000183	Area (sq ft)	64.91	949.69	149.89
Q Total (cfs)	2000.00	Flow (cfs)		1989.73	10.27
Top Width (ft)	164.69	Top Width (ft)	18.72	92.20	53.77
Vel Total (ft/s)	2.39	Avg. Vel. (ft/s)		2.41	0.91
Max Chl Dpth (ft)	11.13	Hydr. Depth (ft)		10.79	5.03
Conv. Total (cfs)	147732.8	Conv. (cfs)		146974.2	758.6
Length Wtd. (ft)	98.00	Wetted Per. (ft)		78.45	2.26
Min Ch El (ft)	1352.00	Shear (lb/sq ft)		0.12	0.06
Alpha	1.01	Stream Power (lb/ft s)		0.29	0.05
Frctn Loss (ft)		Cum Volume (acre-ft)	0.95	9.13	1.25
C & E Loss (ft)		Cum SA (acres)	0.05	1.26	0.22

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1368.44	Element			
Vel Head (ft)	0.08	Wt. n-Val.	0.065	0.040	0.065
W.S. Elev (ft)	1368.36	Reach Len. (ft)	118.60	98.00	106.70
Crit W.S. (ft)	1356.70	Flow Area (sq ft)	183.21	1431.59	508.00
E.G. Slope (ft/ft)	0.000113	Area (sq ft)	183.21	1431.59	508.00
Q Total (cfs)	4000.00	Flow (cfs)	142.40	3440.75	416.85
Top Width (ft)	202.39	Top Width (ft)	29.36	92.20	80.83
Vel Total (ft/s)	1.88	Avg. Vel. (ft/s)	0.78	2.40	0.82
Max Chl Dpth (ft)	16.36	Hydr. Depth (ft)	6.24	15.53	6.28
Conv. Total (cfs)	377005.9	Conv. (cfs)	13421.1	324296.0	39288.8
Length Wtd. (ft)	98.00	Wetted Per. (ft)	31.94	95.07	81.63
Min Ch El (ft)	1352.00	Shear (lb/sq ft)	0.04	0.11	0.04
Alpha	1.43	Stream Power (lb/ft s)	0.03	0.25	0.04
Frctn Loss (ft)		Cum Volume (acre-ft)	1.69	13.91	2.45
C & E Loss (ft)		Cum SA (acres)	0.14	1.47	0.42

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1369.99	Element			
Vel Head (ft)	0.14	Wt. n-Val.	0.065	0.040	0.065
W.S. Elev (ft)	1369.85	Reach Len. (ft)	118.60	98.00	106.70
Crit W.S. (ft)	1358.09	Flow Area (sq ft)	231.53	1568.83	634.53
E.G. Slope (ft/ft)	0.000179	Area (sq ft)	231.53	1568.83	634.53
Q Total (cfs)	6000.00	Flow (cfs)	235.20	5053.55	711.26

Top Width (ft)	217.19	Top Width (ft)	35.49	92.20	89.50
Vel Total (ft/s)	2.46	Avg. Vel. (ft/s)	1.02	3.22	1.12
Max Chl Dpth (ft)	17.85	Hydr. Depth (ft)	6.52	17.02	7.09
Conv. Total (cfs)	448497.0	Conv. (cfs)	17580.8	377750.2	53166.1
Length Wtd. (ft)	98.00	Wetted Per. (ft)	38.25	95.07	90.43
Min Ch El (ft)	1352.00	Shear (lb/sq ft)	0.07	0.18	0.08
Alpha	1.47	Stream Power (lb/ft s)	0.07	0.59	0.09
Frctn Loss (ft)		Cum Volume (acre-ft)	3.14	18.25	4.00
C & E Loss (ft)		Cum SA (acres)	0.56	1.52	0.62

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9942.25	9972.98	402.56	163.77	15.11	20.13	10.93	2.46
9972.98	10003.72	856.05	342.12	30.73	42.80	11.13	2.50
10003.72	RB 10034.45	731.12	318.66	32.60	36.56	10.37	2.29
10034.45	10104.39	10.27	11.33	2.26	0.51	5.03	0.91

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9853.57	9942.25	142.40	183.21	31.94	3.56	6.24	0.78
LB 9942.25	9972.98	1035.23	449.55	31.73	25.88	14.63	2.30
9972.98	10003.72	1274.25	502.75	30.73	31.86	16.36	2.53
10003.72	RB 10034.45	1131.27	479.29	32.60	28.28	15.60	2.36
10034.45	10104.39	413.89	495.75	70.47	10.35	7.09	0.83
10104.39	10174.32	2.96	12.25	11.16	0.07	1.12	0.24

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9853.57	9942.25	235.20	231.53	38.25	3.92	6.52	1.02
LB 9942.25	9972.98	1534.52	495.30	31.73	25.58	16.12	3.10
9972.98	10003.72	1858.14	548.50	30.73	30.97	17.85	3.39
10003.72	RB 10034.45	1660.89	525.04	32.60	27.68	17.08	3.16
10034.45	10104.39	697.28	599.85	70.47	11.62	8.58	1.16
10104.39	10174.32	13.97	34.68	19.96	0.23	1.77	0.40

CULVERT RIVER: Dreamy Draw
REACH: Upper Wash RS: 19.6145

INPUT
Description: Northern Avenue Culvert
Distance from Upstream XS = 22
Deck/Roadway Width = 70
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew =
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
9914.4	1367.7	1350	10113.3	1367.7	1350

Upstream Bridge Cross Section Data
Station Elevation Data num= 123

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9676.2	1382	9683.45	1381.7	9685.45	1381.5	9686.15	1381.5	9686.75	1381.4
9693.95	1380	9711.75	1379	9713.15	1378.9	9733.75	1378	9740.55	1377.5
9740.95	1377.5	9755.35	1376	9757.95	1375.7	9760.75	1375.2	9768.75	1374
9772.85	1373.7	9779.65	1373.3	9781.65	1373.3	9787.35	1373.5	9794.55	1373.6
9803.55	1373.5	9804.15	1373.5	9807.65	1373.4	9814.45	1373.5	9830.35	1373
9836.05	1373	9840.65	1372.9	9849.05	1372.7	9858.95	1372.2	9859.95	1372.2
9872.65	1372.1	9873.55	1372.1	9881.15	1372	9881.85	1372	9885.55	1371.8
9886.45	1371.8	9887.15	1371.8	9888.05	1371.7	9893.15	1371.2	9898.85	1370.8
9901.25	1370.6	9906.15	1370	9909.35	1369.2	9914.4	1368	9916.95	1367.2

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 9918.45  1366.7 9920.25    1366 9921.35  1364.9 9922.55    1364 9923.15  1363.6
 9923.95  1362.6 9924.55    1362 9925.95  1361.4 9929.55    1360 9929.75  1359.8
 9942.25    1358 9943.05  1357.5 9943.35  1357.1 9944.65  1356.7 9946.85    1356
  9954.2    1354 9963.22    135210024.52    135210029.35    1354 10030.9  1354.9
10032.75    135610034.25  1357.710034.45    135810048.25  1359.210056.85    1360
10057.05    136010081.95    136210086.45  1362.910094.85    136410101.05  1365.1
10104.55    136610105.75  1366.310107.65  1366.8 10113.3    136810121.05  1369.4
10123.55  1369.810125.25    137010128.55  1370.210163.45    137210173.75  1372.9
10186.05    137410193.05    137510202.05    137610208.65  1377.310212.65    1378
10220.85  1379.510224.25    138010226.85  1380.910229.95    138210232.45  1382.3
10240.05  1383.110249.15    138410258.35  1385.710260.15    138610261.05  1386.1
10261.35  1386.110267.65  1386.610271.25  1386.810274.95  1386.810281.65  1386.4
10282.95  1386.310287.05    138610288.95  1385.710290.15  1385.610303.55    1384
10309.55  1383.310321.15    138210326.05  1380.610329.35    138010345.85    1378
10403.75    137810423.65    138010455.25    138210480.05    138410488.95    1386
10500.85    138810514.05    1390   10524    1390

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  9676.2    .065 9942.25     .0410034.45    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
       9942.2510034.45             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  9676.2    9958    1367 10036.7   10524    1367

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
    9800  1367.7    1350 10170.5  1367.7    1350

Downstream Bridge Cross Section Data
Station Elevation Data    num=     104
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    9550    1388    9610    1386  9649.2    1384  9668.7  1382.5  9669.4  1382.4
  9683.2    1382  9696.9  1381.1    9699  1380.9  9699.2  1380.6  9738.3  1380.4
  9739.6  1380.4  9740.1  1380.3  9747.9  1380.2  9759.4    1380  9759.5    1380
  9778.2  1378.9  9784.4  1378.5  9791.6  1378.5  9800.5  1378.2  9804.3    1378
  9806.1  1377.8  9807.1  1377.8  9809.4  1377.6  9829.8    1376  9830.6  1375.9
  9832.6  1375.4  9836.2  1375.3  9837.6  1375.2  9854.5    1374  9857.6  1373.5
  9869.1    1372  9869.3  1371.9  9869.6  1371.9  9871.7    1371  9875.2    1370
  9883.7  1367.4  9886.9  1366.6  9889.1    1366  9890.4  1365.4  9893.4    1364
  9895.8  1363.1  9900.5    1362    9906  1360.3  9907.9    1360  9921.3  1359.5
  9948.1  1359.1  9966.6  1359.8  9974.8  1359.7  9977.9    1359  9984.6  1356.9
  9994.5    1352   10029    1352 10032.8    1356 10034.9  1356.3 10073.9    1358
   10076  1358.7 10076.1  1359.1 10078.2    1360 10080.9  1361.4 10082.6    1362
 10084.7  1362.6 10087.8    1364 10092.1  1365.3   10096  1365.5 10102.7    1366
 10103.2    1366 10122.1  1366.7 10144.8    1366 10147.8    1366 10170.5  1367.7
 10183.8    1368 10214.2  1369.7 10217.2    1370 10219.1  1370.1 10241.6    1372
 10262.2  1373.9 10262.8    1374 10263.4  1374.1 10288.7    1376 10305.9  1377.7
 10308.5    1378 10309.7  1378.1 10310.6  1378.2 10316.9  1378.7 10322.5  1378.9
 10323.9  1378.9 10328.3  1378.9 10334.3  1378.8 10336.2  1378.8 10352.1    1378
 10352.9    1378 10354.1  1377.9 10364.6  1377.1 10371.4  1376.4 10374.2  1376.2
 10375.5    1376 10379.2  1375.6 10393.5    1374 10401.5  1373.2 10413.5    1372
 10429.3    1370 10467.4    1370 10521.1    1372 10547.6    1374

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    9550    .065  9966.6     .04 10073.9    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9966.6 10073.9             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
    9550  9991.5    1367 10031.5 10547.6    1367

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
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Energy head used in spillway design          =
Spillway height used in design               =
Weir crest shape                             = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Northern Ave    Circular      14
FHWA Chart # 2 - Corrugated Metal Pipe Culvert
FHWA Scale # 3 - Pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
                 22      70       .024                   .7                1
Number of Barrels =  2
Upstream   Elevation =  1352
Centerline Stations
    Sta.    Sta.
  9988.2 10007.2
Downstream Elevation =  1352
Centerline Stations
    Sta.    Sta.
   10002   10021

CULVERT OUTPUT    Profile #1/3 Spillway
Culvert ID : Northern Ave

  Culv Q (cfs)           2000.00   Culv Vel In (ft/s)       10.51
  # Barrels                    2   Culv Vel Out (ft/s)      13.20
  Q Barrel (cfs)         1000.00   Culv Inv El Up (ft)    1352.00
  E.G. US. (ft)          1363.22   Culv Inv El Dn (ft)    1352.00
  W.S. US. (ft)          1363.13   Culv Frctn Ls (ft)        0.40
  Delta EG (ft)             4.68   Culv Ext Lss (ft)         3.08
  Delta WS (ft)             6.72   Culv Ent Lss (ft)         1.20
  E.G. IC (ft)           1362.71   Q Weir (cfs)
  E.G. OC (ft)           1363.22   Weir Sta Lft (ft)
  Culvert Control         Outlet   Weir Sta Rgt (ft)
  Culv WS In (ft)        1360.31   Weir Submerg
  Culv WS Out (ft)       1358.91   Weir Max Depth (ft)
  Culv Nml Depth (ft)              Weir Avg Depth (ft)
  Culv Crt Depth (ft)       6.91   Wr Flw Area (sq ft)
  Culv Ful Lngh (ft)               Min Top Rd (ft)        1367.70


CULVERT OUTPUT    Profile #2/3 Spillway
Culvert ID : Northern Ave

  Culv Q (cfs)           3670.87   Culv Vel In (ft/s)       13.70
  # Barrels                    2   Culv Vel Out (ft/s)      16.53
  Q Barrel (cfs)         1835.44   Culv Inv El Up (ft)    1352.00
  E.G. US. (ft)          1368.44   Culv Inv El Dn (ft)    1352.00
  W.S. US. (ft)          1368.36   Culv Frctn Ls (ft)        0.56
  Delta EG (ft)             6.14   Culv Ext Lss (ft)         3.43
  Delta WS (ft)             9.43   Culv Ent Lss (ft)         2.14
  E.G. IC (ft)           1368.44   Q Weir (cfs)            329.13
  E.G. OC (ft)           1368.41   Weir Sta Lft (ft)      9912.55
  Culvert Control          Inlet   Weir Sta Rgt (ft)     10115.73
  Culv WS In (ft)        1363.38   Weir Submerg              0.00
  Culv WS Out (ft)       1361.49   Weir Max Depth (ft)       0.74
  Culv Nml Depth (ft)              Weir Avg Depth (ft)       0.73
  Culv Crt Depth (ft)       9.49   Wr Flw Area (sq ft)     147.75
  Culv Ful Lngh (ft)               Min Top Rd (ft)        1367.70


CULVERT OUTPUT    Profile #Full Spillway
Culvert ID : Northern Ave

  Culv Q (cfs)           4150.12   Culv Vel In (ft/s)       14.64
  # Barrels                    2   Culv Vel Out (ft/s)      17.46
  Q Barrel (cfs)         2075.06   Culv Inv El Up (ft)    1352.00
  E.G. US. (ft)          1369.99   Culv Inv El Dn (ft)    1352.00
  W.S. US. (ft)          1369.85   Culv Frctn Ls (ft)        0.63
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Delta EG (ft)	4.54	Culv Ext Lss (ft)	1.38
Delta WS (ft)	8.85	Culv Ent Lss (ft)	2.52
E.G. IC (ft)	1369.99	Q Weir (cfs)	1849.88
E.G. OC (ft)	1369.96	Weir Sta Lft (ft)	9906.17
Culvert Control	Inlet	Weir Sta Rgt (ft)	10125.20
Culv WS In (ft)	1364.14	Weir Submerg	0.00
Culv WS Out (ft)	1362.10	Weir Max Depth (ft)	2.29
Culv Nml Depth (ft)		Weir Avg Depth (ft)	2.17
Culv Crt Depth (ft)	10.10	Wr Flw Area (sq ft)	475.41
Culv Ful Lngh (ft)		Min Top Rd (ft)	1367.70

CROSS SECTION RIVER: Dreamy Draw
REACH: Upper Wash RS: 19.604

INPUT
Description: Upper Wash Reach
Downstream Face Phoenix Mountain Preserve
Culvert
Cross Section Data Digitized from Topo Map Supplied by
the FCD using BOSS-RMS
Station Elevation Data num= 104

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9550	1388	9610	1386	9649.2	1384	9668.7	1382.5	9669.4	1382.4
9683.2	1382	9696.9	1381.1	9699	1380.9	9699.2	1380.6	9738.3	1380.4
9739.6	1380.4	9740.1	1380.3	9747.9	1380.2	9759.4	1380	9759.5	1380
9778.2	1378.9	9784.4	1378.5	9791.6	1378.5	9800.5	1378.2	9804.3	1378
9806.1	1377.8	9807.1	1377.8	9809.4	1377.6	9829.8	1376	9830.6	1375.9
9832.6	1375.4	9836.2	1375.3	9837.6	1375.2	9854.5	1374	9857.6	1373.5
9869.1	1372	9869.3	1371.9	9869.6	1371.9	9871.7	1371	9875.2	1370
9883.7	1367.4	9886.9	1366.6	9889.1	1366	9890.4	1365.4	9893.4	1364
9895.8	1363.1	9900.5	1362	9906	1360.3	9907.9	1360	9921.3	1359.5
9948.1	1359.1	9966.6	1359.8	9974.8	1359.7	9977.9	1359	9984.6	1356.9
9994.5	1352	10029	1352	10032.8	1356	10034.9	1356.3	10073.9	1358
10076	1358.7	10076.1	1359.1	10078.2	1360	10080.9	1361.4	10082.6	1362
10084.7	1362.6	10087.8	1364	10092.1	1365.3	10096	1365.5	10102.7	1366
10103.2	1366	10122.1	1366.7	10144.8	1366	10147.8	1366	10170.5	1367.7
10183.8	1368	10214.2	1369.7	10217.2	1370	10219.1	1370.1	10241.6	1372
10262.2	1373.9	10262.8	1374	10263.4	1374.1	10288.7	1376	10305.9	1377.7
10308.5	1378	10309.7	1378.1	10310.6	1378.2	10316.9	1378.7	10322.5	1378.9
10323.9	1378.9	10328.3	1378.9	10334.3	1378.8	10336.2	1378.8	10352.1	1378
10352.9	1378	10354.1	1377.9	10364.6	1377.1	10371.4	1376.4	10374.2	1376.2
10375.5	1376	10379.2	1375.6	10393.5	1374	10401.5	1373.2	10413.5	1372
10429.3	1370	10467.4	1370	10521.1	1372	10547.6	1374		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9550	.065	9966.6	.04	10073.9	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9966.6	10073.9	320	274	199.1	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9550	9991.5	1367	10031.5	10547.6	1367

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1358.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.13	Wt. n-Val.		0.040	
W.S. Elev (ft)	1356.41	Reach Len. (ft)	320.00	274.00	199.10
Crit W.S. (ft)	1356.41	Flow Area (sq ft)		170.87	
E.G. Slope (ft/ft)	0.015033	Area (sq ft)		181.62	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	51.82	Top Width (ft)		51.82	
Vel Total (ft/s)	11.70	Avg. Vel. (ft/s)		11.70	
Max Chl Dpth (ft)	4.41	Hydr. Depth (ft)		4.27	
Conv. Total (cfs)	16311.9	Conv. (cfs)		16311.9	
Length Wtd. (ft)	271.97	Wetted Per. (ft)		41.48	
Min Ch El (ft)	1352.00	Shear (lb/sq ft)		3.87	
Alpha	1.00	Stream Power (lb/ft s)		45.25	
Frctn Loss (ft)	2.55	Cum Volume (acre-ft)	0.86	7.86	1.06

C & E Loss (ft)	0.61	Cum SA (acres)	0.03	1.10	0.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1362.30	Element			
Vel Head (ft)	3.37	Wt. n-Val.		0.040	
W.S. Elev (ft)	1358.93	Reach Len. (ft)	320.00	274.00	199.10
Crit W.S. (ft)	1358.93	Flow Area (sq ft)		271.67	
E.G. Slope (ft/ft)	0.012820	Area (sq ft)		383.96	1.22
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	97.93	Top Width (ft)		95.78	2.16
Vel Total (ft/s)	14.72	Avg. Vel. (ft/s)		14.72	
Max Chl Dpth (ft)	6.93	Hydr. Depth (ft)		6.79	
Conv. Total (cfs)	35328.1	Conv. (cfs)		35328.1	
Length Wtd. (ft)	272.20	Wetted Per. (ft)		41.48	
Min Ch El (ft)	1352.00	Shear (lb/sq ft)		5.24	
Alpha	1.00	Stream Power (lb/ft s)		77.18	
Frctn Loss (ft)	2.41	Cum Volume (acre-ft)	1.44	11.86	1.83
C & E Loss (ft)	0.94	Cum SA (acres)	0.10	1.26	0.32

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1365.45	Element			
Vel Head (ft)	4.46	Wt. n-Val.		0.040	
W.S. Elev (ft)	1360.99	Reach Len. (ft)	320.00	274.00	199.10
Crit W.S. (ft)	1360.99	Flow Area (sq ft)		354.18	
E.G. Slope (ft/ft)	0.011915	Area (sq ft)	92.92	597.27	9.74
Q Total (cfs)	6000.00	Flow (cfs)		6000.00	
Top Width (ft)	176.35	Top Width (ft)	62.84	107.30	6.21
Vel Total (ft/s)	16.94	Avg. Vel. (ft/s)		16.94	
Max Chl Dpth (ft)	8.99	Hydr. Depth (ft)		8.85	
Conv. Total (cfs)	54967.2	Conv. (cfs)		54967.2	
Length Wtd. (ft)	271.50	Wetted Per. (ft)		41.48	
Min Ch El (ft)	1352.00	Shear (lb/sq ft)		6.35	
Alpha	1.00	Stream Power (lb/ft s)		107.60	
Frctn Loss (ft)	2.50	Cum Volume (acre-ft)	2.70	15.81	3.21
C & E Loss (ft)	1.15	Cum SA (acres)	0.43	1.29	0.50

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9966.60	10002.37	530.86	45.69	11.21	26.54	4.20	11.62
10002.37	10038.13	1469.14	125.18	30.26	73.46	4.30	11.74

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9966.60	10002.37	1072.22	73.07	11.21	26.81	6.72	14.67
10002.37	10038.13	2927.78	198.59	30.26	73.19	6.82	14.74

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9966.60	10002.37	1614.57	95.49	11.21	26.91	8.79	16.91
10002.37	10038.13	4385.43	258.69	30.26	73.09	8.88	16.95

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for

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         additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to
         critical depth, the calculated water surface came back below critical depth.  This
indicates
         that there is not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest,
valid,
         energy was used.

CROSS SECTION          RIVER: Dreamy Draw
REACH: Upper Wash         RS: 19.552

INPUT
Description: Upper Wash Reach
Exit Section Phoenix Mountain Preserve
             Culvert
Cross Section Data Digitized from Topo Map Supplied by
             the FCD using BOSS-RMS
Station Elevation Data     num=     113
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
  9748.9     1400    9773     1390    9802     1380  9841.4     1370  9848.7     1368
  9864.3     1366  9873.4     1364  9873.5     1364  9879.7     1362    9889     1362
  9890.4   1362.3  9890.9   1362.3  9891.4   1362.4  9892.5   1362.4    9894   1362.4
  9896.4   1362.4  9908.3   1362.9  9913.9   1363.1  9922.1   1363.3  9924.1   1363.4
  9925.8   1363.4  9926.4   1363.3  9927.4   1363.3  9928.3   1363.2  9935.2   1362.5
  9940.7     1362  9942.4     1362  9947.3   1362.7  9948.4   1362.7    9949   1362.8
  9950.7   1362.7  9956.9   1362.4  9963.3     1362  9963.6     1362  9964.9   1361.8
  9972.4   1360.5  9976.1     1360  9985.8   1350.8  9986.9     1350  9987.3   1349.9
  9994.5     1348  9999.1   1346.6  9999.5   1346.4  9999.6   1346.2  9999.7   1346.2
  9999.9   1346.2   10000   1346.2 10000.4   1346.2 10001.2   1346.4 10002.3   1346.5
 10009.6   1347.9 10010.5     1348 10013.3   1348.2 10041.1     1350 10046.6   1350.5
 10056.8     1352 10060.4     1353 10063.4     1354 10075.6   1355.7 10078.5   1355.8
 10083.3     1356 10084.3     1356 10092.4   1356.1 10094.6     1356   10096   1355.8
 10098.9     1356   10108     1356 10109.8     1356 10111.6     1357 10113.1     1358
 10115.3   1358.7 10116.3   1359.3   10118     1360 10120.4   1360.7 10126.3     1362
 10143.4     1362 10155.2     1362 10165.5     1362 10166.7     1362 10169.5     1362
 10173.3   1362.6 10180.9     1364 10197.5     1365   10216     1366 10227.9   1366.9
 10244.7     1368 10254.1   1369.4 10261.5     1370 10274.2     1371 10284.5     1372
 10284.7     1372 10285.1     1372 10295.3   1372.8 10301.1     1373 10303.7   1373.1
 10310.2   1373.2 10313.1   1373.3 10316.7   1373.2 10322.5     1373 10330.3   1372.7
 10333.2   1372.6 10343.5     1372 10346.5   1371.8 10364.8     1370 10365.1     1370
 10386.4   1369.1 10398.5   1368.7 10415.8     1368 10458.6     1366 10499.7     1364
 10523.1     1364 10538.6     1366 10566.9     1368

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  9748.9    .045  9986.9     .04 10041.1    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        9986.9 10041.1            409.4     417   414.4              .1       .3

CROSS SECTION OUTPUT    Profile #1/3 Spillway

  E.G. Elev (ft)            1353.74   Element                    Left OB    Channel   Right OB
  Vel Head (ft)                0.91   Wt. n-Val.                   0.045      0.040      0.045
  W.S. Elev (ft)            1352.83   Reach Len. (ft)             409.40     417.00     414.40
  Crit W.S. (ft)            1351.95   Flow Area (sq ft)             4.84     237.61      31.52
  E.G. Slope (ft/ft)       0.006385   Area (sq ft)                  4.84     237.61      31.52
  Q Total (cfs)             2000.00   Flow (cfs)                   13.81    1869.34     116.85
  Top Width (ft)              76.12   Top Width (ft)                3.24      54.20      18.68
  Vel Total (ft/s)             7.30   Avg. Vel. (ft/s)              2.85       7.87       3.71
  Max Chl Dpth (ft)            6.63   Hydr. Depth (ft)              1.49       4.38       1.69
  Conv. Total (cfs)         25028.5   Conv. (cfs)                  172.9    23393.4     1462.3
  Length Wtd. (ft)           416.90   Wetted Per. (ft)              4.31      55.07      18.93
  Min Ch El (ft)            1346.20   Shear (lb/sq ft)              0.45       1.72       0.66
  Alpha                        1.10   Stream Power (lb/ft s)        1.28      13.53       2.46
  Frctn Loss (ft)              4.01   Cum Volume (acre-ft)          0.84       6.54       0.99
  C & E Loss (ft)              0.07   Cum SA (acres)                0.02       0.76       0.11
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Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1356.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.18	Wt. n-Val.	0.045	0.040	0.045
W.S. Elev (ft)	1352.58	Reach Len. (ft)	409.40	417.00	414.40
Crit W.S. (ft)	1353.81	Flow Area (sq ft)	4.08	224.38	27.07
E.G. Slope (ft/ft)	0.031401	Area (sq ft)	4.08	224.38	27.07
Q Total (cfs)	4000.00	Flow (cfs)	24.41	3767.85	207.74
Top Width (ft)	74.99	Top Width (ft)	2.98	54.20	17.80
Vel Total (ft/s)	15.65	Avg. Vel. (ft/s)	5.98	16.79	7.68
Max Chl Dpth (ft)	6.38	Hydr. Depth (ft)	1.37	4.14	1.52
Conv. Total (cfs)	22572.8	Conv. (cfs)	137.7	21262.7	1172.3
Length Wtd. (ft)	416.82	Wetted Per. (ft)	3.95	55.07	18.02
Min Ch El (ft)	1346.20	Shear (lb/sq ft)	2.02	7.99	2.95
Alpha	1.10	Stream Power (lb/ft s)	12.10	134.13	22.60
Frctn Loss (ft)	5.28	Cum Volume (acre-ft)	1.43	9.95	1.76
C & E Loss (ft)	0.24	Cum SA (acres)	0.09	0.79	0.27

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1359.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.23	Wt. n-Val.	0.045	0.040	0.045
W.S. Elev (ft)	1353.37	Reach Len. (ft)	409.40	417.00	414.40
Crit W.S. (ft)	1355.36	Flow Area (sq ft)	6.74	266.74	42.04
E.G. Slope (ft/ft)	0.037804	Area (sq ft)	6.74	266.74	42.04
Q Total (cfs)	6000.00	Flow (cfs)	52.13	5515.35	432.52
Top Width (ft)	78.41	Top Width (ft)	3.81	54.20	20.40
Vel Total (ft/s)	19.02	Avg. Vel. (ft/s)	7.74	20.68	10.29
Max Chl Dpth (ft)	7.17	Hydr. Depth (ft)	1.77	4.92	2.06
Conv. Total (cfs)	30858.9	Conv. (cfs)	268.1	28366.2	2224.5
Length Wtd. (ft)		Wetted Per. (ft)	5.09	55.07	20.73
Min Ch El (ft)	1346.20	Shear (lb/sq ft)	3.12	11.43	4.79
Alpha	1.11	Stream Power (lb/ft s)	24.17	236.37	49.25
Frctn Loss (ft)	5.32	Cum Volume (acre-ft)	2.33	13.09	3.09
C & E Loss (ft)	0.53	Cum SA (acres)	0.19	0.79	0.44

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9907.57	9986.90	13.81	4.84	4.31	0.69	1.49	2.85
LB 9986.90	10004.97	769.97	91.43	18.78	38.50	5.06	8.42
10004.97	10023.03	690.03	84.51	18.18	34.50	4.68	8.17
10023.03	RB 10041.10	409.35	61.67	18.10	20.47	3.41	6.64
10041.10	10116.21	116.85	31.52	18.93	5.84	1.69	3.71

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9907.57	9986.90	24.41	4.08	3.95	0.61	1.37	5.98
LB 9986.90	10004.97	1569.85	87.02	18.78	39.25	4.82	18.04
10004.97	10023.03	1397.15	80.10	18.18	34.93	4.43	17.44
10023.03	RB 10041.10	800.85	57.26	18.10	20.02	3.17	13.99
10041.10	10116.21	207.74	27.07	18.02	5.19	1.52	7.68

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9907.57	9986.90	52.13	6.74	5.09	0.87	1.77	7.74
LB 9986.90	10004.97	2222.78	101.14	18.78	37.05	5.60	21.98
10004.97	10023.03	2018.19	94.22	18.18	33.64	5.22	21.42
10023.03	RB 10041.10	1274.38	71.38	18.10	21.24	3.95	17.85
10041.10	10116.21	432.52	42.04	20.73	7.21	2.06	10.29

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Upper Wash RS: 19.473

INPUT
Description: Upper Wash Reach
Approach Section SR 51 Box Culvert
Cross
Section Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 140

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9829.7	1362	9858.4	1361.5	9860.9	1361.5	9862.3	1361.5	9863.7	1361.4
9870.5	1361.3	9875.4	1361.2	9879.6	1361.1	9884.6	1361	9920.5	1360
9925.5	1359.4	9938.6	1358	9943.4	1356.4	9944.6	1356	9946.2	1355.4
9950.9	1354	9956.2	1352.7	9957.6	1352.3	9958.6	1352	9960.8	1351.5
9966.5	1350	9972	1348.6	9974.3	1348	9984	1346.3	9986	1346
9988.7	1344.6	9990	1344	9992.7	1343.3	9993.2	1343.2	9996.8	1342.5
9997.5	1342.4	9999.5	1342.2	10000	1342.2	10000	1342.1	10000.5	1342.1
10000.7	1342.1	10001.5	1342.3	10002.3	1342.4	10017.4	1344	10020.2	1344.7
10023.1	1345.4	10026	1346	10031.9	1347.6	10033.4	1348	10038.9	1349.8
10039.8	1350	10041.3	1350.3	10049.7	1352	10088.7	1353.5	10092.9	1353.7
10095.5	1353.8	10097.2	1353.8	10098.8	1353.8	10105.1	1354	10124.3	1354.6
10132.5	1354.9	10162.4	1356	10180	1357.7	10181.1	1357.8	10191.6	1358.5
10194.4	1358.8	10210.3	1360	10214.3	1360	10235.4	1360	10240	1360
10243.3	1358.3	10243.5	1358.2	10244.1	1358	10244.6	1357.8	10248.3	1356
10251.5	1355.1	10254.7	1354	10257.8	1352.8	10260.5	1352	10262.8	1351.4

10265	1352	10272.2	1352.9	10284.3	1353.1	10289.3	1353.2	10294.5	1353.5
10295.8	1353.5	10302.6	1353.6	10305.4	1353.6	10306.6	1353.5	10307.1	1353.5
10307.9	1353.1	10308.6	1353	10324.4	1354	10330.2	1355.8	10330.8	1356
10332.3	1356.4	10338.2	1358	10340.5	1359.7	10341.1	1360	10343	1360.2
10348.3	1360.6	10348.3	1360	10349.5	1360	10349.9	1359.6	10352	1359.4
10353.3	1359.4	10354.1	1359.5	10358.7	1360	10358.8	1360.1	10361.1	1362
10370.4	1361.4	10371.5	1362	10375.5	1362	10382.7	1362	10384.3	1361.7
10385.5	1361.3	10388.3	1360	10390.9	1358.8	10392.2	1358.2	10392.5	1358
10394	1357.7	10405.4	1356	10419	1355	10421.3	1355	10427.7	1354.8
10439.6	1354.6	10457.3	1354.3	10459.2	1354.3	10463.8	1354.1	10466.2	1354
10472.4	1353.8	10475.6	1353.7	10477.9	1353.7	10503.5	1352.9	10510.7	1352.6
10527	1352	10566.3	1352	10571.3	1352	10582.4	1352	10583.8	1352
10584.3	1352	10584.4	1352	10640.6	1352	10641	1352	10751.7	1352

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9829.7	.045	9960.8	.04	10049.7	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9960.8	10049.7	424	411	395.3	.3	.5

Right Levee Station=10210.37 Elevation= 1361.12

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1349.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.63	Wt. n-Val.		0.040	
W.S. Elev (ft)	1348.03	Reach Len. (ft)	411.00	411.00	411.00
Crit W.S. (ft)	1348.03	Flow Area (sq ft)		195.16	
E.G. Slope (ft/ft)	0.016087	Area (sq ft)		195.16	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	59.30	Top Width (ft)		59.30	
Vel Total (ft/s)	10.25	Avg. Vel. (ft/s)		10.25	
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)		3.29	
Conv. Total (cfs)	15768.4	Conv. (cfs)		15768.4	
Length Wtd. (ft)	411.00	Wetted Per. (ft)		60.84	
Min Ch El (ft)	1342.10	Shear (lb/sq ft)		3.22	
Alpha	1.00	Stream Power (lb/ft s)		33.01	
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.82	4.72	0.84
C & E Loss (ft)	0.80	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: A flow split was encountered. The program first calculated the momentum of both channels below the junction. An energy balance was performed across the junction from the stream with the highest momentum downstream to the section upstream.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1352.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.23	Wt. n-Val.		0.040	
W.S. Elev (ft)	1350.11	Reach Len. (ft)	411.00	411.00	411.00
Crit W.S. (ft)	1350.11	Flow Area (sq ft)		334.00	
E.G. Slope (ft/ft)	0.014547	Area (sq ft)		334.00	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	74.30	Top Width (ft)		74.30	
Vel Total (ft/s)	11.98	Avg. Vel. (ft/s)		11.98	
Max Chl Dpth (ft)	8.01	Hydr. Depth (ft)		4.50	

Conv. Total (cfs)	33164.3	Conv. (cfs)		33164.3	
Length Wtd. (ft)	411.00	Wetted Per. (ft)		76.43	
Min Ch El (ft)	1342.10	Shear (lb/sq ft)		3.97	
Alpha	1.00	Stream Power (lb/ft s)		47.53	
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	1.33	7.03	1.37
C & E Loss (ft)	1.11	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: A flow split was encountered. The program first calculated the momentum of both channels below the junction. An energy balance was performed across the junction from the stream with the highest momentum downstream to the section upstream.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1354.31	Element			
Vel Head (ft)	2.62	Wt. n-Val.	0.045	0.040	
W.S. Elev (ft)	1351.69	Reach Len. (ft)	411.00	411.00	411.00
Crit W.S. (ft)	1351.69	Flow Area (sq ft)	0.08	461.90	
E.G. Slope (ft/ft)	0.013777	Area (sq ft)	0.08	461.90	
Q Total (cfs)	6000.00	Flow (cfs)	0.06	5999.94	
Top Width (ft)	88.20	Top Width (ft)	0.84	87.37	
Vel Total (ft/s)	12.99	Avg. Vel. (ft/s)	0.79	12.99	
Max Chl Dpth (ft)	9.59	Hydr. Depth (ft)	0.09	5.29	
Conv. Total (cfs)	51117.1	Conv. (cfs)	0.5	51116.6	
Length Wtd. (ft)	411.00	Wetted Per. (ft)	0.86	89.83	
Min Ch El (ft)	1342.10	Shear (lb/sq ft)	0.08	4.42	
Alpha	1.00	Stream Power (lb/ft s)	0.06	57.45	
Frctn Loss (ft)		Cum Volume (acre-ft)	1.99	8.99	2.12
C & E Loss (ft)		Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9960.80	9990.43	145.47	26.26	16.90	7.27	1.62	5.54
9990.43	10020.07	1717.13	145.47	30.10	85.86	4.91	11.80
10020.07	RB 10049.70	137.40	23.43	13.84	6.87	1.75	5.87

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: A flow split was encountered. The program first calculated the momentum of both channels below the junction. An energy balance was performed across the junction from the stream with the highest momentum downstream to the section upstream.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9960.80	9990.43	534.48	68.58	25.29	13.36	2.81	7.79
9990.43	10020.07	3006.70	207.28	30.10	75.17	6.99	14.51
10020.07	RB 10049.70	458.82	58.14	21.04	11.47	2.86	7.89

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: A flow split was encountered. The program first calculated the momentum of both channels below the junction. An energy balance was performed across the junction from the stream with the highest momentum downstream to the section upstream.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9917.10	9960.80	0.06	0.08	0.86	0.00	0.09	0.79
LB 9960.80	9990.43	1033.86	111.64	30.74	17.23	3.77	9.26
9990.43	10020.07	4125.99	253.98	30.10	68.77	8.57	16.25
10020.07	RB 10049.70	840.09	96.29	28.99	14.00	3.43	8.72

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 19.262

INPUT
Description: Lower Wash Reach
Exit Section SR 51 Box Culvert

Cross Section
Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 138

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9842	1362	9866.3	1360	9875.6	1358.7	9881.2	1358	9886	1357.3
9892.3	1356	9901.9	1354.4	9904.8	1354	9911.2	1352.6	9913.6	1352
9921.5	1350	9921.6	1350	9921.7	1350	9930.7	1348	9937.1	1346.5
9939.7	1346	9941.3	1345.4	9945.3	1344	9947.7	1343.4	9951.8	1342
9958.9	1340.4	9960.5	1340	9961.9	1339.7	9966.5	1338	9974.1	1336.2
9975.4	1336	9976.7	1335.7	9982.7	1334	9984.4	1333.7	9990.7	1332
9996.1	1331.4	10000	1330	10001.8	1330.6	10002.7	1330.6	10003.6	1330.5
10006.3	1330.5	10008.2	1330.5	10009.9	1330.5	10012.6	1330.5	10018.6	1330.6
10026.6	1330	10027.4	1331.2	10038.9	1332	10039.5	1332.5	10043.2	1334
10044.6	1335.1	10046.2	1336	10047.7	1336.9	10050.3	1338	10053	1339.7
10054.9	1340	10055.7	1340	10057.2	1340	10063.1	1340	10072.3	1340
10073.4	1340	10076.1	1340.2	10078.3	1340.4	10079.7	1340.4	10084.2	1340.4
10087.9	1340.6	10090.2	1340.7	10093.8	1340.7	10099	1340.8	10101.1	1340.8
10103.4	1340.8	10105.9	1340.8	10108.8	1340.8	10114.4	1340.7	10143.1	1340.4
10157.8	1340.3	10165.8	1340.2	10166.5	1340.2	10181.8	1340.2	10182.3	1340.2
10186.6	1340.2	10187	1340.2	10189.7	1340.2	10192.1	1340.2	10195.5	1340.3
10199.4	1340.3	10204.4	1340.5	10207.6	1340.5	10209.7	1340.6	10211.7	1340.6
10215.1	1340.5	10220.2	1340.5	10224.7	1340.4	10241.4	1340	10274.3	1339.2
10276.3	1339.1	10277.9	1339.1	10291	1338.8	10293.3	1338.8	10293.7	1338.8
10294.8	1338.8	10296	1338.9	10300.1	1338.9	10301.8	1338.9	10303.3	1338.9
10304.9	1338.9	10308.4	1339	10330.7	1338.8	10331.7	1338.7	10332.5	1338.7
10335.3	1338.6	10336.2	1338.6	10363.5	1338	10390.6	1336	10405.6	1334
10418.4	1332	10436.9	1332	10482	1332	10489.2	1330	10493.2	1328
10496.8	1326	10510.4	1326	10515.1	1328	10522.3	1330	10528.6	1332
10633.5	1332	10636.2	1332	10664.9	1334	10769	1334	10774.9	1332
10780.1	1330	10786.2	1328	10811.2	1328	10824.2	1330	10843.2	1332
10858.8	1334	10895.4	1336	10966.8	1336	10974.1	1334	10985.5	1332
11075.3	1332	11106.2	1340	11299.1	1346				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9842	.065	9984.4	.055	10043.2	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9984.4	10043.2	246.2	253	259.5	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
10240.8	11299.1	1345

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1337.59	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-Val.	0.065	0.055	0.065
W.S. Elev (ft)	1337.11	Reach Len. (ft)	246.20	253.00	259.50
Crit W.S. (ft)	1334.56	Flow Area (sq ft)	23.84	344.32	7.13
E.G. Slope (ft/ft)	0.004280	Area (sq ft)	23.84	344.32	3173.28
Q Total (cfs)	2000.00	Flow (cfs)	49.49	1938.41	12.09
Top Width (ft)	797.48	Top Width (ft)	14.15	58.80	724.52
Vel Total (ft/s)	5.33	Avg. Vel. (ft/s)	2.08	5.63	1.70
Max Chl Dpth (ft)	11.11	Hydr. Depth (ft)	1.68	5.86	1.43
Conv. Total (cfs)	30570.3	Conv. (cfs)	756.5	29628.9	184.9
Length Wtd. (ft)	252.94	Wetted Per. (ft)	14.57	60.57	5.91
Min Ch El (ft)	1330.00	Shear (lb/sq ft)	0.44	1.52	0.32
Alpha	1.09	Stream Power (lb/ft s)	0.91	8.55	0.55
Frctn Loss (ft)	2.22	Cum Volume (acre-ft)	2.22	30.98	69.49
C & E Loss (ft)	0.09	Cum SA (acres)	5.18	9.88	44.95

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1340.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.89	Wt. n-Val.	0.065	0.055	0.065
W.S. Elev (ft)	1339.35	Reach Len. (ft)	246.20	253.00	259.50
Crit W.S. (ft)	1336.56	Flow Area (sq ft)	64.73	476.00	23.55
E.G. Slope (ft/ft)	0.005338	Area (sq ft)	64.73	476.00	4889.58
Q Total (cfs)	4000.00	Flow (cfs)	219.86	3713.67	66.46
Top Width (ft)	925.25	Top Width (ft)	21.56	58.80	844.89
Vel Total (ft/s)	7.09	Avg. Vel. (ft/s)	3.40	7.80	2.82
Max Chl Dpth (ft)	13.35	Hydr. Depth (ft)	3.00	8.10	2.55
Conv. Total (cfs)	54750.2	Conv. (cfs)	3009.4	50831.1	909.7
Length Wtd. (ft)	252.87	Wetted Per. (ft)	22.32	60.57	10.73
Min Ch El (ft)	1330.00	Shear (lb/sq ft)	0.97	2.62	0.73
Alpha	1.14	Stream Power (lb/ft s)	3.28	20.43	2.06
Frctn Loss (ft)	2.11	Cum Volume (acre-ft)	8.58	47.23	138.88
C & E Loss (ft)	0.05	Cum SA (acres)	14.34	11.90	96.81

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1341.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.60	Wt. n-Val.	0.065	0.055	0.065
W.S. Elev (ft)	1340.20	Reach Len. (ft)	246.20	253.00	259.50
Crit W.S. (ft)	1338.20	Flow Area (sq ft)	84.31	526.08	37.38
E.G. Slope (ft/ft)	0.008471	Area (sq ft)	84.31	526.08	5631.38
Q Total (cfs)	6000.00	Flow (cfs)	392.71	5527.20	80.09
Top Width (ft)	1023.04	Top Width (ft)	24.71	58.80	939.53
Vel Total (ft/s)	9.26	Avg. Vel. (ft/s)	4.66	10.51	2.14
Max Chl Dpth (ft)	14.20	Hydr. Depth (ft)	3.41	8.95	0.55
Conv. Total (cfs)	65191.7	Conv. (cfs)	4267.0	60054.6	870.1
Length Wtd. (ft)	253.05	Wetted Per. (ft)	25.60	60.57	69.19
Min Ch El (ft)	1330.00	Shear (lb/sq ft)	1.74	4.59	0.29
Alpha	1.20	Stream Power (lb/ft s)	8.11	48.26	0.61
Frctn Loss (ft)	2.22	Cum Volume (acre-ft)	18.03	61.05	197.76
C & E Loss (ft)	0.18	Cum SA (acres)	23.01	12.48	112.45

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9936.93	9984.40	49.49	23.84	14.57	2.47	1.68	2.08
LB 9984.40	10004.00	577.30	107.76	20.20	28.87	5.50	5.36
10004.00	10023.60	802.32	129.75	19.62	40.12	6.62	6.18
10023.60	RB 10043.20	558.78	106.81	20.75	27.94	5.45	5.23
10043.20	10222.61	12.09	7.13	5.91	0.60	1.43	1.70

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9936.93	9984.40	219.87	64.73	22.32	5.50	3.00	3.40
LB 9984.40	10004.00	1142.61	151.66	20.20	28.57	7.74	7.53
10004.00	10023.60	1460.35	173.64	19.62	36.51	8.86	8.41
10023.60	RB 10043.20	1110.72	150.70	20.75	27.77	7.69	7.37
10043.20	10222.61	66.46	23.55	10.73	1.66	2.55	2.82

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9936.93	9984.40	392.71	84.31	25.60	6.55	3.41	4.66
LB 9984.40	10004.00	1714.09	168.35	20.20	28.57	8.59	10.18
10004.00	10023.60	2145.11	190.34	19.62	35.75	9.71	11.27
10023.60	RB 10043.20	1667.99	167.40	20.75	27.80	8.54	9.96
10043.20	10222.61	79.61	36.63	61.28	1.33	0.61	2.17
10222.61	10402.03	0.48	0.75	7.91	0.01	0.09	0.64

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 19.214

INPUT
Description: Lower Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 148

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9724.7	1350	9730.1	1348.3	9731	1348	9731.1	1348	9731.8	1347.6
9734	1346.5	9734.9	1346	9736.9	1345.2	9739.6	1344	9742.8	1343
9745.2	1342	9745.9	1341.7	9750.6	1340	9753.9	1338.8	9754.4	1338.5
9754.4	1338.3	9754.5	1338.2	9755.4	1338	9758.3	1338	9768.1	1338
9810.6	1338	9822.3	1338	9829.1	1338	9832.1	1338	9839.8	1338
9844.4	1338	9846.9	1338	9862.2	1338	9865	1338	9868	1338
9877.3	1337.8	9878	1337.8	9893.1	1337.4	9893.9	1337.4	9906.3	1337
9908.9	1337.1	9910.8	1337.2	9913.1	1337.2	9915.3	1337.2	9917.9	1337.1
9920.2	1337.1	9925.4	1337	9930.9	1336.8	9957.2	1336	9962.8	1334.1
9963	1334	9963.4	1333.9	9970.8	1332	9975	1331.1	9983.2	1330
9991.5	1328.8	9994	1328.5	10000	1328.4	10000.9	1328.5	10004	1328.9
10010.9	1329.9	10011.9	1330	10016.4	1331.4	10018.2	1332	10018.4	1332
10029.1	1334	10031.3	1334.8	10034.8	1336	10042.7	1337.8	10043.8	1338
10045.7	1338	10045.9	1338	10049.1	1338	10071.4	1338	10082.3	1338
10095.4	1336.8	10097.4	1336.7	10101.1	1336.6	10105.8	1336.7	10108.5	1336.8
10117.6	1336.9	10121.4	1336.9	10123	1336.9	10128.8	1336.9	10137.6	1337.1
10139.8	1337.2	10141.5	1337.2	10147.7	1337.2	10152.9	1337.1	10156.7	1337.1
10164.7	1337	10170.8	1337.1	10176.1	1337.2	10178.2	1337.3	10179.4	1337.3
10183.3	1337.3	10188.2	1337.5	10192	1337.5	10193.3	1337.6	10195	1337.6
10195.9	1337.6	10196.2	1337.6	10196.5	1337.6	10200.3	1337.4	10200.9	1337.4
10201.4	1337.4	10204.3	1337.4	10207.5	1337.4	10207.9	1337.4	10208.2	1337.4
10209.6	1337.6	10210.1	1337.6	10210.5	1337.6	10211.6	1337.6	10212.7	1337.6
10214.6	1337.5	10238.1	1337.1	10246.9	1336.9	10250	1336.8	10251.2	1336.8
10252.9	1337	10254.3	1337	10255.4	1337	10273.1	1336.3	10274.3	1336.3
10282	1336	10282.4	1336	10283.1	1336	10295.8	1337.5	10298.9	1337.9
10299.6	1338	10303	1338	10335.5	1338	10342.2	1337.5	10346.4	1337.1

10351.6	1336.7	10363.6	1336	10374.9	1336	10379.1	1336	10383.1	1336
10386.8	1336	10464.2	1334	10684.2	1332	10815.6	1326	11093.6	1338
11103.8	1336	11141.8	1334	11151.1	1332	11159.4	1330	11226.3	1330
11242.7	1332	11267.9	1340	11326.8	1350				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9724.7	.065	9957.2	.055	10043.8	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9957.2	10043.8	229.1	212	209.6	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
10334.7	11326.8	1345

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1335.28	Element			
Vel Head (ft)	1.43	Wt. n-Val.		0.055	
W.S. Elev (ft)	1333.85	Reach Len. (ft)	229.10	212.00	209.60
Crit W.S. (ft)	1333.70	Flow Area (sq ft)		208.43	
E.G. Slope (ft/ft)	0.027091	Area (sq ft)		208.43	1877.88
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	686.83	Top Width (ft)		64.66	622.17
Vel Total (ft/s)	9.60	Avg. Vel. (ft/s)		9.60	
Max Chl Dpth (ft)	7.85	Hydr. Depth (ft)		3.22	
Conv. Total (cfs)	12151.2	Conv. (cfs)		12151.2	
Length Wtd. (ft)	212.00	Wetted Per. (ft)		65.76	
Min Ch El (ft)	1328.40	Shear (lb/sq ft)		5.36	
Alpha	1.00	Stream Power (lb/ft s)		51.44	
Frctn Loss (ft)	3.81	Cum Volume (acre-ft)	2.16	29.38	54.44
C & E Loss (ft)	0.12	Cum SA (acres)	5.14	9.52	40.94

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1338.08	Element			
Vel Head (ft)	1.43	Wt. n-Val.	0.065	0.055	0.065
W.S. Elev (ft)	1336.65	Reach Len. (ft)	229.10	212.00	209.60
Crit W.S. (ft)	1335.62	Flow Area (sq ft)	6.94	413.40	8.42
E.G. Slope (ft/ft)	0.014766	Area (sq ft)	6.94	413.40	3992.77
Q Total (cfs)	4000.00	Flow (cfs)	9.10	3979.60	11.29
Top Width (ft)	997.04	Top Width (ft)	21.36	80.45	895.23
Vel Total (ft/s)	9.33	Avg. Vel. (ft/s)	1.31	9.63	1.34
Max Chl Dpth (ft)	10.65	Hydr. Depth (ft)	0.32	5.14	0.30
Conv. Total (cfs)	32917.1	Conv. (cfs)	74.9	32749.3	92.9
Length Wtd. (ft)	212.02	Wetted Per. (ft)	21.37	82.33	28.57
Min Ch El (ft)	1328.40	Shear (lb/sq ft)	0.30	4.63	0.27
Alpha	1.06	Stream Power (lb/ft s)	0.39	44.56	0.36
Frctn Loss (ft)	3.94	Cum Volume (acre-ft)	8.38	44.64	112.43
C & E Loss (ft)	0.09	Cum SA (acres)	14.22	11.50	91.63

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1339.41	Element			
Vel Head (ft)	1.01	Wt. n-Val.	0.065	0.055	0.065
W.S. Elev (ft)	1338.40	Reach Len. (ft)	229.10	212.00	209.60
Crit W.S. (ft)	1338.40	Flow Area (sq ft)	163.28	560.58	321.70

E.G. Slope (ft/ft)	0.009103	Area (sq ft)	163.28	560.58	5886.32
Q Total (cfs)	6000.00	Flow (cfs)	308.02	4942.10	749.88
Top Width (ft)	1508.46	Top Width (ft)	202.80	86.60	1219.06
Vel Total (ft/s)	5.74	Avg. Vel. (ft/s)	1.89	8.82	2.33
Max Chl Dpth (ft)	12.40	Hydr. Depth (ft)	0.81	6.47	1.11
Conv. Total (cfs)	62886.8	Conv. (cfs)	3228.4	51798.8	7859.6
Length Wtd. (ft)	212.31	Wetted Per. (ft)	203.00	88.63	291.16
Min Ch El (ft)	1328.40	Shear (lb/sq ft)	0.46	3.59	0.63
Alpha	1.97	Stream Power (lb/ft s)	0.86	31.69	1.46
Frctn Loss (ft)		Cum Volume (acre-ft)	17.33	57.89	163.45
C & E Loss (ft)		Cum SA (acres)	22.37	12.06	106.02

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9957.20	9986.07	394.40	54.92	22.89	19.72	2.45	7.18
9986.07	10014.93	1524.81	136.26	29.19	76.24	4.72	11.19
10014.93	RB 10043.80	80.79	17.26	13.68	4.04	1.29	4.68

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9879.70	9957.20	9.10	6.94	21.37	0.23	0.32	1.31
LB 9957.20	9986.07	1047.05	129.03	29.65	26.18	4.47	8.12
9986.07	10014.93	2520.42	217.20	29.19	63.01	7.52	11.60
10014.93	RB 10043.80	412.13	67.17	23.48	10.30	2.96	6.14
10043.80	10227.09	0.02	0.10	4.18	0.00	0.02	0.24
10227.09	10410.37	11.27	8.31	24.39	0.28	0.34	1.36

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9724.70	9802.20	18.33	18.94	47.96	0.31	0.40	0.97
9802.20	9879.70	32.47	32.35	77.50	0.54	0.42	1.00
9879.70	9957.20	257.22	111.99	77.53	4.29	1.45	2.30
LB 9957.20	9986.07	1440.67	179.51	29.65	24.01	6.22	8.03
9986.07	10014.93	2833.48	267.69	29.19	47.22	9.27	10.58
10014.93	RB 10043.80	667.95	113.38	29.78	11.13	3.93	5.89
10043.80	10227.09	432.70	192.52	183.39	7.21	1.05	2.25
10227.09	10410.37	317.18	129.18	107.77	5.29	1.20	2.46

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 19.174

INPUT
Description: Lower Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 151

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9395.2	1360	9472.4	1340	9478.7	1339.3	9484.4	1338	9488.2	1338
9492.1	1337.4	9495.3	1338	9528.3	1338	9530.3	1338	9533.3	1338
9537.9	1338	9561.2	1338	9606.9	1338	9611	1338	9613.1	1338
9620.9	1338	9621.4	1338	9627.8	1338	9643.4	1338	9674.3	1337.4
9693	1337	9701.4	1336.8	9735.8	1336	9742.5	1334.8	9744.2	1334.7
9752.6	1334.6	9763.6	1334.5	9767.6	1334.3	9768.4	1334.3	9769.3	1334.3
9770.3	1334.2	9782.2	1334.3	9787.9	1334.2	9792.4	1334.2	9794.7	1334.3
9795.4	1334.3	9824.7	1334.4	9836.1	1334	9842.6	1334	9856.5	1334
9873.8	1334	9881.6	1334	9887.4	1334	9897.7	1333.5	9916.8	1333.3
9918.2	1333.4	9920.9	1333.4	9922.9	1333.5	9924.4	1333.5	9925.5	1333.5
9927	1333.5	9929.5	1333.4	9930	1333.4	9930.2	1333.5	9930.7	1333.5
9931	1333.5	9931.5	1333.5	9932.3	1333.5	9933.2	1333.5	9934.5	1333.5
9935.8	1333.5	9938.9	1333.3	9944.7	1333	9948	1333	9961.8	1332
9965.5	1331.3	9966.5	1331	9971	1330	9977.2	1328	9977.3	1328
9983.9	1326	9988.7	1324.7	9989.5	1324	9996.5	1322.7	9998.6	1322.4
9999.5	1322.3	9999.8	1322.3	10000.2	1322.3	10000.4	1322.3	10000.6	1322.3
10002.3	1322.4	10008.9	1324	10011.6	1325.3	10013.5	1326	10017.1	1327.7
10017.9	1328	10021.1	1329.4	10022.5	1330	10025	1331.3	10026.4	1332
10045.9	1332.8	10068.5	1334	10079.3	1334.4	10082.5	1334.9	10083.8	1335.1
10084.3	1335.2	10085	1335.2	10087	1335.2	10089.8	1335.2	10115.5	1335
10118.9	1335	10121.9	1335	10134.5	1334.7	10139.1	1334.7	10143.3	1334.6
10145.7	1334.6	10148.4	1334.7	10150.8	1334.7	10155	1334.7	10158.1	1334.7
10162.3	1334.7	10175.1	1334.5	10204.4	1334.1	10211.9	1334	10213	1334
10217.8	1333.7	10221.7	1334	10226.7	1334.3	10231.5	1334.5	10234.2	1334.6
10236.4	1334.7	10239.1	1334.7	10242.5	1334.7	10250.7	1334.7	10254.4	1334.7
10262.6	1334.6	10266.9	1334.5	10270.1	1334.4	10280.7	1334	10282.4	1333.9
10294	1333.5	10294.6	1334	10298.6	1335	10303.2	1336	10308.1	1337.3
10311.4	1338	10329.8	1338	10338.5	1338	10345.9	1336.2	10346.6	1336
10347.7	1335.9	10359.2	1334	10446.5	1334	10658.5	1332	10784.8	1324
10877.5	1326	11013.1	1328	11140.9	1332	11174.2	1330	11266.7	1330
11303	1340								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9395.2	.065	9961.8	.055	10026.4	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9961.8	10026.4	363	359	361	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
10341.3	11303	1345

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1331.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.055	
W.S. Elev (ft)	1330.32	Reach Len. (ft)	363.00	359.00	361.00
Crit W.S. (ft)	1328.94	Flow Area (sq ft)		245.44	
E.G. Slope (ft/ft)	0.012775	Area (sq ft)		245.44	1373.47
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	554.48	Top Width (ft)		53.53	500.95
Vel Total (ft/s)	8.15	Avg. Vel. (ft/s)		8.15	
Max Chl Dpth (ft)	8.02	Hydr. Depth (ft)		4.58	
Conv. Total (cfs)	17694.7	Conv. (cfs)		17694.7	
Length Wtd. (ft)	359.54	Wetted Per. (ft)		56.31	
Min Ch El (ft)	1322.30	Shear (lb/sq ft)		3.48	
Alpha	1.00	Stream Power (lb/ft s)		28.33	
Frctn Loss (ft)	8.03	Cum Volume (acre-ft)	2.16	28.27	46.62
C & E Loss (ft)	0.04	Cum SA (acres)	5.14	9.23	38.23

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1334.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.33	Wt. n-Val.		0.055	
W.S. Elev (ft)	1331.72	Reach Len. (ft)	363.00	359.00	361.00
Crit W.S. (ft)	1331.46	Flow Area (sq ft)		326.73	
E.G. Slope (ft/ft)	0.024253	Area (sq ft)		326.73	2143.07
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	658.91	Top Width (ft)		62.55	596.35
Vel Total (ft/s)	12.24	Avg. Vel. (ft/s)		12.24	
Max Chl Dpth (ft)	9.42	Hydr. Depth (ft)		5.22	
Conv. Total (cfs)	25684.8	Conv. (cfs)		25684.8	
Length Wtd. (ft)	359.62	Wetted Per. (ft)		65.83	
Min Ch El (ft)	1322.30	Shear (lb/sq ft)		7.52	
Alpha	1.00	Stream Power (lb/ft s)		92.01	
Frctn Loss (ft)	9.29	Cum Volume (acre-ft)	8.36	42.84	97.66
C & E Loss (ft)	0.40	Cum SA (acres)	14.16	11.15	88.04

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1336.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.06	Wt. n-Val.	0.065	0.055	0.065
W.S. Elev (ft)	1333.17	Reach Len. (ft)	363.00	359.00	361.00
Crit W.S. (ft)	1333.85	Flow Area (sq ft)	10.18	420.47	16.43
E.G. Slope (ft/ft)	0.024036	Area (sq ft)	10.18	420.47	3128.30
Q Total (cfs)	6000.00	Flow (cfs)	22.62	5935.14	42.24
Top Width (ft)	855.87	Top Width (ft)	20.48	64.60	770.80
Vel Total (ft/s)	13.42	Avg. Vel. (ft/s)	2.22	14.12	2.57
Max Chl Dpth (ft)	10.87	Hydr. Depth (ft)	0.50	6.51	0.62
Conv. Total (cfs)	38701.2	Conv. (cfs)	145.9	38282.8	272.5
Length Wtd. (ft)	359.66	Wetted Per. (ft)	20.52	67.96	26.58
Min Ch El (ft)	1322.30	Shear (lb/sq ft)	0.74	9.28	0.93
Alpha	1.09	Stream Power (lb/ft s)	1.65	131.04	2.38
Frctn Loss (ft)	2.96	Cum Volume (acre-ft)	16.87	55.51	141.76
C & E Loss (ft)	0.21	Cum SA (acres)	21.78	11.69	101.24

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9961.80	9983.33	121.63	28.11	14.38	6.08	2.04	4.33
9983.33	10004.87	1403.60	145.14	22.22	70.18	6.74	9.67
10004.87	RB 10026.40	474.77	72.19	19.71	23.74	3.96	6.58

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less

than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9961.80	9983.33	358.88	51.70	20.83	8.97	2.58	6.94
9983.33	10004.87	2631.45	175.35	22.22	65.79	8.14	15.01
10004.87	RB 10026.40	1009.68	99.68	22.78	25.24	4.75	10.13

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9772.93	9961.80	22.62	10.18	20.52	0.38	0.50	2.22
LB 9961.80	9983.33	772.22	82.84	22.34	12.87	3.85	9.32
9983.33	10004.87	3557.25	206.69	22.22	59.29	9.60	17.21
10004.87	RB 10026.40	1605.67	130.94	23.41	26.76	6.08	12.26
10026.40	10208.77	42.24	16.43	26.58	0.70	0.62	2.57

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 19.106

INPUT
Description: Lower Wash Reach
Approach Section for Culvert Under Apartment Complex
Cross Section Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 234

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9044.7	1340	9050.5	1338.6	9052.8	1338	9057.2	1336.6	9059.2	1336
9061	1335.5	9067.6	1334	9069.7	1333.5	9076	1332	9077.5	1331.5
9081.5	1330.2	9081.8	1330	9081.9	1330	9082.5	1329.9	9089.8	1328
9098.1	1328	9099.2	1328	9124	1327.6	9130.8	1327.6	9135.9	1327.6
9145.7	1327.6	9147.4	1327.6	9150.5	1327.6	9159.2	1328	9206.3	1329.4
9213.3	1329.6	9228.7	1330	9232.3	1330.1	9235.4	1330.2	9250.9	1330.7
9254.4	1330.7	9257.6	1330.8	9260.5	1330.8	9263.4	1330.9	9274.1	1331
9327	1330.5	9328.2	1330.5	9331.3	1330.4	9352.9	1330.1	9353.4	1330.1
9357.3	1330	9372.2	1329.7	9380.7	1329.6	9385.4	1329.6	9392.3	1329.6
9398.8	1329.7	9403.8	1329.7	9413.9	1330	9414.9	1330	9415	1330
9420.5	1330.2	9428.3	1330.3	9433.2	1330.3	9435.8	1330.3	9443.6	1330.1
9448.1	1330	9449.7	1329.8	9461.3	1328	9477	1327.8	9478	1327.8
9498.7	1327.5	9503.1	1327.4	9507.3	1327.4	9509.2	1327.4	9513	1327.4
9521.3	1327.5	9529.6	1327.6	9558.8	1328	9567.9	1328.7	9577	1329.2
9579.6	1329.4	9587.6	1330	9593	1330.1	9602.8	1330.4	9607.3	1330.7
9608	1330.7	9609.6	1330.7	9618.5	1330.6	9624.6	1330.5	9634	1330.2
9641.8	1330	9646.8	1329.7	9648.3	1329.8	9648.6	1329.8	9649.5	1329.8
9650.6	1329.8	9656	1329.8	9672.3	1329.5	9685.7	1329.4	9695.4	1329.3
9716.8	1328.9	9721.4	1328.9	9725.6	1328.8	9729.8	1328.8	9735.5	1328.8
9738.5	1328.7	9741.6	1328.7	9743.6	1328.7	9748.5	1328.7	9757.2	1328.8
9760.6	1328.8	9763	1328.8	9769.8	1328.8	9775.2	1328.8	9781.8	1328.8
9784.9	1328.7	9791.2	1328.7	9802.7	1328.6	9812.2	1328.5	9814	1328.4

9816.4	1328.4	9822.8	1328	9825.1	1327.9	9830.9	1327.8	9846.5	1327.6
9850.1	1327.9	9853.1	1328	9854.9	1328	9858.5	1328.1	9865.1	1328.1
9872.3	1328.1	9883.4	1328.1	9896.2	1328	9910.6	1327.9	9910.7	1327.9
9913.3	1327.9	9917	1327.7	9917.2	1327.7	9919.8	1327.8	9920.8	1327.8
9943.3	1327	9957	1326.6	9973.6	1326	9974.7	1325.6	9977.2	1324.7
9979.1	1324	9982.7	1322.8	9984.7	1322	9986.7	1321.4	9987.7	1321
9990.5	1320	9996.2	1318.8	9998.3	1318.4	9999	1318.2	9999.4	1318.1
9999.6	1318.1	9999.7	1318.1	10000.2	1318.1	10000.5	1318.1	10000.8	1318.2
10001.9	1318.3	10006	1318.8	10006.6	1318.8	10008.1	1318.9	10015.6	1320
10017	1320.4	10023.3	1322	10027.1	1323.2	10029.3	1324	10032.6	1325.7
10033.4	1326	10039.1	1327.8	10039.8	1328	10040.8	1328.2	10041.8	1328.5
10042.3	1328.5	10043.4	1328.7	10052.5	1329.1	10063.8	1329.8	10066.9	1330
10069.8	1330.1	10074	1330.3	10078.7	1330.4	10081.9	1330.4	10085.2	1330.4
10088.3	1330.4	10093.9	1330.4	10098.8	1330.3	10105.4	1330	10105.5	1330
10106	1330	10106.3	1330	10155.8	1328.7	10157.1	1328.7	10158.6	1328.8
10159.2	1328.8	10159.8	1328.8	10160.9	1328.8	10162.1	1328.7	10163.5	1328.6
10172.8	1328.6	10174.1	1328.6	10175.7	1328.6	10176.9	1328.6	10180.1	1328.6
10180.8	1328.6	10181.5	1328.6	10182.2	1328.6	10183.1	1328.6	10188.4	1328.8
10192.6	1328.9	10195.3	1328.9	10196.7	1329	10201.6	1329.1	10212.7	1329.4
10215.3	1329.4	10218	1329.5	10219	1329.5	10220.4	1329.5	10223.2	1329.5
10223.9	1329.5	10224.8	1329.5	10225	1329.5	10231.7	1329.5	10234.5	1329.4
10235.2	1329.4	10235.2	1329.3	10236.7	1329.3	10238.1	1329.3	10238.4	1329.1
10242.7	1328.3	10245.5	1328	10400.5	1328	10480.7	1328	10713.1	1324
10996.1	1322	11121.6	1322	11147.8	1320	11158.4	1318	11170.5	1318
11179	1320	11189.2	1322	11200.9	1324	11245.7	1336		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9044.7	.065	9973.6	.05	10043.4	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9973.6	10043.4	332.9	335	335.5	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev
10708.57	10999.44	1331.61

Left Levee Station= 9622.89 Elevation= 1333.75

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1323.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.41	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1321.87	Reach Len. (ft)	332.90	335.00	335.50
Crit W.S. (ft)	1321.87	Flow Area (sq ft)		83.85	133.59
E.G. Slope (ft/ft)	0.048611	Area (sq ft)		83.85	133.59
Q Total (cfs)	2000.00	Flow (cfs)		922.01	1077.99
Top Width (ft)	102.94	Top Width (ft)		37.67	65.27
Vel Total (ft/s)	9.20	Avg. Vel. (ft/s)		11.00	8.07
Max Chl Dpth (ft)	3.87	Hydr. Depth (ft)		2.23	2.05
Conv. Total (cfs)	9071.1	Conv. (cfs)		4181.8	4889.3
Length Wtd. (ft)	335.25	Wetted Per. (ft)		38.56	65.94
Min Ch El (ft)	1318.10	Shear (lb/sq ft)		6.60	6.15
Alpha	1.07	Stream Power (lb/ft s)		72.56	49.61
Frctn Loss (ft)	5.06	Cum Volume (acre-ft)	2.16	26.92	40.37
C & E Loss (ft)	0.49	Cum SA (acres)	5.14	8.86	35.89

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,

water surface was used.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1324.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.00	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1323.36	Reach Len. (ft)	332.90	335.00	335.50
Crit W.S. (ft)	1323.36	Flow Area (sq ft)		146.50	405.39
E.G. Slope (ft/ft)	0.027572	Area (sq ft)		146.50	540.60
Q Total (cfs)	4000.00	Flow (cfs)		1523.10	2476.90
Top Width (ft)	439.86	Top Width (ft)		46.51	393.35
Vel Total (ft/s)	7.25	Avg. Vel. (ft/s)		10.40	6.11
Max Chl Dpth (ft)	5.36	Hydr. Depth (ft)		3.15	2.05
Conv. Total (cfs)	24089.2	Conv. (cfs)		9172.6	14916.6
Length Wtd. (ft)		Wetted Per. (ft)		47.90	198.51
Min Ch El (ft)	1318.10	Shear (lb/sq ft)		5.26	3.52
Alpha	1.22	Stream Power (lb/ft s)		54.73	21.48
Frctn Loss (ft)		Cum Volume (acre-ft)	8.36	40.89	86.54
C & E Loss (ft)		Cum SA (acres)	14.16	10.70	83.94

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1325.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.48	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1323.80	Reach Len. (ft)	332.90	335.00	335.50
Crit W.S. (ft)	1324.00	Flow Area (sq ft)		167.70	493.69
E.G. Slope (ft/ft)	0.036022	Area (sq ft)		167.70	729.64
Q Total (cfs)	6000.00	Flow (cfs)		2102.53	3897.47
Top Width (ft)	507.80	Top Width (ft)		49.07	458.73
Vel Total (ft/s)	9.07	Avg. Vel. (ft/s)		12.54	7.89
Max Chl Dpth (ft)	5.80	Hydr. Depth (ft)		3.42	2.46
Conv. Total (cfs)	31613.1	Conv. (cfs)		11077.9	20535.2
Length Wtd. (ft)		Wetted Per. (ft)		50.61	201.15
Min Ch El (ft)	1318.10	Shear (lb/sq ft)		7.45	5.52
Alpha	1.16	Stream Power (lb/ft s)		93.43	43.57
Frctn Loss (ft)	10.48	Cum Volume (acre-ft)	16.83	53.08	125.78
C & E Loss (ft)	0.47	Cum SA (acres)	21.70	11.22	96.14

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
water surface was used.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9973.60	9996.87	188.44	21.06	12.19	9.42	1.79	8.95
9996.87	10020.13	730.92	61.88	23.62	36.55	2.66	11.81
10020.13	RB 10043.40	2.66	0.90	2.75	0.13	0.34	2.95
10043.40	11073.94						
11073.94	11245.70	1077.99	133.59	65.94	53.90	2.05	8.07

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9973.60	9996.87	351.21	41.51	16.56	8.78	2.62	8.46
9996.87	10020.13	1130.37	96.49	23.62	28.26	4.15	11.72
10020.13	RB 10043.40	41.52	8.49	7.72	1.04	1.15	4.89
10043.40	10902.19						
10902.19	11073.94	454.27	101.25	74.50	11.36	1.36	4.49
11073.94	11245.70	2022.63	304.14	124.01	50.57	2.47	6.65

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9973.60	9996.87	497.77	48.84	17.97	8.30	2.84	10.19
9996.87	10020.13	1528.24	106.81	23.62	25.47	4.59	14.31
10020.13	RB 10043.40	76.51	12.05	9.01	1.28	1.40	6.35
10043.40	10902.19						
10902.19	11073.94	843.45	134.31	74.50	14.06	1.80	6.28
11073.94	11245.70	3054.02	359.38	126.65	50.90	2.86	8.50

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 19.043

INPUT
Description: Lower Wash Reach
Upstream Face for Culvert Under Apartment Complex
Cross Section Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 315

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8678.3	1330	8685.05	1328.2	8685.75	1328	8688.15	1327.5	8696.15	1326
8700.25	1324.6	8701.45	1324	8706.75	1323.8	8735.15	1322	8766.15	1320.3
8770.95	1320	8771.05	1320	8773.85	1320	8782.95	1320	8784.65	1320
8785.25	1320	8786.35	1320	8788.6	1320	8818.55	1318.9	8821.55	1318.8
8823.45	1318.8	8825.15	1318.8	8832.05	1318.7	8837.85	1318.7	8868.55	1318.6

8888.05	1318.6	8900.65	1318.6	8904.75	1318.6	8909.85	1318.7	8914.55	1318.7
8919.95	1318.7	8923.45	1318.7	8942.85	1319.1	8945.85	1319.1	8950.45	1319.1
8953.15	1319.1	8956.05	1319.1	8962.35	1319	9001.25	1318.6	9003.95	1318.5
9011.75	1318.4	9013.35	1318.4	9013.95	1318.4	9014.65	1318.4	9016.65	1318.4
9018.15	1318.4	9019.75	1318.4	9034.25	1318.3	9045.65	1318.2	9046.45	1318.1
9053.95	1318.1	9055.55	1318.1	9078.45	1318.1	9100.05	1318.1	9121.25	1318
9125.35	1318	9129.35	1318	9131.85	1318	9132.95	1318	9133.15	1317.8
9139.35	1316	9140.25	1315.7	9144.25	1314	9149.55	1312.6	9150.05	1312
9154.55	1311.2	9155.45	1311.1	9156.25	1311	9157.35	1311.1	9158.85	1311.2
9163.85	1311.6	9166.45	1311.8	9167.45	1312	9168.35	1312.3	9176.45	1314
9183.35	1315.6	9184.65	1316	9197.25	1316.3	9223.95	1317	9228.85	1317.1
9233.85	1317.2	9237.55	1317.3	9239.25	1317.3	9240.45	1317.3	9243.05	1317.2
9248.15	1317.3	9249.45	1317.3	9251.25	1317.2	9252.35	1317.2	9254.55	1317.2
9255.95	1317.3	9259.25	1317.3	9260.95	1317.3	9293.75	1317.3	9296.55	1317.3
9300.55	1317.3	9305.35	1317.4	9314.65	1317.6	9335.75	1318	9342.35	1318.6
9345.65	1318.7	9348.45	1318.8	9351.95	1319	9355.05	1319.3	9400.25	1320.7
9405.65	1320.8	9418.15	1321.1	9426.85	1321.2	9431.75	1321.3	9432.25	1321.3
9443.35	1321.5	9447.25	1321.6	9459.65	1321.7	9464.55	1321.8	9465.45	1321.8
9466.65	1321.8	9468.05	1321.8	9468.85	1321.8	9469.35	1321.8	9470.55	1321.8
9471.15	1321.8	9473.05	1321.8	9473.85	1321.8	9475.65	1321.7	9476.05	1321.7
9478.15	1321.8	9478.65	1321.8	9479.05	1321.7	9479.35	1321.7	9479.55	1321.7
9480.25	1321.6	9481.05	1321.6	9481.95	1321.6	9499.25	1321.7	9499.45	1321.7
9520.05	1322	9524.95	1321.9	9537.05	1321.8	9540.25	1321.9	9542.35	1322
9543.25	1322	9555.55	1322.3	9558.85	1322.3	9562.15	1322.3	9572.85	1322.4
9597.75	1322.4	9606.15	1322.5	9609.55	1322.5	9613.05	1322.5	9616.65	1322.4
9620.45	1322.4	9624.25	1322.3	9633.95	1322.1	9634.05	1322.1	9635.85	1322.1
9635.95	1322.1	9638.55	1322.1	9639.05	1322.1	9639.25	1322.1	9639.35	1322.1
9639.65	1322.1	9639.75	1322.1	9639.85	1322.1	9640.05	1322.1	9640.65	1322.1
9640.85	1322.1	9648.65	1322.1	9655.95	1322.3	9658.25	1322.3	9658.85	1322.5
9659.25	1322.6	9660.85	1322.6	9664.75	1322.7	9668.05	1322.8	9670.55	1322.8
9673.85	1322.8	9676.95	1322.8	9679.45	1322.8	9683.95	1322.8	9691.25	1322.7
9701.45	1322.6	9745.45	1322.1	9750.55	1322	9768.65	1321.3	9777.25	1321
9778.75	1321	9783.15	1321.1	9794.05	1321.2	9804.15	1321.3	9806.55	1321.3
9807.15	1321.3	9860.95	1321.5	9862.25	1321.5	9866.65	1321.6	9872.35	1321.7
9873.05	1321.7	9873.85	1321.7	9875.65	1321.7	9878.35	1321.8	9884.25	1321.8
9900.95	1321.8	9903.45	1321.8	9903.65	1321.8	9903.85	1321.8	9904.05	1321.8
9904.15	1321.8	9904.45	1321.8	9905.15	1321.8	9906.15	1321.8	9906.85	1321.8
9908.25	1321.8	9908.65	1321.8	9919.25	1321.6	9919.65	1321.5	9920.45	1321.5
9921.15	1321.5	9925.15	1321.4	9937.25	1321.3	9940.75	1321.3	9941.75	1321.3
9945.05	1321.4	9947.95	1321.5	9953.65	1321.6	9965.5	1320.8	9968.65	1320.8
9971.35	1320.7	9972.85	1320.6	9975.6	1320	9976.35	1319.8	9976.85	1319.5
9981.25	1318	9983.85	1316.3	9984.45	1316	9984.65	1315.8	9987.55	1314
9988.65	1313.7	9993.2	1307	9997.4	1307	10006.8	1307	10007.75	1312.4
10011.75	1314	10013.35	1314.6	10015.75	1315.2	10018.55	1316	10022.25	1317.2
10024.55	1318	10032.55	1319.4	10035.5	1320	10037.25	1320.3	10043.75	1322
10047.8	1323.2	10050.35	1323.4	10052.45	1323.4	10056.25	1323.4	10060.05	1323.3
10063.35	1323.1	10065.15	1323.1	10066.85	1323.1	10071.35	1323.2	10075.35	1323.3
10095.15	1324	10095.55	1324	10101.35	1324.2	10105.65	1324	10111.95	1324
10129.25	1324	10133.05	1324	10135.05	1324.1	10140.45	1324.2	10144.85	1324.2
10156.05	1324.2	10159.45	1324.2	10162.25	1324.1	10165.35	1324	10178.55	1324
10182.45	1324	10194.55	1323.9	10199.85	1323.9	10204.15	1323.9	10206.55	1323.9
10209.05	1323.7	10210.05	1323.6	10220.35	1324	10227.95	1325.6	10230.55	1326
10231.35	1326.1	10233.95	1326.2	10235.05	1326.2	10237.25	1326.2	10239.35	1326.2
10241.15	1326.1	10242.65	1326	10245.15	1325.4	10252.35	1324	10275.55	1323
10297.95	1322	10437.45	1322	10538.65	1322	10563.95	1320	10702.35	1320
10922.85	1320	11010.15	1320	11018.55	1318	11056.95	1318	11067.45	1320
11124.95	1320	11155.15	1318	11170.05	1316	11180.05	1314	11193.25	1312
11229.05	1312	11256.15	1314	11264.15	1316	11316.15	1318	11350.6	1320

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
8678.3	.065	9965.5	.05	10047.8	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9965.5	10047.8	1100.1	1091	1070.8	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9800	9958	1319	10042	10047.8	1319

Left Levee Station= 9684.89 Elevation= 1326.07

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1316.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1315.65	Reach Len. (ft)	1100.10	1091.00	1070.80
Crit W.S. (ft)	1314.46	Flow Area (sq ft)		165.53	249.28
E.G. Slope (ft/ft)	0.007256	Area (sq ft)		165.53	249.28
Q Total (cfs)	2000.00	Flow (cfs)		1053.10	946.90
Top Width (ft)	123.31	Top Width (ft)		32.41	90.91
Vel Total (ft/s)	4.82	Avg. Vel. (ft/s)		6.36	3.80
Max Chl Dpth (ft)	8.65	Hydr. Depth (ft)		5.11	2.74
Conv. Total (cfs)	23478.8	Conv. (cfs)		12362.8	11116.0
Length Wtd. (ft)	1091.00	Wetted Per. (ft)		41.55	91.50
Min Ch El (ft)	1307.00	Shear (lb/sq ft)		1.80	1.23
Alpha	1.21	Stream Power (lb/ft s)		11.48	4.69
Frctn Loss (ft)		Cum Volume (acre-ft)	2.16	25.96	38.90
C & E Loss (ft)		Cum SA (acres)	5.14	8.59	35.29

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1318.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1317.64	Reach Len. (ft)	1100.10	1091.00	1070.80
Crit W.S. (ft)	1315.84	Flow Area (sq ft)		239.73	481.65
E.G. Slope (ft/ft)	0.008350	Area (sq ft)		239.73	481.65
Q Total (cfs)	4000.00	Flow (cfs)		1808.44	2191.56
Top Width (ft)	190.73	Top Width (ft)		41.72	149.01
Vel Total (ft/s)	5.54	Avg. Vel. (ft/s)		7.54	4.55
Max Chl Dpth (ft)	10.64	Hydr. Depth (ft)		5.75	3.23
Conv. Total (cfs)	43774.7	Conv. (cfs)		19791.0	23983.7
Length Wtd. (ft)	1091.00	Wetted Per. (ft)		51.78	149.82
Min Ch El (ft)	1307.00	Shear (lb/sq ft)		2.41	1.68
Alpha	1.21	Stream Power (lb/ft s)		18.21	7.63
Frctn Loss (ft)		Cum Volume (acre-ft)	8.36	39.41	82.61
C & E Loss (ft)		Cum SA (acres)	14.16	10.36	81.85

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1319.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1318.95	Reach Len. (ft)	1100.10	1091.00	1070.80
Crit W.S. (ft)	1317.00	Flow Area (sq ft)		300.06	745.76
E.G. Slope (ft/ft)	0.008619	Area (sq ft)		300.06	745.76
Q Total (cfs)	6000.00	Flow (cfs)		2368.99	3631.01
Top Width (ft)	290.66	Top Width (ft)		51.53	239.13
Vel Total (ft/s)	5.74	Avg. Vel. (ft/s)		7.89	4.87
Max Chl Dpth (ft)	11.95	Hydr. Depth (ft)		5.82	3.12
Conv. Total (cfs)	64628.6	Conv. (cfs)		25517.4	39111.2
Length Wtd. (ft)	1091.00	Wetted Per. (ft)		61.99	240.24
Min Ch El (ft)	1307.00	Shear (lb/sq ft)		2.60	1.67
Alpha	1.18	Stream Power (lb/ft s)		20.56	8.13
Frctn Loss (ft)		Cum Volume (acre-ft)	16.83	51.28	120.09
C & E Loss (ft)		Cum SA (acres)	21.70	10.84	93.45

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9965.50	9992.93	105.92	25.99	11.88	5.30	3.24	4.07
9992.93	10020.37	947.18	139.54	29.67	47.36	5.72	6.79
10020.37	11164.49						
11164.49	11350.60	946.90	249.28	91.50	47.34	2.74	3.80

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9965.50	9992.93	230.20	45.13	15.58	5.75	4.05	5.10
9992.93	10020.37	1575.55	192.91	32.87	39.39	7.03	8.17
10020.37	RB 10047.80	2.70	1.69	3.32	0.07	0.54	1.60
10047.80	10978.37						
10978.37	11164.49	3.54	2.98	6.72	0.09	0.45	1.19
11164.49	11350.60	2188.01	478.67	143.10	54.70	3.36	4.57

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9965.50	9992.93	325.31	61.66	19.19	5.42	4.26	5.28
9992.93	10020.37	2021.08	228.83	32.87	33.68	8.34	8.83
10020.37	RB 10047.80	22.60	9.57	9.93	0.38	0.99	2.36
10047.80	10978.37						
10978.37	11164.49	115.40	62.36	71.40	1.92	0.88	1.85
11164.49	11350.60	3515.62	683.40	168.83	58.59	4.07	5.14

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CULVERT RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.9445

INPUT
Description: Culvert Under Appartment Complex
Distance from Upstream XS = 72
Deck/Roadway Width = 1000
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew =
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
9975.6	1320	1000	10035.5	1320	1000

Upstream Bridge Cross Section Data
Station Elevation Data num= 315

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8678.3	1330	8685.05	1328.2	8685.75	1328	8688.15	1327.5	8696.15	1326
8700.25	1324.6	8701.45	1324	8706.75	1323.8	8735.15	1322	8766.15	1320.3
8770.95	1320	8771.05	1320	8773.85	1320	8782.95	1320	8784.65	1320
8785.25	1320	8786.35	1320	8788.6	1320	8818.55	1318.9	8821.55	1318.8
8823.45	1318.8	8825.15	1318.8	8832.05	1318.7	8837.85	1318.7	8868.55	1318.6
8888.05	1318.6	8900.65	1318.6	8904.75	1318.6	8909.85	1318.7	8914.55	1318.7
8919.95	1318.7	8923.45	1318.7	8942.85	1319.1	8945.85	1319.1	8950.45	1319.1
8953.15	1319.1	8956.05	1319.1	8962.35	1319	9001.25	1318.6	9003.95	1318.5
9011.75	1318.4	9013.35	1318.4	9013.95	1318.4	9014.65	1318.4	9016.65	1318.4
9018.15	1318.4	9019.75	1318.4	9034.25	1318.3	9045.65	1318.2	9046.45	1318.1
9053.95	1318.1	9055.55	1318.1	9078.45	1318.1	9100.05	1318.1	9121.25	1318
9125.35	1318	9129.35	1318	9131.85	1318	9132.95	1318	9133.15	1317.8
9139.35	1316	9140.25	1315.7	9144.25	1314	9149.55	1312.6	9150.05	1312
9154.55	1311.2	9155.45	1311.1	9156.25	1311	9157.35	1311.1	9158.85	1311.2
9163.85	1311.6	9166.45	1311.8	9167.45	1312	9168.35	1312.3	9176.45	1314
9183.35	1315.6	9184.65	1316	9197.25	1316.3	9223.95	1317	9228.85	1317.1
9233.85	1317.2	9237.55	1317.3	9239.25	1317.3	9240.45	1317.3	9243.05	1317.2
9248.15	1317.3	9249.45	1317.3	9251.25	1317.2	9252.35	1317.2	9254.55	1317.2
9255.95	1317.3	9259.25	1317.3	9260.95	1317.3	9293.75	1317.3	9296.55	1317.3
9300.55	1317.3	9305.35	1317.4	9314.65	1317.6	9335.75	1318	9342.35	1318.6
9345.65	1318.7	9348.45	1318.8	9351.95	1319	9355.05	1319.3	9400.25	1320.7
9405.65	1320.8	9418.15	1321.1	9426.85	1321.2	9431.75	1321.3	9432.25	1321.3
9443.35	1321.5	9447.25	1321.6	9459.65	1321.7	9464.55	1321.8	9465.45	1321.8

9466.65	1321.8	9468.05	1321.8	9468.85	1321.8	9469.35	1321.8	9470.55	1321.8
9471.15	1321.8	9473.05	1321.8	9473.85	1321.8	9475.65	1321.7	9476.05	1321.7
9478.15	1321.8	9478.65	1321.8	9479.05	1321.7	9479.35	1321.7	9479.55	1321.7
9480.25	1321.6	9481.05	1321.6	9481.95	1321.6	9499.25	1321.7	9499.45	1321.7
9520.05	1322	9524.95	1321.9	9537.05	1321.8	9540.25	1321.9	9542.35	1322
9543.25	1322	9555.55	1322.3	9558.85	1322.3	9562.15	1322.3	9572.85	1322.4
9597.75	1322.4	9606.15	1322.5	9609.55	1322.5	9613.05	1322.5	9616.65	1322.4
9620.45	1322.4	9624.25	1322.3	9633.95	1322.1	9634.05	1322.1	9635.85	1322.1
9635.95	1322.1	9638.55	1322.1	9639.05	1322.1	9639.25	1322.1	9639.35	1322.1
9639.65	1322.1	9639.75	1322.1	9639.85	1322.1	9640.05	1322.1	9640.65	1322.1
9640.85	1322.1	9648.65	1322.1	9655.95	1322.3	9658.25	1322.3	9658.85	1322.5
9659.25	1322.6	9660.85	1322.6	9664.75	1322.7	9668.05	1322.8	9670.55	1322.8
9673.85	1322.8	9676.95	1322.8	9679.45	1322.8	9683.95	1322.8	9691.25	1322.7
9701.45	1322.6	9745.45	1322.1	9750.55	1322	9768.65	1321.3	9777.25	1321
9778.75	1321	9783.15	1321.1	9794.05	1321.2	9804.15	1321.3	9806.55	1321.3
9807.15	1321.3	9860.95	1321.5	9862.25	1321.5	9866.65	1321.6	9872.35	1321.7
9873.05	1321.7	9873.85	1321.7	9875.65	1321.7	9878.35	1321.8	9884.25	1321.8
9900.95	1321.8	9903.45	1321.8	9903.65	1321.8	9903.85	1321.8	9904.05	1321.8
9904.15	1321.8	9904.45	1321.8	9905.15	1321.8	9906.15	1321.8	9906.85	1321.8
9908.25	1321.8	9908.65	1321.8	9919.25	1321.6	9919.65	1321.5	9920.45	1321.5
9921.15	1321.5	9925.15	1321.4	9937.25	1321.3	9940.75	1321.3	9941.75	1321.3
9945.05	1321.4	9947.95	1321.5	9953.65	1321.6	9965.5	1320.8	9968.65	1320.8
9971.35	1320.7	9972.85	1320.6	9975.6	1320	9976.35	1319.8	9976.85	1319.5
9981.25	1318	9983.85	1316.3	9984.45	1316	9984.65	1315.8	9987.55	1314
9988.65	1313.7	9993.2	1307	9997.4	1307	10006.8	1307	10007.75	1312.4
10011.75	1314	10013.35	1314.6	10015.75	1315.2	10018.55	1316	10022.25	1317.2
10024.55	1318	10032.55	1319.4	10035.5	1320	10037.25	1320.3	10043.75	1322
10047.8	1323.2	10050.35	1323.4	10052.45	1323.4	10056.25	1323.4	10060.05	1323.3
10063.35	1323.1	10065.15	1323.1	10066.85	1323.1	10071.35	1323.2	10075.35	1323.3
10095.15	1324	10095.55	1324	10101.35	1324.2	10105.65	1324	10111.95	1324
10129.25	1324	10133.05	1324	10135.05	1324.1	10140.45	1324.2	10144.85	1324.2
10156.05	1324.2	10159.45	1324.2	10162.25	1324.1	10165.35	1324	10178.55	1324
10182.45	1324	10194.55	1323.9	10199.85	1323.9	10204.15	1323.9	10206.55	1323.9
10209.05	1323.7	10210.05	1323.6	10220.35	1324	10227.95	1325.6	10230.55	1326
10231.35	1326.1	10233.95	1326.2	10235.05	1326.2	10237.25	1326.2	10239.35	1326.2
10241.15	1326.1	10242.65	1326	10245.15	1325.4	10252.35	1324	10275.55	1323
10297.95	1322	10437.45	1322	10538.65	1322	10563.95	1320	10702.35	1320
10922.85	1320	11010.15	1320	11018.55	1318	11056.95	1318	11067.45	1320
11124.95	1320	11155.15	1318	11170.05	1316	11180.05	1314	11193.25	1312
11229.05	1312	11256.15	1314	11264.15	1316	11316.15	1318	11350.6	1320

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
8678.3	.065	9965.5	.05	10047.8	.065

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff Contr.	Expan.
9965.5	10047.8	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9800	9958	1319	10042	10047.8	1319

Left Levee Station= 9684.89 Elevation= 1326.07

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
9650	1307.5	1000	10275	1307.5	1000

Downstream Bridge Cross Section Data
Station Elevation Data num= 55

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9640.8	1310	9655.3	1308	9675.1	1306	9695.9	1304	9714.4	1302
9729.5	1300	9747.3	1300	9756	1302	9797.7	1304	9807.4	1302
9819.7	1302	9840.7	1304	9963.7	1302	9964.3	1301.7	9968.7	1300
9971.5	1298.4	9972.2	1298	9972.7	1297.7	9975.3	1296	9976.9	1295.1
9978.8	1294	9979.6	1293.7	9981.8	1293	9983.6	1292	9992.6	1291
10007.4	1291	10010.5	1292.2	10011.5	1293	10014.6	1294	10014.8	1294
10017.7	1295.5	10018.1	1295.7	10018.7	1296	10019.5	1296.4	10022.1	1298
10026.9	1299.8	10027.5	1300	10139.3	1306	10273.8	1308	10572.4	1306
10678	1308	10737.8	1308	10805	1308	10842.4	1308	10858.8	1306
10873.2	1304	10884.4	1304	10898.4	1306	10970.9	1306	10994.3	1304
11009.9	1302	11028.4	1298	11030.6	1298	11047.3	1300	11133.1	1306

```
Manning's n Values          num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
  9640.8    .065  9963.7     .04 10026.9    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9963.7 10026.9             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  9640.8  9984.9    1307 10013.9   10300    1307
Left Levee      Station= 9841.71      Elevation= 1308.46

Upstream Embankment side slope                =         horiz. to 1.0 vertical
Downstream Embankment side slope              =         horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =       1
Elevation at which weir flow begins           =    1320
Energy head used in spillway design           =
Spillway height used in design                =
Weir crest shape                              = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Apartments   Semi-Circle       6
FHWA Chart #
FHWA Scale #
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
                 72    1002       .015                   .9                1
Upstream   Elevation =  1307
           Centerline Station =  10000
Downstream Elevation =  1291
           Centerline Station =  9999.4

CULVERT OUTPUT    Profile #1/3 Spillway
Culvert ID : Apartments

  Culv Q (cfs)            606.78   Culv Vel In (ft/s)       10.73
  # Barrels                    1   Culv Vel Out (ft/s)      10.73
  Q Barrel (cfs)          606.78   Culv Inv El Up (ft)    1307.00
  E.G. US. (ft)          1316.08   Culv Inv El Dn (ft)    1291.00
  W.S. US. (ft)          1315.65   Culv Frctn Ls (ft)       15.41
  Delta EG (ft)            16.71   Culv Ext Lss (ft)
  Delta WS (ft)            18.68   Culv Ent Lss (ft)         1.61
  E.G. IC (ft)           1316.08   Q Weir (cfs)           1393.22
  E.G. OC (ft)           1306.80   Weir Sta Lft (ft)     11169.37
  Culvert Control          Inlet   Weir Sta Rgt (ft)     11266.52
  Culv WS In (ft)        1313.00   Weir Submerg              0.00
  Culv WS Out (ft)       1297.59   Weir Max Depth (ft)       4.09
  Culv Nml Depth (ft)       2.82   Weir Avg Depth (ft)       2.99
  Culv Crt Depth (ft)       4.21   Wr Flw Area (sq ft)     290.83
  Culv Ful Lngh (ft)      947.26   Min Top Rd (ft)        1320.00


Note:    During supercritical analysis, the culvert direct step method went to normal depth.  The
         program then assumed normal depth at the outlet.
Note:    During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CULVERT OUTPUT    Profile #2/3 Spillway
Culvert ID : Apartments

  Culv Q (cfs)            744.27   Culv Vel In (ft/s)       13.16
  # Barrels                    1   Culv Vel Out (ft/s)      13.16
  Q Barrel (cfs)          744.27   Culv Inv El Up (ft)    1307.00
  E.G. US. (ft)          1318.22   Culv Inv El Dn (ft)    1291.00
  W.S. US. (ft)          1317.64   Culv Frctn Ls (ft)       12.01
  Delta EG (ft)            14.43   Culv Ext Lss (ft)
  Delta WS (ft)            17.33   Culv Ent Lss (ft)         2.42
  E.G. IC (ft)           1318.31   Q Weir (cfs)           3255.73
  E.G. OC (ft)           1318.22   Weir Sta Lft (ft)     11017.47
  Culvert Control         Outlet   Weir Sta Rgt (ft)     11320.60
```

Culv WS In (ft)	1313.00	Weir Submerg	0.00
Culv WS Out (ft)	1297.00	Weir Max Depth (ft)	6.26
Culv Nml Depth (ft)	3.32	Weir Avg Depth (ft)	2.81
Culv Crt Depth (ft)	4.74	Wr Flw Area (sq ft)	590.07
Culv Ful Lngh (ft)	506.39	Min Top Rd (ft)	1320.00

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

CULVERT OUTPUT Profile #Full Spillway
Culvert ID : Apartments

Culv Q (cfs)	833.00	Culv Vel In (ft/s)	14.73
# Barrels	1	Culv Vel Out (ft/s)	14.73
Q Barrel (cfs)	833.00	Culv Inv El Up (ft)	1307.00
E.G. US. (ft)	1319.56	Culv Inv El Dn (ft)	1291.00
W.S. US. (ft)	1318.95	Culv Frctn Ls (ft)	9.88
Delta EG (ft)	13.08	Culv Ext Lss (ft)	0.17
Delta WS (ft)	15.67	Culv Ent Lss (ft)	3.03
E.G. IC (ft)	1319.60	Q Weir (cfs)	5172.32
E.G. OC (ft)	1319.56	Weir Sta Lft (ft)	11012.00
Culvert Control	Outlet	Weir Sta Rgt (ft)	11343.00
Culv WS In (ft)	1313.00	Weir Submerg	0.00
Culv WS Out (ft)	1297.00	Weir Max Depth (ft)	7.56
Culv Nml Depth (ft)	3.66	Weir Avg Depth (ft)	3.40
Culv Crt Depth (ft)	5.02	Wr Flw Area (sq ft)	898.73
Culv Ful Lngh (ft)	1002.00	Min Top Rd (ft)	1320.00

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.
Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.836

INPUT
Description: Lower Wash Reach
Downstream Face of Culvert Under Apartment Complex
Cross Section Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 55

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9640.8	1310	9655.3	1308	9675.1	1306	9695.9	1304	9714.4	1302
9729.5	1300	9747.3	1300	9756	1302	9797.7	1304	9807.4	1302
9819.7	1302	9840.7	1304	9963.7	1302	9964.3	1301.7	9968.7	1300
9971.5	1298.4	9972.2	1298	9972.7	1297.7	9975.3	1296	9976.9	1295.1
9978.8	1294	9979.6	1293.7	9981.8	1293	9983.6	1292	9992.6	1291
10007.4	1291	10010.5	1292.2	10011.5	1293	10014.6	1294	10014.8	1294
10017.7	1295.5	10018.1	1295.7	10018.7	1296	10019.5	1296.4	10022.1	1298
10026.9	1299.8	10027.5	1300	10139.3	1306	10273.8	1308	10572.4	1306
10678	1308	10737.8	1308	10805	1308	10842.4	1308	10858.8	1306
10873.2	1304	10884.4	1304	10898.4	1306	10970.9	1306	10994.3	1304
11009.9	1302	11028.4	1298	11030.6	1298	11047.3	1300	11133.1	1306

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9640.8	.065	9963.7	.04	10026.9	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9963.7	10026.9	534.8	534	537	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9640.8	9984.9	1307	10013.9	10300	1307

Left Levee Station= 9841.71 Elevation= 1308.46

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1299.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.41	Wt. n-Val.		0.040	
W.S. Elev (ft)	1296.96	Reach Len. (ft)	534.80	534.00	537.00
Crit W.S. (ft)	1296.70	Flow Area (sq ft)		160.40	
E.G. Slope (ft/ft)	0.011877	Area (sq ft)		204.19	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	46.58	Top Width (ft)		46.58	
Vel Total (ft/s)	12.47	Avg. Vel. (ft/s)		12.47	
Max Chl Dpth (ft)	5.96	Hydr. Depth (ft)		5.53	
Conv. Total (cfs)	18352.0	Conv. (cfs)		18352.0	
Length Wtd. (ft)	534.21	Wetted Per. (ft)		29.67	
Min Ch El (ft)	1291.00	Shear (lb/sq ft)		4.01	
Alpha	1.00	Stream Power (lb/ft s)		49.97	
Frctn Loss (ft)	8.87	Cum Volume (acre-ft)	2.16	21.33	35.83
C & E Loss (ft)	0.56	Cum SA (acres)	5.14	7.60	34.17

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1303.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.48	Wt. n-Val.		0.040	0.065
W.S. Elev (ft)	1300.32	Reach Len. (ft)	534.80	534.00	537.00
Crit W.S. (ft)	1300.32	Flow Area (sq ft)		257.69	40.19
E.G. Slope (ft/ft)	0.009308	Area (sq ft)		381.39	41.38
Q Total (cfs)	4000.00	Flow (cfs)		3901.86	98.14
Top Width (ft)	99.64	Top Width (ft)		59.02	40.62
Vel Total (ft/s)	13.43	Avg. Vel. (ft/s)		15.14	2.44
Max Chl Dpth (ft)	9.32	Hydr. Depth (ft)		8.89	1.18
Conv. Total (cfs)	41459.3	Conv. (cfs)		40442.2	1017.2
Length Wtd. (ft)	534.26	Wetted Per. (ft)		29.67	34.51
Min Ch El (ft)	1291.00	Shear (lb/sq ft)		5.05	0.68
Alpha	1.24	Stream Power (lb/ft s)		76.41	1.65
Frctn Loss (ft)	7.52	Cum Volume (acre-ft)	8.36	31.63	76.18
C & E Loss (ft)	0.85	Cum SA (acres)	14.16	9.10	79.52

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1306.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.20	Wt. n-Val.		0.040	0.065
W.S. Elev (ft)	1303.28	Reach Len. (ft)	534.80	534.00	537.00

Crit W.S. (ft)	1303.28	Flow Area (sq ft)		343.64	227.11
E.G. Slope (ft/ft)	0.006465	Area (sq ft)	50.40	565.32	329.38
Q Total (cfs)	6000.00	Flow (cfs)		5253.87	746.13
Top Width (ft)	297.95	Top Width (ft)	78.74	63.20	156.02
Vel Total (ft/s)	10.51	Avg. Vel. (ft/s)		15.29	3.29
Max Chl Dpth (ft)	12.28	Hydr. Depth (ft)		11.85	2.41
Conv. Total (cfs)	74623.0	Conv. (cfs)		65343.2	9279.8
Length Wtd. (ft)	534.43	Wetted Per. (ft)		29.67	95.04
Min Ch El (ft)	1291.00	Shear (lb/sq ft)		4.67	0.96
Alpha	1.86	Stream Power (lb/ft s)		71.46	3.17
Frctn Loss (ft)	5.28	Cum Volume (acre-ft)	16.19	40.45	106.88
C & E Loss (ft)	0.70	Cum SA (acres)	20.70	9.40	88.60

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9984.77	10005.83	1575.34	121.50	20.98	78.77	5.80	12.97
10005.83	RB 10026.90	424.66	38.90	8.69	21.23	4.82	10.92

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9984.77	10005.83	2992.44	191.73	20.98	74.81	9.16	15.61
10005.83	RB 10026.90	909.42	65.96	8.69	22.74	8.18	13.79
10026.90	10975.07						
10975.07	11133.10	98.14	40.19	34.51	2.45	1.18	2.44

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,

energy was used.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9984.77	10005.83	3983.45	253.78	20.98	66.39	12.12	15.70
10005.83	RB 10026.90	1270.42	89.87	8.69	21.17	11.14	14.14
10026.90	10975.07						
10975.07	11133.10	746.13	227.11	95.04	12.44	2.41	3.29

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.735

INPUT
Description: Lower Wash Reach
Exit Section for Culvert Under Apartment Complex
Approach Section 16th Street Box Culvert
Cross Section
Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 138

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9532.7	1330	9552.5	1320	9560.5	1315.4	9566.8	1310.9	9567.7	1310
9571.8	1309.3	9579.5	1308	9588.3	1306.4	9589.9	1306	9597.4	1304.1
9597.8	1304	9602.4	1303.8	9612.7	1303.4	9631	1302	9646.7	1300.5
9652.6	1300	9660.8	1299.2	9666.6	1298.7	9669.2	1298.5	9672.4	1298.3
9677.3	1298.3	9679.5	1298.2	9680	1298.2	9680.3	1298.2	9680.7	1298.2
9683	1298.2	9683.7	1298.2	9685.5	1298.2	9693.4	1298.3	9694.6	1298.3
9697.2	1298.3	9730.4	1298.8	9737.8	1298.7	9742.9	1298.8	9748.6	1298.8
9755.2	1298.8	9760.4	1298.8	9763.2	1298.8	9776.1	1298.6	9777.6	1298.6
9781.6	1298.6	9783.1	1298.5	9787.1	1298.6	9801.6	1298.6	9809.1	1298.6
9813.3	1298.6	9817.9	1298.6	9825	1298.5	9829	1298.4	9833.4	1298.3
9841.8	1298	9883.5	1297	9891.3	1296.8	9893.9	1296.7	9935.5	1296
9938.3	1295.3	9945.2	1294	9948.4	1293.3	9949.6	1293	9950.7	1292.3
9951.6	1291.5	9953.8	1290	9955.6	1289.6	9959.2	1288.8	9963	1288
9970	1286.9	9977.3	1286	9978.8	1285.3	9982.5	1284	9984.4	1283.7
9994.4	1282.9	9999.3	1282.9	9999.6	1283.1	10000	1283.4	10000.1	1284
10003.2	1284.9	10005.3	1286	10015.5	1287.8	10016.7	1288	10018.7	1288.7
10022.9	1290	10027.1	1292.3	10028.4	1293	10033.5	1293.9	10034.2	1294
10044.8	1294.5	10080.5	1296	10085.9	1296.1	10091.4	1296.2	10097.8	1296.3
10104.7	1296.4	10111.3	1296.4	10116.8	1296.5	10128.1	1296.5	10170.2	1296.4
10180.4	1296.4	10192.2	1296.3	10216.5	1296.3	10248.6	1296.1	10251.1	1296.1
10253	1296.1	10254.2	1296.1	10254.4	1296.1	10254.7	1296.1	10256.2	1296.1
10256.7	1296.1	10260	1296.1	10263.6	1296.1	10278	1296.2	10288.2	1296.2
10294.2	1296.2	10298.5	1296.2	10320.1	1296.1	10324.9	1296.1	10336.8	1296.2
10340.4	1296.2	10343.7	1296.2	10354.2	1296.1	10362.4	1296	10363.9	1296
10376.3	1294	10434.9	1294	10473.8	1296	10484.4	1296	10866.4	1294
10876.1	1292	10880.5	1290	10887.1	1288	10897.9	1286	10906.5	1286
10913.1	1288	10918.6	1290	10926.7	1292	10935.9	1294	10946.5	1296
10969.1	1296	11463.7	1296	11552.4	1296				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9532.7	.065	9935.5	.05	10033.5	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9935.5	10033.5	266.5	263	249.1	.3	.5

Left Levee Station= 9666.29 Elevation= 1308.39

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1289.95	Element			
Vel Head (ft)	1.30	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1288.65	Reach Len. (ft)	266.50	263.00	249.10
Crit W.S. (ft)	1288.65	Flow Area (sq ft)		179.25	52.91
E.G. Slope (ft/ft)	0.024766	Area (sq ft)		179.25	52.91
Q Total (cfs)	2000.00	Flow (cfs)		1726.12	273.88
Top Width (ft)	88.63	Top Width (ft)		58.68	29.96
Vel Total (ft/s)	8.61	Avg. Vel. (ft/s)		9.63	5.18
Max Chl Dpth (ft)	5.75	Hydr. Depth (ft)		3.05	1.77
Conv. Total (cfs)	12708.8	Conv. (cfs)		10968.5	1740.4
Length Wtd. (ft)		Wetted Per. (ft)		60.67	30.65
Min Ch El (ft)	1282.90	Shear (lb/sq ft)		4.57	2.67
Alpha	1.13	Stream Power (lb/ft s)		43.99	13.82
Frctn Loss (ft)		Cum Volume (acre-ft)	2.16	18.98	35.51
C & E Loss (ft)		Cum SA (acres)	5.14	6.95	33.98

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1292.97	Element			
Vel Head (ft)	3.94	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1289.03	Reach Len. (ft)	266.50	263.00	249.10
Crit W.S. (ft)	1290.25	Flow Area (sq ft)		201.73	64.53
E.G. Slope (ft/ft)	0.068921	Area (sq ft)		201.73	64.53
Q Total (cfs)	4000.00	Flow (cfs)		3394.86	605.14
Top Width (ft)	93.81	Top Width (ft)		61.59	32.22
Vel Total (ft/s)	15.02	Avg. Vel. (ft/s)		16.83	9.38
Max Chl Dpth (ft)	6.13	Hydr. Depth (ft)		3.28	2.00
Conv. Total (cfs)	15236.4	Conv. (cfs)		12931.4	2305.1
Length Wtd. (ft)	258.97	Wetted Per. (ft)		63.68	33.03
Min Ch El (ft)	1282.90	Shear (lb/sq ft)		13.63	8.40
Alpha	1.12	Stream Power (lb/ft s)		229.39	78.82
Frctn Loss (ft)	10.69	Cum Volume (acre-ft)	8.36	28.06	75.53
C & E Loss (ft)	0.14	Cum SA (acres)	14.16	8.36	79.07

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1296.32	Element			
Vel Head (ft)	6.94	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1289.38	Reach Len. (ft)	266.50	263.00	249.10
Crit W.S. (ft)	1291.47	Flow Area (sq ft)		224.09	76.35
E.G. Slope (ft/ft)	0.112545	Area (sq ft)		224.09	76.35
Q Total (cfs)	6000.00	Flow (cfs)		5020.66	979.34
Top Width (ft)	98.70	Top Width (ft)		64.33	34.37
Vel Total (ft/s)	19.97	Avg. Vel. (ft/s)		22.40	12.83

Max Chl Dpth (ft)	6.48	Hydr. Depth (ft)		3.48	2.22
Conv. Total (cfs)	17885.0	Conv. (cfs)		14965.8	2919.2
Length Wtd. (ft)	258.66	Wetted Per. (ft)		66.52	35.30
Min Ch El (ft)	1282.90	Shear (lb/sq ft)		23.67	15.20
Alpha	1.12	Stream Power (lb/ft s)		530.33	194.95
Frctn Loss (ft)	9.04	Cum Volume (acre-ft)	15.88	35.61	104.38
C & E Loss (ft)	1.12	Cum SA (acres)	20.22	8.62	87.42

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9935.50	9968.17	23.09	6.49	8.41	1.15	0.78	3.56
9968.17	10000.83	1466.93	136.92	33.88	73.35	4.19	10.71
10000.83	RB 10033.50	236.10	35.84	18.39	11.80	2.02	6.59
10033.50	10684.46						
10684.46	10901.44	141.40	27.98	16.78	7.07	1.70	5.05
10901.44	11118.43	132.48	24.93	13.87	6.62	1.85	5.31

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9935.50	9968.17	68.67	9.91	10.16	1.72	0.99	6.93
9968.17	10000.83	2821.61	149.13	33.88	70.54	4.57	18.92
10000.83	RB 10033.50	504.57	42.69	19.64	12.61	2.26	11.82
10033.50	10684.46						
10684.46	10901.44	316.59	34.38	18.07	7.91	1.94	9.21
10901.44	11118.43	288.55	30.15	14.96	7.21	2.08	9.57

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9935.50	9968.17	137.02	13.75	11.80	2.28	1.19	9.97
9968.17	10000.83	4087.02	160.73	33.88	68.12	4.92	25.43
10000.83	RB 10033.50	796.62	49.61	20.84	13.28	2.47	16.06
10033.50	10684.46						
10684.46	10901.44	517.06	40.88	19.30	8.62	2.16	12.65
10901.44	11118.43	462.27	35.47	16.00	7.70	2.29	13.03

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.685

INPUT
Description: Lower Wash Reach
Upstream Face 16th Street Box Culvert
Cross
Section Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS

Station Elevation Data num= 125

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9192.1	1294	9220.3	1293	9319.7	1293	9319.9	1293	9336.4	1294
9336.7	1294	9469.4	1294	9470.8	1294	9532.2	1294	9585.1	1294
9585.2	1294	9656.9	1293	9657.2	1293	9662	1292.9	9689.6	1292.7
9691	1292.7	9698.2	1292.7	9714.7	1292.6	9721.5	1292.5	9726.9	1292.5
9736.5	1292.6	9757	1293	9759.5	1292.8	9760.1	1292	9764	1292.1
9764.1	1292.1	9766.5	1292	9774.9	1292.2	9791.2	1292.4	9818.1	1292.7
9819.4	1292.8	9821.4	1292.8	9823.5	1292.8	9824.3	1292.8	9825.2	1292.8
9826.2	1292.7	9827.3	1292.7	9827.9	1292	9838.7	1292.4	9842.1	1292.4
9870.8	1291.3	9883.8	1291.4	9901.1	1291.5	9904.4	1291.6	9906.9	1291.7
9931.2	1291.1	9964.8	1290	9967	1289	9968.4	1288	9970.5	1287
9972.6	1286	9976.1	1284.6	9978	1284	9980	1283	9983.1	1282
9985.2	1280.8	9986.6	1279	9987.1	1279	10000	1279	10002.2	1279
10004	1279	10005.3	1279	10008	1279	10010.4	1279	10017.01	1285.94
10018.33	1286.63	10019.64	1287.93	10021.62	1288.51	10024.92	1290.01	10026.6	1290.9
10026.7	1290.9	10027.6	1291.2	10028.5	1291.3	10032.3	1291.5	10057.3	1292
10058.8	1292	10063.5	1292.1	10066	1292.1	10066.4	1292.2	10070.6	1292.3
10088.9	1292	10101.1	1292	10116.5	1291.5	10149.7	1291.3	10152	1291.3
10153.7	1291.3	10160.2	1291.4	10163.6	1291.4	10170.1	1291.3	10176.3	1291.3
10188.4	1291	10189.7	1291	10214	1291	10216.8	1291.1	10224.7	1291.1
10241.6	1291.5	10251.7	1291.6	10256.6	1291.7	10257.9	1291.7	10259.6	1291.7
10260.6	1291.7	10262.8	1291.7	10263.6	1291.7	10274.5	1291.6	10319.5	1292
10321.9	1292	10329.7	1292.1	10360.8	1292	10566.7	1292	10699.8	1292
10871.3	1290	10876	1288	10881.3	1286	10890.7	1284	10900.2	1282
10905.3	1280	10916.4	1280	10925.1	1282	10930.7	1284	10936.8	1286
10948.3	1288	10969.1	1290	11025.9	1292	11249.7	1292	11278.7	1292

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9192.1	.065	9964.8	.05	10027.6	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9964.8	10027.6	176.2	170	170	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9950	9962.8	1289.5	10035.8	10040	1289.5

Left Levee Station= 9336.25 Elevation= 1298.03

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1285.99	Element			
Vel Head (ft)	0.50	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1285.49	Reach Len. (ft)	176.20	170.00	170.00
Crit W.S. (ft)	1283.63	Flow Area (sq ft)		207.40	169.05
E.G. Slope (ft/ft)	0.006469	Area (sq ft)		207.40	169.05
Q Total (cfs)	2000.00	Flow (cfs)		1327.27	672.73
Top Width (ft)	94.24	Top Width (ft)		42.70	51.54
Vel Total (ft/s)	5.31	Avg. Vel. (ft/s)		6.40	3.98
Max Chl Dpth (ft)	6.49	Hydr. Depth (ft)		4.86	3.28
Conv. Total (cfs)	24866.0	Conv. (cfs)		16502.0	8364.0
Length Wtd. (ft)	170.00	Wetted Per. (ft)		47.34	53.09
Min Ch El (ft)	1279.00	Shear (lb/sq ft)		1.77	1.29
Alpha	1.15	Stream Power (lb/ft s)		11.32	5.12

Frctn Loss (ft)	Cum Volume (acre-ft)	2.16	17.81	34.87
C & E Loss (ft)	Cum SA (acres)	5.14	6.65	33.75

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1288.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.63	Wt. n-Val.		0.050	0.065
W.S. Elev (ft)	1288.16	Reach Len. (ft)	176.20	170.00	170.00
Crit W.S. (ft)	1285.54	Flow Area (sq ft)		334.42	336.24
E.G. Slope (ft/ft)	0.005830	Area (sq ft)		334.42	336.24
Q Total (cfs)	4000.00	Flow (cfs)		2427.39	1572.61
Top Width (ft)	126.67	Top Width (ft)		52.28	74.39
Vel Total (ft/s)	5.96	Avg. Vel. (ft/s)		7.26	4.68
Max Chl Dpth (ft)	9.16	Hydr. Depth (ft)		6.40	4.52
Conv. Total (cfs)	52386.8	Conv. (cfs)		31790.8	20596.1
Length Wtd. (ft)	170.00	Wetted Per. (ft)		58.45	76.66
Min Ch El (ft)	1279.00	Shear (lb/sq ft)		2.08	1.60
Alpha	1.14	Stream Power (lb/ft s)		15.11	7.47
Frctn Loss (ft)		Cum Volume (acre-ft)	8.36	26.44	74.38
C & E Loss (ft)		Cum SA (acres)	14.16	8.02	78.77

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1290.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.74	Wt. n-Val.	0.065	0.050	0.065
W.S. Elev (ft)	1290.07	Reach Len. (ft)	176.20	170.00	170.00
Crit W.S. (ft)	1286.92	Flow Area (sq ft)	0.07	441.55	501.02
E.G. Slope (ft/ft)	0.005941	Area (sq ft)	0.07	441.55	501.02
Q Total (cfs)	6000.00	Flow (cfs)	0.01	3545.65	2454.34
Top Width (ft)	167.60	Top Width (ft)	2.02	60.23	105.35
Vel Total (ft/s)	6.37	Avg. Vel. (ft/s)	0.18	8.03	4.90
Max Chl Dpth (ft)	11.07	Hydr. Depth (ft)	0.03	7.33	4.76
Conv. Total (cfs)	77841.6	Conv. (cfs)	0.2	45999.8	31841.7
Length Wtd. (ft)	170.00	Wetted Per. (ft)	2.02	67.27	108.08
Min Ch El (ft)	1279.00	Shear (lb/sq ft)	0.01	2.43	1.72
Alpha	1.18	Stream Power (lb/ft s)	0.00	19.55	8.42
Frctn Loss (ft)		Cum Volume (acre-ft)	15.88	33.60	102.73
C & E Loss (ft)		Cum SA (acres)	20.21	8.24	87.02

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9964.80	9985.73	99.44	27.76	13.17	4.97	2.34	3.58
9985.73	10006.67	1005.95	135.35	21.48	50.30	6.47	7.43
10006.67	RB 10027.60	221.88	44.28	12.69	11.09	4.47	5.01
10027.60	10742.51						
10742.51	10921.24	573.32	136.57	38.41	28.67	3.64	4.20
10921.24	11099.97	99.40	32.49	14.68	4.97	2.32	3.06

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9964.80	9985.73	318.55	67.48	19.48	7.96	3.84	4.72
9985.73	10006.67	1695.46	191.35	21.48	42.39	9.14	8.86
10006.67	RB 10027.60	413.38	75.59	17.50	10.33	5.48	5.47
10027.60	10742.51						
10742.51	10921.24	1272.15	249.01	46.95	31.80	5.46	5.11

10921.24	11099.97	300.46	87.23	29.71	7.51	3.03	3.44

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9707.23	9964.80	0.01	0.07	2.02	0.00	0.03	0.18
LB 9964.80	9985.73	583.29	103.87	23.33	9.72	4.96	5.62
9985.73	10006.67	2338.46	231.16	21.48	38.97	11.04	10.12
10006.67	RB 10027.60	623.90	106.52	22.46	10.40	5.80	5.86
10027.60	10742.51						
10742.51	10921.24	1872.30	340.23	57.31	31.20	6.12	5.50
10921.24	11099.97	582.04	160.79	50.77	9.70	3.23	3.62

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CULVERT RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.674

INPUT
Description: 16 th Street Box Culvert
Distance from Upstream XS = 30
Deck/Roadway Width = 117
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew =
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
9964.8	1290		10023.2	1290	

Upstream Bridge Cross Section Data
Station Elevation Data num= 125

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9192.1	1294	9220.3	1293	9319.7	1293	9319.9	1293	9336.4	1294
9336.7	1294	9469.4	1294	9470.8	1294	9532.2	1294	9585.1	1294
9585.2	1294	9656.9	1293	9657.2	1293	9662	1292.9	9689.6	1292.7
9691	1292.7	9698.2	1292.7	9714.7	1292.6	9721.5	1292.5	9726.9	1292.5
9736.5	1292.6	9757	1293	9759.5	1292.8	9760.1	1292	9764	1292.1
9764.1	1292.1	9766.5	1292	9774.9	1292.2	9791.2	1292.4	9818.1	1292.7
9819.4	1292.8	9821.4	1292.8	9823.5	1292.8	9824.3	1292.8	9825.2	1292.8
9826.2	1292.7	9827.3	1292.7	9827.9	1292	9838.7	1292.4	9842.1	1292.4
9870.8	1291.3	9883.8	1291.4	9901.1	1291.5	9904.4	1291.6	9906.9	1291.7
9931.2	1291.1	9964.8	1290	9967	1289	9968.4	1288	9970.5	1287
9972.6	1286	9976.1	1284.6	9978	1284	9980	1283	9983.1	1282
9985.2	1280.8	9986.6	1279	9987.1	1279	10000	1279	10002.2	1279
10004	1279	10005.3	1279	10008	1279	10010.4	1279	10017.01	1285.94
10018.33	1286.63	10019.64	1287.93	10021.62	1288.51	10024.92	1290.01	10026.6	1290.9
10026.7	1290.9	10027.6	1291.2	10028.5	1291.3	10032.3	1291.5	10057.3	1292
10058.8	1292	10063.5	1292.1	10066	1292.1	10066.4	1292.2	10070.6	1292.3
10088.9	1292	10101.1	1292	10116.5	1291.5	10149.7	1291.3	10152	1291.3
10153.7	1291.3	10160.2	1291.4	10163.6	1291.4	10170.1	1291.3	10176.3	1291.3
10188.4	1291	10189.7	1291	10214	1291	10216.8	1291.1	10224.7	1291.1
10241.6	1291.5	10251.7	1291.6	10256.6	1291.7	10257.9	1291.7	10259.6	1291.7
10260.6	1291.7	10262.8	1291.7	10263.6	1291.7	10274.5	1291.6	10319.5	1292
10321.9	1292	10329.7	1292.1	10360.8	1292	10566.7	1292	10699.8	1292
10871.3	1290	10876	1288	10881.3	1286	10890.7	1284	10900.2	1282
10905.3	1280	10916.4	1280	10925.1	1282	10930.7	1284	10936.8	1286
10948.3	1288	10969.1	1290	11025.9	1292	11249.7	1292	11278.7	1292

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9192.1	.065	9964.8	.05	10027.6	.065

Bank Sta: Left	Right	Coeff Contr.	Expan.
9964.8	10027.6	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev

```
    9950  9962.8  1289.5 10035.8   10040  1289.5
Left Levee      Station= 9336.25      Elevation= 1298.03

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  9737.6    1290         10083.3    1290

Downstream Bridge Cross Section Data
Station Elevation Data    num=      74
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  9780.4    1292  9780.4    1288  9940.8    1286  9948.9  1285.8  9949.6  1285.8
  9950.5  1285.7  9954.6  1285.3  9968.3    1284  9970.2  1283.4  9988.8    1279
  9998.8    1279  9999.8    1279 10009.8    1279 10036.2    1282   10040    1283
 10046.8  1283.7 10048.5    1284 10049.9  1284.4   10056    1286   10059  1286.7
 10063.6    1288 10070.7    1289 10083.3    1290 10096.4  1290.2 10108.1  1290.3
 10171.2  1290.9 10209.5  1290.6 10210.5  1290.5 10212.7  1290.4 10215.4  1290.3
 10217.5  1290.3 10218.5  1290.3 10220.2  1290.3 10223.3  1290.3 10225.2  1290.4
 10233.5  1290.2 10239.6  1290.1 10248.4    1290 10255.6  1289.9 10260.8  1289.9
 10287.1  1289.8   10293  1289.8 10297.4  1289.8 10307.9    1290 10310.1    1290
 10310.2    1290 10310.3    1290 10310.4    1290 10314.1  1289.9 10370.7  1289.6
 10380.4  1289.9 10384.3    1290 10432.6    1290 10484.1    1290 10596.2    1290
 10831.4    1288 10855.2    1286 10863.8    1284 10870.3    1282 10876.1    1280
 10879.7    1278 10896.5    1278 10904.1    1280 10910.7    1282 10920.6    1284
 10929.1    1286 10937.9    1288 10951.9    1290 10988.3    1290 11069.3    1288
 11280.3    1288 11314.8    1288 11397.2    1288 11581.1    1290

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  9780.4    .065  9940.8     .04 10083.3    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9940.8 10083.3             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
    9800  9975.3    1289 10023.3   10080    1289

Upstream Embankment side slope              =         horiz. to 1.0 vertical
Downstream Embankment side slope            =         horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =       1
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
16th Street          Box      10      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
                 30     117       .015                   .4                1
Number of Barrels =  2
Upstream   Elevation =  1279
Centerline Stations
    Sta.    Sta.
  9993.8 10004.8
Downstream Elevation =  1279
Centerline Stations
    Sta.    Sta.
  9993.8 10004.8

CULVERT OUTPUT    Profile #1/3 Spillway
Culvert ID : 16th Street

  Culv Q (cfs)            933.08   Culv Vel In (ft/s)        8.76
  # Barrels                    2   Culv Vel Out (ft/s)      10.01
  Q Barrel (cfs)          466.54   Culv Inv El Up (ft)    1279.00
  E.G. US. (ft)          1285.99   Culv Inv El Dn (ft)    1279.00
```

W.S. US. (ft)	1285.49	Culv Frctn Ls (ft)	0.30
Delta EG (ft)	1.81	Culv Ext Lss (ft)	1.03
Delta WS (ft)	1.83	Culv Ent Lss (ft)	0.48
E.G. IC (ft)	1285.81	Q Weir (cfs)	1066.92
E.G. OC (ft)	1285.99	Weir Sta Lft (ft)	10881.33
Culvert Control	Outlet	Weir Sta Rgt (ft)	10936.78
Culv WS In (ft)	1284.33	Weir Submerg	0.48
Culv WS Out (ft)	1283.66	Weir Max Depth (ft)	5.99
Culv Nml Depth (ft)		Weir Avg Depth (ft)	3.54
Culv Crt Depth (ft)	4.07	Wr Flw Area (sq ft)	196.01
Culv Ful Lngh (ft)		Min Top Rd (ft)	1280.00

CULVERT OUTPUT Profile #2/3 Spillway
Culvert ID : 16th Street

Culv Q (cfs)	1517.14	Culv Vel In (ft/s)	9.90
# Barrels	2	Culv Vel Out (ft/s)	10.61
Q Barrel (cfs)	758.57	Culv Inv El Up (ft)	1279.00
E.G. US. (ft)	1288.79	Culv Inv El Dn (ft)	1279.00
W.S. US. (ft)	1288.16	Culv Frctn Ls (ft)	0.29
Delta EG (ft)	1.87	Culv Ext Lss (ft)	0.97
Delta WS (ft)	2.02	Culv Ent Lss (ft)	0.61
E.G. IC (ft)	1288.58	Q Weir (cfs)	2482.86
E.G. OC (ft)	1288.79	Weir Sta Lft (ft)	10874.16
Culvert Control	Outlet	Weir Sta Rgt (ft)	10956.44
Culv WS In (ft)	1286.67	Weir Submerg	0.58
Culv WS Out (ft)	1286.15	Weir Max Depth (ft)	8.78
Culv Nml Depth (ft)		Weir Avg Depth (ft)	4.68
Culv Crt Depth (ft)	5.63	Wr Flw Area (sq ft)	384.68
Culv Ful Lngh (ft)		Min Top Rd (ft)	1280.00

CULVERT OUTPUT Profile #Full Spillway
Culvert ID : 16th Street

Culv Q (cfs)	1796.80	Culv Vel In (ft/s)	8.98
# Barrels	2	Culv Vel Out (ft/s)	9.20
Q Barrel (cfs)	898.40	Culv Inv El Up (ft)	1279.00
E.G. US. (ft)	1290.80	Culv Inv El Dn (ft)	1279.00
W.S. US. (ft)	1290.07	Culv Frctn Ls (ft)	0.22
Delta EG (ft)	1.18	Culv Ext Lss (ft)	0.46
Delta WS (ft)	1.30	Culv Ent Lss (ft)	0.50
E.G. IC (ft)	1290.52	Q Weir (cfs)	4203.20
E.G. OC (ft)	1290.80	Weir Sta Lft (ft)	9940.34
Culvert Control	Outlet	Weir Sta Rgt (ft)	10991.85
Culv WS In (ft)	1289.00	Weir Submerg	0.67
Culv WS Out (ft)	1288.76	Weir Max Depth (ft)	10.80
Culv Nml Depth (ft)		Weir Avg Depth (ft)	2.43
Culv Crt Depth (ft)	6.31	Wr Flw Area (sq ft)	668.44
Culv Ful Lngh (ft)	19.32	Min Top Rd (ft)	1280.00

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.653

INPUT
Description: Lower Wash Reach
Dounstream Face 16th Street Box Culvert
Cross
Section Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9780.4	1292	9780.4	1288	9940.8	1286	9948.9	1285.8	9949.6	1285.8
9950.5	1285.7	9954.6	1285.3	9968.3	1284	9970.2	1283.4	9988.8	1279
9998.8	1279	9999.8	1279	10009.8	1279	10036.2	1282	10040	1283
10046.8	1283.7	10048.5	1284	10049.9	1284.4	10056	1286	10059	1286.7
10063.6	1288	10070.7	1289	10083.3	1290	10096.4	1290.2	10108.1	1290.3
10171.2	1290.9	10209.5	1290.6	10210.5	1290.5	10212.7	1290.4	10215.4	1290.3
10217.5	1290.3	10218.5	1290.3	10220.2	1290.3	10223.3	1290.3	10225.2	1290.4

10233.5	1290.2	10239.6	1290.1	10248.4	1290	10255.6	1289.9	10260.8	1289.9
10287.1	1289.8	10293	1289.8	10297.4	1289.8	10307.9	1290	10310.1	1290
10310.2	1290	10310.3	1290	10310.4	1290	10314.1	1289.9	10370.7	1289.6
10380.4	1289.9	10384.3	1290	10432.6	1290	10484.1	1290	10596.2	1290
10831.4	1288	10855.2	1286	10863.8	1284	10870.3	1282	10876.1	1280
10879.7	1278	10896.5	1278	10904.1	1280	10910.7	1282	10920.6	1284
10929.1	1286	10937.9	1288	10951.9	1290	10988.3	1290	11069.3	1288
11280.3	1288	11314.8	1288	11397.2	1288	11581.1	1290		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9780.4	.065	9940.8	.04	10083.3	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9940.8	10083.3	409.1	418	442.5	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9800	9975.3	1289	10023.3	10080	1289

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1284.18	Element			
Vel Head (ft)	0.52	Wt. n-Val.		0.040	0.065
W.S. Elev (ft)	1283.66	Reach Len. (ft)	409.10	418.00	442.50
Crit W.S. (ft)	1281.98	Flow Area (sq ft)		191.70	191.49
E.G. Slope (ft/ft)	0.005187	Area (sq ft)		233.56	191.49
Q Total (cfs)	2000.00	Flow (cfs)		1282.91	717.09
Top Width (ft)	131.02	Top Width (ft)		77.02	54.00
Vel Total (ft/s)	5.22	Avg. Vel. (ft/s)		6.69	3.74
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)		3.99	3.55
Conv. Total (cfs)	27768.5	Conv. (cfs)		17812.2	9956.3
Length Wtd. (ft)	423.36	Wetted Per. (ft)		48.46	55.82
Min Ch El (ft)	1279.00	Shear (lb/sq ft)		1.28	1.11
Alpha	1.24	Stream Power (lb/ft s)		8.57	4.16
Frctn Loss (ft)	2.70	Cum Volume (acre-ft)	2.16	16.95	34.17
C & E Loss (ft)	0.15	Cum SA (acres)	5.14	6.42	33.55

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1286.93	Element			
Vel Head (ft)	0.78	Wt. n-Val.		0.040	0.065
W.S. Elev (ft)	1286.15	Reach Len. (ft)	409.10	418.00	442.50
Crit W.S. (ft)	1283.67	Flow Area (sq ft)		311.16	352.16
E.G. Slope (ft/ft)	0.004190	Area (sq ft)	0.87	466.97	352.16
Q Total (cfs)	4000.00	Flow (cfs)		2584.84	1415.16
Top Width (ft)	203.95	Top Width (ft)	11.82	115.83	76.30
Vel Total (ft/s)	6.03	Avg. Vel. (ft/s)		8.31	4.02
Max Chl Dpth (ft)	8.15	Hydr. Depth (ft)		6.48	4.62
Conv. Total (cfs)	61794.5	Conv. (cfs)		39932.2	21862.3
Length Wtd. (ft)	423.80	Wetted Per. (ft)		48.46	78.69
Min Ch El (ft)	1279.00	Shear (lb/sq ft)		1.68	1.17
Alpha	1.38	Stream Power (lb/ft s)		13.95	4.70
Frctn Loss (ft)	2.94	Cum Volume (acre-ft)	8.36	24.87	73.04
C & E Loss (ft)	0.37	Cum SA (acres)	14.14	7.69	78.47

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1289.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.86	Wt. n-Val.	0.065	0.040	0.065
W.S. Elev (ft)	1288.76	Reach Len. (ft)	409.10	418.00	442.50
Crit W.S. (ft)	1285.03	Flow Area (sq ft)	17.32	436.65	926.96
E.G. Slope (ft/ft)	0.003151	Area (sq ft)	282.58	783.88	926.96
Q Total (cfs)	6000.00	Flow (cfs)	19.96	3942.74	2037.30
Top Width (ft)	918.81	Top Width (ft)	160.40	128.21	630.20
Vel Total (ft/s)	4.34	Avg. Vel. (ft/s)	1.15	9.03	2.20
Max Chl Dpth (ft)	10.76	Hydr. Depth (ft)	0.88	9.10	1.47
Conv. Total (cfs)	106887.4	Conv. (cfs)	355.6	70238.1	36293.7
Length Wtd. (ft)	423.70	Wetted Per. (ft)	20.36	48.46	632.95
Min Ch El (ft)	1279.00	Shear (lb/sq ft)	0.17	1.77	0.29
Alpha	2.93	Stream Power (lb/ft s)	0.19	16.01	0.63
Frctn Loss (ft)	2.92	Cum Volume (acre-ft)	15.31	31.21	99.94
C & E Loss (ft)	0.90	Cum SA (acres)	19.88	7.88	85.59

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9940.80	9988.30	210.36	39.03	13.36	10.52	3.00	5.39
9988.30	10035.80	1072.55	152.67	35.10	53.63	4.36	7.03
10035.80	10725.21						
10725.21	10939.19	717.09	191.49	55.82	35.85	3.55	3.74

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9940.80	9988.30	521.56	71.39	13.36	13.04	5.49	7.31
9988.30	10035.80	2063.28	239.77	35.10	51.58	6.85	8.61
10035.80	10725.21						
10725.21	10939.19	1415.16	352.16	78.69	35.38	4.62	4.02

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9780.40	9833.87	19.96	17.32	20.36	0.33	0.88	1.15
9833.87	9940.80						
LB 9940.80	9988.30	867.84	105.38	13.36	14.46	8.11	8.24
9988.30	10035.80	3074.89	331.28	35.10	51.25	9.47	9.28
10035.80	10725.21						
10725.21	10939.19	1752.52	637.60	200.06	29.21	3.23	2.75

10939.19	11153.16	72.87	76.79	118.80	1.21	0.65	0.95
11153.16	11367.13	172.53	162.99	213.97	2.88	0.76	1.06
11367.13	11581.10	39.39	49.58	100.12	0.66	0.50	0.79

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.574

INPUT
Description: Lower Wash Reach
Exit Section 16th Street Box Culvert
Approach
Section 15th Street Culvert
Cross Section Data Digitized from
Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 117

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8914.4	1290	8924.7	1288	8955.7	1286	8970.2	1284	8994.6	1284
9048	1286	9062.3	1286	9111.3	1286	9216.2	1286	9477.1	1284.7
9481.7	1284.6	9484.1	1284.5	9486	1284.5	9486.8	1284.4	9487.4	1284.4
9487.9	1284.4	9491	1284.4	9491.9	1284.4	9492.8	1284.4	9495.6	1284.4
9498.4	1284.4	9509.6	1284.6	9516.1	1284.6	9518.9	1284.6	9521.6	1284.6
9529.6	1284.3	9535.3	1284.1	9541.2	1284	9543.2	1283.9	9546.1	1283.8
9548.4	1283.8	9551.3	1283.9	9554.5	1284	9561.6	1284	9564.1	1284.1
9569.9	1284	9578.2	1284	9578.9	1284	9582	1283.9	9583.6	1283.9
9587.3	1283.9	9587.7	1283.9	9590.8	1283.9	9596.5	1283.9	9613.8	1283.8
9668	1283.6	9680.2	1283.5	9699.1	1283.4	9716.6	1283.3	9734.8	1283.2
9738.2	1283.2	9788.9	1282.9	9841.9	1282.7	9960.1	1282	9966.1	1280.6
9970.7	1280	9978.9	1276	9980.3	1275.1	9983.5	1274.8	9987	1274.6
10000	1274	10003.6	1274.2	10010.7	1276	10013.3	1277.8	10016	1278.5
10019	1279.6	10021.6	1280.8	10024.4	1282	10025.2	1282.5	10028.4	1284
10030.6	1284.9	10032.1	1285.9	10032.3	1286	10032.8	1286.2	10036.7	1288
10037.8	1288.1	10038.9	1288.2	10040.3	1288.2	10041	1288.2	10042.3	1288.2
10043.2	1288.1	10043.4	1288	10052.8	1287.4	10056.8	1287.2	10073.6	1286
10086.7	1285.2	10105.7	1284	10112	1283.5	10119.5	1282.9	10121.9	1282.7
10123.6	1282.7	10129.3	1282.9	10138.5	1283.2	10145.4	1283.3	10160.8	1283.6
10161.6	1283.7	10176.9	1284	10188.3	1284	10225.6	1284	10228.3	1284
10228.4	1284	10228.5	1284	10380.3	1284	10726.4	1284	10769.8	1284
10873.2	1282	10878.8	1280	10884	1278	10900.8	1278	10906.1	1280
10912.6	1282	11044.8	1282	11111.2	1282	11130	1284	11178.2	1284
11314	1284	11568.5	1286						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
8914.4	.065	9960.1	.04	10040.3	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9960.1	10040.3	382.9	376	376.1	.3	.5

Left Levee Station= 9048.04 Elevation= 1287.01
Blocked Obstructions num= 1

Sta L	Sta R	Elev
9635	9960	1300

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1281.33	Element			
Vel Head (ft)	1.02	Wt. n-Val.		0.040	0.065
W.S. Elev (ft)	1280.30	Reach Len. (ft)	382.90	376.00	376.10
Crit W.S. (ft)	1279.57	Flow Area (sq ft)		218.92	52.66
E.G. Slope (ft/ft)	0.008064	Area (sq ft)		218.92	52.66
Q Total (cfs)	2000.00	Flow (cfs)		1842.58	157.42
Top Width (ft)	81.29	Top Width (ft)		52.15	29.14
Vel Total (ft/s)	7.36	Avg. Vel. (ft/s)		8.42	2.99

Max Chl Dpth (ft)	6.30	Hydr. Depth (ft)		4.20	1.81
Conv. Total (cfs)	22272.2	Conv. (cfs)		20519.2	1753.1
Length Wtd. (ft)	376.03	Wetted Per. (ft)		54.62	29.97
Min Ch El (ft)	1274.00	Shear (lb/sq ft)		2.02	0.88
Alpha	1.22	Stream Power (lb/ft s)		16.98	2.64
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	2.16	14.78	32.93
C & E Loss (ft)	0.49	Cum SA (acres)	5.14	5.80	33.12

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1283.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.00	Wt. n-Val.		0.040	0.065
W.S. Elev (ft)	1281.63	Reach Len. (ft)	382.90	376.00	376.10
Crit W.S. (ft)	1281.63	Flow Area (sq ft)		294.87	96.55
E.G. Slope (ft/ft)	0.013693	Area (sq ft)		294.87	96.55
Q Total (cfs)	4000.00	Flow (cfs)		3522.53	477.47
Top Width (ft)	98.98	Top Width (ft)		61.84	37.15
Vel Total (ft/s)	10.22	Avg. Vel. (ft/s)		11.95	4.95
Max Chl Dpth (ft)	7.63	Hydr. Depth (ft)		4.77	2.60
Conv. Total (cfs)	34183.4	Conv. (cfs)		30103.0	4080.4
Length Wtd. (ft)	376.10	Wetted Per. (ft)		64.73	38.41
Min Ch El (ft)	1274.00	Shear (lb/sq ft)		3.89	2.15
Alpha	1.23	Stream Power (lb/ft s)		46.52	10.63
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	8.36	21.22	70.76
C & E Loss (ft)	0.96	Cum SA (acres)	14.08	6.84	77.90

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1285.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.86	Wt. n-Val.		0.040	0.065
W.S. Elev (ft)	1281.94	Reach Len. (ft)	382.90	376.00	376.10
Crit W.S. (ft)	1281.94	Flow Area (sq ft)		314.36	108.36
E.G. Slope (ft/ft)	0.025528	Area (sq ft)		314.36	108.36
Q Total (cfs)	6000.00	Flow (cfs)		5235.80	764.20
Top Width (ft)	102.91	Top Width (ft)		63.89	39.02
Vel Total (ft/s)	14.19	Avg. Vel. (ft/s)		16.66	7.05
Max Chl Dpth (ft)	7.94	Hydr. Depth (ft)		4.92	2.78
Conv. Total (cfs)	37552.5	Conv. (cfs)		32769.6	4782.9
Length Wtd. (ft)	376.17	Wetted Per. (ft)		66.88	40.39
Min Ch El (ft)	1274.00	Shear (lb/sq ft)		7.49	4.28
Alpha	1.23	Stream Power (lb/ft s)		124.77	30.16
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)	13.98	25.94	94.68
C & E Loss (ft)	1.86	Cum SA (acres)	19.13	6.95	82.19

Warning: The energy equation could not be balanced within the specified number of iterations. The

program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9960.10	9986.83	408.30	61.69	19.69	20.42	3.34	6.62
9986.83	10013.57	1399.84	147.78	27.55	69.99	5.53	9.47
10013.57	RB 10040.30	34.44	9.45	7.39	1.72	1.36	3.64
10040.30	10695.24						
10695.24	10913.56	157.42	52.66	29.97	7.87	1.81	2.99

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9960.10	9986.83	823.44	91.07	26.50	20.59	3.62	9.04
9986.83	10013.57	2572.05	183.18	27.55	64.30	6.85	14.04
10013.57	RB 10040.30	127.03	20.62	10.67	3.18	2.07	6.16
10040.30	10695.24						
10695.24	10913.56	477.47	96.55	38.41	11.94	2.60	4.95

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9960.10	9986.83	1249.60	99.07	27.87	20.83	3.74	12.61
9986.83	10013.57	3776.07	191.47	27.55	62.93	7.16	19.72
10013.57	RB 10040.30	210.14	23.83	11.46	3.50	2.23	8.82
10040.30	10695.24						
10695.24	10913.56	764.20	108.36	40.39	12.74	2.78	7.05

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.503

INPUT
Description: Lower Wash Reach
Upstream Face 15th Street Culvert
Cross Section
Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 120

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8747.8	1290	8815	1284	8904.5	1282	8944.3	1284	9134.5	1282
9251.4	1280.4	9282.5	1280.5	9289.1	1280.4	9290.6	1280.4	9291.8	1280.4
9299.1	1280.5	9320.2	1280.6	9321.7	1280.6	9330.7	1280.7	9332.8	1280.7
9352.8	1280.8	9357.1	1280.8	9360.5	1280.8	9364.5	1280.8	9367.5	1280.7
9372.3	1280.6	9385.2	1280.3	9388.3	1280.2	9389	1280.2	9389.6	1280.2
9393.4	1280.2	9396.1	1280.2	9397.4	1280.1	9397.7	1280.1	9398.5	1280.2
9398.6	1280.2	9398.8	1280.2	9399.4	1280.1	9400.4	1280.1	9414.8	1280.4
9443.1	1280.6	9463.3	1280.8	9469.8	1280.8	9477.7	1280.9	9529.3	1282
9529.9	1282	9530.5	1282	9534.4	1282.2	9536.4	1282.2	9539.2	1282.2
9545.9	1282.2	9548	1282.1	9550.4	1282.1	9556.5	1282	9578.4	1282
9638	1281.4	9650.7	1281.6	9664.8	1281.8	9676.5	1282	9695.1	1282
9786.9	1280.9	9797.7	1280.8	9801.7	1280.7	9808.7	1280.6	9811.2	1280.6
9812.4	1280.6	9819.1	1280.5	9828.3	1280.6	9831.5	1280.5	9836.6	1280.5
9841.2	1280.5	9843	1280.5	9888.9	1280.3	9890.5	1280.2	9891.7	1280.2
9892.7	1280.2	9902.9	1280.2	9915.7	1280.3	9927.1	1280	9978.2	1276
9988	1272	9989	1272	9991.8	1268	9993.5	1269.4	9994	1270
9994.6	1269.4	9995.4	1268	9996.1	1268.4	9996.8	1266	9997.4	1267.3
9998.1	1266.6	9998.5	1266	10002.5	1266	10002.9	1266	10003	1266.2
10003.1	1266	10007.1	1267.5	10007.8	1268	10008.5	1268	10009.1	1268
10016	1269.8	10016.9	1270	10022.7	1272	10030.5	1276	10052.1	1272.1
10055.4	1272.2	10069.7	1273	10189.2	1279.7	10194.8	1280	10197.3	1279.9
10262.9	1278	10291.9	1278	10316.5	1278	10336.1	1278	10336.5	1278
10336.7	1278	10336.8	1278	10339.3	1278	10339.5	1278	10481.2	1280
10685.1	1282	10996	1280	11283.4	1282	11425.1	1282	11790.6	1284

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
8747.8	.065	9927.1	.04	10030.5	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9927.1	10030.5	162.6	171	185.5	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9925	9959	1279	10039.9	10425	1279

Left Levee Station= 8945.88 Elevation= 1286.16

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1280.59	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.065	0.040	0.065
W.S. Elev (ft)	1280.56	Reach Len. (ft)	162.60	171.00	185.50
Crit W.S. (ft)	1273.43	Flow Area (sq ft)	42.92	660.96	1379.05
E.G. Slope (ft/ft)	0.000210	Area (sq ft)	42.92	660.96	1379.05

Q Total (cfs)	2000.00	Flow (cfs)	4.80	1150.17	845.03
Top Width (ft)	1025.33	Top Width (ft)	245.07	103.40	676.86
Vel Total (ft/s)	0.96	Avg. Vel. (ft/s)	0.11	1.74	0.61
Max Chl Dpth (ft)	14.56	Hydr. Depth (ft)	0.18	6.39	2.04
Conv. Total (cfs)	137914.0	Conv. (cfs)	331.1	79312.1	58270.7
Length Wtd. (ft)	171.00	Wetted Per. (ft)	245.11	113.85	677.48
Min Ch El (ft)	1266.00	Shear (lb/sq ft)	0.00	0.08	0.03
Alpha	2.06	Stream Power (lb/ft s)	0.00	0.13	0.02
Frctn Loss (ft)		Cum Volume (acre-ft)	1.97	10.98	26.75
C & E Loss (ft)		Cum SA (acres)	4.06	5.12	30.08

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1281.19	Element			
Vel Head (ft)	0.08	Wt. n-Val.	0.065	0.040	0.065
W.S. Elev (ft)	1281.12	Reach Len. (ft)	162.60	171.00	185.50
Crit W.S. (ft)	1276.35	Flow Area (sq ft)	246.26	718.12	1814.45
E.G. Slope (ft/ft)	0.000534	Area (sq ft)	246.26	718.12	1814.45
Q Total (cfs)	4000.00	Flow (cfs)	87.75	2104.42	1807.83
Top Width (ft)	1449.04	Top Width (ft)	447.08	103.40	898.56
Vel Total (ft/s)	1.44	Avg. Vel. (ft/s)	0.36	2.93	1.00
Max Chl Dpth (ft)	15.12	Hydr. Depth (ft)	0.55	6.95	2.02
Conv. Total (cfs)	173099.9	Conv. (cfs)	3797.4	91068.6	78233.9
Length Wtd. (ft)	171.00	Wetted Per. (ft)	447.14	113.85	899.18
Min Ch El (ft)	1266.00	Shear (lb/sq ft)	0.02	0.21	0.07
Alpha	2.40	Stream Power (lb/ft s)	0.01	0.62	0.07
Frctn Loss (ft)		Cum Volume (acre-ft)	7.27	16.85	62.51
C & E Loss (ft)		Cum SA (acres)	12.12	6.12	73.86

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1281.58	Element			
Vel Head (ft)	0.13	Wt. n-Val.	0.065	0.040	0.065
W.S. Elev (ft)	1281.45	Reach Len. (ft)	162.60	171.00	185.50
Crit W.S. (ft)	1278.11	Flow Area (sq ft)	404.71	752.17	2132.14
E.G. Slope (ft/ft)	0.000906	Area (sq ft)	404.71	752.17	2132.14
Q Total (cfs)	6000.00	Flow (cfs)	237.51	2961.95	2800.54
Top Width (ft)	1655.62	Top Width (ft)	521.56	103.40	1030.66
Vel Total (ft/s)	1.82	Avg. Vel. (ft/s)	0.59	3.94	1.31
Max Chl Dpth (ft)	15.45	Hydr. Depth (ft)	0.78	7.27	2.07
Conv. Total (cfs)	199286.7	Conv. (cfs)	7888.7	98379.5	93018.5
Length Wtd. (ft)	171.00	Wetted Per. (ft)	521.62	113.85	1031.29
Min Ch El (ft)	1266.00	Shear (lb/sq ft)	0.04	0.37	0.12
Alpha	2.55	Stream Power (lb/ft s)	0.03	1.47	0.15
Frctn Loss (ft)		Cum Volume (acre-ft)	12.20	21.33	85.01
C & E Loss (ft)		Cum SA (acres)	16.84	6.23	77.57

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9140.90	9534.00	2.04	20.53	137.30	0.10	0.15	0.10
9534.00	9927.10	2.77	22.39	107.81	0.14	0.21	0.12
LB 9927.10	9961.57	47.21	65.93	34.57	2.36	1.91	0.72
9961.57	9996.03	315.52	217.00	39.33	15.78	6.30	1.45
9996.03	RB 10030.50	787.44	378.03	39.95	39.37	10.97	2.08
10030.50	10281.94	685.13	946.13	252.04	34.26	3.76	0.72
10281.94	10533.39	153.49	385.23	251.46	7.67	1.53	0.40
10533.39	10784.83	0.00	0.14	5.30	0.00	0.03	0.03
10784.83	11036.27	5.94	41.77	127.92	0.30	0.33	0.14
11036.27	11287.71	0.47	5.78	40.75	0.02	0.14	0.08

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9140.90	9534.00	50.69	149.11	288.85	1.27	0.52	0.34
9534.00	9927.10	37.06	97.14	158.29	0.93	0.61	0.38
LB 9927.10	9961.57	117.59	84.98	34.57	2.94	2.47	1.38
9961.57	9996.03	592.32	236.05	39.33	14.81	6.85	2.51
9996.03	RB 10030.50	1394.51	397.08	39.95	34.86	11.52	3.51
10030.50	10281.94	1343.39	1085.11	252.04	33.58	4.32	1.24
10281.94	10533.39	400.19	524.22	251.46	10.00	2.08	0.76
10533.39	10784.83	3.93	18.64	61.65	0.10	0.30	0.21
10784.83	11036.27	47.18	136.23	213.85	1.18	0.64	0.35
11036.27	11287.71	13.15	50.25	120.18	0.33	0.42	0.26

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9140.90	9534.00	145.56	250.74	328.37	2.43	0.76	0.58
9534.00	9927.10	91.95	153.97	193.25	1.53	0.80	0.60
LB 9927.10	9961.57	191.02	96.33	34.57	3.18	2.79	1.98
9961.57	9996.03	844.34	247.41	39.33	14.07	7.18	3.41
9996.03	RB 10030.50	1926.58	408.43	39.95	32.11	11.85	4.72
10030.50	10281.94	1965.80	1167.92	252.04	32.76	4.64	1.68
10281.94	10533.39	661.50	607.03	251.46	11.03	2.41	1.09
10533.39	10784.83	15.16	45.07	108.83	0.25	0.41	0.34
10784.83	11036.27	116.83	214.50	251.45	1.95	0.85	0.54
11036.27	11287.71	41.25	97.63	167.51	0.69	0.58	0.42

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CULVERT RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.4915

INPUT
Description: 15th Street Culvert
Distance from Upstream XS = 34
Deck/Roadway Width = 120
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew =
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
9927.1	1280		10481.2	1280	

Upstream Bridge Cross Section Data
Station Elevation Data num= 120

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8747.8	1290	8815	1284	8904.5	1282	8944.3	1284	9134.5	1282
9251.4	1280.4	9282.5	1280.5	9289.1	1280.4	9290.6	1280.4	9291.8	1280.4
9299.1	1280.5	9320.2	1280.6	9321.7	1280.6	9330.7	1280.7	9332.8	1280.7
9352.8	1280.8	9357.1	1280.8	9360.5	1280.8	9364.5	1280.8	9367.5	1280.7
9372.3	1280.6	9385.2	1280.3	9388.3	1280.2	9389	1280.2	9389.6	1280.2
9393.4	1280.2	9396.1	1280.2	9397.4	1280.1	9397.7	1280.1	9398.5	1280.2
9398.6	1280.2	9398.8	1280.2	9399.4	1280.1	9400.4	1280.1	9414.8	1280.4
9443.1	1280.6	9463.3	1280.8	9469.8	1280.8	9477.7	1280.9	9529.3	1282
9529.9	1282	9530.5	1282	9534.4	1282.2	9536.4	1282.2	9539.2	1282.2
9545.9	1282.2	9548	1282.1	9550.4	1282.1	9556.5	1282	9578.4	1282
9638	1281.4	9650.7	1281.6	9664.8	1281.8	9676.5	1282	9695.1	1282
9786.9	1280.9	9797.7	1280.8	9801.7	1280.7	9808.7	1280.6	9811.2	1280.6
9812.4	1280.6	9819.1	1280.5	9828.3	1280.6	9831.5	1280.5	9836.6	1280.5
9841.2	1280.5	9843	1280.5	9888.9	1280.3	9890.5	1280.2	9891.7	1280.2
9892.7	1280.2	9902.9	1280.2	9915.7	1280.3	9927.1	1280	9978.2	1276
9988	1272	9989	1272	9991.8	1268	9993.5	1269.4	9994	1270
9994.6	1269.4	9995.4	1268	9996.1	1268.4	9996.8	1266	9997.4	1267.3
9998.1	1266.6	9998.5	1266	10002.5	1266	10002.9	1266	10003	1266.2
10003.1	1266	10007.1	1267.5	10007.8	1268	10008.5	1268	10009.1	1268

```
   10016  1269.8 10016.9    1270 10022.7    1272 10030.5    1276 10052.1  1272.1
 10055.4  1272.2 10069.7    1273 10189.2  1279.7 10194.8    1280 10197.3  1279.9
 10262.9    1278 10291.9    1278 10316.5    1278 10336.1    1278 10336.5    1278
 10336.7    1278 10336.8    1278 10339.3    1278 10339.5    1278 10481.2    1280
 10685.1    1282   10996    1280 11283.4    1282 11425.1    1282 11790.6    1284

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  8747.8    .065  9927.1     .04 10030.5    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9927.1 10030.5             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
    9925    9959    1279 10039.9   10425    1279
Left Levee      Station= 8945.88      Elevation= 1286.16

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  8930.3    1280         10845.6    1280

Downstream Bridge Cross Section Data
Station Elevation Data    num=      52
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  9800.9    1284  9800.9    1280  9803.2  1279.8  9808.4  1279.3  9818.5  1278.3
  9821.9    1278    9838  1276.7  9847.1    1276  9860.7  1275.6  9875.7  1275.2
  9898.4    1274  9924.9    1272  9925.2    1272  9960.5  1270.1  9961.2  1270.1
  9961.4  1270.1  9961.8    1270    9962    1270  9962.4    1270  9962.6    1270
    9963  1269.9    9976    1268  9979.9  1267.3  9982.7  1267.1  9991.4    1266
  9998.8    1266 10008.5    1266 10014.3  1267.3 10014.6    1268 10015.2  1269.1
 10017.9  1268.7 10020.6  1268.9 10026.5  1269.8 10027.5  1269.9 10028.1    1270
 10028.5  1270.1 10034.6    1272 10041.7  1273.6   10043    1274 10064.7  1275.8
 10067.5    1276 10068.6  1276.2 10071.7  1276.4 10077.4  1276.7 10083.9  1276.9
   10495    1278 10845.6    1280 11004.9    1278 11089.2    1278 11519.7    1280
 11757.3    1280   11914    1284

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  9800.9    .065  9898.4    .043   10043    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9898.4   10043             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
    9800  9984.5    1279 10014.6   10700    1279

Upstream Embankment side slope              =         horiz. to 1.0 vertical
Downstream Embankment side slope            =         horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =       1
Elevation at which weir flow begins         =    1280
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
15th Street        Arch       8.3    12.8
FHWA Chart # 41- Arch; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
               34   119.7       .024                   .7               .5
Upstream   Elevation =  1266
           Centerline Station =  10000.9
Downstream Elevation =  1266
           Centerline Station =  9999.5

CULVERT OUTPUT    Profile #1/3 Spillway
Culvert ID : 15th Street
```

Culv Q (cfs)	1179.24	Culv Vel In (ft/s)	14.13
# Barrels	1	Culv Vel Out (ft/s)	16.50
Q Barrel (cfs)	1179.24	Culv Inv El Up (ft)	1266.00
E.G. US. (ft)	1280.59	Culv Inv El Dn (ft)	1266.00
W.S. US. (ft)	1280.56	Culv Frctn Ls (ft)	1.96
Delta EG (ft)	6.57	Culv Ext Lss (ft)	2.44
Delta WS (ft)	8.75	Culv Ent Lss (ft)	2.17
E.G. IC (ft)	1280.54	Q Weir (cfs)	820.76
E.G. OC (ft)	1280.59	Weir Sta Lft (ft)	9237.38
Culvert Control	Outlet	Weir Sta Rgt (ft)	11081.06
Culv WS In (ft)	1274.30	Weir Submerg	0.00
Culv WS Out (ft)	1272.23	Weir Max Depth (ft)	0.59
Culv Nml Depth (ft)		Weir Avg Depth (ft)	0.42
Culv Crt Depth (ft)	6.23	Wr Flw Area (sq ft)	448.33
Culv Ful Lngh (ft)	60.10	Min Top Rd (ft)	1280.00

CULVERT OUTPUT Profile #2/3 Spillway
Culvert ID : 15th Street

Culv Q (cfs)	940.17	Culv Vel In (ft/s)	11.27
# Barrels	1	Culv Vel Out (ft/s)	11.27
Q Barrel (cfs)	940.17	Culv Inv El Up (ft)	1266.00
E.G. US. (ft)	1281.19	Culv Inv El Dn (ft)	1266.00
W.S. US. (ft)	1281.12	Culv Frctn Ls (ft)	1.29
Delta EG (ft)	2.67	Culv Ext Lss (ft)	
Delta WS (ft)	6.67	Culv Ent Lss (ft)	1.38
E.G. IC (ft)	1281.11	Q Weir (cfs)	3048.34
E.G. OC (ft)	1281.19	Weir Sta Lft (ft)	9193.55
Culvert Control	Outlet	Weir Sta Rgt (ft)	11167.26
Culv WS In (ft)	1274.30	Weir Submerg	0.00
Culv WS Out (ft)	1274.30	Weir Max Depth (ft)	1.19
Culv Nml Depth (ft)		Weir Avg Depth (ft)	0.82
Culv Crt Depth (ft)	5.44	Wr Flw Area (sq ft)	1225.63
Culv Ful Lngh (ft)	119.70	Min Top Rd (ft)	1280.00

CULVERT OUTPUT Profile #Full Spillway
Culvert ID : 15th Street

Culv Q (cfs)	773.35	Culv Vel In (ft/s)	9.27
# Barrels	1	Culv Vel Out (ft/s)	9.27
Q Barrel (cfs)	773.35	Culv Inv El Up (ft)	1266.00
E.G. US. (ft)	1281.58	Culv Inv El Dn (ft)	1266.00
W.S. US. (ft)	1281.45	Culv Frctn Ls (ft)	0.87
Delta EG (ft)	2.38	Culv Ext Lss (ft)	0.57
Delta WS (ft)	2.44	Culv Ent Lss (ft)	0.93
E.G. IC (ft)	1281.49	Q Weir (cfs)	5214.25
E.G. OC (ft)	1281.58	Weir Sta Lft (ft)	9165.52
Culvert Control	Outlet	Weir Sta Rgt (ft)	11222.39
Culv WS In (ft)	1274.30	Weir Submerg	0.00
Culv WS Out (ft)	1274.30	Weir Max Depth (ft)	1.58
Culv Nml Depth (ft)		Weir Avg Depth (ft)	1.05
Culv Crt Depth (ft)	4.81	Wr Flw Area (sq ft)	1846.04
Culv Ful Lngh (ft)	119.70	Min Top Rd (ft)	1280.00

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.470

INPUT
Description: Lower Wash Reach
Downstream Face 15th Street Culvert
Cross
Section Data Digitized from Topo Map Supplied by the FCD using
BOSS-RMS
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9800.9	1284	9800.9	1280	9803.2	1279.8	9808.4	1279.3	9818.5	1278.3
9821.9	1278	9838	1276.7	9847.1	1276	9860.7	1275.6	9875.7	1275.2

9898.4	1274	9924.9	1272	9925.2	1272	9960.5	1270.1	9961.2	1270.1
9961.4	1270.1	9961.8	1270	9962	1270	9962.4	1270	9962.6	1270
9963	1269.9	9976	1268	9979.9	1267.3	9982.7	1267.1	9991.4	1266
9998.8	1266	10008.5	1266	10014.3	1267.3	10014.6	1268	10015.2	1269.1
10017.9	1268.7	10020.6	1268.9	10026.5	1269.8	10027.5	1269.9	10028.1	1270
10028.5	1270.1	10034.6	1272	10041.7	1273.6	10043	1274	10064.7	1275.8
10067.5	1276	10068.6	1276.2	10071.7	1276.4	10077.4	1276.7	10083.9	1276.9
10495	1278	10845.6	1280	11004.9	1278	11089.2	1278	11519.7	1280
11757.3	1280	11914	1284						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9800.9	.065	9898.4	.043	10043	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9898.4	10043	249	251	251	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9800	9984.5	1279	10014.6	10700	1279

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1274.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.21	Wt. n-Val.		0.043	
W.S. Elev (ft)	1271.82	Reach Len. (ft)	249.00	251.00	251.00
Crit W.S. (ft)	1271.40	Flow Area (sq ft)		167.76	
E.G. Slope (ft/ft)	0.012398	Area (sq ft)		315.67	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	105.37	Top Width (ft)		105.37	
Vel Total (ft/s)	11.92	Avg. Vel. (ft/s)		11.92	
Max Chl Dpth (ft)	5.82	Hydr. Depth (ft)		5.57	
Conv. Total (cfs)	17961.8	Conv. (cfs)		17961.8	
Length Wtd. (ft)	251.00	Wetted Per. (ft)		30.76	
Min Ch El (ft)	1266.00	Shear (lb/sq ft)		4.22	
Alpha	1.00	Stream Power (lb/ft s)		50.33	
Frctn Loss (ft)	3.91	Cum Volume (acre-ft)	1.89	9.06	23.81
C & E Loss (ft)	0.49	Cum SA (acres)	3.61	4.71	28.63

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1278.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.07	Wt. n-Val.		0.043	
W.S. Elev (ft)	1274.45	Reach Len. (ft)	249.00	251.00	251.00
Crit W.S. (ft)	1274.45	Flow Area (sq ft)		246.92	
E.G. Slope (ft/ft)	0.013673	Area (sq ft)	1.87	654.57	1.19
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	158.39	Top Width (ft)	8.42	144.60	5.37
Vel Total (ft/s)	16.20	Avg. Vel. (ft/s)		16.20	
Max Chl Dpth (ft)	8.45	Hydr. Depth (ft)		8.20	
Conv. Total (cfs)	34208.6	Conv. (cfs)		34208.6	
Length Wtd. (ft)	251.00	Wetted Per. (ft)		30.76	
Min Ch El (ft)	1266.00	Shear (lb/sq ft)		6.85	
Alpha	1.00	Stream Power (lb/ft s)		111.00	
Frctn Loss (ft)	3.89	Cum Volume (acre-ft)	6.81	14.15	58.64
C & E Loss (ft)	1.12	Cum SA (acres)	11.27	5.64	71.93

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to

critical depth, the calculated water surface came back below critical depth. This indicates
that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
energy was used.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1279.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.	0.065	0.043	0.065
W.S. Elev (ft)	1279.01	Reach Len. (ft)	249.00	251.00	251.00
Crit W.S. (ft)	1279.01	Flow Area (sq ft)	254.11	1314.29	1101.71
E.G. Slope (ft/ft)	0.000646	Area (sq ft)	254.11	1314.29	1101.71
Q Total (cfs)	6000.00	Flow (cfs)	301.29	4975.67	723.04
Top Width (ft)	1241.70	Top Width (ft)	87.05	144.60	1010.06
Vel Total (ft/s)	2.25	Avg. Vel. (ft/s)	1.19	3.79	0.66
Max Chl Dpth (ft)	13.01	Hydr. Depth (ft)	2.92	9.09	1.09
Conv. Total (cfs)	235981.3	Conv. (cfs)	11849.7	195694.2	28437.5
Length Wtd. (ft)	251.00	Wetted Per. (ft)	87.22	146.94	1010.19
Min Ch El (ft)	1266.00	Shear (lb/sq ft)	0.12	0.36	0.04
Alpha	2.38	Stream Power (lb/ft s)	0.14	1.37	0.03
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	10.98	17.28	78.13
C & E Loss (ft)	0.59	Cum SA (acres)	15.70	5.75	73.23

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates
that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
energy was used.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9946.60	9994.80	681.46	56.89	10.35	34.07	5.52	11.98
9994.80	RB 10043.00	1318.54	110.87	20.41	65.93	5.60	11.89

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9946.60	9994.80	1369.57	83.97	10.35	34.24	8.15	16.31
9994.80	RB 10043.00	2630.43	162.95	20.41	65.76	8.23	16.14

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to

critical depth, the calculated water surface came back below critical depth. This indicates
that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
energy was used.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9800.90	9833.40	11.87	22.37	22.13	0.20	1.01	0.53
9833.40	9865.90	103.35	95.65	32.55	1.72	2.94	1.08
9865.90	9898.40	186.07	136.09	32.54	3.10	4.19	1.37
LB 9898.40	9946.60	992.64	323.59	48.31	16.54	6.71	3.07
9946.60	9994.80	2055.84	501.75	48.52	34.26	10.41	4.10
9994.80	RB 10043.00	1927.18	488.95	50.12	32.12	10.14	3.94
10043.00	10310.29	459.96	546.34	267.40	7.67	2.04	0.84
10310.29	10577.57	165.21	295.51	267.29	2.75	1.11	0.56
10577.57	10844.86	5.49	25.23	94.06	0.09	0.27	0.22
10844.86	11112.14	65.55	147.26	187.50	1.09	0.79	0.45
11112.14	11379.43	26.85	87.37	193.94	0.45	0.45	0.31

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates
that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
energy was used.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.423

INPUT
Description: Lower Wash Reach
Exit Section 15th Street Culvert
Cross Section
Data Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 151

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8485.7	1280	8500.6	1278	8511	1276	8564.9	1276	8595.8	1278
8642.6	1280	8672.7	1280	8727.4	1278	8737.9	1276	8956.2	1276
8981.8	1276	9454.3	1274	9469.3	1274.5	9470.8	1274.6	9476	1274.6
9479.6	1274.6	9483.1	1274.6	9486.2	1274.6	9491.7	1274.6	9494.3	1274.6
9499.9	1274.6	9501.9	1274.6	9505.1	1274.6	9508.2	1274.5	9519.7	1274.2
9525	1274	9527.6	1273.4	9533	1272	9566.8	1272	9567.7	1272
9568.9	1272	9594.8	1272.5	9610.1	1272.7	9622.5	1272.9	9631.2	1273
9633.9	1273.1	9643.3	1273.2	9647.7	1273.2	9655.1	1273.3	9662.4	1273.3
9665.7	1273.3	9682.4	1273.3	9686.5	1273.3	9688	1273.3	9689.4	1273.3
9694.3	1273.4	9695.5	1273.4	9696.4	1273.4	9697.5	1273.4	9703.9	1273.4
9708.1	1273.3	9710.7	1273.3	9714.6	1273.3	9716.7	1273.3	9722.2	1273.1
9772.3	1272	9775.2	1271.8	9844.4	1271.7	9847.9	1272	9865.7	1272
9941.7	1272	9950.5	1272	9956.4	1271	9957.8	1270.7	9963.2	1270
9967.3	1268.7	9969.8	1268	9981.4	1266.4	9983.2	1266	9985.5	1265.8
9987.5	1265.7	9992.1	1265.6	9992.7	1265.6	9995.7	1265.3	9996.8	1265.1
9997.2	1265	10000	1264.9	10008	1265	10008.1	1265	10009.7	1265.1
10021.9	1265.4	10032.4	1265.6	10037.6	1265.7	10047.3	1266	10055.7	1267.3
10058.9	1268	10063.6	1269.7	10064.3	1270	10065	1270.2	10070.9	1272
10071	1272	10076.6	1272.4	10078	1272.5	10080	1272.5	10081.4	1272.5
10086.3	1272.5	10088.4	1272.5	10092.5	1272.5	10099.7	1272.7	10103.7	1272.7

10108.4	1272.7	10115.6	1272.6	10125.1	1272.5	10130.3	1272.5	10154.3	1272
10156	1272	10156.2	1272	10171.5	1271.7	10180.6	1271.6	10192.3	1271.5
10193.4	1271.5	10218.1	1271.4	10220.1	1271.4	10222.7	1271.3	10234.5	1271.2
10238.2	1271.2	10240.2	1271.2	10257.1	1271.1	10271.1	1270.9	10305	1272
10323.2	1272	10323.3	1272	10324.5	1272	10333.1	1272	10335.4	1272
10336.8	1272	10339.7	1272	10350.4	1272	10350.8	1272	10355.2	1271.9
10369.3	1271.8	10378.3	1271.7	10383.3	1271.7	10389.5	1271.7	10393.9	1271.8
10411.8	1271.9	10420.8	1272	10420.9	1272	10428.3	1272	10442.6	1272
10445.1	1272	10453.7	1272	10578.2	1272	10673.5	1272	10816.9	1272
10920.8	1272	11140.2	1272	11225.6	1272	11327.2	1272	11391	1272
11549	1274								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
8485.7	.065	9950.5	.043	10071	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9950.5	10071	343	357	364.9	.1	.3

Left Levee Station= 8985.34 Elevation= 1280.27

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1269.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.23	Wt. n-Val.		0.043	
W.S. Elev (ft)	1268.39	Reach Len. (ft)	343.00	357.00	364.90
Crit W.S. (ft)	1268.39	Flow Area (sq ft)		224.78	
E.G. Slope (ft/ft)	0.020179	Area (sq ft)		224.78	
Q Total (cfs)	2000.00	Flow (cfs)		2000.00	
Top Width (ft)	91.59	Top Width (ft)		91.59	
Vel Total (ft/s)	8.90	Avg. Vel. (ft/s)		8.90	
Max Chl Dpth (ft)	3.49	Hydr. Depth (ft)		2.45	
Conv. Total (cfs)	14079.2	Conv. (cfs)		14079.2	
Length Wtd. (ft)		Wetted Per. (ft)		92.12	
Min Ch El (ft)	1264.90	Shear (lb/sq ft)		3.07	
Alpha	1.00	Stream Power (lb/ft s)		27.35	
Frctn Loss (ft)		Cum Volume (acre-ft)	1.89	7.51	23.81
C & E Loss (ft)		Cum SA (acres)	3.61	4.15	28.63

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1272.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.51	Wt. n-Val.		0.043	
W.S. Elev (ft)	1268.84	Reach Len. (ft)	343.00	357.00	364.90
Crit W.S. (ft)	1269.88	Flow Area (sq ft)		266.10	
E.G. Slope (ft/ft)	0.047933	Area (sq ft)		266.10	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	94.35	Top Width (ft)		94.35	
Vel Total (ft/s)	15.03	Avg. Vel. (ft/s)		15.03	
Max Chl Dpth (ft)	3.94	Hydr. Depth (ft)		2.82	
Conv. Total (cfs)	18270.2	Conv. (cfs)		18270.2	
Length Wtd. (ft)	359.39	Wetted Per. (ft)		95.01	
Min Ch El (ft)	1264.90	Shear (lb/sq ft)		8.38	
Alpha	1.00	Stream Power (lb/ft s)		125.98	
Frctn Loss (ft)	5.88	Cum Volume (acre-ft)	6.81	11.50	58.64
C & E Loss (ft)	0.30	Cum SA (acres)	11.24	4.95	71.92

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1275.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.41	Wt. n-Val.		0.043	
W.S. Elev (ft)	1269.14	Reach Len. (ft)	343.00	357.00	364.90
Crit W.S. (ft)	1271.15	Flow Area (sq ft)		295.31	
E.G. Slope (ft/ft)	0.078271	Area (sq ft)		295.31	
Q Total (cfs)	6000.00	Flow (cfs)		6000.00	
Top Width (ft)	96.16	Top Width (ft)		96.16	
Vel Total (ft/s)	20.32	Avg. Vel. (ft/s)		20.32	
Max Chl Dpth (ft)	4.24	Hydr. Depth (ft)		3.07	
Conv. Total (cfs)	21446.2	Conv. (cfs)		21446.2	
Length Wtd. (ft)	359.54	Wetted Per. (ft)		96.93	
Min Ch El (ft)	1264.90	Shear (lb/sq ft)		14.89	
Alpha	1.00	Stream Power (lb/ft s)		302.47	
Frctn Loss (ft)	6.47	Cum Volume (acre-ft)	10.25	12.64	74.95
C & E Loss (ft)	0.31	Cum SA (acres)	15.45	5.05	70.32

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9950.50	9990.67	251.77	37.71	22.49	12.59	1.69	6.68
9990.67	10030.83	1284.62	126.52	40.22	64.23	3.15	10.15
10030.83	RB 10071.00	463.61	60.55	29.40	23.18	2.08	7.66

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9950.50	9990.67	555.40	47.96	24.08	13.89	2.02	11.58
9990.67	10030.83	2476.17	144.36	40.22	61.90	3.59	17.15
10030.83	RB 10071.00	968.42	73.78	30.71	24.21	2.43	13.13

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9950.50	9990.67	879.89	55.40	25.10	14.66	2.24	15.88
9990.67	10030.83	3633.56	156.68	40.22	60.56	3.90	23.19
10030.83	RB 10071.00	1486.55	83.23	31.61	24.78	2.67	17.86

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.355

INPUT
Description: Lower Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 123

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
7419.5	1272	7437.4	1270	7525.9	1268	7597.8	1266	7785.5	1266
7888.5	1266	7953.5	1264	8011.6	1262	8081.2	1262	8179.4	1264
8196.8	1264	8214.5	1264	8697.4	1264	8743.9	1264	8890.7	1266
8970.1	1266	9344.8	1266	9436.5	1266	9462.6	1266	9487.9	1268
9507.4	1268	9509.3	1268	9511.9	1267.9	9555.8	1267.3	9563.7	1267.6
9568.7	1267.8	9571.6	1267.8	9575.6	1267.8	9586.6	1267.7	9599.8	1267.5
9621.6	1267.2	9625.3	1267.2	9632.9	1267.2	9635.3	1267.2	9642.1	1267.1
9643.8	1267.1	9652.2	1267	9662.5	1266.9	9667.4	1266.9	9683.6	1266
9710.2	1266	9712.5	1265.6	9717	1266	9722.8	1266	9726.7	1266
9731.8	1266	9748.5	1266	9762.9	1266	9788.8	1267.1	9793.5	1267.1
9795.9	1267.1	9797.5	1267.2	9801.1	1267.1	9809.7	1266.9	9811.8	1266.9
9820.2	1266.9	9825.2	1266.9	9831.9	1267	9838.3	1267	9842.5	1267
9860.1	1267.1	9861.2	1267.1	9870.2	1267.2	9871.4	1267.3	9881.3	1267.1
9893.1	1266.9	9900	1266.9	9918.4	1266	9922	1266	9925.6	1266
9950.5	1266	9953.2	1266	9957.9	1265.4	9970	1264	9970.2	1264
9980.6	1262.7	9984.1	1262	9986.2	1261.7	10000	1261.2	10010.5	1261.9
10010.6	1261.9	10011.3	1262	10012.1	1262.1	10021.1	1264	10023.1	1264
10025.6	1264.1	10026.5	1264.2	10028.3	1264.3	10030.5	1264.4	10066.3	1266
10069.4	1266.3	10069.7	1266.4	10107.3	1267	10108.6	1267	10113.2	1266.9
10118.3	1266.8	10126.5	1266.7	10130.4	1266.7	10137	1266.6	10156.1	1266.6
10166.6	1266.5	10174.1	1266.5	10180.4	1266.4	10200.1	1266.1	10203.8	1266
10312.9	1266	10333.9	1266	10365.5	1266	10454.8	1266	10859.5	1266
10900.1	1266	11349.5	1264	11363.5	1262	11374.8	1260	11386.3	1258
11394.4	1258	11402.3	1260	11418.2	1260	11426.2	1260	11437.8	1262
11446.3	1264	11452.8	1266	11462	1268				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
7419.5	.065	9953.2	.043	10069.7	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9953.2	10069.7	427.7	409	406.6	.1	.3

Left Levee Station= 9491.54 Elevation= 1269.96

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1264.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.		0.043	0.065
W.S. Elev (ft)	1264.74	Reach Len. (ft)	427.70	409.00	406.60
Crit W.S. (ft)	1262.67	Flow Area (sq ft)		136.59	466.15
E.G. Slope (ft/ft)	0.007892	Area (sq ft)		136.59	466.15
Q Total (cfs)	2000.00	Flow (cfs)		625.62	1374.38
Top Width (ft)	339.70	Top Width (ft)		74.47	265.23
Vel Total (ft/s)	3.32	Avg. Vel. (ft/s)		4.58	2.95
Max Chl Dpth (ft)	6.74	Hydr. Depth (ft)		1.83	1.76
Conv. Total (cfs)	22513.0	Conv. (cfs)		7042.3	15470.7
Length Wtd. (ft)	407.74	Wetted Per. (ft)		74.95	266.49
Min Ch El (ft)	1261.20	Shear (lb/sq ft)		0.90	0.86
Alpha	1.14	Stream Power (lb/ft s)		4.11	2.54
Frctn Loss (ft)	3.00	Cum Volume (acre-ft)	1.89	6.03	21.86
C & E Loss (ft)	0.02	Cum SA (acres)	3.61	3.47	27.52

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1266.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.	0.065	0.043	0.065
W.S. Elev (ft)	1266.18	Reach Len. (ft)	427.70	409.00	406.60
Crit W.S. (ft)	1263.98	Flow Area (sq ft)	23.51	276.10	1213.55
E.G. Slope (ft/ft)	0.008164	Area (sq ft)	23.51	276.10	1213.55
Q Total (cfs)	4000.00	Flow (cfs)	15.90	1540.28	2443.82
Top Width (ft)	1499.69	Top Width (ft)	125.56	115.01	1259.12
Vel Total (ft/s)	2.64	Avg. Vel. (ft/s)	0.68	5.58	2.01
Max Chl Dpth (ft)	8.18	Hydr. Depth (ft)	0.19	2.40	0.96
Conv. Total (cfs)	44270.8	Conv. (cfs)	176.0	17047.4	27047.5
Length Wtd. (ft)	407.80	Wetted Per. (ft)	125.62	115.60	1260.59
Min Ch El (ft)	1261.20	Shear (lb/sq ft)	0.10	1.22	0.49
Alpha	2.07	Stream Power (lb/ft s)	0.06	6.79	0.99
Frctn Loss (ft)	3.37	Cum Volume (acre-ft)	6.71	9.28	53.56
C & E Loss (ft)	0.02	Cum SA (acres)	10.75	4.09	66.64

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1266.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.	0.065	0.043	0.065
W.S. Elev (ft)	1266.61	Reach Len. (ft)	427.70	409.00	406.60
Crit W.S. (ft)	1265.38	Flow Area (sq ft)	82.55	325.56	1758.32
E.G. Slope (ft/ft)	0.006928	Area (sq ft)	82.55	325.56	1758.32
Q Total (cfs)	6000.00	Flow (cfs)	104.56	1851.31	4044.13
Top Width (ft)	1600.91	Top Width (ft)	151.94	116.50	1332.47
Vel Total (ft/s)	2.77	Avg. Vel. (ft/s)	1.27	5.69	2.30
Max Chl Dpth (ft)	8.61	Hydr. Depth (ft)	0.54	2.79	1.32
Conv. Total (cfs)	72083.4	Conv. (cfs)	1256.1	22241.5	48585.8
Length Wtd. (ft)	407.73	Wetted Per. (ft)	152.03	117.11	1333.99
Min Ch El (ft)	1261.20	Shear (lb/sq ft)	0.23	1.20	0.57
Alpha	1.77	Stream Power (lb/ft s)	0.30	6.84	1.31
Frctn Loss (ft)	3.46	Cum Volume (acre-ft)	9.92	10.10	67.59
C & E Loss (ft)	0.03	Cum SA (acres)	14.86	4.18	64.74

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9953.20	9992.03	207.27	49.72	28.64	10.36	1.75	4.17
9992.03	10030.87	417.36	85.70	39.09	20.87	2.21	4.87
10030.87	RB 10069.70	0.99	1.16	7.22	0.05	0.16	0.85
10069.70	11064.20						
11064.20	11263.10	7.47	14.11	79.63	0.37	0.18	0.53
11263.10	11462.00	1366.91	452.04	186.86	68.35	2.44	3.02

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9108.63	9953.20	15.90	23.51	125.62	0.40	0.19	0.68
LB 9953.20	9992.03	515.66	99.47	39.13	12.89	2.56	5.18
9992.03	10030.87	932.37	141.85	39.09	23.31	3.65	6.57
10030.87	RB 10069.70	92.25	34.78	37.39	2.31	0.93	2.65
10069.70	10268.60	4.39	12.71	74.07	0.11	0.17	0.35
10268.60	10467.50	13.35	36.76	198.90	0.33	0.18	0.36
10467.50	10666.40	13.35	36.76	198.90	0.33	0.18	0.36
10666.40	10865.30	13.35	36.76	198.90	0.33	0.18	0.36
10865.30	11064.20	66.89	96.68	198.90	1.67	0.49	0.69
11064.20	11263.10	370.54	270.05	198.90	9.26	1.36	1.37
11263.10	11462.00	1961.96	723.83	192.02	49.05	3.80	2.71

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9108.63	9953.20	104.56	82.55	152.03	1.74	0.54	1.27
LB 9953.20	9992.03	630.02	115.99	39.13	10.50	2.99	5.43
9992.03	10030.87	1059.50	158.38	39.09	17.66	4.08	6.69
10030.87	RB 10069.70	161.79	51.19	38.90	2.70	1.32	3.16
10069.70	10268.60	35.48	52.78	145.47	0.59	0.36	0.67
10268.60	10467.50	115.41	121.40	198.90	1.92	0.61	0.95
10467.50	10666.40	115.41	121.40	198.90	1.92	0.61	0.95
10666.40	10865.30	115.41	121.40	198.90	1.92	0.61	0.95
10865.30	11064.20	225.23	181.32	198.90	3.75	0.91	1.24
11064.20	11263.10	689.11	354.69	198.90	11.49	1.78	1.94
11263.10	11462.00	2748.09	805.33	194.02	45.80	4.18	3.41

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.278

INPUT
Description: Lower Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 152

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
7334	1266	7464.6	1266	7598.8	1266	7685.8	1264	7770.3	1262
8096.4	1260	8181.6	1258	8188.3	1256	8203.6	1256	8367.7	1256
8387	1254	8387.7	1254	8426.6	1254	8433	1252	8442.9	1252
8446.8	1254	8490.6	1256	8491.9	1256	8615.9	1256	8695.7	1256
8757.5	1256	8769.3	1256	8774.1	1256	8816.4	1258	8866.7	1260
8919.6	1262	9196.3	1262	9236.5	1262	9435.1	1262	9446.5	1262
9500.1	1264	9521.5	1264.1	9552.8	1264	9562	1264	9572.4	1264
9578.5	1264.1	9585.4	1264.1	9593.6	1264.1	9615.5	1264	9617.8	1264
9662.8	1263.5	9670.1	1263.5	9674	1263.5	9678.4	1263.5	9701.6	1263.9
9711.5	1264	9734.7	1264.5	9739.6	1264.4	9749.4	1264.6	9756.2	1264.6
9773.7	1264.7	9781.1	1264.7	9799.1	1264.8	9803.6	1264.9	9807.4	1264.9
9810.2	1264.9	9830.5	1264.8	9832.6	1264.8	9833.9	1264.9	9835.4	1264.9
9836.7	1264.9	9836.9	1265	9853.3	1265	9857.7	1265	9879.6	1264.7
9908.9	1264.4	9939.1	1264.1	9947.9	1264	9952.4	1263.2	9958.4	1262
9961.7	1261.3	9967.9	1260	9980.3	1258	9980.4	1258	9987.6	1257.5
9990.4	1257.3	9991.1	1257.3	9992.4	1257.2	9992.6	1257.1	9998	1256.9
9999.3	1256.8	10000.3	1256.8	10000.7	1256.8	10003.1	1256.9	10003.6	1257.1
10003.7	1258	10003.8	1258	10024.5	1259.2	10042.7	1260	10046.3	1260.7
10053.6	1262	10089.2	1263.9	10092.3	1264	10093.4	1264	10133.1	1264
10137.4	1263.9	10147.5	1264	10172	1264	10176.2	1264	10183.1	1264.1

10201.6	1264.2	10222.5	1264.2	10235.4	1264.2	10247.3	1264.1	10262.3	1264.1
10276.6	1264	10279.1	1264	10303.1	1263.6	10303.9	1263.7	10304.4	1263.7
10306.8	1263.8	10307.1	1263.8	10307.5	1263.8	10308.4	1263.8	10309.6	1263.8
10311	1263.8	10311.7	1263.8	10312.2	1263.9	10312.6	1263.8	10314.1	1263.8
10315	1263.8	10315.4	1263.8	10316	1263.8	10316.8	1263.8	10318.7	1263.8
10322.3	1263.8	10360.3	1263.6	10367.8	1263.6	10401.2	1263.5	10412.5	1263.4
10420.8	1263.4	10437.3	1263.3	10547.9	1262	10568.1	1262	10736.1	1262
10773	1262	10851.8	1262	10890.1	1262	11326.4	1262	11337.1	1262
11378.4	1262	11579.2	1262	11723	1262	11726.4	1260	11732.2	1258
11737.6	1256	11752.5	1256	11757.6	1258	11762.6	1260	11766.7	1262
11892.8	1262	12156.2	1264						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
7334	.065	9947.9	.043	10089.2	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9947.9	10089.2	411.7	403	372.6	.1	.3

Left Levee Station= 9502.82 Elevation= 1265.95

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1261.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.		0.043	0.065
W.S. Elev (ft)	1261.51	Reach Len. (ft)	411.70	403.00	372.60
Crit W.S. (ft)	1260.23	Flow Area (sq ft)		236.73	160.68
E.G. Slope (ft/ft)	0.006877	Area (sq ft)		236.73	160.68
Q Total (cfs)	2000.00	Flow (cfs)		1278.34	721.66
Top Width (ft)	131.95	Top Width (ft)		90.10	41.85
Vel Total (ft/s)	5.03	Avg. Vel. (ft/s)		5.40	4.49
Max Chl Dpth (ft)	9.51	Hydr. Depth (ft)		2.63	3.84
Conv. Total (cfs)	24117.6	Conv. (cfs)		15415.3	8702.3
Length Wtd. (ft)	391.74	Wetted Per. (ft)		91.51	44.06
Min Ch El (ft)	1256.80	Shear (lb/sq ft)		1.11	1.57
Alpha	1.02	Stream Power (lb/ft s)		6.00	7.03
Frctn Loss (ft)	4.04	Cum Volume (acre-ft)	1.89	4.27	18.94
C & E Loss (ft)	0.02	Cum SA (acres)	3.61	2.69	26.09

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1263.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.42	Wt. n-Val.		0.043	0.065
W.S. Elev (ft)	1262.60	Reach Len. (ft)	411.70	403.00	372.60
Crit W.S. (ft)	1262.60	Flow Area (sq ft)		343.99	1029.52
E.G. Slope (ft/ft)	0.008357	Area (sq ft)		343.99	1029.52
Q Total (cfs)	4000.00	Flow (cfs)		2309.10	1690.90
Top Width (ft)	1584.69	Top Width (ft)		109.47	1475.22
Vel Total (ft/s)	2.91	Avg. Vel. (ft/s)		6.71	1.64
Max Chl Dpth (ft)	10.60	Hydr. Depth (ft)		3.14	0.70
Conv. Total (cfs)	43754.9	Conv. (cfs)		25258.6	18496.3
Length Wtd. (ft)		Wetted Per. (ft)		111.05	1477.69
Min Ch El (ft)	1256.80	Shear (lb/sq ft)		1.62	0.36
Alpha	3.20	Stream Power (lb/ft s)		10.85	0.60
Frctn Loss (ft)		Cum Volume (acre-ft)	6.60	6.37	43.09
C & E Loss (ft)		Cum SA (acres)	10.13	3.04	53.88

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1263.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-Val.		0.043	0.065
W.S. Elev (ft)	1262.85	Reach Len. (ft)	411.70	403.00	372.60
Crit W.S. (ft)	1262.85	Flow Area (sq ft)		372.14	1405.66
E.G. Slope (ft/ft)	0.010646	Area (sq ft)		372.14	1405.66
Q Total (cfs)	6000.00	Flow (cfs)		2869.27	3130.73
Top Width (ft)	1644.91	Top Width (ft)		115.41	1529.50
Vel Total (ft/s)	3.37	Avg. Vel. (ft/s)		7.71	2.23
Max Chl Dpth (ft)	10.85	Hydr. Depth (ft)		3.22	0.92
Conv. Total (cfs)	58150.7	Conv. (cfs)		27808.3	30342.4
Length Wtd. (ft)		Wetted Per. (ft)		117.03	1531.97
Min Ch El (ft)	1256.80	Shear (lb/sq ft)		2.11	0.61
Alpha	2.72	Stream Power (lb/ft s)		16.30	1.36
Frctn Loss (ft)		Cum Volume (acre-ft)	9.52	6.82	52.82
C & E Loss (ft)		Cum SA (acres)	14.11	3.09	51.38

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9947.90	9995.00	520.60	95.41	34.64	26.03	2.78	5.46
9995.00	10042.10	741.54	134.42	48.00	37.08	2.85	5.52
10042.10	RB 10089.20	16.21	6.90	8.87	0.81	0.79	2.35
10089.20	11565.63						
11565.63	11860.91	721.66	160.68	44.06	36.08	3.84	4.49

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9947.90	9995.00	899.06	135.81	40.09	22.48	3.43	6.62
9995.00	10042.10	1346.38	185.98	48.00	33.66	3.95	7.24
10042.10	RB 10089.20	63.66	22.19	22.96	1.59	0.97	2.87
10089.20	10384.49						
10384.49	10679.77	118.47	94.65	183.02	2.96	0.52	1.25
10679.77	10975.06	245.64	177.52	295.29	6.14	0.60	1.38
10975.06	11270.34	245.64	177.52	295.29	6.14	0.60	1.38
11270.34	11565.63	245.64	177.52	295.29	6.14	0.60	1.38
11565.63	11860.91	791.18	359.32	297.75	19.78	1.22	2.20
11860.91	12156.20	44.32	42.97	111.07	1.11	0.39	1.03

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9947.90	9995.00	1107.99	145.89	41.36	18.47	3.57	7.59
9995.00	10042.10	1666.10	197.78	48.00	27.77	4.20	8.42
10042.10	RB 10089.20	95.18	28.48	27.66	1.59	1.04	3.34
10089.20	10384.49						

10384.49	10679.77	253.33	143.14	204.32	4.22	0.70	1.77
10679.77	10975.06	506.85	251.45	295.29	8.45	0.85	2.02
10975.06	11270.34	506.85	251.45	295.29	8.45	0.85	2.02
11270.34	11565.63	506.85	251.45	295.29	8.45	0.85	2.02
11565.63	11860.91	1248.18	433.25	297.75	20.80	1.47	2.88
11860.91	12156.20	108.68	74.90	144.04	1.81	0.52	1.45

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.201

INPUT
Description: Lower Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 214

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
7345.7	1264	7367.75	1262	7404.25	1260	7636.35	1258	7666.55	1258
7752.35	1258	7770.55	1256	7811.45	1256	8125.85	1256	8146.25	1254
8154.25	1252	8160.35	1250	8174.75	1250	8179.45	1252	8187.25	1254
8572.65	1254	8593.75	1254	8796.65	1256	8947.25	1258	8956.95	1258
9016.35	1258	9135.65	1258	9147.55	1256	9154.65	1254	9181.85	1254
9200.45	1256	9334.85	1258	9457.75	1259	9460.75	1259	9469.25	1259
9477.55	1259	9482.25	1259	9485.05	1259	9488.25	1259	9511.05	1258.8
9525.75	1258.7	9552.35	1258.4	9587.05	1258.4	9604.65	1258.1	9611.75	1258
9612.75	1258	9619.75	1257.9	9625.65	1257.9	9638.35	1257.8	9649.15	1257.8
9679.45	1257.9	9679.65	1257.9	9690.35	1257.9	9690.65	1257.9	9706.15	1257.9
9707.05	1257.9	9707.45	1257.9	9708.15	1257.9	9708.35	1257.9	9708.65	1257.9
9708.95	1257.9	9710.75	1257.9	9711.65	1257.9	9713.65	1257.8	9717.05	1257.8
9717.55	1257.8	9721.25	1257.7	9742.35	1257.4	9750.65	1257.4	9755.85	1257.4
9766.75	1257.5	9772.65	1257.6	9794.85	1257.7	9800.85	1257.7	9815.55	1258
9815.65	1258	9817.15	1258	9823.95	1258.1	9833.25	1258.2	9842.25	1258.3
9853.05	1258.3	9867.55	1258.3	9899.65	1258.3	9909.85	1258.3	9915.65	1258.3
9920.15	1258.2	9929.25	1258.1	9935.65	1258	9936.45	1258	9940.15	1257.6
9948.95	1256.6	9953.15	1256.1	9954.25	1256	9954.75	1255.9	9988.05	1254
9990.65	1253.9	9992.55	1253.9	9999.65	1253.2	10000.35	1253.2	10000.85	1253.7
10001.45	1253.8	10003.55	125	410011.75	1255.7	10013.05	125	610019.15	1257.7
10021.35	125	810022.45	1258.1	10025.75	1258.1	10033.95	1258.3	10048.55	1258.5
10070.45	1258.9	10074.15	1258.9	10078.35	1258.9	10104.85	1258.8	10111.55	1258.8
10136.25	1258.7	10146.05	1258.6	10149.75	1258.6	10163.75	1258.4	10165.95	1258.4
10167.25	1258.4	10168.55	1258.4	10172.55	1258.3	10173.75	1258.3	10176.25	1258.3
10176.75	1258.3	10177.55	1258.3	10178.45	1258.3	10179.55	1258.4	10180.35	1258.4
10183.75	1258.3	10184.55	1258.3	10185.55	1258.4	10190.75	1258.5	10191.65	1258.6
10194.15	1258.5	10195.55	1258.6	10200.35	1258.5	10202.55	1258.5	10207.15	1258.5
10209.15	1258.6	10218.65	1258.8	10224.15	1258.8	10229.45	1258.9	10233.15	1258.9
10243.85	1258.9	10246.65	1258.9	10265.35	1258.9	10266.25	1258.9	10271.05	1258.9
10280.25	1258.9	10282.45	125	910287.15	1259.2	10288.15	1259.3	10288.45	1259.3
10288.95	1259.4	10290.35	1259.4	10291.45	1259.4	10298.95	1259.4	10300.15	1259.4
10301.45	1259.4	10306.35	1259.5	10307.85	1259.5	10310.35	1259.5	10312.45	1259.5
10315.35	1259.4	10319.05	1259.4	10322.05	1259.4	10324.15	1259.3	10324.95	1259.3
10327.95	1259.2	10329.45	1259.2	10335.05	1259.2	10336.75	1259.2	10344.55	1259.1
10349.25	125	910354.75	125	910366.05	1258.8	10383.45	1258.6	10384.85	1258.6
10396.75	1258.5	10398.65	1258.6	10409.95	1258.8	10413.55	1258.8	10416.75	1258.8
10419.15	1258.7	10423.35	1258.7	10435.25	1258.7	10439.95	1258.7	10442.05	1258.7
10451.85	1258.6	10470.05	1258.4	10478.95	1258.3	10488.35	125	810490.25	1258
10559.85	125	810563.55	125	810569.75	125	810576.65	125	810723.85	1256
10767.75	125	610945.85	125	811142.75	126	011170.35	126	011305.15	1260
11328.45	126	011372.55	126	011413.95	126	011461.05	125	811470.55	1258
11519.45	125	811535.25	125	811763.15	125	811768.35	125	611772.75	1254
11823.25	125	812033.55	1258	12214.8	1258	12261.5	1260		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
7345.7	.065	9936.45	.043	10022.45	.065

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9936.4510022.45            206.9     207     212            .1        .3
Left Levee      Station= 9455.47      Elevation=    1261
```

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1257.85	Element			
Vel Head (ft)	0.61	Wt. n-Val.		0.043	0.065
W.S. Elev (ft)	1257.25	Reach Len. (ft)	206.90	207.00	212.00
Crit W.S. (ft)	1257.25	Flow Area (sq ft)		163.35	259.61
E.G. Slope (ft/ft)	0.017104	Area (sq ft)		163.35	259.61
Q Total (cfs)	2000.00	Flow (cfs)		1239.99	760.01
Top Width (ft)	369.59	Top Width (ft)		74.27	295.33
Vel Total (ft/s)	4.73	Avg. Vel. (ft/s)		7.59	2.93
Max Chl Dpth (ft)	7.25	Hydr. Depth (ft)		2.20	0.88
Conv. Total (cfs)	15292.4	Conv. (cfs)		9481.2	5811.2
Length Wtd. (ft)	208.72	Wetted Per. (ft)		75.04	296.14
Min Ch El (ft)	1253.20	Shear (lb/sq ft)		2.32	0.94
Alpha	1.74	Stream Power (lb/ft s)		17.64	2.74
Frctn Loss (ft)		Cum Volume (acre-ft)	1.89	2.42	17.14
C & E Loss (ft)		Cum SA (acres)	3.61	1.93	24.65

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1258.74	Element			
Vel Head (ft)	0.39	Wt. n-Val.	0.065	0.043	0.065
W.S. Elev (ft)	1258.34	Reach Len. (ft)	206.90	207.00	212.00
Crit W.S. (ft)	1257.94	Flow Area (sq ft)	139.17	252.45	960.85
E.G. Slope (ft/ft)	0.010307	Area (sq ft)	139.17	252.45	960.85
Q Total (cfs)	4000.00	Flow (cfs)	175.96	1803.09	2020.95
Top Width (ft)	1731.81	Top Width (ft)	346.06	86.00	1299.75
Vel Total (ft/s)	2.96	Avg. Vel. (ft/s)	1.26	7.14	2.10
Max Chl Dpth (ft)	8.34	Hydr. Depth (ft)	0.40	2.94	0.74
Conv. Total (cfs)	39400.3	Conv. (cfs)	1733.2	17760.6	19906.5
Length Wtd. (ft)	209.04	Wetted Per. (ft)	346.08	86.90	1300.77
Min Ch El (ft)	1253.20	Shear (lb/sq ft)	0.26	1.87	0.48
Alpha	2.89	Stream Power (lb/ft s)	0.33	13.35	1.00
Frctn Loss (ft)		Cum Volume (acre-ft)	5.94	3.61	34.57
C & E Loss (ft)		Cum SA (acres)	8.50	2.13	42.01

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1259.71	Element			
Vel Head (ft)	1.77	Wt. n-Val.	0.065	0.043	0.065
W.S. Elev (ft)	1257.94	Reach Len. (ft)	206.90	207.00	212.00
Crit W.S. (ft)	1257.94	Flow Area (sq ft)	39.99	217.58	505.25
E.G. Slope (ft/ft)	0.046191	Area (sq ft)	39.99	217.58	505.25
Q Total (cfs)	6000.00	Flow (cfs)	68.30	3030.32	2901.38
Top Width (ft)	696.83	Top Width (ft)	195.14	83.83	417.86
Vel Total (ft/s)	7.87	Avg. Vel. (ft/s)	1.71	13.93	5.74
Max Chl Dpth (ft)	7.94	Hydr. Depth (ft)	0.20	2.60	1.21
Conv. Total (cfs)	27917.3	Conv. (cfs)	317.8	14099.7	13499.8
Length Wtd. (ft)		Wetted Per. (ft)	195.16	84.72	418.83
Min Ch El (ft)	1253.20	Shear (lb/sq ft)	0.59	7.41	3.48
Alpha	1.84	Stream Power (lb/ft s)	1.01	103.14	19.98
Frctn Loss (ft)		Cum Volume (acre-ft)	9.33	4.09	44.65
C & E Loss (ft)		Cum SA (acres)	13.19	2.17	43.05

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9936.45	9965.12	113.40	24.60	21.96	5.67	1.13	4.61
9965.12	9993.78	657.08	78.59	28.71	32.85	2.74	8.36
9993.78	RB 10022.45	469.51	60.16	24.37	23.48	2.53	7.80
10022.45	10342.31						
10342.31	10662.18	6.23	6.15	30.10	0.31	0.20	1.01
10662.18	10982.04	442.58	175.01	216.61	22.13	0.81	2.53
10982.04	11621.77						
11621.77	11941.64	311.21	78.45	49.43	15.56	1.61	3.97

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9072.87	9936.45	175.96	139.17	346.08	4.40	0.40	1.26
LB 9936.45	9965.12	271.15	53.43	28.81	6.78	1.86	5.07
9965.12	9993.78	905.56	110.01	28.71	22.64	3.84	8.23
9993.78	RB 10022.45	626.38	89.01	29.39	15.66	3.10	7.04
10022.45	10342.31	1.08	2.42	25.43	0.03	0.10	0.45
10342.31	10662.18	169.33	111.22	187.07	4.23	0.59	1.52
10662.18	10982.04	1298.34	466.50	317.46	32.46	1.47	2.78
10982.04	11301.91						
11301.91	11621.77	58.67	56.52	168.81	1.47	0.33	1.04
11621.77	11941.64	394.17	229.12	320.83	9.85	0.72	1.72
11941.64	12261.50	99.36	95.07	281.18	2.48	0.34	1.05

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9072.87	9936.45	68.30	39.99	195.16	1.14	0.20	1.71
LB 9936.45	9965.12	381.48	41.77	28.21	6.36	1.49	9.13
9965.12	9993.78	1570.57	98.33	28.71	26.18	3.43	15.97
9993.78	RB 10022.45	1078.27	77.47	27.81	17.97	2.86	13.92
10022.45	10342.31						
10342.31	10662.18	141.95	44.35	80.80	2.37	0.55	3.20
10662.18	10982.04	1905.81	345.34	277.96	31.76	1.24	5.52
10982.04	11621.77						
11621.77	11941.64	853.63	115.57	60.07	14.23	1.95	7.39

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
water surface was used.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.162

INPUT
Description: Lower Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 232

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
6807.4	1257.5	6820.5	1257.7	6840	1257.9	6840.3	1257.9	6841.2	1257.9
6841.7	1257.9	6842.1	1257.9	6842.3	1257.9	6842.7	1257.9	6843	1257.9
6843.3	1257.9	6843.9	1257.9	6844.3	1257.9	6844.6	1257.9	6852.9	1258
6853.3	1258	6853.4	1258	6853.5	1258	6853.7	1258	6853.8	1258
6853.9	1258	6854.1	1258	6854.5	1258	6861.4	1258	6868.7	1258
6875.7	1258	6881.9	1258	6887.2	1257.9	6943	1258	7046.7	1258
7179.4	1256	7455.6	1254	7501.5	1254	7518.4	1254	7648.7	1254
7764.6	1254	7842.9	1254	7940.3	1252	7963.2	1250	7968.7	1248
7975	1246	7989	1246	7995.3	1248	8003.3	1250	8012.1	1252
8035.3	1254	8101.3	1254	8131.2	1252	8257.8	1252	8292.7	1252
8325.1	1250	8353.4	1250	8358	1252	8361.6	1254	8652.4	1254
8672.1	1254	8846.9	1252	8862.1	1252	8917.4	1252	8925.1	1250
8928.2	1250	9027.6	1252	9151.2	1254	9262.5	1256	9472.9	1256
9490.4	1255.5	9491.5	1255.5	9497.6	1255.3	9507	1254.9	9509.9	1254.8
9514.1	1254.7	9517.7	1254.7	9520.7	1254.6	9521.8	1254.6	9523.1	1254.6
9535.7	1254.9	9540.4	1254.8	9551.2	1254.4	9552.5	1254.4	9554.4	1254.4
9556.3	1254.4	9557.1	1254.4	9559.9	1254.5	9560.9	1254.4	9575	1255
9588.4	1254.5	9592.6	1254.5	9596	1254.5	9597.5	1254.5	9602.4	1254.6
9603.7	1254.6	9608.3	1254.7	9614.2	1254.7	9616.7	1254.8	9623.8	1254.8
9636.1	1254.7	9640.9	1254.7	9645.8	1254.6	9647.6	1254.7	9677.7	1254.1
9678	1254.1	9686	1254	9705.2	1253.7	9734.4	1253.4	9740.9	1253.3
9744.1	1253.3	9749.1	1253.3	9751.9	1253.3	9753.9	1253.4	9756.6	1253.7
9760	1253.8	9766.3	1254	9780	1254.2	9787.2	1254.3	9791.9	1254.3
9796.1	1254.3	9812.2	1254.1	9816	1254.1	9816.8	1254.1	9821.1	1254.1
9821.5	1254.1	9841.7	1254.2	9847.6	1254.2	9856	1254.1	9868.9	1254
9875.6	1254	9875.7	1254	9875.9	1254	9876	1254	9876.2	1254
9876.3	1254	9876.4	1254	9876.5	1254	9876.6	1254	9876.7	1254
9876.8	1254	9876.9	1254	9877.4	1254	9877.7	1254	9879	1253.9
9891	1253.7	9945	1253	9969.8	1252.7	9986.2	1252	9994.5	1250.3
9995.8	1250	9996.1	1249.9	10003.9	1249.9	10004.7	1250	10014.9	1251.3
10017.8	1251.8	10018.5	1251.9	10019.2	1252	10026.9	1252.2	10083.9	1254
10103.3	1255.1	10105.1	1255.1	10107.6	1255.1	10112.8	1255.3	10114.8	1255.3
10116.8	1255.4	10123.1	1255.4	10161.1	1255.3	10168.8	1255.2	10173.5	1255.2
10192.9	1255.4	10193.6	1255.4	10226	1255.6	10226.4	1255.6	10227.3	1255.7
10227.6	1255.7	10228	1255.7	10229.4	1255.7	10231.8	1255.7	10233.1	1255.7
10234.5	1255.8	10235.4	1255.8	10237.7	1255.8	10238.1	1255.8	10252.2	1255.8
10263.7	1255.9	10268.6	1256	10270.2	1256	10294.2	1256.4	10296.7	1256.4
10300.7	1256.4	10303.8	1256.4	10318.8	1256.4	10355.8	1256.2	10371	1256.1
10379.8	1256	10413.5	1255.1	10433.2	1254.2	10435.8	1254.1	10437.9	1254
10445.1	1254	10454.3	1254.1	10457.2	1254	10460.6	1254	10468.6	1254
10478.4	1254.6	10479.4	1254.5	10486	1254.3	10495.6	1254.3	10497.7	1254.3
10499.6	1254.4	10500.8	1254.4	10539.7	1254.8	10546.8	1254.9	10551.5	1254.9
10554.2	1255	10561.5	1255	10570.9	1255	10581.9	1255	10632.6	1254
10664.5	1254	10873.2	1256	11088	1256	11238.6	1256	11267.4	1256
11547.7	1256	11615.1	1256	11625	1256	11748	1256	11758	1254
11767.1	1252	11769.2	1250	11779.5	1250	11783.8	1252	11790.7	1254
11808.4	1256	11895.5	1256						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
6807.4	.065	9986.2	.043	10019.2	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9986.2	10019.2	597	603	594.4	.1	.3

Left Levee Station= 9267.19 Elevation= 1260

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1254.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.66	Wt. n-Val.	0.065	0.043	0.065
W.S. Elev (ft)	1254.27	Reach Len. (ft)	597.00	603.00	594.40
Crit W.S. (ft)	1254.42	Flow Area (sq ft)	191.62	118.08	192.21
E.G. Slope (ft/ft)	0.011749	Area (sq ft)	191.62	118.08	192.21
Q Total (cfs)	2000.00	Flow (cfs)	355.03	1027.06	617.90
Top Width (ft)	555.74	Top Width (ft)	302.69	33.00	220.05
Vel Total (ft/s)	3.98	Avg. Vel. (ft/s)	1.85	8.70	3.21
Max Chl Dpth (ft)	8.27	Hydr. Depth (ft)	0.63	3.58	0.87
Conv. Total (cfs)	18451.2	Conv. (cfs)	3275.4	9475.3	5700.5
Length Wtd. (ft)		Wetted Per. (ft)	302.75	33.37	221.90
Min Ch El (ft)	1249.90	Shear (lb/sq ft)	0.46	2.60	0.64
Alpha	2.69	Stream Power (lb/ft s)	0.86	22.58	2.04
Frctn Loss (ft)	2.92	Cum Volume (acre-ft)	1.43	1.75	16.04
C & E Loss (ft)	0.01	Cum SA (acres)	2.89	1.68	23.39

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1255.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.55	Wt. n-Val.	0.065	0.043	0.065
W.S. Elev (ft)	1255.07	Reach Len. (ft)	597.00	603.00	594.40
Crit W.S. (ft)	1255.10	Flow Area (sq ft)	513.96	144.58	478.41
E.G. Slope (ft/ft)	0.010702	Area (sq ft)	513.96	144.58	478.41
Q Total (cfs)	4000.00	Flow (cfs)	1266.39	1373.72	1359.90
Top Width (ft)	1009.07	Top Width (ft)	483.17	33.00	492.91
Vel Total (ft/s)	3.52	Avg. Vel. (ft/s)	2.46	9.50	2.84
Max Chl Dpth (ft)	9.07	Hydr. Depth (ft)	1.06	4.38	0.97
Conv. Total (cfs)	38665.2	Conv. (cfs)	12241.3	13278.7	13145.2
Length Wtd. (ft)	596.76	Wetted Per. (ft)	483.29	33.37	494.95
Min Ch El (ft)	1249.90	Shear (lb/sq ft)	0.71	2.90	0.65
Alpha	2.88	Stream Power (lb/ft s)	1.75	27.51	1.84
Frctn Loss (ft)	3.03	Cum Volume (acre-ft)	4.39	2.66	31.07
C & E Loss (ft)	0.07	Cum SA (acres)	6.53	1.85	37.65

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1256.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.54	Wt. n-Val.	0.065	0.043	0.065
W.S. Elev (ft)	1255.54	Reach Len. (ft)	597.00	603.00	594.40
Crit W.S. (ft)	1255.54	Flow Area (sq ft)	746.12	160.24	753.01
E.G. Slope (ft/ft)	0.010720	Area (sq ft)	746.12	160.24	753.01
Q Total (cfs)	6000.00	Flow (cfs)	2314.02	1631.87	2054.11
Top Width (ft)	1210.66	Top Width (ft)	497.32	33.00	680.34
Vel Total (ft/s)	3.62	Avg. Vel. (ft/s)	3.10	10.18	2.73
Max Chl Dpth (ft)	9.54	Hydr. Depth (ft)	1.50	4.86	1.11
Conv. Total (cfs)	57949.8	Conv. (cfs)	22349.5	15761.1	19839.2
Length Wtd. (ft)	596.65	Wetted Per. (ft)	497.45	33.37	682.48
Min Ch El (ft)	1249.90	Shear (lb/sq ft)	1.00	3.21	0.74
Alpha	2.64	Stream Power (lb/ft s)	3.11	32.73	2.01
Frctn Loss (ft)		Cum Volume (acre-ft)	7.46	3.20	41.59

C & E Loss (ft)	Cum SA (acres)	11.54	1.89	40.38

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
8926.60	9986.20	355.03	191.62	302.75	17.75	0.63	1.85
LB 9986.20	9997.20	307.76	37.31	11.22	15.39	3.39	8.25
9997.20	10008.20	454.97	46.85	11.03	22.75	4.26	9.71
10008.20	RB 10019.20	264.34	33.92	11.11	13.22	3.08	7.79
10019.20	10287.24	235.16	83.75	69.43	11.76	1.21	2.81
10287.24	10555.29	7.99	8.93	41.20	0.40	0.22	0.89
10555.29	10823.33	11.46	13.95	73.11	0.57	0.19	0.82
10823.33	11627.46						
11627.46	11895.50	363.29	85.58	38.17	18.16	2.35	4.25

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
8926.60	9986.20	1266.39	513.96	483.29	31.66	1.06	2.46
LB 9986.20	9997.20	420.10	46.14	11.22	10.50	4.19	9.10
9997.20	10008.20	581.21	55.69	11.03	14.53	5.06	10.44
10008.20	RB 10019.20	372.41	42.75	11.11	9.31	3.89	8.71
10019.20	10287.24	495.65	145.16	83.61	12.39	1.74	3.41
10287.24	10555.29	156.45	89.61	141.16	3.91	0.64	1.75
10555.29	10823.33	200.54	124.38	220.76	5.01	0.56	1.61
10823.33	11627.46						
11627.46	11895.50	507.25	119.26	49.41	12.68	2.51	4.25

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
8926.60	9986.20	2314.02	746.12	497.45	38.57	1.50	3.10
LB 9986.20	9997.20	503.36	51.36	11.22	8.39	4.67	9.80
9997.20	10008.20	676.30	60.91	11.03	11.27	5.54	11.10
10008.20	RB 10019.20	452.22	47.97	11.11	7.54	4.36	9.43
10019.20	10287.24	509.02	208.23	197.69	8.48	1.05	2.44
10287.24	10555.29	382.48	160.56	158.45	6.37	1.01	2.38
10555.29	10823.33	529.53	240.84	268.06	8.83	0.90	2.20
10823.33	11091.37	0.00	0.02	2.22	0.00	0.01	0.11
11091.37	11627.46						
11627.46	11895.50	633.08	143.36	56.06	10.55	2.65	4.42

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for

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        additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less
        than 0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
        section.  This may indicate the need for additional cross sections.

CROSS SECTION          RIVER: Dreamy Draw
REACH: Lower Wash         RS: 18.048

INPUT
Description: Lower Wash Reach
Cross Section Data Digitized from Topo Map
             Supplied by the FCD using BOSS-RMS
Station Elevation Data    num=     216
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  6294.6  1252.1  6297.6  1252.1  6305.5  1252.1  6348.1  1252.3  6355.3  1252.4
  6360.4  1252.4  6367.1  1252.4  6374.3  1252.3    6378  1252.3  6382.2  1252.2
  6387.2  1252.1  6393.8    1252  6397.5    1252  6402.8    1252  6407.9    1252
  6426.7    1252  6432.6    1252    6440  1252.1  6443.1    1252  6454.2  1251.3
  6455.5  1251.4  6458.5  1251.2  6463.9  1251.1  6467.2  1251.2  6473.1  1250.9
  6487.7  1251.2  6508.8  1250.8  6532.5    1251  6547.1  1250.8  6552.5  1250.9
  6562.3  1250.8  6570.2  1250.8  6581.5  1250.9  6589.8    1251  6594.4    1251
    6598    1251  6598.7    1251  6616.5  1251.1  6639.9  1250.9  6644.2  1250.9
  6646.3  1250.9  6649.2  1250.9  6652.6  1250.9  6687.4  1250.7  6696.5  1250.7
  6704.2  1250.6  6720.9  1250.5  6733.3  1250.5    6743  1250.4  6743.1  1250.4
  6743.2  1250.4  6743.9  1250.4  6745.3  1250.5  6761.1  1250.6  6766.6  1250.6
  6771.6  1250.7  6780.8  1250.6  6936.6    1250  6961.9    1248  7079.6    1248
  7352.7    1248  7405.7    1248  7435.1    1248  7593.7    1246  7730.5    1246
  7805.9    1248  8009.9    1250  8317.6    1250  8364.2    1250  8375.8    1250
  8682.2    1248  8760.1    1246  8765.8    1246    8788    1248  9289.6    1248
  9495.9  1247.1  9497.9  1247.2  9505.6  1247.3  9509.4  1247.3  9521.2  1247.4
  9524.1  1247.4  9531.8  1247.5  9534.8  1247.5  9540.1  1247.5  9542.5  1247.5
  9546.1  1247.6  9548.3  1247.6  9549.1  1247.5  9550.2  1247.5  9554.5  1247.5
  9563.3  1247.4  9565.4  1247.4    9570  1247.4    9604  1247.1  9606.1  1247.1
  9623.9  1246.9  9628.3  1246.9  9654.9  1246.8  9662.9  1246.8  9666.4  1246.8
  9672.2  1246.9  9673.3  1246.9  9717.9  1247.1  9720.9  1247.1  9723.9  1247.1
  9753.2  1246.9  9757.2  1246.9  9759.6  1246.8  9762.9  1246.8  9764.7  1246.7
    9769  1246.5  9770.7  1246.4    9773  1246.5  9774.7  1246.4    9777  1246.5
    9778  1246.5  9779.6  1246.5  9787.6  1246.5  9793.3  1246.5  9800.5  1246.5
    9802  1246.5  9808.6  1246.5  9819.1  1246.4  9819.9  1246.4  9820.7  1246.4
  9826.8  1246.5  9827.8  1246.5  9830.2  1246.5  9831.7  1246.5  9861.1  1246.8
  9883.7  1247.1  9887.3  1247.1  9889.4  1247.2    9894  1247.2  9897.6  1247.2
    9900  1247.1  9914.9  1247.1  9921.5    1247  9926.8    1247    9930    1247
  9934.3  1246.9  9953.3  1246.5  9980.6    1246  9983.7  1245.8  9992.6  1245.2
    9997  1244.9   10003  1244.9 10004.5    1245 10008.9  1245.3 10010.7  1245.5
   10013    1246 10022.6  1246.6 10027.7  1246.8   10031  1246.9 10032.4  1246.9
 10034.3    1247 10038.7  1246.9 10066.5  1246.8 10110.1  1246.5 10120.6  1246.4
 10167.6    1246 10174.2  1245.9 10175.3  1245.9   10194  1245.7 10204.4  1245.7
 10209.3  1245.7 10211.3  1245.7 10213.7    1246 10214.5    1246 10225.7  1246.1
 10239.9  1246.2 10250.4  1246.3 10257.5  1246.4 10267.1  1246.4 10274.6  1246.3
 10296.1  1246.3 10315.7  1246.2 10329.1  1246.1 10329.3  1246.1   10336    1246
 10354.3  1245.7 10354.6  1245.8   10362  1245.8 10364.9  1245.6 10365.5  1245.6
 10366.4  1245.6   10386  1245.3 10402.9  1245.5 10405.4  1245.9 10406.6    1246
 10418.6  1246.2 10440.2  1246.6 10463.7  1246.9 10466.4    1247   10469    1247
 10472.2    1247 10474.2    1247 10479.4    1247 10505.1  1246.8 10533.8  1246.7
 10553.1  1246.6 10566.5  1246.5 10572.8  1246.4 10578.8  1246.3 10597.3    1246
 10605.8    1246 10611.9  1245.7 10671.2    1246 10825.7    1246 10956.2    1246
 11036.4    1248 11557.3    1248 11725.3    1246 11753.1    1244 11914.4    1246
 12097.8    1248

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  6294.6    .065  9953.3    .033 10038.7    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        9953.3 10038.7            232.6     233   225.9             .1       .3
Left Levee      Station= 9282.98      Elevation= 1249.98

CROSS SECTION OUTPUT    Profile #1/3 Spillway

  E.G. Elev (ft)            1246.65   Element                    Left OB    Channel   Right OB
```

Vel Head (ft)	0.14	Wt. n-Val.	0.065	0.033	0.065
W.S. Elev (ft)	1246.51	Reach Len. (ft)	232.60	233.00	225.90
Crit W.S. (ft)	1246.32	Flow Area (sq ft)	1.71	47.88	663.38
E.G. Slope (ft/ft)	0.019740	Area (sq ft)	1.71	47.88	663.38
Q Total (cfs)	2000.00	Flow (cfs)	0.50	239.95	1759.55
Top Width (ft)	1145.56	Top Width (ft)	63.56	67.78	1014.22
Vel Total (ft/s)	2.81	Avg. Vel. (ft/s)	0.29	5.01	2.65
Max Chl Dpth (ft)	2.51	Hydr. Depth (ft)	0.03	0.71	0.65
Conv. Total (cfs)	14235.0	Conv. (cfs)	3.5	1707.9	12523.6
Length Wtd. (ft)	226.68	Wetted Per. (ft)	63.57	67.92	1014.42
Min Ch El (ft)	1244.90	Shear (lb/sq ft)	0.03	0.87	0.81
Alpha	1.17	Stream Power (lb/ft s)	0.01	4.35	2.14
Frctn Loss (ft)	2.79	Cum Volume (acre-ft)	0.11	0.61	10.20
C & E Loss (ft)	0.02	Cum SA (acres)	0.38	0.98	14.97

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1247.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.065	0.033	0.065
W.S. Elev (ft)	1246.97	Reach Len. (ft)	232.60	233.00	225.90
Crit W.S. (ft)	1246.65	Flow Area (sq ft)	56.88	81.99	1201.15
E.G. Slope (ft/ft)	0.016609	Area (sq ft)	56.88	81.99	1201.15
Q Total (cfs)	4000.00	Flow (cfs)	74.67	469.61	3455.73
Top Width (ft)	1605.21	Top Width (ft)	223.77	83.46	1297.98
Vel Total (ft/s)	2.99	Avg. Vel. (ft/s)	1.31	5.73	2.88
Max Chl Dpth (ft)	2.97	Hydr. Depth (ft)	0.25	0.98	0.93
Conv. Total (cfs)	31037.4	Conv. (cfs)	579.4	3643.8	26814.2
Length Wtd. (ft)	226.89	Wetted Per. (ft)	223.80	83.61	1298.20
Min Ch El (ft)	1244.90	Shear (lb/sq ft)	0.26	1.02	0.96
Alpha	1.24	Stream Power (lb/ft s)	0.35	5.82	2.76
Frctn Loss (ft)	2.69	Cum Volume (acre-ft)	0.48	1.10	19.61
C & E Loss (ft)	0.02	Cum SA (acres)	1.68	1.04	25.43

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1247.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.065	0.033	0.065
W.S. Elev (ft)	1247.28	Reach Len. (ft)	232.60	233.00	225.90
Crit W.S. (ft)	1246.95	Flow Area (sq ft)	159.23	108.35	1617.67
E.G. Slope (ft/ft)	0.014926	Area (sq ft)	159.23	108.35	1617.67
Q Total (cfs)	6000.00	Flow (cfs)	245.02	697.78	5057.21
Top Width (ft)	1886.28	Top Width (ft)	418.42	85.40	1382.46
Vel Total (ft/s)	3.18	Avg. Vel. (ft/s)	1.54	6.44	3.13
Max Chl Dpth (ft)	3.28	Hydr. Depth (ft)	0.38	1.27	1.17
Conv. Total (cfs)	49111.3	Conv. (cfs)	2005.5	5711.5	41394.4
Length Wtd. (ft)	226.93	Wetted Per. (ft)	418.46	85.55	1382.69
Min Ch El (ft)	1244.90	Shear (lb/sq ft)	0.35	1.18	1.09
Alpha	1.30	Stream Power (lb/ft s)	0.55	7.60	3.41
Frctn Loss (ft)	2.81	Cum Volume (acre-ft)	1.26	1.34	25.41
C & E Loss (ft)	0.02	Cum SA (acres)	5.27	1.07	26.30

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
8733.73	9953.30	0.50	1.71	63.57	0.02	0.03	0.29
LB 9953.30	9981.77	15.90	7.60	28.47	0.80	0.27	2.09
9981.77	10010.23	212.57	36.03	28.52	10.63	1.27	5.90
10010.23	RB 10038.70	11.48	4.26	10.92	0.57	0.39	2.70
10038.70	10332.86	127.40	80.22	223.53	6.37	0.36	1.59
10332.86	10627.01	225.76	99.78	163.50	11.29	0.61	2.26
10627.01	10921.17	312.96	153.53	294.16	15.65	0.52	2.04
10921.17	11215.33	39.75	22.81	55.29	1.99	0.41	1.74
11215.33	11509.49						
11509.49	11803.64	627.88	163.34	120.85	31.39	1.35	3.84
11803.64	12097.80	425.81	143.70	157.09	21.29	0.91	2.96

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
8733.73	9953.30	74.67	56.88	223.80	1.87	0.25	1.31
LB 9953.30	9981.77	83.70	20.81	28.47	2.09	0.73	4.02
9981.77	10010.23	351.22	49.24	28.52	8.78	1.73	7.13
10010.23	RB 10038.70	34.69	11.94	26.61	0.87	0.45	2.91
10038.70	10332.86	453.69	200.84	294.18	11.34	0.68	2.26
10332.86	10627.01	479.71	202.57	276.46	11.99	0.73	2.37
10627.01	10921.17	837.22	290.05	294.16	20.93	0.99	2.89
10921.17	11215.33	122.89	52.79	73.91	3.07	0.71	2.33
11215.33	11509.49						
11509.49	11803.64	844.49	228.44	159.84	21.11	1.43	3.70
11803.64	12097.80	717.73	226.47	199.65	17.94	1.13	3.17

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
8733.73	9953.30	245.02	159.23	418.46	4.08	0.38	1.54
LB 9953.30	9981.77	151.15	29.61	28.47	2.52	1.04	5.10
9981.77	10010.23	463.48	58.04	28.52	7.72	2.04	7.99
10010.23	RB 10038.70	83.15	20.71	28.55	1.39	0.73	4.02
10038.70	10332.86	804.14	291.75	294.18	13.40	0.99	2.76
10332.86	10627.01	809.84	293.02	294.24	13.50	1.00	2.76
10627.01	10921.17	1254.52	380.97	294.16	20.91	1.30	3.29
10921.17	11215.33	200.10	77.54	86.31	3.34	0.90	2.58
11215.33	11509.49						
11509.49	11803.64	1031.14	281.83	185.81	17.19	1.52	3.66
11803.64	12097.80	957.46	292.56	227.99	15.96	1.28	3.27

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 18.004

INPUT
Description: Lower Wash Reach
Cross Section Data Digitized from Topo Map
Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 330

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5588.3	1244	5634.3	1244.6	5637.6	1244.6	5640.5	1244.6	5642.9	1244.6
5650	1244.7	5669.5	1245	5675.1	1245	5689.1	1245.2	5695.6	1245.3
5703	1245.3	5706.5	1245.3	5708.6	1245.3	5712.3	1245.4	5715.1	1245.4
5717.1	1245.4	5719.9	1245.4	5725.7	1245.4	5732.1	1245.4	5735.1	1245.4
5739.2	1245.4	5740.9	1245.4	5744	1245.4	5747.8	1245.4	5752.4	1245.4
5759.6	1245.4	5765.4	1245.4	5768.7	1245.4	5785.1	1245.4	5792.6	1245.4
5802.5	1245.4	5815.4	1245.4	5857.3	1245.4	5863.2	1245.4	5876.6	1245.4
5885.5	1245.4	5890.7	1245.4	5901.6	1245.5	5912.9	1245.6	5916.5	1245.6
5922.1	1245.6	5928.4	1245.6	5931.6	1245.6	5939.9	1245.7	5943	1245.7
5945.3	1245.7	5947.7	1245.7	5951.2	1245.7	5954.7	1245.6	5956	1245.6
5957.3	1245.6	5960.7	1245.4	5961.6	1245.4	5962.4	1245.4	5966.3	1245.5
5969.9	1245.5	5973.4	1245.6	5974.9	1245.6	5982.2	1245.6	5992.2	1245.6
6015.7	1245.6	6020.5	1245.6	6034.1	1245.6	6036.9	1245.6	6081.3	1245.8
6093.8	1246	6094.6	1246	6101.5	1246.2	6104.1	1246.3	6105.7	1246.4
6106.6	1246.5	6106.7	1246.6	6107.5	1246.7	6110	1246.8	6115.6	1246.8
6120.8	1246.8	6124.4	1246.7	6126.3	1246.7	6129.5	1246.6	6132.3	1246.6
6133.9	1246.4	6137.1	1246	6160.9	1246	6169	1245.8	6170.2	1245.8
6171.3	1245.8	6173.9	1245.8	6180.6	1245.6	6186.6	1245.3	6191	1245
6193.1	1244.8	6199	1245.1	6201.9	1245.2	6205.3	1245.3	6206.9	1245.3
6209.6	1245.4	6210.1	1245.4	6211.3	1245.4	6230	1245.3	6236.9	1244.9
6251.4	1244.1	6251.5	1244.1	6251.8	1244.1	6252.6	1244	6254.5	1244
6256.9	1244	6283.7	1244	6290.6	1244	6291.2	1244	6291.9	1244
6294	1244	6294.9	1244	6295.3	1244	6317.7	1244	6327.8	1244.8
6339.3	1246	6349.5	1247.7	6351.3	1248	6362.8	1248.8	6376.5	1250
6384.5	1250	6388.5	1250	6393.8	1249.9	6394	1249.9	6394.6	1249.9
6395	1249.9	6398.4	1249.8	6410	1249.4	6419.1	1249.1	6424.8	1248.9
6448.3	1248	6457.7	1247.3	6460.1	1247.1	6461.4	1247	6474.9	1246
6475.2	1246	6475.4	1246	6480.2	1244	6501.9	1244	6506.9	1244
6512.2	1244	6522.1	1244	6526.2	1244	6532.2	1244	6532.3	1244
6544.1	1244	6568.3	1244	6575.4	1244	6575.5	1244	6575.6	1244
6575.8	1244	6598.3	1244.9	6599.9	1244.9	6603.9	1245	6612	1244.9
6619.7	1245.1	6624.3	1245.2	6626.5	1245.2	6632.3	1245.2	6639.6	1245.3
6643.9	1245.3	6649.6	1245.3	6654.5	1245.3	6670.7	1245.3	6694.1	1245.3
6699.5	1245.3	6701.9	1245.3	6714.7	1245.3	6723.8	1245.3	6731.7	1245.3
6735.2	1245.3	6738.7	1245.3	6741.5	1245.3	6757	1245.2	6770.7	1245.1
6773.8	1245	6802.6	1244	6959.5	1244	6979	1244	7155	1242
7276.7	1242	7327.7	1242	7568	1242	7695.7	1244	7761.1	1244
7912.4	1242	7962.2	1242	7995.8	1242	8002.7	1242	8023.7	1244
8051	1244	8138.9	1244	8763.5	1244	8792.1	1244	8855.1	1244
8872.9	1242	8907.5	1242	8928.7	1244	9255.5	1244	9502.9	1244
9674.7	1246	9690.5	1246	9695	1245.9	9698.5	1245.9	9734.3	1245.3
9744.8	1245.3	9771.8	1244.9	9776.2	1244.8	9781.5	1244.8	9785.5	1244.7
9847.2	1244.3	9860.2	1244.2	9876.5	1244.1	9877.2	1244.1	9877.6	1244.1
9878.1	1244.1	9878.4	1244.1	9879.7	1244.1	9880.2	1244.1	9880.7	1244.1
9880.8	1244.1	9880.9	1244.1	9882.5	1244.1	9885.9	1244.2	9886.9	1244.2
9888.8	1244.2	9895.8	1244.2	9898.2	1244.2	9916.9	1244.2	9917.4	1244.2
9936.6	1244.1	9945.8	1244	9966.8	1243.7	9968.5	1243.6	9988.6	1243.3
9990.2	1243.2	9995.9	1243.1	9999.3	1243	10000.7	1243	10001	1243.1
10056.1	1242.7	10071.6	1242.4	10088.9	1242	10101.2	1242	10107.9	1242
10118.4	1242	10123.2	1242	10130.8	1242	10214.6	1243.3	10245.1	1244
10282.4	1244	10284.1	1244	10300.8	1243.7	10354.9	1242	10391.3	1242
10408.1	1242	10408.5	1242	10408.7	1242	10432.5	1242.5	10437.3	1242.6
10439.7	1242.6	10441.2	1242.6	10445.2	1242.6	10453.9	1242.5	10467.6	1242.3
10481.6	1242.1	10489.7	1242	10493.8	1242	10502.4	1242	10506.8	1242
10509.3	1242	10545.4	1242	10557.7	1242	10565	1242	10573.4	1242
10627.1	1243.1	10630.4	1243.1	10635.3	1243.2	10646.8	1243.4	10651.9	1243.4
10654.6	1243.5	10655.6	1243.5	10657.1	1243.5	10659.7	1243.4	10663.7	1243.4
10672.6	1243.2	10677.2	1243.2	10680.1	1243.2	10686	1243.1	10688.7	1243.1
10692.9	1243.1	10694.5	1243.1	10696.1	1243.1	10697.4	1243.1	10713.7	1242.8
10715.8	1242.7	10718.2	1242.7	10727.5	1242.7	10731.1	1242.6	10732.5	1242.6
10735.9	1242.7	10745.2	1242.8	10746.8	1242.8	10749.1	1242.8	10750.6	1242.8
10752.8	1243	10754.4	1243	10757.5	1243	10759.7	1243.1	10762.4	1243.1
10773.1	1243.1	10778.2	1243.1	10783.6	1243.1	10787.8	1243.1	10795.1	1243.1
10798.8	1243	10800.8	1243.1	10884.1	1243.5	10884.8	1243.5	10886.3	1243.5
10889.1	1243.5	11118.9	1244	11169.1	1244	11221.1	1244	11276.2	1244

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 11515.7    1244 11801.2    1244 11949.8    1244 12219.8    1244 12423.8    1246

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  5588.3    .065  9966.8    .033 10056.1    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        9966.8 10056.1              395     395     395          .1          .3
Left Levee      Station= 9689.97      Elevation= 1246.86
```

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1243.84	Element			
Vel Head (ft)	0.08	Wt. n-Val.	0.065	0.033	0.065
W.S. Elev (ft)	1243.76	Reach Len. (ft)	395.00	395.00	395.00
Crit W.S. (ft)	1243.15	Flow Area (sq ft)	0.13	61.80	866.03
E.G. Slope (ft/ft)	0.008428	Area (sq ft)	0.13	61.80	866.03
Q Total (cfs)	2000.00	Flow (cfs)	0.03	199.84	1800.13
Top Width (ft)	983.27	Top Width (ft)	4.21	89.30	889.75
Vel Total (ft/s)	2.16	Avg. Vel. (ft/s)	0.20	3.23	2.08
Max Chl Dpth (ft)	1.76	Hydr. Depth (ft)	0.03	0.69	0.97
Conv. Total (cfs)	21785.3	Conv. (cfs)	0.3	2176.8	19608.2
Length Wtd. (ft)	395.00	Wetted Per. (ft)	4.21	89.33	889.86
Min Ch El (ft)	1242.70	Shear (lb/sq ft)	0.02	0.36	0.51
Alpha	1.06	Stream Power (lb/ft s)	0.00	1.18	1.06
Frctn Loss (ft)	7.91	Cum Volume (acre-ft)	0.10	0.31	6.24
C & E Loss (ft)	0.01	Cum SA (acres)	0.20	0.56	10.04

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1244.43	Element			
Vel Head (ft)	0.10	Wt. n-Val.	0.065	0.033	0.065
W.S. Elev (ft)	1244.32	Reach Len. (ft)	395.00	395.00	395.00
Crit W.S. (ft)	1243.56	Flow Area (sq ft)	25.53	112.17	1802.41
E.G. Slope (ft/ft)	0.008987	Area (sq ft)	25.53	112.17	1802.41
Q Total (cfs)	4000.00	Flow (cfs)	19.36	557.35	3423.29
Top Width (ft)	2409.40	Top Width (ft)	123.33	89.30	2196.77
Vel Total (ft/s)	2.06	Avg. Vel. (ft/s)	0.76	4.97	1.90
Max Chl Dpth (ft)	2.32	Hydr. Depth (ft)	0.21	1.26	0.82
Conv. Total (cfs)	42193.7	Conv. (cfs)	204.2	5879.1	36110.3
Length Wtd. (ft)	395.00	Wetted Per. (ft)	123.33	89.33	2196.88
Min Ch El (ft)	1242.70	Shear (lb/sq ft)	0.12	0.70	0.46
Alpha	1.54	Stream Power (lb/ft s)	0.09	3.50	0.87
Frctn Loss (ft)	8.14	Cum Volume (acre-ft)	0.26	0.58	11.82
C & E Loss (ft)	0.02	Cum SA (acres)	0.76	0.58	16.37

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1244.65	Element			
Vel Head (ft)	0.14	Wt. n-Val.	0.065	0.033	0.065
W.S. Elev (ft)	1244.51	Reach Len. (ft)	395.00	395.00	395.00
Crit W.S. (ft)	1244.22	Flow Area (sq ft)	50.81	128.59	2207.98
E.G. Slope (ft/ft)	0.010591	Area (sq ft)	50.81	128.59	2207.98
Q Total (cfs)	6000.00	Flow (cfs)	57.65	759.71	5182.63
Top Width (ft)	2456.51	Top Width (ft)	151.69	89.30	2215.52
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.13	5.91	2.35
Max Chl Dpth (ft)	2.51	Hydr. Depth (ft)	0.33	1.44	1.00
Conv. Total (cfs)	58300.9	Conv. (cfs)	560.2	7382.0	50358.7

Length Wtd. (ft)	395.00	Wetted Per. (ft)	151.70	89.33	2215.64
Min Ch El (ft)	1242.70	Shear (lb/sq ft)	0.22	0.95	0.66
Alpha	1.46	Stream Power (lb/ft s)	0.25	5.62	1.55
Frctn Loss (ft)	8.09	Cum Volume (acre-ft)	0.70	0.70	15.49
C & E Loss (ft)	0.02	Cum SA (acres)	3.75	0.61	16.97

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
8507.30	9966.80	0.03	0.13	4.21	0.00	0.03	0.20
LB 9966.80	9996.57	22.47	11.16	29.78	1.12	0.37	2.01
9996.57	10026.33	71.18	22.30	29.78	3.56	0.75	3.19
10026.33	RB 10056.10	106.20	28.34	29.77	5.31	0.95	3.75
10056.10	10394.34	741.62	335.90	275.49	37.08	1.22	2.21
10394.34	10732.58	946.97	422.25	338.28	47.35	1.25	2.24
10732.58	11070.83	111.54	107.88	276.09	5.58	0.39	1.03

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
8507.30	9966.80	19.36	25.53	123.33	0.48	0.21	0.76
LB 9966.80	9996.57	112.12	27.95	29.78	2.80	0.94	4.01
9996.57	10026.33	196.03	39.09	29.78	4.90	1.31	5.01
10026.33	RB 10056.10	249.20	45.13	29.77	6.23	1.52	5.52
10056.10	10394.34	1142.36	514.49	338.30	28.56	1.52	2.22
10394.34	10732.58	1529.98	613.05	338.28	38.25	1.81	2.50
10732.58	11070.83	450.77	294.48	338.26	11.27	0.87	1.53
11070.83	11409.07	90.24	112.18	338.24	2.26	0.33	0.80
11409.07	11747.31	86.90	109.66	338.24	2.17	0.32	0.79
11747.31	12085.56	86.90	109.66	338.24	2.17	0.32	0.79
12085.56	12423.80	36.14	48.89	167.32	0.90	0.29	0.74

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
8507.30	9966.80	57.65	50.81	151.70	0.96	0.33	1.13
LB 9966.80	9996.57	164.75	33.42	29.78	2.75	1.12	4.93
9996.57	10026.33	266.02	44.56	29.78	4.43	1.50	5.97
10026.33	RB 10056.10	328.95	50.61	29.77	5.48	1.70	6.50
10056.10	10394.34	1615.06	576.67	338.30	26.92	1.70	2.80
10394.34	10732.58	2100.93	675.23	338.28	35.02	2.00	3.11
10732.58	11070.83	725.14	356.66	338.26	12.09	1.05	2.03
11070.83	11409.07	220.01	174.36	338.24	3.67	0.52	1.26
11409.07	11747.31	214.74	171.85	338.24	3.58	0.51	1.25
11747.31	12085.56	214.74	171.85	338.24	3.58	0.51	1.25
12085.56	12423.80	92.00	81.37	186.07	1.53	0.44	1.13

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less

than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Dreamy Draw
REACH: Lower Wash RS: 17.929

INPUT
Description: Lower Wash Reach
Section added from AS-Builts for the
Arizona
Canal Diversion Channel
Cross Section elevations along top North
wall
Station Elevation Data num= 69

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5859	1242	5867	1238.4	6225	1238.06	6245	1236.06	6385	1236.06
6525	1236.06	6545	1238.06	6733	1237.95	6743	1236.95	6753	1236.95
6763	1236.95	6773	1237.95	7030	1237.86	7045	1236.36	7060	1236.36
7075	1236.36	7090	1237.86	7658	1237.67	7668	1236.67	7686	1236.67
7704	1236.67	7714	1237.67	8568.5	1236	8578.5	1235	8591	1235
8603.5	1235	8613.5	1236	9204	1236.21	9248	1240.81	9313	1240.5
9325	1236.21	9974.3	1236.48	9984.3	1235.48	9999.3	1235.48	10014.3	1235.48
10024.3	1236.48	10281.3	1236.35	10291.3	1235.35	10296.3	1235.35	10301.3	1235.35
10311.3	1236.35	10543.8	1236.31	10553.8	1235.31	10566.3	1235.31	10578.8	1235.31
10588.8	1236.31	10724.8	1236.25	10734.8	1235.25	10747.3	1235.25	10759.7	1235.25
10769.7	1236.25	10971.7	1235.68	10981.7	1234.68	10994.2	1234.68	11006.7	1234.68
11016.7	1235.68	11261.7	1235.59	11271.7	1234.59	11284.2	1234.59	11296.6	1234.59
11306.6	1235.59	11959.2	1235.37	11979.2	1233.37	12009.2	1233.37	12039.2	1233.37
12059.2	1235.37	12204.2	1235.3	12213.2	1238.8	12223.2	1240		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5859	.065	9974.3	.033	10024.3	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9974.3	10024.3	43	43	43	.1	.3

Left Levee Station= 7714.14 Elevation= 1238.03

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1235.92	Element			
Vel Head (ft)	0.22	Wt. n-Val.	0.065	0.033	0.065
W.S. Elev (ft)	1235.70	Reach Len. (ft)			
Crit W.S. (ft)	1235.70	Flow Area (sq ft)	22.36	7.05	509.15
E.G. Slope (ft/ft)	0.091243	Area (sq ft)	22.36	7.05	509.15
Q Total (cfs)	2000.00	Flow (cfs)	106.44	33.29	1860.27
Top Width (ft)	1397.17	Top Width (ft)	38.98	34.38	1323.82
Vel Total (ft/s)	3.71	Avg. Vel. (ft/s)	4.76	4.73	3.65
Max Chl Dpth (ft)	2.33	Hydr. Depth (ft)	0.57	0.20	0.38
Conv. Total (cfs)	6621.1	Conv. (cfs)	352.4	110.2	6158.5
Length Wtd. (ft)		Wetted Per. (ft)	39.05	34.40	1324.41
Min Ch El (ft)	1235.48	Shear (lb/sq ft)	3.26	1.17	2.19
Alpha	1.01	Stream Power (lb/ft s)	15.53	5.51	8.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1236.26	Element			
Vel Head (ft)	0.35	Wt. n-Val.	0.065	0.033	0.065
W.S. Elev (ft)	1235.92	Reach Len. (ft)			
Crit W.S. (ft)	1235.92	Flow Area (sq ft)	31.27	14.96	805.60
E.G. Slope (ft/ft)	0.086576	Area (sq ft)	31.27	14.96	805.60
Q Total (cfs)	4000.00	Flow (cfs)	169.00	105.07	3725.93
Top Width (ft)	1496.14	Top Width (ft)	43.31	38.71	1414.12
Vel Total (ft/s)	4.70	Avg. Vel. (ft/s)	5.41	7.02	4.63
Max Chl Dpth (ft)	2.55	Hydr. Depth (ft)	0.72	0.39	0.57

Conv. Total (cfs)	13594.4	Conv. (cfs)	574.4	357.1	12663.0
Length Wtd. (ft)		Wetted Per. (ft)	43.40	38.75	1414.82
Min Ch El (ft)	1235.48	Shear (lb/sq ft)	3.89	2.09	3.08
Alpha	1.02	Stream Power (lb/ft s)	21.05	14.65	14.23
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1236.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.35	Wt. n-Val.	0.065	0.033	0.065
W.S. Elev (ft)	1236.19	Reach Len. (ft)			
Crit W.S. (ft)	1236.19	Flow Area (sq ft)	103.10	26.31	1208.61
E.G. Slope (ft/ft)	0.056886	Area (sq ft)	103.10	26.31	1208.61
Q Total (cfs)	6000.00	Flow (cfs)	160.71	199.80	5639.50
Top Width (ft)	2246.89	Top Width (ft)	674.35	44.19	1528.35
Vel Total (ft/s)	4.48	Avg. Vel. (ft/s)	1.56	7.59	4.67
Max Chl Dpth (ft)	2.82	Hydr. Depth (ft)	0.15	0.60	0.79
Conv. Total (cfs)	25156.4	Conv. (cfs)	673.8	837.7	23644.9
Length Wtd. (ft)		Wetted Per. (ft)	674.45	44.26	1529.18
Min Ch El (ft)	1235.48	Shear (lb/sq ft)	0.54	2.11	2.81
Alpha	1.12	Stream Power (lb/ft s)	0.85	16.03	13.10
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning: Divided flow computed for this cross-section.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
7230.77	8602.53	95.11	19.24	31.06	4.76	0.62	4.94
8602.53	9974.30	11.33	3.12	7.99	0.57	0.39	3.63
LB 9974.30	9990.97	7.66	1.70	8.87	0.38	0.19	4.51
9990.97	10007.63	17.97	3.65	16.67	0.90	0.22	4.93
10007.63	RB 10024.30	7.66	1.70	8.87	0.38	0.19	4.51
10024.30	10338.43	11.00	4.71	17.01	0.55	0.28	2.34
10338.43	10652.56	30.25	11.23	32.81	1.51	0.34	2.69
10652.56	10966.69	37.49	13.20	35.57	1.87	0.37	2.84
10966.69	11280.81	134.03	67.74	314.28	6.70	0.22	1.98
11280.81	11594.94	138.23	69.00	314.18	6.91	0.22	2.00
11594.94	11909.07	181.98	81.37	314.13	9.10	0.26	2.24
11909.07	12223.20	1327.29	261.91	296.43	66.36	0.88	5.07

Warning: Divided flow computed for this cross-section.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
7230.77	8602.53	147.87	26.19	33.23	3.70	0.79	5.65
8602.53	9974.30	21.13	5.07	10.17	0.53	0.50	4.16
LB 9974.30	9990.97	25.11	3.85	11.04	0.63	0.35	6.52
9990.97	10007.63	54.86	7.26	16.67	1.37	0.44	7.56
10007.63	RB 10024.30	25.11	3.85	11.04	0.63	0.35	6.52
10024.30	10338.43	29.41	8.85	21.36	0.74	0.42	3.32
10338.43	10652.56	71.34	18.80	37.17	1.78	0.51	3.80
10652.56	10966.69	71.19	29.67	116.67	1.78	0.25	2.40
10966.69	11280.81	463.85	135.77	314.28	11.60	0.43	3.42
11280.81	11594.94	471.12	137.02	314.18	11.78	0.44	3.44
11594.94	11909.07	544.18	149.39	314.13	13.60	0.48	3.64
11909.07	12223.20	2074.84	326.10	297.03	51.87	1.10	6.36

Warning: Divided flow computed for this cross-section.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
7230.77	8602.53	100.03	44.65	130.96	1.67	0.34	2.24
8602.53	9974.30	60.68	58.45	543.50	1.01	0.11	1.04
LB 9974.30	9990.97	50.03	7.25	13.80	0.83	0.53	6.90
9990.97	10007.63	99.74	11.82	16.67	1.66	0.71	8.44
10007.63	RB 10024.30	50.03	7.25	13.80	0.83	0.53	6.90
10024.30	10338.43	53.67	15.44	26.87	0.89	0.58	3.48
10338.43	10652.56	117.42	29.71	42.67	1.96	0.70	3.95
10652.56	10966.69	187.22	75.66	219.27	3.12	0.35	2.47
10966.69	11280.81	884.51	221.82	314.28	14.74	0.71	3.99
11280.81	11594.94	893.07	223.07	314.18	14.88	0.71	4.00
11594.94	11909.07	977.23	235.44	314.13	16.29	0.75	4.15
11909.07	12223.20	2526.37	407.48	297.78	42.11	1.37	6.20

Warning: Divided flow computed for this cross-section.

CROSS SECTION RIVER: Bridge
REACH: SR51 Bridge RS: 0.1687

INPUT
Description: First Cross Section Downstream of Junction
Bridge Loop
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9902.25	1350.2	9922.85	1348.2	9924.15	1348.1	9924.75	1348	9925.35	1347.9
9938.95	1346	9943.75	1346	9991.55	1344	9992.25	1344	9999.55	1343.1
10000.45	1343.1	10016.85	1344	10019.45	1343.9	10019.85	1344	10027.45	1344.6
10034.85	1345.2	10039.35	1345.5	10041.05	1345.6	10041.95	1345.6	10045.35	1345.8
10047.85	1345.8	10048.35	1345.8	10053.65	1346	10061.45	1346.2	10068.95	1346.6
10071.15	1346.9	10079.65	1347.8	10081.45	1348	10100.35	1348.7	10104.45	1349
10112.15	1349.4	10120.85	1350.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9902.25	.065	9938.95	.035	10048.35	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9938.95	10048.35	121	82	51.7	.1	.3

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1346.66	Element			
Vel Head (ft)	0.67	Wt. n-Val.		0.035	0.065
W.S. Elev (ft)	1345.99	Reach Len. (ft)	121.00	82.00	51.70
Crit W.S. (ft)	1345.99	Flow Area (sq ft)		141.56	0.47
E.G. Slope (ft/ft)	0.015973	Area (sq ft)		141.56	0.47
Q Total (cfs)	930.00	Flow (cfs)		929.72	0.28
Top Width (ft)	109.32	Top Width (ft)		104.33	5.00
Vel Total (ft/s)	6.55	Avg. Vel. (ft/s)		6.57	0.60
Max Chl Dpth (ft)	2.89	Hydr. Depth (ft)		1.36	0.09
Conv. Total (cfs)	7358.5	Conv. (cfs)		7356.2	2.2
Length Wtd. (ft)	82.00	Wetted Per. (ft)		104.53	5.00
Min Ch El (ft)	1343.10	Shear (lb/sq ft)		1.35	0.09
Alpha	1.01	Stream Power (lb/ft s)		8.87	0.06
Frctn Loss (ft)	1.26	Cum Volume (acre-ft)	0.90	6.69	15.96
C & E Loss (ft)	0.03	Cum SA (acres)	0.28	2.01	3.91

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1349.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1348.23	Reach Len. (ft)	121.00	82.00	51.70
Crit W.S. (ft)	1347.53	Flow Area (sq ft)	17.77	386.58	54.69
E.G. Slope (ft/ft)	0.005473	Area (sq ft)	17.77	386.58	54.69
Q Total (cfs)	2960.00	Flow (cfs)	31.52	2813.36	115.12
Top Width (ft)	165.07	Top Width (ft)	16.40	109.40	39.28
Vel Total (ft/s)	6.45	Avg. Vel. (ft/s)	1.77	7.28	2.11
Max Chl Dpth (ft)	5.13	Hydr. Depth (ft)	1.08	3.53	1.39
Conv. Total (cfs)	40011.1	Conv. (cfs)	426.0	38028.9	1556.1
Length Wtd. (ft)	82.05	Wetted Per. (ft)	16.55	109.60	39.38
Min Ch El (ft)	1343.10	Shear (lb/sq ft)	0.37	1.21	0.47
Alpha	1.22	Stream Power (lb/ft s)	0.65	8.77	1.00
Frctn Loss (ft)	0.62	Cum Volume (acre-ft)	1.39	9.35	24.68
C & E Loss (ft)	0.09	Cum SA (acres)	0.38	2.04	4.34

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1350.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.80	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1350.08	Reach Len. (ft)	121.00	82.00	51.70
Crit W.S. (ft)	1348.66	Flow Area (sq ft)	65.95	589.63	162.63
E.G. Slope (ft/ft)	0.003354	Area (sq ft)	65.95	589.63	162.63
Q Total (cfs)	4955.00	Flow (cfs)	131.31	4451.00	372.69
Top Width (ft)	216.16	Top Width (ft)	35.51	109.40	71.25
Vel Total (ft/s)	6.06	Avg. Vel. (ft/s)	1.99	7.55	2.29
Max Chl Dpth (ft)	6.98	Hydr. Depth (ft)	1.86	5.39	2.28
Conv. Total (cfs)	85560.2	Conv. (cfs)	2267.3	76857.4	6435.5
Length Wtd. (ft)	82.29	Wetted Per. (ft)	35.76	109.60	71.41
Min Ch El (ft)	1343.10	Shear (lb/sq ft)	0.39	1.13	0.48
Alpha	1.41	Stream Power (lb/ft s)	0.77	8.50	1.09
Frctn Loss (ft)	0.44	Cum Volume (acre-ft)	1.82	11.23	29.35
C & E Loss (ft)	0.14	Cum SA (acres)	0.47	2.07	4.67

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9938.95	9975.42	75.17	20.62	31.42	8.08	0.66	3.65
9975.42.	10011.88	622.51	77.87	36.55	66.94	2.14	7.99
10011.88	RB 10048.35	232.03	43.07	36.56	24.95	1.18	5.39
10048.35	10058.71	0.28	0.47	5.00	0.03	0.09	0.60

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9914.48	9926.72	0.54	0.96	4.20	0.02	0.23	0.56
9926.72	9938.95	30.98	16.81	12.35	1.05	1.37	1.84
LB 9938.95	9975.42	626.76	102.25	36.49	21.17	2.80	6.13
9975.42	10011.88	1314.33	159.56	36.55	44.40	4.38	8.24
10011.88	RB 10048.35	872.27	124.77	36.56	29.47	3.42	6.99
10048.35	10058.71	56.99	23.29	10.36	1.93	2.25	2.45
10058.71	10069.06	42.61	19.56	10.37	1.44	1.89	2.18
10069.06	10079.42	14.90	10.44	10.42	0.50	1.01	1.43
10079.42	10089.78	0.61	1.40	8.22	0.02	0.17	0.44

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9902.25	9914.48	4.32	5.93	11.10	0.09	0.54	0.73
9914.48	9926.72	31.93	20.51	12.31	0.64	1.68	1.56
9926.72	9938.95	95.06	39.52	12.35	1.92	3.23	2.41
LB 9938.95	9975.42	1156.00	169.94	36.49	23.33	4.66	6.80
9975.42	10011.88	1874.23	227.24	36.55	37.82	6.23	8.25
10011.88	RB 10048.35	1420.77	192.45	36.56	28.67	5.28	7.38
10048.35	10058.71	123.00	42.51	10.36	2.48	4.10	2.89
10058.71	10069.06	105.51	38.78	10.37	2.13	3.74	2.72
10069.06	10079.42	67.26	29.66	10.42	1.36	2.86	2.27
10079.42	10089.78	36.56	20.54	10.38	0.74	1.98	1.78
10089.78	10100.14	25.18	16.41	10.36	0.51	1.58	1.53
10100.14	10110.49	12.85	10.97	10.38	0.26	1.06	1.17
10110.49	10120.85	2.35	3.76	9.14	0.05	0.41	0.62

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Bridge
REACH: SR51 Bridge RS: 0.1532

INPUT
Description:
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9914.25	1350	9921.45	1348.9	9928.05	1348	9942.95	1346.5	9948.25	1346
9961.15	1344.2	9962.55	1344	9963.55	1343.9	9983.45	1342	10006.75	1342
10016.55	1342	10022.15	1343.2	10024.85	1344	10033.45	1345.8	10034.15	1346
10037.05	1347	10040.65	1348	10046.45	1348.8	10048.95	1349	10053.35	1349.1
10058.25	1349.2	10070.85	1349.7	10072.25	1349.8	10072.65	1349.9	10072.95	1349.9
10073.95	1349.8	10080.45	1350						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9914.25	.065	9962.55	.035	10040.65	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9962.55	10040.65	68.9	128	213.7	.1	.3

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1345.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.00	Wt. n-Val.	0.065	0.035	
W.S. Elev (ft)	1344.32	Reach Len. (ft)	68.90	128.00	213.70
Crit W.S. (ft)	1344.37	Flow Area (sq ft)	0.36	116.12	
E.G. Slope (ft/ft)	0.016136	Area (sq ft)	0.36	116.12	
Q Total (cfs)	930.00	Flow (cfs)	0.30	929.70	

Top Width (ft)	66.06	Top Width (ft)	2.25	63.82	
Vel Total (ft/s)	7.98	Avg. Vel. (ft/s)	0.84	8.01	
Max Chl Dpth (ft)	2.32	Hydr. Depth (ft)	0.16	1.82	
Conv. Total (cfs)	7321.2	Conv. (cfs)	2.4	7318.8	
Length Wtd. (ft)	127.98	Wetted Per. (ft)	2.27	64.19	
Min Ch El (ft)	1342.00	Shear (lb/sq ft)	0.16	1.82	
Alpha	1.01	Stream Power (lb/ft s)	0.13	14.59	
Frctn Loss (ft)	1.31	Cum Volume (acre-ft)	0.90	6.45	15.96
C & E Loss (ft)	0.03	Cum SA (acres)	0.27	1.85	3.90

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1348.30	Element			
Vel Head (ft)	1.72	Wt. n-Val.	0.065	0.035	
W.S. Elev (ft)	1346.58	Reach Len. (ft)	68.90	128.00	213.70
Crit W.S. (ft)	1346.58	Flow Area (sq ft)	24.26	271.89	
E.G. Slope (ft/ft)	0.011076	Area (sq ft)	24.26	271.89	
Q Total (cfs)	2960.00	Flow (cfs)	65.25	2894.75	
Top Width (ft)	93.62	Top Width (ft)	20.35	73.27	
Vel Total (ft/s)	9.99	Avg. Vel. (ft/s)	2.69	10.65	
Max Chl Dpth (ft)	4.58	Hydr. Depth (ft)	1.19	3.71	
Conv. Total (cfs)	28125.8	Conv. (cfs)	620.0	27505.8	
Length Wtd. (ft)	127.35	Wetted Per. (ft)	20.52	73.92	
Min Ch El (ft)	1342.00	Shear (lb/sq ft)	0.82	2.54	
Alpha	1.11	Stream Power (lb/ft s)	2.20	27.08	
Frctn Loss (ft)	1.02	Cum Volume (acre-ft)	1.33	8.73	24.65
C & E Loss (ft)	0.32	Cum SA (acres)	0.33	1.86	4.32

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates
that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1350.31	Element			
Vel Head (ft)	2.20	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1348.11	Reach Len. (ft)	68.90	128.00	213.70
Crit W.S. (ft)	1348.11	Flow Area (sq ft)	67.29	388.42	0.05
E.G. Slope (ft/ft)	0.009801	Area (sq ft)	67.29	388.42	0.05
Q Total (cfs)	4955.00	Flow (cfs)	232.88	4722.10	0.02
Top Width (ft)	114.26	Top Width (ft)	35.33	78.10	0.82
Vel Total (ft/s)	10.87	Avg. Vel. (ft/s)	3.46	12.16	0.33
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)	1.90	4.97	0.06
Conv. Total (cfs)	50051.0	Conv. (cfs)	2352.4	47698.4	0.2
Length Wtd. (ft)	126.58	Wetted Per. (ft)	35.58	78.96	0.83
Min Ch El (ft)	1342.00	Shear (lb/sq ft)	1.16	3.01	0.03
Alpha	1.20	Stream Power (lb/ft s)	4.01	36.59	0.01
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)	1.63	10.31	29.26
C & E Loss (ft)	0.38	Cum SA (acres)	0.37	1.90	4.62

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to

critical depth, the calculated water surface came back below critical depth. This indicates
that there is not a valid subcritical answer. The program defaulted to critical depth.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9946.45	9962.55	0.30	0.36	2.27	0.03	0.16	0.84
LB 9962.55	9988.58	272.20	39.49	26.13	29.27	1.52	6.89
9988.58	10014.62	553.22	60.35	26.03	59.49	2.32	9.17
10014.62	RB 10040.65	104.28	16.28	12.03	11.21	1.39	6.40

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9930.35	9946.45	0.65	0.87	4.27	0.02	0.20	0.75
9946.45	9962.55	64.59	23.39	16.25	2.18	1.45	2.76
LB 9962.55	9988.58	1032.10	98.26	26.13	34.87	3.77	10.50
9988.58	10014.62	1425.97	119.12	26.03	48.17	4.58	11.97
10014.62	RB 10040.65	436.69	54.51	21.76	14.75	2.57	8.01

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates
that there is not a valid subcritical answer. The program defaulted to critical depth.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9914.25	9930.35	0.36	0.57	3.15	0.01	0.18	0.62
9930.35	9946.45	39.54	18.57	16.18	0.80	1.15	2.13
9946.45	9962.55	192.99	48.15	16.25	3.89	2.99	4.01
LB 9962.55	9988.58	1713.40	138.30	26.13	34.58	5.31	12.39
9988.58	10014.62	2170.70	159.16	26.03	43.81	6.11	13.64
10014.62	RB 10040.65	837.99	90.96	26.79	16.91	3.49	9.21
10040.65	10046.34	0.02	0.05	0.83	0.00	0.06	0.33

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates
that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: Bridge
REACH: SR51 Bridge RS: 0.1289

INPUT
Description: Approach Section
SR 51
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

9886.9	1350	9894.8	1349.1	9909	1347	9918.9	1346	9929.4	1344.9
9933.9	1344	9947.4	1342.8	9956.4	1342	9957.5	1341.9	9959.3	1341.9
9966.9	1341.6	9985.7	1340.9	9993.9	1340.8	9995.9	1340.7	9996.3	1340.6
10000	1340.3	10014.6	1340.6	10020.6	1340.7	10021.4	1340.7	10026.3	1340.8
10028.8	1340.8	10034	1340.7	10035.1	1340.7	10036.1	1340.7	10071.8	1342
10107.6	1343.9	10110.9	1344	10114	1344.2	10120.2	1344.4	10124	1344.5
10128.5	1344.6	10140.2	1344.7	10155.4	1344.8	10155.7	1344.8	10159.2	1344.9
10160	1344.9	10166.4	1344.6	10167.5	1344.6	10168.4	1344.6	10170.8	1344.7
10175.3	1344.7	10176.3	1344.7	10177	1344.7	10180.4	1344.8	10187.4	1345
10202.7	1346	10202.8	1346	10203.2	1346.1	10218.6	1349.9	10218.9	1349.9
10220.4	1350								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9886.9	.065	9947.4	.035	10110.9	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9947.4	10110.9	67.3	101	153.2	.3	.5

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1343.22	Element			
Vel Head (ft)	0.25	Wt. n-Val.	0.065	0.035	
W.S. Elev (ft)	1342.97	Reach Len. (ft)	67.30	101.00	153.20
Crit W.S. (ft)	1342.34	Flow Area (sq ft)	0.17	233.99	
E.G. Slope (ft/ft)	0.004539	Area (sq ft)	0.17	233.99	
Q Total (cfs)	930.00	Flow (cfs)	0.05	929.95	
Top Width (ft)	144.65	Top Width (ft)	1.93	142.71	
Vel Total (ft/s)	3.97	Avg. Vel. (ft/s)	0.30	3.97	
Max Chl Dpth (ft)	2.67	Hydr. Depth (ft)	0.09	1.64	
Conv. Total (cfs)	13804.5	Conv. (cfs)	0.7	13803.8	
Length Wtd. (ft)	100.96	Wetted Per. (ft)	1.94	142.86	
Min Ch El (ft)	1340.30	Shear (lb/sq ft)	0.02	0.46	
Alpha	1.00	Stream Power (lb/ft s)	0.01	1.84	
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.90	5.94	15.96
C & E Loss (ft)	0.10	Cum SA (acres)	0.27	1.55	3.90

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1345.57	Element			
Vel Head (ft)	2.65	Wt. n-Val.	0.065	0.035	
W.S. Elev (ft)	1342.92	Reach Len. (ft)	67.30	101.00	153.20
Crit W.S. (ft)	1343.75	Flow Area (sq ft)	0.08	226.46	
E.G. Slope (ft/ft)	0.050802	Area (sq ft)	0.08	226.46	
Q Total (cfs)	2960.00	Flow (cfs)	0.06	2959.94	
Top Width (ft)	143.05	Top Width (ft)	1.34	141.72	
Vel Total (ft/s)	13.07	Avg. Vel. (ft/s)	0.78	13.07	
Max Chl Dpth (ft)	2.62	Hydr. Depth (ft)	0.06	1.60	
Conv. Total (cfs)	13132.6	Conv. (cfs)	0.3	13132.3	
Length Wtd. (ft)	101.10	Wetted Per. (ft)	1.34	141.86	
Min Ch El (ft)	1340.30	Shear (lb/sq ft)	0.19	5.06	
Alpha	1.00	Stream Power (lb/ft s)	0.15	66.18	
Frctn Loss (ft)	2.63	Cum Volume (acre-ft)	1.31	8.00	24.65
C & E Loss (ft)	0.09	Cum SA (acres)	0.31	1.55	4.32

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1347.63	Element			

Vel Head (ft)	4.21	Wt. n-Val.	0.065	0.035	
W.S. Elev (ft)	1343.42	Reach Len. (ft)	67.30	101.00	153.20
Crit W.S. (ft)	1344.69	Flow Area (sq ft)	2.19	300.50	
E.G. Slope (ft/ft)	0.060334	Area (sq ft)	2.19	300.50	
Q Total (cfs)	4955.00	Flow (cfs)	5.66	4949.34	
Top Width (ft)	158.27	Top Width (ft)	7.03	151.24	
Vel Total (ft/s)	16.37	Avg. Vel. (ft/s)	2.58	16.47	
Max Chl Dpth (ft)	3.12	Hydr. Depth (ft)	0.31	1.99	
Conv. Total (cfs)	20172.7	Conv. (cfs)	23.0	20149.6	
Length Wtd. (ft)	101.50	Wetted Per. (ft)	7.05	151.39	
Min Ch El (ft)	1340.30	Shear (lb/sq ft)	1.17	7.48	
Alpha	1.01	Stream Power (lb/ft s)	3.02	123.14	
Frctn Loss (ft)	2.51	Cum Volume (acre-ft)	1.58	9.29	29.26
C & E Loss (ft)	0.20	Cum SA (acres)	0.34	1.56	4.62

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9927.23	9947.40	0.05	0.17	1.94	0.01	0.09	0.30
LB 9947.40	10001.90	321.53	87.01	54.59	34.57	1.60	3.70
10001.90	10056.40	540.72	118.80	54.52	58.14	2.18	4.55
10056.40	RB 10110.90	67.70	28.19	33.75	7.28	0.84	2.40

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9927.23	9947.40	0.06	0.08	1.34	0.00	0.06	0.78
LB 9947.40	10001.90	1016.58	84.12	54.59	34.34	1.54	12.08
10001.90	10056.40	1735.86	115.91	54.52	58.64	2.13	14.98
10056.40	RB 10110.90	207.49	26.43	32.75	7.01	0.81	7.85

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9927.23	9947.40	5.66	2.19	7.05	0.11	0.31	2.58
LB 9947.40	10001.90	1778.02	111.67	54.59	35.88	2.05	15.92
10001.90	10056.40	2701.48	143.46	54.52	54.52	2.63	18.83
10056.40	RB 10110.90	469.84	45.37	42.29	9.48	1.07	10.35

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Bridge
REACH: SR51 Bridge RS: 0.1098

INPUT
Description: Upstream Face of Bridge
SR 51
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9938.45	1357.6	9939.25	1357.7	9939.75	1357.7	9940.25	1357.6	9943.15	1357.2
9951.75	1352.1	9962.25	1348.1	9972.7	1339.7	9999.9	1339	10000	1338.5
10094.4	1339	10094.5	1339.5	10120.4	1340.8	10183.4	1365.1		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9938.45	.065	9999.9	.035	10094.5	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9999.9	10094.5	212.9	208	209.1	.3	.5

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1343.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1342.99	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)	1340.16	Flow Area (sq ft)	105.77	401.14	79.80
E.G. Slope (ft/ft)	0.000308	Area (sq ft)	105.77	401.14	79.80
Q Total (cfs)	930.00	Flow (cfs)	93.20	777.98	58.81
Top Width (ft)	157.47	Top Width (ft)	31.29	94.60	31.58
Vel Total (ft/s)	1.59	Avg. Vel. (ft/s)	0.88	1.94	0.74
Max Chl Dpth (ft)	4.49	Hydr. Depth (ft)	3.38	4.24	2.53
Conv. Total (cfs)	53028.6	Conv. (cfs)	5314.4	44360.6	3353.6
Length Wtd. (ft)	15.00	Wetted Per. (ft)	32.46	95.42	32.02
Min Ch El (ft)	1338.50	Shear (lb/sq ft)	0.06	0.08	0.05
Alpha	1.30	Stream Power (lb/ft s)	0.06	0.16	0.04
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.82	5.20	15.82
C & E Loss (ft)	0.00	Cum SA (acres)	0.24	1.27	3.85

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1344.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.28	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1344.33	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)	1341.60	Flow Area (sq ft)	148.76	527.72	124.38
E.G. Slope (ft/ft)	0.001196	Area (sq ft)	148.76	527.72	124.38
Q Total (cfs)	2960.00	Flow (cfs)	310.98	2423.18	225.83
Top Width (ft)	162.61	Top Width (ft)	32.96	94.60	35.05
Vel Total (ft/s)	3.70	Avg. Vel. (ft/s)	2.09	4.59	1.82
Max Chl Dpth (ft)	5.83	Hydr. Depth (ft)	4.51	5.58	3.55
Conv. Total (cfs)	85586.9	Conv. (cfs)	8991.9	70065.1	6529.9
Length Wtd. (ft)	15.00	Wetted Per. (ft)	34.60	95.42	35.74
Min Ch El (ft)	1338.50	Shear (lb/sq ft)	0.32	0.41	0.26
Alpha	1.32	Stream Power (lb/ft s)	0.67	1.90	0.47
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	1.19	7.13	24.43
C & E Loss (ft)	0.00	Cum SA (acres)	0.28	1.27	4.25

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1345.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.56	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1345.22	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)	1342.63	Flow Area (sq ft)	178.56	611.85	156.57
E.G. Slope (ft/ft)	0.002004	Area (sq ft)	178.56	611.85	156.57
Q Total (cfs)	4955.00	Flow (cfs)	531.29	4013.40	410.31
Top Width (ft)	166.02	Top Width (ft)	34.07	94.60	37.36
Vel Total (ft/s)	5.23	Avg. Vel. (ft/s)	2.98	6.56	2.62
Max Chl Dpth (ft)	6.72	Hydr. Depth (ft)	5.24	6.47	4.19
Conv. Total (cfs)	110687.0	Conv. (cfs)	11868.2	89653.2	9165.6

Length Wtd. (ft)	15.00	Wetted Per. (ft)	36.02	95.42	38.21
Min Ch El (ft)	1338.50	Shear (lb/sq ft)	0.62	0.80	0.51
Alpha	1.33	Stream Power (lb/ft s)	1.85	5.26	1.34
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	1.44	8.24	28.98
C & E Loss (ft)	0.01	Cum SA (acres)	0.31	1.27	4.56

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9958.93	9979.42	21.06	29.42	11.97	2.26	2.72	0.72
9979.42	9999.90	72.14	76.35	20.49	7.76	3.73	0.94
LB 9999.90	10031.43	275.59	138.97	31.94	29.63	4.41	1.98
10031.43	10062.97	260.72	133.73	31.53	28.03	4.24	1.95
10062.97	RB 10094.50	241.67	128.44	31.94	25.99	4.07	1.88
10094.50	10107.20	33.07	40.29	12.72	3.56	3.17	0.82
10107.20	10119.90	22.75	32.19	12.72	2.45	2.53	0.71
10119.90	10132.60	2.99	7.32	6.59	0.32	1.19	0.41

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9958.93	9979.42	75.16	45.00	14.11	2.54	3.61	1.67
9979.42	9999.90	235.82	103.76	20.49	7.97	5.07	2.27
LB 9999.90	10031.43	845.65	181.16	31.94	28.57	5.75	4.67
10031.43	10062.97	812.23	175.92	31.53	27.44	5.58	4.62
10062.97	RB 10094.50	765.30	170.63	31.94	25.85	5.41	4.49
10094.50	10107.20	116.32	57.28	12.72	3.93	4.51	2.03
10107.20	10119.90	90.23	49.19	12.72	3.05	3.87	1.83
10119.90	10132.60	19.28	17.91	10.31	0.65	1.86	1.08

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9958.93	9979.42	133.17	56.59	15.53	2.69	4.17	2.35
9979.42	9999.90	398.12	121.97	20.49	8.03	5.95	3.26
LB 9999.90	10031.43	1391.42	209.21	31.94	28.08	6.63	6.65
10031.43	10062.97	1345.35	203.97	31.53	27.15	6.47	6.60
10062.97	RB 10094.50	1276.64	198.67	31.94	25.76	6.30	6.43
10094.50	10107.20	202.25	68.58	12.72	4.08	5.40	2.95
10107.20	10119.90	164.04	60.48	12.72	3.31	4.76	2.71
10119.90	10132.60	44.02	27.52	12.78	0.89	2.30	1.60

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

```
BRIDGE                    RIVER: Bridge
REACH: SR51 Bridge           RS: 0.0899

INPUT
Description: SR 51 Bridge over Northern Avenue
Distance from Upstream XS =      15
Deck/Roadway Width        =     180
Weir Coefficient          =     2.6
Bridge Deck/Roadway Skew  =
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
    9800    1361    1356   10200    1361    1356

Upstream Bridge Cross Section Data
Station Elevation Data    num=      14
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 9938.45  1357.6 9939.25  1357.7 9939.75  1357.7 9940.25  1357.6 9943.15  1357.2
 9951.75  1352.1 9962.25  1348.1  9972.7  1339.7  9999.9    1339   10000  1338.5
 10094.4    1339 10094.5  1339.5 10120.4  1340.8 10183.4  1365.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 9938.45    .065  9999.9    .035 10094.5    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9999.9 10094.5             .3       .5

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
    9800    1361    1356   10200    1361    1356

Downstream Bridge Cross Section Data
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 9812.75    1358  9876.2  1339.2  9905.2  1338.4  9905.3  1337.9   10000  1337.7
 10000.1  1338.2 10025.5  1339.7 10075.5  1360.110076.55    136010078.75  1360.1
10094.65  1360.210098.65  1360.3 10141.5    1360

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 9812.75    .065  9905.2    .035 10000.1    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9905.2 10000.1             .3       .5

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  1

Pier Data
Pier Station     Upstream= 10047.2    Downstream=  9952.6
Upstream     num=       2
    Width   Elev    Width   Elev
        4   1000        4   1357
Downstream     num=       2
    Width   Elev    Width   Elev
        4   1000        4   1357

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT    Profile #1/3 Spillway
Opening : Bridge #1

  E.G. US. (ft)                1343.04   Element                  Inside BR US  Inside BR DS
  W.S. US. (ft)                1342.99   E.G. Elev (ft)                1343.04       1342.98
```

Q Total (cfs)	930.00	W.S. Elev (ft)	1342.98	1342.95
Q Bridge (cfs)	930.00	Crit W.S. (ft)	1340.19	1339.29
Q Weir (cfs)		Max Chl Dpth (ft)	4.48	5.25
Weir Sta Lft (ft)		Vel Total (ft/s)	1.64	1.28
Weir Sta Rgt (ft)		Flow Area (sq ft)	568.54	726.22
Weir Submerg		Froude # Chl	0.17	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	1162.13	1744.13
Min Top Rd (ft)	1361.00	Hydr Depth (ft)	3.71	4.38
Min El Prs (ft)	1356.00	W.P. Total (ft)	164.34	178.25
Delta EG (ft)	0.06	Conv. Total (cfs)	48546.3	68150.4
Delta WS (ft)	0.05	Top Width (ft)	153.44	165.90
BR Open Area (sq ft)	2926.93	Frctn Loss (ft)	0.05	0.00
BR Open Vel (ft/s)	1.64	C & E Loss (ft)	0.01	0.00
Coef of Q		Shear Total (lb/sq ft)	0.08	0.05
Br Sel Method	Energy only	Power Total (lb/ft s)	0.13	0.06

BRIDGE OUTPUT Profile #2/3 Spillway
Opening : Bridge #1

		Element	Inside BR US	Inside BR DS
E.G. US. (ft)	1344.61	E.G. Elev (ft)	1344.58	1344.33
W.S. US. (ft)	1344.33	W.S. Elev (ft)	1344.29	1344.12
Q Total (cfs)	2960.00	Crit W.S. (ft)	1341.66	1340.75
Q Bridge (cfs)	2960.00	Max Chl Dpth (ft)	5.79	6.42
Q Weir (cfs)		Vel Total (ft/s)	3.83	3.20
Weir Sta Lft (ft)		Flow Area (sq ft)	772.74	925.59
Weir Sta Rgt (ft)		Froude # Chl	0.35	0.28
Weir Submerg		Specif Force (cu ft)	2375.05	3002.06
Weir Max Depth (ft)		Hydr Depth (ft)	4.88	5.36
Min Top Rd (ft)	1361.00	W.P. Total (ft)	172.68	187.87
Min El Prs (ft)	1356.00	Conv. Total (cfs)	76789.7	96987.7
Delta EG (ft)	0.29	Top Width (ft)	158.47	172.76
Delta WS (ft)	0.21	Frctn Loss (ft)	0.21	0.01
BR Open Area (sq ft)	2926.93	C & E Loss (ft)	0.04	0.00
BR Open Vel (ft/s)	3.83	Shear Total (lb/sq ft)	0.42	0.29
Coef of Q		Power Total (lb/ft s)	1.59	0.92
Br Sel Method	Energy only			

BRIDGE OUTPUT Profile #Full Spillway
Opening : Bridge #1

		Element	Inside BR US	Inside BR DS
E.G. US. (ft)	1345.78	E.G. Elev (ft)	1345.74	1345.29
W.S. US. (ft)	1345.22	W.S. Elev (ft)	1345.15	1344.83
Q Total (cfs)	4955.00	Crit W.S. (ft)	1342.70	1341.78
Q Bridge (cfs)	4955.00	Max Chl Dpth (ft)	6.65	7.13
Q Weir (cfs)		Vel Total (ft/s)	5.45	4.72
Weir Sta Lft (ft)		Flow Area (sq ft)	910.00	1048.81
Weir Sta Rgt (ft)		Froude # Chl	0.47	0.40
Weir Submerg		Specif Force (cu ft)	3631.30	4180.90
Weir Max Depth (ft)		Hydr Depth (ft)	5.63	5.93
Min Top Rd (ft)	1361.00	W.P. Total (ft)	178.15	193.63
Min El Prs (ft)	1356.00	Conv. Total (cfs)	97855.9	116127.5
Delta EG (ft)	0.52	Top Width (ft)	161.76	176.87
Delta WS (ft)	0.41	Frctn Loss (ft)	0.39	0.02
BR Open Area (sq ft)	2926.93	C & E Loss (ft)	0.07	0.00
BR Open Vel (ft/s)	5.45	Shear Total (lb/sq ft)	0.82	0.62
Coef of Q		Power Total (lb/ft s)	4.45	2.91
Br Sel Method	Energy only			

CROSS SECTION RIVER: Bridge
REACH: SR51 Bridge RS: 0.0704

INPUT
Description: Dounstream Face of Bridge
SR 51
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9812.75	1358	9876.2	1339.2	9905.2	1338.4	9905.3	1337.9	10000	1337.7
10000.1	1338.2	10025.5	1339.7	10075.5	1360.1	10076.55	1360	10078.75	1360.1

```
10094.65  1360.210098.65  1360.3 10141.5    1360

Manning's n Values          num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
 9812.75    .065  9905.2    .035 10000.1    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        9905.2 10000.1             103.9     128   170.6              .3       .5
```

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1342.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1342.95	Reach Len. (ft)	103.90	128.00	170.60
Crit W.S. (ft)	1339.25	Flow Area (sq ft)	143.89	488.25	114.39
E.G. Slope (ft/ft)	0.000155	Area (sq ft)	143.89	488.25	114.39
Q Total (cfs)	930.00	Flow (cfs)	92.73	764.26	73.01
Top Width (ft)	169.90	Top Width (ft)	41.64	94.90	33.36
Vel Total (ft/s)	1.25	Avg. Vel. (ft/s)	0.64	1.57	0.64
Max Chl Dpth (ft)	5.25	Hydr. Depth (ft)	3.46	5.14	3.43
Conv. Total (cfs)	74742.8	Conv. (cfs)	7452.5	61422.7	5867.6
Length Wtd. (ft)	129.84	Wetted Per. (ft)	42.19	95.72	34.04
Min Ch El (ft)	1337.70	Shear (lb/sq ft)	0.03	0.05	0.03
Alpha	1.34	Stream Power (lb/ft s)	0.02	0.08	0.02
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.22	3.16	15.36
C & E Loss (ft)	0.02	Cum SA (acres)	0.07	0.84	3.69

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1344.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1344.12	Reach Len. (ft)	103.90	128.00	170.60
Crit W.S. (ft)	1340.68	Flow Area (sq ft)	194.93	599.30	155.10
E.G. Slope (ft/ft)	0.000762	Area (sq ft)	194.93	599.30	155.10
Q Total (cfs)	2960.00	Flow (cfs)	320.62	2385.55	253.83
Top Width (ft)	176.71	Top Width (ft)	45.59	94.90	36.22
Vel Total (ft/s)	3.12	Avg. Vel. (ft/s)	1.64	3.98	1.64
Max Chl Dpth (ft)	6.42	Hydr. Depth (ft)	4.28	6.32	4.28
Conv. Total (cfs)	107242.4	Conv. (cfs)	11616.3	86429.8	9196.3
Length Wtd. (ft)	132.00	Wetted Per. (ft)	46.31	95.72	37.13
Min Ch El (ft)	1337.70	Shear (lb/sq ft)	0.20	0.30	0.20
Alpha	1.37	Stream Power (lb/ft s)	0.33	1.19	0.33
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	0.38	4.55	23.77
C & E Loss (ft)	0.02	Cum SA (acres)	0.10	0.84	4.08

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1345.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1344.81	Reach Len. (ft)	103.90	128.00	170.60
Crit W.S. (ft)	1341.71	Flow Area (sq ft)	227.40	665.20	180.85
E.G. Slope (ft/ft)	0.001479	Area (sq ft)	227.40	665.20	180.85
Q Total (cfs)	4955.00	Flow (cfs)	558.01	3954.69	442.30
Top Width (ft)	180.76	Top Width (ft)	47.93	94.90	37.92
Vel Total (ft/s)	4.62	Avg. Vel. (ft/s)	2.45	5.95	2.45
Max Chl Dpth (ft)	7.11	Hydr. Depth (ft)	4.74	7.01	4.77
Conv. Total (cfs)	128858.1	Conv. (cfs)	14511.4	102844.5	11502.3
Length Wtd. (ft)	132.83	Wetted Per. (ft)	48.76	95.72	38.97
Min Ch El (ft)	1337.70	Shear (lb/sq ft)	0.43	0.64	0.43
Alpha	1.38	Stream Power (lb/ft s)	1.06	3.81	1.05
Frctn Loss (ft)	0.29	Cum Volume (acre-ft)	0.47	5.32	28.18
C & E Loss (ft)	0.00	Cum SA (acres)	0.11	0.84	4.38

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9843.57	9874.38	6.18	17.36	11.29	0.66	1.60	0.36
9874.38	9905.20	86.55	126.53	30.91	9.31	4.11	0.68
LB 9905.20	9936.83	248.51	160.63	32.04	26.72	5.08	1.55
9936.83	9968.47	256.25	162.77	31.63	27.55	5.15	1.57
9968.47	RB 10000.10	259.50	164.85	32.04	27.90	5.21	1.57
10000.10	10020.30	58.86	83.81	20.24	6.33	4.15	0.70
10020.30	10040.50	14.15	30.58	13.80	1.52	2.32	0.46

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9843.57	9874.38	31.19	32.34	15.41	1.05	2.19	0.96
9874.38	9905.20	289.43	162.59	30.91	9.78	5.28	1.78
LB 9905.20	9936.83	778.88	197.64	32.04	26.31	6.25	3.94
9936.83	9968.47	799.84	199.79	31.63	27.02	6.32	4.00
9968.47	RB 10000.10	806.84	201.87	32.04	27.26	6.38	4.00
10000.10	10020.30	196.63	107.45	20.24	6.64	5.32	1.83
10020.30	10040.50	57.20	47.66	16.90	1.93	2.97	1.20

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9843.57	9874.38	64.14	43.41	17.85	1.29	2.94	1.48
9874.38	9905.20	493.87	183.99	30.91	9.97	5.97	2.68
LB 9905.20	9936.83	1293.50	219.61	32.04	26.10	6.94	5.89
9936.83	9968.47	1325.94	221.76	31.63	26.76	7.01	5.98
9968.47	RB 10000.10	1335.26	223.84	32.04	26.95	7.08	5.97
10000.10	10020.30	335.27	121.48	20.24	6.77	6.01	2.76
10020.30	10040.50	107.03	59.37	18.74	2.16	3.35	1.80

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Bridge
REACH: SR51 Bridge RS: 0.0462

INPUT
Description: Exit Section
SR 51
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9877.5	1352	9882.2	1351.1	9887.4	1350	9891.6	1348.9	9895.5	1348
9898.8	1347.1	9903.5	1346	9910.4	1344.5	9912.5	1344	9920.2	1342.6
9923.2	1342	9928.9	1341.5	9930.8	1341.4	9944.1	1341.5	9945.3	1341.4
9959.5	1341.1	9987.5	1340	9987.7	1340	9989.9	1339.7	10000	1339.4
10011.1	1339.7	10019.3	1340	10027.3	1340	10031.2	1340.1	10031.7	1340.1
10035.4	1340.2	10048	1340.6	10074.2	1341.5	10077.7	1341.6	10082.9	1341.7
10090.1	1341.9	10090.6	1341.9	10094.8	1342	10097.2	1341.9	10099.6	1341.9
10106.7	1342	10118	1342	10123.8	1342	10125.1	1342	10126.9	1342
10135.9	1342	10137.5	1342	10144.4	1342.3	10152.9	1342.4	10169.1	1342.8
10236.7	1342.3	10251.6	1342	10256.2	1342	10262.4	1342	10617.5	1342
10688.9	1344	10767.4	1346						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9877.5	.065	9920.2	.035	10094.8	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9920.2	10094.8	103.7	165	173.5	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
10289.4	10767.4	1346

CROSS SECTION OUTPUT Profile #1/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1342.92	Element			
Vel Head (ft)	0.08	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1342.83	Reach Len. (ft)	103.70	165.00	173.50
Crit W.S. (ft)	1341.63	Flow Area (sq ft)	0.15	362.83	110.05
E.G. Slope (ft/ft)	0.001205	Area (sq ft)	0.15	362.83	396.44
Q Total (cfs)	930.00	Flow (cfs)	0.03	870.25	59.72
Top Width (ft)	728.40	Top Width (ft)	1.29	174.60	552.51
Vel Total (ft/s)	1.97	Avg. Vel. (ft/s)	0.19	2.40	0.54
Max Chl Dpth (ft)	3.43	Hydr. Depth (ft)	0.12	2.08	0.57
Conv. Total (cfs)	26787.9	Conv. (cfs)	0.8	25066.8	1720.3
Length Wtd. (ft)	165.49	Wetted Per. (ft)	1.31	174.78	194.62
Min Ch El (ft)	1339.40	Shear (lb/sq ft)	0.01	0.16	0.04
Alpha	1.40	Stream Power (lb/ft s)	0.00	0.37	0.02
Frctn Loss (ft)	0.51	Cum Volume (acre-ft)	0.05	1.91	14.36
C & E Loss (ft)	0.03	Cum SA (acres)	0.02	0.44	2.55

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1344.13	Element			
Vel Head (ft)	0.28	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1343.86	Reach Len. (ft)	103.70	165.00	173.50
Crit W.S. (ft)	1342.91	Flow Area (sq ft)	4.34	541.11	308.76
E.G. Slope (ft/ft)	0.002563	Area (sq ft)	4.34	541.11	979.23
Q Total (cfs)	2960.00	Flow (cfs)	3.64	2470.33	486.03
Top Width (ft)	770.47	Top Width (ft)	6.91	174.60	588.96
Vel Total (ft/s)	3.47	Avg. Vel. (ft/s)	0.84	4.57	1.57
Max Chl Dpth (ft)	4.46	Hydr. Depth (ft)	0.63	3.10	1.59
Conv. Total (cfs)	58472.6	Conv. (cfs)	72.0	48799.5	9601.1
Length Wtd. (ft)	166.79	Wetted Per. (ft)	7.02	174.78	194.62
Min Ch El (ft)	1339.40	Shear (lb/sq ft)	0.10	0.50	0.25
Alpha	1.48	Stream Power (lb/ft s)	0.08	2.26	0.40
Frctn Loss (ft)	0.81	Cum Volume (acre-ft)	0.14	2.87	21.55
C & E Loss (ft)	0.03	Cum SA (acres)	0.03	0.44	2.86

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1344.98	Element			
Vel Head (ft)	0.46	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1344.52	Reach Len. (ft)	103.70	165.00	173.50
Crit W.S. (ft)	1343.57	Flow Area (sq ft)	9.97	657.19	438.13
E.G. Slope (ft/ft)	0.003407	Area (sq ft)	9.97	657.19	1379.14
Q Total (cfs)	4955.00	Flow (cfs)	13.21	3937.68	1004.12
Top Width (ft)	799.04	Top Width (ft)	9.90	174.60	614.54
Vel Total (ft/s)	4.48	Avg. Vel. (ft/s)	1.32	5.99	2.29
Max Chl Dpth (ft)	5.12	Hydr. Depth (ft)	1.01	3.76	2.25
Conv. Total (cfs)	84895.7	Conv. (cfs)	226.2	67465.6	17203.9
Length Wtd. (ft)	167.13	Wetted Per. (ft)	10.08	174.78	194.62
Min Ch El (ft)	1339.40	Shear (lb/sq ft)	0.21	0.80	0.48
Alpha	1.47	Stream Power (lb/ft s)	0.28	4.79	1.10
Frctn Loss (ft)	1.01	Cum Volume (acre-ft)	0.19	3.38	25.13

C & E Loss (ft)	0.03	Cum SA (acres)	0.04	0.44	3.10

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9905.97	9920.20	0.03	0.15	1.31	0.00	0.12	0.19
LB 9920.20	9978.40	177.39	92.82	58.31	19.07	1.59	1.91
9978.40	10036.60	503.07	173.40	58.24	54.09	2.98	2.90
10036.60	RB 10094.80	189.79	96.60	58.23	20.41	1.66	1.96
10094.80	10190.89	26.93	51.54	96.10	2.90	0.54	0.52
10190.89	10286.97	31.37	56.48	96.09	3.37	0.59	0.56
10286.97	10383.06	1.42	2.03	2.43	0.15	0.83	0.70

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9905.97	9920.20	3.64	4.34	7.02	0.12	0.63	0.84
LB 9920.20	9978.40	606.34	152.25	58.31	20.48	2.62	3.98
9978.40	10036.60	1231.74	232.83	58.24	41.61	4.00	5.29
10036.60	RB 10094.80	632.25	156.03	58.23	21.36	2.68	4.05
10094.80	10190.89	232.59	149.65	96.10	7.86	1.56	1.55
10190.89	10286.97	245.56	154.60	96.09	8.30	1.61	1.59
10286.97	10383.06	7.88	4.51	2.43	0.27	1.86	1.75

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9905.97	9920.20	13.20	9.97	10.08	0.27	1.01	1.32
LB 9920.20	9978.40	1027.11	190.94	58.31	20.73	3.28	5.38
9978.40	10036.60	1848.34	271.52	58.24	37.30	4.67	6.81
10036.60	RB 10094.80	1062.24	194.72	58.23	21.44	3.35	5.46
10094.80	10190.89	485.04	213.53	96.10	9.79	2.22	2.27
10190.89	10286.97	503.95	218.48	96.09	10.17	2.27	2.31
10286.97	10383.06	15.13	6.12	2.43	0.31	2.52	2.47

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Bridge
REACH: SR51 Bridge RS: 0.0149

INPUT
Description: Last Cross Section
Bridge Loop
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9848.6	1344	9852	1343.4	9855.7	1343.5	9856.1	1343.5	9856.5	1343.5
9857.4	1343.5	9861	1343.3	9862.3	1343.2	9863.5	1343.2	9868.7	1343.3
9874.6	1343.3	9875.4	1343.3	9882.7	1342	10000	1340	10009.6	1340.6
10014.6	1340.7	10022.2	1340.9	10023.8	1341	10034.4	1341.3	10036.8	1341.4
10042.5	1341.5	10044.7	1341.6	10047.5	1341.6	10048.1	1341.7	10049.3	1341.6

10077.5	1342	10187	1341.5	10192.2	1341.5	10236	1341.9	10241	1342
10241.2	1342	10241.3	1342	10241.4	1342	10241.5	1342	10241.6	1342
10242.3	1342	10243.9	1342	10461.8	1342	10533	1332	10551.1	1330
10590	1334	10757.4	1338	10789.4	1330	10847.4	1340	10921.4	1342
11051	1344	11109.4	1346						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9848.6	.065	9882.7	.035	10077.5	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9882.7	10077.5	94.5	79	162.4	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
10461.9	11109.4	1346

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1342.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.41	Wt. n-Val.		0.035	0.065
W.S. Elev (ft)	1341.97	Reach Len. (ft)	147.00	147.00	147.00
Crit W.S. (ft)	1341.97	Flow Area (sq ft)		167.74	38.80
E.G. Slope (ft/ft)	0.018282	Area (sq ft)		167.74	2710.20
Q Total (cfs)	930.00	Flow (cfs)		882.52	47.48
Top Width (ft)	805.27	Top Width (ft)		191.11	614.16
Vel Total (ft/s)	4.50	Avg. Vel. (ft/s)		5.26	1.22
Max Chl Dpth (ft)	11.97	Hydr. Depth (ft)		0.88	0.25
Conv. Total (cfs)	6878.1	Conv. (cfs)		6526.9	351.1
Length Wtd. (ft)	147.00	Wetted Per. (ft)		191.18	155.82
Min Ch El (ft)	1340.00	Shear (lb/sq ft)		1.00	0.28
Alpha	1.30	Stream Power (lb/ft s)		5.27	0.35
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	0.02	0.57	7.25
C & E Loss (ft)	0.01	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1343.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1342.77	Reach Len. (ft)	147.00	147.00	147.00
Crit W.S. (ft)	1342.77	Flow Area (sq ft)	1.67	323.45	339.74
E.G. Slope (ft/ft)	0.012550	Area (sq ft)	1.67	323.45	3397.77
Q Total (cfs)	2960.00	Flow (cfs)	2.24	2156.50	801.26
Top Width (ft)	1092.99	Top Width (ft)	4.33	194.80	893.86
Vel Total (ft/s)	4.45	Avg. Vel. (ft/s)	1.34	6.67	2.36
Max Chl Dpth (ft)	12.77	Hydr. Depth (ft)	0.39	1.66	0.88
Conv. Total (cfs)	26422.7	Conv. (cfs)	20.0	19250.2	7152.5
Length Wtd. (ft)	147.00	Wetted Per. (ft)	4.40	194.87	384.41
Min Ch El (ft)	1340.00	Shear (lb/sq ft)	0.30	1.30	0.69
Alpha	1.71	Stream Power (lb/ft s)	0.40	8.67	1.63
Frctn Loss (ft)	1.08	Cum Volume (acre-ft)	0.06	0.95	9.86
C & E Loss (ft)	0.04	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross

section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1343.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.73	Wt. n-Val.	0.065	0.035	0.065
W.S. Elev (ft)	1343.21	Reach Len. (ft)	147.00	147.00	147.00
Crit W.S. (ft)	1343.21	Flow Area (sq ft)	4.17	409.86	510.26
E.G. Slope (ft/ft)	0.013453	Area (sq ft)	4.17	409.86	3800.67
Q Total (cfs)	4955.00	Flow (cfs)	7.80	3313.10	1634.11
Top Width (ft)	1126.38	Top Width (ft)	8.97	194.80	922.61
Vel Total (ft/s)	5.36	Avg. Vel. (ft/s)	1.87	8.08	3.20
Max Chl Dpth (ft)	13.21	Hydr. Depth (ft)	0.46	2.10	1.33
Conv. Total (cfs)	42720.4	Conv. (cfs)	67.2	28564.4	14088.7
Length Wtd. (ft)	147.00	Wetted Per. (ft)	9.08	194.87	384.41
Min Ch El (ft)	1340.00	Shear (lb/sq ft)	0.39	1.77	1.11
Alpha	1.64	Stream Power (lb/ft s)	0.72	14.28	3.57
Frctn Loss (ft)	1.51	Cum Volume (acre-ft)	0.08	1.14	11.16
C & E Loss (ft)	0.09	Cum SA (acres)			

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
LB 9882.70	9947.63	112.10	34.12	63.27	12.05	0.54	3.29
9947.63	10012.57	659.99	99.89	64.96	70.97	1.54	6.61
10012.57	RB 10077.50	110.44	33.74	62.95	11.88	0.54	3.27
10077.50	10224.91	46.50	37.32	141.16	5.00	0.26	1.25
10224.91	10372.33	0.97	1.48	14.66	0.10	0.10	0.66

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9871.33	9882.70	2.24	1.67	4.40	0.08	0.39	1.34
LB 9882.70	9947.63	471.92	86.01	64.94	15.94	1.32	5.49
9947.63	10012.57	1216.22	151.80	64.96	41.09	2.34	8.01
10012.57	RB 10077.50	468.38	85.63	64.96	15.82	1.32	5.47
10077.50	10224.91	405.82	155.10	147.42	13.71	1.05	2.62

10224.91	10372.33	248.56	115.58	147.42	8.40	0.78	2.15
10372.33	10519.74	146.87	69.06	89.57	4.96	0.77	2.13

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9859.97	9871.33	0.00	0.02	2.15	0.00	0.01	0.13
9871.33	9882.70	7.79	4.14	6.93	0.16	0.61	1.88
LB 9882.70	9947.63	803.84	114.81	64.94	16.22	1.77	7.00
9947.63	10012.57	1709.99	180.61	64.96	34.51	2.78	9.47
10012.57	RB 10077.50	799.28	114.44	64.96	16.13	1.76	6.98
10077.50	10224.91	760.42	220.49	147.42	15.35	1.50	3.45
10224.91	10372.33	547.10	180.97	147.42	11.04	1.23	3.02
10372.33	10519.74	326.57	108.79	89.57	6.59	1.21	3.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: Culvert
REACH: SR51 Culvert RS: 19.395

INPUT
Description: SR51 Reach
Upstream Face SR 51 Box Culvert
Cross Section Data
Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9820.8	1358	9839.25	1356.3	9843.7	1356	9860.75	1354.8	9872.85	1354
9876.75	1353.6	9878.15	1353.4	9888.55	1352.3	9889.65	1352.2	9889.75	1352.2
9891.35	1352.3	9892.45	1352.3	9893.95	1352.3	9895.05	1352.3	9914.35	1352
9914.55	1352	9914.65	1352	9915.35	1352	9919.35	1351.8	9924.55	1351.1
9929.1	1350	9933.15	1349.1	9938.95	1348	9944.05	1346.6	9946.15	1346
9948.15	1345.4	9954.45	1344	9960.75	1342.1	9961.15	1342	9961.35	1341.9
9966.85	1340	9969.05	1339	9971.45	1338	9976.55	1336.5	9978.2	1336
9983.6	1331	10006.4	1331	10013.9	1331	10014.5	1331	10016.3	1331
10022.2	1336	10028.35	1337.7	10028.65	1337.8	10028.95	1338	10030.05	1338.3
10034.75	1340	10038.15	1341.2	10044.3	1342	10047.25	1342.3	10047.55	1342.3
10048	1360								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9820.8	.045	9978.2	.04	10022.2	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9978.2	10022.2	517.7	511	504.9	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9820.8	9974.5	1335	10025.5	10048	1335

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1346.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.045	0.040	0.045
W.S. Elev (ft)	1346.69	Reach Len. (ft)	517.70	511.00	504.90
Crit W.S. (ft)	1334.09	Flow Area (sq ft)	173.46	662.06	177.60
E.G. Slope (ft/ft)	0.000037	Area (sq ft)	173.46	662.06	177.60
Q Total (cfs)	1070.00	Flow (cfs)	98.46	857.21	114.33
Top Width (ft)	103.93	Top Width (ft)	34.47	44.00	25.46
Vel Total (ft/s)	1.06	Avg. Vel. (ft/s)	0.57	1.29	0.64
Max Chl Dpth (ft)	15.69	Hydr. Depth (ft)	5.03	15.05	6.98
Conv. Total (cfs)	177072.5	Conv. (cfs)	16294.1	141857.9	18920.6
Length Wtd. (ft)	511.00	Wetted Per. (ft)	36.15	47.79	30.65
Min Ch El (ft)	1331.00	Shear (lb/sq ft)	0.01	0.03	0.01
Alpha	1.27	Stream Power (lb/ft s)	0.01	0.04	0.01
Frctn Loss (ft)		Cum Volume (acre-ft)	1.23	7.30	22.90
C & E Loss (ft)		Cum SA (acres)	0.29	0.60	4.35

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1349.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.045	0.040	0.045
W.S. Elev (ft)	1348.99	Reach Len. (ft)	517.70	511.00	504.90
Crit W.S. (ft)	1334.05	Flow Area (sq ft)	263.12	763.19	236.19
E.G. Slope (ft/ft)	0.000019	Area (sq ft)	263.12	763.19	236.19
Q Total (cfs)	1040.00	Flow (cfs)	121.53	790.91	127.55
Top Width (ft)	113.98	Top Width (ft)	44.46	44.00	25.52
Vel Total (ft/s)	0.82	Avg. Vel. (ft/s)	0.46	1.04	0.54
Max Chl Dpth (ft)	17.99	Hydr. Depth (ft)	5.92	17.35	9.26
Conv. Total (cfs)	236402.5	Conv. (cfs)	27626.1	179782.7	28993.7
Length Wtd. (ft)	511.00	Wetted Per. (ft)	46.41	47.79	32.95
Min Ch El (ft)	1331.00	Shear (lb/sq ft)	0.01	0.02	0.01
Alpha	1.29	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	2.12	9.23	35.11
C & E Loss (ft)		Cum SA (acres)	0.39	0.60	5.05

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1350.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.045	0.040	0.045
W.S. Elev (ft)	1350.88	Reach Len. (ft)	517.70	511.00	504.90
Crit W.S. (ft)	1334.05	Flow Area (sq ft)	355.57	846.66	284.65
E.G. Slope (ft/ft)	0.000013	Area (sq ft)	355.57	846.66	284.65
Q Total (cfs)	1045.00	Flow (cfs)	145.64	763.28	136.08
Top Width (ft)	122.33	Top Width (ft)	52.76	44.00	25.57
Vel Total (ft/s)	0.70	Avg. Vel. (ft/s)	0.41	0.90	0.48
Max Chl Dpth (ft)	19.88	Hydr. Depth (ft)	6.74	19.24	11.13
Conv. Total (cfs)	292624.9	Conv. (cfs)	40784.0	213735.6	38105.2
Length Wtd. (ft)	511.00	Wetted Per. (ft)	54.92	47.79	34.87
Min Ch El (ft)	1331.00	Shear (lb/sq ft)	0.01	0.01	0.01
Alpha	1.31	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	2.86	10.34	40.56
C & E Loss (ft)		Cum SA (acres)	0.46	0.60	5.60

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9925.73	9978.20	98.46	173.46	36.15	9.20	5.03	0.57
LB 9978.20	9992.87	268.06	216.61	16.63	25.05	14.77	1.24
9992.87	10007.53	322.31	230.09	14.67	30.12	15.69	1.40
10007.53	RB 10022.20	266.83	215.36	16.50	24.94	14.68	1.24
10022.20	10025.89	30.56	37.52	3.82	2.86	10.18	0.81
10025.89	10029.57	25.26	33.65	3.88	2.36	9.13	0.75

10029.57	10033.26	19.71	29.09	3.91	1.84	7.89	0.68
10033.26	10036.94	14.50	24.21	3.91	1.36	6.57	0.60
10036.94	10040.63	10.87	20.09	3.78	1.02	5.45	0.54
10040.63	10044.31	9.29	18.16	3.72	0.87	4.93	0.51
10044.31	10048.00	4.13	14.88	7.63	0.39	4.45	0.28

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9925.73	9978.20	121.53	263.12	46.41	11.69	5.92	0.46
LB 9978.20	9992.87	248.46	250.32	16.63	23.89	17.07	0.99
9992.87	10007.53	294.81	263.80	14.67	28.35	17.99	1.12
10007.53	RB 10022.20	247.64	249.07	16.50	23.81	16.98	0.99
10022.20	10025.89	30.77	45.99	3.82	2.96	12.48	0.67
10025.89	10029.57	26.34	42.13	3.88	2.53	11.43	0.63
10029.57	10033.26	21.65	37.56	3.91	2.08	10.19	0.58
10033.26	10036.94	17.15	32.69	3.91	1.65	8.87	0.52
10036.94	10040.63	14.02	28.56	3.78	1.35	7.75	0.49
10040.63	10044.31	12.62	26.63	3.72	1.21	7.23	0.47
10044.31	10048.00	5.00	22.64	9.93	0.48	6.65	0.22

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9873.27	9925.73	0.00	0.01	0.30	0.00	0.04	0.01
9925.73	9978.20	145.64	355.56	54.62	13.94	6.78	0.41
LB 9978.20	9992.87	240.48	278.15	16.63	23.01	18.96	0.86
9992.87	10007.53	282.91	291.62	14.67	27.07	19.88	0.97
10007.53	RB 10022.20	239.89	276.89	16.50	22.96	18.88	0.87
10022.20	10025.89	31.00	52.98	3.82	2.97	14.38	0.59
10025.89	10029.57	27.07	49.12	3.88	2.59	13.33	0.55
10029.57	10033.26	22.90	44.55	3.91	2.19	12.09	0.51
10033.26	10036.94	18.85	39.68	3.91	1.80	10.76	0.48
10036.94	10040.63	16.07	35.55	3.78	1.54	9.65	0.45
10040.63	10044.31	14.80	33.62	3.72	1.42	9.12	0.44
10044.31	10048.00	5.39	29.15	11.85	0.52	8.44	0.18

CULVERT RIVER: Culvert
REACH: SR51 Culvert RS: 19.326

INPUT
Description: Culvert SR 51
Culvert information from AS-Bulit Plans
Distance from Upstream XS = 60
Deck/Roadway Width = 380
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew =
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
9843.7	1361	1330	10212	1361	1330

Upstream Bridge Cross Section Data
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9820.8	1358	9839.25	1356.3	9843.7	1356	9860.75	1354.8	9872.85	1354
9876.75	1353.6	9878.15	1353.4	9888.55	1352.3	9889.65	1352.2	9889.75	1352.2
9891.35	1352.3	9892.45	1352.3	9893.95	1352.3	9895.05	1352.3	9914.35	1352
9914.55	1352	9914.65	1352	9915.35	1352	9919.35	1351.8	9924.55	1351.1
9929.1	1350	9933.15	1349.1	9938.95	1348	9944.05	1346.6	9946.15	1346
9948.15	1345.4	9954.45	1344	9960.75	1342.1	9961.15	1342	9961.35	1341.9
9966.85	1340	9969.05	1339	9971.45	1338	9976.55	1336.5	9978.2	1336
9983.6	1331	10006.4	1331	10013.9	1331	10014.5	1331	10016.3	1331
10022.2	1336	10028.35	1337.7	10028.65	1337.8	10028.95	1338	10030.05	1338.3
10034.75	1340	10038.15	1341.2	10044.3	1342	10047.25	1342.3	10047.55	1342.3
10048	1360								

```
Manning's n Values          num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
  9820.8    .045  9978.2     .04 10022.2    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9978.2 10022.2             .3       .5
Ineffective Flow     num=        2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  9820.8  9974.5    1335 10025.5   10048    1335

Downstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  9825.9    1361    1330   10232    1361    1330

Downstream Bridge Cross Section Data
Station Elevation Data    num=       37
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  9825.9    1356 9830.35  1354.7 9832.75    1354 9840.85  1352.3 9842.45    1352
 9842.95  1351.9 9846.75  1350.9 9850.05    1350 9861.05  1348.4  9864.7    1348
 9867.45  1347.2 9871.95    1346 9882.45  1345.7 9884.25  1345.7 9885.15  1345.7
 9885.95  1345.7 9886.35  1345.7 9887.85  1345.7 9891.75  1345.6 9893.65  1345.5
 9917.25    1345 9927.25  1344.6 9932.25  1344.5  9938.8    1344  9959.7  1341.4
 9962.85    1338 9968.35    1336  9972.4    1334 9976.75    1332 9993.45    1330
10006.55    133010036.95    1332   10042    133410046.45    133610049.75    1338
10056.65    1340   10057    1360

Manning's n Values          num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
  9825.9    .045  9972.4     .04   10042    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9972.4   10042             .3       .5
Ineffective Flow     num=        2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  9825.9  9982.5    1335 10017.5   10057    1335

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =       1
Elevation at which weir flow begins         =    1342
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
SR 51               Box       4      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
          .       15     482       .016                .2              .75
Number of Barrels =  2
Upstream   Elevation =  1331.1
Centerline Stations
    Sta.    Sta.
  9994.5 10005.5
Downstream Elevation =  1329.9
Centerline Stations
    Sta.    Sta.
  9994.5 10005.5

CULVERT OUTPUT    Profile #1/3 Spillway
Culvert ID : SR 51

  Culv Q (cfs)           1070.00   Culv Vel In (ft/s)       13.38
  # Barrels                    2   Culv Vel Out (ft/s)      13.38
  Q Barrel (cfs)          535.00   Culv Inv El Up (ft)    1331.10
```

E.G. US. (ft)	1346.71	Culv Inv El Dn (ft)	1329.90
W.S. US. (ft)	1346.69	Culv Frctn Ls (ft)	6.21
Delta EG (ft)	8.80	Culv Ext Lss (ft)	2.03
Delta WS (ft)	8.85	Culv Ent Lss (ft)	0.56
E.G. IC (ft)	1340.74	Q Weir (cfs)	
E.G. OC (ft)	1346.71	Weir Sta Lft (ft)	
Culvert Control	Outlet	Weir Sta Rgt (ft)	
Culv WS In (ft)	1335.10	Weir Submerg	
Culv WS Out (ft)	1333.90	Weir Max Depth (ft)	
Culv Nml Depth (ft)	4.00	Weir Avg Depth (ft)	
Culv Crt Depth (ft)	4.00	Wr Flw Area (sq ft)	
Culv Ful Lngh (ft)	482.00	Min Top Rd (ft)	1361.00

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
Note: Culvert critical depth exceeds the height of the culvert.

CULVERT OUTPUT Profile #2/3 Spillway
Culvert ID : SR 51

Culv Q (cfs)	1040.00	Culv Vel In (ft/s)	13.00
# Barrels	2	Culv Vel Out (ft/s)	13.00
Q Barrel (cfs)	520.00	Culv Inv El Up (ft)	1331.10
E.G. US. (ft)	1349.00	Culv Inv El Dn (ft)	1329.90
W.S. US. (ft)	1348.99	Culv Frctn Ls (ft)	5.87
Delta EG (ft)	8.34	Culv Ext Lss (ft)	1.94
Delta WS (ft)	8.36	Culv Ent Lss (ft)	0.52
E.G. IC (ft)	1340.40	Q Weir (cfs)	
E.G. OC (ft)	1349.00	Weir Sta Lft (ft)	
Culvert Control	Outlet	Weir Sta Rgt (ft)	
Culv WS In (ft)	1335.10	Weir Submerg	
Culv WS Out (ft)	1333.90	Weir Max Depth (ft)	
Culv Nml Depth (ft)	4.00	Weir Avg Depth (ft)	
Culv Crt Depth (ft)	4.00	Wr Flw Area (sq ft)	
Culv Ful Lngh (ft)	482.00	Min Top Rd (ft)	1361.00

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
Note: Culvert critical depth exceeds the height of the culvert.

CULVERT OUTPUT Profile #Full Spillway
Culvert ID : SR 51

Culv Q (cfs)	1045.00	Culv Vel In (ft/s)	13.06
# Barrels	2	Culv Vel Out (ft/s)	13.06
Q Barrel (cfs)	522.50	Culv Inv El Up (ft)	1331.10
E.G. US. (ft)	1350.89	Culv Inv El Dn (ft)	1329.90
W.S. US. (ft)	1350.88	Culv Frctn Ls (ft)	5.93
Delta EG (ft)	8.43	Culv Ext Lss (ft)	1.97
Delta WS (ft)	8.44	Culv Ent Lss (ft)	0.53
E.G. IC (ft)	1340.46	Q Weir (cfs)	
E.G. OC (ft)	1350.89	Weir Sta Lft (ft)	
Culvert Control	Outlet	Weir Sta Rgt (ft)	
Culv WS In (ft)	1335.10	Weir Submerg	
Culv WS Out (ft)	1333.90	Weir Max Depth (ft)	
Culv Nml Depth (ft)	4.00	Weir Avg Depth (ft)	
Culv Crt Depth (ft)	4.00	Wr Flw Area (sq ft)	
Culv Ful Lngh (ft)	482.00	Min Top Rd (ft)	1361.00

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.
Note: Culvert critical depth exceeds the height of the culvert.

CROSS SECTION RIVER: Culvert
REACH: SR51 Culvert RS: 19.298

INPUT
Description: SR51 Reach

Downstream Face SR 51 Box Culvert
Cross Section Data
Digitized from Topo Map Supplied by the FCD using BOSS-RMS
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9825.9	1356	9830.35	1354.7	9832.75	1354	9840.85	1352.3	9842.45	1352
9842.95	1351.9	9846.75	1350.9	9850.05	1350	9861.05	1348.4	9864.7	1348
9867.45	1347.2	9871.95	1346	9882.45	1345.7	9884.25	1345.7	9885.15	1345.7
9885.95	1345.7	9886.35	1345.7	9887.85	1345.7	9891.75	1345.6	9893.65	1345.5
9917.25	1345	9927.25	1344.6	9932.25	1344.5	9938.8	1344	9959.7	1341.4
9962.85	1338	9968.35	1336	9972.4	1334	9976.75	1332	9993.45	1330
10006.55	1330	10036.95	1332	10042	1334	10046.45	1336	10049.75	1338
10056.65	1340	10057	1360						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9825.9	.045	9972.4	.04	10042	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9972.4	10042	172.3	189	206.7	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9825.9	9982.5	1335	10017.5	10057	1335

CROSS SECTION OUTPUT Profile #1/3 Spillway

E.G. Elev (ft)	1337.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.	0.045	0.040	0.045
W.S. Elev (ft)	1337.84	Reach Len. (ft)	189.00	189.00	189.00
Crit W.S. (ft)	1333.38	Flow Area (sq ft)	16.15	470.33	15.43
E.G. Slope (ft/ft)	0.000285	Area (sq ft)	16.15	470.33	15.43
Q Total (cfs)	1070.00	Flow (cfs)	12.49	1044.64	12.87
Top Width (ft)	86.19	Top Width (ft)	9.11	69.60	7.49
Vel Total (ft/s)	2.13	Avg. Vel. (ft/s)	0.77	2.22	0.83
Max Chl Dpth (ft)	7.84	Hydr. Depth (ft)	1.77	6.76	2.06
Conv. Total (cfs)	63357.4	Conv. (cfs)	739.3	61855.7	762.3
Length Wtd. (ft)	189.00	Wetted Per. (ft)	9.90	70.60	8.43
Min Ch El (ft)	1330.00	Shear (lb/sq ft)	0.03	0.12	0.03
Alpha	1.06	Stream Power (lb/ft s)	0.02	0.26	0.03
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	0.06	1.39	3.48
C & E Loss (ft)	0.12	Cum SA (acres)			

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #2/3 Spillway

E.G. Elev (ft)	1340.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.045	0.040	0.045
W.S. Elev (ft)	1340.63	Reach Len. (ft)	189.00	189.00	189.00
Crit W.S. (ft)	1333.33	Flow Area (sq ft)	45.97	664.53	48.28
E.G. Slope (ft/ft)	0.000079	Area (sq ft)	45.97	664.53	48.28
Q Total (cfs)	1040.00	Flow (cfs)	29.96	981.01	29.03
Top Width (ft)	96.25	Top Width (ft)	11.99	69.60	14.66
Vel Total (ft/s)	1.37	Avg. Vel. (ft/s)	0.65	1.48	0.60
Max Chl Dpth (ft)	10.63	Hydr. Depth (ft)	3.84	9.55	3.29
Conv. Total (cfs)	116662.9	Conv. (cfs)	3361.0	110045.2	3256.7
Length Wtd. (ft)	189.00	Wetted Per. (ft)	13.95	70.60	16.54
Min Ch El (ft)	1330.00	Shear (lb/sq ft)	0.02	0.05	0.01
Alpha	1.11	Stream Power (lb/ft s)	0.01	0.07	0.01
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.17	1.96	5.41
C & E Loss (ft)	0.26	Cum SA (acres)			

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Full Spillway

E.G. Elev (ft)	1342.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.045	0.040	0.045
W.S. Elev (ft)	1342.45	Reach Len. (ft)	189.00	189.00	189.00
Crit W.S. (ft)	1333.33	Flow Area (sq ft)	73.14	790.88	74.93
E.G. Slope (ft/ft)	0.000043	Area (sq ft)	73.14	790.88	74.93
Q Total (cfs)	1045.00	Flow (cfs)	33.96	969.43	41.61
Top Width (ft)	105.39	Top Width (ft)	21.10	69.60	14.69
Vel Total (ft/s)	1.11	Avg. Vel. (ft/s)	0.46	1.23	0.56
Max Chl Dpth (ft)	12.45	Hydr. Depth (ft)	3.47	11.36	5.10
Conv. Total (cfs)	158551.2	Conv. (cfs)	5153.0	147084.8	6313.4
Length Wtd. (ft)	189.00	Wetted Per. (ft)	23.47	70.60	18.38
Min Ch El (ft)	1330.00	Shear (lb/sq ft)	0.01	0.03	0.01
Alpha	1.14	Stream Power (lb/ft s)	0.00	0.04	0.01
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.25	2.29	6.27
C & E Loss (ft)	0.47	Cum SA (acres)			

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #1/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9923.57	9972.40	12.49	16.15	9.90	1.17	1.77	0.77
LB 9972.40	9995.60	327.16	152.13	23.76	30.58	6.56	2.15
9995.60	10018.80	427.21	176.93	23.23	39.93	7.63	2.41
10018.80	RB 10042.00	290.26	141.26	23.62	27.13	6.09	2.05
10042.00	10044.14	7.26	7.19	2.35	0.68	3.36	1.01
10044.14	10046.29	4.13	5.13	2.35	0.39	2.39	0.81
10046.29	10048.43	1.41	2.76	2.49	0.13	1.29	0.51
10048.43	10050.57	0.07	0.34	1.24	0.01	0.32	0.20

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #2/3 Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9923.57	9972.40	29.96	45.97	13.95	2.88	3.84	0.65
LB 9972.40	9995.60	312.68	216.86	23.76	30.07	9.35	1.44
9995.60	10018.80	380.22	241.67	23.23	36.56	10.42	1.57
10018.80	RB 10042.00	288.11	206.00	23.62	27.70	8.88	1.40
10042.00	10044.14	10.36	13.17	2.35	1.00	6.15	0.79
10044.14	10046.29	7.80	11.11	2.35	0.75	5.19	0.70
10046.29	10048.43	5.02	8.74	2.49	0.48	4.08	0.57
10048.43	10050.57	2.80	6.07	2.40	0.27	2.83	0.46
10050.57	10052.71	1.76	4.46	2.23	0.17	2.08	0.40
10052.71	10054.86	0.98	3.13	2.23	0.09	1.46	0.31
10054.86	10057.00	0.30	1.60	2.48	0.03	0.89	0.19

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

FLOW DISTRIBUTION OUTPUT Profile #Full Spillway

Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	% Conv.	Hydr D. (ft)	Velocity (ft/s)
9923.57	9972.40	33.96	73.14	23.47	3.25	3.47	0.46
LB 9972.40	9995.60	311.01	258.98	23.76	29.76	11.16	1.20
9995.60	10018.80	367.73	283.78	23.23	35.19	12.23	1.30
10018.80	RB 10042.00	290.69	248.12	23.62	27.82	10.69	1.17
10042.00	10044.14	12.15	17.06	2.35	1.16	7.96	0.71

10044.14	10046.29	9.81	15.01	2.35	0.94	7.00	0.65
10046.29	10048.43	7.07	12.63	2.49	0.68	5.89	0.56
10048.43	10050.57	4.88	9.96	2.40	0.47	4.65	0.49
10050.57	10052.71	3.82	8.35	2.23	0.37	3.90	0.46
10052.71	10054.86	2.86	7.02	2.23	0.27	3.28	0.41
10054.86	10057.00	1.01	4.90	4.33	0.10	2.67	0.21

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

SUMMARY OF MANNING'S N VALUES

River:Dreamy Draw

Reach	River Sta.	n1	n2	n3
Upper Wash	20	.045	.028	.045
Upper Wash	19.949	.045	.028	.045
Upper Wash	19.891	.045	.028	.045
Upper Wash	19.829	.045	.028	.045
Upper Wash	19.725	.045	.03	.045
Upper Wash	19.658	.065	.045	.065
Upper Wash	19.622	.065	.04	.065
Upper Wash	19.6145	Culvert		
Upper Wash	19.604	.065	.04	.065
Upper Wash	19.552	.045	.04	.045
Upper Wash	19.473	.045	.04	.045
Lower Wash	19.262	.065	.055	.065
Lower Wash	19.214	.065	.055	.065
Lower Wash	19.174	.065	.055	.065
Lower Wash	19.106	.065	.05	.065
Lower Wash	19.043	.065	.05	.065
Lower Wash	18.9445	Culvert		
Lower Wash	18.836	.065	.04	.065
Lower Wash	18.735	.065	.05	.065
Lower Wash	18.685	.065	.05	.065
Lower Wash	18.674	Culvert		
Lower Wash	18.653	.065	.04	.065
Lower Wash	18.574	.065	.04	.065
Lower Wash	18.503	.065	.04	.065
Lower Wash	18.4915	Culvert		
Lower Wash	18.470	.065	.043	.065
Lower Wash	18.423	.065	.043	.065
Lower Wash	18.355	.065	.043	.065
Lower Wash	18.278	.065	.043	.065
Lower Wash	18.201	.065	.043	.065
Lower Wash	18.162	.065	.043	.065
Lower Wash	18.048	.065	.033	.065
Lower Wash	18.004	.065	.033	.065
Lower Wash	17.929	.065	.033	.065

River:Bridge

Reach	River Sta.	n1	n2	n3
SR51 Bridge	0.1687	.065	.035	.065
SR51 Bridge	0.1532	.065	.035	.065
SR51 Bridge	0.1289	.065	.035	.065
SR51 Bridge	0.1098	.065	.035	.065
SR51 Bridge	0.0899	Bridge		
SR51 Bridge	0.0704	.065	.035	.065
SR51 Bridge	0.0462	.065	.035	.065
SR51 Bridge	0.0149	.065	.035	.065

River:Culvert

Reach	River Sta.	n1	n2	n3
SR51 Culvert	19.395	.045	.04	.045
SR51 Culvert	19.326	Culvert		
SR51 Culvert	19.298	.045	.04	.045

SUMMARY OF REACH LENGTHS

River: Dreamy Draw

Reach	River Sta.	Left	Channel	Right
Upper Wash	20	270.5	270	265.1
Upper Wash	19.949	343	306	251.8
Upper Wash	19.891	356.2	326	250.8
Upper Wash	19.829	488.2	550	584.3
Upper Wash	19.725	294.6	355	389.5
Upper Wash	19.658	184.9	188	190.1
Upper Wash	19.622	118.6	98	106.7
Upper Wash	19.6145	Culvert		
Upper Wash	19.604	320	274	199.1
Upper Wash	19.552	409.4	417	414.4
Upper Wash	19.473	424	411	395.3
Lower Wash	19.262	246.2	253	259.5
Lower Wash	19.214	229.1	212	209.6
Lower Wash	19.174	363	359	361
Lower Wash	19.106	332.9	335	335.5
Lower Wash	19.043	1100.1	1091	1070.8
Lower Wash	18.9445	Culvert		
Lower Wash	18.836	534.8	534	537
Lower Wash	18.735	266.5	263	249.1
Lower Wash	18.685	176.2	170	170
Lower Wash	18.674	Culvert		
Lower Wash	18.653	409.1	418	442.5
Lower Wash	18.574	382.9	376	376.1
Lower Wash	18.503	162.6	171	185.5
Lower Wash	18.4915	Culvert		
Lower Wash	18.470	249	251	251
Lower Wash	18.423	343	357	364.9
Lower Wash	18.355	427.7	409	406.6
Lower Wash	18.278	411.7	403	372.6
Lower Wash	18.201	206.9	207	212
Lower Wash	18.162	597	603	594.4
Lower Wash	18.048	232.6	233	225.9
Lower Wash	18.004	395	395	395
Lower Wash	17.929	43	43	43

River: Bridge

Reach	River Sta.	Left	Channel	Right
SR51 Bridge	0.1687	121	82	51.7
SR51 Bridge	0.1532	68.9	128	213.7
SR51 Bridge	0.1289	67.3	101	153.2
SR51 Bridge	0.1098	212.9	208	209.1
SR51 Bridge	0.0899	Bridge		
SR51 Bridge	0.0704	103.9	128	170.6
SR51 Bridge	0.0462	103.7	165	173.5
SR51 Bridge	0.0149	94.5	79	162.4

River: Culvert

Reach	River Sta.	Left	Channel	Right

SR51 Culvert	19.395	517.7	511	504.9
SR51 Culvert	19.326	Culvert		
SR51 Culvert	19.298	172.3	189	206.7

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Dreamy Draw

Reach	River Sta.	Contr.	Expan.
Upper Wash	20	.1	.3
Upper Wash	19.949	.1	.3
Upper Wash	19.891	.1	.3
Upper Wash	19.829	.1	.3
Upper Wash	19.725	.1	.3
Upper Wash	19.658	.3	.5
Upper Wash	19.622	.3	.5
Upper Wash	19.6145	Culvert	
Upper Wash	19.604	.3	.5
Upper Wash	19.552	.1	.3
Upper Wash	19.473	.3	.5
Lower Wash	19.262	.1	.3
Lower Wash	19.214	.1	.3
Lower Wash	19.174	.1	.3
Lower Wash	19.106	.3	.5
Lower Wash	19.043	.3	.5
Lower Wash	18.9445	Culvert	
Lower Wash	18.836	.3	.5
Lower Wash	18.735	.3	.5
Lower Wash	18.685	.3	.5
Lower Wash	18.674	Culvert	
Lower Wash	18.653	.3	.5
Lower Wash	18.574	.3	.5
Lower Wash	18.503	.3	.5
Lower Wash	18.4915	Culvert	
Lower Wash	18.470	.3	.5
Lower Wash	18.423	.1	.3
Lower Wash	18.355	.1	.3
Lower Wash	18.278	.1	.3
Lower Wash	18.201	.1	.3
Lower Wash	18.162	.1	.3
Lower Wash	18.048	.1	.3
Lower Wash	18.004	.1	.3
Lower Wash	17.929	.1	.3

River: Bridge

Reach	River Sta.	Contr.	Expan.
SR51 Bridge	0.1687	.1	.3
SR51 Bridge	0.1532	.1	.3
SR51 Bridge	0.1289	.3	.5
SR51 Bridge	0.1098	.3	.5
SR51 Bridge	0.0899	Bridge	
SR51 Bridge	0.0704	.3	.5
SR51 Bridge	0.0462	.1	.3
SR51 Bridge	0.0149	.1	.3

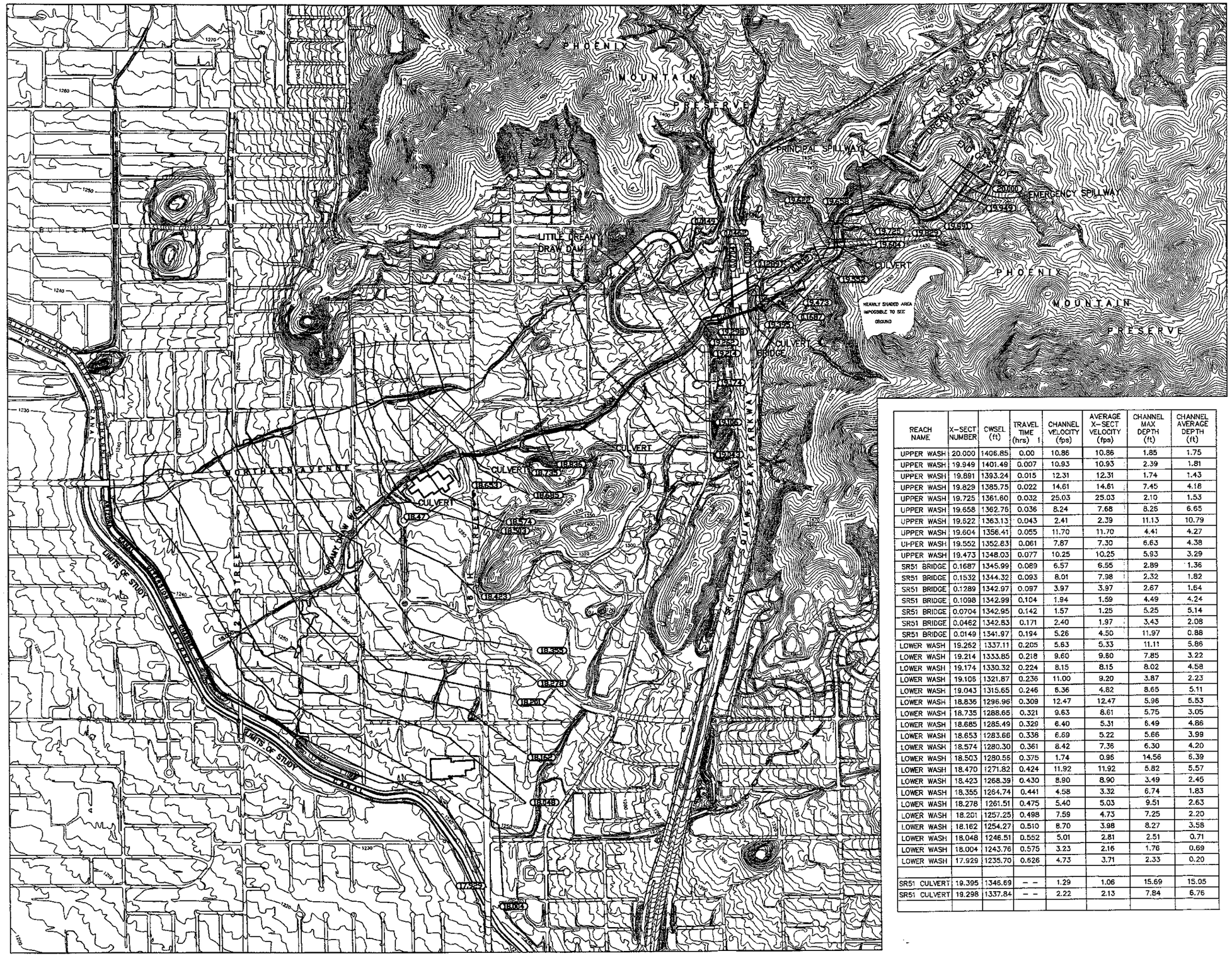
River: Culvert

Reach	River Sta.	Contr.	Expan.
SR51 Culvert	19.395	.3	.5
SR51 Culvert	19.326	Culvert	
SR51 Culvert	19.298	.3	.5

APPENDIX D

EXHIBITS

Kimley-Horn
and Associates, Inc.



REACH NAME	X-SECT NUMBER	CWSEL (ft)	TRAVEL TIME (hrs) 1	CHANNEL VELOCITY (fps)	AVERAGE X-SECT VELOCITY (fps)	CHANNEL MAX DEPTH (ft)	CHANNEL AVERAGE DEPTH (ft)
UPPER WASH	20.000	1406.85	0.00	10.86	10.86	1.85	1.75
UPPER WASH	19.949	1401.49	0.007	10.93	10.93	2.39	1.81
UPPER WASH	19.891	1393.24	0.015	12.31	12.31	1.74	1.43
UPPER WASH	19.829	1385.75	0.022	14.61	14.61	7.45	4.18
UPPER WASH	19.725	1361.60	0.032	25.03	25.03	2.10	1.53
UPPER WASH	19.658	1362.76	0.036	8.24	7.68	8.26	6.65
UPPER WASH	19.622	1363.13	0.043	2.41	2.39	11.13	10.79
UPPER WASH	19.604	1356.41	0.055	11.70	11.70	4.41	4.27
UPPER WASH	19.552	1352.83	0.061	7.87	7.30	6.63	4.38
UPPER WASH	19.473	1348.03	0.077	10.25	10.25	5.93	3.29
SR51 BRIDGE	0.1687	1345.99	0.089	6.57	6.55	2.89	1.36
SR51 BRIDGE	0.1532	1344.32	0.093	8.01	7.98	2.32	1.82
SR51 BRIDGE	0.1289	1342.97	0.097	3.97	3.97	2.67	1.64
SR51 BRIDGE	0.1098	1342.99	0.104	1.94	1.59	4.49	4.24
SR51 BRIDGE	0.0704	1342.95	0.142	1.57	1.25	5.25	5.14
SR51 BRIDGE	0.0462	1342.83	0.171	2.40	1.97	3.43	2.08
SR51 BRIDGE	0.0149	1341.97	0.194	5.26	4.50	11.97	0.88
LOWER WASH	19.262	1337.11	0.205	5.83	5.33	11.11	5.86
LOWER WASH	19.214	1333.85	0.218	9.60	9.60	7.85	3.22
LOWER WASH	19.174	1330.32	0.224	8.15	8.15	8.02	4.58
LOWER WASH	19.108	1321.87	0.236	11.00	9.20	3.87	2.23
LOWER WASH	19.043	1315.65	0.246	6.36	4.82	8.65	5.11
LOWER WASH	18.836	1296.96	0.309	12.47	12.47	5.96	5.53
LOWER WASH	18.735	1288.65	0.321	9.63	8.61	5.75	3.05
LOWER WASH	18.685	1285.49	0.329	6.40	5.31	6.49	4.86
LOWER WASH	18.653	1283.66	0.336	6.69	5.22	5.66	3.99
LOWER WASH	18.574	1280.30	0.361	8.42	7.36	6.30	4.20
LOWER WASH	18.503	1280.56	0.375	1.74	0.96	14.56	6.39
LOWER WASH	18.470	1271.82	0.424	11.92	11.92	5.82	5.57
LOWER WASH	18.423	1268.39	0.430	8.90	8.90	3.49	2.45
LOWER WASH	18.355	1264.74	0.441	4.58	3.32	6.74	1.83
LOWER WASH	18.278	1261.51	0.475	5.40	5.03	9.51	2.63
LOWER WASH	18.201	1257.25	0.498	7.59	4.73	7.25	2.20
LOWER WASH	18.162	1254.27	0.510	8.70	3.98	8.27	3.58
LOWER WASH	18.048	1246.51	0.552	5.01	2.81	2.51	0.71
LOWER WASH	18.004	1243.76	0.575	3.23	2.16	1.76	0.69
LOWER WASH	17.929	1235.70	0.626	4.73	3.71	2.33	0.20
SR51 CULVERT	19.395	1346.69	- -	1.29	1.06	15.69	15.05
SR51 CULVERT	19.298	1337.84	- -	2.22	2.13	7.84	6.76

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FOR **DREAMY DRAW DAM**

F.C.D. CONTRACT NO. **98-16**

LEGEND

INUNDATION BOUNDARY

CROSS SECTION (18.74)

POTENTIAL DIVERSION

NOTES

1) TRAVEL TIME IS CALCULATED FROM THE EMERGENCY SPILLWAY TO THE DOWNSTREAM STUDY LIMIT, AND IS BASED ON THE AVERAGE VELOCITY OF THE ENTIRE CROSS SECTION.

2) DISCHARGE THROUGH THE PRINCIPAL SPILLWAY IN DREAMY DRAW DAM WAS NOT ANALYZED UNDER THIS STUDY, AND CONSEQUENTLY, NO FLOODING LIMITS ARE SHOWN.

3) THE STRUCTURAL AND HYDRAULIC INTEGRITY OF ANY LEVEES, BERMS, OR FILL, TO WITHSTAND EROSION (OR FAILURE) DURING FLOODING WAS NOT EVALUATED AS PART OF THIS STUDY.

4) HYDRAULIC BASELINES WERE USED TO DETERMINE REACH LENGTHS. ROUTE LINES WERE USED TO DETERMINE RIVER MILE STATIONING FOR CROSS SECTION IDENTIFIERS.

5) FLOW ARROWS INDICATE POTENTIAL DIVERSIONS TO STREET SYSTEM.

Registered Professional Engineer (Civil) CERTIFICATE NO. 24767 ROBERT A. EICHINGER Date Signed 6/2/99

DELINEATION OF SPILLWAY FLOWS FOR DREAMY DRAW DAM. 1/3 SPILLWAY DESIGN DISCHARGE (2000 cfs).

N

500 0' 500 1000

SCALE: 1"= 500

Kimley-Horn and Associates, Inc.

	BY	DATE
DESIGN	JTA	6/2/99
DESIGN CHK.	RAE	6/2/99
PLANS	JTA	6/2/99
PLANS CHK.		
SUBMITTED BY:		DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

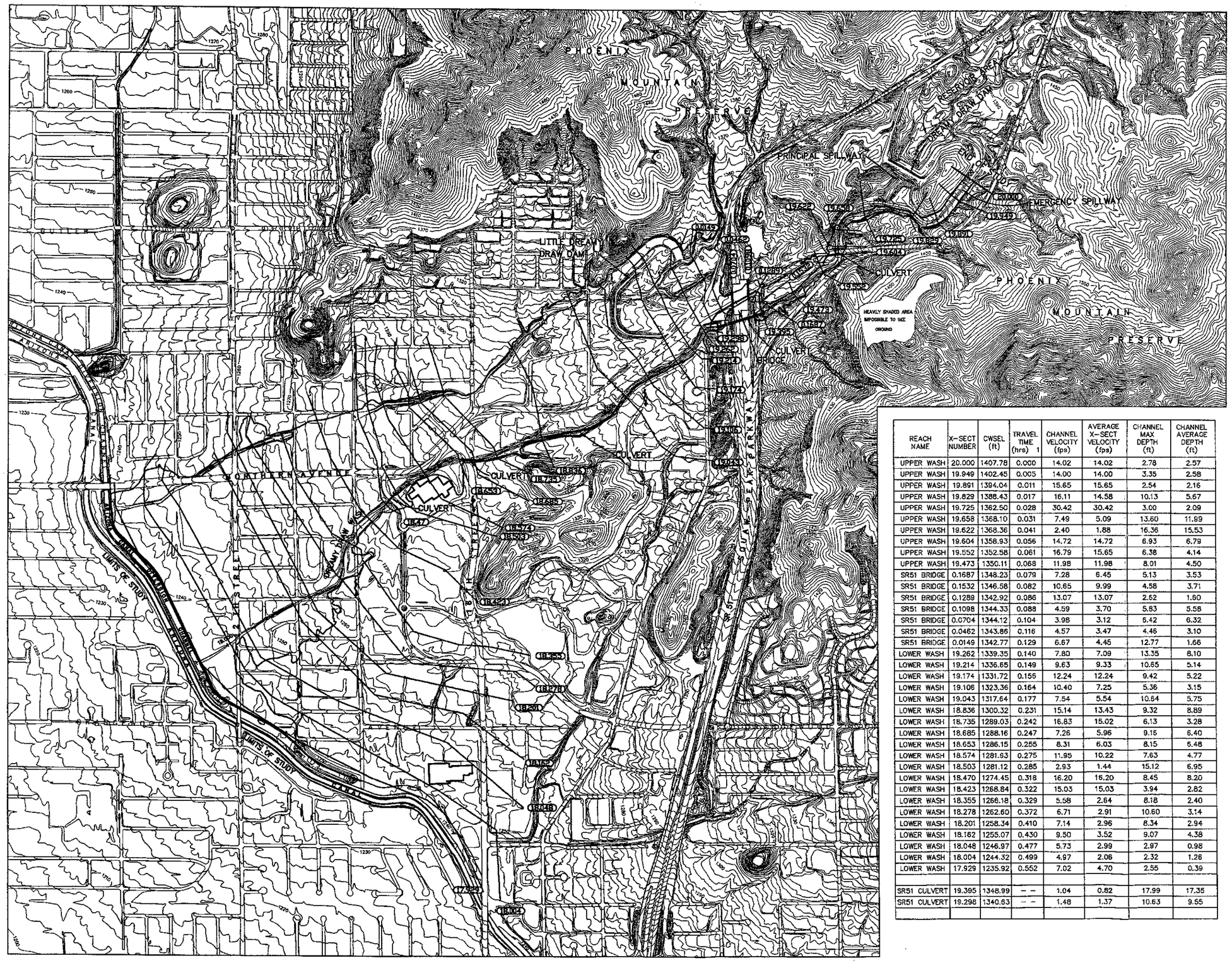
APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 1 OF 3

TOPOGRAPHY PROVIDED BY:
KAMINSKI, HUBBARD ENGINEERING, INC.
DATE FLOWN: 11/15/1990

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1"= 500' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY KAMINSKI, HUBBARD ENGINEERING, INC.



REACH NAME	X-SECT NUMBER	CWSEL (ft)	TRAVEL TIME (hrs) 1	CHANNEL VELOCITY (fps)	AVERAGE X-SECT VELOCITY (fps)	CHANNEL MAX DEPTH (ft)	CHANNEL AVERAGE DEPTH (ft)
UPPER WASH	20.000	1407.78	0.000	14.02	14.02	2.78	2.57
UPPER WASH	19.949	1402.45	0.005	14.00	14.00	3.35	2.58
UPPER WASH	19.891	1394.04	0.011	15.65	15.65	2.54	2.16
UPPER WASH	19.829	1388.43	0.017	16.11	14.58	10.13	5.67
UPPER WASH	19.725	1362.50	0.028	30.42	30.42	3.00	2.09
UPPER WASH	19.658	1368.10	0.031	7.49	5.09	13.60	11.99
UPPER WASH	19.622	1368.36	0.041	2.40	1.88	16.36	15.53
UPPER WASH	19.604	1358.93	0.056	14.72	14.72	6.93	6.79
UPPER WASH	19.552	1352.58	0.061	16.79	15.65	6.38	4.14
UPPER WASH	19.473	1350.11	0.068	11.98	11.98	8.01	4.50
SR51 BRIDGE	0.1687	1348.23	0.079	7.28	6.45	5.13	3.53
SR51 BRIDGE	0.1532	1346.58	0.082	10.65	9.99	4.58	3.71
SR51 BRIDGE	0.1289	1342.92	0.086	13.07	13.07	2.62	1.60
SR51 BRIDGE	0.1098	1344.33	0.088	4.59	3.70	5.83	5.58
SR51 BRIDGE	0.0704	1344.12	0.104	3.98	3.12	5.42	6.32
SR51 BRIDGE	0.0462	1343.86	0.116	4.57	3.47	4.46	3.10
SR51 BRIDGE	0.0149	1342.77	0.129	6.67	4.45	12.77	1.66
LOWER WASH	19.262	1339.35	0.140	7.80	7.09	13.35	8.10
LOWER WASH	19.214	1336.65	0.149	9.63	9.33	10.65	5.14
LOWER WASH	19.174	1331.72	0.156	12.24	12.24	9.42	5.22
LOWER WASH	19.106	1323.36	0.164	10.40	7.25	5.36	3.15
LOWER WASH	19.043	1317.64	0.177	7.54	5.54	10.64	5.75
LOWER WASH	18.836	1300.32	0.231	15.14	13.43	9.32	8.89
LOWER WASH	18.735	1289.03	0.242	16.83	15.02	6.13	3.28
LOWER WASH	18.685	1288.16	0.247	7.26	5.96	9.16	6.40
LOWER WASH	18.653	1286.15	0.255	8.31	6.03	8.15	5.48
LOWER WASH	18.574	1281.63	0.275	11.95	10.22	7.63	4.77
LOWER WASH	18.503	1281.12	0.285	2.93	1.44	15.12	6.95
LOWER WASH	18.470	1274.45	0.318	16.20	16.20	8.45	8.20
LOWER WASH	18.423	1268.84	0.322	15.03	15.03	3.94	2.82
LOWER WASH	18.355	1266.18	0.329	5.58	2.64	8.18	2.40
LOWER WASH	18.278	1262.60	0.372	6.71	2.91	10.60	3.14
LOWER WASH	18.201	1258.34	0.410	7.14	2.96	8.34	2.94
LOWER WASH	18.162	1255.07	0.430	9.50	3.52	9.07	4.38
LOWER WASH	18.048	1246.97	0.477	5.73	2.99	2.97	0.98
LOWER WASH	18.004	1244.32	0.499	4.97	2.06	2.32	1.26
LOWER WASH	17.929	1235.92	0.552	7.02	4.70	2.55	0.39
SR51 CULVERT	19.395	1348.99	--	1.04	0.82	17.99	17.35
SR51 CULVERT	19.298	1340.63	--	1.48	1.37	10.63	9.55

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FOR **DREAMY DRAW DAM**

F.C.D. CONTRACT NO. **98-16**

LEGEND

INUNDATION BOUNDARY

CROSS SECTION (18.74)

POTENTIAL DIVERSION

NOTES

1) TRAVEL TIME IS CALCULATED FROM THE EMERGENCY SPILLWAY TO THE DOWNSTREAM STUDY LIMIT, AND IS BASED ON THE AVERAGE VELOCITY OF THE ENTIRE CROSS SECTION.

2) DISCHARGE THROUGH THE PRINCIPAL SPILLWAY IN DREAMY DRAW DAM WAS NOT ANALYZED UNDER THIS STUDY, AND CONSEQUENTLY, NO FLOODING LIMITS ARE SHOWN.

3) THE STRUCTURAL AND HYDRAULIC INTEGRITY OF ANY LEVEES, BERMS, OR FILL, TO WITHSTAND EROSION (OR FAILURE) DURING FLOODING WAS NOT EVALUATED AS PART OF THIS STUDY.

4) HYDRAULIC BASELINES WERE USED TO DETERMINE REACH LENGTHS. ROUTE LINES WERE USED TO DETERMINE RIVER MILE STATIONING FOR CROSS SECTION IDENTIFIERS.

5) FLOW ARROWS INDICATE POTENTIAL DIVERSIONS TO STREET SYSTEM.

24767 ROBERT A. EICHINGER

DELINEATION OF SPILLWAY FLOWS FOR DREAMY DRAW DAM. 2/3 SPILLWAY DESIGN DISCHARGE (4000 cfs).

N

500 0' 500 1000

SCALE: 1" = 500

Kimley-Horn and Associates, Inc.

	BY	DATE
DESIGN	JTA	6/2/99
DESIGN CHK.	RAE	6/2/99
PLANS	JTA	6/2/99
PLANS CHK.		
SUBMITTED BY:		DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

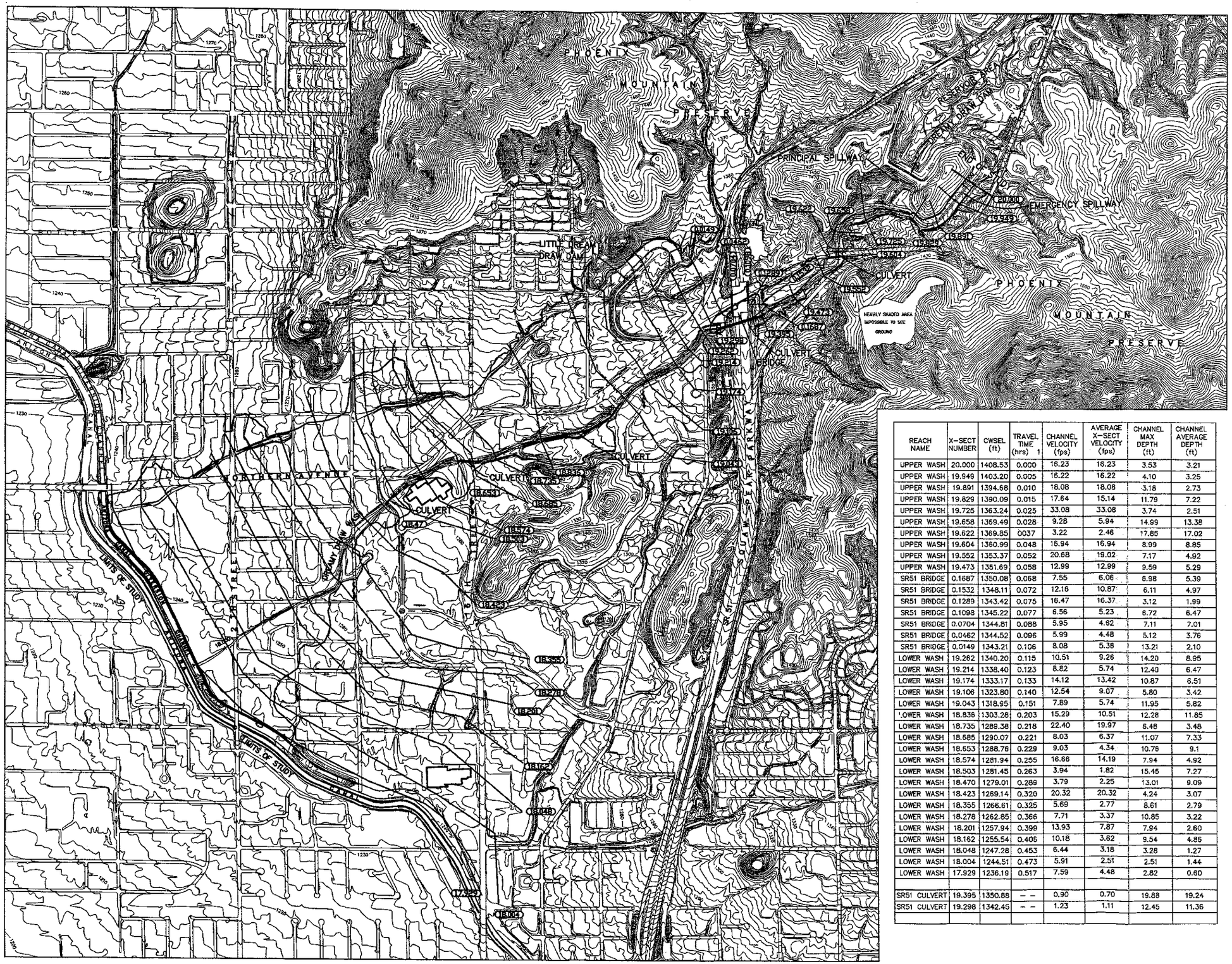
APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 2 OF 3

TOPOGRAPHY PROVIDED BY:
KAMINSKI, HUBBARD ENGINEERING, INC.
DATE FLOWN: 11/15/1990

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1" = 500' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY KAMINSKI, HUBBARD ENGINEERING, INC.



REACH NAME	X-SECT NUMBER	CWSEL (ft)	TRAVEL TIME (hrs) 1	CHANNEL VELOCITY (fps)	AVERAGE X-SECT VELOCITY (fps)	CHANNEL MAX DEPTH (ft)	CHANNEL AVERAGE DEPTH (ft)
UPPER WASH	20.000	1408.53	0.000	16.23	16.23	3.53	3.21
UPPER WASH	19.949	1403.20	0.005	16.22	16.22	4.10	3.25
UPPER WASH	19.891	1394.68	0.010	18.08	18.08	3.18	2.73
UPPER WASH	19.829	1390.09	0.015	17.64	15.14	11.79	7.22
UPPER WASH	19.725	1363.24	0.025	33.08	33.08	3.74	2.51
UPPER WASH	19.658	1359.49	0.028	9.28	5.94	14.99	13.38
UPPER WASH	19.622	1369.85	0037	3.22	2.46	17.85	17.02
UPPER WASH	19.604	1360.99	0.048	18.94	16.94	8.99	8.85
UPPER WASH	19.552	1353.37	0.052	20.68	19.02	7.17	4.92
UPPER WASH	19.473	1351.69	0.058	12.99	12.99	9.59	5.29
SR51 BRIDGE	0.1687	1350.08	0.068	7.55	6.06	6.98	5.39
SR51 BRIDGE	0.1532	1348.11	0.072	12.16	10.87	6.11	4.97
SR51 BRIDGE	0.1289	1343.42	0.075	16.47	16.37	3.12	1.99
SR51 BRIDGE	0.1098	1345.22	0.077	6.56	5.23	6.72	6.47
SR51 BRIDGE	0.0704	1344.81	0.088	5.95	4.82	7.11	7.01
SR51 BRIDGE	0.0462	1344.52	0.096	5.99	4.48	5.12	3.76
SR51 BRIDGE	0.0149	1343.21	0.106	8.08	5.38	13.21	2.10
LOWER WASH	19.262	1340.20	0.115	10.51	9.26	14.20	8.95
LOWER WASH	19.214	1338.40	0.123	8.82	5.74	12.40	6.47
LOWER WASH	19.174	1333.17	0.133	14.12	13.42	10.87	6.51
LOWER WASH	19.106	1323.80	0.140	12.54	9.07	5.80	3.42
LOWER WASH	19.043	1318.95	0.151	7.89	5.74	11.95	5.82
LOWER WASH	18.836	1303.26	0.203	15.29	10.51	12.28	11.85
LOWER WASH	18.735	1289.38	0.218	22.40	19.97	6.48	3.48
LOWER WASH	18.685	1290.07	0.221	8.03	6.37	11.07	7.33
LOWER WASH	18.653	1288.76	0.229	9.03	4.34	10.76	9.1
LOWER WASH	18.574	1281.94	0.255	16.66	14.19	7.94	4.92
LOWER WASH	18.503	1281.45	0.263	3.94	1.82	15.45	7.27
LOWER WASH	18.470	1279.01	0.289	3.79	2.25	13.01	9.09
LOWER WASH	18.423	1269.14	0.320	20.32	20.32	4.24	3.07
LOWER WASH	18.355	1266.61	0.325	5.69	2.77	8.61	2.79
LOWER WASH	18.278	1262.85	0.366	7.71	3.37	10.85	3.22
LOWER WASH	18.201	1257.94	0.399	13.93	7.87	7.94	2.60
LOWER WASH	18.162	1255.54	0.406	10.18	3.62	9.54	4.86
LOWER WASH	18.048	1247.28	0.453	6.44	3.18	3.28	1.27
LOWER WASH	18.004	1244.51	0.473	5.91	2.51	2.51	1.44
LOWER WASH	17.929	1236.19	0.517	7.59	4.48	2.82	0.60
SR51 CULVERT	19.395	1350.88	– –	0.90	0.70	19.88	19.24
SR51 CULVERT	19.298	1342.45	– –	1.23	1.11	12.45	11.36

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FOR **DREAMY DRAW DAM**

F.C.D. CONTRACT NO. **98-16**

LEGEND

INUNDATION BOUNDARY

CROSS SECTION (18.74)

POTENTIAL DIVERSION

NOTES

1) TRAVEL TIME IS CALCULATED FROM THE EMERGENCY SPILLWAY TO THE DOWNSTREAM STUDY LIMIT, AND IS BASED ON THE AVERAGE VELOCITY OF THE ENTIRE CROSS SECTION.

2) DISCHARGE THROUGH THE PRINCIPAL SPILLWAY IN DREAMY DRAW DAM WAS NOT ANALYZED UNDER THIS STUDY, AND CONSEQUENTLY, NO FLOODING LIMITS ARE SHOWN.

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4) HYDRAULIC BASELINES WERE USED TO DETERMINE REACH LENGTHS. ROUTE LINES WERE USED TO DETERMINE RIVER MILE STATIONING FOR CROSS SECTION IDENTIFIERS.

5) FLOW ARROWS INDICATE POTENTIAL DIVERSIONS TO STREET SYSTEM.

24767 ROBERT A. EICHINGER

DELINEATION OF SPILLWAY FLOWS FOR DREAMY DRAW DAM. FULL SPILLWAY DESIGN DISCHARGE (6000 cfs).

N

500 0' 500 1000

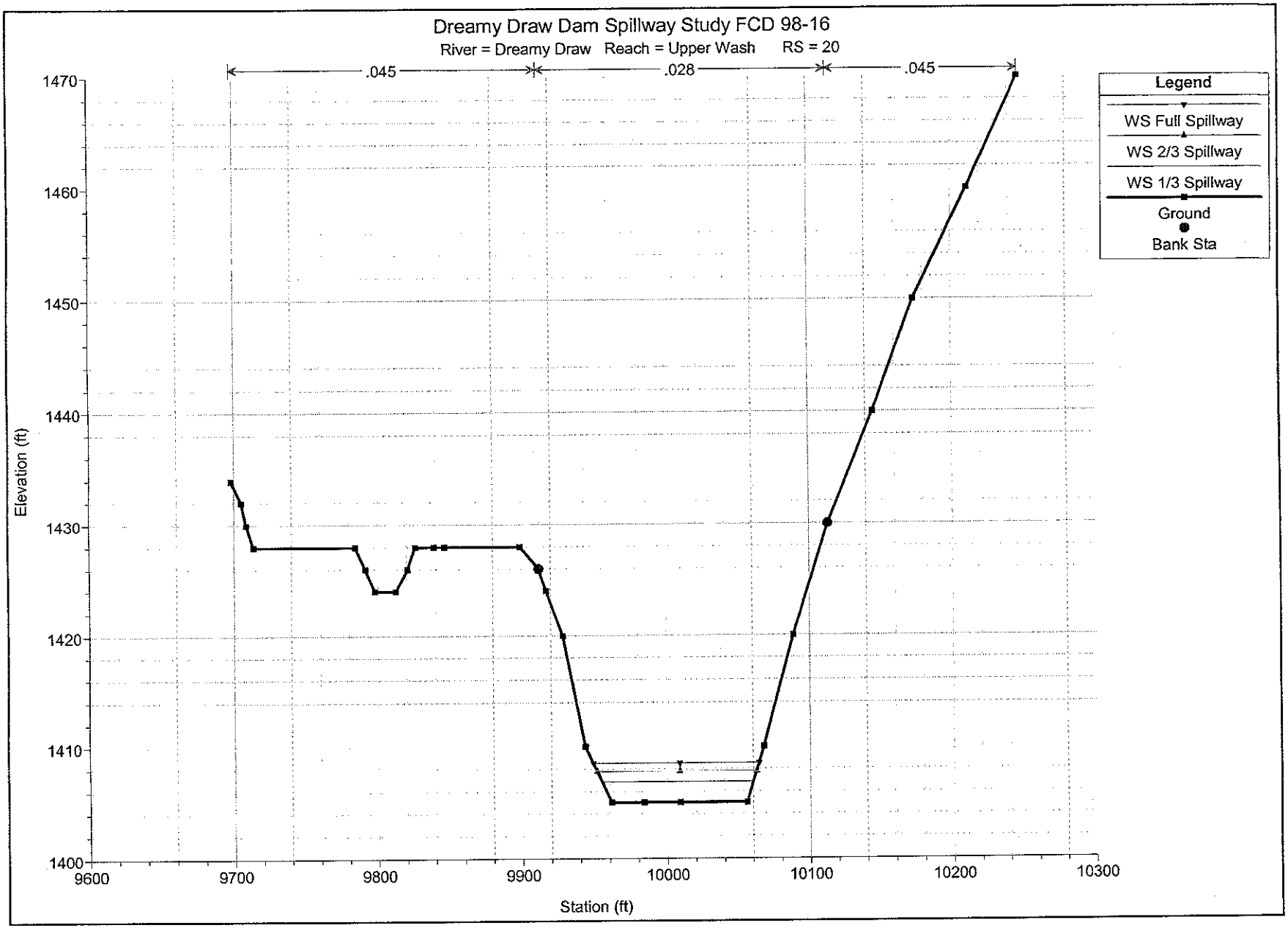
SCALE: 1"= 500

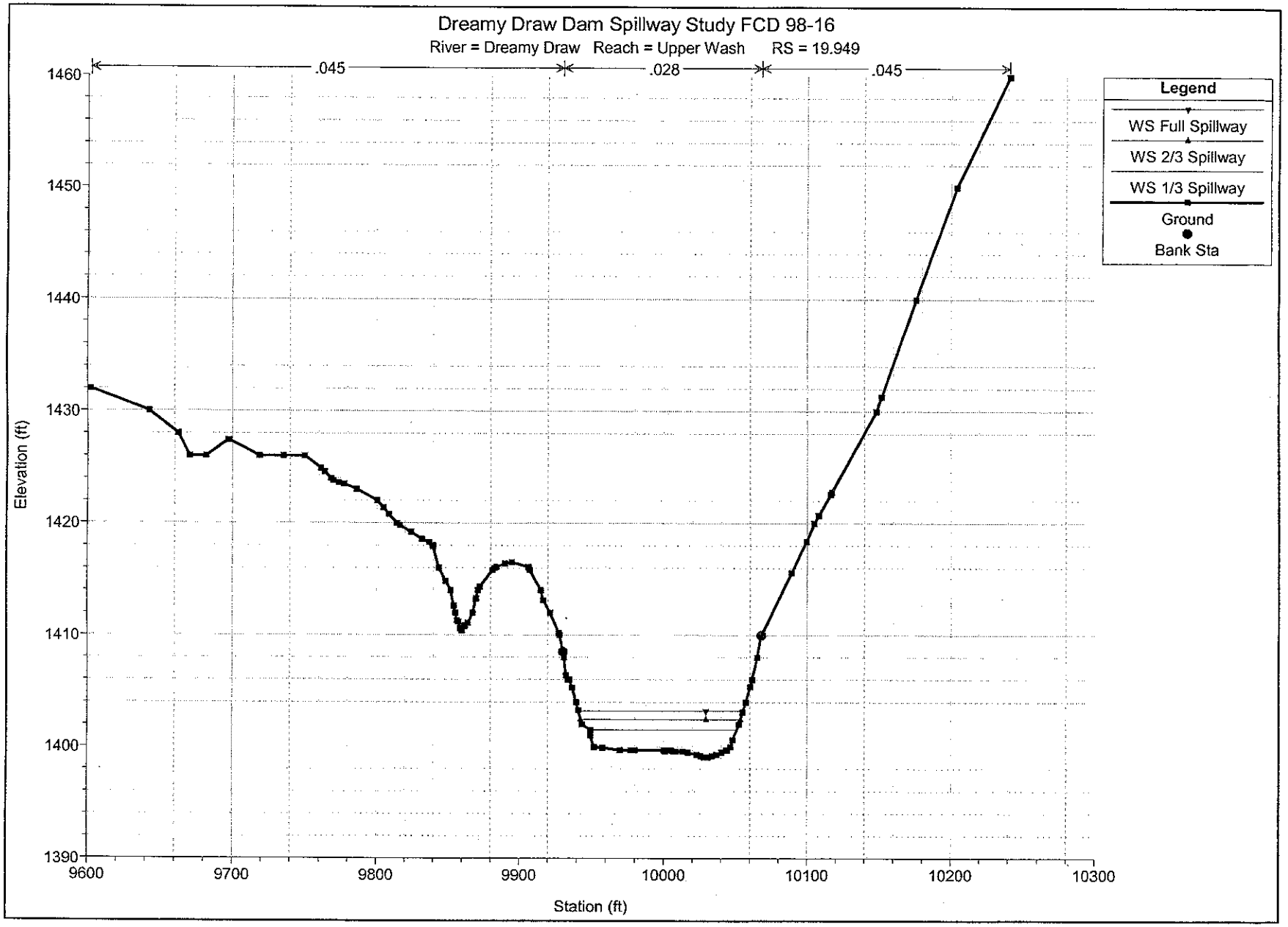
Kimley-Horn and Associates, Inc.

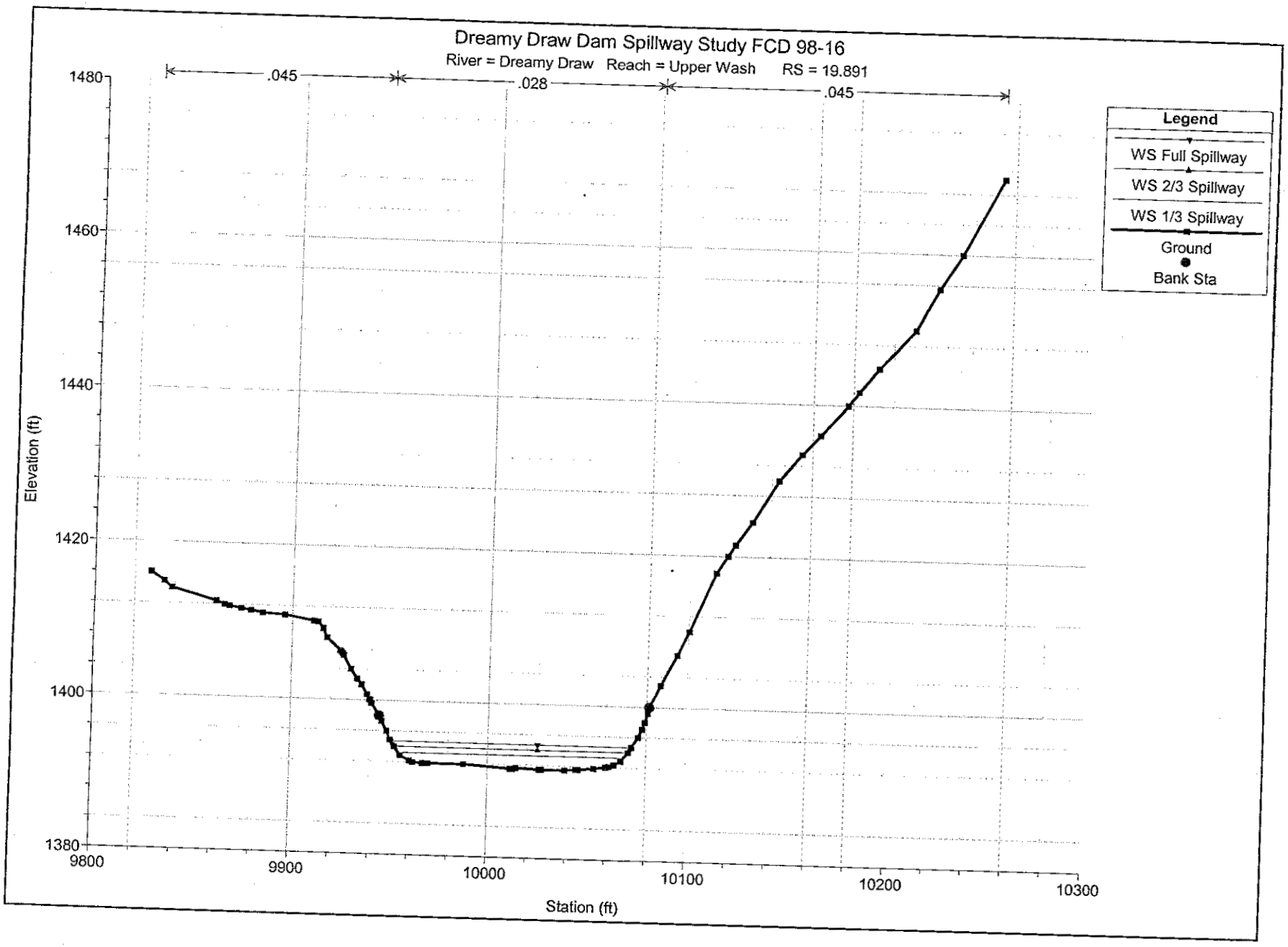
	BY	DATE	
DESIGN	JTA	6/2/99	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	RAE	6/2/99	
PLANS	JTA	6/2/99	RECOMMENDED BY: DATE
PLANS CHK.			APPROVED BY: DATE
SUBMITTED BY: DATE:			CHIEF ENGINEER AND GENERAL MANAGER
			SHEET 3 OF 3

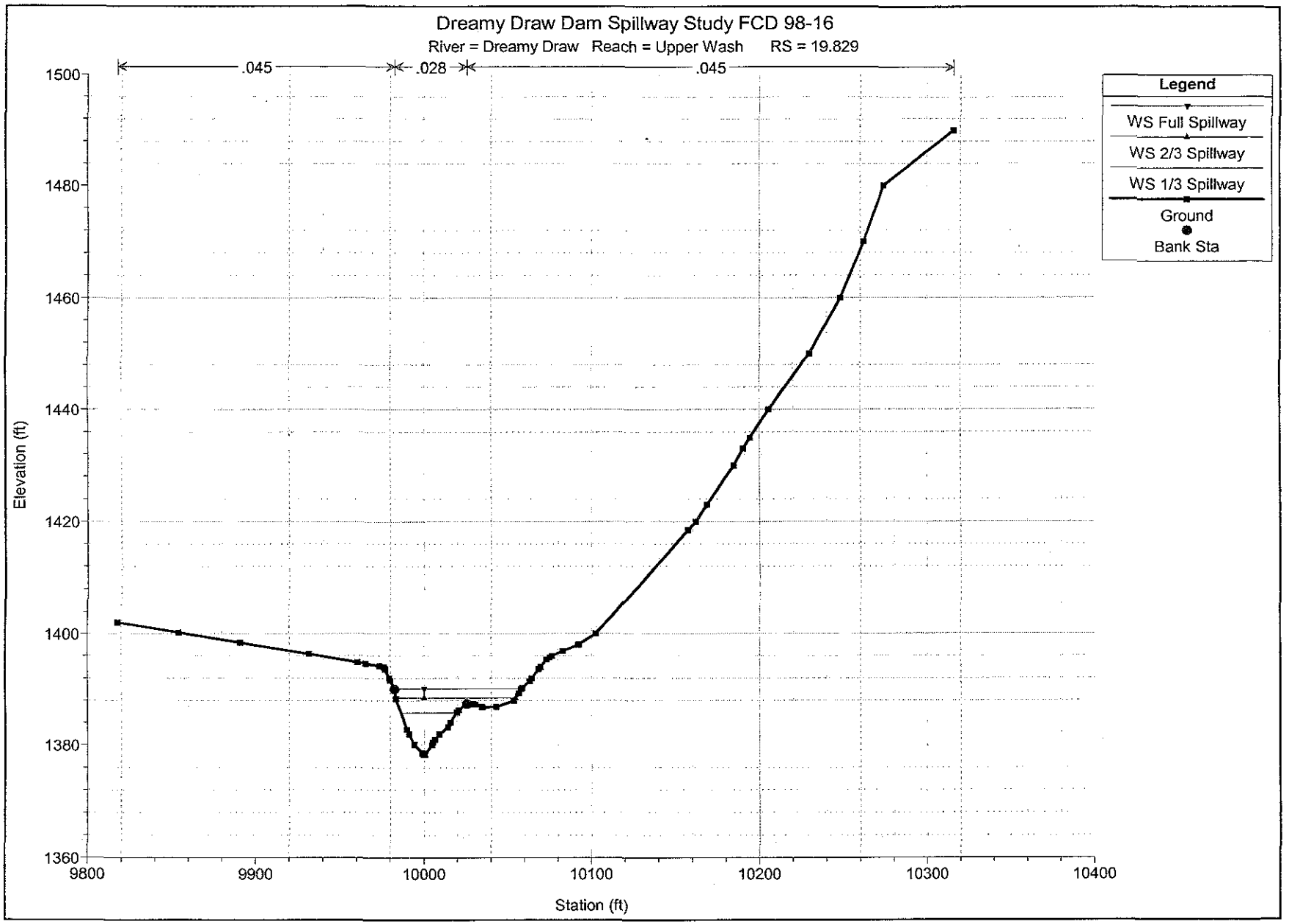
TOPOGRAPHY PROVIDED BY:
KAMINSKI, HUBBARD ENGINEERING, INC.
DATE FLOWN: 11/15/1990

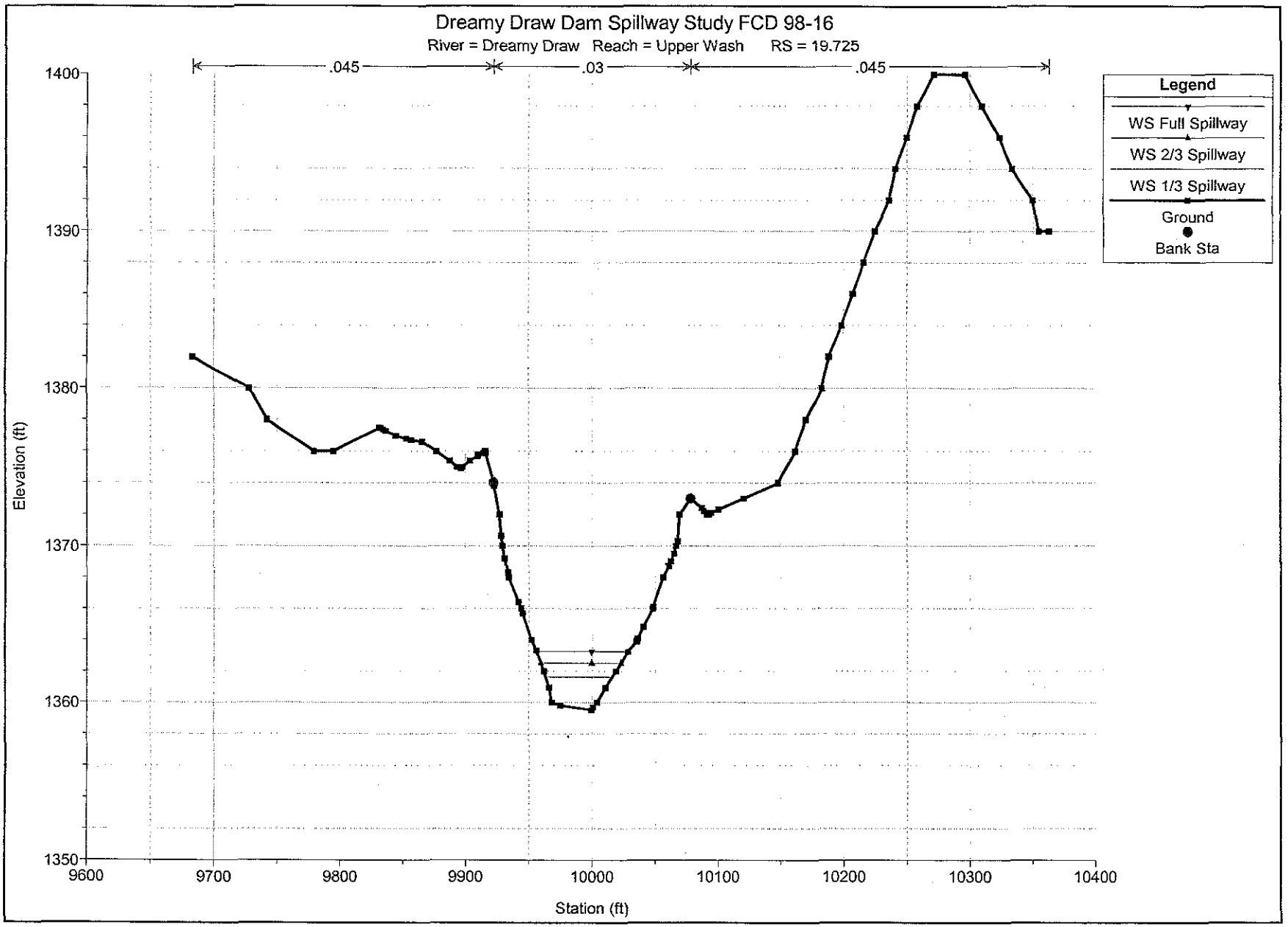
THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1"= 500' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY KAMINSKI, HUBBARD ENGINEERING, INC.

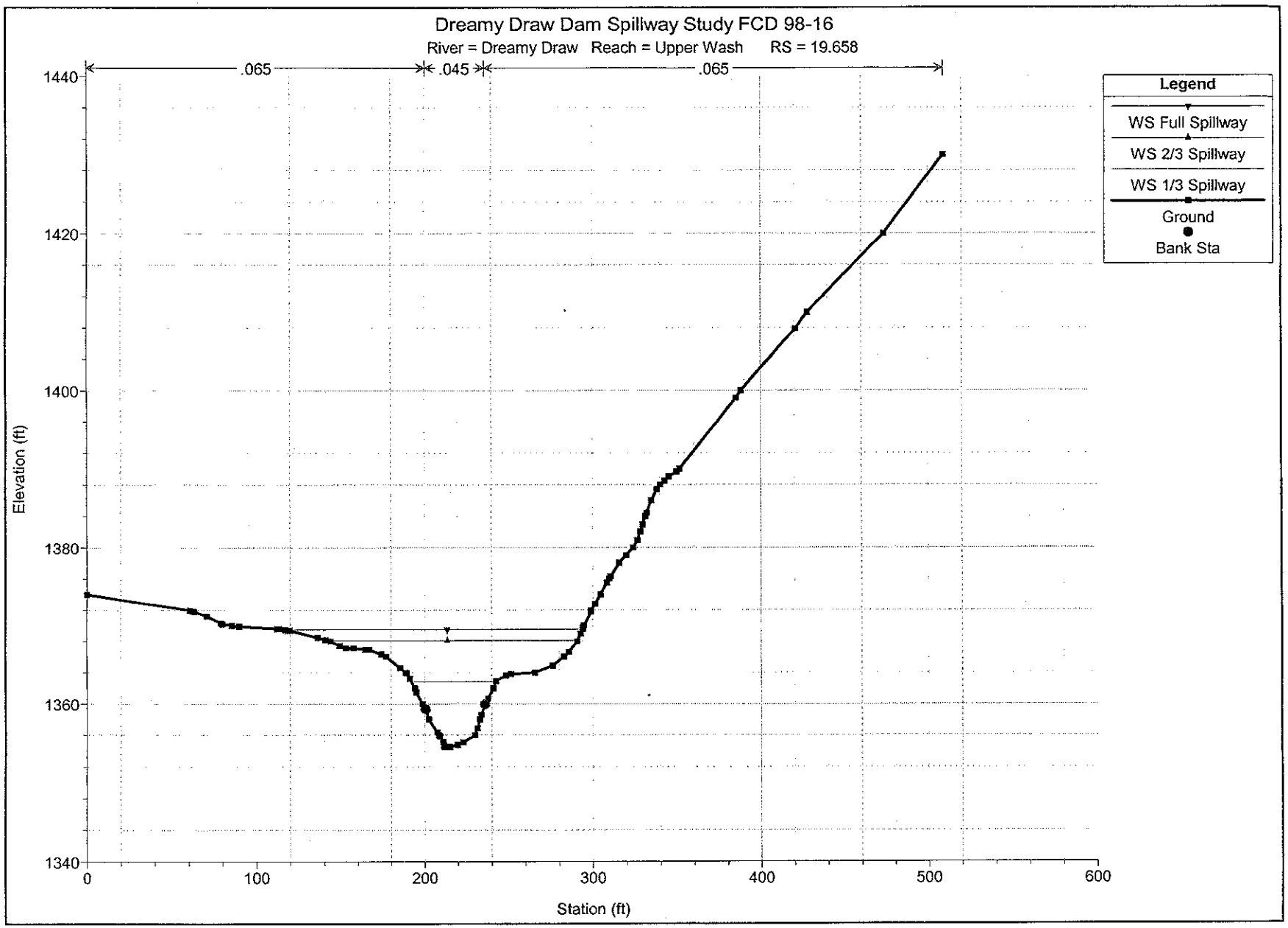

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 20
.045
.028
.045
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1470
1460
1450
1440
1430
1420
1410
1400
9600
9700
9800
9900
10000
10100
10200
10300
Station (ft)

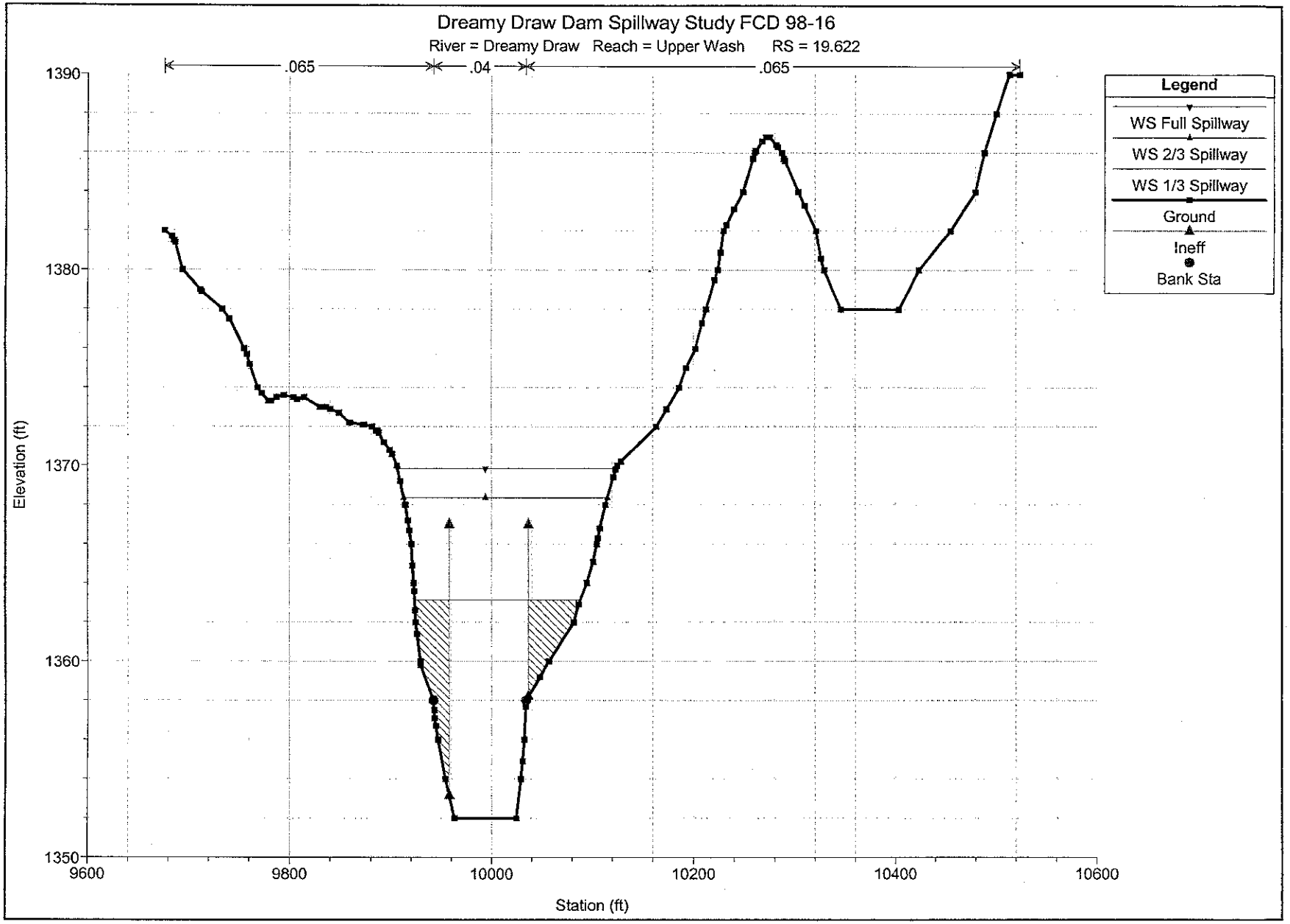

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 19.949
.045
.028
.045
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1460
1450
1440
1430
1420
1410
1400
1390
9600
9700
9800
9900
10000
10100
10200
10300
Station (ft)

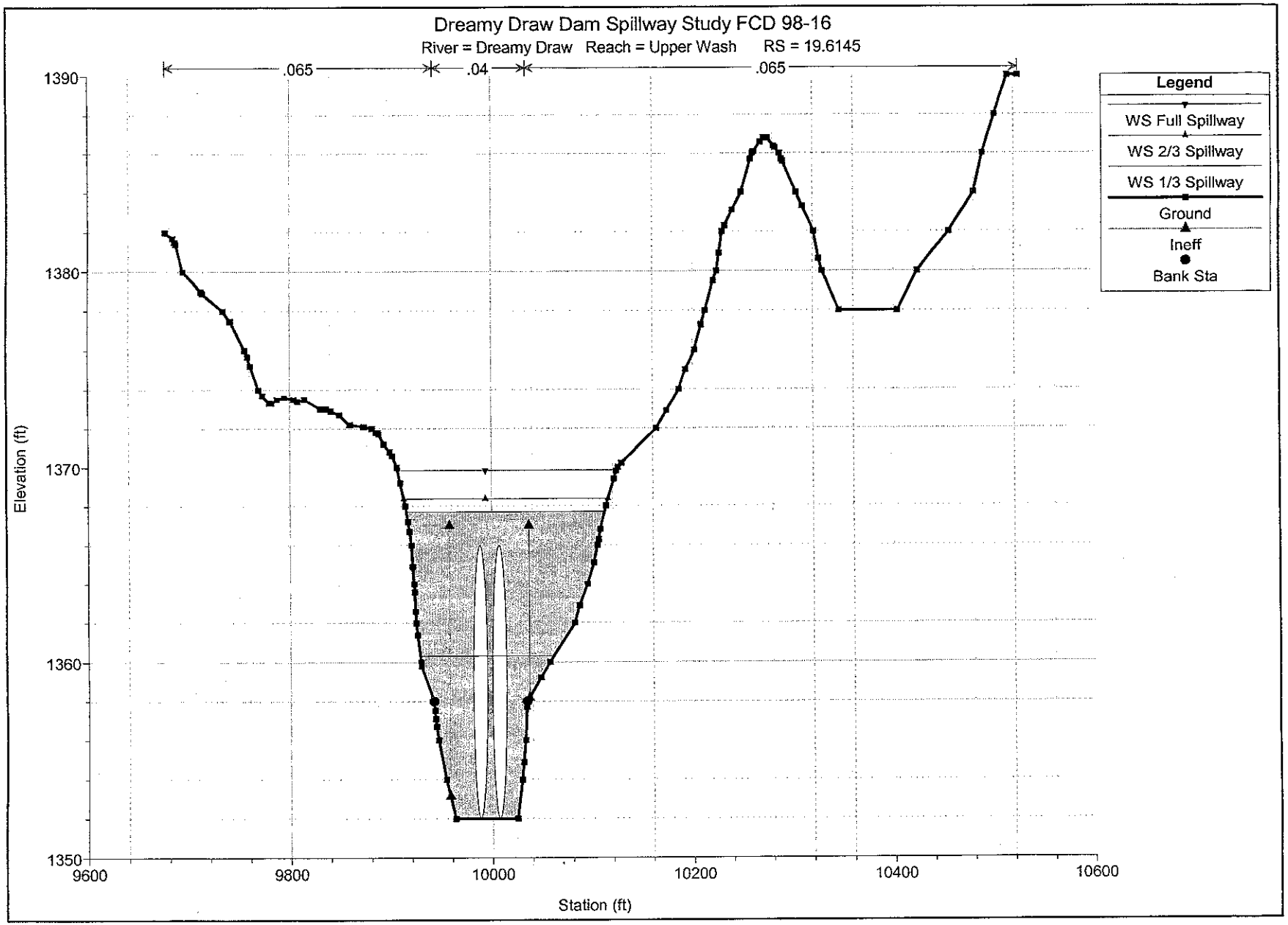

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 19.891
.045
.028
.045
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1480
1460
1440
1420
1400
1380
9800
9900
10000
10100
10200
10300
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 19.829
.045
.028
.045
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1500
1480
1460
1440
1420
1400
1380
1360
9800
9900
10000
10100
10200
10300
10400
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 19.725
.045
.03
.045
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1400
1390
1380
1370
1360
1350
9600
9700
9800
9900
10000
10100
10200
10300
10400
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 19.658
.065
.045
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1440
1420
1400
1380
1360
1340
0
100
200
300
400
500
600
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 19.622
.065
.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1390
1380
1370
1360
1350
9600
9800
10000
10200
10400
10600
Station (ft)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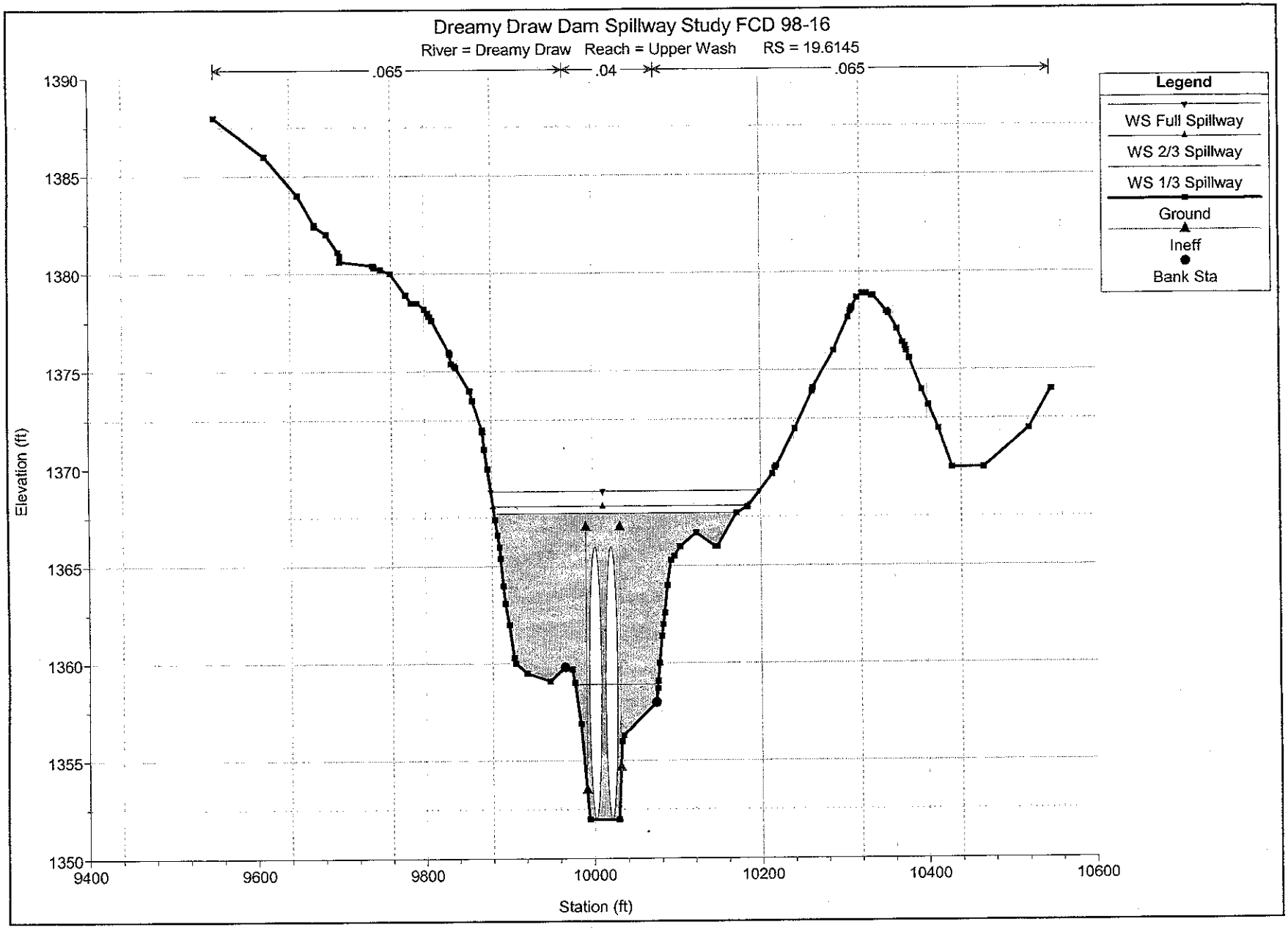
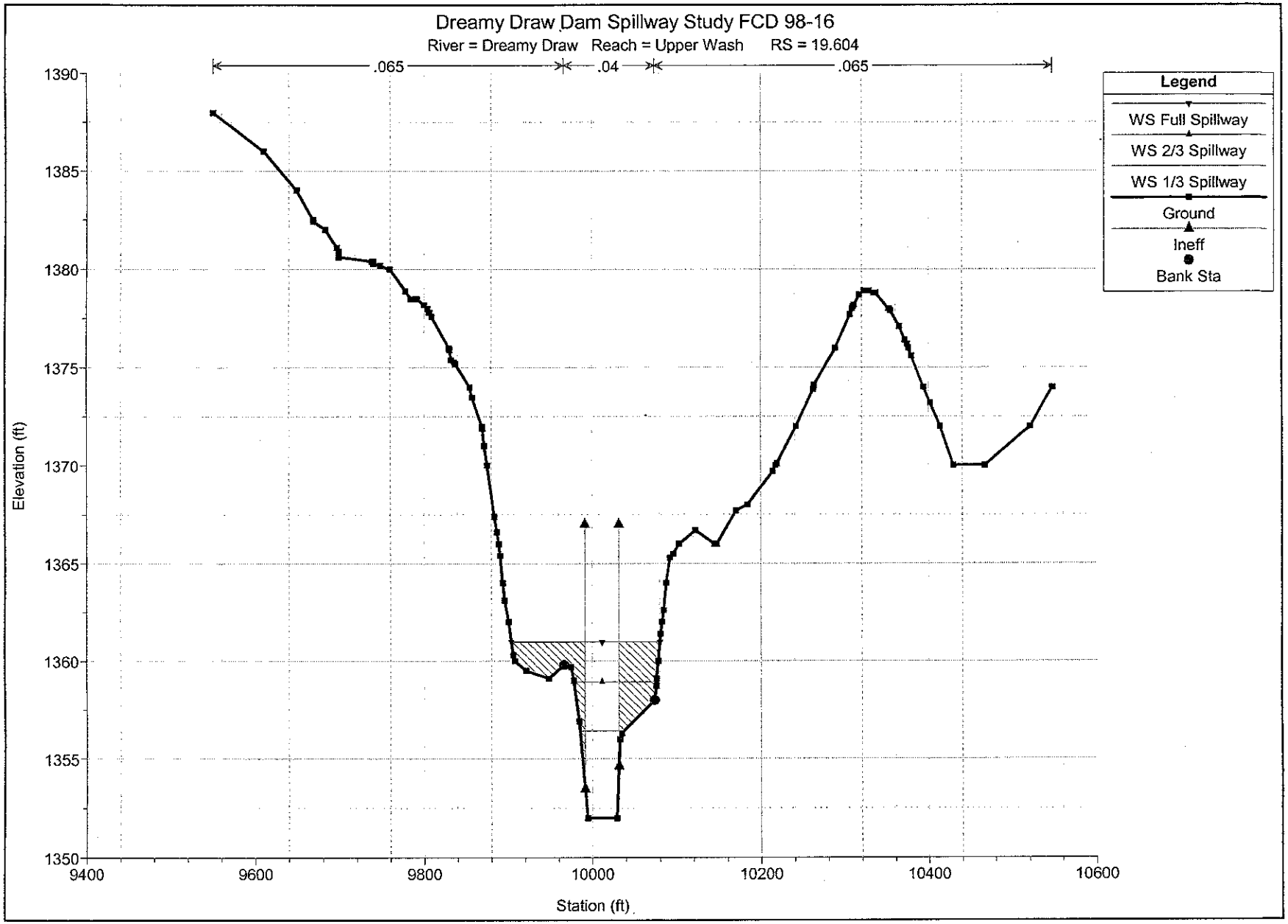
River = Dreamy Draw Reach = Upper Wash RS = 19.6145
.065
.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1390
1380
1370
1360
1350
9600
9800
10000
10200
10400
10600
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 19.6145
.065
.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1390
1385
1380
1375
1370
1365
1360
1355
1350
9400
9600
9800
10000
10200
10400
10600
Station (ft)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River = Dreamy Draw Reach = Upper Wash RS = 19.604
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.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1390
1385
1380
1375
1370
1365
1360
1355
1350
9400
9600
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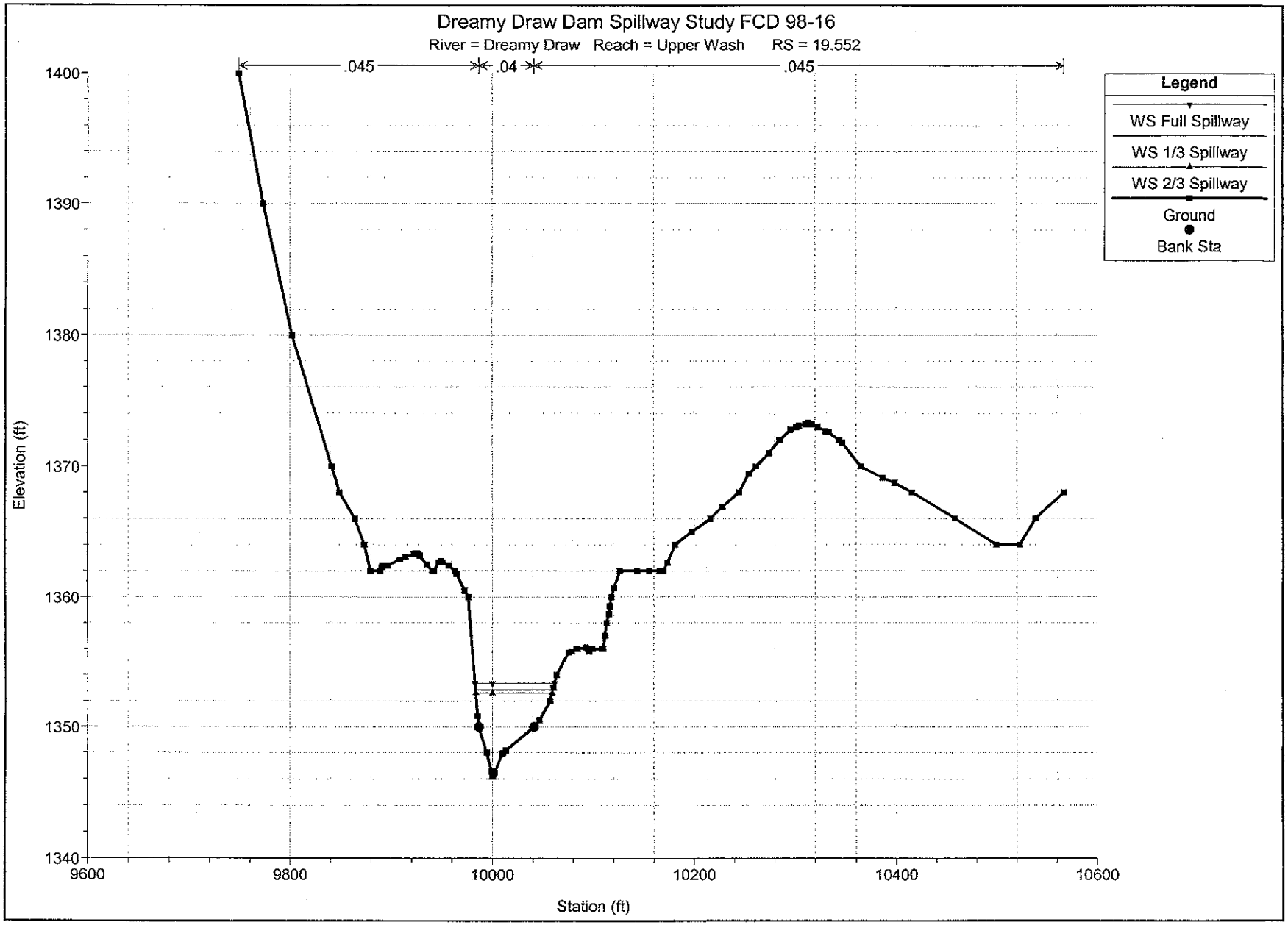
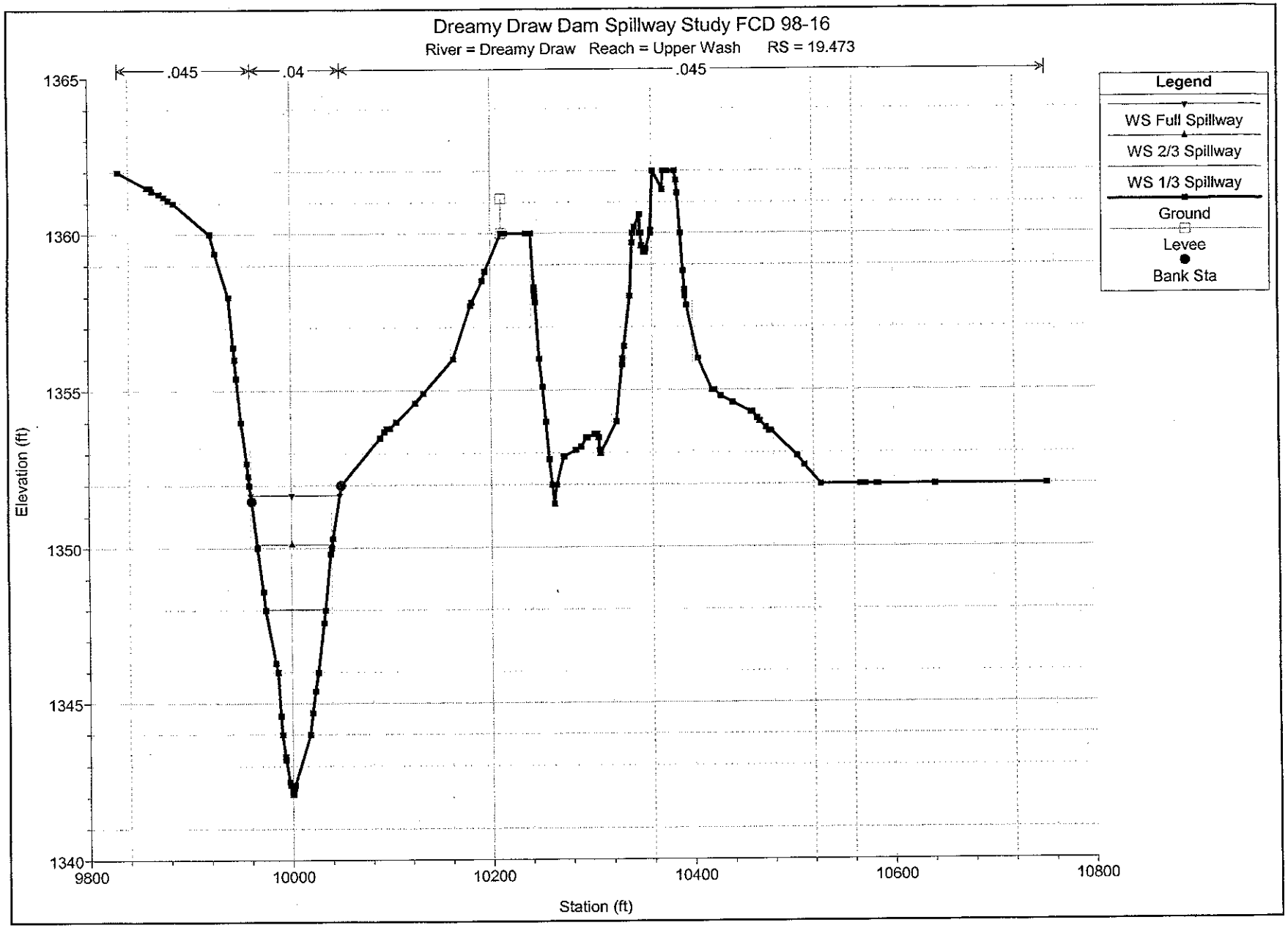
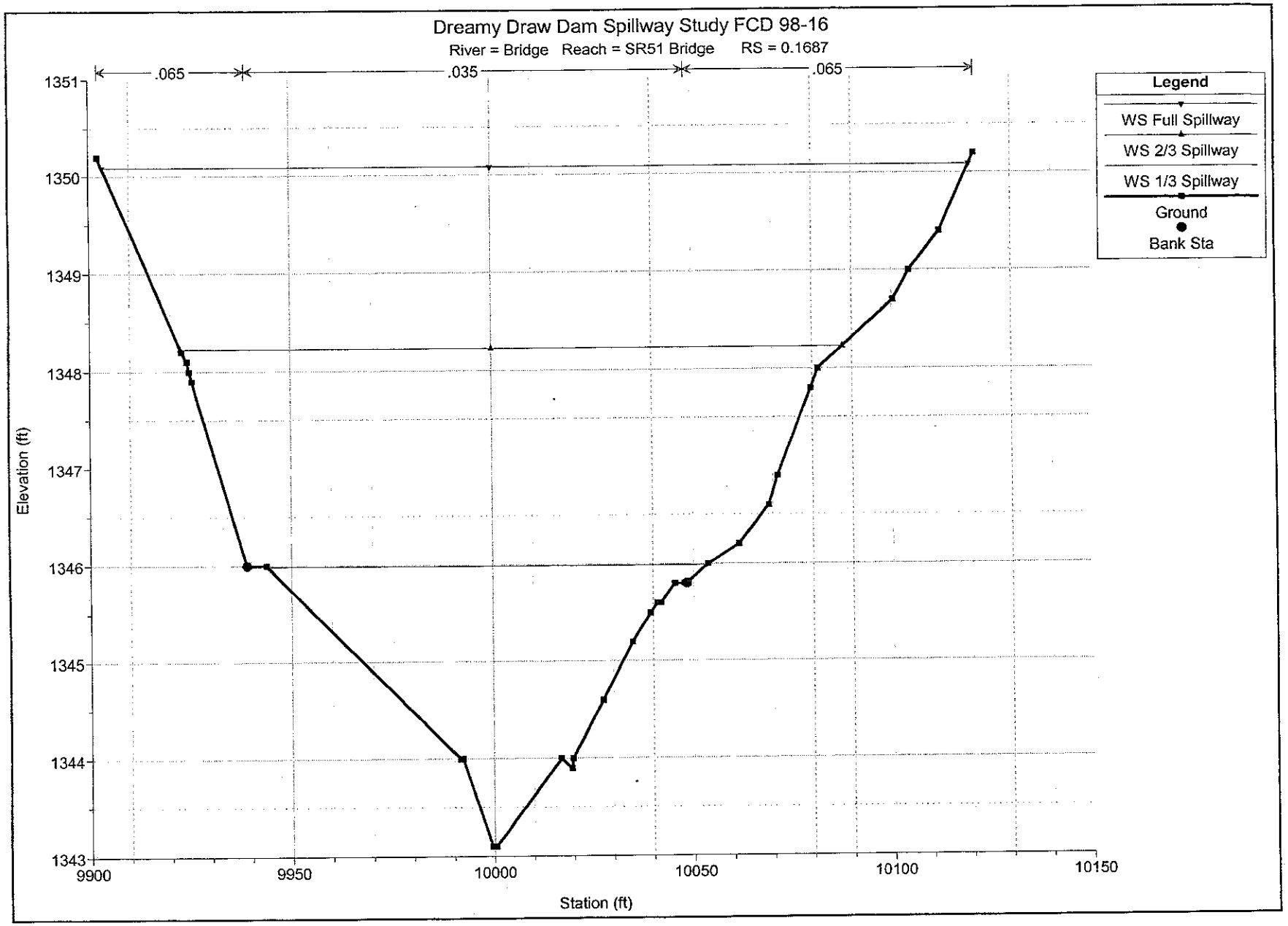
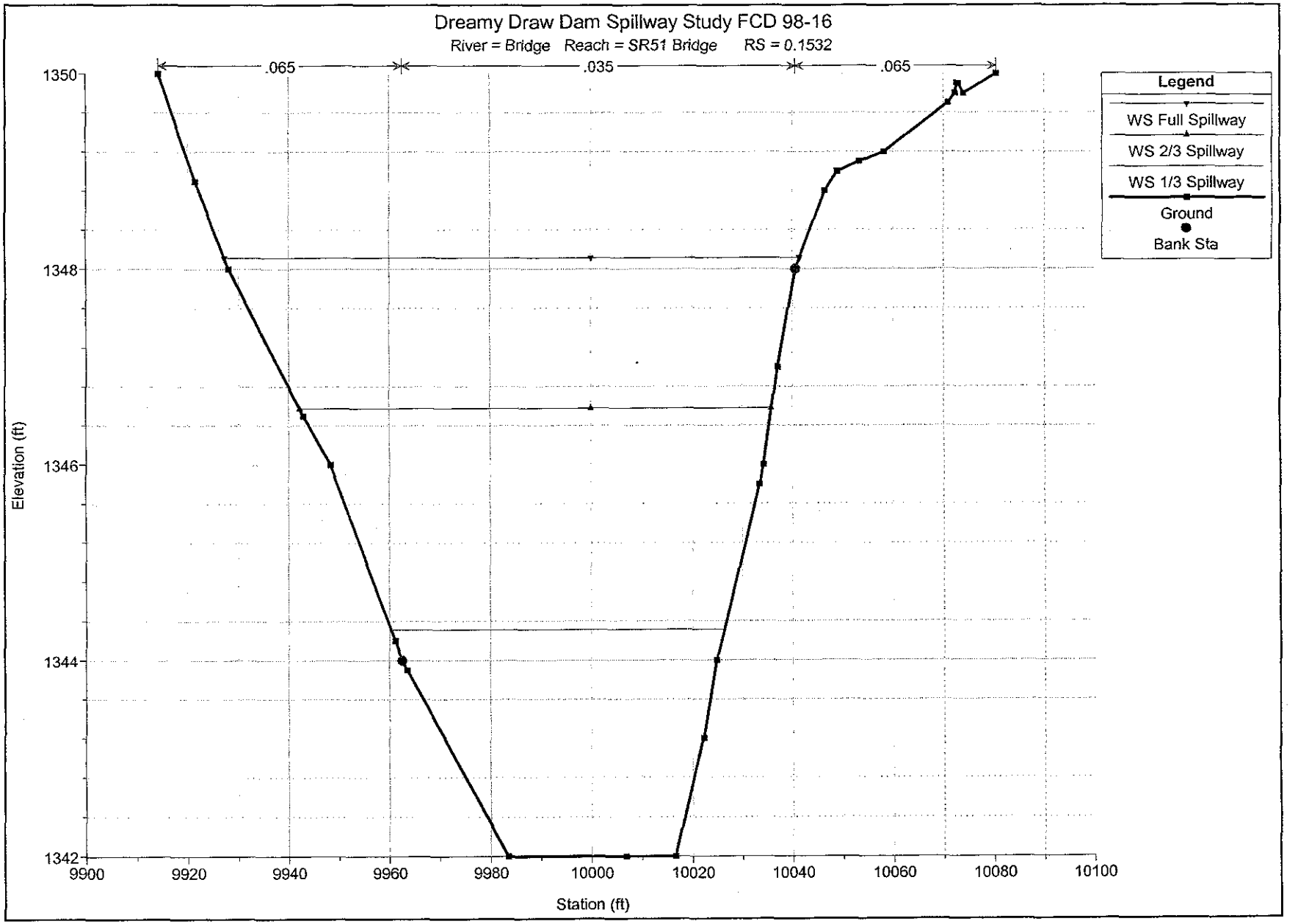
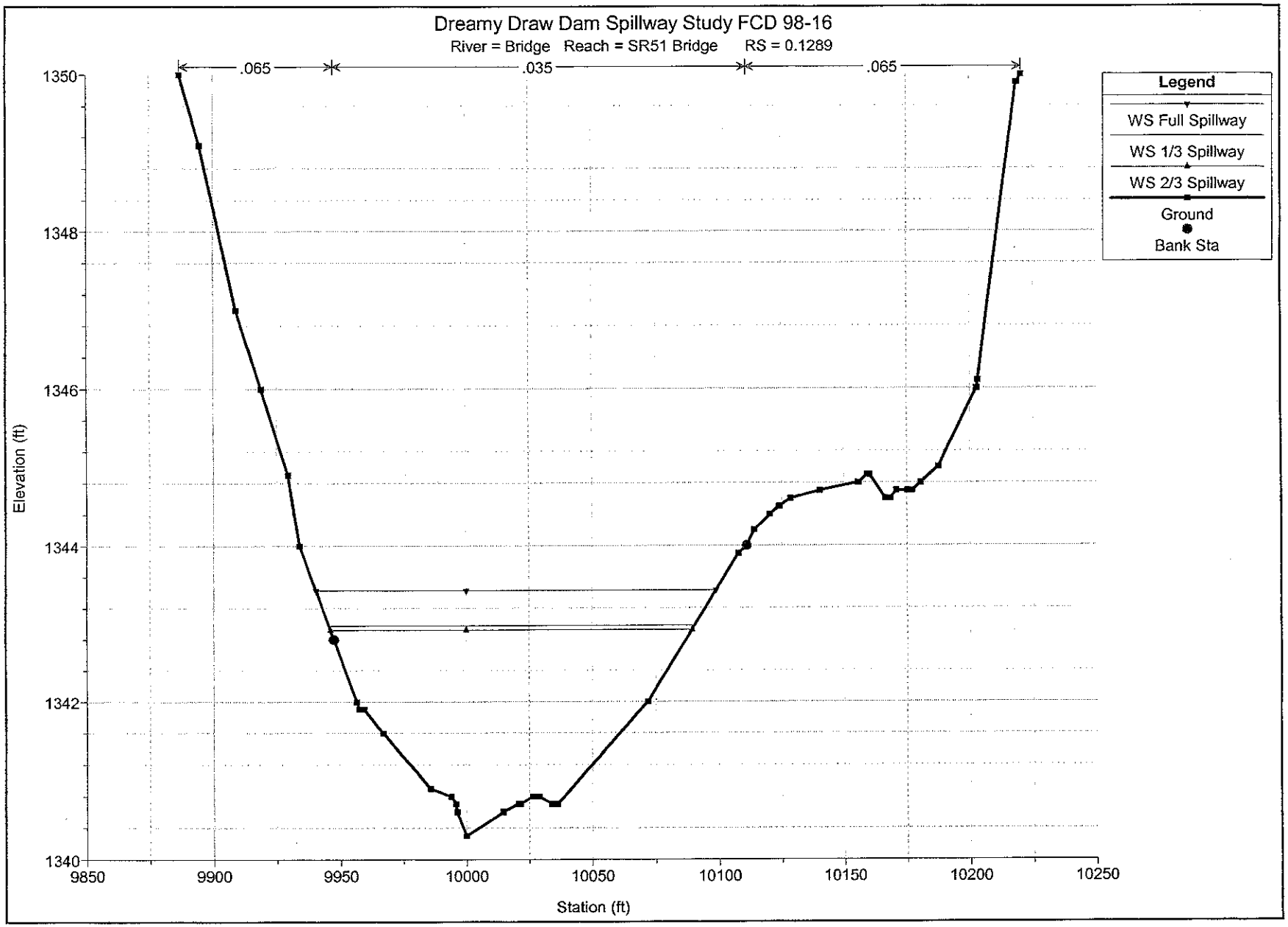
10200
10400
10600
Station (ft)

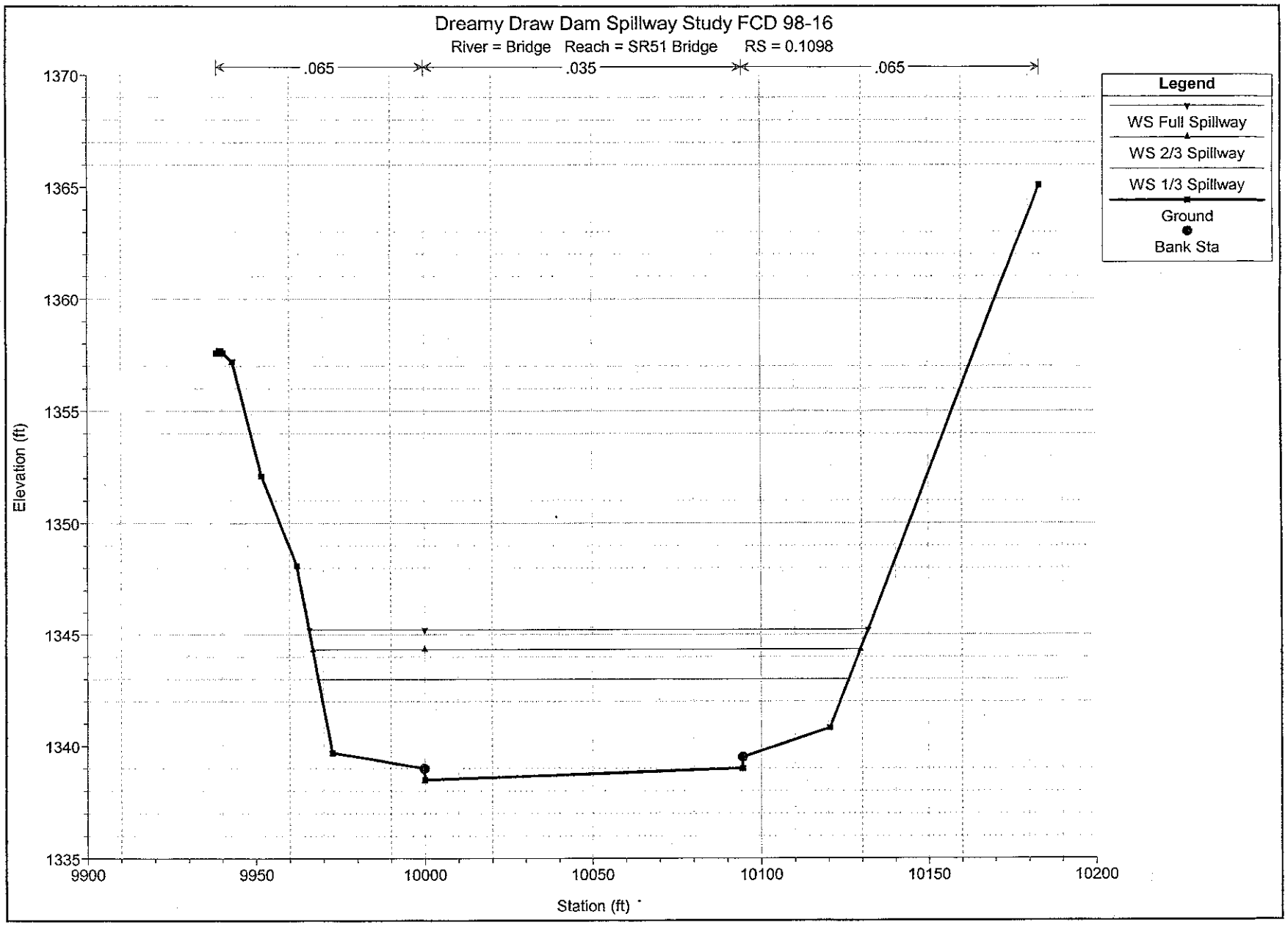

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 19.552
.045
.04
.045
Legend
WS Full Spillway
WS 1/3 Spillway
WS 2/3 Spillway
Ground
Bank Sta
Elevation (ft)
1400
1390
1380
1370
1360
1350
1340
9600
9800
10000
10200
10400
10600
Station (ft)

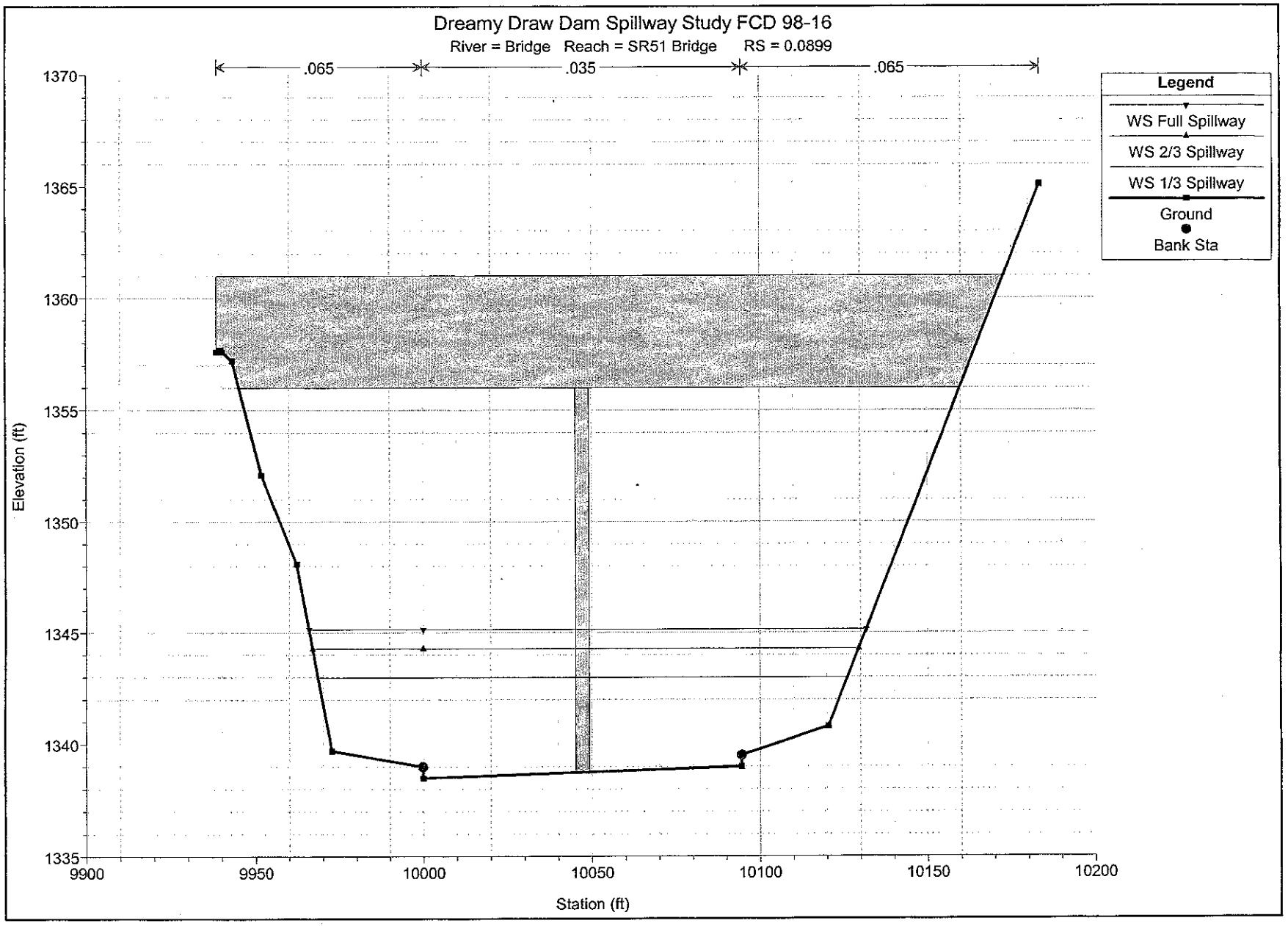

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Upper Wash RS = 19.473
.045
.04
.045
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1365
1360
1355
1350
1345
1340
9800
10000
10200
10400
10600
10800
Station (ft)

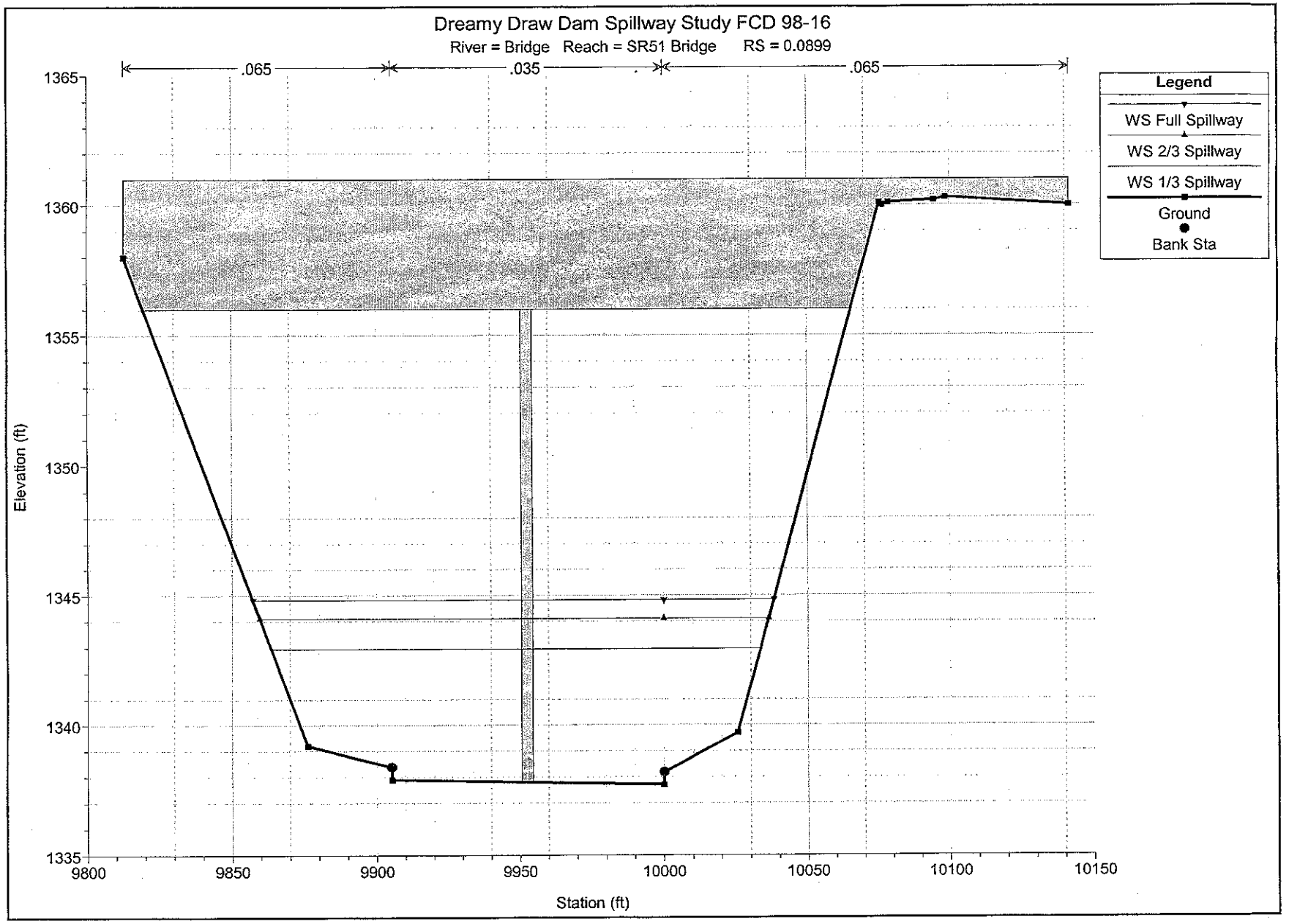

Dreamy Draw Dam Spillway Study FCD 98-16
River = Bridge Reach = SR51 Bridge RS = 0.1687
.065
.035
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1351
1350
1349
1348
1347
1346
1345
1344
1343
9900
9950
10000
10050
10100
10150
Station (ft)

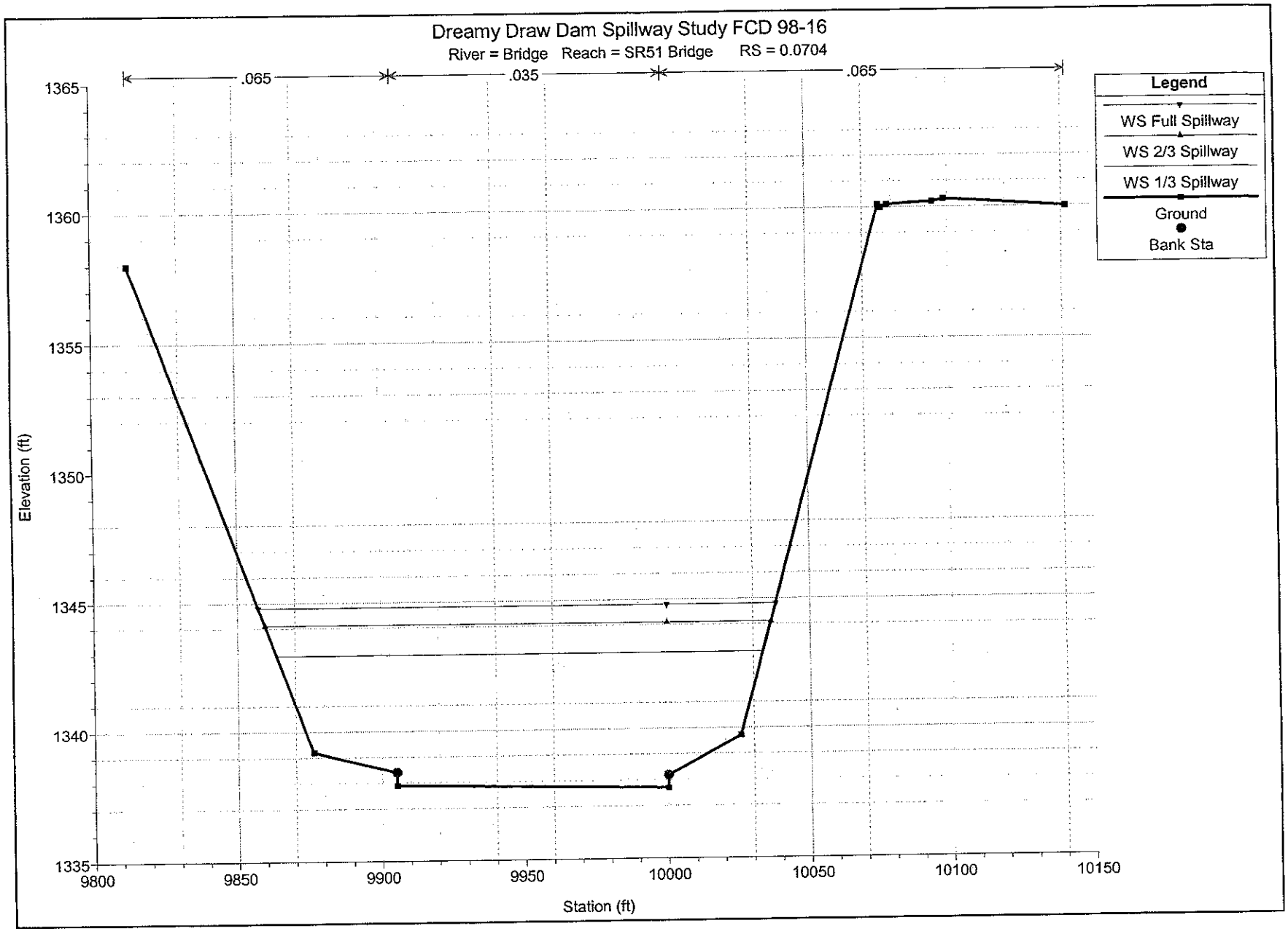

Dreamy Draw Dam Spillway Study FCD 98-16
River = Bridge Reach = SR51 Bridge RS = 0.1532
.065
.035
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1350
1348
1346
1344
1342
9900
9920
9940
9960
9980
10000
10020
10040
10060
10080
10100
Station (ft)

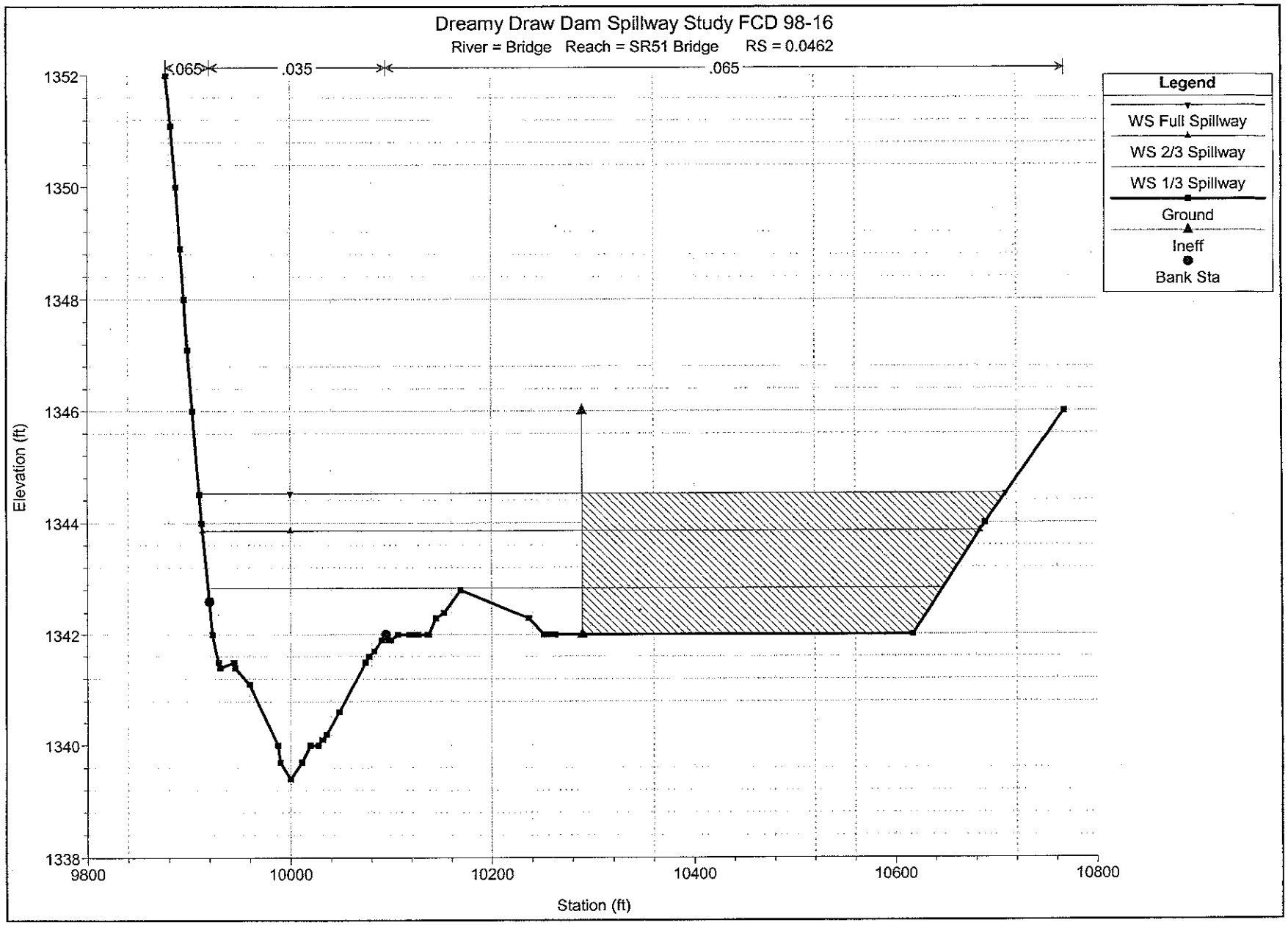

Dreamy Draw Dam Spillway Study FCD 98-16
River = Bridge Reach = SR51 Bridge RS = 0.1289
.065
.035
.065
Legend
WS Full Spillway
WS 1/3 Spillway
WS 2/3 Spillway
Ground
Bank Sta
Elevation (ft)
1350
1348
1346
1344
1342
1340
9850
9900
9950
10000
10050
10100
10150
10200
10250
Station (ft)

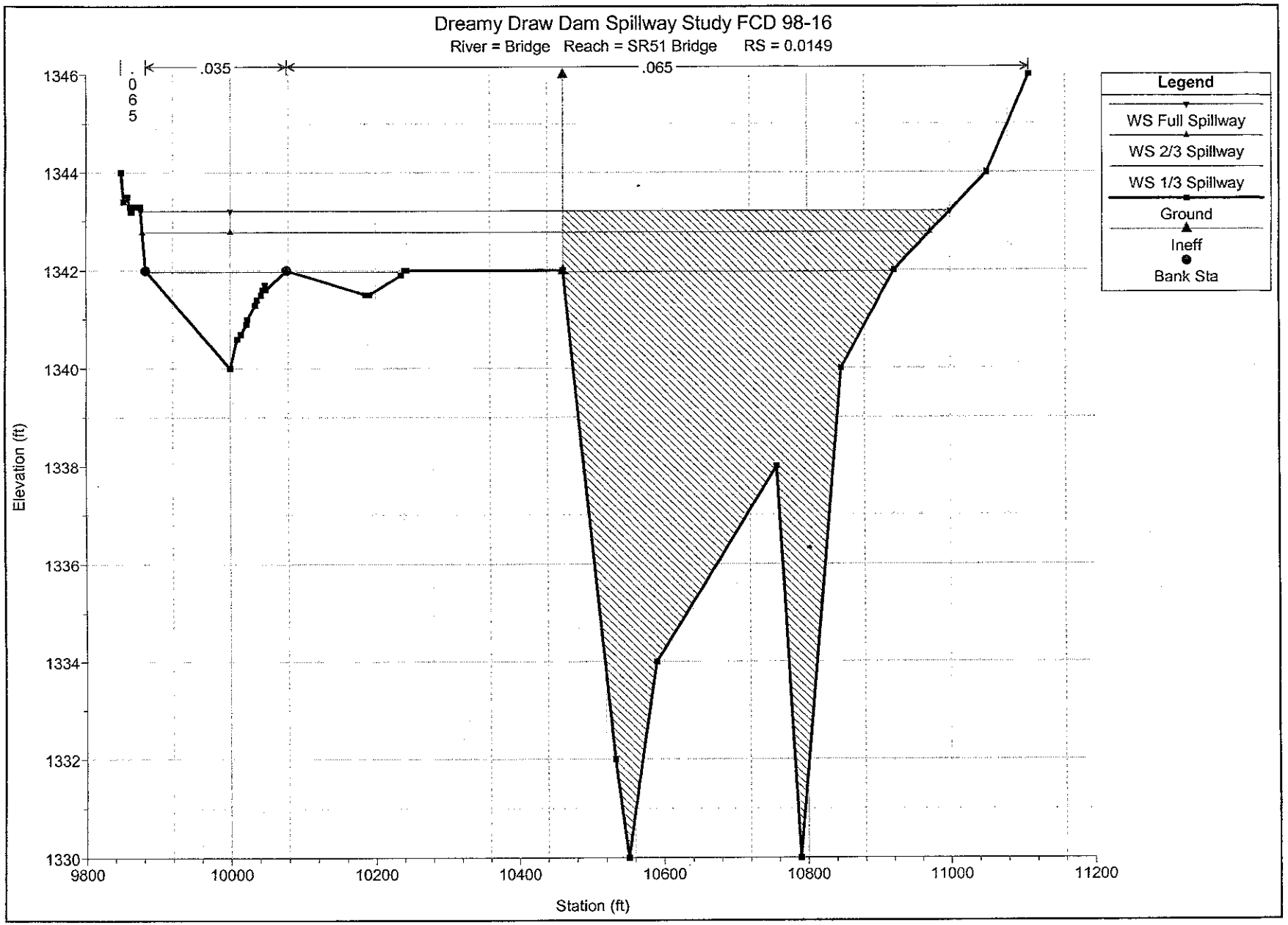

Dreamy Draw Dam Spillway Study FCD 98-16
River = Bridge Reach = SR51 Bridge RS = 0.1098
.065
.035
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1370
1365
1360
1355
1350
1345
1340
1335
9900
9950
10000
10050
10100
10150
10200
Station (ft)

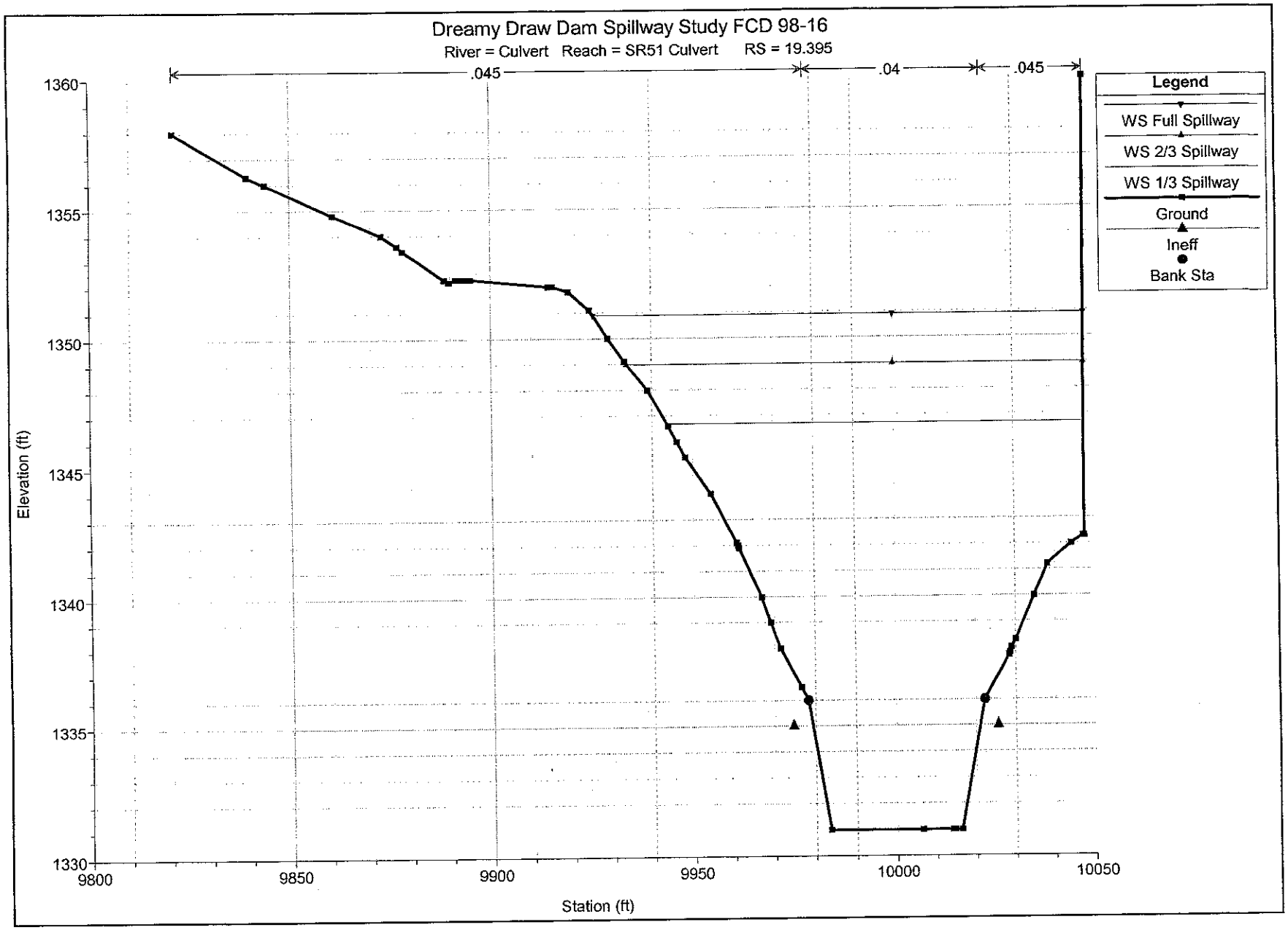

Dreamy Draw Dam Spillway Study FCD 98-16
River = Bridge Reach = SR51 Bridge RS = 0.0899
.065
.035
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1370
1365
1360
1355
1350
1345
1340
1335
9900
9950
10000
10050
10100
10150
10200
Station (ft)

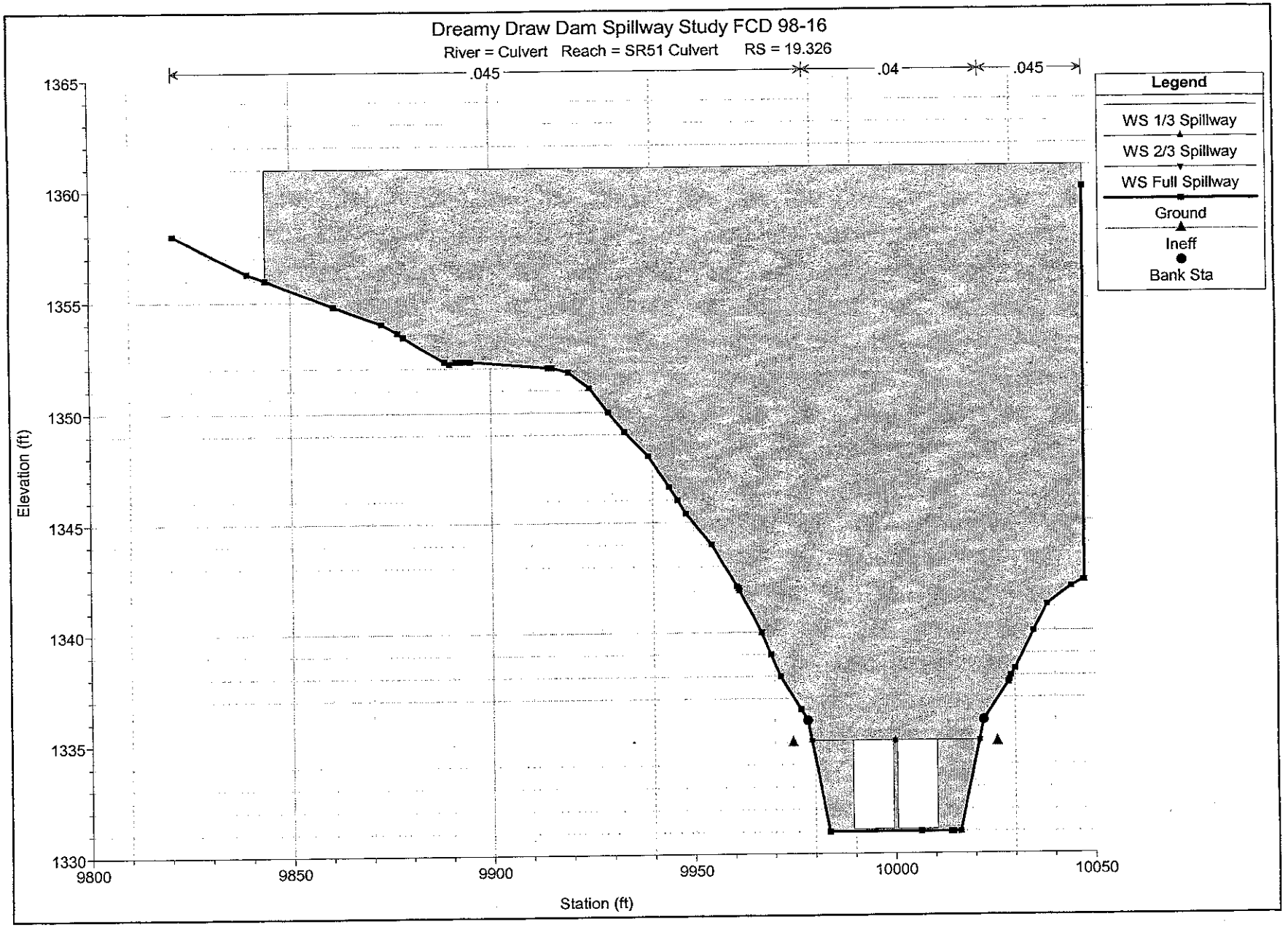

Dreamy Draw Dam Spillway Study FCD 98-16
River = Bridge Reach = SR51 Bridge RS = 0.0899
.065
.035
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1365
1360
1355
1350
1345
1340
1335
9800
9850
9900
9950
10000
10050
10100
10150
Station (ft)

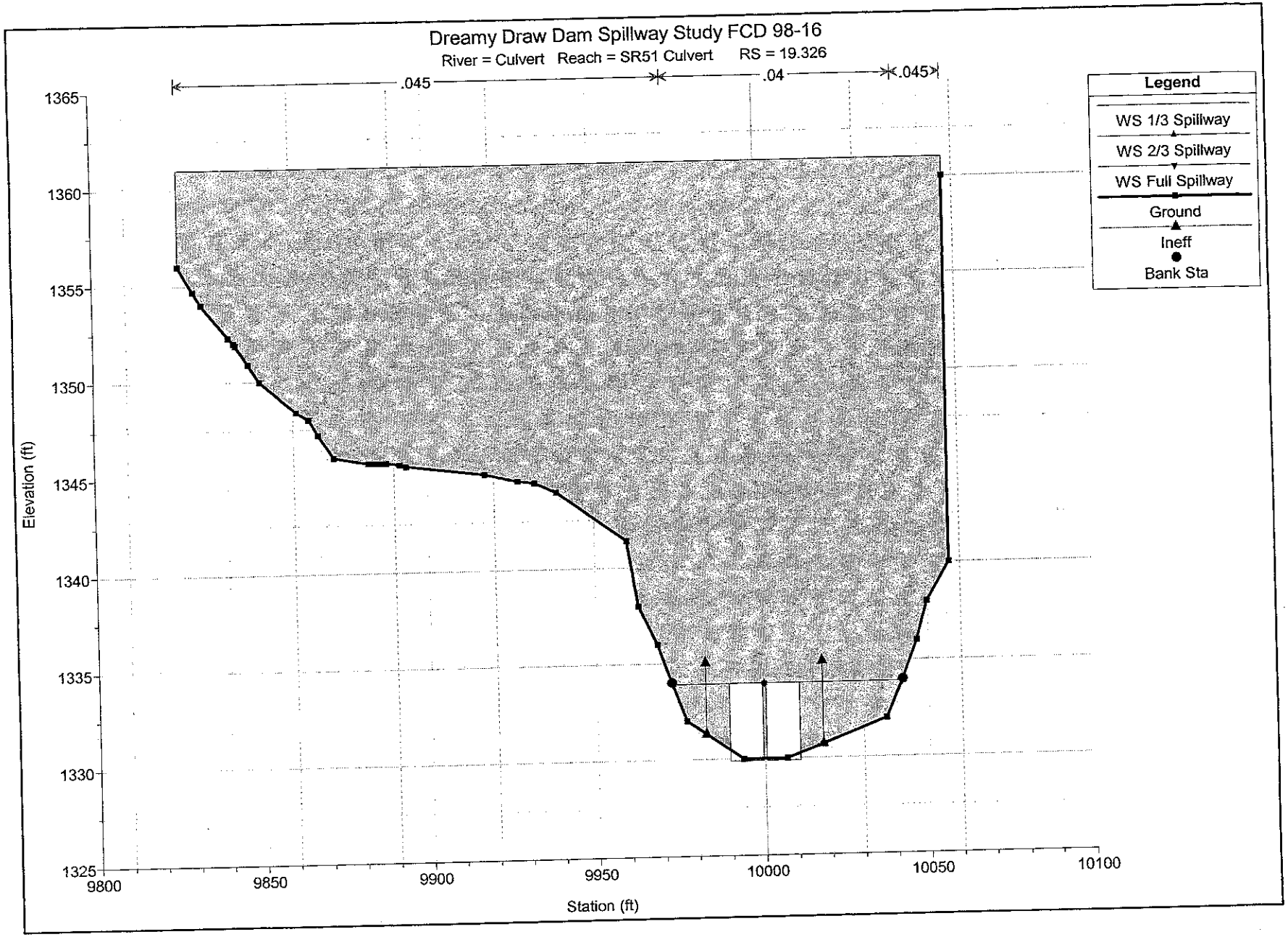

Dreamy Draw Dam Spillway Study FCD 98-16
River = Bridge Reach = SR51 Bridge RS = 0.0704
.065
.035
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Bank Sta
Elevation (ft)
1365
1360
1355
1350
1345
1340
1335
9800
9850
9900
9950
10000
10050
10100
10150
Station (ft)

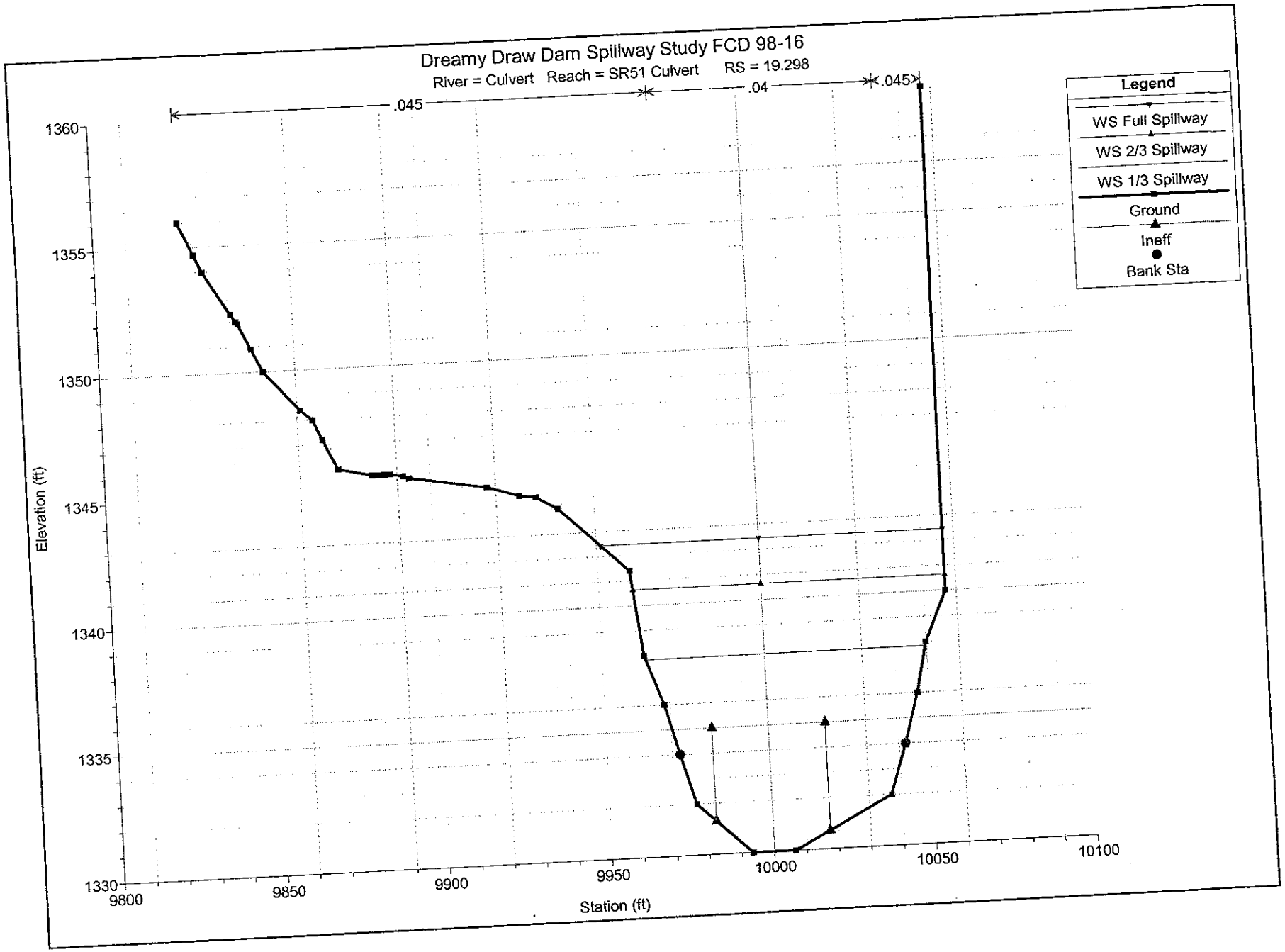

Dreamy Draw Dam Spillway Study FCD 98-16
River = Bridge Reach = SR51 Bridge RS = 0.0462
.065
.035
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1352
1350
1348
1346
1344
1342
1340
1338
9800
10000
10200
10400
10600
10800
Station (ft)

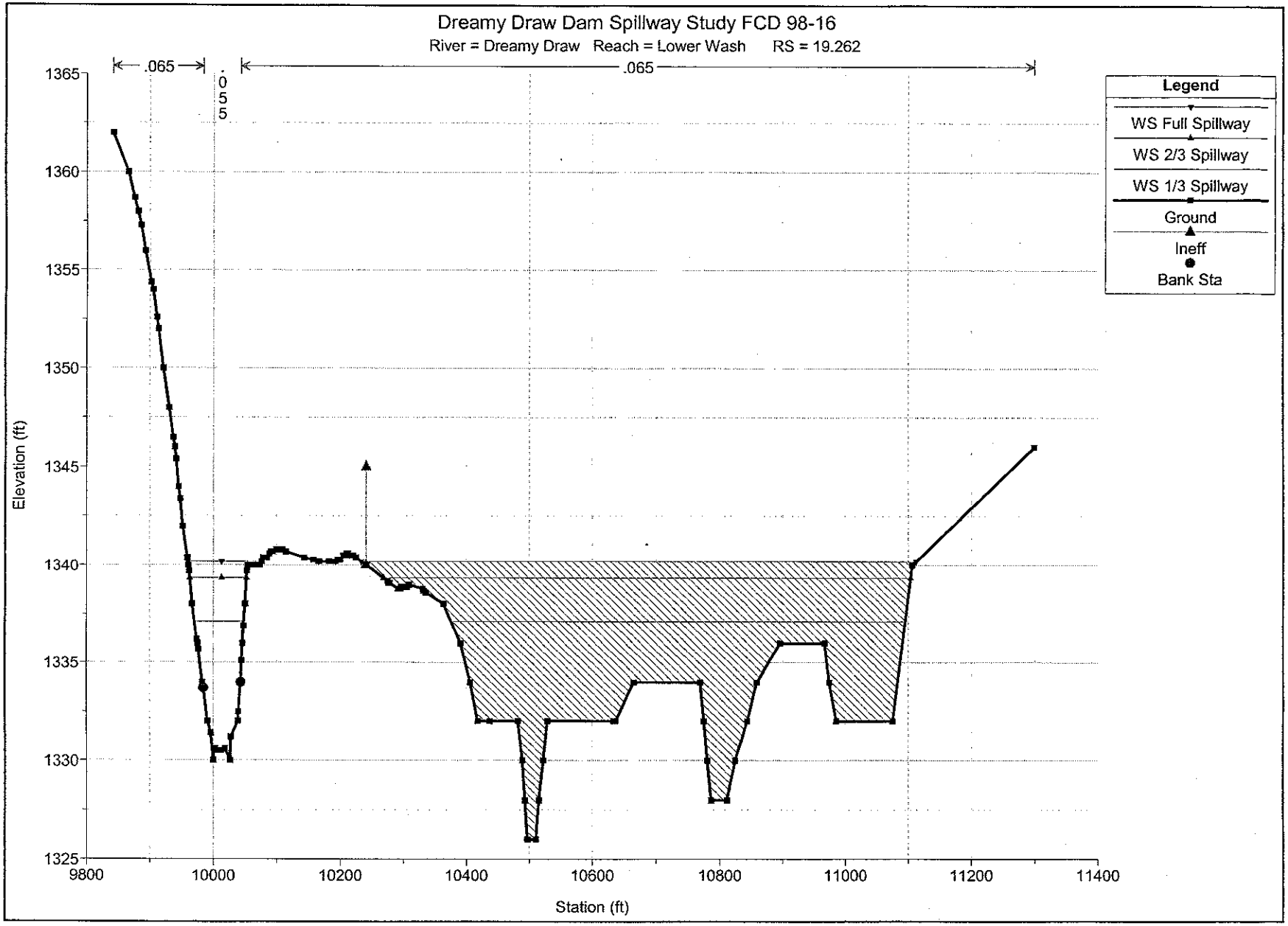

Dreamy Draw Dam Spillway Study FCD 98-16
River = Bridge Reach = SR51 Bridge RS = 0.0149
.065
.035
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1346
1344
1342
1340
1338
1336
1334
1332
1330
9800
10000
10200
10400
10600
10800
11000
11200
Station (ft)

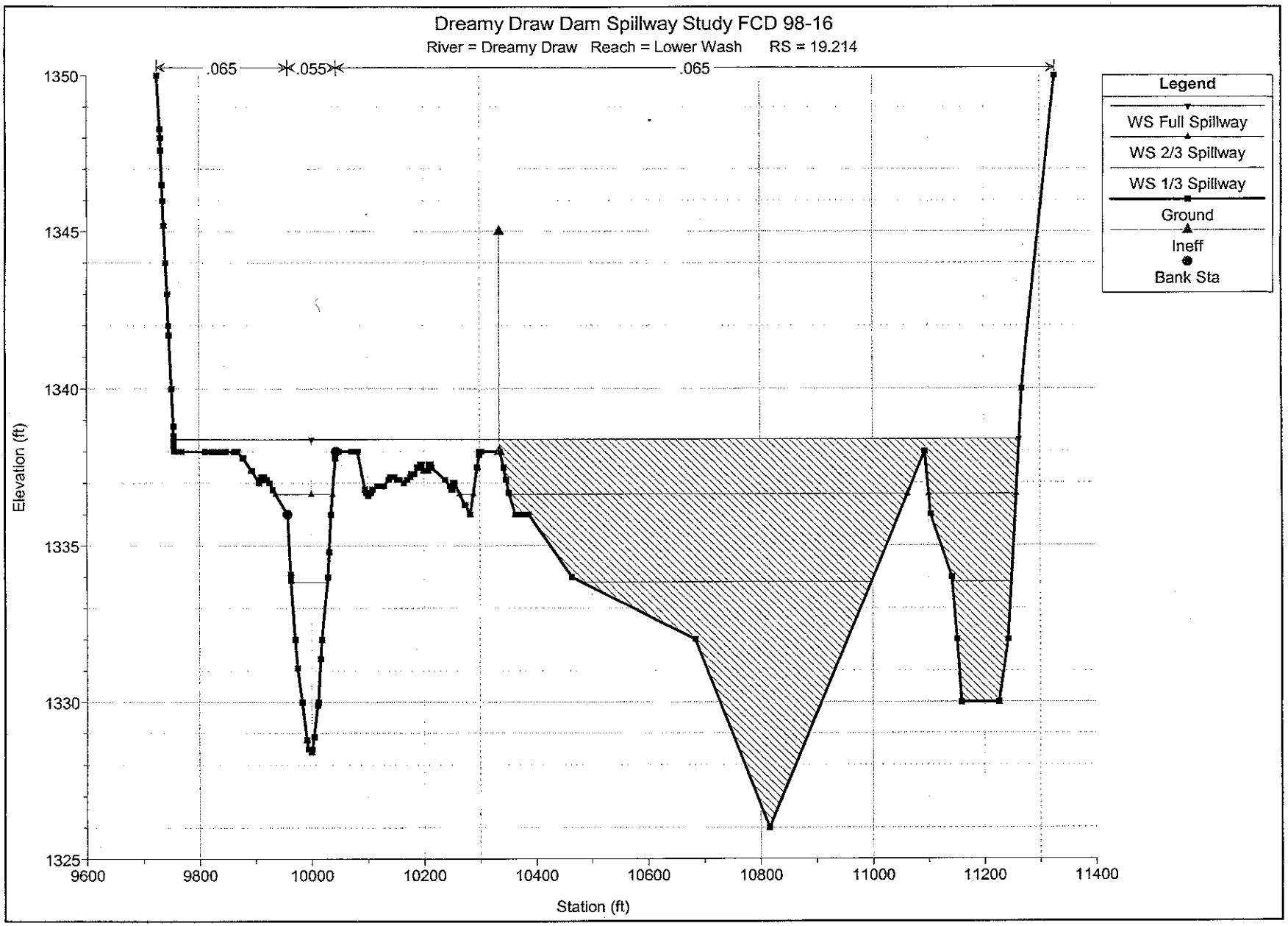

Dreamy Draw Dam Spillway Study FCD 98-16
River = Culvert Reach = SR51 Culvert RS = 19.395
.045
.04
.045
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1360
1355
1350
1345
1340
1335
1330
9800
9850
9900
9950
10000
10050
Station (ft)

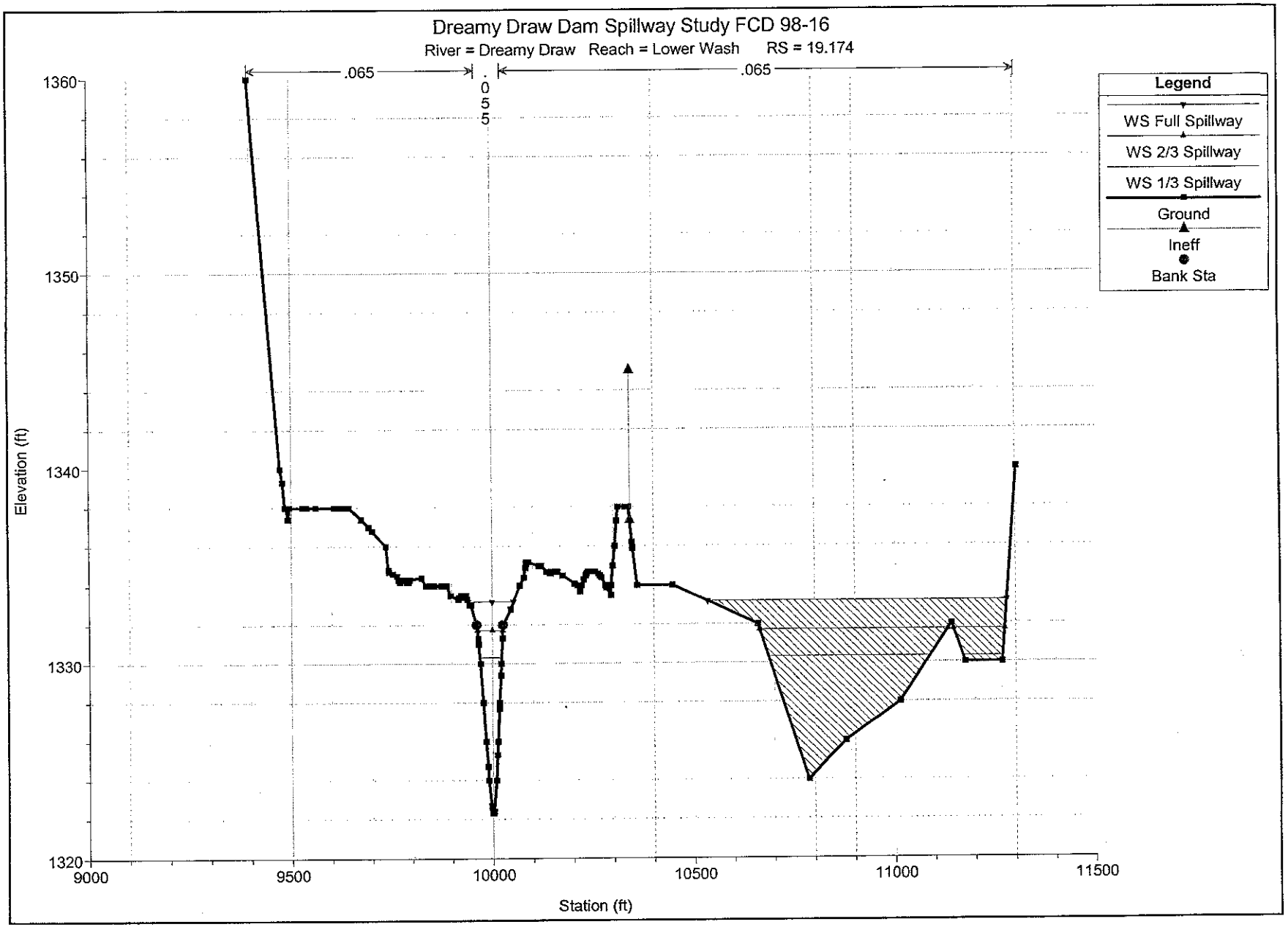

Dreamy Draw Dam Spillway Study FCD 98-16
River = Culvert Reach = SR51 Culvert RS = 19.326
.045
.04
.045
Legend
WS 1/3 Spillway
WS 2/3 Spillway
WS Full Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1365
1360
1355
1350
1345
1340
1335
1330
9800
9850
9900
9950
10000
10050
Station (ft)

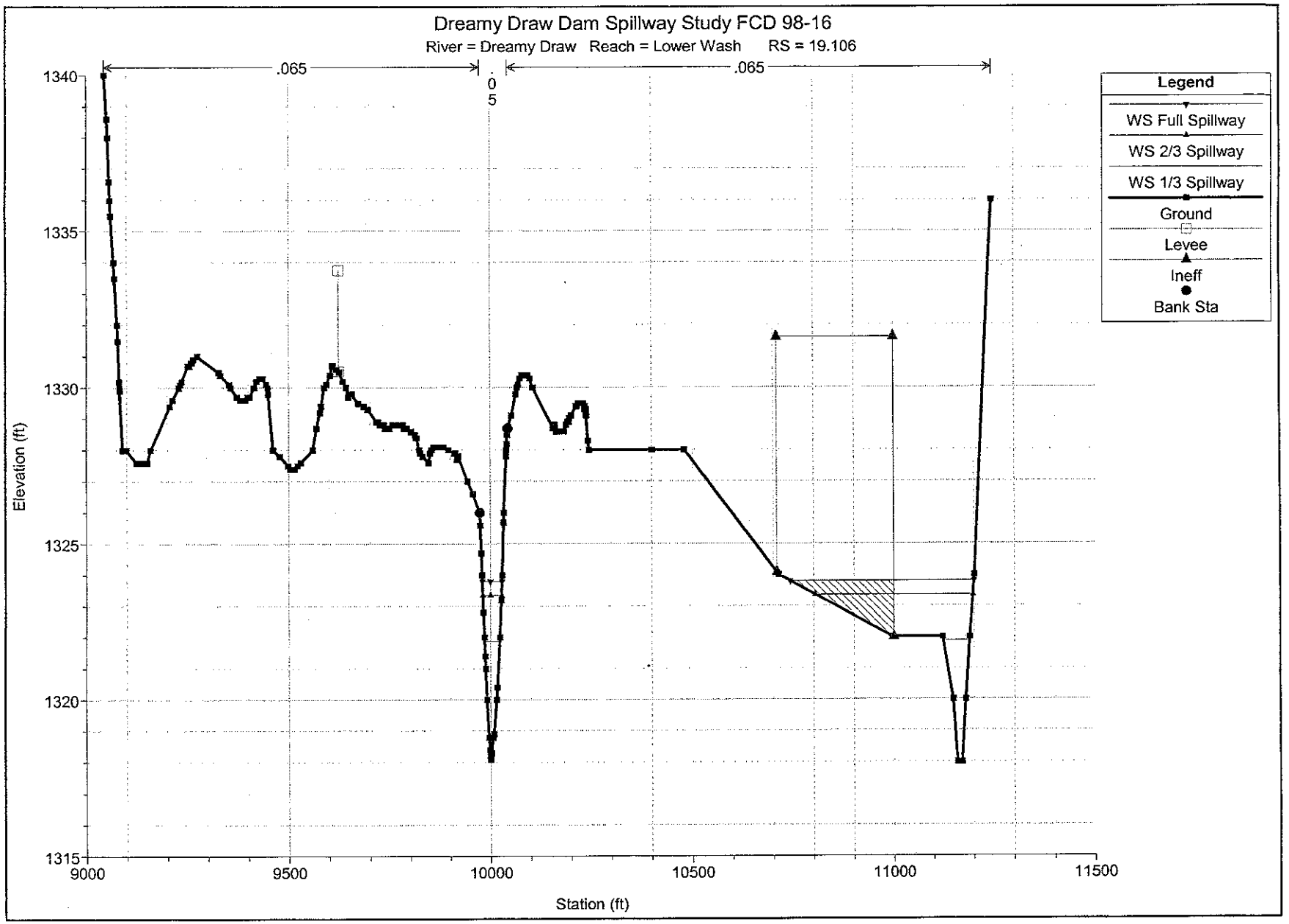

Dreamy Draw Dam Spillway Study FCD 98-16
River = Culvert Reach = SR51 Culvert RS = 19.326
.045
.04
.045
Legend
WS 1/3 Spillway
WS 2/3 Spillway
WS Full Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1365
1360
1355
1350
1345
1340
1335
1330
1325
9800
9850
9900
9950
10000
10050
10100
Station (ft)

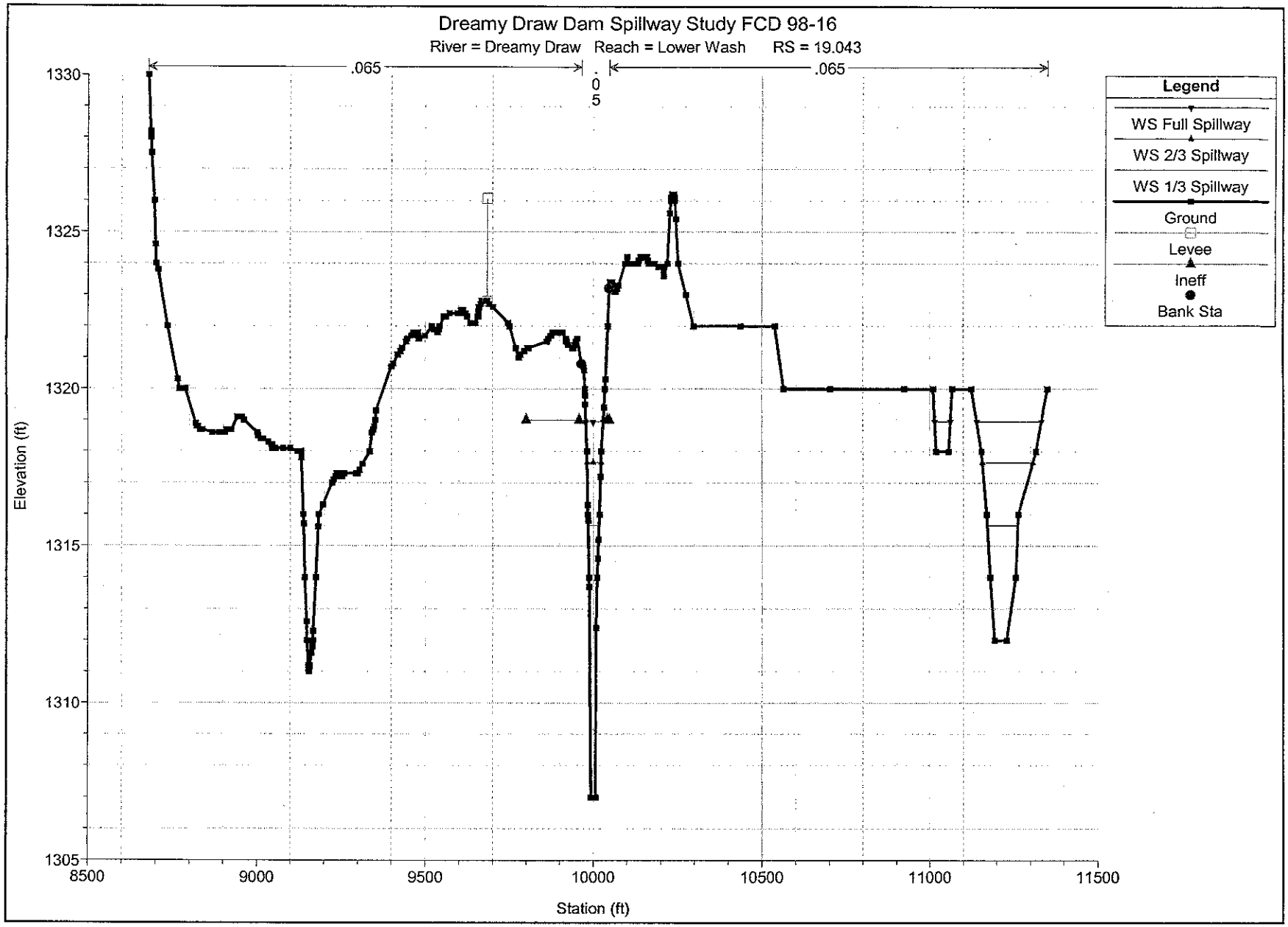

Dreamy Draw Dam Spillway Study FCD 98-16
River = Culvert Reach = SR51 Culvert RS = 19.298
.045
.04
.045
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1360
1355
1350
1345
1340
1335
1330
9800
9850
9900
9950
10000
10050
10100
Station (ft)

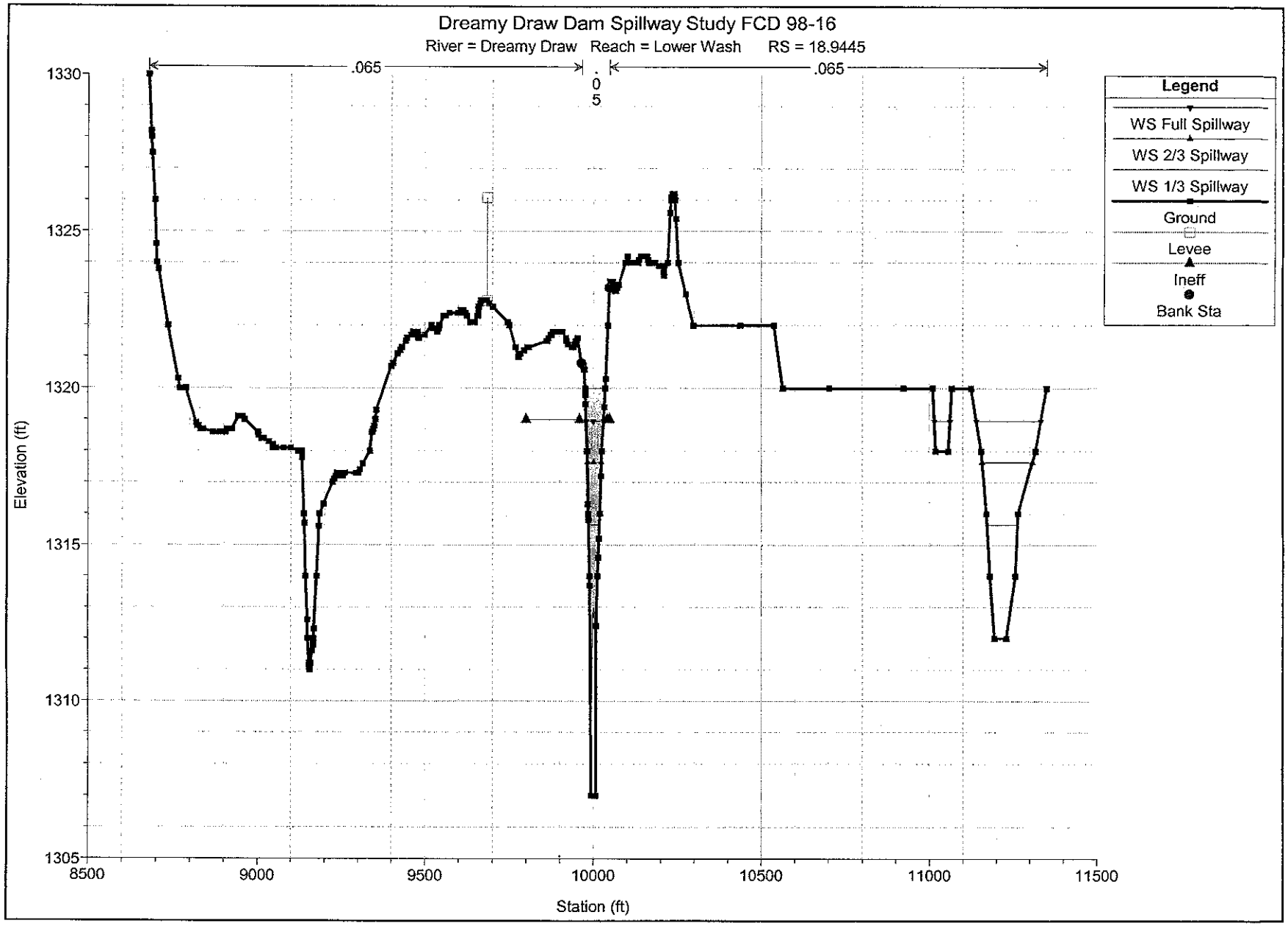

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 19.262
.065
.055
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1365
1360
1355
1350
1345
1340
1335
1330
1325
9800
10000
10200
10400
10600
10800
11000
11200
11400
Station (ft)

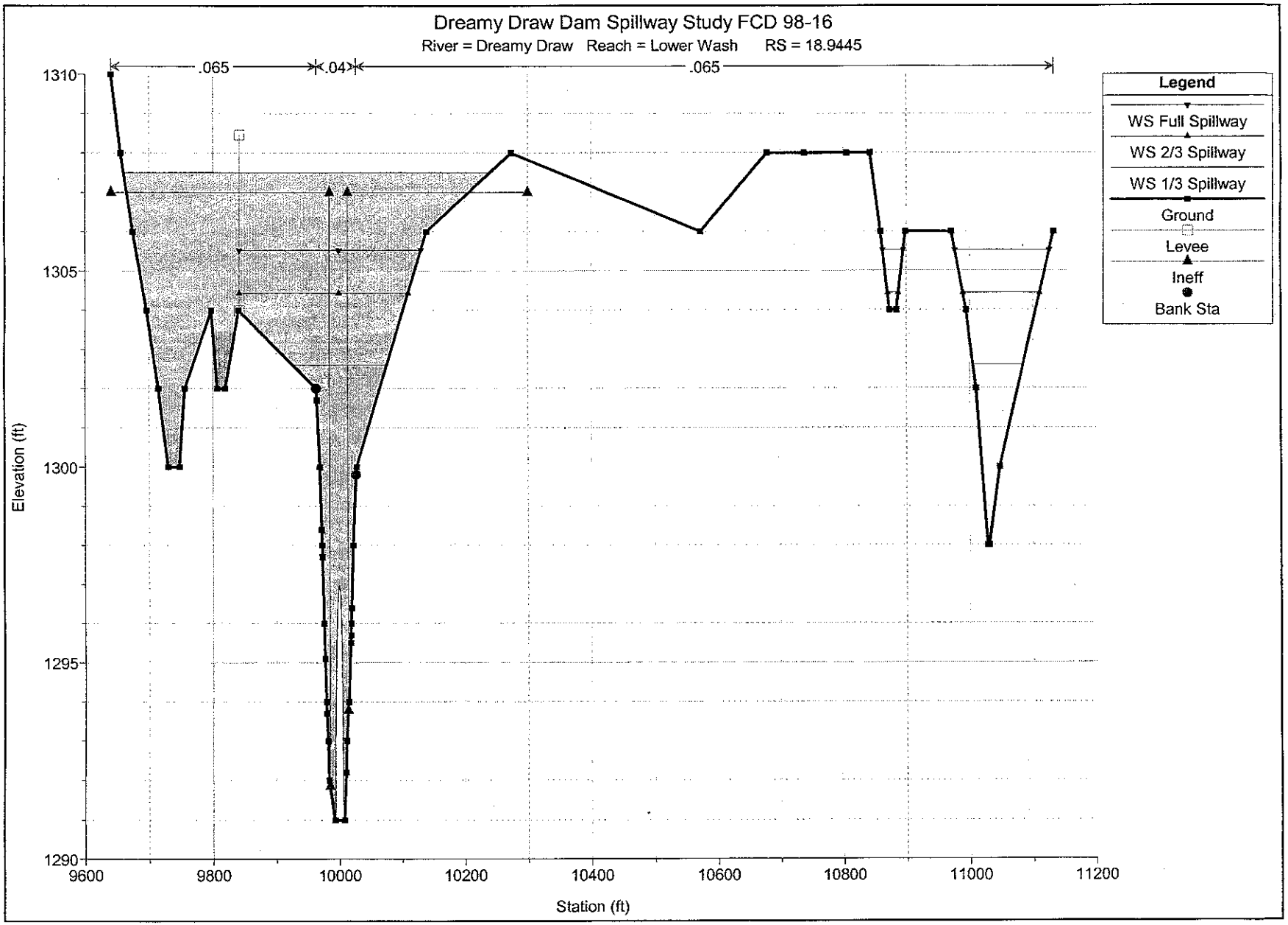

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 19.214
.065
.055
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1350
1345
1340
1335
1330
1325
9600
9800
10000
10200
10400
10600
10800
11000
11200
11400
Station (ft)

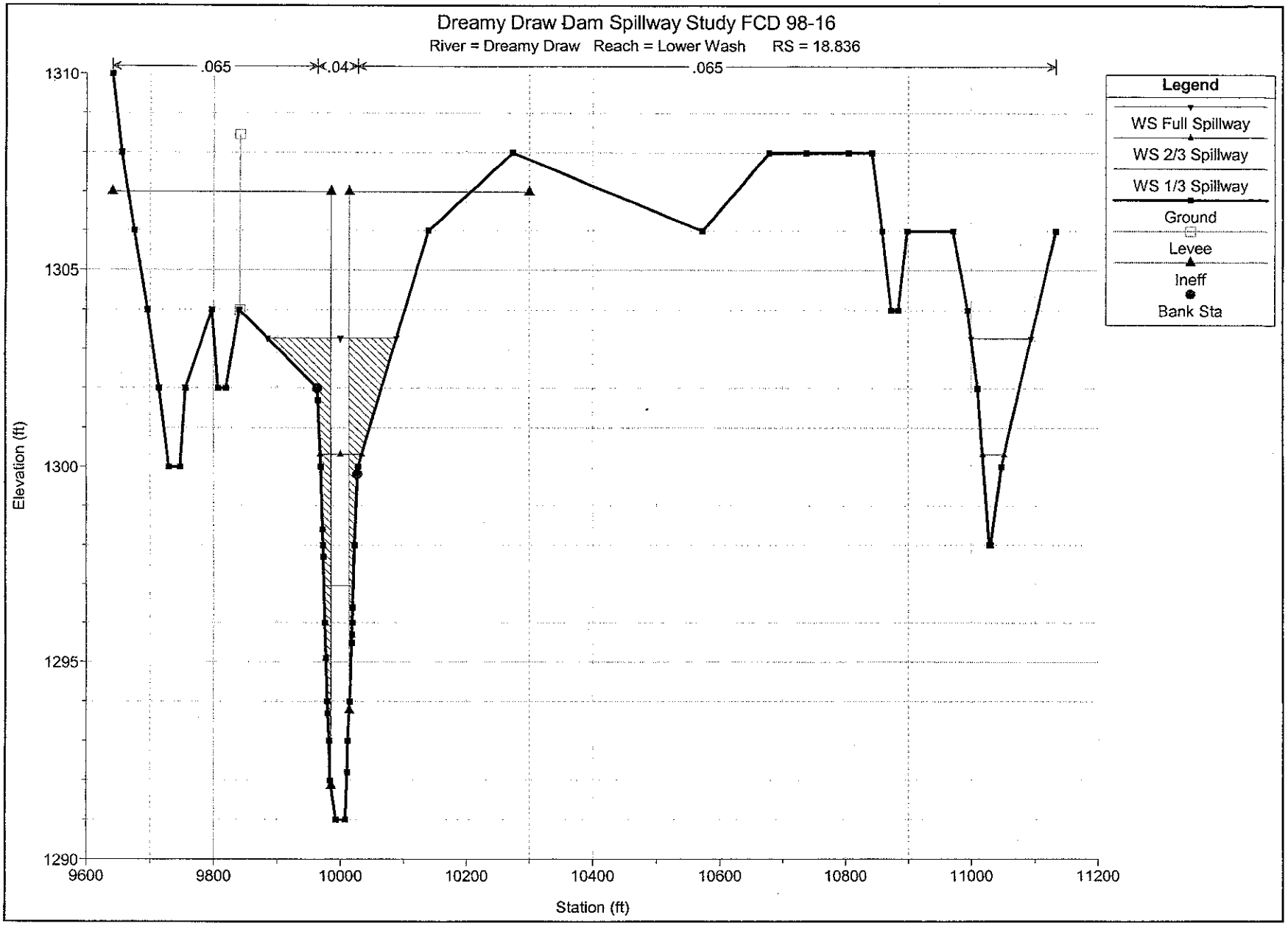

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 19.174
.065
.055
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1360
1350
1340
1330
1320
9000
9500
10000
10500
11000
11500
Station (ft)

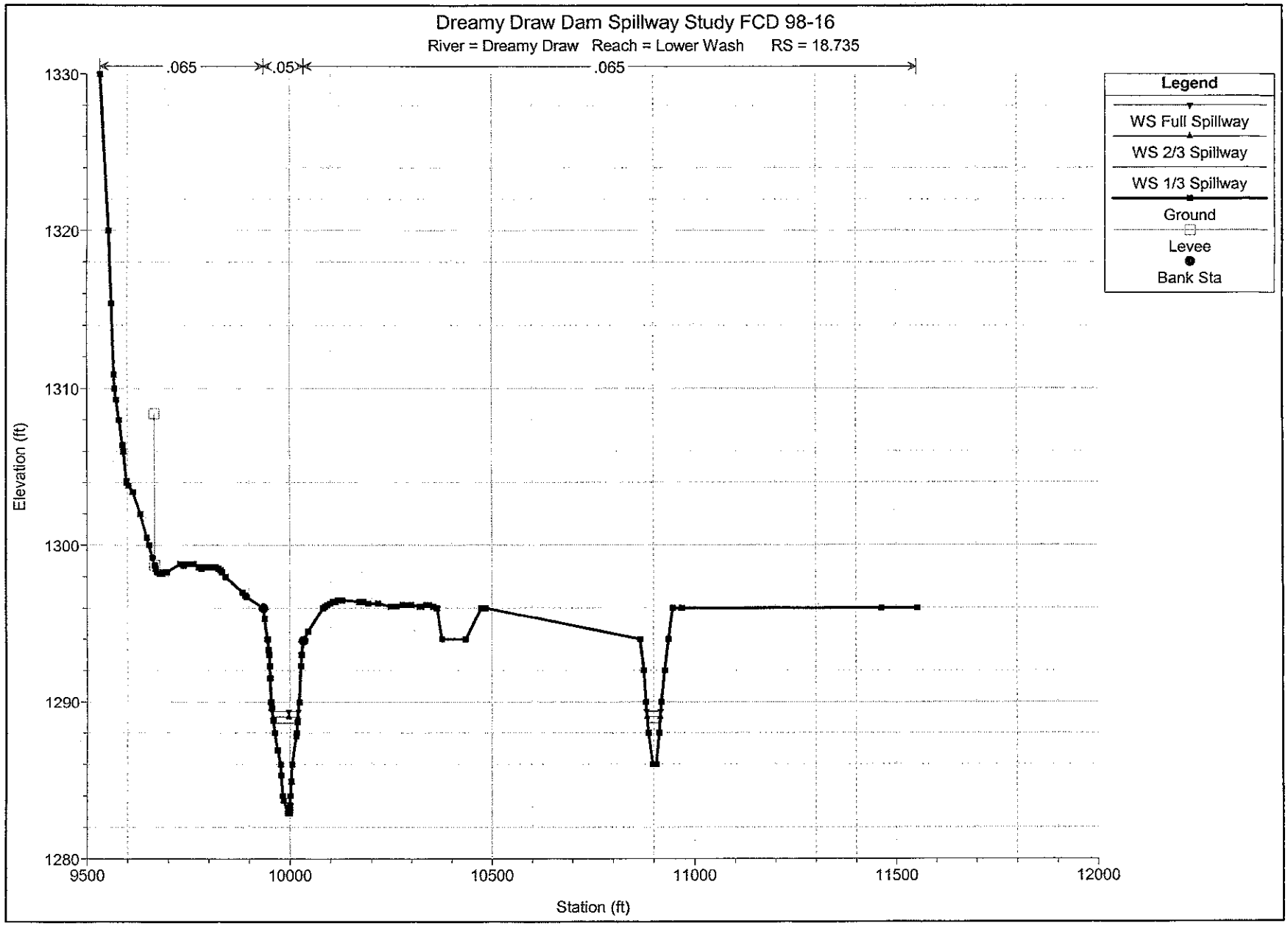

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 19.106
.065
.05
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1340
1335
1330
1325
1320
1315
9000
9500
10000
10500
11000
11500
Station (ft)

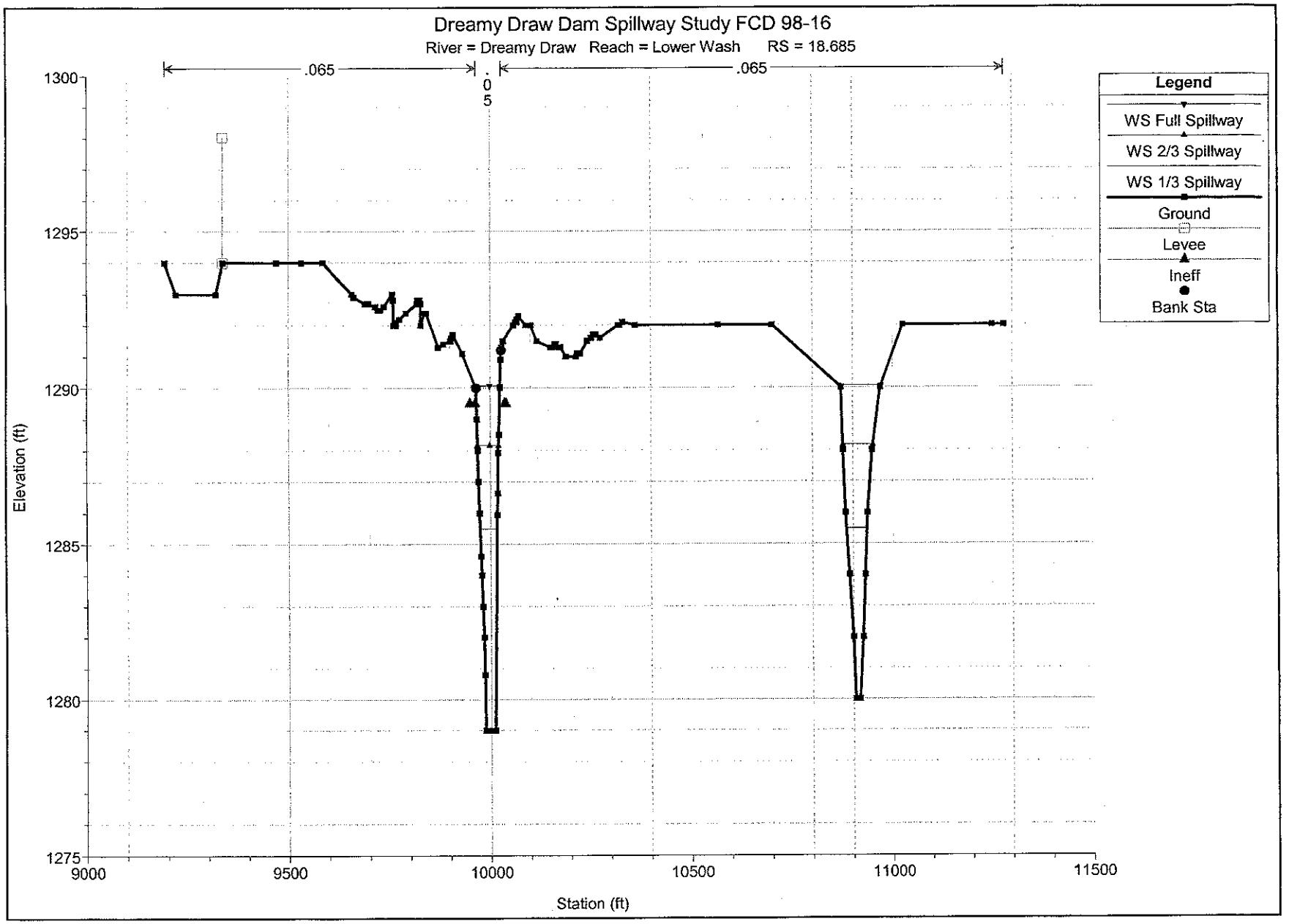

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 19.043
.065
.05
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1330
1325
1320
1315
1310
1305
8500
9000
9500
10000
10500
11000
11500
Station (ft)

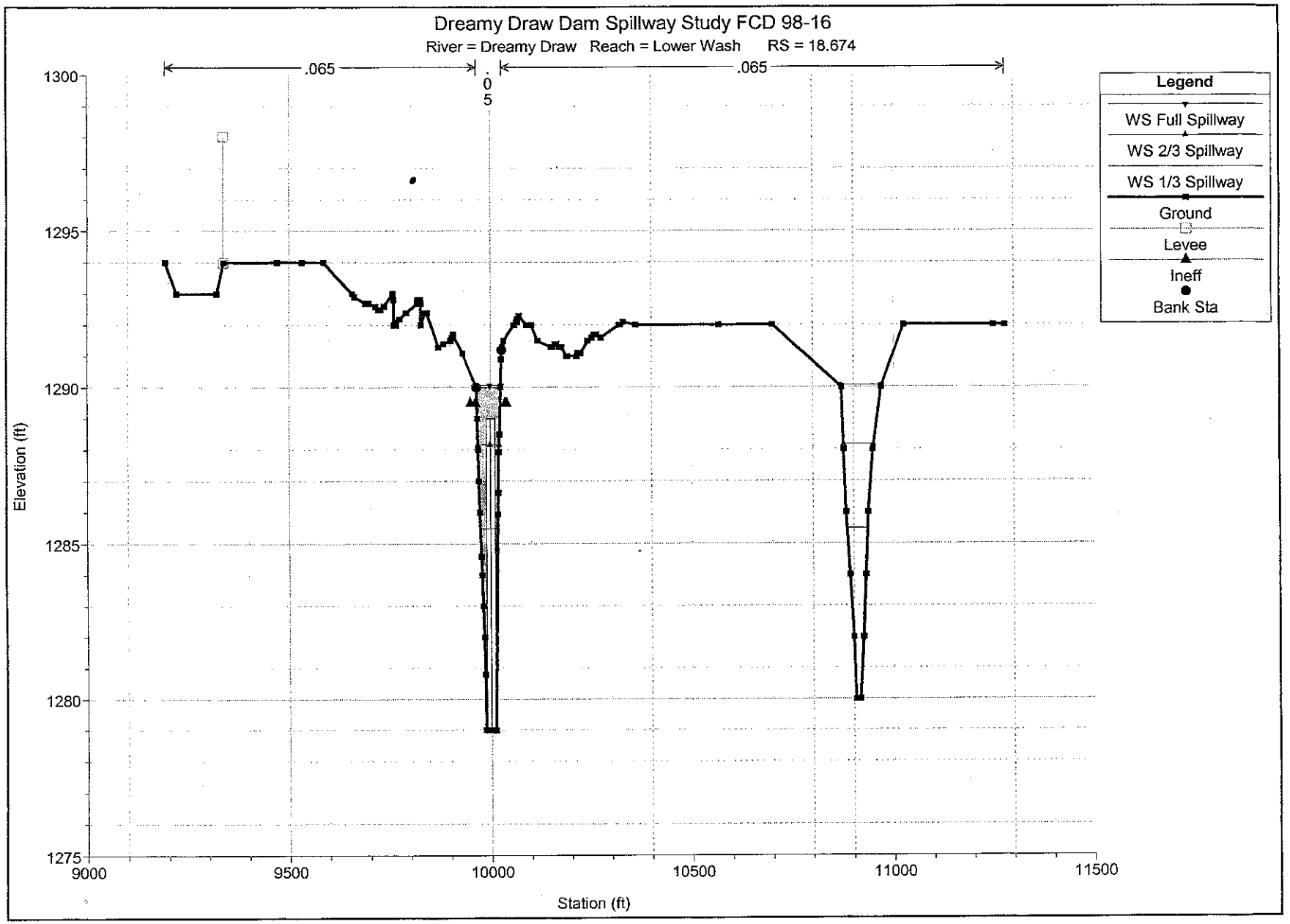

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.9445
.065
.05
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1330
1325
1320
1315
1310
1305
8500
9000
9500
10000
10500
11000
11500
Station (ft)

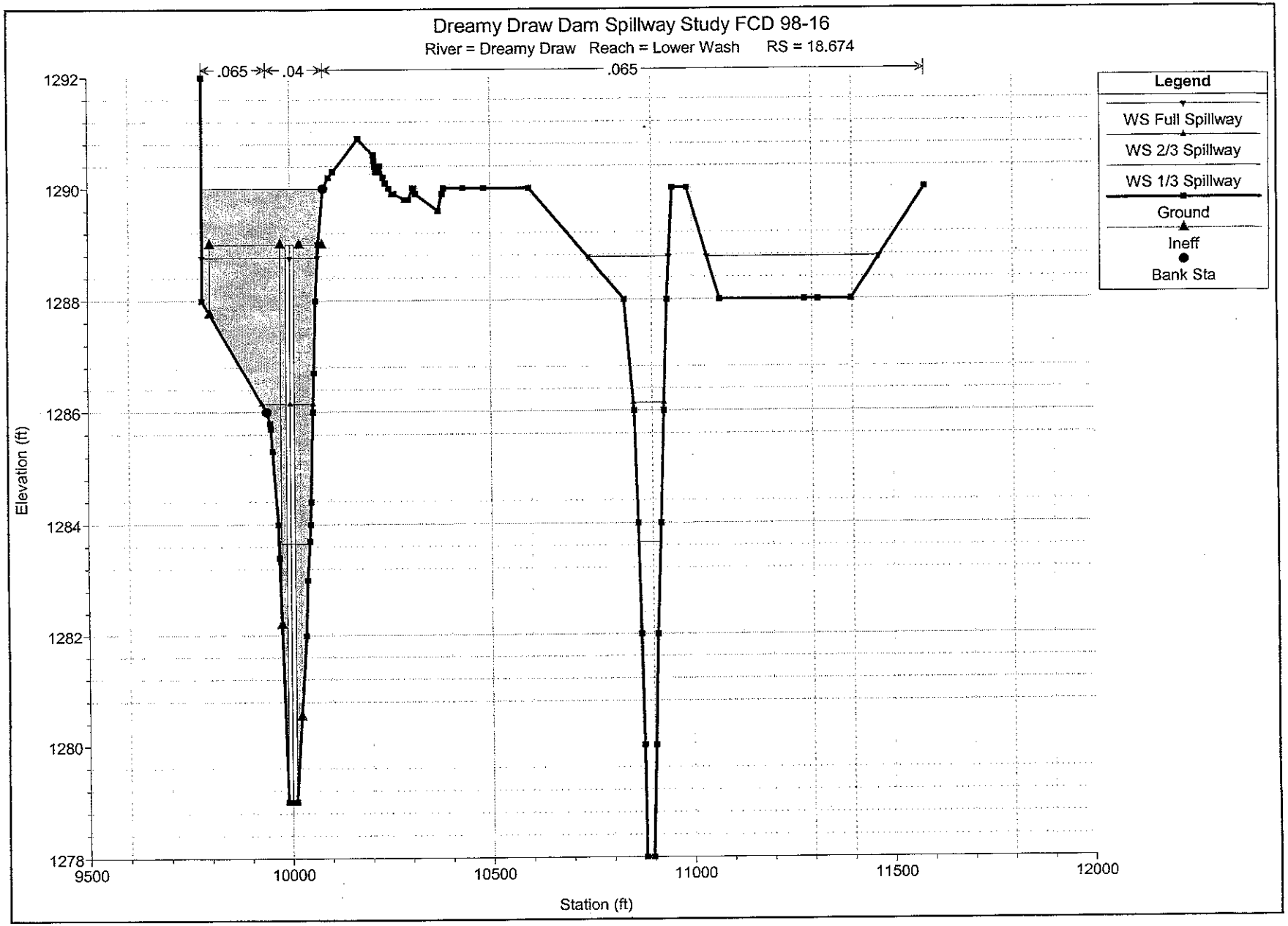

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.9445
.065
.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1310
1305
1300
1295
1290
9600
9800
10000
10200
10400
10600
10800
11000
11200
Station (ft)

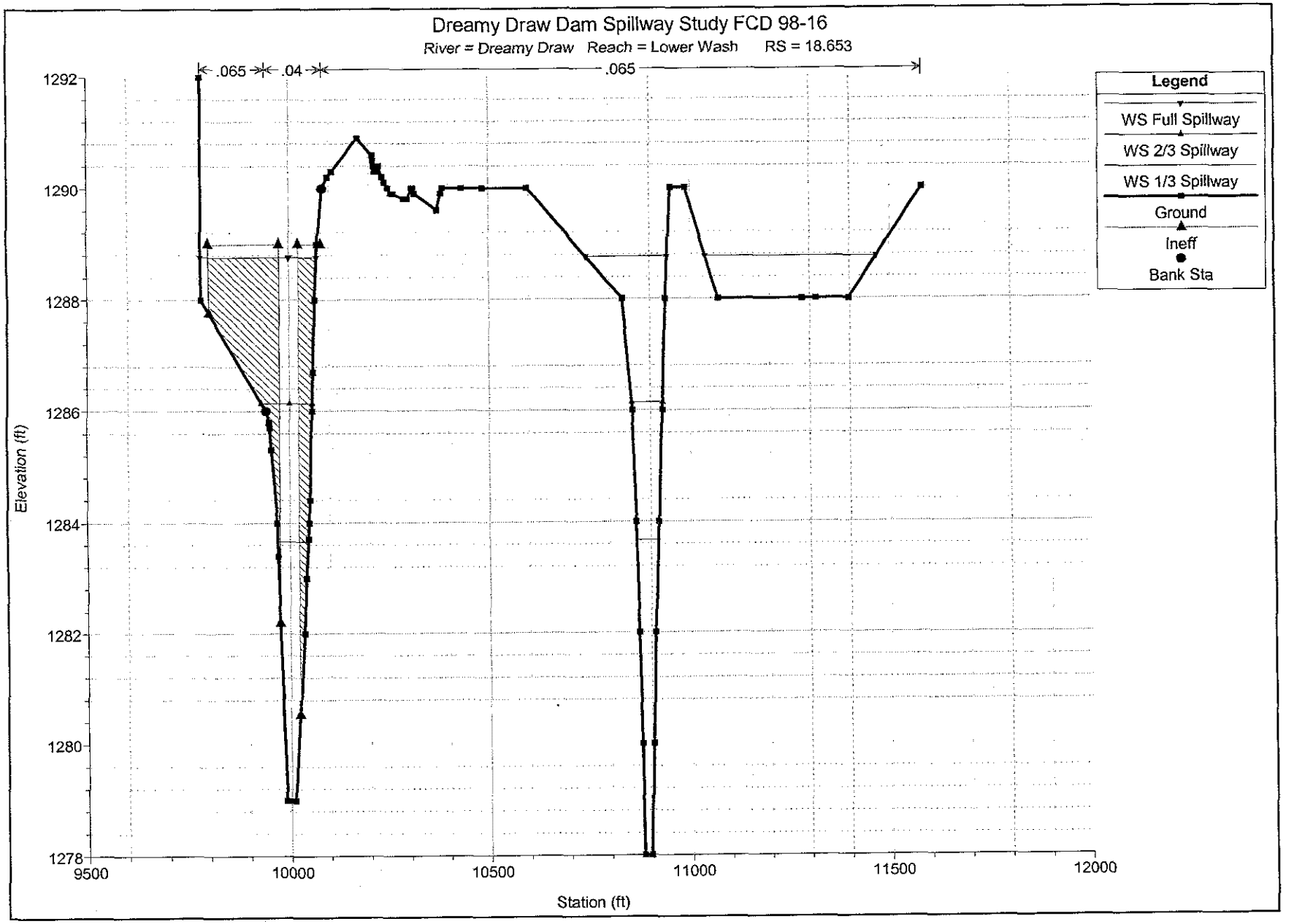

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.836
.065
.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1310
1305
1300
1295
1290
9600
9800
10000
10200
10400
10600
10800
11000
11200
Station (ft)

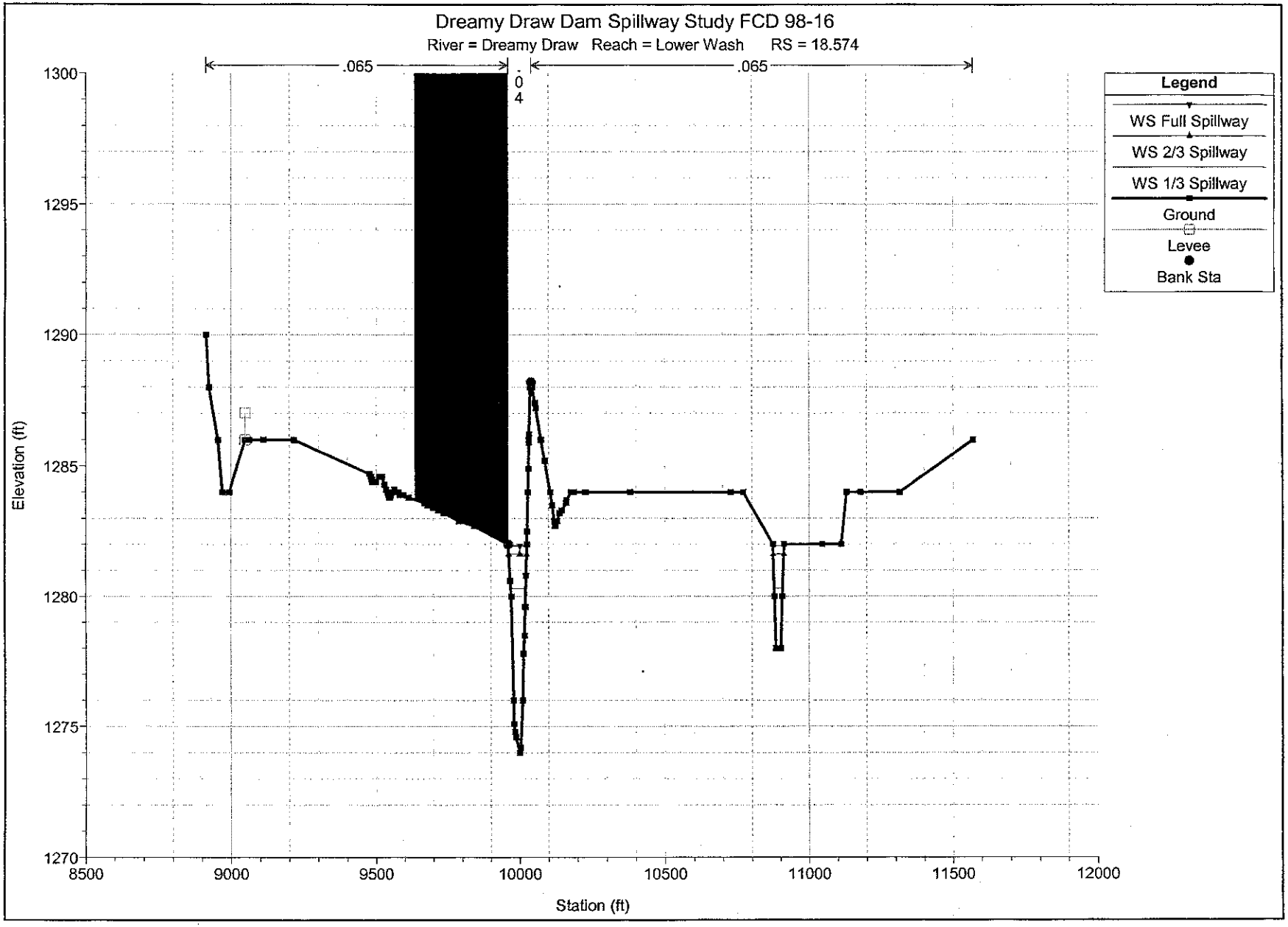

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.735
.065
.05
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1330
1320
1310
1300
1290
1280
9500
10000
10500
11000
11500
12000
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.685
.065
.05
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1300
1295
1290
1285
1280
1275
9000
9500
10000
10500
11000
11500
Station (ft)

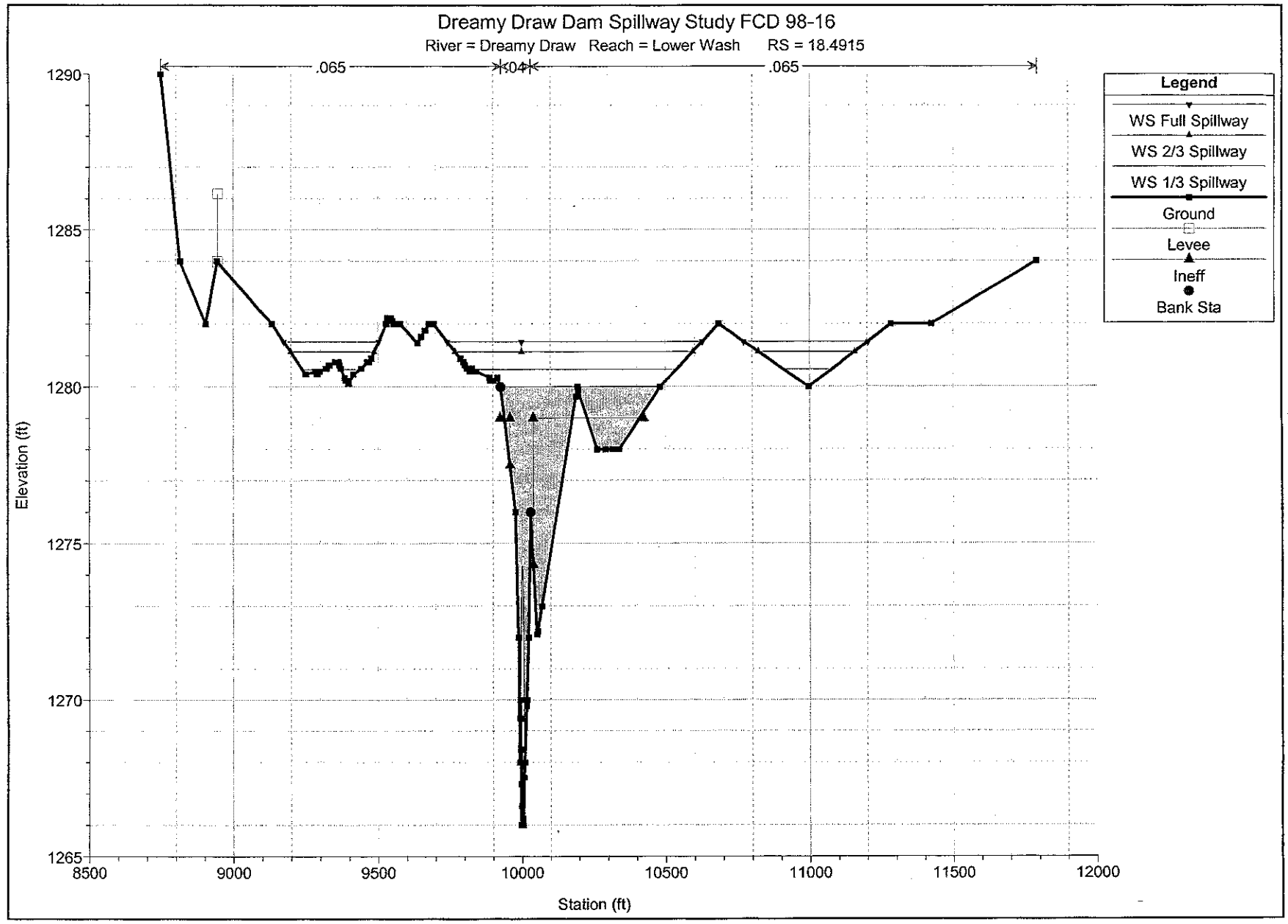

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.674
.065
.05
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1300
1295
1290
1285
1280
1275
9000
9500
10000
10500
11000
11500
Station (ft)

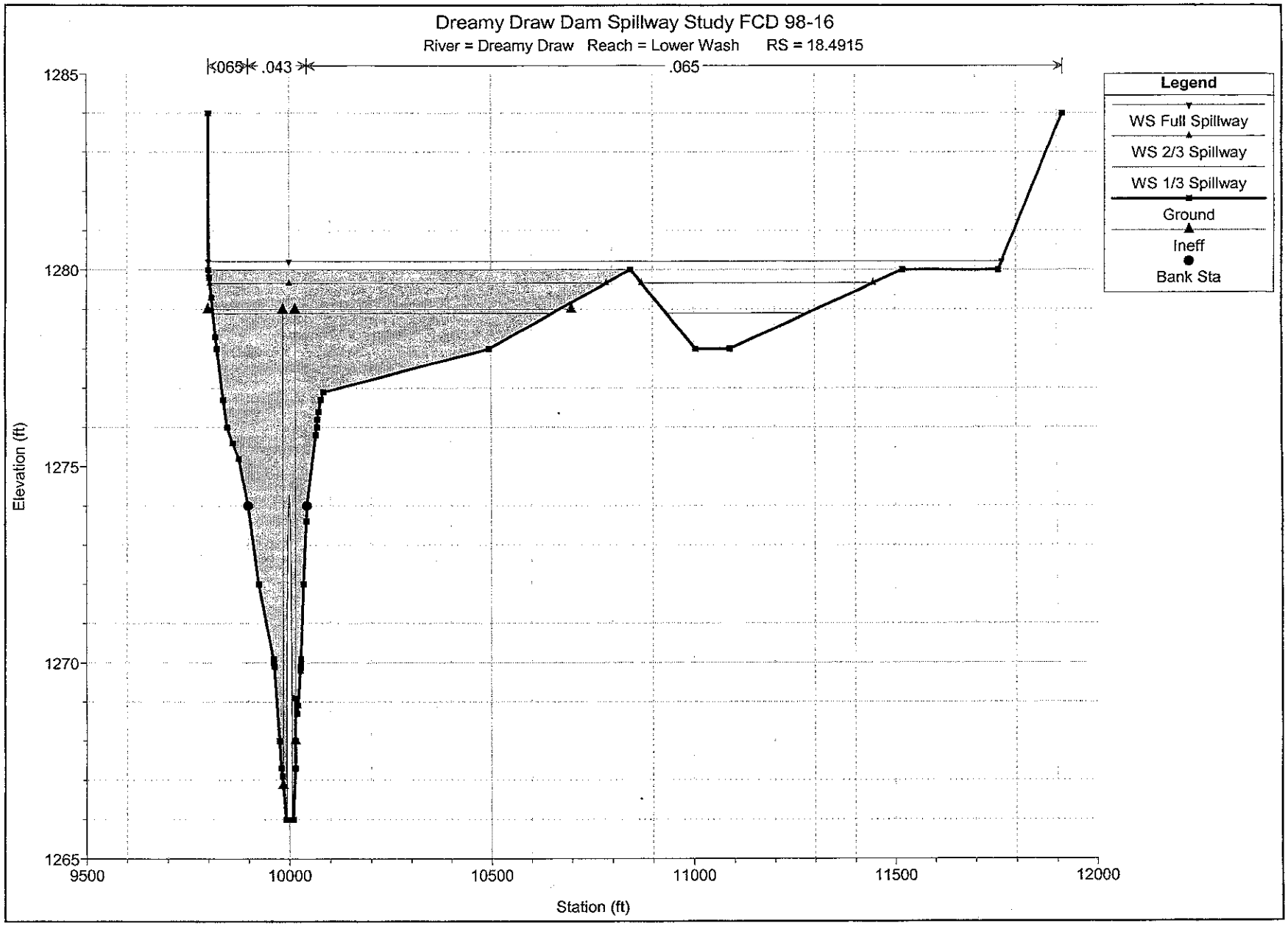

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.674
.065
.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1292
1290
1288
1286
1284
1282
1280
1278
9500
10000
10500
11000
11500
12000
Station (ft)

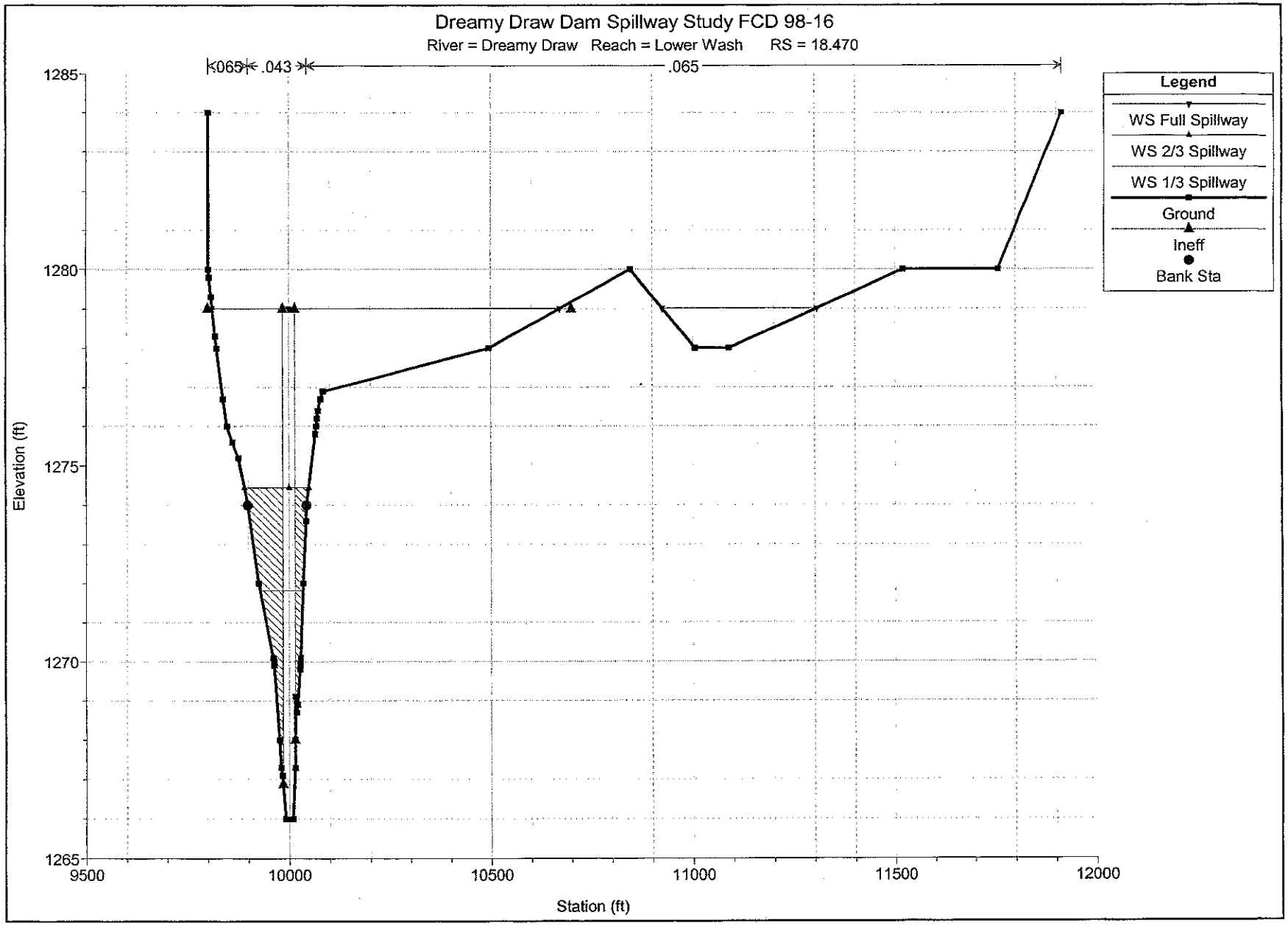

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.653
.065
.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1292
1290
1288
1286
1284
1282
1280
1278
9500
10000
10500
11000
11500
12000
Station (ft)

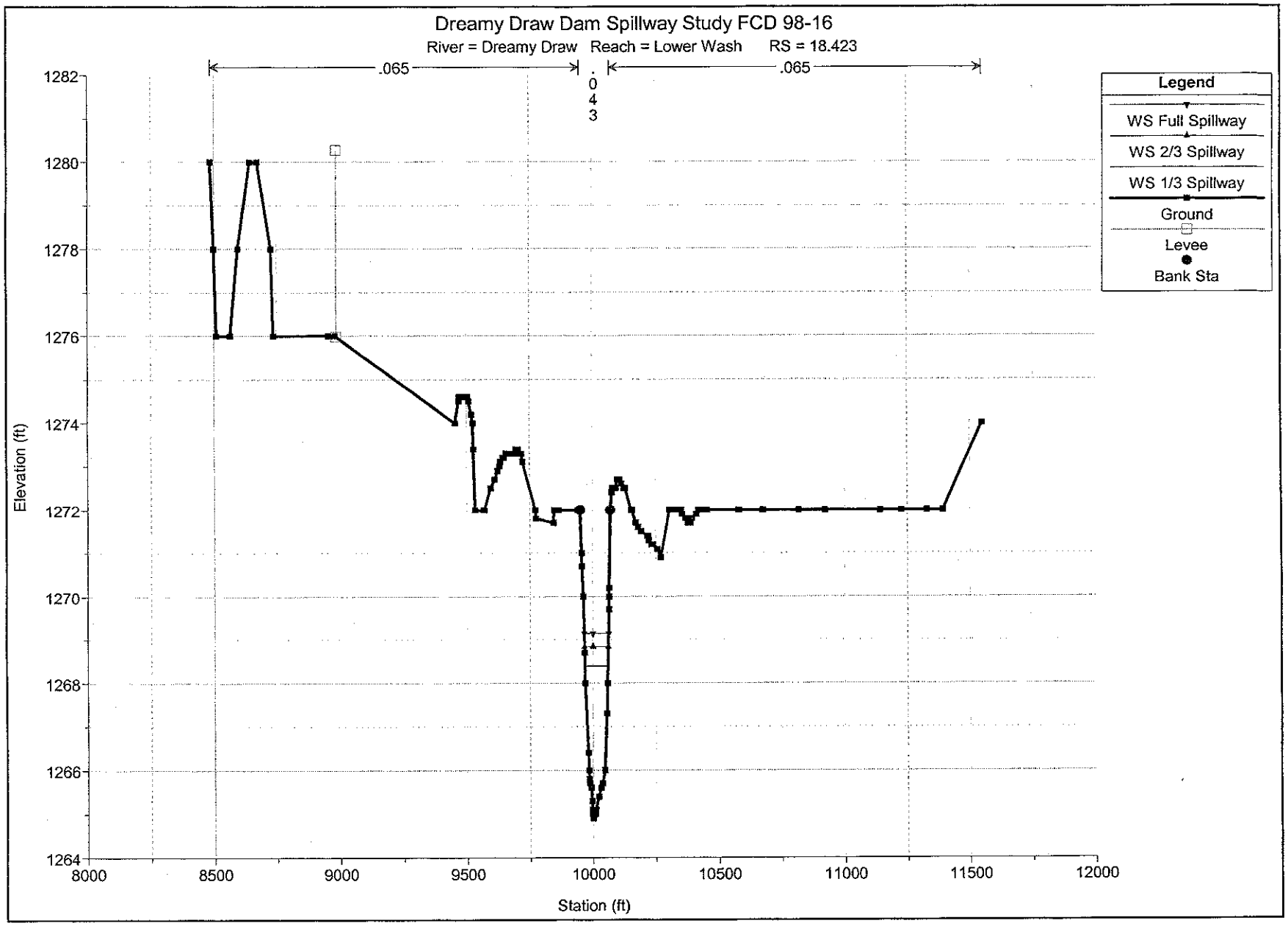

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.574
.065
.065
.04
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1300
1295
1290
1285
1280
1275
1270
8500
9000
9500
10000
10500
11000
11500
12000
Station (ft)

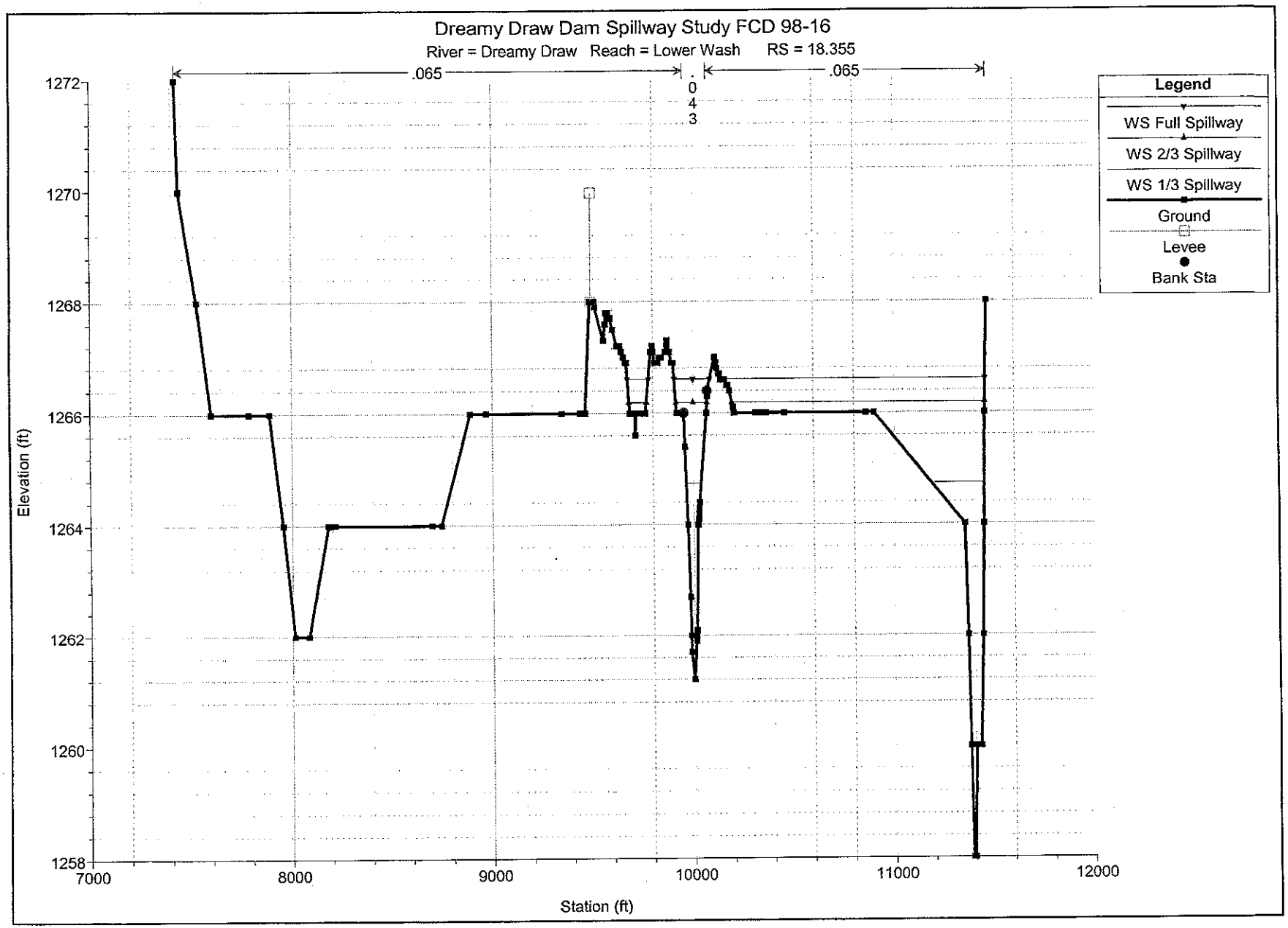
Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.503
.065
.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1290
1285
1280
1275
1270
1265
8500
9000
9500
10000
10500
11000
11500
12000
Station (ft)

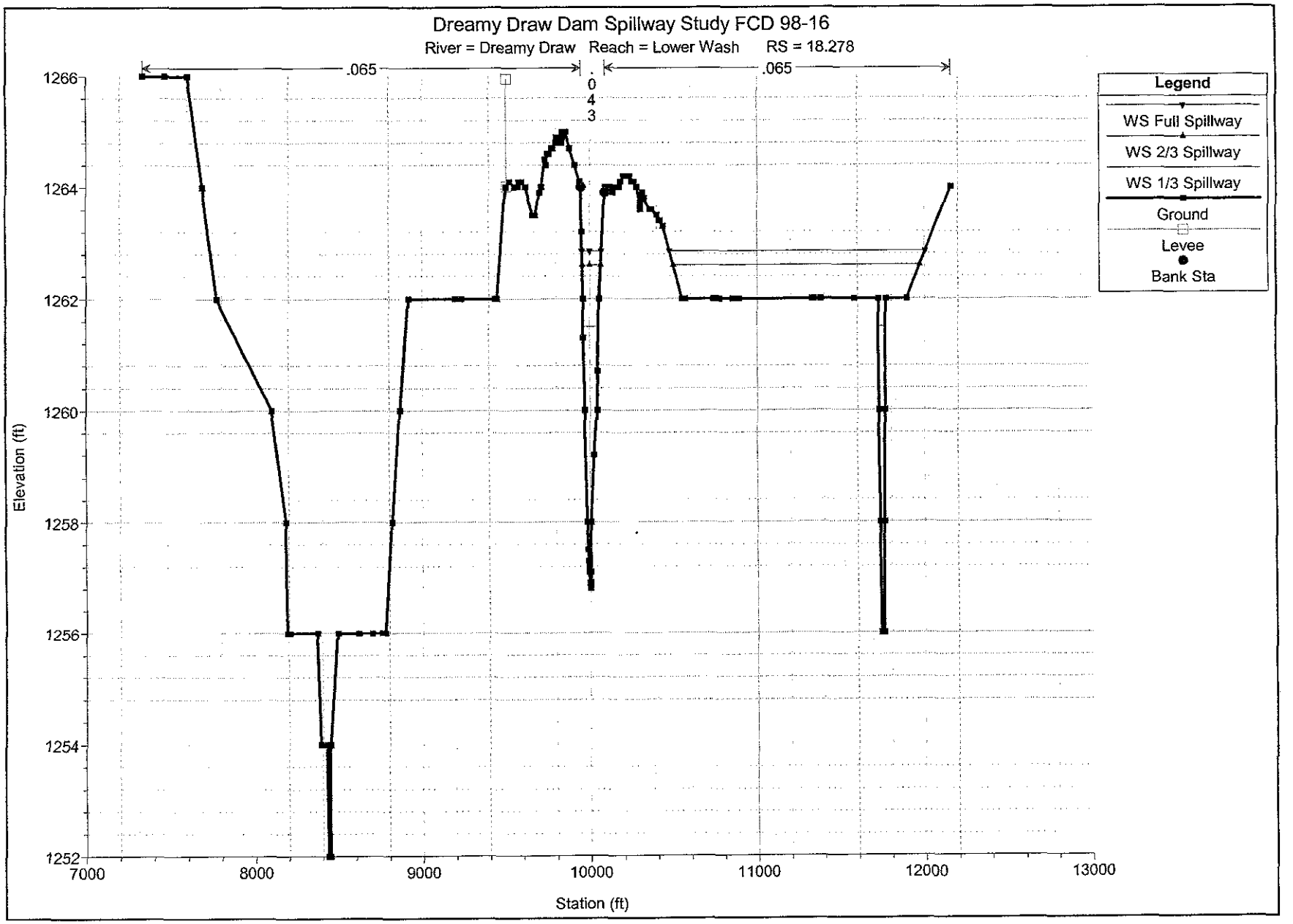

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.4915
.065
.04
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
1290
1285
1280
1275
1270
1265
8500
9000
9500
10000
10500
11000
11500
12000
Station (ft)

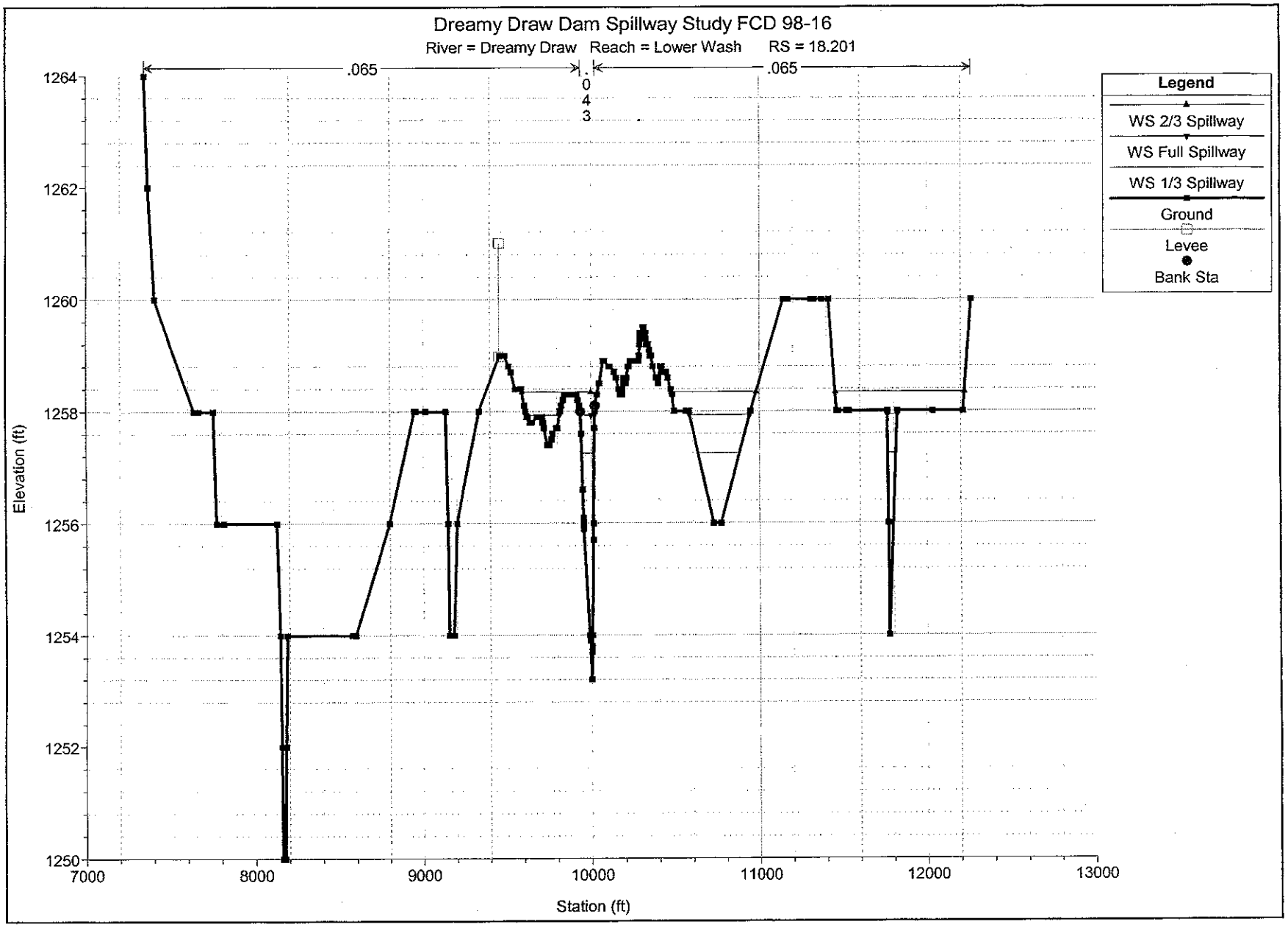

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.4915
.065
.043
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1285
1280
1275
1270
1265
9500
10000
10500
11000
11500
12000
Station (ft)

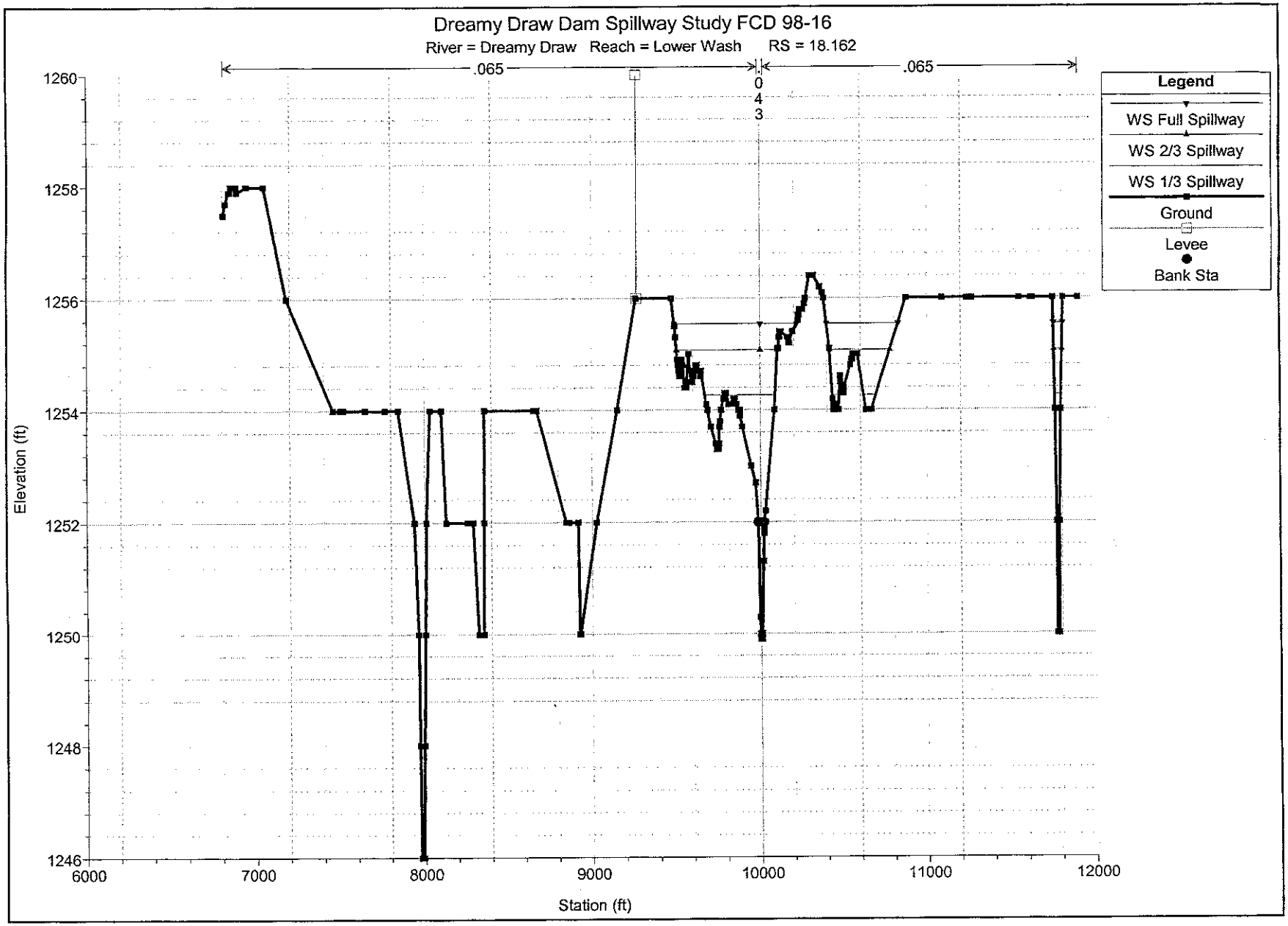

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.470
.065
.043
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Ineff
Bank Sta
Elevation (ft)
1285
1280
1275
1270
1265
9500
10000
10500
11000
11500
12000
Station (ft)

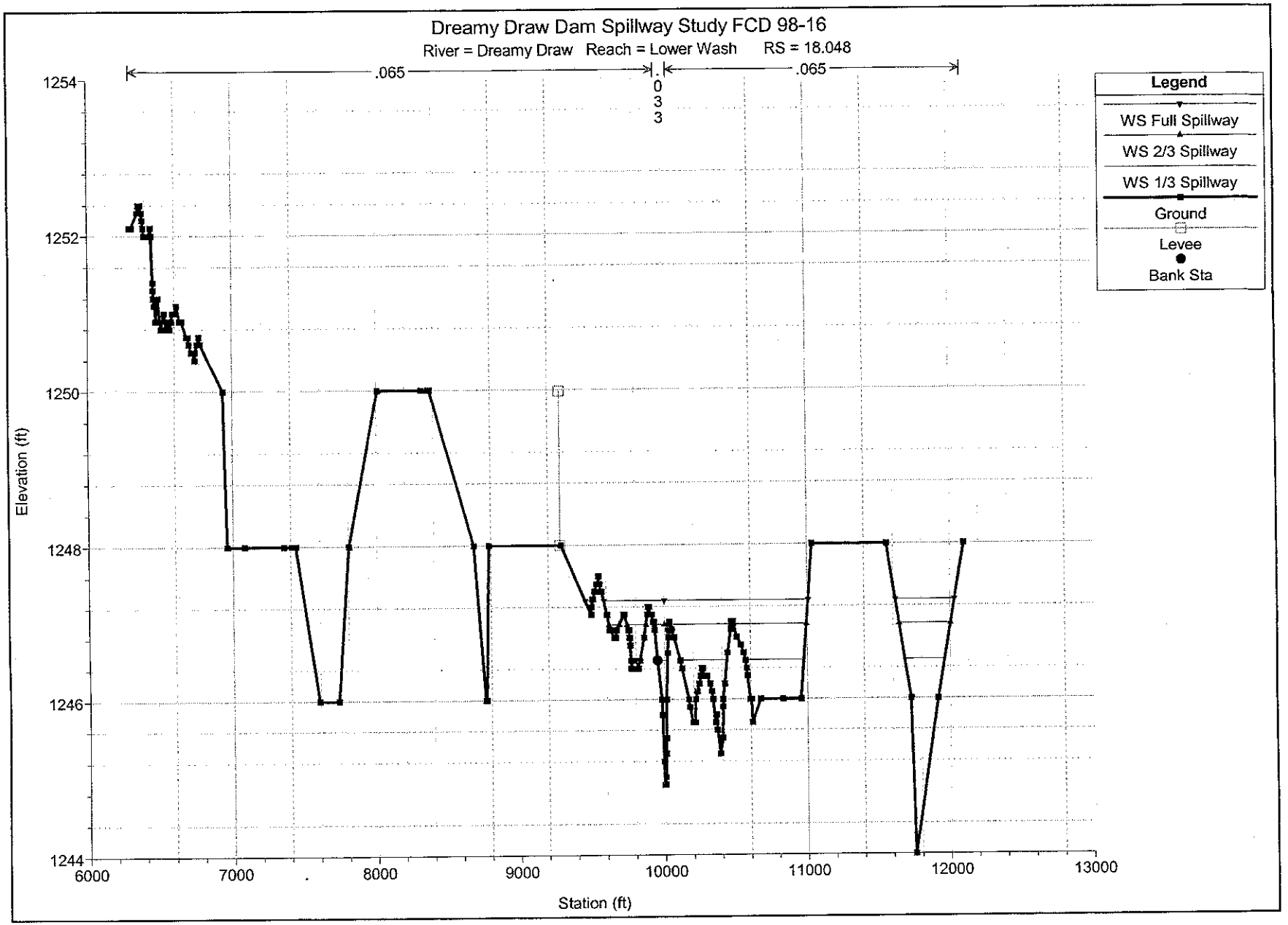

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.423
.065
.043
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1282
1280
1278
1276
1274
1272
1270
1268
1266
1264
8000
8500
9000
9500
10000
10500
11000
11500
12000
Station (ft)

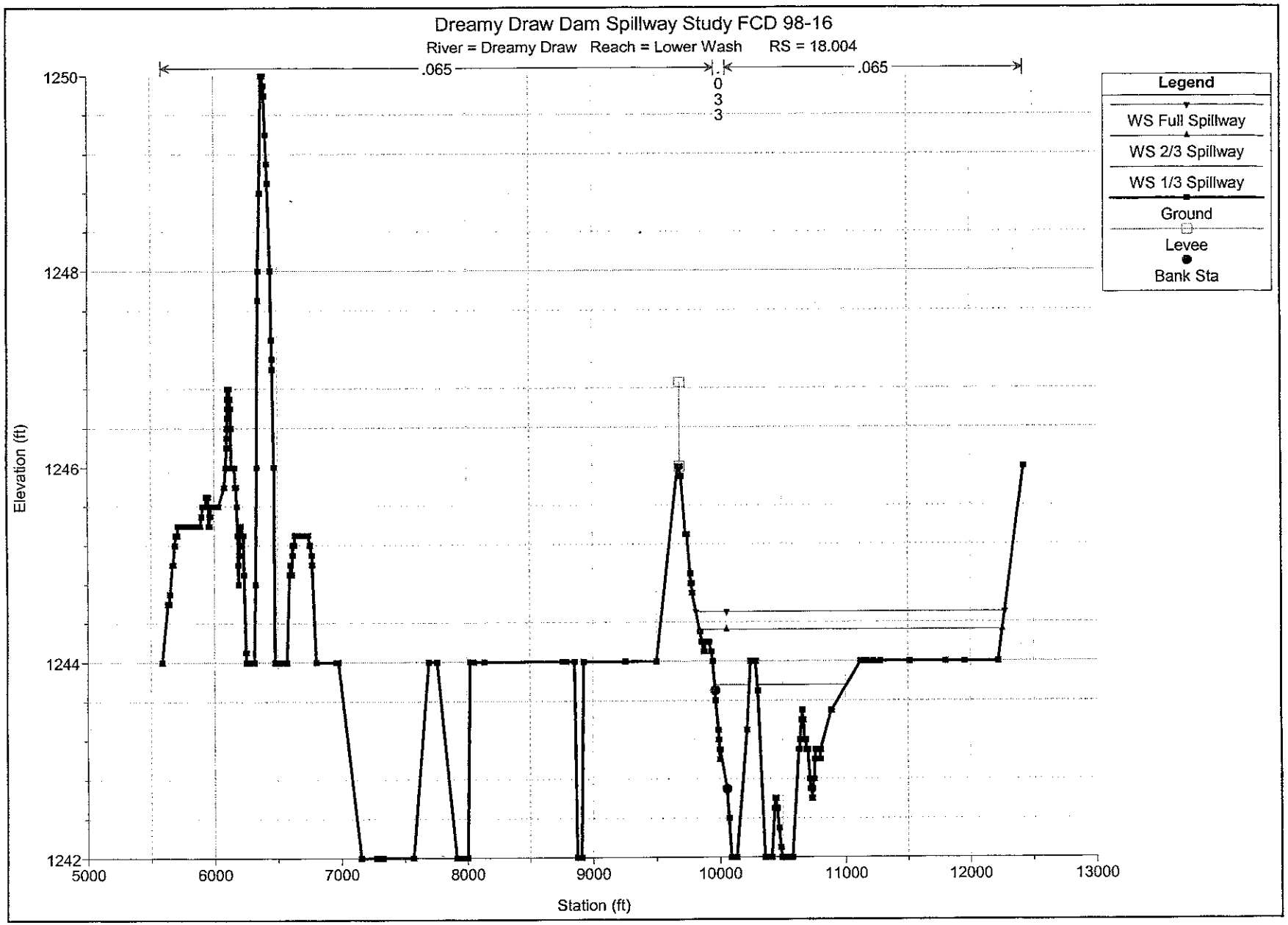

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.355
.065
.043
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1272
1270
1268
1266
1264
1262
1260
1258
7000
8000
9000
10000
11000
12000
Station (ft)

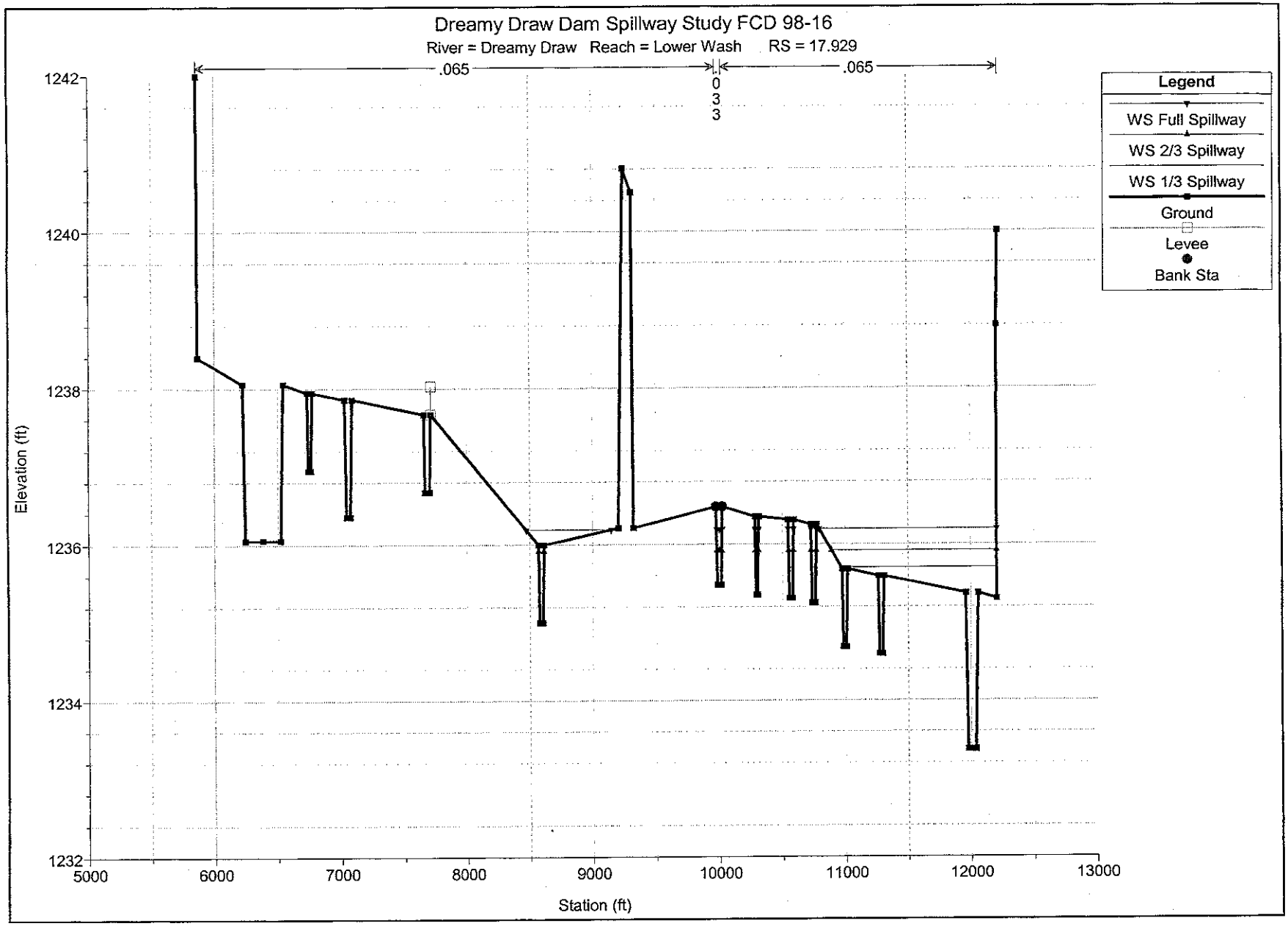

Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.278
.065
.043
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1266
1264
1262
1260
1258
1256
1254
1252
7000
8000
9000
10000
11000
12000
13000
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.201
.065
.043
.065
Legend
WS 2/3 Spillway
WS Full Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1264
1262
1260
1258
1256
1254
1252
1250
7000
8000
9000
10000
11000
12000
13000
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.162
.065
.043
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1260
1258
1256
1254
1252
1250
1248
1246
6000
7000
8000
9000
10000
11000
12000
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.048
.065
.033
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1254
1252
1250
1248
1246
1244
6000
7000
8000
9000
10000
11000
12000
13000
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 18.004
.065
.0333
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1250
1248
1246
1244
1242
5000
6000
7000
8000
9000
10000
11000
12000
13000
Station (ft)


Dreamy Draw Dam Spillway Study FCD 98-16
River = Dreamy Draw Reach = Lower Wash RS = 17.929
.065
0
3
3
.065
Legend
WS Full Spillway
WS 2/3 Spillway
WS 1/3 Spillway
Ground
Levee
Bank Sta
Elevation (ft)
1242
1240
1238
1236
1234
1232
5000
6000
7000
8000
9000
10000
11000
12000
13000
Station (ft)

APPENDIX E

MEETING MINUTES/TELEPHONE CONVERSATION RECORDS/CORRESPONDENCE

Kimley-Horn
and Associates, Inc.

RA:

Kimley-Horn
and Associates, Inc.

Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

September 23, 1998

Mr. Tim Murphy, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Delineation of Spillway Flows for Dreamy Draw Dam FCD 98-16
KHA No.: 091131.01

Dear Tim:

Kimley-Horn and Associates, Inc. is pleased to begin the delineation of spillway flows for Dream Draw Dam. We understand that the notice-to-proceed and project begin date is Monday, September 21, 1998, and that the project duration is 240 calendar days.

We have enclosed the minutes of the project kickoff meeting held at your offices on September 17, 1998.

If you have any questions, please contact me at my direct line at 906-1182.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Robert A. Eichinger

Robert A. Eichinger, P.E.
Project Manager

RAE:rae

TEL 602 944 5500
FAX 602 944 7423

K:\-CIVIL\09113101\CORRESPOND\MEETING-1.DOC

Kimley-Horn
and Associates, Inc.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FRO DREAMY DRAW DAM
FCD 98-16

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: Sept. 17, 1998 Meeting No.: 1 - Project Kick-off

Meeting Time: 3:00 PM

Meeting Place: Flood Control District

Attendees: FCD - Tim Murphy
KHA - Doug Plasencia, Bob Eichinger, Jon Ahern

Item No.

1. Notice to Proceed - Monday, September 21, 1998
2. Duration - 240 calendar days
3. KHA to provide monthly fee projection and schedule
4. Rights-of-Entry: most likely will not need any for this project
5. Data provided or available to project
    a. As-builts of dam (note some sheets not included in set)
    b. Spillway drawing (note: sheet shows top of spillway crest at 1410 msl)
    c. Planting and seeding plan
    d. Design Memo No. 1 Jan 1972
    e. Dam break analysis : Tim to copy all except appendices, KHA to pickup next week
    f. Supplement to DM no 1: Tim to copy whole doc
    g. Master Plan and Feature Design Memo DM#5
    h. Specifications to Dreamy Draw Dam
    i. Planting and Seeding specs
6. Discharge PMF = 5900 cfs outflow inflow = 11,000 cfs ; may use full spillway at 6,000cfs
7. Guidelines for DDD study
8. meetings with ADOT/PHX - Tim would like to attend if meetings are held, otherwise telephone records or copies of correspondence
9. Field Walk - Bob to schedule, Tim would like to attend
10. Call Jon Benoist at ADWR regarding the dam on the Phx preserve north of Northern Avenue. Might be SCS dam.

These are the minutes of the meeting as understood by KHA. Any revisions to these minutes must be received by KHA 7 days after the meeting date.

Kimley-Horn
and Associates, Inc.

Memorandum To File

Prepared By: BOB EICHINGER Project No.: 091133.01

Date: 10/26/98 Copies To: JTA

Subject: DREAMY DRAW DAM

Notes: CALLED TIM MURPHY – DISCUSSED X-SECTION LOCATIONS + X-SECTION PLOTS. TIM SAID THEY WERE A GOOD START AND WILL MOST LIKELY BE REVISED/MODIFIED ONCE WE RUN SOME H&D THROUGH MODEL.

ALSO – NEED TO CHANGE BORDER SHEET – SAYS 100-YR BOUNDARY – NEED TO TAKE THIS OFF.

DID JON GET AC/DC STUFF? HAVE TO CHECK –

Kimley-Horn
and Associates, Inc.

faxed
11/12/98
9:00 AM

Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

November 12, 1998

Mr. Ray Acuna, P.E.
Floodplain Administrator
City of Phoenix
200 West Washington, 5th Floor
Phoenix, AZ 85003-1611

RE: Delineation of Spillway Flows for Dreamy Draw Dam
KHA Project No. 091131.01

Dear Ray:

Kimley-Horn & Associates, Inc is conducting a hydraulic study on behalf of the Flood Control District of Maricopa County for the above referenced project. The study is to delineate the inundation limits of the 1/3, 2/3, and full spillway discharge values for Dreamy Draw Dam. The project consists of approximately 2 linear miles of emergency spillway delineations beginning at the crest of the dam emergency spillway, along Dreamy Draw Wash, and ending at the Arizona Canal Diversion Channel.

The purpose of the study is to develop inundation maps for the three discharge values for local emergency management purposes. The study is not a flood insurance study and no submittal will be made to FEMA. The study will result in a technical report summarizing the hydraulic study and include copies of the inundation mapping.

We anticipate that the study will be completed in late December, 1998, or early January, 1999.

If you have any questions, please call me at 944-5000.

Sincerely,

KIMLEY-HORN & ASSOCIATES, INC

Robert A. Eichinger

Robert A. Eichinger, P.E.
Project Manager

RAE:rae

K:\civil\09113101\correspond\cityphx.rtc

TEL 602 944 5500
FAX 602 944 7423

Kimley-Horn
and Associates, Inc.

bard
11/17/98
10:10 am

November 17, 1998

Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

Mr. Joe Warren, P.E.
Arizona Department of Transportation
205 S. 17th Ave.
Maildrop 281E
Phoenix, AZ 85007

RE: Delineation of Spillway Flows for Dreamy Draw Dam
KHA Project No. 091131.01

Dear Joe:

Kimley-Horn & Associates, Inc is conducting a hydraulic study on behalf of the Flood Control District of Maricopa County for the above referenced project. The study is to delineate the inundation limits of the 1/3, 2/3, and full spillway discharge values for Dreamy Draw Dam. The project consists of approximately 2 linear miles of emergency spillway delineations beginning at the crest of the dam emergency spillway, along Dreamy Draw Wash, and ending at the Arizona Canal Diversion Channel.

The purpose of the study is to develop inundation maps for the three discharge values for local emergency management purposes. The study is not a flood insurance study and no submittal will be made to FEMA. The study will result in a technical report summarizing the hydraulic study and include copies of the inundation mapping.

We anticipate that the study will be completed in late December, 1998, or early January, 1999.

If you have any questions, please call me at 944-5000.

Sincerely,

KIMLEY-HORN & ASSOCIATES, INC

Robert A. Eichinger

Robert A. Eichinger, P.E.
Project Manager

RAE:rae

K:\civil\09113101\correspond\adot-notice.rtc

TEL 602 944 5500
FAX 602 944 7423

Kimley-Horn
and Associates, Inc.

Suite 250
7600 N 15th Street
Phoenix, Arizona 85020

TEL 602 944 5500
FAX 602 944 7423

Transmittal

Date: *November 18, 1998* Job. No: 091131.01

To: *Mr. Tim Murphy, P.E.*
Flood Control District of Maricopa County
2801 W. Durango St
Phoenix, Arizona
RE: DREAMY DRAW DAM FCD 98-16

We are sending you

X Attached ___ Under separate cover via _____ the following items:
___ Shop Drawings ___ Prints/Plans ___ Samples ___ Specifications ___ Change
___ Other: Memorandum

Copies	*Date*	*No.*	*Description*
1	11/18/98		Draft Field Reconnaissance Report
1	11/18/98		Draft Initial HECRAS model, cross section plots

Engineering
Planning
and
Environmental
Consultants

These are transmitted as checked below:

x For your use ___ Approved as submitted ___ Resubmit ___ copies for approval
___ As requested ___ Approved as noted ___ Submit ___ copies for distribution
x For review and comment ___ Returned for corrections ___ Return ___ corrected prints

Remarks

Tim: We are having a problem with HECRAS on the upstream side of the SR 51 bridge. There is Two-dimensional flow here and HECRAS is not capable of handling this condition. We are taking another approach by using a divided flow procedure because of the culvert and the bridge opening at SR 51. If you have any thoughts on an approach, we would entertain your ideas.
The model also is putting flow over into the smaller dam in the Phx Mtn Preserve on the north side Of Northern Avenue. We are adjusting the profile of Northern Avenue to check the impact.
We may need to code out the smaller dam and it's reservoir area. I would like to me and discuss This model with you as soon as you've looked it over. Thanks

Copy to File 091131.01 Signed Bob Eichinger

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399
(602) 506-1501
FAX: (602) 506-4601
TT: (602) 506-5859

12-07-98

MEMO TO: Bob Eichinger, Kimley-Horn

FROM: Tim Murphy

SUBJECT: FCD 98-16, Delineation of Spillway Flows for Dreamy Draw Dam

1. For cross section 18.428 check the channel distance being used in the HEC-RAS model. I scaled off a distance of approximately 350 feet, and 600 feet is being used in the model.

2. Cross Sections 19.22 and 19.65 need to be shown on the exhibit.

3. The descriptions on cross sections 19.65 to 19.554 need to be revised. They currently are making reference to 16th Street.

4. When we get close to the final model need to identify the river and reaches by name. The profiles should also be identified by number and event. Also, a complete project description and cross section descriptions should be provided.

5. Russ Cruff and I looked the study area over and I've attached his comments.

REVIEW OF DELINEATION OF SPILLWAY FLOWS
FOR DREAMY DRAW DAM
FIELD RECONNAISANCE REPORT
FCD CONTRACT # 98-16
BY
R.W. CRUFF, P.E.
NOVEMBER 25, 1998

My first reaction after a visit to the site was that the "N" values were generally to low for the main channel and to high for the overbanks. But, upon review of the HECRAS model, I decided that the model uses NH format and that the field report shows values for main channel and overbanks (NC format). When possible the NC format will do the best hydraulic computation and I would recommend that it be used where flows overbanks are somewhat uniform. In this study this may not be possible when you get into areas of flow over streets and around buildings. For the upper part, I would recommend that the NC format be used. In the lower reaches, if the NH format is required, I would compute an average main channel value and use it between the channel bank stations.

In the computation of average "N" for the NC format, the average must use a base value that is the average for the bottom between channel banks with additions for vegetation, scalloping, and etc. The same is true for each overbank.

If I were to apply "N" values to this area based on the report, I would have main channel values that were low and overbank values that may be high. Remember that an "N" value for a cross section is the average value for the reach from half way between the next upstream section through the section in question to half way to the next downstream section. Thus they are an average of conditions in both the length and width directions.

In reviewing the "N" values used in the report, I find that in most cases a value of less than 0.030 was used for the base value. I did not see any natural bottom sections where I would use a value of less than 0.030.

For sections 20 to 19.891 I would use 0.025 to 0.028 for the main channel and 0.045 for the overbanks.

For sections along the gunite channel, I would use a main channel average of about 0.030 with overbanks of 0.045 or greater.

Below the gunite channel to the culvert there seems to be very heavy growth and main channel values of 0.040 or 0.045 seem reasonable.

The area shown by Photo 4 has much more dense growth than the photo indicates. For this area I would use a main channel of 0.045 to 0.050.

In the area of Photo 5 again the growth is quite heavy and a value of 0.050 or more would be appropriate.

In the area of Photo's 6, 7, & 8 raise the base to 0.030.

Kimley-Horn
and Associates, Inc.

Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

December 15, 1998

Mr. Tim Murphy, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Delineation of Spillway Flows for Dreamy Draw Dam FCD 98-16
KHA No.: 091131.01

Dear Tim:

We enclose the minutes of the project review meeting held at our offices on December 7, 1998.

If you have any questions, please contact me at my direct line at 906-1182.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Robert A. Eichinger

Robert A. Eichinger, P.E.
Project Manager

RAE:rae

TEL 602 944 5500
FAX 602 944 7423

Kimley-Horn
and Associates, Inc.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FOR DREAMY DRAW DAM
FCD 98-16

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: Dec. 7, 1998 Meeting No.: 2 - Project Review

Meeting Time: 9:00 AM

Meeting Place: Flood Control District

Attendees: FCD - Tim Murphy, Russ Cruff
KHA - Doug Plasencia, Bob Eichinger, Jon Ahern

Item No.

1. Tim provided to KHA a memo with his review comments for the initial submittal. Tim has some corrections regarding channel distance, cross section not shown, descriptions of cross sections, and river/reach names. KHA will incorporate these comments.
2. Russ also had a memo regarding his site visit to the dam and Dreamy Draw Wash area. He reviewed the draft Manning's n-value report and his comments are provided in his memo. Russ suggested that the base n-values need to be raised and to use the same n-value across the wash from bank-to-bank.

These are the minutes of the meeting as understood by KHA. Any revisions to these minutes must be received by KHA 7 days after the receipt of these meeting minutes.

Kimley-Horn
and Associates, Inc.

Memorandum To File

Prepared By: BOB EICHINGER Project No.: 091131.01

Date: 1/19/99 Copies To: JTA

Subject: Dreamy Draw Dam FILE

Notes: TRAVEL TIME COMPUTATION. TIM MURPHY RETURNED MY PHONE CALL @ 8:40 AM. HE SAID TRAVEL TIME MAY BE COMPUTED USING EITHER CHANNEL VELOCITY OR AVERAGE VELOCITY ACROSS THE X-SECTION. WE NEED TO DOCUMENT WHICH ONE WE USE. HE SUGGESTED THAT WE MAKE A CUSTOM HECRAS TABLE WITH X-SECTION, REACH LENGTH, AND VELOCITY (BOTH MAIN CHANNEL VELOCITY AND AVERAGE VELOCITY) AND EXPORT THE TABLE TO A SPREADSHEET. THE SPREADSHEET THEN WILL HAVE A FORMULA TO CALCULATE TRAVEL TIME BETWEEN EACH X-SECTION AND CUMULATIVE TRAVEL TIME.

Kimley-Horn
and Associates, Inc.

Suite 250
7600 N 15th Street
Phoenix, Arizona 85020

TEL 602 944 5500
FAX 602 944 7423

Transmittal

Date: *January 29, 1999* Job. No: *091131.01*

To: *Tim Murphy, P.E.*
Flood Control District of Maricopa County
2801 W. Durango
Phoenix, Arizona

We are sending you

x Attached ___ Under separate cover via _____ the following items:

___ Shop Drawings ___ Prints/Plans ___ Samples ___ Specifications ___ Change

___ Other: Memorandum

Copies	*Date*	*No.*	*Description*
1	1/29/99		Preliminary Submittal – Delineation of Spillway Flows
			For Dreamy Draw Dam FCD 98-16
			(Draft Technical Report, HECRAS diskette/hardcopy, Cross Sections)

Engineering
Planning
and
Environmental
Consultants

These are transmitted as checked below:

___ For your use ___ Approved as submitted ___ Resubmit ____ copies for approval

___ As requested ___ Approved as noted ___ Submit ____ copies for distribution

x For review and comment ___ Returned for corrections ___ Return ____ corrected prints

Remarks

If you have any questions, please call me directly at 906-1182

Copy to File Signed RAE

FCD 98-16
Delineation of Spillway Flows for Dreamy Draw Dam

Some General Guidelines for the Study

September 17, 1998

PRELIMINARY SUBMITTAL JAN 1999

1. All submittals should include a copy of the HEC-RAS model on diskette. The diskette should include the input and output files, and the generated report. ✓

2. Use the project description and cross section description features of HEC-RAS. The project description should include the study name, contract number, consultants name, consultant contact, purpose of the study, general assumptions, source of the study data (topographic mapping (flight date), hydrology, n-values, etc...). The cross section description (if necessary) might include a comment on the specific modeling approach, or a comment about the relationship of the cross section to roads or other significant features. ✓

3. When printing out the HEC-RAS model results make use of headers and/or footers. All output pages should be numbered and dated, it can be helpful to have the study name and contract number included on the pages. If the three discharges are modeled separately, then that should be included in the footer. ✓
   1/3 / 2/3 / Full

4. The hydraulic results summary table should really be on the same page as the cross sections it pertains to. The intent is to have some of the pertinent results on the same page with the cross sections. We don't want to have a separate page for the hydraulic results summary table. ✓

5. The final HEC-RAS model should only include the final results. This means that usually there is only one plan, one geometry file, and one hydrology file. Any intermediate files (usually different geometry files for different approaches to a problem area) should not be included. The only exception to this is if the three discharges are modeled separately. FOR FINAL

6. Items that are preliminary or draft should be identified as such. Dating the items can also help in this matter. ✓

7. The Manning's n Value Report and the Data Collection Report are not intended to be stand-alone reports. They are supposed to be sections of the main report. ✓

8. In the main report headers and/or footers should be included (similar to item number 3). ✓

9. On the profile names include the profile number with the profile name. ✓

10. The cross section numbering will begin with river mile 20 at the crest of the emergency spillway. The numbering will decrease in the downstream direction. ✓

Kimley-Horn
and Associates, Inc.

March 9, 1999

Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

Mr. Tim Murphy, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Delineation of Spillway Flows for Dreamy Draw Dam FCD 98-16
KHA No.: 091131.01

Dear Tim:

Kimley-Horn and Associates, Inc. (KHA) has prepared the following responses to the Flood Control District's (FCD) review comments for the above referenced project. The FCD provided review comments in their March 2, 1999 memorandum (enclosed) to KHA. The District reviewed KHA's preliminary study results submittal forwarded to the District on January 29, 1999.

Our responses correspond to the District's numeration as provided in your March 2 memo, item per item.

Item 1. We will provide in the report a brief discussion of what we believe may be likely possible consequences as a result of partially blocked (clogged/plugged) or totally blocked culvert inlets in Dreamy Draw Wash. The discussion of the consequences will be limited only to potential changes in flow direction, flow breakouts, or flow splits. No additional hydraulic modeling is included to quantify hydrologic or hydraulic parameters. We will qualitatively indicate what potentially could happen to the overtopping flow for the 2/3 and the full discharge flow at the old Northern Avenue culvert.

Item 2. We will re-examine the cross section orientation at the 15th and 16th Street culvert according to modeling requirements and HEC-RAS guidelines. We agree that the cross section should not cross the road. However, at the beginning of the project, cross sections were located and limits set to account for the potential of the split flow for the channel that parallels the west side of SR 51. In light of our preliminary results and our overall discussion with you regarding your comments on the cross sections and culvert routines (items 2, 3, and 7) we will truncate and re-orient cross sections accordingly.

TEL 602 944 5500
FAX 602 944 7423

Item 3. The HEC-RAS message output suggests that this culvert should be modeled using a bridge routine instead of the culvert routine. What we believe may be happening Item 3. The HEC-RAS message output suggests that this culvert should be modeled using a bridge routine instead of the culvert routine. What we believe may be happening is HEC-RAS is computing flow over the roadway as weir flow and computing the total weir flow capacity using the entire available cross section above the roadway (weir crest) is HEC-RAS is computing flow over the roadway as weir flow and computing the total weir flow capacity using the entire available cross section above the roadway (weir crest) elevation of 1280. If the weir takes all of the flow discharge being modeled then no flow goes through the culvert. The program places a miniscule amount of flow in the culvert to continue the weir/culvert algorithm. KHA will examine the cross sections upstream and downstream of the culvert and review the water surface elevations and flow distribution. Per Item 2 we will re-examine the cross section limits and orientation at this culvert location. Per the message from the HEC-RAS output, we will model the culvert using a bridge routine and evaluate the results of this modeling approach.

Item 4. We will review the inundation limits at this cross section after the culvert at 15th Street is re-examined. If this potential exists that flow may not return to the main channel, then we will indicate on the plans to such an effect. We will examine the flow distribution at this location and the flow depths. The potential that flow may not return to the main channel may be a very shallow depth, low velocity of overbank flow, and small volume of flow reflecting a small weir flow.

Item 5. We will review the inundation limits at this cross section after the culvert at 15th Street is re-examined. We agree that just looking at the topographic mapping that some flow may not return back to the main channel. If this potential exists, then we will indicate on the plans to such an effect.

Item 6. We agree that just by looking at the topographic mapping, the inundation limits, and the street layout, that some flow may not return back to the main channel. However, due to the limitations of the model, the amount of flow diverted south by the street system was not investigated. The potential exists and will be indicated on the plans with a note and discussed in the report.

Item 7. The original cross section limits were set to develop a split flow situation for the channel that parallels SR 51 on the west. Since we believe that this situation most likely may not occur, we will reduce the limits of the cross sections.

Item 8. We will check the cross section labels and correct as required.

Item 9. We will follow your suggestion.

Item 10. We will revise the tables according to you requirements.

Item 11. Your comment is a valid observation. The review of flow distribution is a normal part of the our modeling approach when there are changes in cross section orientation, cross section geometry, n-values, or ineffective flow areas from cross section to cross section. However, we need to re-iterate an important modeling assumption to clarify what the flow distribution reflects in the field. We are assuming that a single storm event produces the flow discharges used in this study on Dreamy Draw Wash also produces flow in the Little Dreamy Draw Dam watershed because of the close proximity of the two watersheds to each other and the similar watershed sizes and hydrologic

characteristics. Although this study is not evaluating or examining emergency spillway discharges from Little Dreamy Draw Dam and it's impacts, we are assuming that the reservoir of this dam is full of stormwater to the level of the dam crest and there is no discharge from either the principal or emergency spillway. This assumption is valid and conservative in that we are making unavailable any storage in Little Dreamy Dam reservoir and making the reservoir area ineffective to flow for hydraulic modeling purposes. Hence, for the purposes of this study, there is more than likely to be some flow contributing to the project area from the Little Dreamy Draw watershed and some flows to occur in the Little Dreamy Draw Wash and it's overbank areas. We did not investigate and the scope does not require an investigation of coincident events, peaks, or discharges from both watersheds.

If we examine the flow as it passes west under the SR 51 bridge the discharge spreads out and flows (northwesterly) toward the Little Dreamy Draw Dam and flows (southwesterly) back toward Dreamy Draw Wash. A high point in Northern Avenue west of the bridge and the low exit ramp profile provide for this flow distribution. The field reconnaissance walk confirmed the possibility of this flow distribution.

Our cross section limits includes the Little Dreamy Draw Wash and Little Dreamy Draw Dam. Because of the flow spread of the spillway discharges from Dreamy Draw Dam and the likelihood of contributing, but unknown quantity or distribution of, flow from Little Dreamy Draw Dam, we believe that the northern boundary of the study inundation limits to be Little Dreamy Draw wash. The southern boundary of the study inundation limits is approximately Dreamy Draw wash. We did not model each and every building structure and obstructions within the inundation limits. This approach is beyond the capabilities of the HEC-RAS model, nor would it provide the District much more in accuracy regarding the hydraulic results.

However, we will examine the flow distribution, in light of the unknown interaction between Dreamy Draw Wash flow and Little Dreamy Draw Wash flow. We believe the conservative approach is to map the inundation limits as shown on the exhibits because of the above discussion.

Item 12. We will add the project title in the project window, if possible.

Item 13. We will add the culvert sizes.

Item 14. We will add the month/year of the study and the version of HEC-RAS used in the study.

Item 15. We have previously tried to change the river "wash" to "dreamy draw". We will attempt again.

If you have any questions, please contact me at my direct line at 906-1182.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Robert A. Eichinger

Robert A. Eichinger, P.E.
Project Manager

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399
(602) 506-1501
FAX: (602) 506-4601
TT: (602) 506-5859

3-2-99

MEMO TO: Bob Eichinger, Kimley-Horn

FROM: Tim Murphy

SUBJECT: FCD 98-16, Delineation of Spillway Flows for Dreamy Draw Dam

1) In the report include some general, and specific discussion on the possibility of any culverts being plugged, and what might happen to the flow if they are plugged.

   a) In sections 8.6 and 10.0 of the report you need to include a brief discussion on what might happen if the culverts under SR 51 are plugged, or even partially plugged.

   b) In the 2/3 and full discharge models flow overtops the road at the old Northern Avenue culvert. Will this flow return to Dreamy Draw Wash, or can some of it go down the old Northern Avenue? The possibility of this happening needs to be indicated on the exhibits, and there should be a discussion about this in the report

   c) Did you look at what might happen if the culverts at 15th Street, 16th Street, or under the apartments are plugged? The possibility of this happening needs to be indicated on the exhibits, and what could happen if they get plugged should be discussed in the report.

2) The cross sections (18.470, and 18.653) used to model the downstream sides of the culverts at 15th and 16th Streets should not cross the roads.

3) In the HEC-RAS model why does the flow in the 15th Street culvert (18.4915) decrease as the discharge being modeled increases? For the full discharge profile the culvert discharge is shown as 0.01 cfs.

4) In the full discharge model, at cross section 19.214 flow is shown coming out of the main channel on the left side. The possibility that this flow will not be able to return to the main channel needs to be indicated on the exhibit

5) In the full and 2/3 discharge models you are indicating that flow leaves the main channel between the culverts at 15th and 16th Streets. I don't see how this flow will return to the main channel of Dreamy Draw Wash. If this can't return to the main channel this should be indicated on the plans, and briefly discussed in the report.

6) Between 12th and 16th Streets did you consider the possibility that the street system could divert some of the flow to the south? I think that this possibility needs to be indicated on the plans, and discussed in the report.

7) For most of the cross sections downstream of SR 51 the left overbanks need to be reduced. The cross sections are currently too long for the left overbanks, the extra data is affecting the scale of the cross section plots. Reducing the extra cross section data will improve the scale being used in the plotting of the cross sections. I've indicated the approximate limits on the full discharge exhibit.

8) Some of the cross sections around SR 51 are mislabeled. I've indicated on the full discharge exhibit the problems that I saw. Please check and revise them as appropriate.

9) For the flow distribution consider a maximum of 3 subdivisions for the main channel, and about 5 to 7 subdivisions for the overbanks. In general the main channels aren't very wide, therefore you don't need very many subdivisions there. Based upon your current delineation you probably only need a few subdivisions in the right overbank, and you might want a few more subdivisions in left overbank because more of the flow is there.

10) In the tables on the delineation exhibit drawings the last column is titled maximum depth, the values that you have in that column are hydraulic depth. The items that I would like to see in these tables are: reach name, cross section number, water surface elevation, travel time, channel velocity, average cross section velocity, maximum depth, average depth. I only spot checked the values you have in the table, the few corrections that I have are shown on the exhibits.

11) Take a close look at the distribution of flow along a cross section, and at the change in the distribution between cross sections? Is the change in the distribution possible between one cross section and another? Two examples are:

    a) On cross section 19.262 to 19.174 the majority of the flow is in the channel, and from 19.106 to 19.043 significant portion is in the right overbank. And then on cross sections 18.836 the majority of the flow is back in the main channel.

    b) On cross sections 18.470 and 18.423 100% of the flow is in the channel, and then on cross section 18.355 approximately 30% is in the main channel.

12) Under the open project window add to the title line. Consider adding "Dreamy Draw Dam Spillway Study FCD 98-16." I believe that there might be a bug in the program which is causing the current project tile not to be displayed when in the open project window. To get around this you will probably have to create the project title in the new project window.

13) To Figure 1 in the report can you add the culvert sizes? I've added two examples of what I mean to the figure.

14) In the project description add the month and year that the model was created, and also the version of HEC-RAS being used.

15) For the river named "Wash", change it to Dreamy Draw.

Kimley-Horn
and Associates, Inc.

Suite 250
7600 N. 15th Street
Phoenix, Arizona
85020

May 26, 1999

Mr. Tim Murphy, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Re: Delineation of Spillway Flows for Dreamy Draw Dam FCD 98-16
KHA No.: 091131.01

Dear Tim:

We enclose the minutes of the project review meeting held at our offices on Wednesday, May 26, 1999.

If you have any questions, please contact me at my direct line at 906-1182.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Robert A. Eichinger

Robert A. Eichinger, P.E.
Project Manager

RAE:rae

TEL 602 944 5500
FAX 602 944 7423

Kimley-Horn
and Associates, Inc.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FOR DREAMY DRAW DAM
FCD 98-16

MEETING MINUTES

KIMLEY-HORN AND ASSOCIATES, INC.

Meeting Date: May 26, 1999 Meeting No.: 3 - Project Review

Meeting Time: 9:00 AM

Meeting Place: Kimley-Horn and Associates, Inc.

Attendees: FCD - Tim Murphy
KHA - Bob Eichinger, Jon Ahern

Item No. Final Review

1. Seal final report.
2. Provide titles for section dividers.
3. Provide color photos for N-value discussion.
4. Eight and one-half inch by 11 inch cross section plots are ok. Can put cross section plots double sided.
5. Add discussion regarding the 15th Avenue culvert. Increase flowrate in channel, decrease flowrate in culvert.
6. Provide 11-inch by 17-inch inundation maps to report.
7. Change table heading on inundation mapping to read "Channel ave depth" and "channel maximum depth".
8. Place diversion arrow to indicate potential split at upstream side of Cantera culvert.
9. Add contents of remaining appendices (e.g.: appendix E : meeting minutes, etc.)
10. KHA is working on GIS deliverables. Schedule for submittal is next week with the final report.
11. Tim will issue change order to delete the contingency budget for the split flow.

These are the minutes of the meeting as understood by KHA. Any revisions to these minutes must be received by KHA 7 days after the receipt of these meeting minutes.

LEGEND

ACHH - ALUMINUM CAP IN HANDHOLE
BD - BOTTOM BRIDGE DECK
CLP - CENTERLINE OF PIER
FL - FLOW LINE
PK - PK NAIL
SW - SIDEWALK
TBD - TOP BRIDGE DECK
TC - TOP OF CURB
TOE - TOE OF SLOPE
TW - TOP OF WALL
NG - NATURAL GROUND

10/14/98

PK
CM

NORTHERN AVE AT
STATE RTE 51
SQUAW PEAK PKWY
TOPO

HR 652

10737.5340
10738.8380

P7 2

(1) FND STAMPED ALDOT HIGHWAY
AIC HA STA 16+4777 ℄
EL. 1340.434
1991

FND SAID A/C IN NORTHERN AVE
MEDIAN WEST SIDE OF SR-51

(2) SET P.K. ℄ NORTHERN AVE
300'± EAST OF SR. 51

COORD'S ARE ASSUMED

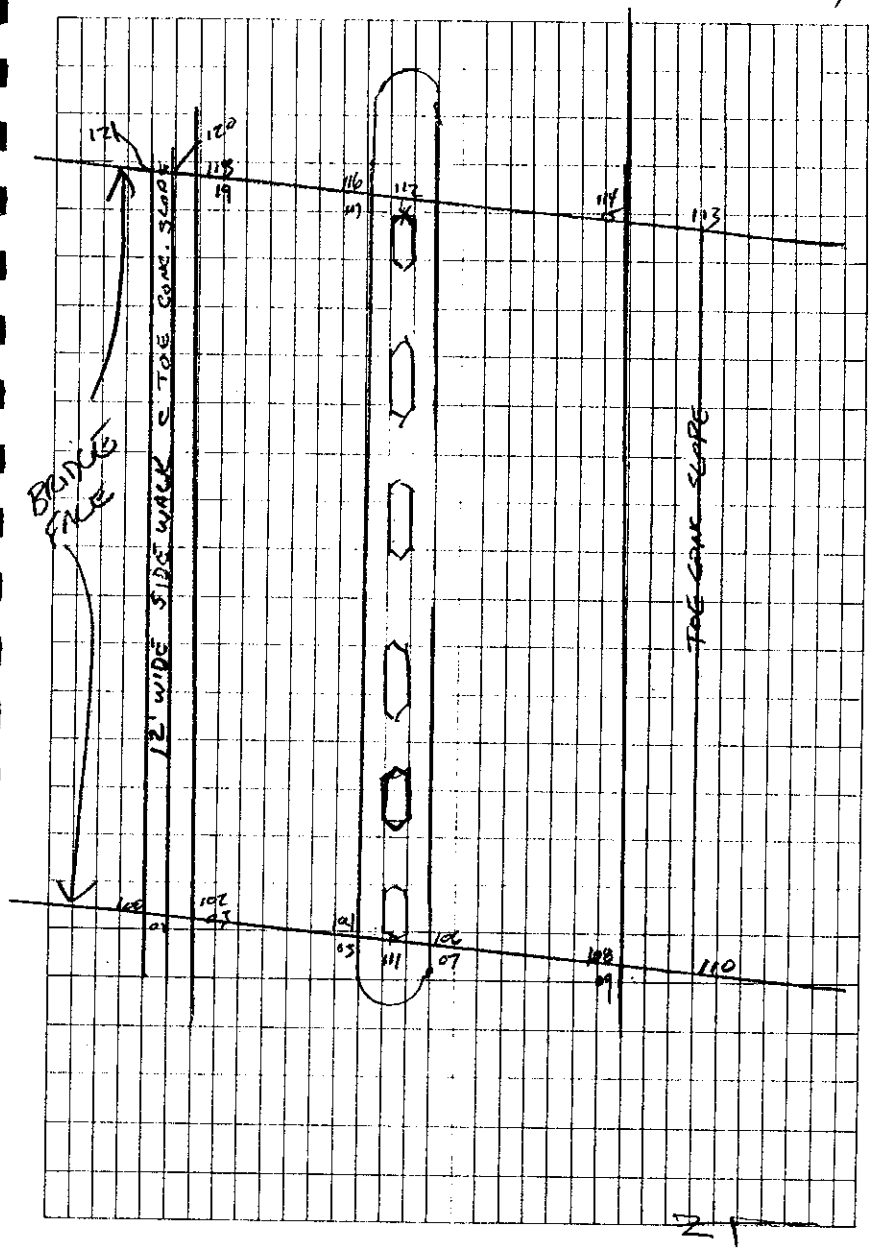
1.000164454

PT
1 A/CHK w/CON. COLLAR
NORTHERN
AVE
PT 2
SET PK

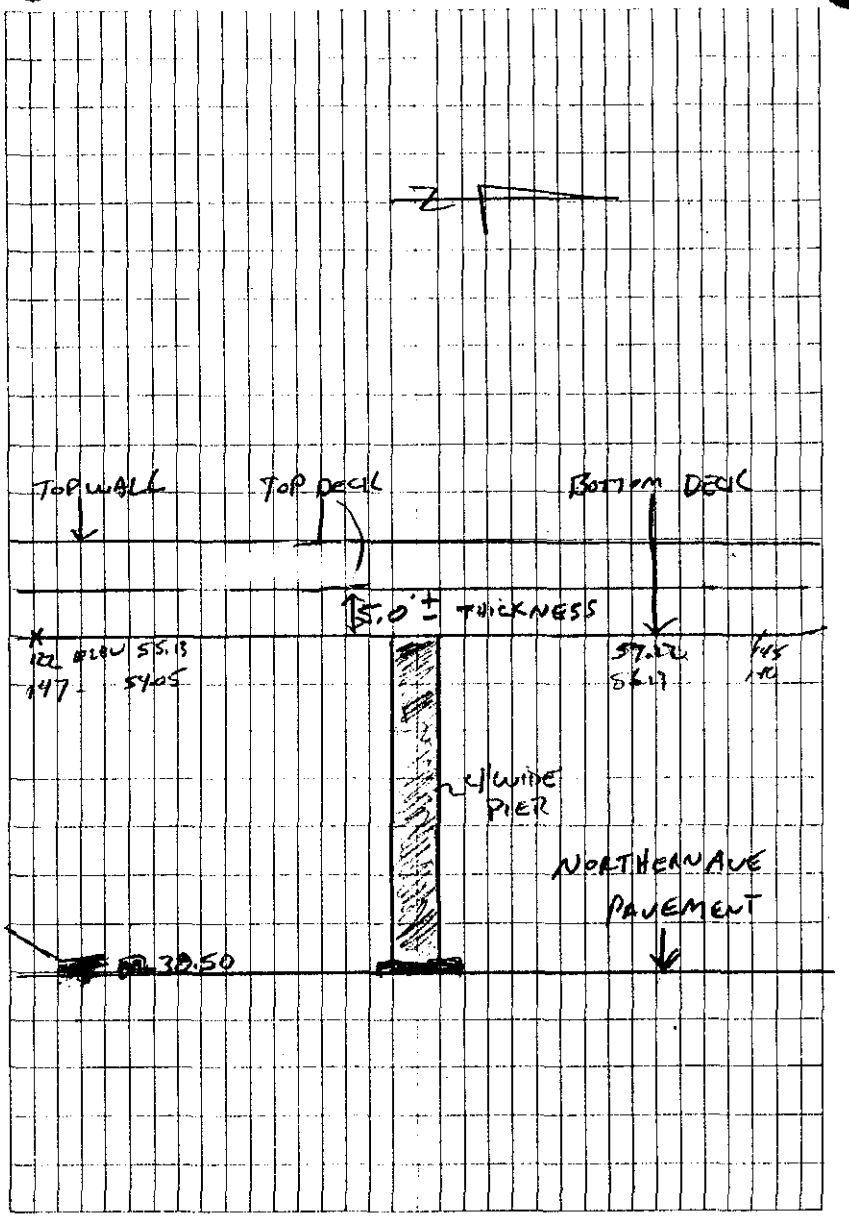
T @ 2 BS 1

HI 514

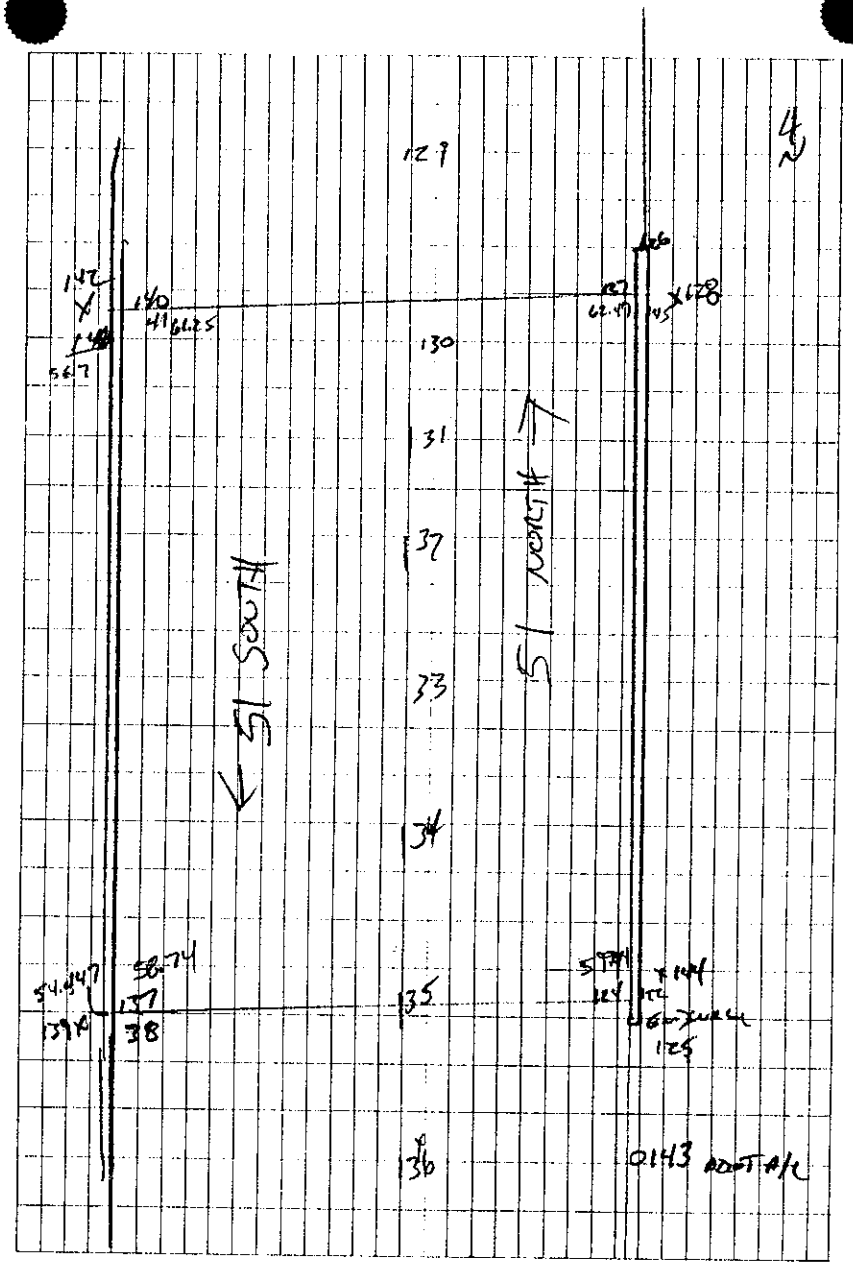
			HR
100	S.W		5.76
01	S.W.		
02	TIC BIC		
03	℄		
04	℄		
05	TIC		
06	TIC		
07	℄		
08	℄		
09	TC		
110	TOE		
11	℄ P	℄ 4' inde PIER	
12	℄ P	" " " "	
13	TOE		
14	TIC		.25
15	℄		.25
16	TIC		5.76
17	℄		
18	℄		
19	TC		



120	S.W		
21	S.W.	SIDEWALK ℄ TOE CONSLOPE	
22	B.D	ELEV A BATUM DECK	5.25
23	B.D	℄ ABUTMENT	
24	T.B.D	TOP BRIDGE DECK	5.76
25	T.W	TOP WALL	
26	T.W		
27	TBD		
28	TS	TOP SLOPE	
29	NG.		
130	TBD		
31	"		
32	"		
33	"		
34	"		
35	TBD		
36	NG		
37	TBD		9.85
38	T.W		5.76
39	T.S		9.85
140	TBD		"
41	T.W		"
42	T.S		"
143	BED	ADD AC IN CON NBMPT ESS 1994	
		P&M GEODETIC SURVEY	5.76



144	T.S.		5.16
145	B.D	BOTTOM BRIDGE DECK	-.26
146	B D		"
147	B D		"



GPS. 10/15/96 R.K.L.M

PT#	HI	OPP	ON	OFF	EPOPS
SR51	2.205	RKR	8:46	11:06	0
2	1.964	L.M.	9:04	10:58	0
3	2.034	RK.	9:31	9:41	120
004	"	"	10:06	10:07	12
005	"	"	10:25	10:26	12
006			10:41	10:54	120

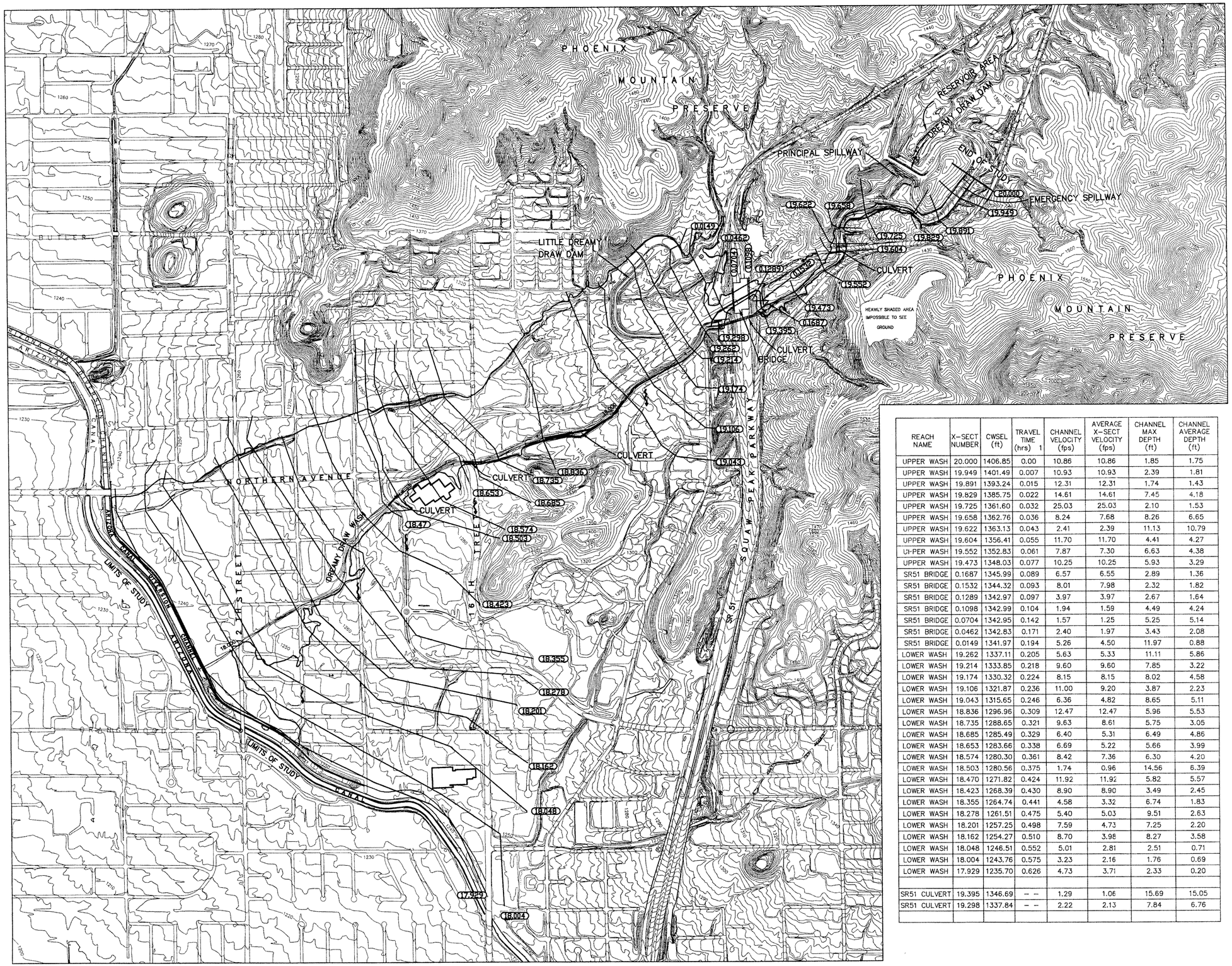
SR51 CODE NORTHERN

REMARK
UNIT 3 = POINT 1 ALCH
UNIT 2 @ ΔZ SET PK

ROVER 1 BCF 16ST + E WINTER DR
SAID PT 2' WEST OF ANOTHER BCF @
INTERSECTION
BCHH 7ST & DUNLAP

BCHH 7ST & GLENDALE

ALC IN CON S/E COR BRIDGE OF SR51
OVER NORTHERN AVE
STAMPED NBMP7 ESS 1994
PHM GEODETIC SURVY
POINT 143 IN TOPO FILE



REACH NAME	X-SECT NUMBER	CWSEL (ft)	TRAVEL TIME (hrs) 1	CHANNEL VELOCITY (fps)	AVERAGE X-SECT VELOCITY (fps)	CHANNEL MAX DEPTH (ft)	CHANNEL AVERAGE DEPTH (ft)
UPPER WASH	20.000	1406.85	0.00	10.86	10.86	1.85	1.75
UPPER WASH	19.949	1401.49	0.007	10.93	10.93	2.39	1.81
UPPER WASH	19.891	1393.24	0.015	12.31	12.31	1.74	1.43
UPPER WASH	19.829	1385.75	0.022	14.61	14.61	7.45	4.18
UPPER WASH	19.725	1361.60	0.032	25.03	25.03	2.10	1.53
UPPER WASH	19.658	1362.76	0.036	8.24	7.68	8.26	6.65
UPPER WASH	19.622	1363.13	0.043	2.41	2.39	11.13	10.79
UPPER WASH	19.604	1356.41	0.055	11.70	11.70	4.41	4.27
UPPER WASH	19.552	1352.83	0.061	7.87	7.30	6.63	4.38
UPPER WASH	19.473	1348.03	0.077	10.25	10.25	5.93	3.29
SR51 BRIDGE	0.1687	1345.99	0.089	6.57	6.55	2.89	1.36
SR51 BRIDGE	0.1532	1344.32	0.093	8.01	7.98	2.32	1.82
SR51 BRIDGE	0.1289	1342.97	0.097	3.97	3.97	2.67	1.64
SR51 BRIDGE	0.1098	1342.99	0.104	1.94	1.59	4.49	4.24
SR51 BRIDGE	0.0704	1342.95	0.142	1.57	1.25	5.25	5.14
SR51 BRIDGE	0.0462	1342.83	0.171	2.40	1.97	3.43	2.08
SR51 BRIDGE	0.0149	1341.97	0.194	5.26	4.50	11.97	0.88
LOWER WASH	19.262	1337.11	0.205	5.63	5.33	11.11	5.86
LOWER WASH	19.214	1333.85	0.218	9.60	9.60	7.85	3.22
LOWER WASH	19.174	1330.32	0.224	8.15	8.15	8.02	4.58
LOWER WASH	19.106	1321.87	0.236	11.00	9.20	3.87	2.23
LOWER WASH	19.043	1315.65	0.246	6.36	4.82	8.65	5.11
LOWER WASH	18.836	1296.96	0.309	12.47	12.47	5.96	5.53
LOWER WASH	18.735	1288.65	0.321	9.63	8.61	5.75	3.05
LOWER WASH	18.685	1285.49	0.329	6.40	5.31	6.49	4.86
LOWER WASH	18.653	1283.66	0.338	6.69	5.22	5.66	3.99
LOWER WASH	18.574	1280.30	0.361	8.42	7.36	6.30	4.20
LOWER WASH	18.503	1280.56	0.375	1.74	0.96	14.56	6.39
LOWER WASH	18.470	1271.82	0.424	11.92	11.92	5.82	5.57
LOWER WASH	18.423	1268.39	0.430	8.90	8.90	3.49	2.45
LOWER WASH	18.355	1264.74	0.441	4.58	3.32	6.74	1.83
LOWER WASH	18.278	1261.51	0.475	5.40	5.03	9.51	2.63
LOWER WASH	18.201	1257.25	0.498	7.59	4.73	7.25	2.20
LOWER WASH	18.162	1254.27	0.510	8.70	3.98	8.27	3.58
LOWER WASH	18.048	1246.51	0.552	5.01	2.81	2.51	0.71
LOWER WASH	18.004	1243.76	0.575	3.23	2.16	1.76	0.69
LOWER WASH	17.929	1235.70	0.626	4.73	3.71	2.33	0.20
SR51 CULVERT	19.395	1346.69	-- --	1.29	1.06	15.69	15.05
SR51 CULVERT	19.298	1337.84	-- --	2.22	2.13	7.84	6.76

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FOR **DREAMY DRAW DAM**

F.C.D. CONTRACT NO. **98-16**

LEGEND

INUNDATION BOUNDARY

CROSS SECTION (18.74)

POTENTIAL DIVERSION

NOTES

1) TRAVEL TIME IS CALCULATED FROM THE EMERGENCY SPILLWAY TO THE DOWNSTREAM STUDY LIMIT, AND IS BASED ON THE AVERAGE VELOCITY OF THE ENTIRE CROSS SECTION.

2) DISCHARGE THROUGH THE PRINCIPAL SPILLWAY IN DREAMY DRAW DAM WAS NOT ANALYZED UNDER THIS STUDY, AND CONSEQUENTLY, NO FLOODING LIMITS ARE SHOWN.

3) THE STRUCTURAL AND HYDRAULIC INTEGRITY OF ANY LEVEES, BERMS, OR FILL, TO WITHSTAND EROSION (OR FAILURE) DURING FLOODING WAS NOT EVALUATED AS PART OF THIS STUDY.

4) HYDRAULIC BASELINES WERE USED TO DETERMINE REACH LENGTHS. ROUTE LINES WERE USED TO DETERMINE RIVER MILE STATIONING FOR CROSS SECTION IDENTIFIERS.

5) FLOW ARROWS INDICATE POTENTIAL DIVERSIONS TO STREET SYSTEM.

Registered Professional Engineer (Civil) CERTIFICATE NO. 24767 ROBERT A. EICHINGER Date Signed 6-2-99 ARIZONA U.S.A.

DELINEATION OF SPILLWAY FLOWS FOR DREAMY DRAW DAM. 1/3 SPILLWAY DESIGN DISCHARGE (2000 cfs).

N

500 0' 500 1000

SCALE: 1"= 500

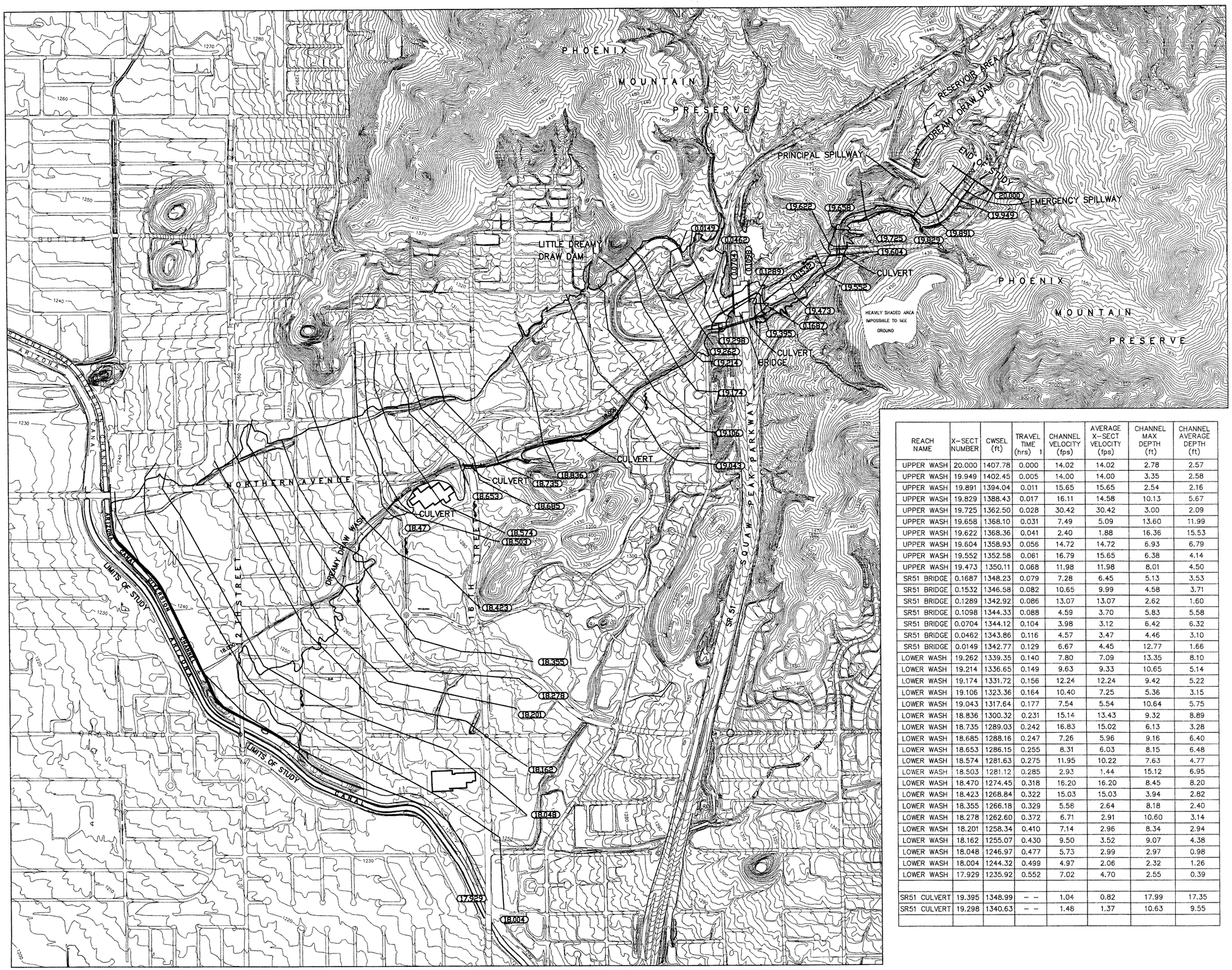
Kimley-Horn and Associates, Inc.

	BY	DATE	
DESIGN	JTA	6/2/99	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	RAE	6/2/99	
PLANS	JTA	6/2/99	RECOMMENDED BY: DATE
PLANS CHK.			APPROVED BY: DATE
SUBMITTED BY: DATE:			CHIEF ENGINEER AND GENERAL MANAGER
			SHEET 1 OF 3

TOPOGRAPHY PROVIDED BY:
KAMINSKI, HUBBARD ENGINEERING, INC.
DATE FLOWN: 11/15/1990

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1"= 500' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY KAMINSKI, HUBBARD ENGINEERING, INC.

K:\-CIVIL\891\191\191\DWG\191\2000s.dwg Thu Jun 03 09:32:59 1999 |s



REACH NAME	X-SECT NUMBER	CWSEL (ft)	TRAVEL TIME (hrs) 1	CHANNEL VELOCITY (fps)	AVERAGE X-SECT VELOCITY (fps)	CHANNEL MAX DEPTH (ft)	CHANNEL AVERAGE DEPTH (ft)
UPPER WASH	20.000	1407.78	0.000	14.02	14.02	2.78	2.57
UPPER WASH	19.949	1402.45	0.005	14.00	14.00	3.35	2.58
UPPER WASH	19.891	1394.04	0.011	15.65	15.65	2.54	2.16
UPPER WASH	19.829	1388.43	0.017	16.11	14.58	10.13	5.67
UPPER WASH	19.725	1362.50	0.028	30.42	30.42	3.00	2.09
UPPER WASH	19.658	1368.10	0.031	7.49	5.09	13.60	11.99
UPPER WASH	19.622	1368.36	0.041	2.40	1.88	16.36	15.53
UPPER WASH	19.604	1358.93	0.056	14.72	14.72	6.93	6.79
UPPER WASH	19.552	1352.58	0.061	16.79	15.65	6.38	4.14
UPPER WASH	19.473	1350.11	0.068	11.98	11.98	8.01	4.50
SR51 BRIDGE	0.1687	1348.23	0.079	7.28	6.45	5.13	3.53
SR51 BRIDGE	0.1532	1346.58	0.082	10.65	9.99	4.58	3.71
SR51 BRIDGE	0.1289	1342.92	0.086	13.07	13.07	2.62	1.60
SR51 BRIDGE	0.1098	1344.33	0.088	4.59	3.70	5.83	5.58
SR51 BRIDGE	0.0704	1344.12	0.104	3.98	3.12	6.42	6.32
SR51 BRIDGE	0.0462	1343.86	0.116	4.57	3.47	4.46	3.10
SR51 BRIDGE	0.0149	1342.77	0.129	6.67	4.45	12.77	1.66
LOWER WASH	19.262	1339.35	0.140	7.80	7.09	13.35	8.10
LOWER WASH	19.214	1336.65	0.149	9.63	9.33	10.65	5.14
LOWER WASH	19.174	1331.72	0.156	12.24	12.24	9.42	5.22
LOWER WASH	19.106	1323.36	0.164	10.40	7.25	5.36	3.15
LOWER WASH	19.043	1317.64	0.177	7.54	5.54	10.64	5.75
LOWER WASH	18.836	1300.32	0.231	15.14	13.43	9.32	8.89
LOWER WASH	18.735	1289.03	0.242	16.83	15.02	6.13	3.28
LOWER WASH	18.685	1288.16	0.247	7.26	5.96	9.16	6.40
LOWER WASH	18.653	1286.15	0.255	8.31	6.03	8.15	6.48
LOWER WASH	18.574	1281.63	0.275	11.95	10.22	7.63	4.77
LOWER WASH	18.503	1281.12	0.285	2.93	1.44	15.12	6.95
LOWER WASH	18.470	1274.45	0.318	16.20	16.20	8.45	8.20
LOWER WASH	18.423	1268.84	0.322	15.03	15.03	3.94	2.82
LOWER WASH	18.355	1266.18	0.329	5.58	2.64	8.18	2.40
LOWER WASH	18.278	1262.60	0.372	6.71	2.91	10.60	3.14
LOWER WASH	18.201	1258.34	0.410	7.14	2.96	8.34	2.94
LOWER WASH	18.162	1255.07	0.430	9.50	3.52	9.07	4.38
LOWER WASH	18.048	1246.97	0.477	5.73	2.99	2.97	0.98
LOWER WASH	18.004	1244.32	0.499	4.97	2.06	2.32	1.26
LOWER WASH	17.929	1235.92	0.552	7.02	4.70	2.55	0.39
SR51 CULVERT	19.395	1348.99	– –	1.04	0.82	17.99	17.35
SR51 CULVERT	19.298	1340.63	– –	1.48	1.37	10.63	9.55

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FOR **DREAMY DRAW DAM**

F.C.D. CONTRACT NO. **98–16**

LEGEND

INUNDATION BOUNDARY

CROSS SECTION (18.74)

POTENTIAL DIVERSION

NOTES

1) TRAVEL TIME IS CALCULATED FROM THE EMERGENCY SPILLWAY TO THE DOWNSTREAM STUDY LIMIT, AND IS BASED ON THE AVERAGE VELOCITY OF THE ENTIRE CROSS SECTION.

2) DISCHARGE THROUGH THE PRINCIPAL SPILLWAY IN DREAMY DRAW DAM WAS NOT ANALYZED UNDER THIS STUDY, AND CONSEQUENTLY, NO FLOODING LIMITS ARE SHOWN.

3) THE STRUCTURAL AND HYDRAULIC INTEGRITY OF ANY LEVEES, BERMS, OR FILL, TO WITHSTAND EROSION (OR FAILURE) DURING FLOODING WAS NOT EVALUATED AS PART OF THIS STUDY.

4) HYDRAULIC BASELINES WERE USED TO DETERMINE REACH LENGTHS. ROUTE LINES WERE USED TO DETERMINE RIVER MILE STATIONING FOR CROSS SECTION IDENTIFIERS.

5) FLOW ARROWS INDICATE POTENTIAL DIVERSIONS TO STREET SYSTEM.

Registered Professional Engineer (Civil) CERTIFICATE NO. 24767 ROBERT A. EICHINGER Date Signed 6/2/99 ARIZONA U.S.A.

DELINEATION OF SPILLWAY FLOWS FOR DREAMY DRAW DAM. 2/3 SPILLWAY DESIGN DISCHARGE (4000 cfs).

N

500 0' 500 1000

SCALE: 1"= 500

Kimley-Horn and Associates, Inc.

	BY	DATE
DESIGN	JTA	6/2/99
DESIGN CHK.	RAE	6/2/99
PLANS	JTA	6/2/99
PLANS CHK.		
SUBMITTED BY:		DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 2 OF 3

TOPOGRAPHY PROVIDED BY:
KAMINSKI, HUBBARD ENGINEERING, INC.
DATE FLOWN: 11/15/1990

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1"= 500' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY KAMINSKI, HUBBARD ENGINEERING, INC.

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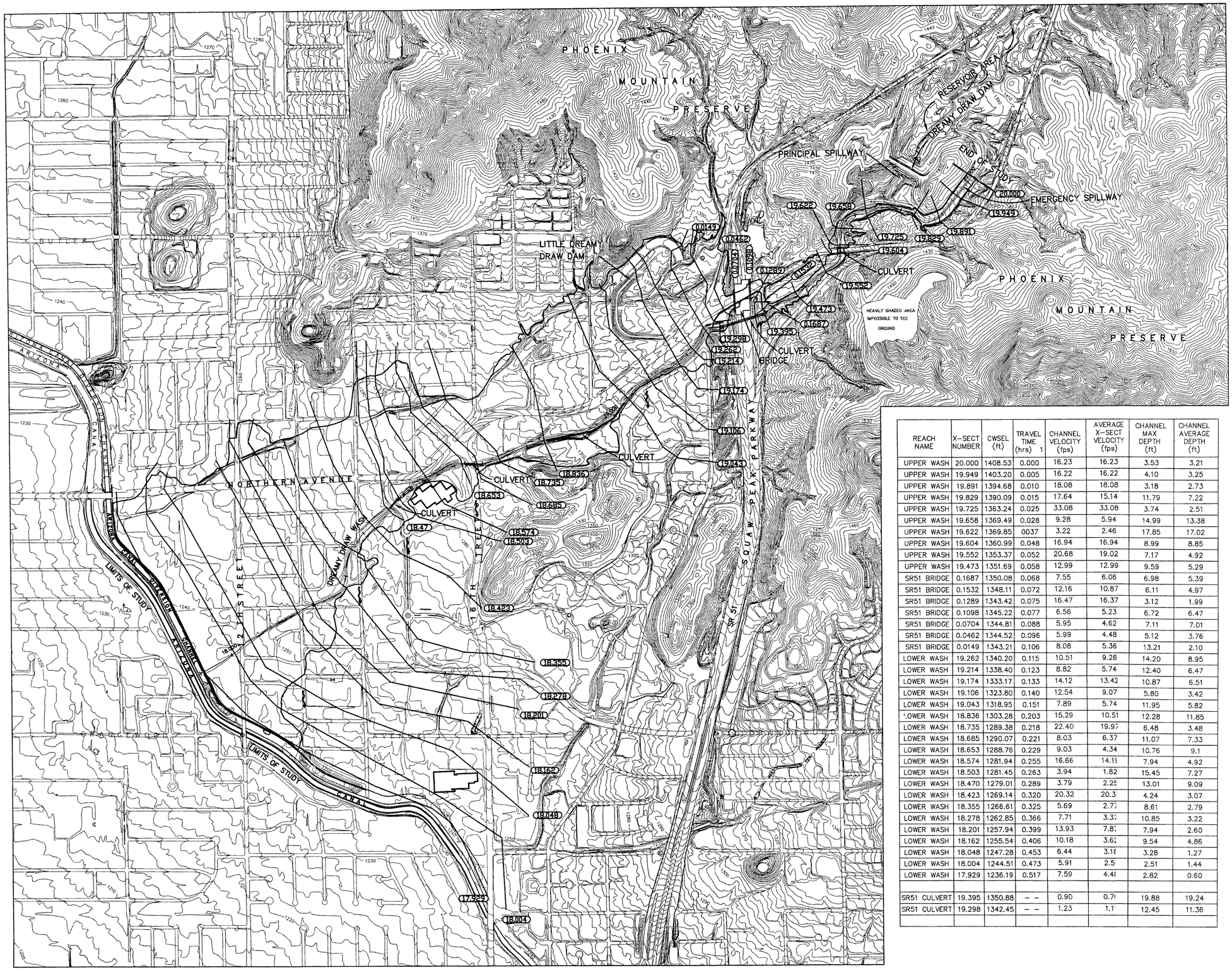

REACH NAME	X-SECT NUMBER	CWSEL (ft)	TRAVEL TIME (hrs) 1	CHANNEL VELOCITY (fps)	AVERAGE X-SECT VELOCITY (fps)	CHANNEL MAX DEPTH (ft)	CHANNEL AVERAGE DEPTH (ft)
UPPER WASH	20.000	1408.53	0.000	16.23	16.23	3.53	3.21
UPPER WASH	19.949	1403.20	0.005	16.22	16.22	4.10	3.25
UPPER WASH	19.891	1394.68	0.010	18.08	18.08	3.18	2.73
UPPER WASH	19.829	1390.09	0.015	17.64	15.14	11.79	7.22
UPPER WASH	19.725	1363.24	0.025	33.08	33.08	3.74	2.51
UPPER WASH	19.658	1369.49	0.028	9.28	5.94	14.99	13.38
UPPER WASH	19.622	1369.85	0037	3.22	2.46	17.85	17.02
UPPER WASH	19.604	1360.99	0.048	16.94	16.94	8.99	8.85
UPPER WASH	19.552	1353.37	0.052	20.68	19.02	7.17	4.92
UPPER WASH	19.473	1351.69	0.058	12.99	12.99	9.59	5.29
SR51 BRIDGE	0.1687	1350.08	0.068	7.55	6.06	6.98	5.39
SR51 BRIDGE	0.1532	1348.11	0.072	12.16	10.87	6.11	4.97
SR51 BRIDGE	0.1289	1343.42	0.075	16.47	16.37	3.12	1.99
SR51 BRIDGE	0.1098	1345.22	0.077	6.56	5.23	6.72	6.47
SR51 BRIDGE	0.0704	1344.81	0.088	5.95	4.62	7.11	7.01
SR51 BRIDGE	0.0462	1344.52	0.096	5.99	4.48	5.12	3.76
SR51 BRIDGE	0.0149	1343.21	0.106	8.08	5.36	13.21	2.10
LOWER WASH	19.262	1340.20	0.115	10.51	9.26	14.20	8.95
LOWER WASH	19.214	1338.40	0.123	8.82	5.74	12.40	6.47
LOWER WASH	19.174	1333.17	0.133	14.12	13.42	10.87	6.51
LOWER WASH	19.106	1323.80	0.140	12.54	9.07	5.80	3.42
LOWER WASH	19.043	1318.95	0.151	7.89	5.74	11.95	5.82
LOWER WASH	18.836	1303.28	0.203	15.29	10.51	12.28	11.85
LOWER WASH	18.735	1289.38	0.218	22.40	19.97	6.48	3.48
LOWER WASH	18.685	1290.07	0.221	8.03	6.37	11.07	7.33
LOWER WASH	18.653	1288.76	0.229	9.03	4.34	10.76	9.1
LOWER WASH	18.574	1281.94	0.255	16.66	14.19	7.94	4.92
LOWER WASH	18.503	1281.45	0.263	3.94	1.82	15.45	7.27
LOWER WASH	18.470	1279.01	0.289	3.79	2.25	13.01	9.09
LOWER WASH	18.423	1269.14	0.320	20.32	20.3	4.24	3.07
LOWER WASH	18.355	1266.61	0.325	5.69	2.77	8.61	2.79
LOWER WASH	18.278	1262.85	0.366	7.71	3.37	10.85	3.22
LOWER WASH	18.201	1257.94	0.399	13.93	7.87	7.94	2.60
LOWER WASH	18.162	1255.54	0.406	10.18	3.62	9.54	4.86
LOWER WASH	18.048	1247.28	0.453	6.44	3.18	3.28	1.27
LOWER WASH	18.004	1244.51	0.473	5.91	2.5	2.51	1.44
LOWER WASH	17.929	1236.19	0.517	7.59	4.41	2.82	0.60
SR51 CULVERT	19.395	1350.88	– –	0.90	0.7	19.88	19.24
SR51 CULVERT	19.298	1342.45	– –	1.23	1.1	12.45	11.36

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

DELINEATION OF SPILLWAY FLOWS FOR **DREAMY DRAW DAM**

F.C.D. CONTRACT NO. **98–16**

LEGEND

INUNDATION BOUNDARY

CROSS SECTION (18.74)

POTENTIAL DIVERSION

NOTES

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Registered Professional Engineer (Civil) CERTIFICATE NO. 24767 ROBERT A. EICHINGER Date Signed 6/2/99 ARIZONA U.S.A.

DELINEATION OF SPILLWAY FLOWS FOR DREAMY DRAW DAM. FULL SPILLWAY DESIGN DISCHARGE (6000 cfs).

500 0' 500 1000

SCALE: 1"= 500

Kimley-Horn and Associates, Inc.

	BY	DATE
DESIGN	JTA	6/2/99
DESIGN CHK.	RAE	6/2/99
PLANS	JTA	6/2/99
PLANS CHK.		
SUBMITTED BY:		DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 3 OF 3

TOPOGRAPHY PROVIDED BY:
KAMINSKI, HUBBARD ENGINEERING, INC.
DATE FLOWN: 11/15/1990

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1"= 500' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY KAMINSKI, HUBBARD ENGINEERING, INC.

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