UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
YREKA FIELD OFFICE, CALIFORNIA

Landowner: Farmers Ditch Group
Project: Loose Rock Weir, Irrigation Water Conveyance
Program: Environmental Quality Incentive Program 2003
County: Siskiyou County
Resource Conservation District: Siskiyou
Job Code: 410-A Loose Rock Drop Structures, 430 II Pipeline used as a Canal
Engineering Class: VI

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September 14, 2005

DESIGN REPORT

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SUMMARY

The Farmers Ditch diverts water out of the Scott River (RM 51). The Farmers Ditch is the second largest diversion in the watershed (36.00 cfs). Site is located at confluence of Sugar Creek and Scott River. This is also the take-out of the Farmers Ditch diversion. It is more particularly located in Sec 1 T.40N R.9W or 122 52' 30" N 41 22' 30" W latitude and longitude.
The current method of diversion is to construct a gravel/rock dam using bed load from the channel. The gravel dam is a fish passage barrier when fully installed as the dam extends across the active channel. The intent of the project is to move the diversion up stream and install a vortex boulder weir to replace the gravel dam. Furthermore, we propose to replace the existing fish screen with one that meets CDFG/NOAA screening criteria and protect the diversion from high flows with a headgate and bulkhead structure. This effort is in cooperation with the NRCS and the CDFG. A majority of the cost share is provided by NRCS.

ORIGIN OF REQUEST

The Farmers Ditch Group applied for technical and financial assistance through the Environmental Quality Incentive Program (EQIP) in 2003. The Natural Resources Conservation Service and the California Department of Fish and Game and the Siskiyou Resource Conservation District will provide technical and financial support. The Natural Resources Conservation Service personnel at the Yreka Field Office will provide the technical assistance.

DESCRIPTION OF PROBLEM

The Scott River is a major tributary to the Klamath River. The Scott River and many of its tributaries support three species of anadromous salmonids: Chinook salmon, coho salmon, and steelhead. The intent of this proposal is to improve fish passage through the Farmers Ditch diversion by installing a boulder vortex weir as a diversion structure, which is connected to a head gate. We also propose to replace the existing fish screen with one that meets CDFG/NOAA screening criteria. Both fish passage and fish protection are high priority issues in the Coho Recovery Plan and the Scott River Strategic Action Plan. The boulder weir will replace the current method of diversion, which is constructing a gravel dam across the active channel. The NRCS and

the water users intend to also convey the water using a partially full pipe the first 3,500' of the Farmers Ditch to improve delivery efficiency. The pipe is needed instead of an open canal to protect the diversion from flooding and causing maintenance damage. NRCS is a cooperating partner and is providing a majority of the matching funds. The Farmers Ditch is the second largest diversion in the Scott River watershed with an adjudicated diversion volume of 36.00 cfs.

The Farmers Ditch diversion is located in the southern portion of Scott Valley within the mine tailings area. Habitat around the Farmers Ditch is poor due to the affects of the tailings. Even so, the reach is a vital corridor for adults migrating to spawning areas and Juveniles moving through the system. The Farmer's Ditch diverts water using a large gravel dam that is constructed with equipment. As flows reduce in the summer, the water users extend the gravel dam further across the channel until mid July when the diversion extends fully across the wetted channel and diverts most of the water in the Scott River (roughly 20 cfs). At that point, the diversion operation exacerbates the scenario where the 3-mile reach of the Scott River (the reach from below Farmers Ditch to the end of the tailings) below the tailings goes subsurface. While the river would likely go subsurface on most years (due to channel aggradation and other factors) the Farmer's Ditch makes the surface flows subside more abruptly, stranding fish. This has been a concern of the water users, RCD and CDFG for years.

While the transition from a gravel dam to a boulder weir will not resolve the connectivity issue below the diversion, it may reduce the volume of fish stranded as the reduction in flows will be more gradual rather than abrupt. Gradual reduction in flows will allow fish using the area where surface flows will subside to sense gradual flow reduction and move out of the area. If fish choose to move upstream they will have passage over the weir.

The condition of streams and riparian areas reflect the health of the surrounding landscape. The Scott River and its tributaries are no exceptions. The conservation symptom is continuing accelerated channel erosion. There is a combination of factors upstream impacting this reach. The purpose of the project is to enhance the stream corridor for fisheries, as well as allow the owners to irrigate their lands.

The benefits to the owners are compliance with current Fish and Game screening and passage requirements. They will be able to divert water without undue maintenance costs, improve stream channel and ditch stability and improve fish passage within the watershed.

SOLUTION

A vortex loose rock weir is planned to reduce the fluctuations in the stream channel elevations at the diversion. This will be a loose rock drop structure keyed into the banks and streambed with a low flow notch created for fish passage. A pipeline with headworks and a locking headgate is planned. The pipeline will be installed to replace the existing ditch along the east bank and will still function as a ditch only enclosed. The partially full flowing pipe acts as a enclosed canal.

DESIGN CRITERIA

The design criteria are in accordance with NRCS Conservation Practice Standard 410-A and 430-II with the following considerations:

Biological Considerations

This stream has been used historically for spawning and rearing habitat for salmon. Local efforts are currently focused on data collection for salmon and water quality issues in this watershed, which will impact fish downstream.

Vegetation:

Riparian vegetation is well established and is expected to protect the headgates and pipes.

Water Quality:

Water Quality - By providing an alternative to annually constructing and removing a gravel dam in the stream with large equipment, turbidity will be reduced and sediment production in the immediate areas will be reduced.

Water Quantity:

1.) Increased upland consumption and diversions have reduced summer and fall stream flows, which limits available over summering habitat, breaks connectivity and often affects access to historical spawning areas.

There are three water quantity issues at Farmers Ditch:

a.) The primary issue is fish passage over diversion structures. There is sufficient flow to provide fish passage, but the flow seeps through the gravel dam, preventing passage. Installation of a boulder weir with a low flow notch for fish passage during low flow allows the water user to divert flows yet allow passage through a confined notch. The stream reach below the diversion structure usually goes subsurface. Under current operation the diversion is built across the active channel as flows diminish in mid -July. The final move to close off flow and divert it down the channel abruptly reduces flow stranding fish below the diversion that either perish or are rescue trapped. The proposal does not address this issue fully but the installation of a weir will make the reduction in flow more gradual and the number of stranded fish will likely be less.

b.) A headgate/bulk head will be moved up to the diversion take-out in front of the weir to control volume of flow being diverted. With a gravel dam, there is no way to adjust flow without accessing the stream with equipment to change the size of the gravel dam. Control of flow with a headgate will allow the water users to manage water better, resulting in reduced diversion.

c.) The NRCS and the water user will share costs with NRCS to pipe the Farmers Ditch for about 3,500 feet in order to improve delivery efficiency.

2.) Excessive sediment yield - Reduced annual in stream construction and storage of piled bedload on or near the channel will reduce the source of sediment caused by routine instream activity. Estimated bedload material washed downstream on an average year is 60 cubic yards.

3.) Spawning requirements - Fish passage, especially of over-summering juveniles, will be obtained through the objectives of the project. There are some scenarios when fall rains are late and adult access to historical spawning areas is limited by gravel dams, which were not removed or are still being used for stockwatering purposes. Farmers Ditch has experienced this scenario. The weirs concentrate available flows through a low flow notch providing fish passage previously unavailable.

4.) Rearing requirements - The proposed project will protect juvenile fish by replacing the older fish screen with a new fish screen that meets CDFG/NOAA screening specifications.

Technical and Site Considerations

Hydrology and hydraulic analysis are based on previous NRCS designs in the same reach of the Scott River by John Lenz, retired SCS engineer 1971.

Hydrology

The contributing watershed is 157 square miles. The full bank capacity used for the design will be 8860 cubic feet per second (cfs) for a 25- year storm, based on previously successful designs in the area.

Hydraulics

The primary consideration in the hydraulic design is providing channel grade control. Streambank rock is designed to tie into the channel to a depth of 6-8 feet. The rock will be sized to handle a maximum calculated velocity of 8.5 feet per second. A Hes-Ras model was made of this reach and the hydraulic grade line to provide irrigation water with minimum drop showed that Section 14+90 was the best location and the rock level be set at 3005.0 elevation. See Appendix A for calculations.

Pipeline:

A 50" x 31" CMP arch pipe will handle the 36 cfs flowing partially full at 22" deep and will follow the general direction of an old existing ditch. See Appendix B for calculations.

Soils and Geology

Recent alluvium is mapped over bedrock of pre-cretaceous meta-volcanic rocks. Hydrologic data indicate that these deposits (along the west side of the valley) are of much lower permeability that the soils in the Scott River flood plane proper, according to Mack's report. The estimated yield of this alluvium is estimated to range from 5 to 7 percent. (Mack, p2).

Soils in the project area are Riverwash. The channel itself is possibly naturally unstable due to its high gradient and annual flooding. Equipment needed to protect and maintain diversion dams have added to the stream configuration today. Vegetation is difficult to establish due to these conditions as well as excessive drainage, deep scouring and substantial gravel deposition.

Structural

1. Detailed Project Tasks:

Boulder Vortex Weirs: General description: Boulder vortex weirs are composed of large boulders placed on a deep bed of large quarry rock and boulders. The vortex weirs are arched upstream and extend across the active channel where they are keyed into the banks. Channel elevation change over the weir will not exceed six inches in vertical height. The weir will serve to improve instream habitat and eliminate the negative effects caused by developing and operating the existing diversion system. The weir will be arched upstream in order to focus flow towards the center of the stream to direct flows and create a pool. Elevation of the weir will change over the length of the structure. Elevations will be higher near the banks and the lowest elevation will be located at the desired thalweg and low flow location. Desired low flow positioning will be placed slightly on the side of the channel where the diversion take-out is located. This reduces the need for increased channel manipulation and places the low flow against the bank near the diversion take-out.

Instream work will occur when flows are low to protect water quality and fish. During construction, turbid flows will be diverted down the diversion ditch to protect water quality. A deep trench (6-8 feet deep and 12-20 feet wide) will be excavated in segments. Geo-textile fabric will be pinned to the bottom of the upstream side of the trench and folded upstream. Large quarry boulders (3-5 feet diameter) and quarry rock (6"- 3' diameter) will be placed in the trench to provide a solid base to bed the weir rocks. Large quarry boulders will then be placed on the pad to be the weir (3/4 of the boulder will be buried in bed load). The large boulders will be 4-6' in diameter. The weir will consist of one row of boulders placed across the channel in an upstream facing arch. The weir will be bedded with a slopped apron of placed quarry rock and smaller boulders below the weir to prevent plunging, excessive scour and undermining of the structure. A small spacing between boulders will allow bed load movement and fish passage through the weirs through a wide variation of flow scenarios. Placement and angle of the weirs will vary based on meander pattern, location of diversion (head gate) and gradient. The geotextile fabric will then be folded back over the newly completed weir and additional quarry rock will be placed in front of the weir to protect the fabric and refine the elevation of the weir by "chinking" between the boulders to achieve desired weir elevation across the weir. Spoils will be placed against the weir to match the desired grade of the stream. The fabric will be cut to match the weir as the final step. Design assistance will be provided by Tom Bens0n, NRCS and Donna Cobb and/or Gray Flosi, CDFG.

Installation of culvert and head gates: The head gate structure will be placed at the diversion take-out, which will be located just upstream of the weir. The head gate will be a concrete vault with a waterman head gate connected to a length of 50" arched culvert. Bank armoring will be installed over the culvert and around the head gate to protect it from being eroded during high flow. Stream bank armoring will be placed above and below the weir. The stream bank armoring will protect the head gate and stream bank from energy released from the plunge of the weir. The bank armoring will have roughness (large boulders and trees with root wads) installed in the toe to improve cover and habitat conditions for juveniles. Boulders will be up to 4' feet in diameter at the toe to provide additional cover and complexity. Trees with root wads will be keyed into the bank and secured with the armoring . The weir is proposed not to build channel elevation, but to act as a grade control to increase confidence in a stable channel elevation. This provides the opportunity to install fixed elevation structures such as head gates, diversion piping and fish screens.

Proposed construction of the weir and headgate: The proposed weir on the Scott River is proposed to be 250 feet' in length from the key in trench on the east bank to the key in trench on the west bank. The weir will be arched up stream and the boulders making up the weir will be placed so they interlock and act as a unit rather than individual boulders. The low flow notch will be placed in the center of the stream at it's existing position. The elevation of the weir will change a maximum of 3.5' over the length of the weir. The high points will be at the edge of the channel where the weir will key into the bank. Design assistance and funding of the weir will be provided by CDFG and the NRCS.

The elevation of the invert of the head gate will be 1.0' below the low flow notch of the weir. The headgate will be a concrete vault fixed with a 50" arched culvert Waterman headgate. The head gate will be connected to 360' of 50" arched culvert where the fish screen is proposed. The exit of the fish screen will be connected to an additional 3,500 feet of 50" arched culvert. The specifics of the Farmer's Ditch Site weir and headgate structure are below:

Farmer's Ditch Site Description:
Length of weir: 250 feet
Length of weir key in on East bank: 26' to bedrock
Length of weir key in on west bank: 85'
Desired channel elevational increase at weir: 0-.4' change at low flow (apex)
Length of bank armoring: East Bank: 40' above weir, 100' below
West Bank: 40' above bank 140' below

Materials Volumes for site:

Number of individual Large Boulders:	186 Large Boulders	
Cubic Yards of Quarry Rock:	2,900	cu/yds
Trees with root wads:	8	

Realignment and piping of diversions: Previous installation of boulder vortex weirs has shown that it is difficult to successfully raise significant channel elevation in order to build grade for the diversion. Therefore, we propose to move the diversion take-out up stream to gain fall. This will require us to extend and re-profile the diversion ditches so most of the fall is near the take-out in order for the fish screen to have sufficient fall to operate. Design of the pipeline will be provided by NRCS. Funding for the pipe line will be provided by the diversion users and the NRCS. RCD has added extra equipment time in order to re-profile the pipeline layout so the fish screen and measuring weir are properly placed related to elevation.

Fish Screen Replacement. The existing fish screen is proposed to be moved up and placed closer to the diversion take-out as required by the CDFG/NOAA fish screening criteria. The screen will be designed to meet CDFG /NOAA fish screening specifications. The screen will be designed to screen 40.00 cfs. We propose to construct a chevron style self-cleaning sloping plate screens driven by two paddle wheels. The Siskiyou RCD and CDFG have constructed three chevron style fish screens in the Scott River watershed and they are operating well. The fish screen will have a trapping box if rescue trapping or monitoring is needed. This proposal will supply the material for the fish screens, while the CDFG staff at Yreka Stream Improvement Headquarters will construct both screens.

CONSTRUCTION

A private contractor or the landowner will construct the project. Cal-OHSA safety requirements will be in effect during all construction. The Natural Resources Conservation Service will provide layout and inspection. The landowner shall be responsible for obtaining any needed permits, easements, and/or right-of-ways, and meeting any legal requirements. These may include a valid 1603 Stream Alternation Agreement from the California Department of Fish and Game, a 404 permit from the Army Corps of Engineers, and a Water Quality Certification from the Water Quality Control Board.

MAINTENANCE

The landowner is required to maintain the project for five years, during the EQIP contract period. Inspection of the project after every large storm event is recommended. Removal of debris as necessary, and repairs as needed will be the owner's responsibility, as well as replant vegetation as necessary. Property fencing will be maintained and replaced as necessary. Vegetative management to encourage streamside vegetation will be a project component for the life of this contract.

REFERENCES

USDA, Natural Resources Conservation Service, The Practical Streambank Bioengineering Guide, NRCS Plant Materials Center, Aberdeen Idaho, May 1998

USDA, Natural Resources Conservation Service. Field Office Technical Guide, Yreka Field Office.

USDA, Natural Resources Conservation Service. Soil Survey of Siskiyou County, California, Central Part, 1983, Sheets 11, 19.

US Geological Survey, Indian Creek Baldy and Fort Jones 7.5 minute Quadrangle, (Provisional Edition 1984)

ENGINEERING APPROVAL

The controlling classification factor for this project, Loose Rock Drop Structures 410-A is the drainage area of 157 square miles. NRCS National Engineering Manual, CA 501 indicates Class V if other agencies have approval.

PREPARED AND REVISED BY: _____ Date: _____
Field Office Engineer

CONCURRED BY: _____ Date: _____
Area Engineer

APPROVED BY: _____ Date: _____
State Conservation Engineer

KEQIP 2004 Proposed Design

Date: 6/20/2005

Customer(s): FARMERS DITCH COMPANY

District: SISKIYOU RESOURCE CONSERVATION DISTRICT

Field Office: YREKA SERVICE CENTER

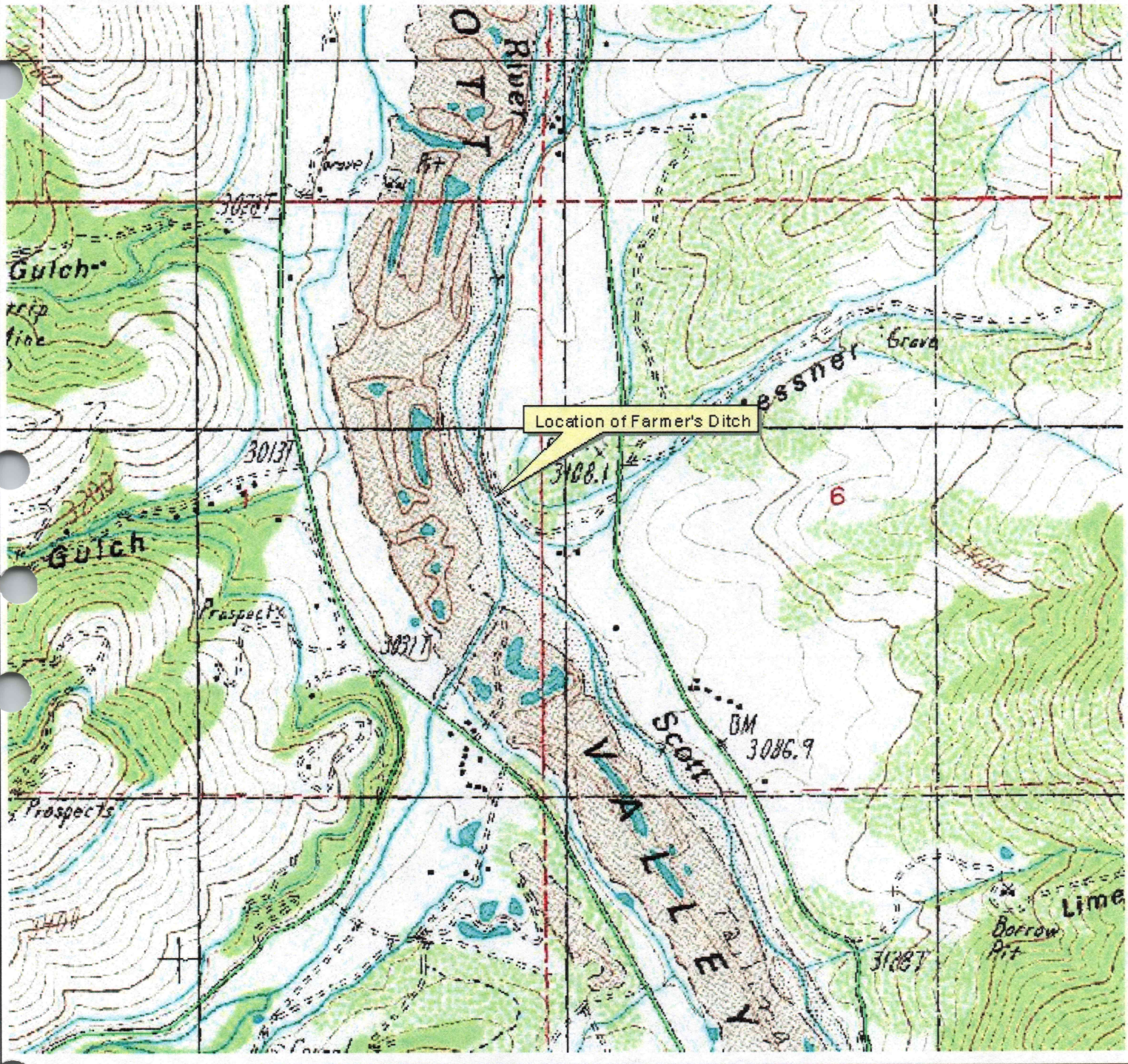
Assisted By: Lorrie M Bundy

Farmer's Ditch

Scott Valley

Date: 01/22/2004

NRCS



2000 0 2000 4000 Feet

N

2004 EQIP Plan Map

Farmer's Ditch

Siskiyou Resource Conservation District

Natural Resources Conservation Service

Date: 07/07/2004

Legend

- Fish Screen
- Instream Weir
- Pipeline
- Roads
- Planned Land Units

1000 0 1000 2000 Feet

N

NRCS

CALIFORNIA
ENVIRONMENTAL ASSESSMENT WORKSHEET

Date 8-26-04

Client and/or Business Name: Farmer's Ditch Group
Purpose and Need Statement (Client Objective): Improve Fish Passage & Water Control
Description of Proposed Project: @ Diversion
Treatment Unit: Farm #: various Tract #: Field #:
Watershed: Scott River
Name of Person(s) Completing Worksheet: A

- This worksheet is used to document the effects a proposed activity may have on natural, human, and cultural resources, in compliance with NEPA and NRCS NEPA Policy (General Manual 190, Section 410).
- Effects are documented in terms of: Short Term - those that occur during installation/construction; and Long Term - those that occur during and after the activity is finished. Onsite and offsite, positive and negative, and cumulative effects must be documented. If mitigation is proposed effects must be documented.

	Environmental Effects Element	Description of Effects
I.	SOIL:	
a.	Soil surface (e.g. disruptions, destruction of structure, displacements, compaction, deposition, removal of organic material, improvements)?	tailings construction -
b.	Soil fertility?	NE
c.	Unique geologic or natural physical features (e.g. covering, modification, partial destruction, protection, etc.)?	mining landscape - minor chg -
d.	Wind or water erosion of soils, or soil erodibility, either on or off site?	construction may cause soil movement -
e.	Siltation, deposition or erosion which may impact or modify the channel of a river, stream, ocean shoreline, or other water?	"
f.	Exposure of people or property to geologic hazards such as landslides, mudslides, subsidence or similar hazards?	NE
g.	Number of acres of prime &/or unique cropland?	NE
h.	Other?	
II.	WATER:	
a.	Stream channel dimension, pattern, and/or slope (including down stream impacts)?	yes, construction of rock sill with low water notch
b.	Surface water infiltration rates, drainage patterns, velocities and/or volumes?	may change irr. delivery patterns
c.	Quality or quantity of discharge into surface waters, including, but not limited to temperature, nutrients, bacteria, or turbidity?	may increase run-off until fields are improved (flood)
d.	Quantity of ground waters through either direct additions/withdrawals or interception of aquifers?	may reduce pumping in some years
e.	Ground water quality?	" "
f.	Amount of water available for public use?	may improve instream flows
g.	Exposure of people or property to flooding?	NE
h.	Other?	

	Environmental Effects Element	Description of Effects
III.	AIR:	
a.	Air quality?	NE
b.	Odors?	↓
c.	Other?	
IV.	PLANTS:	
a.	Diversity of species, or numbers of any plant species (upland, riparian, wetland, etc.)?	may plant willows along east bank
b.	Numbers or health & vigor of any unique, species of concern, rare, threatened or endangered plants?	NE
c.	Normal recruitment of existing, native species?	↓
d.	Other?	
V.	ANIMALS:	
a.	Diversity of species, or numbers of any species of animals (birds, mammals, fish, invertebrates)?	3 T&E sp. in stream
b.	Unique, species of concern, rare, threatened, or endangered animals (review T&E lists)?	"
c.	Native animals (migration barriers, competition from non-natives, etc.)?	"
d.	Existing fish & wildlife habitat or critical habitat (nesting, spawning, etc.)?	"
e.	Human activity during sensitive life stages (nesting, spawning, etc)?	construction will require all permits
f.	Other?	
VII.	OTHER HUMAN CONSIDERATIONS:	
a.	Noise levels?	NE
b.	Present or planned land uses?	↓
c.	Aesthetic resource, scenic value, or natural area?	
d.	Recreational opportunities?	
e.	Public health and safety?	
f.	Public interest related to the site or watershed?	yes - high priority project for F&G
g.	Economic impacts to the clients, landowners, or public?	yes - will impact - $ from each
h.	Client well being?	yes - improved community
i.	Environmental justice?	NE
J.	Other?	

SPECIAL ENVIRONMENTAL CONCERNS: Check each category. If the effect is adverse or positive to any of the following, explain in the notes section or on an attachment. . Under **Present** indicate Yes or No. For **Cultural Resources** purposes, if the activity is an "Undertaking", separate primary documentation is required. For other **Concerns** supplemental documentation may be required.

Concerns	NRCS Policy Procedure	Present	Positive/Adverse Effect
Threatened or Endangered Species (To ensure actions do not jeopardize T&E species)	190 GM- 410.22 , California Endangered Species Handbook	Y	will remove migration barrier
Natural Area (To recognize and consider impacts when planning and recommending actions adjacent to nearby Natural Areas)	190 GM 410.23	N	
Landscape Resource (To preserve and enhance scenic beauty or improve landscape)	190 GM 410.24	↓	
Floodplain Management (To conserve, preserve and restore existing natural and beneficial values of floodplains)	190 GM 410.25	Y	area will flood annually
Wetland (To protect, maintain and restore wetland functions and values)	190 GM 410.26, NFSA Manual	Y	riparian zone
Stream Channel Modification (To maintain and restore streams, wetlands and riparian vegetation as functioning parts of a viable ecosystem)	190 GM 410.27-28	Y	will mod. channel gradient
Riparian Area (To protect, maintain, and restore riparian areas)	190 GM 411	Y	will protect flood functions
Prime and Unique Farmland (To minimize unnecessary and irreversible conversion of farmland to non agricultural use)	310 GM 403	Y	no change
Cultural Resources (To preserve and prevent the destruction or degradation of cultural resources, including historical archaeological sites and traditional cultural places)	420 GM 401	Y	tailings are cultural resources
Coastal Zone Management Area (To ensure conservation of coastal resources)	Federal Register 6/25/99, PL 92-583	N	
Wild and Scenic River (Consideration of impacts when actions affect areas adjacent to Wild and Scenic Rivers)	Federal Register 9/7/82, p. 39454	↓	
Special Aquatic Site (To protect, restore and maintain special aquatic sites)	Federal Register 12/24/80 EPA 404(b)(1) 230.3 & 230.10		
Essential Fish Habitat (To conserve and enhance fish habitat for salmon, shellfish, marine fish)	50 CFR 600.905-930 Federal Register 12/19/97		

OTHER CONSIDERATIONS

Documentation of the following questions can be completed here.

a. If wetland impacts are proposed, conduct a wetland determination and complete the NRCS minimal effects procedure per the Food Security Act Manual. Make certain that the client contacts the US Army Corps of Engineers to determine the need for a Permit under Section 404 of the Clean Water Act and Section 10 Rivers and Harbors Act and the Regional Water Quality Control Board for Section 401 Clean Water Act certification.

all permits will be needed

b. If a stream, lake or other water body is involved the client should contact the California Department of Fish and Game for a Section 1600 Stream Alteration Agreement.

permits by F&G r.f.p. will be part of project -

c. Document mitigation planned or required to avoid, minimize, or compensate for negative impacts:
F&G permit will specify construction requirements

d. Document communications with USFWS, NMFS, Corps of Engineers, EPA, CDFG, RWQCB, NRCS Biologist, etc.
SQRCD will be lead on all permits
contact is G. Black 467-3402

e. Discuss any **Cumulative Effects** (beneficial or adverse):
Long term cum. effects are likely due to nature of project - will tie into other project work in tailings to improve fish passage & spawning habitat

f. Alternatives to Proposed Action that were considered (include reasons why alternative was not selected):
1. No Action
2. Remove gravel dam - no diversion of surface water
3. Pump from 2 or more pump stations
4. Several diversion locations were discussed - see write up in file

g. Remarks or Other Considerations:
See F&G RFP for more details & environmental effects
CEQA & NEPA docs. will be required by F&G

RECOMMENDATION (check one)

☑ Based upon the conclusions below, I find that this action will not have significant adverse impacts on the quality of the human environment. No further environmental analysis is required. The assessment indicates work should proceed.

☐ Further analysis is necessary, including the possible need to prepare an Environmental Impact Statement or a Finding Of No Significant Impact. The landowner will be informed not to proceed until further assessment is completed.

h. Conclusions, based upon the assessment (rational for the findings above):
This project is a grade control structure & pipeline with a structure for water control & rock rip rap for bank protection

Signature (Planner)	Title	Date
[signature]	SC	8-26-04
Reviewed/Concurred By	**Title (District Conservationist)**	**Date**
William Bradenic	DC	8/30/04

ESTIMATED BUDGET
Farmers Ditch

			Amount Requested	Amount Cost Share	Project Total
Personnel Costs					
Level of staff	# of Hours	HourlyRate			
Planning/Coordination	440	$29	$12,760	$8,500	$21,260
Skilled Labor	180	$16	$2,880	$2,000	$4,880
Staff benefits @ 34%			$4,338	$0	$7,228
Subtotal			$19,978	$10,500	$33,368
48" Arched culvert	$9,000	3,880	$3,600	$0	$3,600
Professional Services(NRCS/CI	200	$50		$10,000	$10,000
TOTAL PERSONEL COST			$23,578	$20,500	$46,968
Materials and Supplies	Unit Price	# OF UNITS			
(including but not limited to;					
Delivered Quarry Rock	$20	2,600	$27,000	$25,000	$52,000
4' Boulders	$68	190	$6,920	$6,000	$12,920
Trees with root wads	$300	6	$1,800	$0	$1,800
Fish screen concrete materials	$9,000	1	$9,000	$0	$9,000
Fish Screen fabrication mat.	$5,000	1	$5,000	$0	$5,000
Headgate	$4,800	1	$2,400	$2,400	$4,800
48" arched culvert	$68	3,860	$24,480	$238,000	$262,480
30" HDPE culvert	$20	200	$4,000	$0	$4,000
Geotextile Fabric	$328	6	$1,968	$900	$2,868
misc	$1,500	1	$800	$700	$1,500
Total Materials and Supplies			$83,368	$273,100	$356,368
OPERATING EXPENSE					
	RATE	# OF UNIT			
Excavator	$135	420	$24,300	$32,400	$56,700
Dump Truck - 10yd.	$65	200	$4,550	$8,450	$13,000
Back-hoe	$65	75	$1,625	$3,250	$4,875
Water truck	$75	40	$3,000	$2,000	$5,000
Loader	80.00	160	$3,200	$9,600	$12,800
Fish screen -concrete const.	35.00	325	$0	$11,375	$11,375
Fish screen Fabrication	35.00	350	$0	$12,250	$12,250
Head gate installation	1,400.00	1	$1,400	$0	$1,400
Mobilization	2,000.00	1	$1,000	$1,000	$2,000
Permitting - 1602/CEQA	6,000.00	1	$6,000	$0	$6,000
Office Supplies			$400	$200	$600
Phone, fax, email			$300	$200	$500
Transportation	0.36	600	$216	$200	$416
Film/Development			$120	$50	$120
Copying /Printing			$300	$300	$600
Postage			$100	$50	$100

Survey equipment		$200	$500	$700
Total Operating Expenses		$46,711	$81,825	$128,436
Subtotal		$153,657	$375,425	$531,772
Admin overhead @ 10%		$15,366		$53,177
Total Funding Requested		$169,023	$375,425	$584,950
% Match	0.64			

HYDRAULICS OF 50" X 31" ARCH PIPE

Table E, Bethleham Steel Handbook, Arch Pipe

This irrigation system is a pipe acting as a canal along a river. The pipe affords the owners free maintenance when high water occurs.

The water right is 36 cfs.

Try a 50" x 31" arch. Assume flow depth at 22", Slope is .006

Chart values for Area and Wetted Perimeter P are A= 6.811, P = 7.324

R = A/P = 6.811 / 7.324 = .93951 $R_{2/3}$ = .95929 S = .006 S1/2 = .0775

Mannings equation V =1.486 r2/3 s1/2 / n

Q= AV Q = A * 1.486/n * R2/3 * S1/2

Q = 6.811 * 1.486/.021 * .95929 * .0775 = 35.83 cfs. This is good.

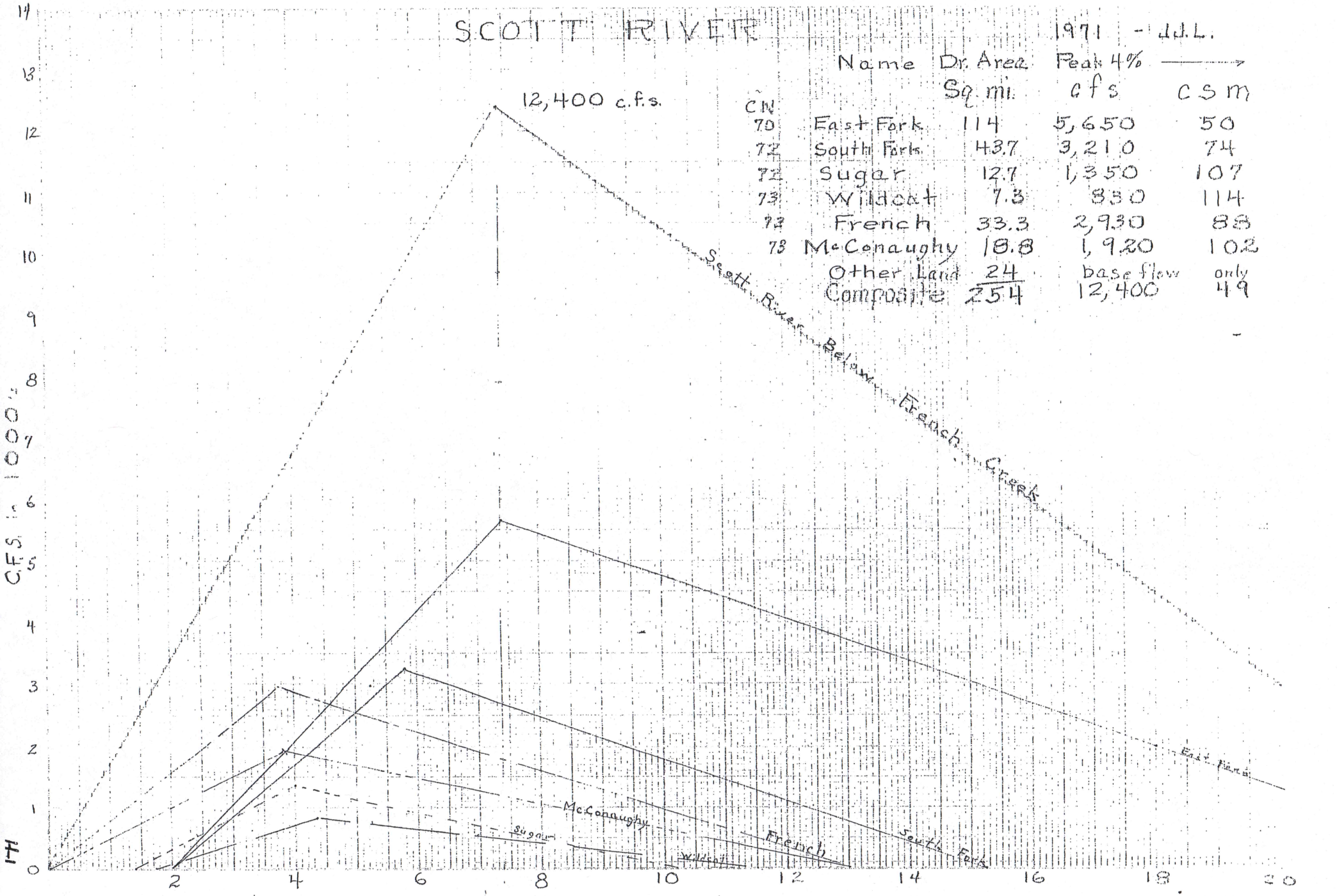
Open pipe flow 50" x 31" arch pipe flowing 22" is okay.

SCOTT RIVER

1971 - J.J.L.

12,400 c.f.s.

CN	Name	Dr. Area Sq. mi.	Peak 4% cfs	csm
70	East Fork	114	5,650	50
72	South Fork	43.7	3,210	74
72	Sugar	12.7	1,350	107
73	Wildcat	7.3	830	114
72	French	33.3	2,930	88
73	McConaughy	18.8	1,920	102
	Other Land	24	base flow only	49
	Composite	254	12,400	



~~14,200 c.f.s.~~

J. H. WEIL & CO., PHILA. NO. 317-F

N.G. 170 Lag time

1971 - d.d.h.

Name	Dr Area Sq. Mi.	Peak 4% c.f.s	Peak 4% c.s.m.
East Fork	114	5,650	49.6
South Fork	43.7	3,210	73.5
Wildcat	7.3	830	114
Sugar	12.65	1,350	107
French	33.35	2930	88
McConaughy	18.8	1,920	102
Other Land	24	base flow only c.s.f.	→ 03
~~Composite Hydrograph~~	254	~~14,200~~	~~56~~

~~for Scott River at mouth of Eastside Cr~~

8,300 c.f.s.

Composite at Callahan
8,300 c.f.s. 53 c.s.m.

O.K.

South River at Callahan 158 mi²

East F

South Fork

McConaughy

French

Sugar

Wildcat

4,000
3000
000
500
2000
CFS
0
2
4
6
8
10
12
14
16
18
20
Hours

E-2

SCS-319
6-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

HYDROGRAPH COMPUTATION

J.L.L. 1-15-71

WATERSHED OR PROJECT E. Fk. Scott STATE

STRUCTURE SITE OR SUBAREA

DR. AREA 114 SQ. MI. T_c 4.75 HR. ~~RUNOFF CONDITION NO.~~

RUNOFF CURVE NO. 70 . ~~STORM DISTRIB. CURVE~~ . HYDROGRAPH FAMILY NO. 4

STORM DURATION 6 HR. 40% RAINFALL: POINT 2.3 IN. 91% AREAL 2.53 IN.

Q .475 IN. COMPUTED T_p 3.3 HR. T_o 3.85 HR.

$(T_o + T_p)$: COMPUTED 1.165 ; USED 1 . REVISED T_p 3.85 .

$q_p = \frac{484\ A}{REV.\ T_p}$ = 14,320 CFS. Qq_p = 6,800 CFS.

t(COLUMN) = (t/T_p) REV. T_p . q(COLUMN) = (q_c/q_p) Qq_p . 5650 c.f.s. 49.6 c.s.m.

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0	0	21	21.60	7	41		
2	1.08	346	22	22.68	0	42		
3	2.16	1496	23			43		
4	3.24	3330	24			44		
5	4.32	5020	25			45		
6	5.40	5650 (5830)	26			46		
7	6.48	5100	27			47		
8	7.56	3990	28			48		
9	8.64	2670	29			49		
10	9.72	1760	30			50		
11	10.80	1180	31			51		
12	11.88	802	32			52		
13	12.96	547	33			53		
14	14.04	380	34			54		
15	15.12	245	35			55		
16	16.20	170	36			56		
17	17.28	115	37			57		
18	18.36	75	38			58		
19	19.44	41	39			59		
20	20.52	20	40			60		

SCS-319
6-58

J.J.L. 1-15-71

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

HYDROGRAPH COMPUTATION

WATERSHED OR PROJECT South Fork South River STATE

STRUCTURE SITE OR SUBAREA

DR. AREA 43.7 SQ. MI. T_c 2.64 HR. ~~RUNOFF CONDITION NO.~~ 72

RUNOFF CURVE NO. 72 . ~~STORM DISTRIB. CURVE~~ . HYDROGRAPH FAMILY NO. 4

STORM DURATION 6 HR. 47% RAINFALL: POINT 2.8 IN. 95% AREAL 2.66 IN.

Q .53 IN. COMPUTED T_p 1.95 HR. T_o 3.95 HR.

$(T_o + T_p)$: COMPUTED 2.13 ; USED 2 . REVISED T_p 1.975 .

$q_p = \frac{484\ A}{REV.\ T_p}$ = 10709 CFS. Qq_p = 5,670 CFS. (.567)

t(COLUMN) = (t/T_p) REV. T_p . q(COLUMN) = (q_c/q_p) Qq_p . 3,210 c.f.s. 73.65 c.s.m.

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0	0	21	12.63	6	41		
2	.63	176	22	13.26	0	42		
3	1.26	980	23			43		
4	1.90	2040	24			44		
5	2.53	2800	25			45		
6	3.16	3150	26			46		
7	3.80	(.567) 3210	27			47		
8	4.43	3150	28			48		
9	5.06	2780	29			49		
10	5.69	2100	30			50		
11	6.32	1370	31			51		
12	6.95	850	32			52		
13	7.59	555	33			53		
14	8.22	359	34			54		
15	8.86	215	35			55		
16	9.48	136	36			56		
17	10.10	74	37			57		
18	10.74	45	38			58		
19	11.38	23	39			59		
20	12.00	12	40			60		

At Fremont Lag

H-4

SCS - 319
Rev. (2 - 66)

HYDROGRAPH COMPUTATION

DATE 2-71
COMPUTED BY CC
CHECKED BY

WATERSHED OR PROJECT Wildcat

STATE

STRUCTURE SITE OR SUBAREA

DR. AREA 7.3 SQ. MI. STRUCTURE CLASS

T_c 1.62 HR. STORM DURATION 6 HR.

POINT RAINFALL 2.8 IN. 47.
2.9

ADJUSTED RAINFALL:

AREAL : FACTOR ——— IN.

DURATION : FACTOR ——— IN.

RUNOFF CURVE NO. 73

Q 0.74 IN.

HYDROGRAPH FAMILY NO. 4

COMPUTED T_p 1.35 HR.

T_o 3.98 HR.

(T_o / T_p):
COMPUTED 2.95 ; USED 3

REVISED T_p 1.33

$q_p = \frac{484A}{\text{REV. } T_p} = \frac{3,540}{\text{REV. } T_p} = 2,660$ CFS.

$(Q)(q_p) =$ 1968 CFS.

t(COLUMN) = (t / T_p) REV. T_p q(COLUMN) = $(q_c / q_p)(Q)(q_p)$

Q(COLUMN) = $(Q_t / Q)Q$

	$t=(t/T_p)$Rev. T_p	$q=(q_c/q_p)(Q)(q_p)$	$Q_t=(Q_t/Q)Q$
	t HOURS	q CFS	Q INCHES
1	0	0	0
2	.372	35	
3	.744	170	
4	1.116	390	
5	1.488	610	
6	1.86	760	
7	2.23	820	
8	2.60	830	
9	2.98	820	
10	3.37	790	
11	3.72	775	
12	4.1	760	
13	4.46	715	
14	4.84	620	
15	5.22	465	
16	5.58	320	
17	5.96	220	
18	6.33	140	
19	6.70	90	
20	7.06	60	
21	7.45	40	
22	7.82	25	
23	8.18	16	
24	8.56	10	
25	8.93	6	
26	9.30	4	
27	9.68	2	
28	10.04	0	
29	10.42	0	
30			
31			
32			
33			
34			

H-5

SCS - 319
Rev. (2 - 66)

HYDROGRAPH COMPUTATION

DATE 2-71
COMPUTED BY
CHECKED BY

WATERSHED OR PROJECT Sugar

STATE

STRUCTURE SITE OR SUBAREA

DR. AREA 12.65 SQ. MI. STRUCTURE CLASS

T_c 1.84 HR. STORM DURATION 6 HR.

POINT RAINFALL 2.8 IN. 4%

ADJUSTED RAINFALL:

AREAL : FACTOR ——— IN.

DURATION : FACTOR ——— IN.

RUNOFF CURVE NO. 72

Q .69 IN.

HYDROGRAPH FAMILY NO. 4

COMPUTED T_p 1.29 HR.

T_o 3.95 HR.

(T_o / T_p):

COMPUTED 3.06 ; USED 3

REVISED T_p 1.32

$q_p = \frac{484A}{\text{REV. } T_p} = \frac{6120}{\text{REV. } T_p}$ = 4640 CFS.

$(Q)(q_p)$ = 3200 CFS.

t(COLUMN) = (t / T_p) REV. T_p

q(COLUMN) = $(q_c / q_p)(Q)(q_p)$

Q(COLUMN) = $(Q_t / Q)Q$

107 cs

	$t=(t/T_p)$Rev. T_p	$q=(q_c/q_p)(Q)(q_p)$	$Q_t=(Q_t/Q)Q$
	t HOURS	q CFS	Q INCHES
1	0	0	0
2	.37	58	
3	.74	275	
4	1.11	640	
5	1.48	1000	
6	1.85	1230	
7	2.22	1330	
8	2.59	1350	
9	2.96	1330	
10	3.33	1280	
11	3.70	1260	
12	4.07	1240	
13	4.44	1160	
14	4.81	1010	
15	5.18	720	
16	5.55	525	
17	5.92	345	
18	6.29	230	
19	6.66	150	
20	7.03	100	
21	7.40	65	
22	7.77	40	
23	8.14	25	
24	8.57	15	
25	8.88	10	
26	9.25	5	
27	9.62	3	
28			
29			
30			
31			
32			
33			
34			

H-

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Rev. (2 - 66)

HYDROGRAPH COMPUTATION

DATE 2-71
COMPUTED BY DAS
CHECKED BY

WATERSHED OR PROJECT French

STATE

STRUCTURE SITE OR SUBAREA

DR. AREA 33.35 SQ. MI. STRUCTURE CLASS

T_c 2.58 HR. STORM DURATION 6 HR.

POINT RAINFALL 2.8 IN. 47%

ADJUSTED RAINFALL:

AREAL : FACTOR 97% IN. 2.7

DURATION : FACTOR — IN. —

RUNOFF CURVE NO. 72

Q .63 IN.

HYDROGRAPH FAMILY NO. 4

COMPUTED T_p 1.85 HR.

T_o 3.93 HR.

(T_o / T_p):
COMPUTED 2.12 ; USED 2

REVISED T_p 1.965

$q_p = \frac{16,150 \times 484A}{\text{REV. } T_p} = 8,220$ CFS.

$(Q)(q_p) = 5175$ CFS.

t(COLUMN) = (t / T_p) REV. T_p q(COLUMN) = $(q_c / q_p)(Q)(q_p)$

Q(COLUMN) = $(Q_t / Q)Q$

	$t=(t/T_p)$Rev. T_p	$q=(q_c/q_p)(Q)(q_p)$	$Q_t=(Q_t/Q)Q$
	t HOURS	q CFS	Q INCHES
1	0	0	0
2	.628	160	
3	1.26	895	
4	1.89	1960	
5	2.51	2560	
6	3.14	2870	
7	3.77	2930	
8	4.4	2870	
9	5.03	2540	
10	5.65	1910	
11	6.28	1250	
12	6.92	775	
13	7.54	510	
14	8.18	330	
15	8.8	195	
16	9.43	125	
17	10	67	
18	10.628	41	
19	11.26	21	
20	11.89	10	
21	12.51	5	
22	13.14		
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			

H-

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Rev. (2 - 66)

HYDROGRAPH COMPUTATION

DATE 2-71
COMPUTED BY [illegible]
CHECKED BY

WATERSHED OR PROJECT McConaughy

STATE

STRUCTURE SITE OR SUBAREA

DR. AREA 18.8 SQ. MI. STRUCTURE CLASS

T_c 2.34 HR. STORM DURATION 6 HR.

POINT RAINFALL 2.8 IN. 47%
ADJUSTED RAINFALL: 2.6

AREAL : FACTOR — IN.

DURATION : FACTOR — IN.

RUNOFF CURVE NO. 73

Q .74 IN.

HYDROGRAPH FAMILY NO. 4

COMPUTED T_p 1.64 HR.

T_o 3.98 HR.

(T_o / T_p):
COMPUTED 2.42 ; USED 2

REVISED T_p 1.99

$q_p = \frac{910 \cdot 484A}{\text{REV. } T_p} = 4570$ CFS.

$(Q)(q_p) =$ 3380 CFS.

t(COLUMN) = (t / T_p) REV. T_p q(COLUMN) = $(q_c / q_p)(Q)(q_p)$

Q(COLUMN) = $(Q_t / Q)Q$ 102 c s m

	$t=(t/T_p)$Rev. T_p	$q=(q_c/q_p)(Q)(q_p)$	$Q_t=(Q_t/Q)Q$
	t HOURS	q CFS	Q INCHES
1	0	0	0
2	.64	105	
3	1.28	585	
4	1.92	1220	
5	2.56	1670	
6	3.20	1880	
7	3.84	1920	
8	4.48	1880	
9	5.12	1660	
10	5.76	1250	
11	6.40	820	
12	7.04	510	
13	7.68	330	
14	8.32	210	
15	8.96	130	
16	9.60	80	
17	10.24	44	
18	10.88	27	
19	11.52	14	
20	12.16	7	
21	12.80	3	
22	13.44	0	
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			

East Fork

Length of Ch 19.4 mi
(to furthest divide) 101,000 ft
or 19.1 mi.

Divide 7240
Outlet 4120
3120

Ave Imperviousness .0407 ft/ft

Ave Land Slope 35%

Hyd. Soil Group
B

C.N. 70
CN adj M.M. 71

T_c (1) E S 10.15 (2.9)(1.67) = 4.85
(2) Kirpich = 3.2

(1) Vel $\frac{101,000}{(4.85)(3600)}$ = 5.8 ft/sec
(2) Vel $\frac{101,000}{(3.2)(3600)}$ = 9.25 ft/sec

Ave Vel $\frac{5.8+6}{2}$ = 5.9 ft/sec

Use T_c = 4.75 hours

South Fork, 43.7

11.0 mi.
57,000'

Divide Elev 7400'
3120
4280

.075 ft/ft

4/09

B

C.N. 72
72

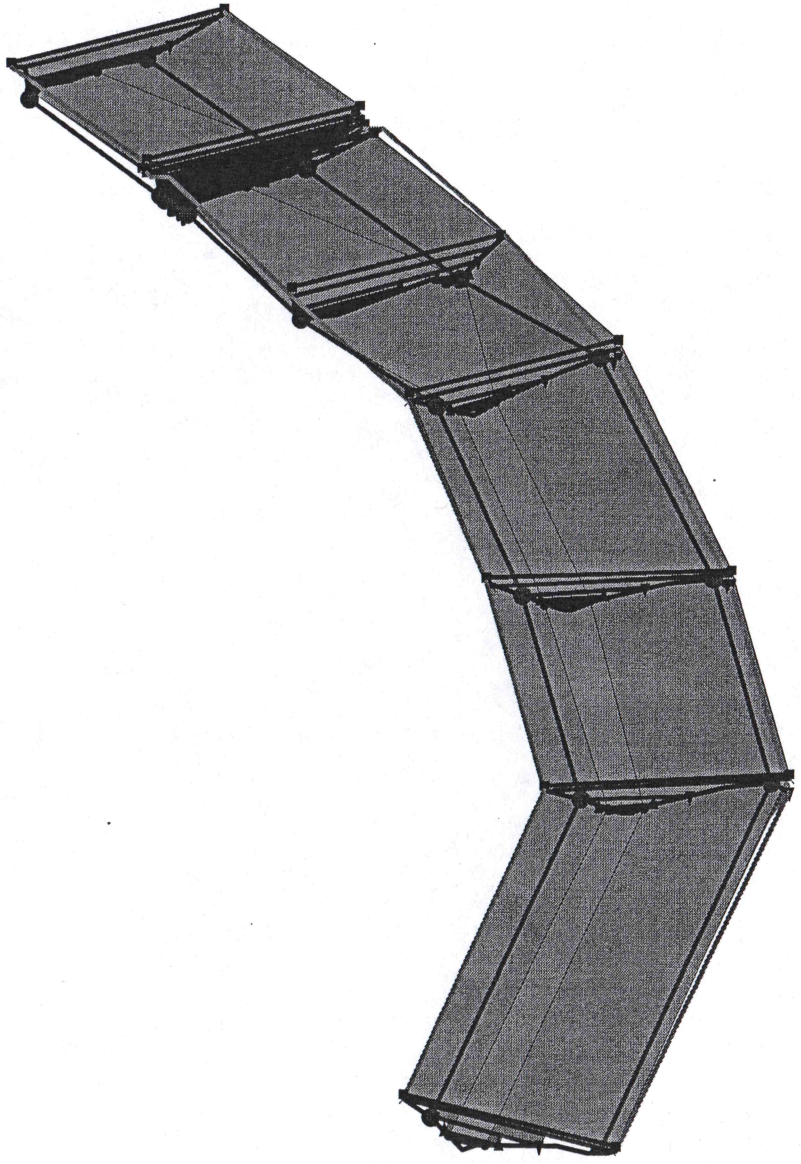
T_c
(1) (1.6)(1.67) = 2.68
(2) 1.5 hrs

(1) Vel $\frac{57,000}{(2.68)(3600)}$ = 5.9 ft/sec
(2) Vel $\frac{57,000}{(1.5)(3600)}$ = 10.5

Ave Vel $\frac{5.9+6}{2}$ = 5.95 ft

Use T_c = 2.64 hours

Farmers Ditch 1 ROCK WEIR AT ELEV. 3005.0



Legend

WS 50

WS 250

WS 1000

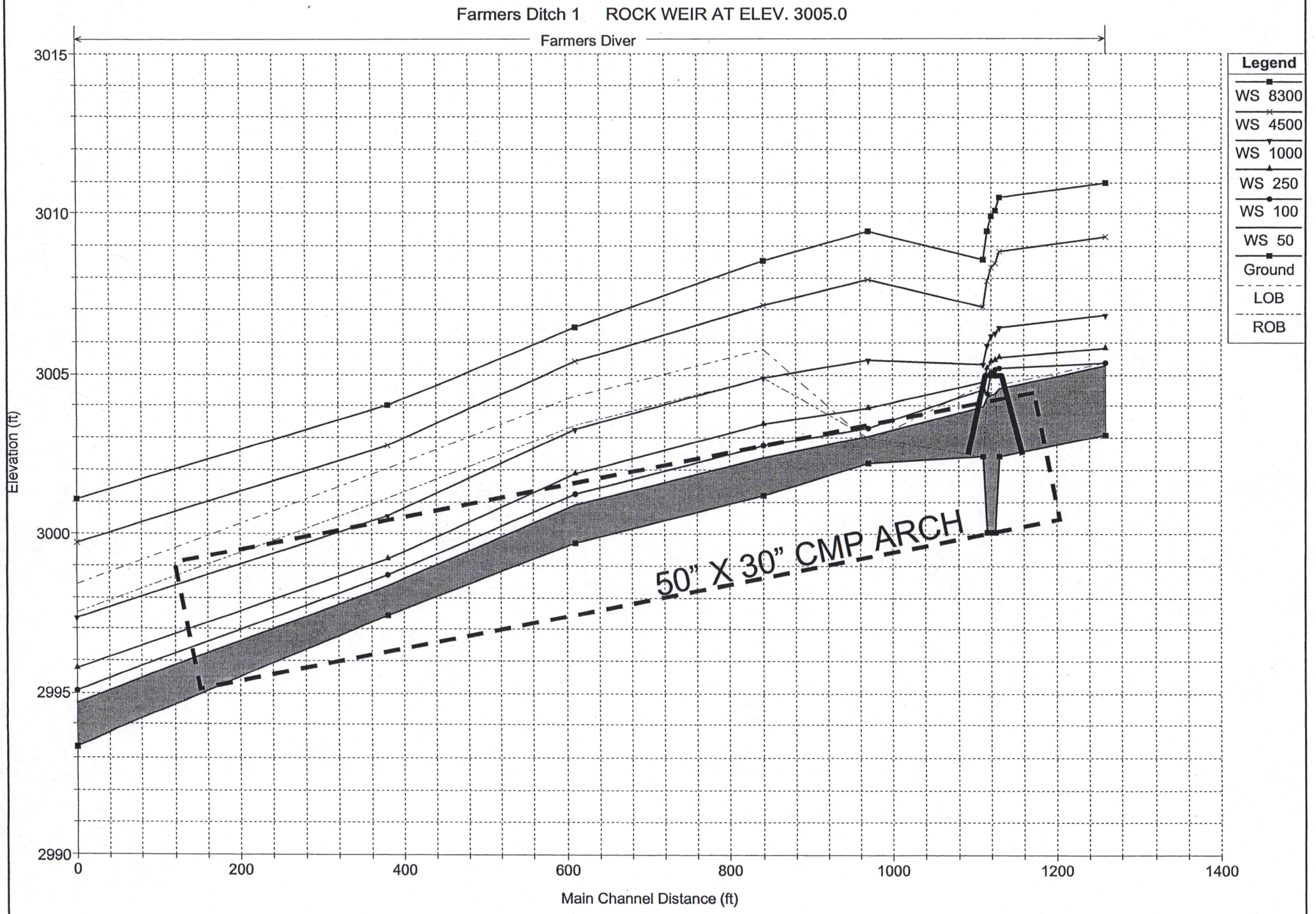
WS 4500

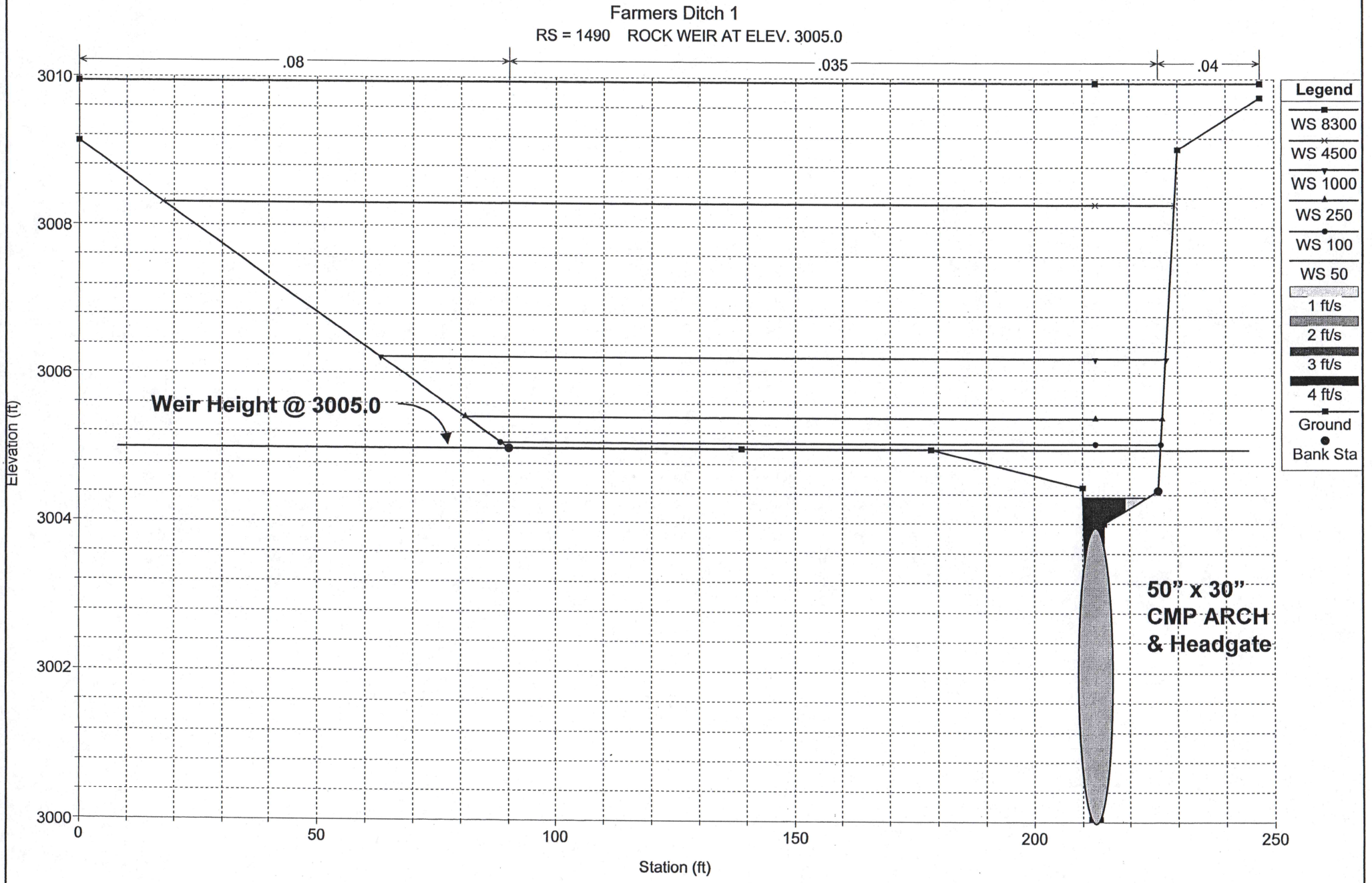
WS 8300

WS 100

Ground

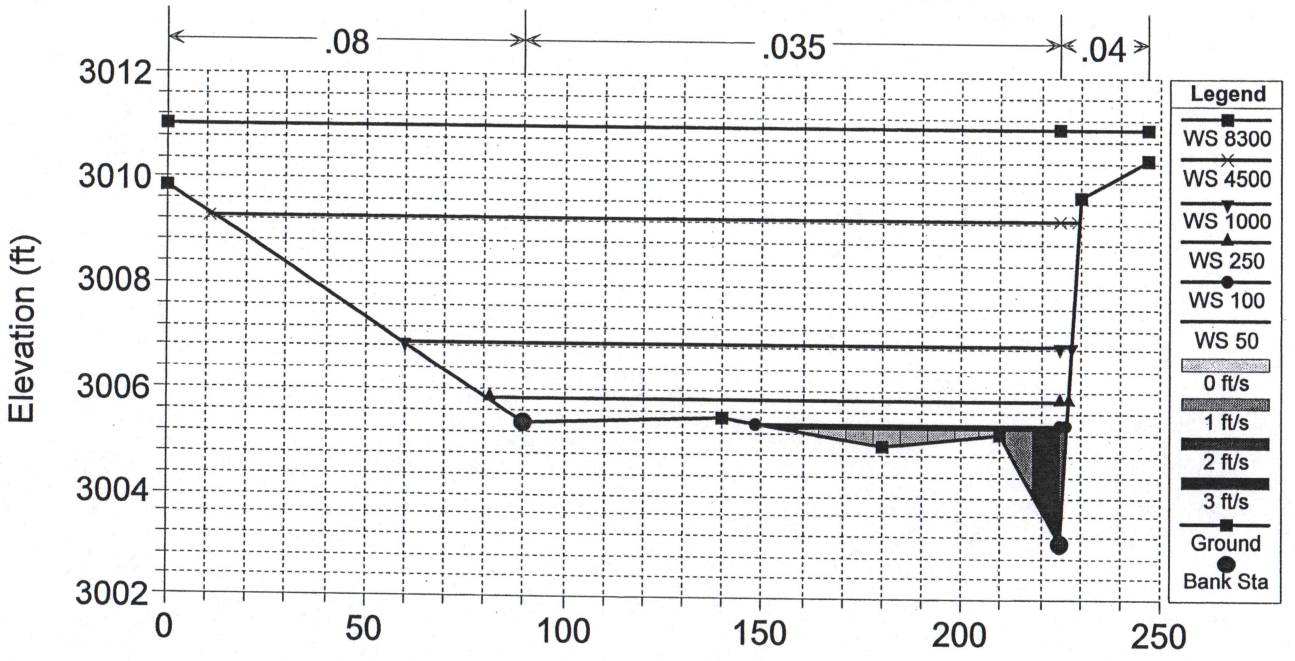
Bank Sta


Farmers Ditch 1 ROCK WEIR AT ELEV. 3005.0
Farmers Diver
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
Ground
LOB
ROB
50" X 30" CMP ARCH
Elevation (ft)
Main Channel Distance (ft)
3015
3010
3005
3000
2995
2990
0
200
400
600
800
1000
1200
1400


Farmers Ditch 1
RS = 1490 ROCK WEIR AT ELEV. 3005.0
.08
.035
.04
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
Weir Height @ 3005.0
50" x 30"
CMP ARCH
& Headgate
Elevation (ft)
3010
3008
3006
3004
3002
3000
0
50
100
150
200
250
Station (ft)

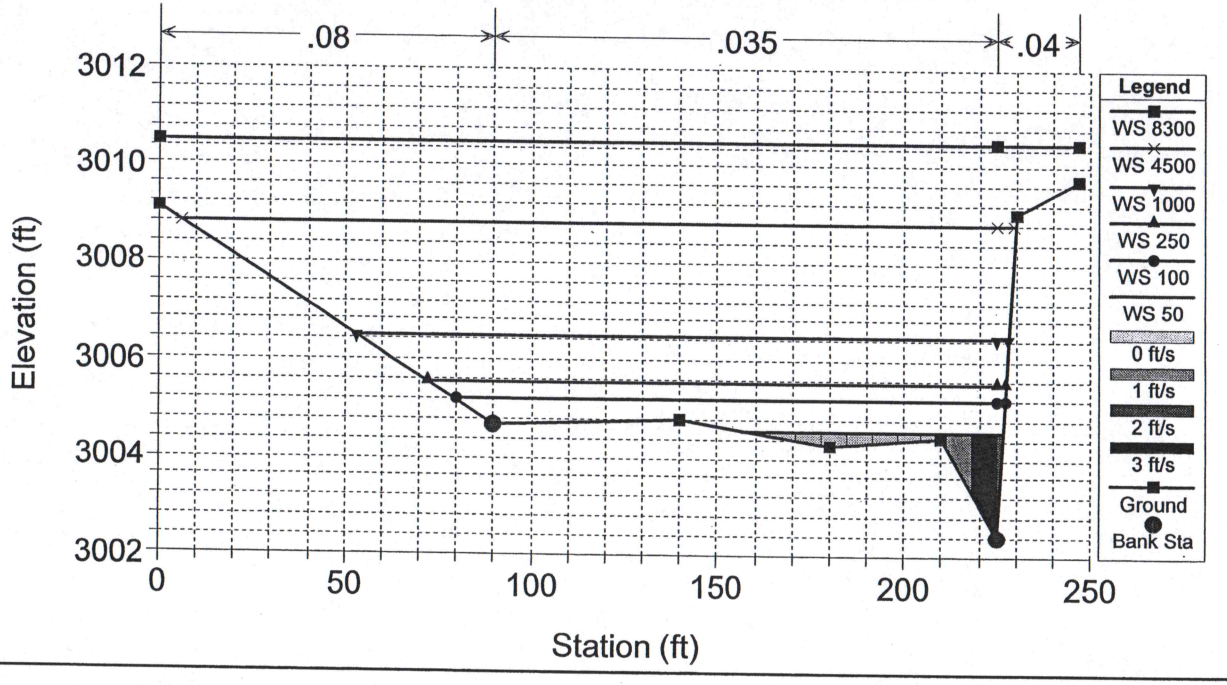
Farmers Ditch 1

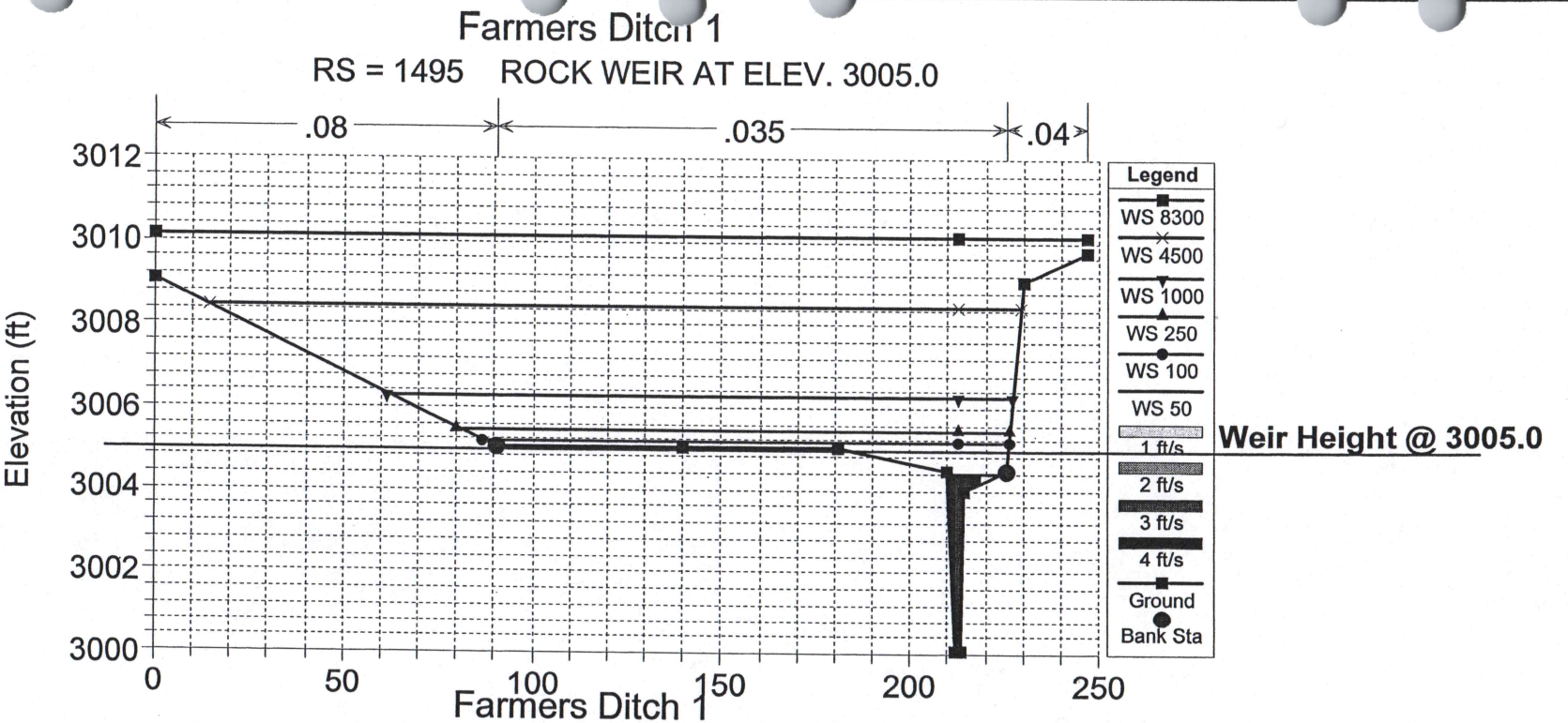
RS = 1590 ROCK WEIR AT ELEV. 3005.0

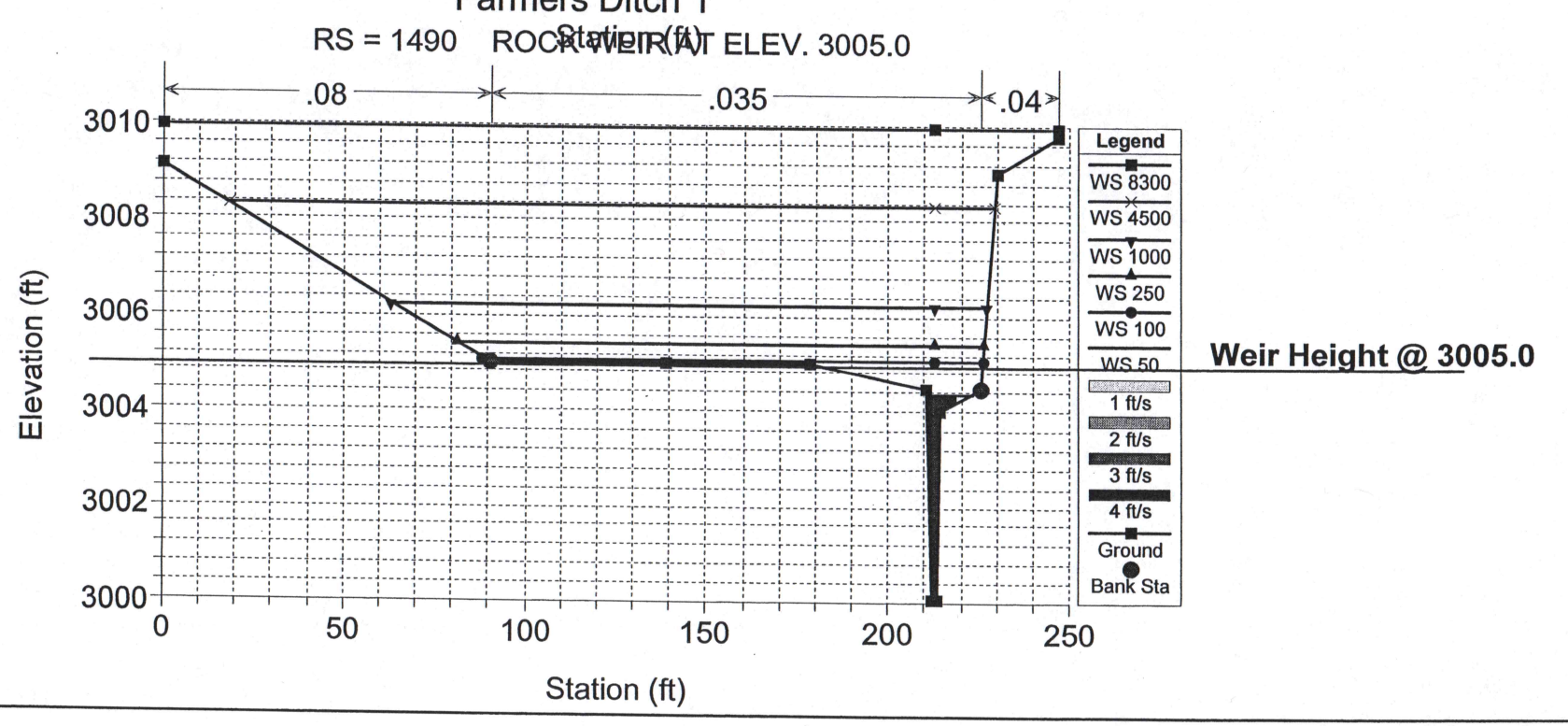


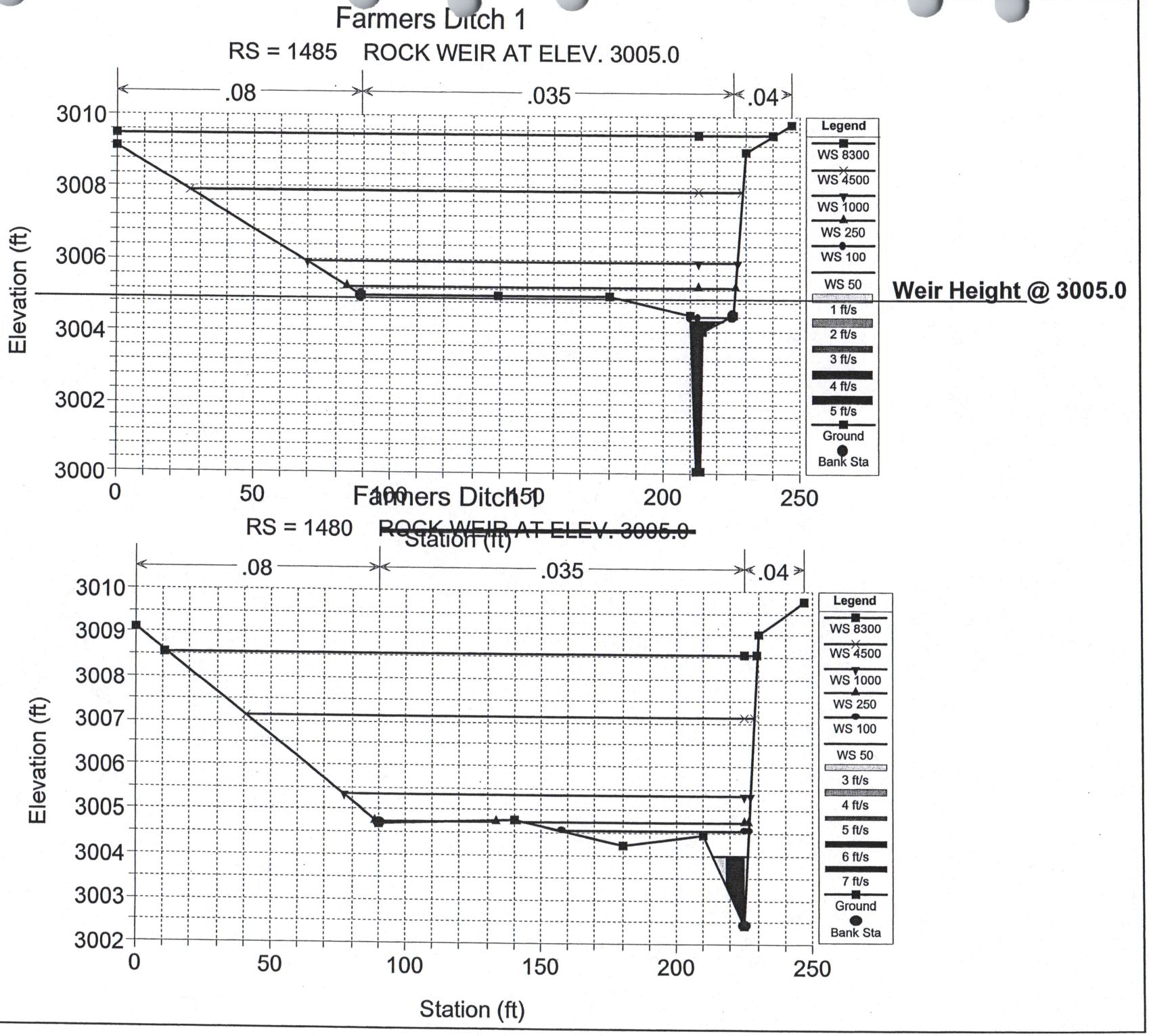
Farmers Ditch 1

RS = 1500 ROCK WEIR AT ELEV. 3005.0



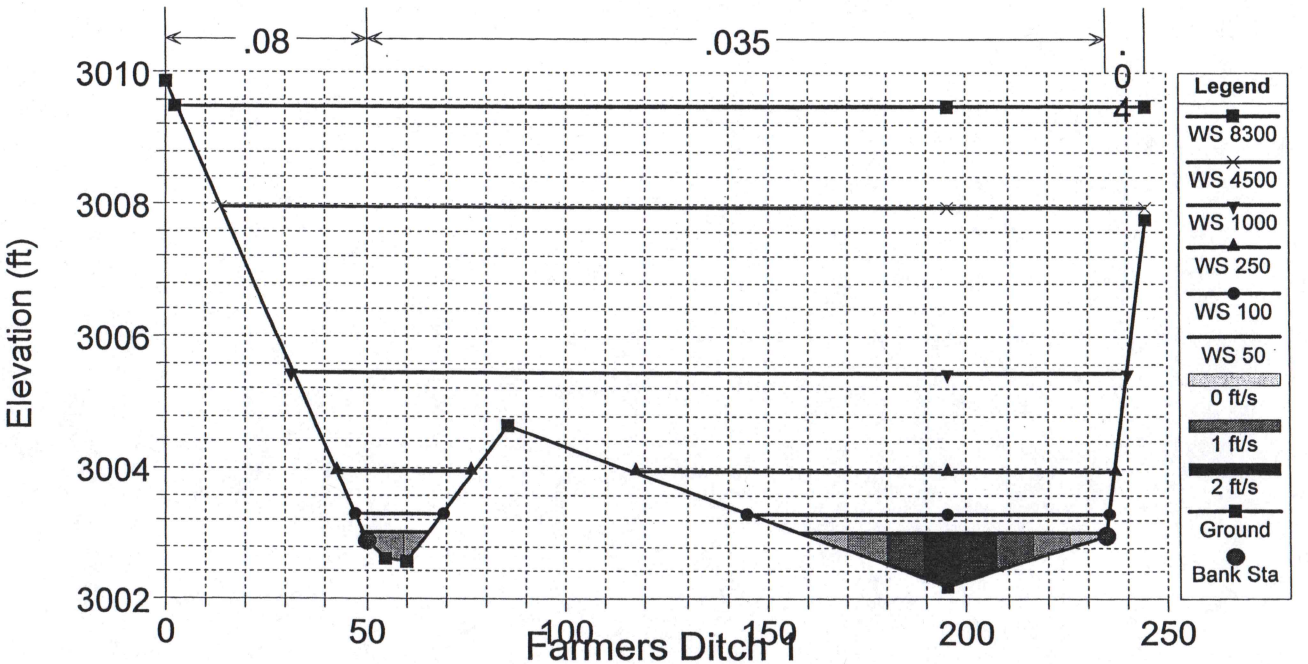

Farmers Ditch 1
RS = 1495 ROCK WEIR AT ELEV. 3005.0
.08
.035
.04
3012
3010
3008
3006
3004
3002
3000
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
Weir Height @ 3005.0


Farmers Ditch 1
RS = 1490 ROCK WEIR AT ELEV. 3005.0
.08
.035
.04
3010
3008
3006
3004
3002
3000
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
Weir Height @ 3005.0


Farmers Ditch 1
RS = 1485 ROCK WEIR AT ELEV. 3005.0
.08
.035
.04
Elevation (ft)
3010
3008
3006
3004
3002
3000
0
50
100
150
200
250
Station (ft)
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
Weir Height @ 3005.0
Farmers Ditch 1
RS = 1480 ROCK WEIR AT ELEV. 3005.0
.08
.035
.04
Elevation (ft)
3010
3009
3008
3007
3006
3005
3004
3003
3002
0
50
100
150
200
250
Station (ft)
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta

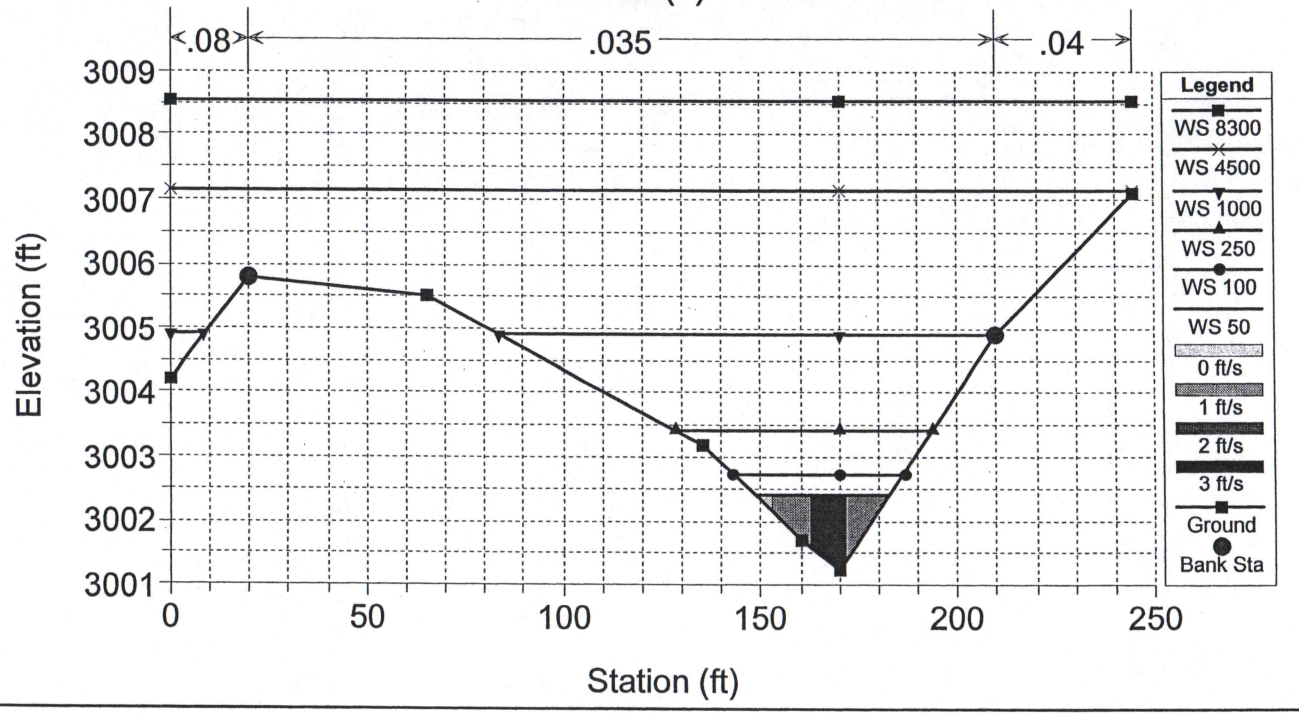
Farmers Ditch 1

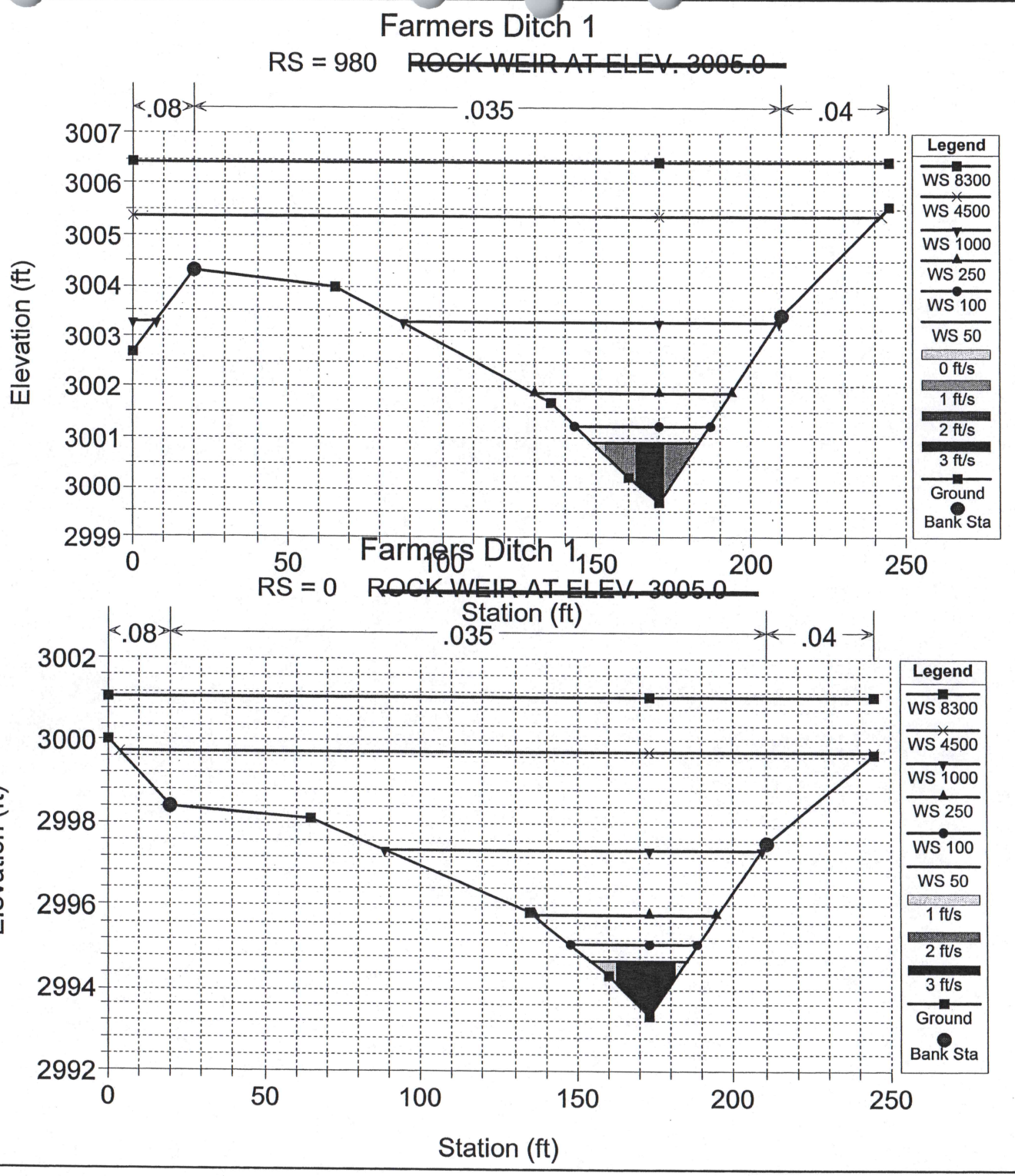
RS = 1350 ~~ROCK WEIR AT ELEV. 3005.0~~



Farmers Ditch 1

RS = 1210 ~~ROCK WEIR AT ELEV. 3005.0~~

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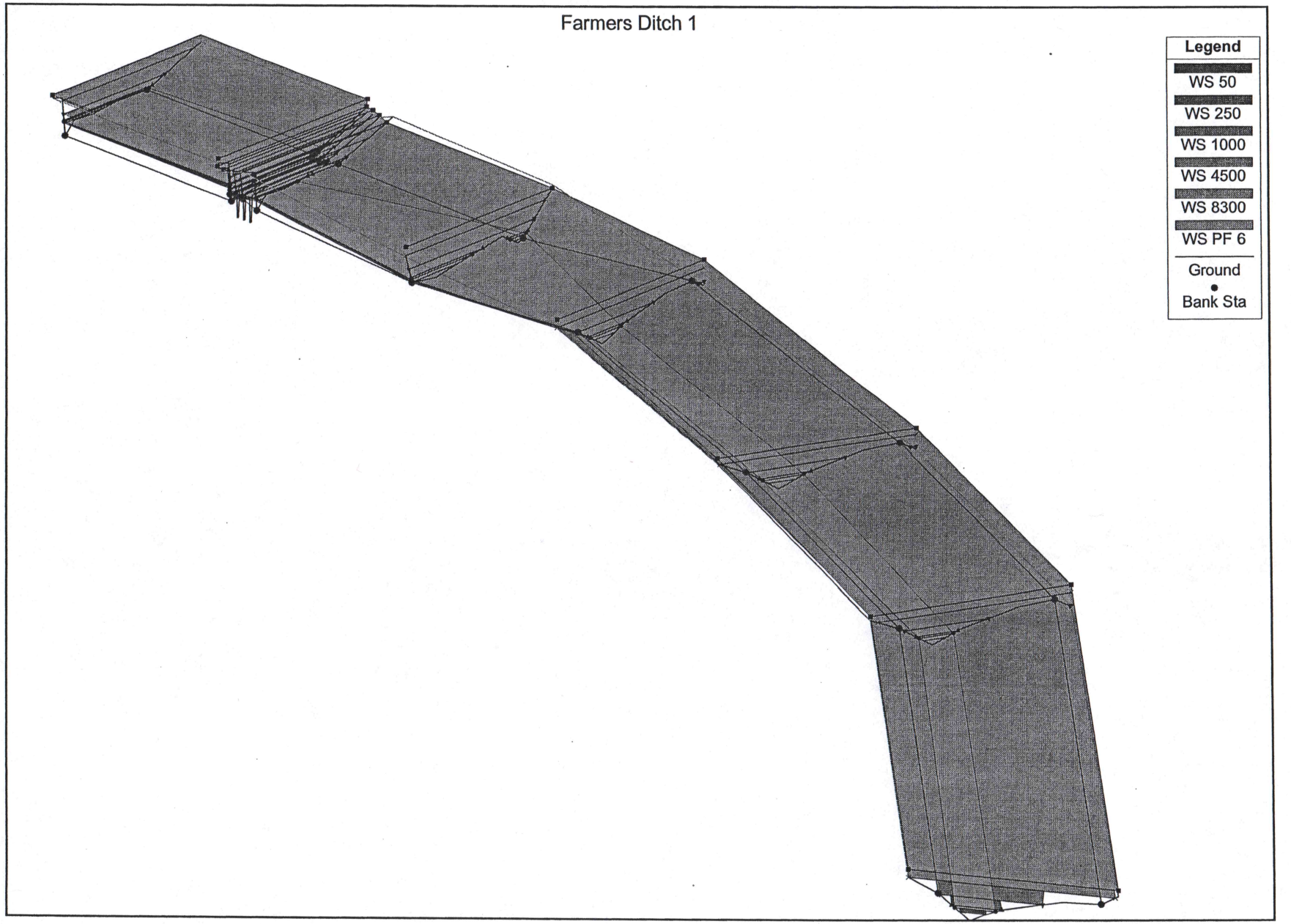
.08
.035
.04
3007
3006
3005
3004
3003
3002
3001
3000
2999
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
0 ft/s
1 ft/s
2 ft/s
3 ft/s
Ground
Bank Sta
Farmers Ditch 1
RS = 0 ROCK WEIR AT ELEV. 3005.0
.08
.035
.04
3002
3000
2998
2996
2994
2992
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
1 ft/s
2 ft/s
3 ft/s
Ground
Bank Sta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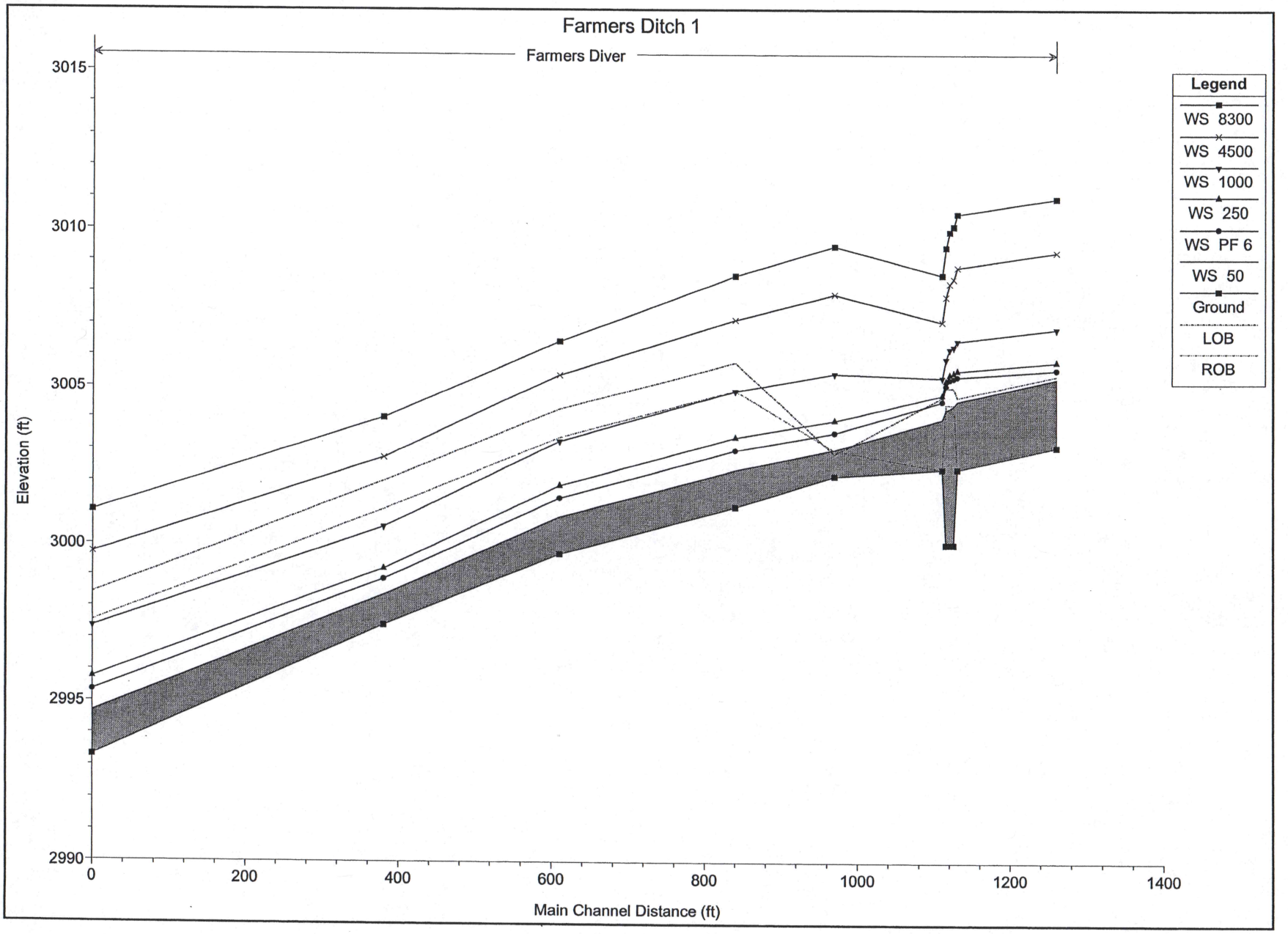
Legend
WS 50
WS 250
WS 1000
WS 4500
WS 8300
WS PF 6
Ground
Bank Sta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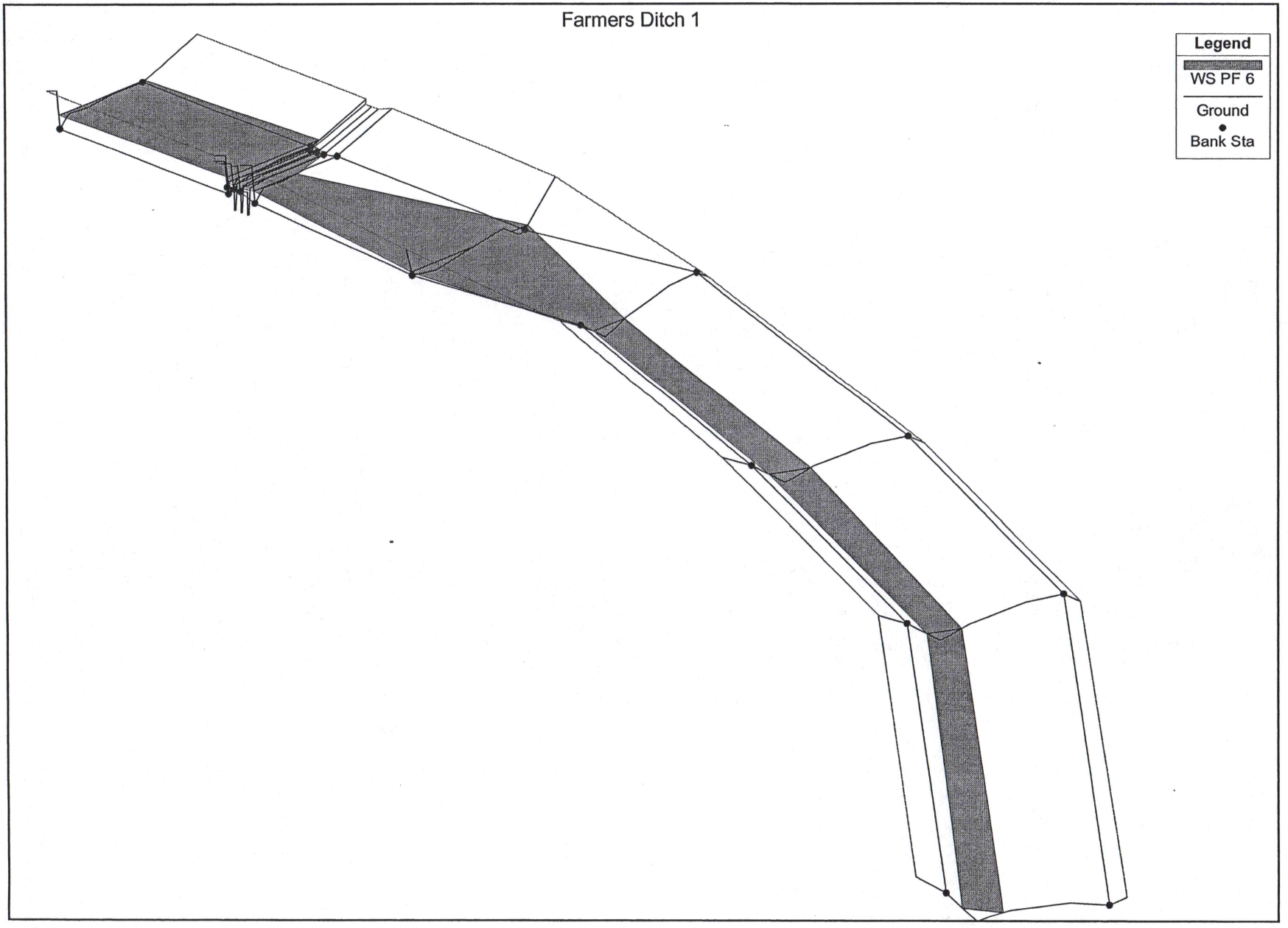
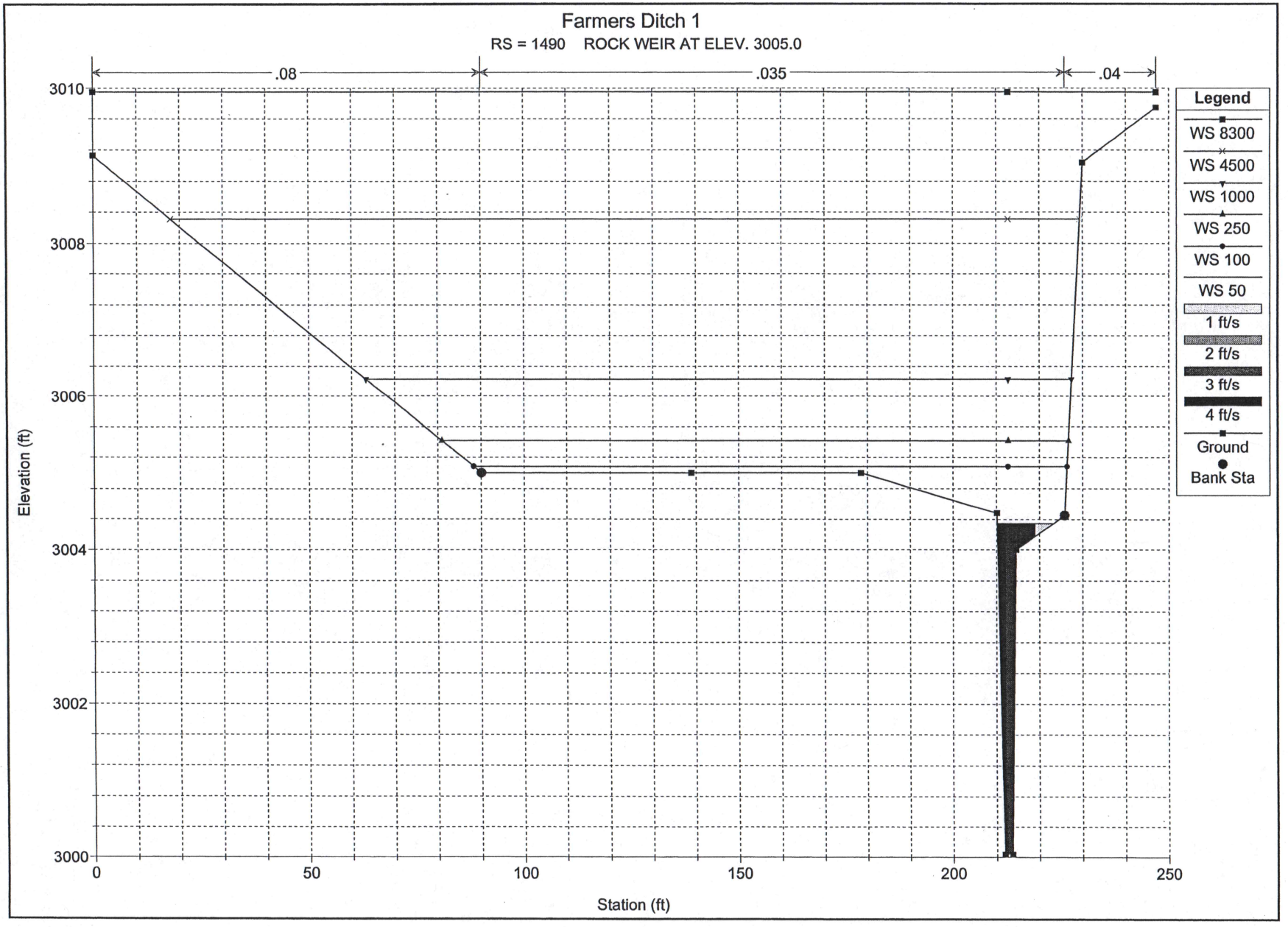
Farmers Diver
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS PF 6
WS 50
Ground
LOB
ROB
Elevation (ft)
3015
3010
3005
3000
2995
2990
0
200
400
600
800
1000
1200
1400
Main Channel Distance (ft)


Farmers Ditch 1
Legend
WS PF 6
Ground
Bank Sta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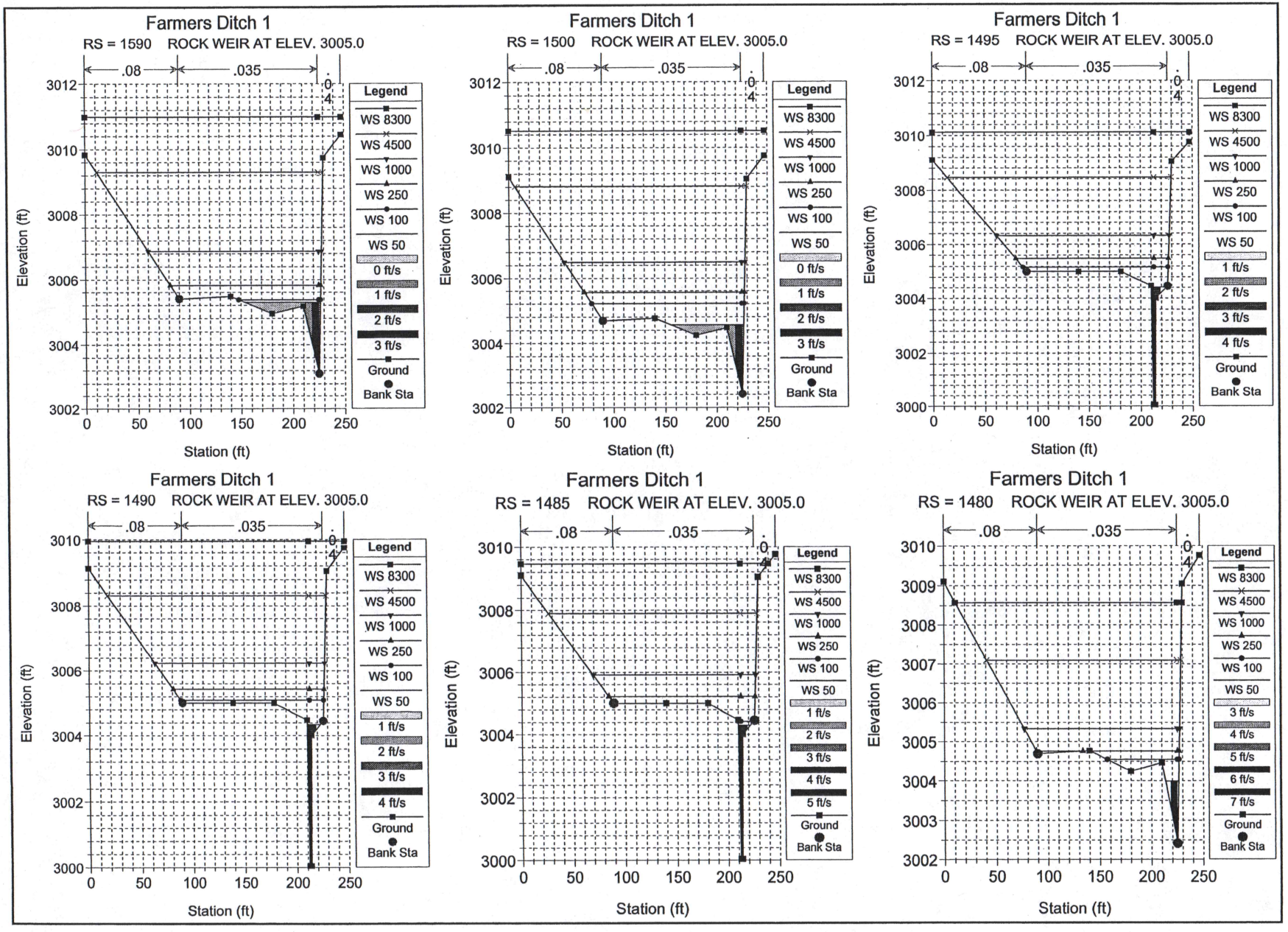
.08
.035
.04
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
Elevation (ft)
3010
3008
3006
3004
3002
3000
0
50
100
150
200
250
Station (ft)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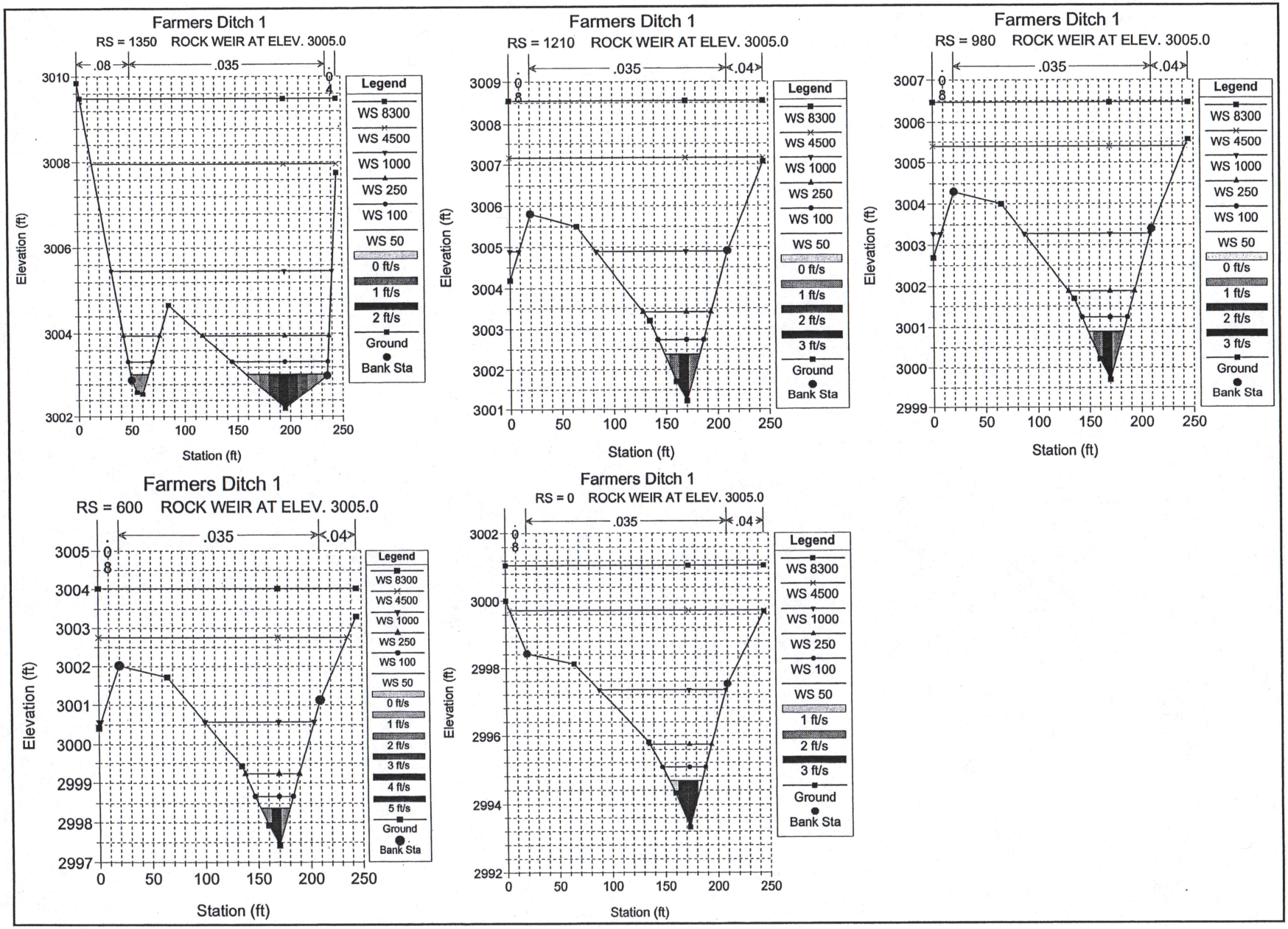
.08
.035
.04
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
0 ft/s
1 ft/s
2 ft/s
3 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
Farmers Ditch 1
RS = 1500 ROCK WEIR AT ELEV. 3005.0
Farmers Ditch 1
RS = 1495 ROCK WEIR AT ELEV. 3005.0
4 ft/s
Farmers Ditch 1
RS = 1490 ROCK WEIR AT ELEV. 3005.0
Farmers Ditch 1
RS = 1485 ROCK WEIR AT ELEV. 3005.0
5 ft/s
Farmers Ditch 1
RS = 1480 ROCK WEIR AT ELEV. 3005.0
6 ft/s
7 ft/s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.08
.035
.04
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
0 ft/s
1 ft/s
2 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
Farmers Ditch 1
RS = 1210 ROCK WEIR AT ELEV. 3005.0
.035
.04
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
0 ft/s
1 ft/s
2 ft/s
3 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
Farmers Ditch 1
RS = 980 ROCK WEIR AT ELEV. 3005.0
.035
.04
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
0 ft/s
1 ft/s
2 ft/s
3 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
Farmers Ditch 1
RS = 600 ROCK WEIR AT ELEV. 3005.0
.035
.04
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)
Farmers Ditch 1
RS = 0 ROCK WEIR AT ELEV. 3005.0
.035
.04
Legend
WS 8300
WS 4500
WS 1000
WS 250
WS 100
WS 50
1 ft/s
2 ft/s
3 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

HEC-RAS Plan: Plan 021 River: Scott River Reach: Farmers Diver

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Farmers Diver	0	50.00	2993.32	2994.67	2994.37	2994.76	0.006008	2.48	20.20	30.84	0.54
Farmers Diver	0	250.00	2993.32	2995.75	2995.30	2995.96	0.005996	3.65	68.55	58.45	0.59
Farmers Diver	0	1000.00	2993.32	2997.34	2996.72	2997.70	0.006001	4.77	209.75	119.85	0.64
Farmers Diver	0	4500.00	2993.32	2999.72	2999.11	3000.50	0.006001	7.15	660.41	241.48	0.70
Farmers Diver	0	8300.00	2993.32	3001.05	3000.40	3002.26	0.006011	9.02	985.91	245.00	0.75
Farmers Diver	0	150.00	2993.32	2995.34	2994.94	2995.50	0.006005	3.22	46.58	47.92	0.58
Farmers Diver	600	50.00	2997.43	2998.38	2998.35	2998.59	0.019696	3.69	13.57	27.83	0.93
Farmers Diver	600	250.00	2997.43	2999.23	2999.20	2999.67	0.017626	5.32	47.03	51.21	0.98
Farmers Diver	600	1000.00	2997.43	3000.56	3000.54	3001.26	0.015432	6.71	149.24	105.64	0.99
Farmers Diver	600	4500.00	2997.43	3002.76	3002.76	3003.96	0.012735	8.94	537.81	236.42	0.99
Farmers Diver	600	8300.00	2997.43	3004.02	3004.02	3005.70	0.010701	10.71	843.51	245.00	0.97
Farmers Diver	600	150.00	2997.43	2998.90	2998.87	2999.25	0.018282	4.74	31.66	42.11	0.96
Farmers Diver	980	50.00	2999.71	3000.89		3000.98	0.006347	2.42	20.69	34.17	0.55
Farmers Diver	980	250.00	2999.71	3001.88	3001.48	3002.09	0.006879	3.67	68.12	63.86	0.63
Farmers Diver	980	1000.00	2999.71	3003.28	3002.82	3003.67	0.007410	5.05	199.93	128.86	0.70
Farmers Diver	980	4500.00	2999.71	3005.39	3005.05	3006.30	0.008109	7.78	622.88	242.15	0.80
Farmers Diver	980	8300.00	2999.71	3006.46		3008.00	0.009189	10.21	884.97	245.00	0.90
Farmers Diver	980	150.00	2999.71	3001.49		3001.65	0.006690	3.25	46.11	50.71	0.60
Farmers Diver	1210	50.00	3001.21	3002.38		3002.47	0.006628	2.46	20.36	33.90	0.56
Farmers Diver	1210	250.00	3001.21	3003.41		3003.61	0.006355	3.55	70.39	65.31	0.60
Farmers Diver	1210	1000.00	3001.21	3004.89		3005.23	0.006208	4.72	214.64	134.85	0.64
Farmers Diver	1210	4500.00	3001.21	3007.16		3007.91	0.005970	7.08	688.00	245.00	0.70
Farmers Diver	1210	8300.00	3001.21	3008.54		3009.68	0.005717	8.82	1026.85	245.00	0.73
Farmers Diver	1210	150.00	3001.21	3003.00		3003.16	0.006427	3.20	46.80	51.09	0.59
Farmers Diver	1350	50.00	3002.20	3003.03	3002.77	3003.06	0.003197	1.32	37.95	93.99	0.36
Farmers Diver	1350	250.00	3002.20	3003.94	3003.24	3003.99	0.001571	1.69	150.93	154.00	0.30
Farmers Diver	1350	1000.00	3002.20	3005.45	3004.08	3005.54	0.001082	2.37	440.47	208.59	0.28
Farmers Diver	1350	4500.00	3002.20	3007.96	3005.81	3008.32	0.001695	4.92	992.49	231.46	0.40
Farmers Diver	1350	8300.00	3002.20	3009.48	3007.10	3010.16	0.002219	6.78	1353.75	242.43	0.48
Farmers Diver	1350	150.00	3002.20	3003.56	3003.06	3003.60	0.001956	1.58	96.46	128.61	0.32
Farmers Diver	1480	50.00	3002.41	3003.99	3003.99	3004.39	0.020435	5.16	10.05	12.71	1.02

HEC-RAS Plan: Plan 021 River: Scott River Reach: Farmers Diver (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Farmers Diver	1480	250.00	3002.41	3004.76	3004.89	3005.24	0.068608	5.40	45.44	131.01	1.64
Farmers Diver	1480	1000.00	3002.41	3005.33	3005.60	3006.33	0.042597	8.09	127.26	150.21	1.51
Farmers Diver	1480	4500.00	3002.41	3007.10	3007.58	3009.19	0.021213	11.86	426.78	187.72	1.28
Farmers Diver	1480	8300.00	3002.41	3008.58	3009.06	3011.28	0.015671	13.69	726.82	218.95	1.19
Farmers Diver	1480	150.00	3002.41	3004.55	3004.73	3005.02	0.058198	5.36	27.56	69.71	1.53
Farmers Diver	1485	50.00	3000.04	3004.29		3004.48	0.008768	3.47	14.41	11.69	0.55
Farmers Diver	1485	250.00	3000.04	3005.22	3005.22	3005.46	0.025099	3.92	64.31	142.12	1.01
Farmers Diver	1485	1000.00	3000.04	3005.91	3005.91	3006.51	0.018848	6.23	167.80	157.77	1.02
Farmers Diver	1485	4500.00	3000.04	3007.89	3007.89	3009.33	0.012547	9.89	524.39	202.64	0.98
Farmers Diver	1485	8300.00	3000.04	3009.46	3009.46	3011.41	0.010297	11.74	869.78	239.96	0.95
Farmers Diver	1485	150.00	3000.04	3005.07	3005.07	3005.26	0.034097	3.51	42.89	138.66	1.11
Farmers Diver	1490	50.00	3000.04	3004.35		3004.52	0.008737	3.36	14.90	13.07	0.55
Farmers Diver	1490	250.00	3000.04	3005.42		3005.54	0.007617	2.74	92.81	145.77	0.59
Farmers Diver	1490	1000.00	3000.04	3006.23		3006.59	0.008365	4.88	217.91	164.13	0.71
Farmers Diver	1490	4500.00	3000.04	3008.31		3009.41	0.008188	8.69	608.91	211.46	0.81
Farmers Diver	1490	8300.00	3000.04	3009.95		3011.49	0.007227	10.51	987.37	247.00	0.81
Farmers Diver	1490	150.00	3000.04	3005.27		3005.34	0.006734	2.16	70.25	142.20	0.53
Farmers Diver	1495	50.00	3000.04	3004.41		3004.56	0.007649	3.11	16.06	14.86	0.53
Farmers Diver	1495	250.00	3000.04	3005.48		3005.58	0.005870	2.54	100.69	147.09	0.53
Farmers Diver	1495	1000.00	3000.04	3006.31		3006.63	0.006997	4.62	231.12	166.16	0.65
Farmers Diver	1495	4500.00	3000.04	3008.45		3009.46	0.007148	8.33	639.58	215.20	0.76
Farmers Diver	1495	8300.00	3000.04	3010.12		3011.54	0.006393	10.10	1031.22	247.00	0.77
Farmers Diver	1495	150.00	3000.04	3005.31		3005.37	0.005159	1.99	76.27	143.24	0.47
Farmers Diver	1500	50.00	3002.41	3004.56		3004.61	0.006138	1.75	28.09	70.30	0.50
Farmers Diver	1500	250.00	3002.41	3005.55		3005.59	0.001249	1.61	161.79	155.00	0.27
Farmers Diver	1500	1000.00	3002.41	3006.49		3006.67	0.002554	3.46	316.06	174.80	0.43
Farmers Diver	1500	4500.00	3002.41	3008.81		3009.51	0.003787	6.98	779.59	223.99	0.59
Farmers Diver	1500	8300.00	3002.41	3010.52		3011.60	0.003941	8.87	1189.05	247.00	0.63
Farmers Diver	1500	150.00	3002.41	3005.36		3005.38	0.000855	1.17	131.92	150.87	0.22
Farmers Diver	1590	50.00	3003.11	3005.29	3004.69	3005.33	0.005037	1.63	30.20	72.60	0.46
Farmers Diver	1590	250.00	3003.11	3005.82	3005.59	3005.93	0.006442	2.63	96.45	145.75	0.56

HEC-RAS Plan: Plan 021 River: Scott River Reach: Farmers Diver (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Farmers Diver	1590	1000.00	3003.11	3006.87	3006.30	3007.13	0.004539	4.12	261.21	167.84	0.55
Farmers Diver	1590	4500.00	3003.11	3009.29	3008.28	3010.08	0.004550	7.39	729.19	218.74	0.64
Farmers Diver	1590	8300.00	3003.11	3010.99	3009.75	3012.18	0.004544	9.28	1131.43	247.00	0.68
Farmers Diver	1590	150.00	3003.11	3005.57	3005.41	3005.67	0.010073	2.44	61.19	140.57	0.65

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

410A - GRADE STABILIZATION - ROCK DROPS

I. SCOPE

The work shall consist of furnishing materials and installing rock drop structures at the locations and to the lines, grades, elevations, and cross- sections as shown on the drawings or as staked in the field.

II. MATERIALS

A. Rock

Rock shall be sound, dense and durable. The rock and the source shall be approved by the Engineer prior to installation. Rock shall be angular to subangular in shape with the greatest dimension not greater than three times the least dimension; and should the least dimension be six inches or greater, then the greatest dimension shall not be greater than two times the least dimension. The rock shall be fairly well graded. The gradation of the rock shall be as specified on the "Practice Requirement" sheet.

B. Filter Material (when specified):

Sand and Gravel--The filter shall consist of a blend of clean sand and gravel, which is not subject to decomposition in air or water and is free from roots and other foreign materials. The size and gradation limits shall be as specified on the drawings or as listed on the "Practice Requirement" sheet.

Geotextile fabric. - The type of geotextile fabric required shall be stated in the "Construction Requirement" sheet, and the fabric shall be conformed to Practice Specification "Geotextile Fabric".

III. SUBGRADE PREPARATION

The subgrade surfaces on which the rock is to be placed shall be cleared and excavated to grade prior to placement of rock. The subgrade shall be inspected prior to the placement of rock.

IV. PLACEMENT

The rock shall be placed in such a manner as to avoid displacement of the under lying materials. The rock shall be delivered and placed in a manner that will insure that the rock in place shall be reasonably homogeneous and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Smaller rocks shall not be grouped as a substitute for larger rock. Some hand placement of rocks will be necessary to achieve the final finish surface.

V. VEGETATIVE COVER

Unless otherwise specified, a protective cover of vegetation shall be established on the disturbed area. The planting of vegetative materials shall conform to the requirements of Practice Specification 342, Critical Area Planting.

VI. SPECIAL MEASURES

Measures and construction methods shall be incorporated as needed and practical that enhance fish and wildlife values. Special attention shall be given to protecting visual resources and maintaining key shade, food, and den trees.

VII. CONSTRUCTION OPERATIONS

Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. The owner, operator, contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

The job shall be completed in a workmanlike manner and present a pleasing appearance.

OPERATION AND MAINTENANCE

A properly operated and maintained grade stabilization structure is an asset to your farm. This grade stabilization structure was designed and installed to stabilize an eroding area and to safely convey runoff from the drainage area. The estimated life span of this installation is at least 10 years. The life of the structure can be assured and usually increased by developing

and carrying out a good operation and maintenance program.

This practice will require you to perform periodic maintenance and may also require operational items to maintain satisfactory performance. Here are some recommendations to help you develop a good operation and maintenance program.

Periodically, it will be necessary to replace and relocate rocks either by machine or by hand. It is necessary to maintain the rocks to the lines and grades of the original design.

Control livestock access to the structure because they may be injured, damage protective vegetation and earthfills or accelerate soil erosion.

Removal of debris that may accumulate at the structure, and immediately upstream or downstream from the structure. Debris accumulation may reduce the hydraulic capacity and cause rocks to move or failure during a design storm.

Eradicate or otherwise remove all rodents or burrowing animals because their burrows may weaken earthen sections and develop flow paths for water and accelerate soil erosion or failure. Immediately repair any damage caused by their activity.

Other items specific to your project are listed on the "Practice Requirement" sheet.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

907 - ROCK RIPRAP

I. SCOPE

The work shall consist of furnishing and installing loose rock riprap at the locations and to the lines, grades, elevations, and cross-sections as shown on the drawings.

II. MATERIALS

Rock

Rock shall be sound, dense, and durable with a bulk specific gravity of not less than 2.5. Rock shall be angular to subrounded in shape with the greatest dimension not greater than 2 times the least dimension. The rock shall conform to the grading limits given below unless otherwise specified.

For toplayer, use 4'-6' boulders.

Size, Inches	Percent Passing	
~~24~~ 5'	100	Use this
~~12~~ 3'	50	gradation
~~6~~ 12"	20	for bottom
~~3~~ 4"	10	layer.

Filter or Bedding

When filter or bedding material is shown on the drawings, the material shall be composed of clean, hard and durable mineral particles free from organic matter, clay balls or other deleterious substances.

Bedding may be pit run material of sand, gravel, crushed stone or a mixture thereof.

Filter material shall conform to the gradation given in the Special Requirements listed on the "Practice Requirements" sheet.

III. SUBGRADE PREPARATION

The subgrade surfaces on which the riprap, bedding, filter, or geotextile is to be placed shall be cleared and graded prior to placement of bedding, geotextile, or rock.

When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of appropriate sections of Conservation Construction Specification 903, Earthfill.

IV. PLACEMENT

Equipment - Placed Rock Riprap

The riprap shall be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks.

Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to the permanent works and to achieve the finished surface placement.

Hand - Placed Riprap

Rocks shall be securely bedded firmly in contact one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge.

Filter Layers or Bedding

When specified, the filter, bedding, or geotextile beneath the rock shall be placed on the prepared subgrade as specified in the Special Requirements listed on the "Practice Requirements" sheet. Compaction of filter layers or bedding will not be required, but the surface of such material shall be finished reasonably free of mounds, dips, or windrows.

V. VEGETATIVE COVER

Unless otherwise specified, a protective cover of vegetation shall be established on the disturbed area. The planting of vegetative materials shall conform to the requirements of Practice Specification 342, Critical Area Planting.

VI. SPECIAL MEASURES

Measures and construction methods shall be incorporated as needed and practical that enhances fish and wildlife values. Special attention shall be given to protecting visual resources and maintaining key shade, food and den trees.

VII. CONSTRUCTION OPERATIONS

Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. The owner, operator, Contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

The completed job shall be workmanlike and present a good appearance.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

430II - IRRIGATION WATER CONVEYANCE CORRUGATED METAL PIPELINE

I. SCOPE

The work shall consist of furnishing and installing corrugated metal pipe to the lines and grades as shown on the drawings and/or as staked in the field, and shall include excavating and backfilling the trenches.

II. INSTALLATION

The trench bottom shall be uniformly excavated so that the full length of pipe contacts the bottom without bridging. Clods, rocks, and uneven spots that can cause non-uniform support shall be removed.

If trenches are excavated in soils containing rock or other hard material that might damage the pipe or coating material, the trenches shall be over excavated a minimum of 4 inches and then backfilled to grade with consolidated sand or fine earth bedding.

The trench at any point below the top of the pipe shall be only wide enough to permit the pipe to be easily placed and joined and to allow the initial backfill material to be uniformly placed under the haunches and along the sides of the pipe.

Provisions shall be made to assure safe working conditions if unstable soil, trench depth, or other conditions can be hazardous to personnel working in the trench. Trench banks more than 5 feet high shall be shored, laid back to a stable slope, or equivalent protection shall be provided if personnel are exposed to danger.

Coated pipe shall be handled in a manner to prevent abrasion of the coating during transportation placement, and backfilling. Pipe shall not be dropped or allowed to roll down skids without proper restraining ropes. If the pipe must be moved longitudinally along the trench care shall be taken to assure that the pipe and the coating are not damaged. Pipe shall not be rolled or dragged on the ground. If the pipe is supported, the supports shall be of sufficient width and number and be padded, if necessary, to prevent damage to the coating. Damaged coating shall be repaired before backfilling.

III. INITIAL BACKFILL FOR LIVE LOADING

Hand, mechanical, or water packing methods shall be used where there is a potential for live loading. The initial backfill material shall be class, II, III, or IV as described in Figure 1. Initial backfill material, as shown in Figure 2, shall be placed from the bottom of the trench to a depth of 0.7 of the pipe diameter for circular pipe. For arched pipe, the initial fill depth shall be as shown in the drawings.

All initial backfill material shall be free from rocks and hard earth clods larger than 3 inches in diameter. It shall not contain frozen material, sod, cinders, or earth containing a high percentage of organic material.

At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. The initial backfill material shall b placed so that the pipe will not be displaced, excessively deformed, or damaged.

If backfilling is done by hand or mechanical means, the initial fill shall be compacted firmly in 4 inch to 6-inch lifts around the pipe, as required in Figure 2, (to provide adequate lateral support to the pipe). Each lift shall be shoveled and tamped between the pipe and the side of the trench to provide satisfactory pipe

Support

Care shall be taken to assure that backfill is placed under the haunches of the pipe sufficiently to fill all voids and provide uniform bearing.

The GC and SC of Class III and all Class III and all Class IV initial backfill material, shall be compacted to a density equal to or greater than the surrounding soil material.

If the water packing method is used, the pipeline shall first be filled with water. The initial backfill, before wetting, shall be of sufficient depth to insure a final depth of 0.7 of the pipe diameter for circular pipe or the depth specified for arched pipe after

Buried pipelines shall be protected with sacrificial galvanic anodes if they are specified to supplement the protection provided by the pipe coating.

The anodes shall be of the kind and number specified for the job or as shown on the drawings, or both. Anode materials shall be as specified under "Material Specification 430-II-M."

Anodes shall be placed as shown on the drawings and shall be bedded in moist clay, clay loam, loam, silt loam, or silt. In sandy and gravelly areas, fine material must be imported for bedding and for covering the anodes to a depth of 6 inches. The packaged anodes and the fine textured soil used or bedding and backfill shall be thoroughly wetted.

Testing station facilities shall be located and installed as specified for the job, as shown on the drawings or both. Wires at testing stations shall be attached to the pipe by one of the processes specified for anode lead wires.

XI. TESTING

Underground pipelines shall be tested before placing the backfill over the field joints. Aboveground pipelines may be tested at any time after they are ready for operation. Any joints that are leaking more than acceptable for that type of joint shall be repaired.

It shall be demonstrated that the pipeline will function properly at and below design flow.

XII. MATERIALS

The corrugated pipe shall conform to the requirements of the Material Specification as listed on the "Practice Requirement" sheet. Prior to purchase of the pipe, owner should check with the Engineer to determine if the manufacturer of the pipe is listed on the "Prequalified" list of suppliers.

All fittings and couplers shall meet or exceed the same strength requirements as those of the pipe.

Such fittings and joints shall be capable of withstanding a working pressure equal to or greater than that for the pipe.

XIII. BASIS OF ACCEPTANCE

The acceptability of the pipeline shall be determined by inspections to check compliance with all the provisions of this specification with respect to the drawings, pipe, pipe marking, and the appurtenances.

The installing contractor shall certify that the installation complies with the requirements of the specification. A written guarantee shall be furnished that protects the owner against defective workmanship and materials for not less than 1 year. The certification identifies the manufacturer and markings of the pipe used.

XIV. VEGETATIVE COVER.

Unless otherwise specified, a protective cover of vegetation shall be established on the disturbed area. The planting of vegetative materials shall conform to the requirements of Practice Specification 342, Critical Area Planting.

XV. SPECIAL MEASURES

Measures and construction methods shall be incorporated as needed and practical that enhance fish and wildlife values. Special attention shall be given to protecting visual resources and maintaining key shade, food and den trees.

XVI. CONSTRUCTION OPERATIONS

Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. The owner, operator, Contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

The completed job shall be workmanlike present a good appearance.

OPERATION AND MAINTENANCE ITEMS

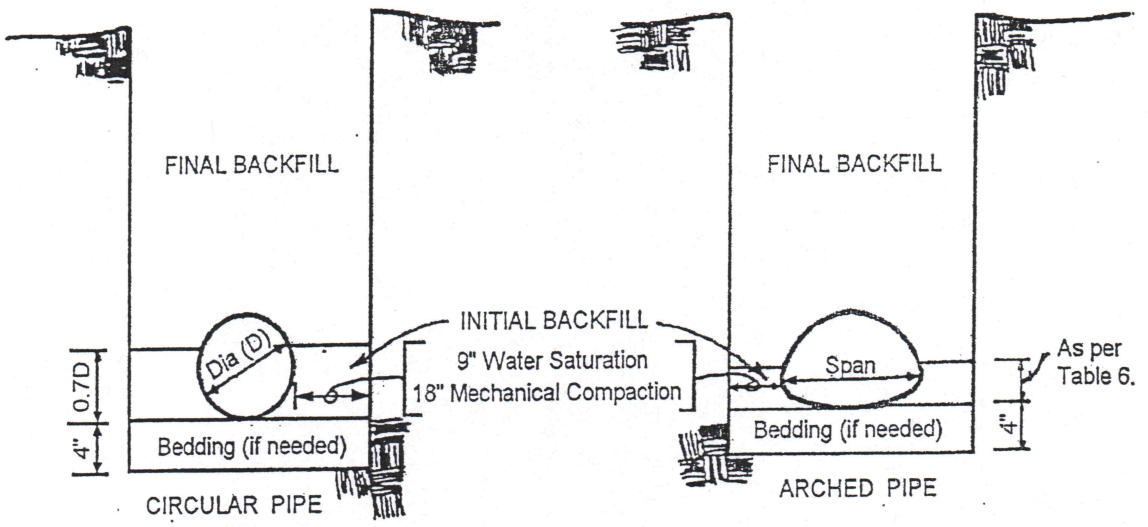
A properly operated and maintained irrigation pipeline is an asset to your farm. This irrigation pipeline was designed and installed to transmit water to where it may be utilized. The estimated life span of this installation is at least 10 years. The life of this pipeline can be assured and usually increased by developing

Figure 1. Initial Backfill Material Description

Class of Select Initial	Description
II	Coarse sands greater than (0.5 mm) and gravels with maximum particle size of 1 inch including sands and gravels containing a maximum of 12 percent non-cohesives fines. Soil types GW, SW, SP are included in this class.
III	Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil type GM, GC, SM, and SC are included in this class.
IV	Silt, silty clays, and clays, including inorganic clays and silts of medium plasticity and liquid limit. Soil types ML and CL are included in this class.

BACKFILL REQUIREMENT FOR LIVE LOADING

FIGURE 2.



NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

IRRIGATION WATER CONVEYANCE CORRUGATED METAL PIPE MATERIAL SPECIFICATION

INTRODUCTION

The materials covered by this specification are as referred to by Conservation Practice **Standard** and Conservation Practice **Specification** 430II Irrigation Water Conveyance - Corrugated Metal Pipeline.

Quality of Pipe

Pipe shall conform to or exceed the requirements specified in one of the below listed standards.

Seams of pipe shall be welded or sealed. Helical pipe shall have annular ends.

ASTM A 760 Corrugated Steel Pipe Metallic Coated, for Sewers and Drains.

ASTM 745 Corrugated Aluminum Pipe for Sewers and Drains.

Fed Spec. WW-P-402C Pipe, Corrugated (Aluminum Alloy [Amd.-1])

AASHTO M 36 Zinc Coated (Galvanized) Corrugated Iron or Steel Culverts and Underdrains

AASHTO M 196 Corrugated Aluminum Alloy Culverts and Underdrains (Amendment AASHTO M 196)

AASHTO M 245 Pre-costed, Galvanized Steel Culverts and Underdrains

AASHTO M 274, Steel Sheet, Aluminum Coated (Aluminized Type II) by the Hot Dip Process for Sewer and Drainage Pipe

Appurtenances

Standard fittings shall be used for the pipe. Elbows, tees, crosses, reducers, gate valves, air-vacuum-release valves and pressure-relief valves shall be of the size and material specified or as shown on the drawings. Steel supports and saddles shall be constructed of material that equals or exceeds the requirements specified in ADTM A 36, "Structural Steel".

Coating

If and interior and/or exterior coating is required, the coating shall meet the requirements of either:

1. ASTM A-849 Post Applied Coatings, Pourings, and Linings for Corrugated Steel Sewer and Drainage Pipe

2. AASHTO M 190, Bituminous Coated Corrugated Metal Culvert Pipe and Pipe and Pipe Arches (Amendment M190-801), or

3. AASHTO M 246 Pre-coated, Galvanized Steel Sheets for Culverts and Underdrains.

Paint

Paint shall meet the Federal Specification TT-P-641G(1), Primer Coating, Zinc Oxide (for galvanized surfaces).

Anodes

Zinc anodes must meet or exceed the requirements specified in ASTM B 418, Standard Specification for Cast and Wrought Galvanic Zinc Andoes.

Each anode shall have a full-length core and a single strand of insulated copper wire solidly attached to it. The wire shall be No. 12 or larger. If a header wire is used, the gage must be adequate to carry the design current with no more than 20-mV IR drop.

All anodes shall be commercially packaged. The packaged backfull mix shall be of the following proportions by weight.

Zinc:	20 to 30 pct bentonite
	70 to 80 pct gypsum

Table 3. Maximum depth of cover for steel corrugated circular pipe, H-20 loading 1/

Corrugation Pattern			Specified Thickness (Inches)					
			.052	.064	.079	.109	.148	.168
1 1/2" X 1/4" 2/	2 2/3" X 1/2"	3" X 1"	Equivalent Standard Gauge					
			18	16	14	12	10	8
Diameter (Inches)			Maximum Depth of Cover (Feet)					
6				200				
8				90				
10				51				
	12		98	119	114			
	15		58	69	83			
	18		41	47	55			
	21		32	36	41	51		
	24		27	30	33	40		
	27			24	28	33		
	30			24	25	29		
	36			21	22	24	26	
		36	31	25	38	48	57	67
	42			19	20	21	23	24
		42	26	25	31	36	42	48
	48			18	19	20	21	22
		48	23	20	26	30	34	38

1/ See WNTC Bulletin W210-4-30-6/29/84, for formula used to compute allowable fill with 5 percent pipe deflection.
2/ This pipe may not be readily available.

Table 4. Maximum depth of cover for aluminum corrugated pipe, H-20 loading circular 1/

Corrugation Pattern				Specified Thickness (Inches					
				.040	.060	.075	.105	.135	.164
1 1/2" X 1/4"	2 2/3" X 7/16"	2 2/3" X 1/2"	3" X 1"	Equivalent Standard Gauge					
				18	16	14	12	10	8
Diameter (Inches)				Maximum Depth of Cover (Feet)					
6				55	77				
8				33	43				
10				25	30				
	12				50	59	78		
	15				34	38	48		
	18				27	29	35		
	21				23	25	28		
	24				21	22	25	27	
	27				20	21	22	24	
		30				20	21	22	
			30		29	29	35	40	
		36			24	19	19	20	
			36		21	24	27	31	
		42			25		18	19	
			42		21	21	23	26	
		48			20		30	18	19
			48		20	20	21	23	24
									24

1/ See WNTC Bulletin W210-4-30-6/29/84, for formula used to compute allowable fill with 5 percent pipe deflection; $E_{Al} = 10 \times 10^6$.

Table 5. Maximum depth of cover for steel and aluminum corrugated arched pipe, H-20 loading

Aluminum-Helical & Riveted				Steel					
		2 2/3" X 1/2"				2 2/3" X 1/2"		3" X 1"	
Size Span X Rise (Inches)		Gauge	Maximum Depth (Feet)	Size Span X Rise (Inches)		Gauge	Maximum Depth (Feet) 2/	Gauge	Maximum Depth (Feet) 2/
17	13	16	13	18	11	16	13		
21	15	16	13	22	13	16	12		
24	18	16	12	25	16	16	10		
28	20	14	11	29	18	16	9		
35	24	14	11	36	22	16	9		
42	29	12	10	43	27	16	7	16	12
49	33	12	10	50	31	14	7	16	12
57	38	10	9	58	36	12	7	16	12

1/ Gauges shown for information purposes only.
2/ Corner bearing pressure assumed to be 2 tons per square foot for maximum depths given. Maximum depth cover based on 5 percent deflection. Re: U.S. Department of Commerce - Bureau of Public Roads, "Corrugated Metal Pipe Culverts Structural Design Criteria and Recommended Installation Practice, U.S. Government Printing Office, June 1966, P.14 & 25

Table 6. Depth of Initial backfill for arched pipe

Steel	Aluminum	Corrugations	
Pipe Span (Inches)	Pipe Span (Inches)	2 2/3" X 1/2"	3" x 1"
		Depth (Feet)	
18	17	0.4	--
22	21	0.4	--
25	24	0.4	--
29	28	0.5	--
36	35	0.6	0.8
43	42	0.7	0.9
58	57	0.8	1.0

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION CONSTRUCTION SPECIFICATION

909 - CONTROL OF WATER

I. SCOPE

The work shall consist of the removal of surface water and ground water as needed to perform the required construction in accordance with the specifications. It shall include (1) building and maintaining all necessary temporary impounding works, channels, and diversions, (2) furnishing, installing and operating all necessary pumps, piping and other facilities and equipment, and (3) removing all such temporary works and equipment after they have served their purposes. All work shall be done in a manner approved by the engineer.

II. DIVERTING SURFACE WATER

The Contractor shall build, maintain and operate all cofferdams, channels, flumes, sumps, and other temporary diversion and protective works needed to divert streamflow and other surface water through or around the construction site and away from the construction work while construction is in progress. Unless otherwise specified, a diversion must discharge into the same natural drainage way in which its headworks are located.

III. DEWATERING THE CONSTRUCTION SITE

Foundation ' cutoff trenches and other parts of the construction site shall be dewatered and kept free of standing water or excessively muddy conditions as needed for proper execution of the construction work. The Contractor shall furnish, install, operate and maintain all drains, sumps, pumps, casings, well-points, and other equipment needed to perform the dewatering as specified.

Dewatering methods that cause a loss of fines from the foundation areas will not be permitted.

IV. DEWATERING BORROW AREA

Unless otherwise specified, Contractor shall maintain the borrow areas free of surface water or otherwise provide for timely and effective removal of surface waters that accumulate within the borrow areas from any source. Borrow material shall be processed as necessary to achieve proper and uniform moisture content for placement.

If pumping to dewater area is included as an item of work in the bid schedule, each pump used for this purpose shall be equipped with a water meter in the discharge line. Accuracy of the meters shall be such that the measured quantity of water is within 3 percent, plus or minus, of the true quantity.

Means shall be provided by the Contractor to check the accuracy of the water meters when requested by the engineer.

V. REMOVAL OF TEMPORARY WORKS

After the temporary works have served their purposes, the Contractor shall remove them or level and grade them to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

Except as otherwise specified, pipes and casings shall be removed from temporary wells and the wells shall be filled to ground level with gravel or other material approved by the engineer.

VI. EROSION AND POLLUTION CONTROL

Removal of water from the construction site, including the borrow areas, shall be accomplished in a manner that erosion and the transporting of sediment and other pollutants are minimized. Dewatering activities shall be accomplished in a manner that the water table water quality is not altered.

VII. SPECIAL MEASURES

Measures and construction methods shall be incorporated as needed and practical that enhances fish and wildlife values. Special attention shall be given to protecting visual resources and maintaining key shade, food, and den trees.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

GRADE STABILIZATION STRUCTURE

(No.)
CODE 410

DEFINITION

A structure used to control the grade and head cutting in natural or artificial channels.

Scope

This standard applies to all types of grade stabilization structures, including a combination of earth embankments and mechanical spillways and full-flow or detention-type structures. This standard also applies to channel side-inlet structures installed to lower the water from a field elevation, a surface drain, or a waterway to a deeper outlet channel. It does not apply to structures designed to control the rate of flow or to regulate the water level in channels.

PURPOSES

To stabilize the grade and control erosion in natural or artificial channels, to prevent the formation or advance of gullies, and to enhance environmental quality and reduce pollution hazards.

CONDITIONS WHERE PRACTICE APPLIES

In areas where the concentration and flow velocity of water require structures to stabilize the grade in channels or to control gully erosion. Special attention shall be given to maintaining or improving habitat for fish and wildlife where applicable.

CRITERIA

The structure must be designed for stability after installation. The crest of the inlet must be set at an elevation that stabilized upstream head cutting.

Embankment dams

Class (a) dams that have product of storage times the effective height of the dam of 3,000 or more, those more than 35 ft in effective height, and all class (b) and class (c) dams shall meet or exceed the requirements specified in Technical Release No. 60 (TR-60).

Class (a) dams that have a product of storage times the effective height of the dam of less than 3,000 and an effective height of 35 ft or less shall meet or exceed the requirements specified for ponds (378).

The effective height of the dam is the difference in elevation, in feet, between the emergency spillway crest and the lowest point in the cross section along the centerline of the dam. If there is no emergency spillway, the top of the dam is the upper limit.

Pond size dams

If mechanical spillways are required, the minimum capacity of the principal spillway shall be that required to pass the peak flow expected from a 24-hour duration design storm of the frequency shown in table 1, less any reduction because of detention storage.

If the effective height of the dam is less than 20 ft and the emergency spillway has a stable grade throughout its length with no overfalls and has good vegetation along its reentry into the downstream channel, the principal spillway capacity may be reduced but can be no less than 80 percent of the 2-year frequency, 24-hour duration storm.

If criteria values exceed those shown in table 1 or the storage capacity is more than 50 acre-ft, the 10-year frequency, 24-hour duration storm must be used as the minimum design storm.

Grade stabilization structures with a settled fill height of less than 15 ft and 10-year frequency, 24-hour storm runoff less than 10 acre-ft, shall be designed to control the 10-year frequency storm without overtopping. The mechanical spillway, regardless of size, may be considered in design and an emergency spillway is not required if the combination of storage and mechanical spillway discharge will handle the design storm. The embankment can be designed to meet the requirements for water and sediment control basins (638) rather than the requirements for ponds (378).

Full-flow open structures

Drop, chute, and box inlet drop spillways shall be designed according to the principles set forth in the Engineering Field Manual for Conservation Practices, the National Engineering Handbook, and other applicable NRCS publications and reports. The minimum capacity shall be that required to pass the peak flow expected from a design storm of the frequency and duration shown in table 2, less any reduction because of detention storage, If site conditions exceed those shown in table 2, the minimum design 24-hour storm frequency is 25 years for the principal spillway and 100 years for the total capacity. Structures must not create unstable conditions upstream or downstream. Provisions must be made to insure reentry of bypassed storm flows.

Toe wall drop structures can be used if the vertical slope is 4 ft or less, flows are intermittent, downstream grades are stable, and tail water depth at design flow is equal to or greater than one-third of the height of the overfall.

The ratio of the capacity of drop boxes to road culverts shall be as required by the responsible road authority or as specified in table 2 or 3, as applicable, less any reduction because of detention storage, whichever is greater. The drop box capacity (attached to a new or existing culvert) must equal or exceed the culvert capacity at design flow.

Island-type structures

If the mechanical spillway is designed as an island-type structure, its minimum capacity shall equal the capacity of the downstream channel. For channels with very small drainage areas, the mechanical spillway should carry at least the 2-year, 24-hour storm or the design drainage curve runoff. The minimum emergency spillway capacity shall be that required to pass the peak flow expected from a design storm of the frequency and duration shown in table 2 for total capacity without overtopping the headwall extensions of the mechanical spillway. Provision must be made for safe reentry of bypassed flow as necessary.

Side-inlet drainage structures

The design criteria for minimum capacity of open-weir or pipe structures used to lower surface water from field elevations or lateral channels into deeper open channels are shown in table 3. The minimum principal spillway capacity shall equal the design drainage curve runoff for all conditions. If site condition values exceed those shown in table 3, the 50-year frequency storm shall be used for minimum design of total capacity.

Landscape resources

In highly visible public areas and those associated with recreation, careful considerations should be given to landscape resources. Landforms, structural materials, water elements, and plant materials should visually and functionally complement their surroundings. Excavated material and cut slopes should be shaped to blend with the natural topography. Shorelines can be shaped and islands created to add visual interest and valuable wildlife habitat. Exposed concrete surfaces may be formed to add texture or finished to reduce reflection and to alter color contrast. Site selection can be used to reduce adverse impacts or create desirable focal points.

General criteria

Earth embankment and emergency spillways of structures for which criteria are not provided under the standard for ponds (378) or in TR-60 must be stable for all anticipated conditions. If earth spillways are used, they must be designed to handle the total capacity flow indicated in tables 2 or 3 without overtopping the dam. The foundation preparation, compaction, top width, and side slopes must ensure a stable dam for anticipated flow conditions. Discharge from the structure shall be sufficient that no crop damage results from flow detention.

Necessary sediment storage capacity must equal the expected life of the structure, unless a provison is made for periodic cleanout.

Necessary sediment storage capacity must equal the expected life of the structure, unless a provision is made for periodic cleanout.

The earth embankment pond structures are potentially hazardous and precautions must be taken to prevent serious injury or loss of life. Protective guardrails, warning signs, fences, or lifesaving equipment shall be added as needed.

If the area is used for livestock, the structures, earthfill, vegetated spillways, and other areas should be fenced as necessary to protect the structure. Near urban areas, fencing may be necessary to control access and exclude traffic that may damage the structure or to prevent serious injury or death to trespassers.

Protection

The exposed surfaces of the embankment, earth spillway, borrow area, and other areas disturbed during construction shall be seeded or sodded as necessary to prevent erosion. If climatic conditions preclude the use of vegetation, non-vegetative covering such as gravel or other mulches may be used.

ROCK DROPS

Site Conditions

Rock drops shall apply to channels with grades less than five percent and width less than 50 feet, or with grades less than eight percent and width less than 25 feet. Flows shall not exceed 3 ft. over the drop for a 50-year frequency storm.

These structures are limited to a maximum drop (F_T) of 4 feet measured from weir to downstream toe; except structures in series, the structures are limited to a drop (F_T) of 4 feet measured from weir to weir.

Design Criteria

Design considerations shall be given to the following points:

(a) Grade of channel
(b) Stability of downstream channel
(c) Rock size and gradation (percent passing)
(d) Existing channel cross-section
(e) Soil material of banks
(f) Filter requirements to prevent piping
(g) Height of drops
(h) Flow depth over drop
(i) Vegetation to be re-established.

Loose rock drops shall be designed according to the principles set forth in National Engineering Handbook, Section 5, Hydraulics, and Figure 2 attached.

Filter blankets will be provided by placement of Geotextile fabric on all interfaces of earth and rock riprap.

The rock size shall be determined by using the empirical relationship shown by the curve in **Figure 2.** D_{75} (percent passing) size rock placed in a row along the downstream crest provides greater stability. Rock should be fairly well graded with no more than 10 percent smaller than 3 inches in size. The total thickness of the rock riprap in the completed structure shall be D_{100} (T). All rock shall be angular or subangular. Subrounded and rounded rock is not permitted.

Structures

Add the following for rock drop structures:

Rock checks may be constructed to control the grade of small channels (or gullies) to prevent further degradation.

a. Flow Design: the design flow shall be the smaller of either the 5-year flow or the full bank capacity flow.

b. Capacity: the drops are to be constructed of loose rocks with sufficient capacity over the weir to pass the design flow.

c. Location: Starting at a given stream channel control point, checks or drops are to be positioned to provide grade control. The structures are to be placed along the channel to provide no more than a 4-foot drop, F_T, from the weir to the downstream toe.

For structures in series the drop will be measured weir to weir, (F_T). The upstream slope of the structure shall be no steeper than 2:1. The top width shall be three feet or greater. The downstream slope shall be no steeper then 6:1 for drops to 3 feet. For drops over 3 feet the downstream slope shall be no steeper than 8:1. The length of the apron (A) of the drop shall be a minimum of $2F_T$. The larger rocks shall be placed in the weir section of the drop. The downstream slope and the apron shall be the same width as the weir.

CONSIDERATIONS

Water Quantity

1. Effects on volumes and rates of runoff, evaporation, deep percolation and ground water recharge.

2. Effects of the structure on soil water and resulting changes in plant growth and transpiration.

Water Quality

1. Ability of structure to trap sediment and sediment-attached substances carried by runoff.

2. Effect of structure on the susceptibility of downstream stream banks and stream beds to erosion.

3. Effects of the proposed structure on the movement of dissolved substances to ground water.

4. Effects on visual quality of water resources.

Endangered Species Considerations

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Some species are year-round residents in some streams, such as, freshwater shrimp. Other species, such as steelhead and salmon, utilize streams during various seasons. Be aware that critical periods, such as spawning, eggs in gravels, and rearing of young may preclude activities in the stream that may directly affect the stream habitat during those periods. For example there should be no disturbance of stream gravel beds that may have eggs in them. That could include any equipment in the stream or even walking in the stream or work upstream that may result in sediment depositing in the gravel beds. Document any special considerations for endangered species in the Practice Requirements Worksheet.

PLANS AND SPECIFICATIONS

Plans and specifications for installing grade stabilization structures shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Tables 1, 2, and 3 available upon request.

OPERATION AND MAINTENANCE

An operation and maintenance plan must be prepared by the Designer for use by the owner or other responsible for operating this practice. The plan should provide specific instructions for operating and maintaining the system to insure that it functions properly. It should also provide for periodic inspections and prompt repair or replacement of damage components.

Table 1. - Design criteria for establishing minimum capacity of the principal spillway for dams with storage capacity of less than 50 acre-feet.

Maximum drainage area for indicated rainfall*			Effective height of dam	Freq. of minimum design, 24-hr duration storm
0-3 in	3-5 in	5+ in		
	acres		ft	yr
200	100	50	35 or less	2
400	200	100	20 or less	2
400	200	100	20-30	5
600	400	200	20 or less	5

*In a 5-year frequency, 24-hour duration storm

Table 2 - Design criteria for establishing minimum capacity of full-flow open structures.

Maximum drainage area for indicated rainfall*			Vertical drop	Freq. of minimum design, 24-hour duration storm: Principal Spillway capacity	Freq. of minimum design, 24-hour duration storm: Total capacity
0-3 in	3-5 in	5+ in			
,,,,,,,,,,,,acres,,,,,,,,,,,,			ft	yr	yr
1,200	450	250	5 or less	5	10
2,200	900	500	10 or less	10	25

*In a 5-year frequency, 24-hour duration storm

Table 3 - Design criteria for establishing minimum capacity of side-inlet, open-weir, or pipe-drop-drainage structure.

Maximum drainage area for indicated rainfall			Vertical drop	Freq. of minimum design, 24-hour duration storm: Receiving channel capacity	Freq. of minimum design, 24-hour duration storm: Total capacity
0-4 in	3-5 in	5+ in			
,,,,,,,,,,,acres,,,,,,,,,,,			ft	ft	yr
1,200	450	250	0-5	0-10	--
1,200	450	250	5-10	10-20	10
2,200	900	500	0-10	0-20	25

*In a 5-year frequency, 24-hour storm.

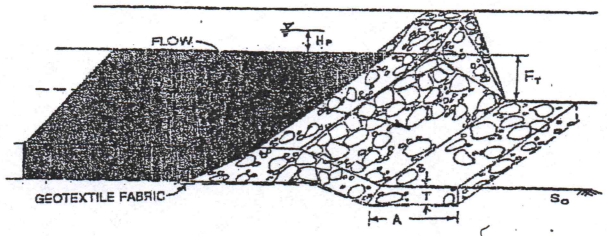


FIGURE - 1 LOOSE ROCK DROP

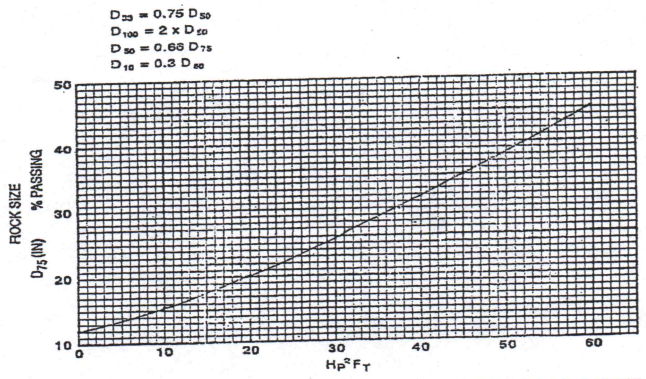
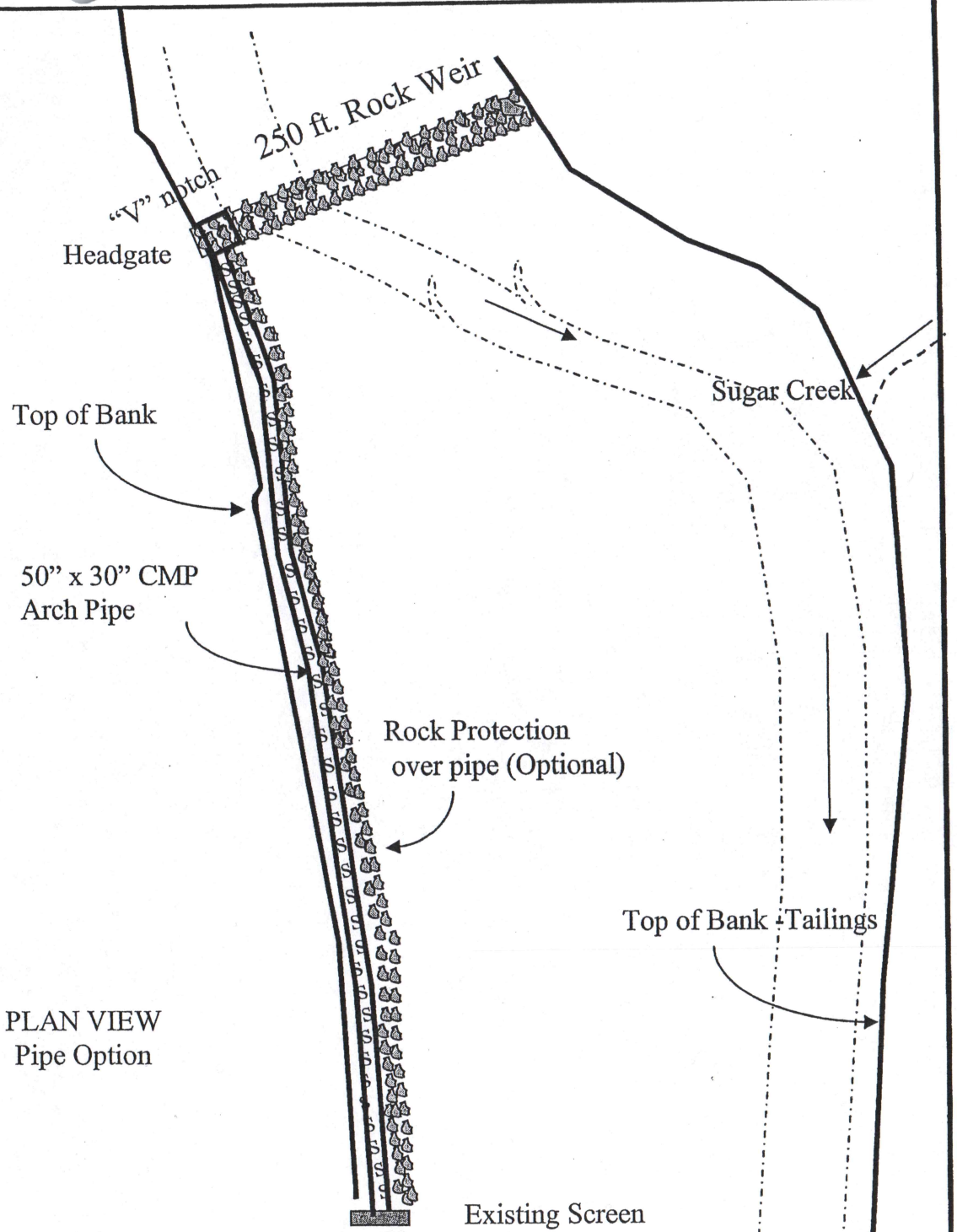
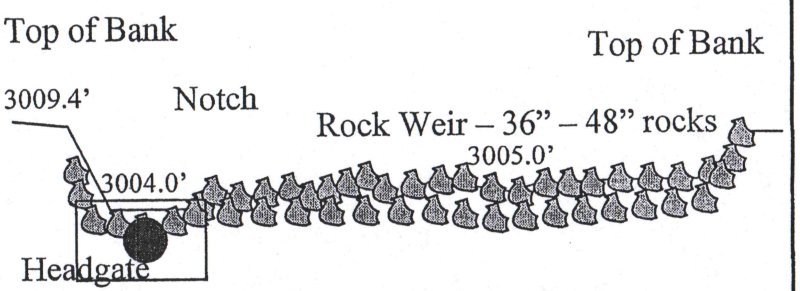


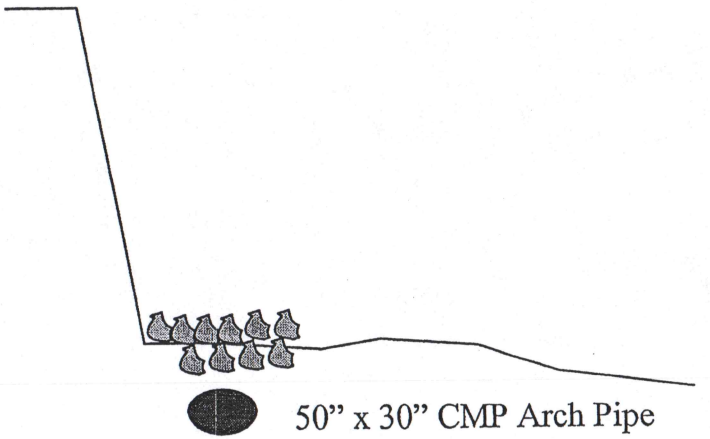
FIGURE - 2 DETERMINATION OF ROCK SIZE



PLAN VIEW
Pipe Option



CROSS SECTION AT WEIR
Looking upstream



CROSS SECTION AT PIPE
Looking upstream

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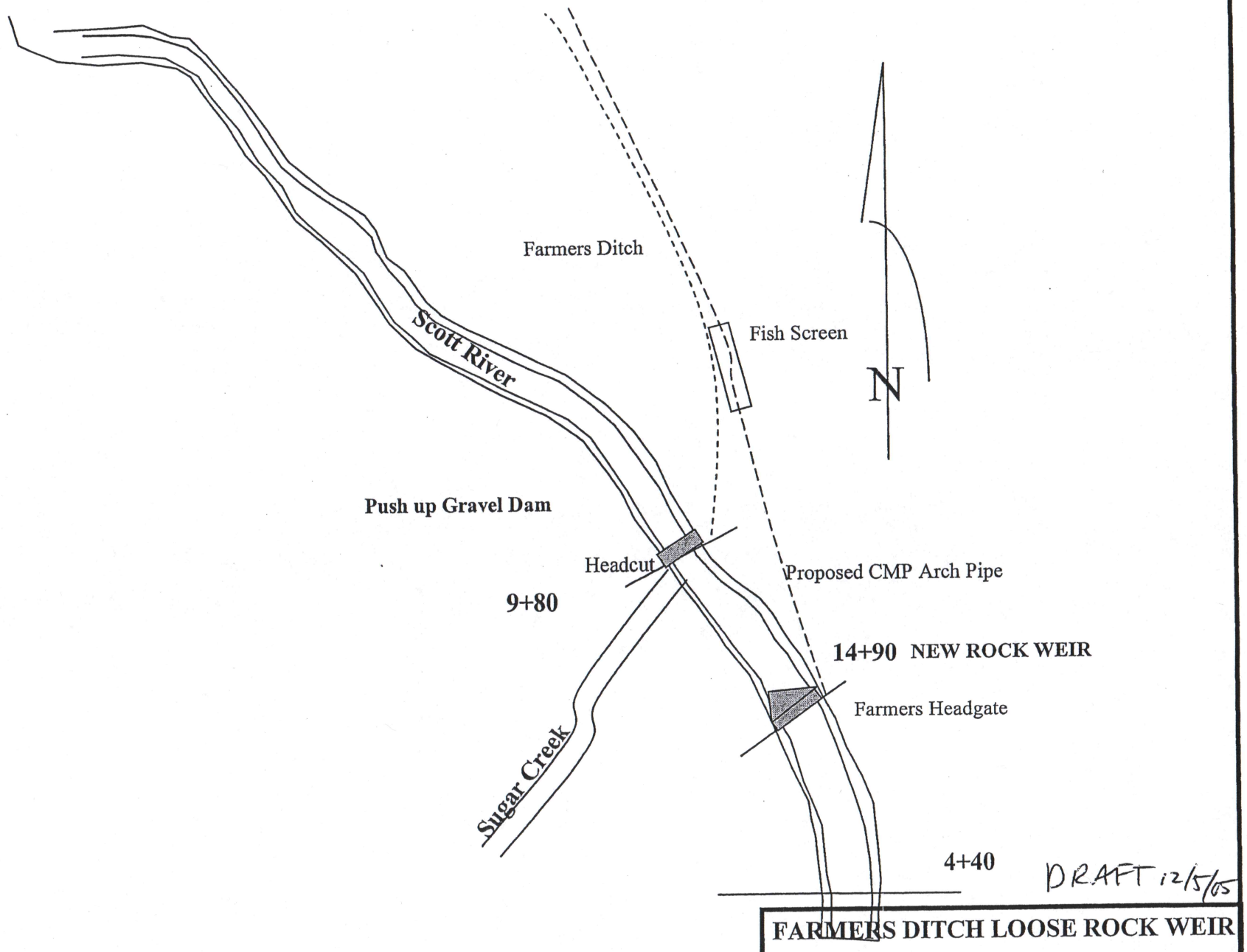
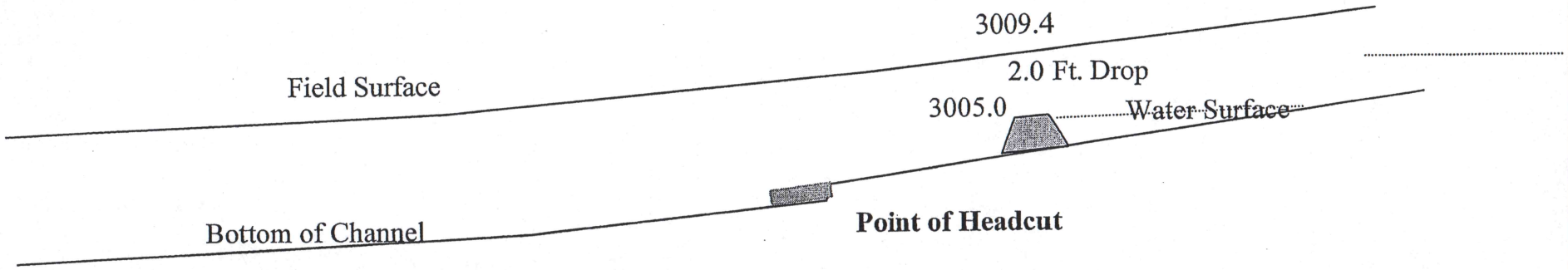
FARMERS DITCH- HEADWORKS

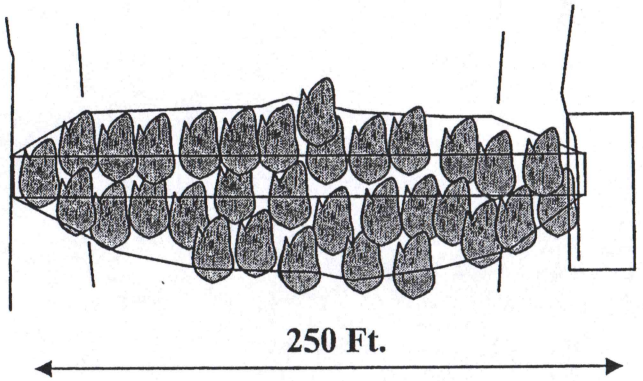
48" PIPE OPTION USDA NRCS

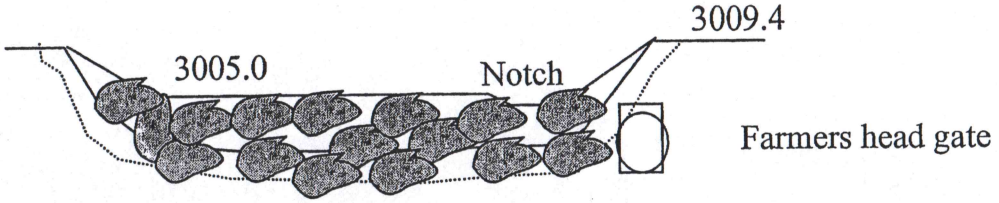


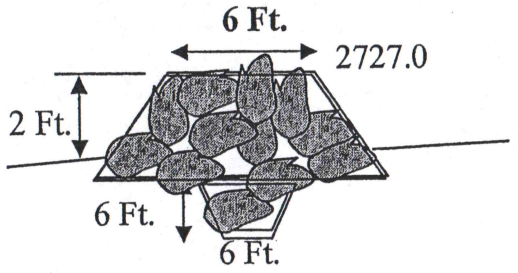
FARMERS DITCH LOOSE ROCK WEIR

NRCS YREKA, CA. 9/13/05









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FARMERS LOOSE ROCK WEIR

NRCS YREKA, CA. 9/13/05

Sources of Funds	Cash	In-kind (if applicable)	Total
Fisheries Restoration Grant Program	$25,000.00*	$	$25,000.00
Other State Agencies Name(s) and amount(s) of each:	$	$	$
Federal	$30,000.00	$10,000.00**	$40,000.00
Applicant	$	$ 1,200.00	$ 1,200.00
Other Sources	$	$	$
Total	$55,000.00	$11,200.00	$66,200.00

10/13/06

This budget includes funds for all costs associated with instream and fencing projects.

*$5,000 Restoration funds for administration of contract, $20,000 for materials, equipment, and labor

**$10,000 NRCS in-kind for planning and engineering services

Total budget available for materials, equipment, and labor: **$50,000**
Instream - $45,200 - $1,200 (4 trees) = **$44,000**
NRCS will contribute $25,500
CDFG will contribute $18,500 to cover 25% cost share
Fencing - $6,000 (1,300 ft x $4.62/ft = **$6,000**)
NRCS will contribute $4,500
CDFG will contribute $1,500 to cover 25% cost share