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INVITATION FOR BIDS
(Construction Contract)

INVITATION NO. FCD-73-2

DATE: March 8, 1973

BUCKEYE WATERSHED-SITE 1
APPROXIMATELY 8 MILES NORTHWEST
OF BUCKEYE, MARICOPA COUNTY, ARIZONA

ISSUED BY THE CONTRACTING
LOCAL ORGANIZATION:
FLOOD CONTROL DISTRICT OF
MARICOPA COUNTY

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Contract Copy
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INVITATION FOR BIDS
(Construction Contract)

INVITATION NO. FCD-73-2 LIBRARY

BUCKEYE WATERSHED-SITE 1
APPROXIMATELY 8 MILES NORTHWEST
OF BUCKEYE, MARICOPA COUNTY, ARIZONA

DATE: March 8, 1973

ISSUED BY THE CONTRACTING
LOCAL ORGANIZATION:
FLOOD CONTROL DISTRICT OF
MARICOPA COUNTY

Sealed bids, in single copy for the work described herein will be received until 2 p.m., local time at the place of bid opening, April 10, 1973, in the office of the Flood Control District, Maricopa County Highway Department Building, 3325 West Durango Street, Phoenix, Arizona 85009, and at that time publicly opened.

Prospective bidders may assemble at 508 North 4th Street, Buckeye, Arizona on Thursday, March 22, and Thursday, March 29, 1973, for a group showing of the work site. The group will leave Buckeye at 10:00 a.m., on each of the above days. If you are unable to attend one of the group showings, arrangements to inspect the site may be made with Colonel John C. Lowry, Contracting Officer for Flood Control District of Maricopa County, 3325 West Durango Street, Phoenix, Arizona 85009 (Phone: 278-7682).

Bid security in an amount of not less than twenty percent (20%) of the total bid price, must be submitted with bid. Security may be in the form of a bid bond, cashier's or certified check, postal money order, or cash. If a bid bond is used it must be executed on Form SCS-AS-158 (copies enclosed). If a check or money order is used, it must be made payable to the Flood Control District of Maricopa County. Bid security, other than bid bonds, submitted by unsuccessful bidders will be returned as soon as practicable after award of contract.

The successful bidder will be required to execute contract, Form SCS-AS-41. Also he will be required to furnish to the Contracting Local Organization a performance bond on Form SCS-AS-161 and a payment bond on Form SCS-AS-160 in penal sums of not less than one hundred percent (100%) and fifty percent (50%), respectively, of the original amount of the contract.

DESCRIPTION OF WORK: Construction of one earthfilled floodwater diversion structure at Site 1 in the Buckeye Watershed involving the estimated quantities shown in the attached bid schedule.

The work shall be commenced within twenty (20) calendar days and be completed within 400 calendar days after the date of receipt of the Notice to Proceed.

NOTICE: The Bid Schedule, General Provisions, Special Provisions, Equal Opportunity Clause, Certification of Nonsegregated Facilities, Instructions to Contractors, Contractor's Affirmative Action Plan, Specifications, and Drawings listed under contents will be incorporated in and become a part of the resultant contract.

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SPECIFICATION

Number	Title
CONSTRUCTION	
2	Clearing and Grubbing
3	Structure Removal
8	Mobilization
11	Removal of Water
21	Excavation
23	Earth Fill
24	Drain Fill
26	Salvaging and Spreading Topsoil
31	Concrete
34	Steel Reinforcement
41	Reinforced Concrete Pressure Pipe Spillway Conduits
51	Corrugated Metal Pipe Conduits

Number	Title
CONSTRUCTION	
61	Loose Rock Riprap
71	Water Control Gates
81	Metal Fabrication and Installation
82	Cleaning and Painting Metalwork
100	Seeding
MATERIALS	
521	Aggregates for Drain Fill and Filters
522	Aggregate for Portland Cement Concrete
523	Rock for Riprap
531	Portland Cement
532	Air-entraining Admixtures (for concrete)
533	Water-reducing and set-retarding Admixtures for Portland Cement Concrete
534	Curing Compound (for Concrete)
535	Preformed Expansion Joint Filler
536	Sealing Compound for Joints in Concrete and Concrete Pipe
537	Non-Metallic Waterstops
539	Steel Reinforcement (for Concrete)
541	Reinforced Concrete Pressure Pipe
551	Zinc-coated Iron or Steel Corrugated Pipe
572	Slide Gates (Sluice Gates), Metal, Moderate Duty
581	Metal
582	Galvanizing
DRAWINGS	
7-E-22084	Sheets 1 through 31

SPECIAL INSTRUCTIONS TO BIDDERS

1. Workweek - Construction Schedule

The Contractor shall, within 10 days after receipt of a written request from the Contracting Officer, and prior to award, submit in writing for approval: (a) the hours and days he proposes to carry out the work; and (b) a construction schedule showing the order in which he proposes to carry on the work indicating the periods during which he will perform work on each item listed in the bid schedule. Failure to submit the proposed construction schedule, and days and hours of work, within the time specified may be cause for rejection of the bid.

SCS-AS-39
Rev. 11-70
File Code AS-14

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service

INSTRUCTIONS TO BIDDERS (LOCAL CONTRACT)

1. EXPLANATIONS TO BIDDERS

Any explanation desired by a bidder regarding the meaning or interpretation of the invitation for bids, drawings, specifications, etc., must be requested in writing and with sufficient time allowed for a reply to reach bidders before the submission of their bids. Any interpretation made will be in the form of an amendment of the invitation for bids, drawings, specifications, etc., and will be furnished to all prospective bidders. Its receipt by the bidder must be acknowledged in the space provided on the bid form or by letter or telegram received before the time set for opening of bids. Oral explanations or instructions given before the award of the contract will not be binding.

2. CONDITIONS AFFECTING THE WORK

Bidders should visit the site and take such other steps as may be reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Failure to do so will not relieve bidders from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Contracting Local Organization will assume no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of the contract, unless included in the invitation for bids, the specifications, or related documents.

3. BIDDER'S QUALIFICATIONS

Before a bid is considered for award, the bidder may be requested by the Contracting Local Organization to submit a statement regarding his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the work.

4. BID GUARANTEE

Where a bid guarantee is required by the invitation for bids, failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

A bid guarantee shall be in the form of a firm commitment, such as a bid bond, postal money order, certified check, or cashier's check. Bid guarantees, other than bid bonds, will be returned (a) to unsuccessful bidders as soon as practicable after the opening of bids, and (b) to the successful bidder upon execution of such further contractual documents and bonds as may be required by the bid as accepted.

If the successful bidder, upon acceptance of his bid by the Contracting Local Organization within the period specified therein for acceptance (sixty days if no period is specified) fails to execute such further contractual documents, if any, and give such bond(s) as may be required by the terms of the bid as accepted within the time specified (ten days if no period is specified) after receipt of the forms by him, his contract may be terminated for default. In such event he shall be liable for any cost of procuring the work which exceeds the amount of his bid, and the bid guarantee shall be available toward offsetting such difference.

5. PREPARATION OF BIDS

(a) Bids shall be submitted on the forms furnished, or copies thereof, and must be manually signed. If erasures or other changes appear on the forms, each erasure or change must be initialed by the person signing the bid. Unless specifically authorized in the invitation for bids, telegraphic bids will not be considered.

(b) No bid will be considered unless all items in the bid schedule are priced. In case of error in the extension of price, the unit price shall

5. **PREPARATION OF BIDS**—Continued

govern. The quantities listed in the bid schedule on which unit prices are requested are estimates only.

(c) Unless called for, alternate bids will not be considered.

(d) Modification of bids already submitted will be considered if received at the office designated in the invitation for bids by the time set for opening of bids. Telegraphic modifications will be considered, but should not reveal the amount of the original or revised bid.

6. SUBMISSION OF BIDS

Bids must be sealed, marked and addressed as directed in the invitation for bids. Failure to do so may result in a premature opening of, or a failure to open, such bid.

7. LATE BIDS AND MODIFICATIONS OR WITHDRAWALS

(a) Bids and modifications or withdrawals thereof received at the office designated in the invitation for bids after the exact time set for opening of bids will not be considered unless: (1) They are received before award is made; and either (2) they are sent by registered mail, or by certified mail for which an official dated post office stamp (postmark) on the original Receipt for Certified Mail has been obtained and it is determined by the Contracting Local Organization that the late receipt was due solely to delay in the mails for which the bidder was not responsible; or (3) if submitted by mail (or by telegram if authorized), it is determined by the Contracting Local Organization that the late receipt was due solely to mishandling by the Contracting Local Organization after receipt at the Contracting Local Organization installation: PROVIDED, That timely receipt at such installation is established upon examination of an appropriate date or time stamp (if any) of such installation, or of other documentary evidence of receipt (if readily available) within the control of such installation or of the post office serving it. However, a modification which makes the terms of the otherwise successful bid more favorable to the Contracting Local Organization will be considered at any time it is received and may thereafter be accepted.

(b) Bidders using certified mail are cautioned to obtain a Receipt for Certified Mail showing a legible, dated postmark and to retain such receipt against the chance that it will be required as evidence that a late bid was timely mailed.

(c) The time of mailing of late bids submitted by registered or certified mail shall be deemed to be the last minute of the date shown in the postmark on the registered mail receipt or registered mail wrapper or on the Receipt for Certified Mail unless the bidder furnishes evidence from the post office station of mailing which establishes an earlier time. In the case of certified mail, the only acceptable evidence is as follows: (1) Where the Receipt for Certified Mail identifies the post office station of mailing, evidence furnished by the bidder which establishes that the business day of that station ended at an earlier time, in which case the time of mailing shall be deemed to be the last minute of the business day of that station; or (2) an entry in ink on the Receipt for Certified Mail showing the time of mailing and the initials of the postal employee receiving the item and making the entry, with appropriate written verification of such entry from the post office station of mailing, in which case the time of mailing shall be the time shown in the entry. If the postmark on the original Receipt for Certified Mail does not show a date, the bid shall not be considered.

8. WITHDRAWAL OF BIDS

Bids may be withdrawn by written or telegraphic request received from bidders prior to the time set for opening of bids.

9. PUBLIC OPENING OF BIDS

Bids will be publicly opened at the time set for opening in the invitation for bids. Their content will be made public for the information of bidders and others interested, who may be present either in person or by representative.

10. AWARD OF CONTRACT

(a) Award of contract will be made to that responsible bidder whose bid, conforming to the

10. AWARD OF CONTRACT–Continued

invitation for bids, is most advantageous to the Contracting Local Organization, price and other factors considered.

(b) The Contracting Local Organization may, when in its interest, reject any or all bids or waive any informality in bids received.

(c) Only one contract will be awarded and the award will be based on the total bid, corrected if necessary, for errors in price extensions and/or addition.

11. CONTRACT, BONDS AND INSURANCE

The bidder whose bid is accepted will, within the time established in the bid, enter into a written contract with the Contracting Local Organization, and if required, furnish performance and payment bonds on forms furnished by the Contracting Officer in the amounts indicated in the invitation for bids or the specifications. The bidder whose bid is accepted will secure and maintain such insurance as is required by statute and/or ordnance.

12. SPECIFICATIONS

Specifications referred to herein shall include all revisions and amendments in effect on the date of issuance of the invitation for bids. Information as to where these specifications may be obtained can be acquired from the office issuing this invitation.

13. RECORDS

Records of the site investigation and soil mechanics testing report may be reviewed by prospective bidders by contacting the office issuing this invitation.

NOTICE TO PROSPECTIVE FEDERALLY ASSISTED CONSTRUCTION CONTRACTORS

(a) A Certification of Nonsegregated Facilities must be submitted prior to the award of a federally assisted construction contract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause.

(b) Contractors receiving federally assisted construction contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity clause.

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

(a) A Certification of Nonsegregated Facilities must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause.

(b) Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity clause.

SCS-AS-51 (Formerly SCS-151)
Rev. 7-70
File Code AS-14

BID FORM
(CONSTRUCTION CONTRACT)

NAME AND LOCATION OF PROJECT	
Buckeye Watershed Approximately 8 miles northwest of Buckeye Maricopa County, Arizona	INVITATION NO. FCD-73-2 Date March 8, 1973

TO: Flood Control District of Maricopa County
3325 West Durango Street
Phoenix, Arizona

_____
Date

In compliance with the above-dated invitation for bids, the undersigned hereby proposes to perform all work for the construction of one earthfilled floodwater diversion structure designated as Site 1 within the Buckeye Watershed

in strict accordance with the terms, conditions, provisions, schedules, specifications, and drawings, for the following amoumt

Total Price Bid: dollars

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within _____ calendar days *(60 calendar days unless a different period be inserted by the bidder)* after the date of opening of bids, he will within 10 calendar days *(unless a longer period is allowed)* after receipt of the prescribed forms, execute Form SCS-AS-41, Contract and, if required by this invitation for bids, give performance and payment bonds on forms furnished by the Contracting Local Organization with good and sufficient surety.

The undersigned agrees, if awarded the contract, to commence the work within 20 calendar days after the date of receipt of notice to proceed, and to complete the work within 400 calendar days after the date of receipt of notice to proceed.

The bidder certifies that no official of the Sponsoring Local Organizations, the Contracting Local Organization, or any member of such official's immediate family, has direct or indirect interest in the pecuniary profits or contracts of this firm.

(Continue on other side)

The bidder represents *(Check appropriate boxes)*:

(1) That he ( ) has, ( ) has not, participated in a previous contract or subcontract subject to the Equal Opportunity clause herein, the clause originally contained in section 301 of Executive Order No. 10925, or the clause contained in section 201 of Executive Order No. 11114; that he ( ) has, ( ) has not, filed all required compliance reports; and that representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained prior to subcontract awards. (The above representation need not be submitted in connection with contracts or subcontracts which are exempt from the clause.)

(2) That he operates as an ☐ individual, ☐ partnership, ☐ joint venture, ☐ corporation, incorporated in State of _____

Receipt of Amendments: The undersigned acknowledges receipt of the following amendments of the invitation for bids, drawings, and/or specifications, etc. (Give number and date of each):

ENCLOSED IS BID GUARANTEE, IF REQUIRED, CONSISTING OF	IN THE AMOUNT OF $
NAME OF BIDDER (Type or print)	FULL NAME OF ALL PARTNERS (Type or print)
BUSINESS ADDRESS (Type or print)	
BY (Signature in ink. Type or print name under signature)	
TITLE (Type or print)	

DIRECTIONS FOR SUBMITTING BIDS	ENVELOPES CONTAINING BIDS, GUARANTEE, ETC, MUST BE SEALED, MARKED, AND ADDRESSED AS FOLLOWS: Contracting Officer Flood Control District of Maricopa County 3325 West Durango Street Phoenix, Arizona 85009

CAUTION: Bids should not be qualified by exceptions to the bidding conditions.

BID FORM (CONSTRUCTION CONTRACT) - Continued

The bidder represents (check appropriate blocks):

(3) That (1) he ☐ has developed and has on file ☐ has not developed and does not have on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor (41 CFR 60-1 and 60-2), or (2) he ☐ has not previously had contracts subject to the written affirmative action program requirement of the rules and regulations of the Secretary of Labor.

BID SCHEDULE			BUCKEYE WATERSHED SITE 1			
ITEM NO.	WORK OR MATERIAL	SPEC. NO.	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1.	Clearing and Grubbing	2	687	Acre	$	$
2.	Structure Removal	3	6,700	Lin.Ft.	$	$
3.	Mobilization	8	- - -	Job	$	$
4.	Channel Excavation, Common 1/	21	554,700	Cu.Yd.	$	$
5.	Foundation Excavation, Common 2/	21	735,500	Cu.Yd.	$	$
6.	Structure Excavation	21	191	Cu.Yd.	$	$
7.	Earth Fill, Compacted 2/	23	2,694,800	Cu.Yd.	$	$
8.	Earth Fill, Uncompacted 3/	23	38,158	Cu.Yd.	$	$
[illegible]	Structure Backfill	23	8,800	Cu.Yd.	$	$
10.	Salv. & Sprd. Topsoil 2/	26	182,700	Sq.Yd.	$	$
11.	Concrete	31	279	Cu.Yd.	$	$
12.	Cement	31	419	Bbl.	$	$
13.	Steel Reinforcement	34	14,328	Lbs.	$	$
14.	R/C Press ure Pipe, 60-Inch Diameter, Stations 907+79.14 to 909+55.5	41	176	Lin.Ft.	$	$
15.	R/C Pipe, 60-Inch Diameter, Stations 909+55.5 to 918+82.69	41	927	Lin.Ft.	$	$
[illegible]	R/C Pipe, 12-Inch Diameter, Stations 710+00 and 817+00	41	320	Lin.Ft.	$	$
	CORRUGATED METAL PIPE					
17.	(a) 85"x54" 12-gage Pipe Arch	51	340	Lin.Ft.	$	$
18.	(b) 29"x48" 14-gage Pipe Arch	51	120	Lin.Ft.	$	$
19.	(c) 15" 16-gage Pipe	51	96	Lin.Ft.	$	$
20.	Special Fittings, 8-End Sections, 2 Prefabricated Tee Sections	51	- - -	Job	$	$
21.	Loose Rock Riprap	61	402	Cu.Yd.	$	$
22.	Water Control Gates, 12"	71	2	Each	$	$
23.	Metal Fabrication, 3-Trash Racks	81	- - -	Job	$	$
24.	Seeding	100	38	Acre	$	$
	TOTAL BID FOR SITE 1					$

GENERAL PROVISIONS

(CONSTRUCTION CONTRACT)

1. DEFINITIONS

Terms used or referred to herein are defined as follows:

(a) Contracting Local Organization: The organization or agency awarding the contract.

(b) Contracting Officer: The person who is designated and authorized to enter into and administer this contract on behalf of the Contracting Local Organization or his duly appointed successor or authorized representative.

(c) Engineer: The person or his representative who is responsible for determining that the construction work conforms to the technical requirements as set forth in the drawings and specifications.

2. SPECIFICATIONS AND DRAWINGS

The Contractor shall keep on the work a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy either in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at his own risk and expense. The Contracting Officer shall furnish from time to time such detail drawings and other information as he may consider necessary, unless otherwise provided.

3. CHANGES

(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make any change in the work within the general scope of the contract, including but not limited to changes:

(1) In the specifications (including drawings and designs);

(2) In the method or manner of performance of the work;

(3) In the Contracting Local Organization-furnished facilities, equipment, materials, services, or site; or

(4) Directing acceleration in the performance of the work.

(b) Any other written order or an oral order (which terms as used in this paragraph (b) shall include direction, instruction, interpretation, or determination) from the Contracting Officer, which causes any such change, shall be treated as a change order under this clause, provided that the Contractor gives the Contracting Officer written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a change order.

(c) Except as herein provided, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment hereunder.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any order, an equitable adjustment shall be made and the contract modified in writing accordingly: *Provided, however,* That except for claims based on defective specifications, no claim for any change under (b) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as therein required: *And provided further,* That in the case of defective specifications for which the Contracting Local Organization is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with such defective specifications.

(e) If the Contractor intends to assert a claim for an equitable adjustment under this clause, he must, within 30 days after receipt of a written change order under (a) above or the furnishing of a written notice under (b) above, submit to the Contracting Officer a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended by the Contracting Officer. The statement of claim hereunder may be included in the notice under (b) above.

(f) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

4. DIFFERING SITE CONDITIONS

(a) The Contractor shall promptly, and before such conditions are disturbed, notify the Contracting Officer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract. The Contracting Officer shall promptly investigate the conditions, and if he finds that such conditions do materially so

4. DIFFERING SITE CONDITIONS–Continued

differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

(b) No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in (a) above; provided, however, the time prescribed therefor may be extended by the Contracting Officer.

(c) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

5. TERMINATION FOR DEFAULT - DAMAGES FOR DELAY - TIME EXTENSIONS

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within such time, the Contracting Local Organization may, by written notice to the Contractor, terminate his right to proceed with the work or such part of the work as to which there has been delay. In such event the Contracting Local Organization may take over the work and prosecute the same to completion, by contract or otherwise, and may take possession of and utilize in completing the work such materials, appliances, and plant as may be on the site of the work and necessary therefor. Whether or not the Contractor's right to proceed with the work is terminated, he and his sureties shall be liable for any damage to the Contracting Local Organization resulting from his refusal or failure to complete the work within the specified time.

(b) If fixed and agreed liquidated damages are provided in the contract and if the Contracting Local Organization so terminates the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Contracting Local Organization in completing the work.

(c) If fixed and agreed liquidated damages are provided in the contract and if the Contracting Local Organization does not so terminate the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until the work is completed or accepted.

(d) The Contractor's right to proceed shall not be so terminated nor the Contractor charged with resulting damage if:

(1) The delay in the completion of the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the Contracting Local Organization in its contractual capacity, acts of another contractor in the performance of a contract with the Contracting Local Organization, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and such subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any such delay (unless the Contracting Officer grants a further period of time before the date of final payment under the contract), notifies the Contracting Officer in writing of the causes of delay.

The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in his judgment, such an extension is justified.

(e) The rights and remedies of the Contracting Local Organization provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

(f) As used in paragraph (d)(1) of this clause, the term 'Subcontractors and Suppliers' means Subcontractors and Suppliers at any tier.

6. CLAIMS

Any claim by the Contractor arising by virtue of this contract which is not disposed of by agreement shall be submitted in writing, together with any written and oral evidence in support thereof, to the Contracting Officer for decision. Before making a decision the Contracting Officer shall notify the Contractor that any additional written and/or oral evidence in support of the claim may be presented to the Contracting Officer within 30 days from receipt by the Contractor of such notification, or within such further period of time as may be granted by the Contracting Officer. The Contracting Officer shall make his decision in writing and mail or otherwise furnish a signed copy thereof to the Contractor. Pending the decision of the Contracting Officer the Contractor shall proceed diligently with the performance of this contract.

7. PAYMENTS TO CONTRACTOR

(a) The Contracting Local Organization will pay the contract price as hereinafter provided.

(b) The Contracting Local Organization will make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for

7. PAYMENTS TO CONTRACTOR–Continued

determining progress payments. In the preparation of estimates the Contracting Officer, at his discretion, may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site may also be taken into consideration (1) if such consideration is specifically authorized by the contract and (2) if the Contractor furnishes satisfactory evidence that he has acquired title to such material and that it will be utilized on the work covered by this contract.

(c) In making such progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer, at any time after 50 percent of the work has been completed, finds that satisfactory progress is being made, he may authorize any of the remaining progress payments to be made in full. Also, whenever the work is substantially complete, the Contracting Officer, if he considers the amount retained to be in excess of the amount adequate for the protection of the Contracting Local Organization, at his discretion, may release to the Contractor all or a portion of such excess amount. Furthermore, on completion and acceptance of each separate building, public work, or other division of the contract on which the price is stated separately in the contract, payment may be made therefor without retention of a percentage.

(d) All material and work covered by progress payments made shall thereupon become the sole property of the Contracting Local Organization, but this provision shall not be construed as relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work, or as waiving the right of the Contracting Local Organization to require the fulfillment of all of the terms of the contract.

(e) Upon completion and acceptance of all work, the amount due the Contractor under this contract shall be paid after the Contractor shall have furnished the Contracting Local Organization with a release of all claims against the Contracting Local Organization arising by virtue of this contract, other than claims in stated amounts as may be specifically excepted by the Contractor from the operation of the release. If the Contractor's claim to amounts payable under the contract has been assigned, a release may also be required of the assignee.

8. MATERIAL AND WORKMANSHIP

(a) Unless otherwise specifically provided in this contract, all equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in this contract, reference to any equipment, material, article, or patented process, by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition, and the Contractor may, at his option, use any equipment, material, article, or process which, in the judgment of the Contracting Officer, is equal to that named. The Contractor shall furnish to the Contracting Officer for his approval the name of the manufacturer, the model number, and other identifying data and information respecting the performance, capacity, nature, and rating of the machinery and mechanical and other equipment which the Contractor contemplates incorporating in the work. When required by this contract or when called for by the Contracting Officer, the Contractor shall furnish the Contracting Officer for approval full information concerning the material or articles which he contemplates incorporating in the work. When so directed, samples shall be submitted for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles installed or used without required approval shall be at the risk of subsequent rejection.

(b) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may, in writing, require the Contractor to remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

9. INSPECTION AND ACCEPTANCE

(a) Except as otherwise provided in this contract, inspection and test by the Contracting Local Organization of material and workmanship required by this contract shall be made at reasonable times and at the site of the work, unless the Contracting Officer determines that such inspection or test of material which is to be incorporated in the work shall be made at the place of production, manufacture, or shipment of such material. To the extent specified by the Contracting Officer at the time of determining to make off-site inspection or test, such inspection or test shall be conclusive as to whether the material involved conforms to the contract requirements. Such off-site inspection or test shall not relieve the Contractor of responsibility for damage to or loss of the material prior to acceptance, nor in any way affect the continuing rights of the Contracting Local Organization after acceptance of the completed work under the terms of paragraph (f) of this clause, except as hereinabove provided.

(b) The Contractor shall, without charge, replace any material or correct any workmanship found by the Contracting Local Organization not to conform to the contract requirements, unless in the public interest the Contracting Local Organization consents to accept such material or workmanship with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

9. INSPECTION AND ACCEPTANCE–Continued

(c) If the Contractor does not promptly replace rejected material or correct rejected workmanship, the Contracting Local Organization (1) may, by contract or otherwise, replace such material or correct such workmanship and charge the cost thereof to the Contractor, or (2) may terminate the Contractor's right to proceed in accordance with Clause 5 of these General Provisions.

(d) The Contractor shall furnish promptly, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspection and test as may be required by the Contracting Officer. All inspection and test by the Contracting Local Organization shall be performed in such manner as not unnecessarily to delay the work. Special, full size, and performance tests shall be performed as described in this contract. The Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready at the time specified by the Contractor for its inspection.

(e) Should it be considered necessary or advisable by the Contracting Local Organization at any time before acceptance of the entire work to make an examination of work already completed, by removing or tearing out same, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, an equitable adjustment shall be made in the contract price to compensate the Contractor for the additional services involved in such examination and reconstruction and, if completion of the work has been delayed thereby, he shall, in addition, be granted a suitable extension of time.

(f) Unless otherwise provided in this contract, acceptance by the Contracting Local Organization shall be made as promptly as practicable after completion and inspection of all work required by this contract. Acceptance shall be final and conclusive except as regards latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Contracting Local Organization's rights under any warranty or guarantee.

10. SUPERINTENDENCE BY CONTRACTOR

The Contractor shall give his personal superintendence to the work or have a competent foreman or superintendent, satisfactory to the Contracting Officer, on the work at all times during progress, with authority to act for him.

11. PERMITS AND RESPONSIBILITIES

The Contractor shall, without additional expense to the Contracting Local Organization, be responsible for obtaining any necessary licenses and permits, and for complying with any applicable Federal, State, and municipal laws, codes, and regulations, in connection with the prosecution of the work. He shall be similarly responsible for all damages to persons or property that occur as a result of his fault or negligence. He shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. He shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire construction work, except for any completed unit of construction thereof which theretofore may have been accepted.

12. CONDITIONS AFFECTING THE WORK

The Contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Any failure by the Contractor to do so will not relieve him from responsibility for successfully performing the work without additional expense to the Contracting Local Organization. The Contracting Local Organization assumes no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of this contract, unless such understanding or representations by the Contracting Local Organization are expressly stated in the contract.

13. OTHER CONTRACTS

The Contracting Local Organization may undertake or award other contracts for additional work, and the Contractor shall fully cooperate with such other contractors and Contracting Local Organization employees and carefully fit his own work to such additional work as may be directed by the Contracting Officer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other contractor or by Contracting Local Organization employees.

14. PATENT INDEMNITY

Except as otherwise provided, the Contractor agrees to indemnify the Contracting Local Organization and its officers, agents and employees against liability, including costs and expenses, for infringement upon any Letters Patent of the United States (except Letters Patent issued upon an application which is now or may hereafter be, for reasons of national security, ordered by the Government to be kept secret or otherwise withheld from issue) arising out of the performance of this contract or out of the use or disposal by or for the account of the Contracting Local Organization of supplies furnished or construction work performed hereunder.

15. ADDITIONAL BOND SECURITY

If any surety upon any bond furnished in connection with this contract becomes unacceptable to the Contracting Local Organization, or if any such surety fails to furnish reports as to his financial condition from time to time as requested by the Contracting Local Organization, the Contractor shall promptly furnish such additional security as may be required from time to time to protect the interests of the Contracting Local Organization and of persons supplying labor or materials in the prosecution of the work contemplated by this contract.

16. LAND RIGHTS

(a) Adequate land rights needed in order to perform the work under this contract have been acquired by or on behalf of the Contracting Local Organization. The right to enter, remove, or otherwise make use of adjacent property, roads, utility lines, fences, and other improvements not included within the land rights provided shall be the sole responsibility of the Contractor.

(b) Where ingress and egress is not defined on the drawings, the Contracting Officer shall designate the right-of-way to be used.

17. RECORDS OF TEST PITS AND BORINGS

The Contracting Local Organization does not represent that the available records show completely the existing conditions and does not guarantee any interpretation of these records. The Contractor assumes all responsibility for deductions and conclusions as to the nature of rock and other materials to be excavated, the difficulties of making and maintaining the required excavations and of doing other work affected by the geology of the site of the work, and for the final preparation of the foundations for the spillway, dikes, and other structures.

18. MATERIALS TO BE FURNISHED BY THE CONTRACTOR

(a) Unless otherwise specified in this contract, the Contractor shall furnish all materials required for the completion of the contract.

(b) Unless otherwise waived in writing by the Contracting Officer, the Contractor shall furnish the Contracting Local Organization with certifications dated and signed by the manufacturer and/or supplier to the effect that the items listed therein meet the requirements of this contract. Such certifications shall be furnished prior to the use of the material in any part of the construction and shall identify the project on which the material is to be used.

19. WATER

Unless otherwise specified in this contract, the Contractor shall provide and maintain at his own expense an adequate supply of water suitable for construction purposes.

20. ACCIDENT PREVENTION AND SAFETY MEASURES

The Contractor shall comply with the safety and health standards in the manual, Construction Safety Standards, published by the United States Department of the Interior, Bureau of Reclamation, in effect on the date of the issuance of the Invitation for Bids, with the following modifications:

(a) Reference to the Bureau of Reclamation shall be interpreted as reference to the Contracting Local Organization.

(b) Subsections 9.6, 9.7 and 9.9 (except paragraph 9.9.5) are applicable regardless of the year in which the equipment was manufactured, the struck capacity of the equipment, or the aggregate amount of the contract. Paragraph 9.9.5 is applicable to equipment manufactured after January 1, 1969, regardless of the struck capacity of the equipment, or the aggregate amount of the contract.

(c) Equipment without the protective canopies and rollover protective structures prescribed in Subsections 9.6, 9.7, 9.8 and 9.9 may be used only with written approval of the Contracting Officer. Requests shall be in writing and supported by evidence that every reasonable effort has been made to comply with the contractual requirement.

Supporting data shall include, but not be limited to, evidence that an order for the canopies and rollover structures has been placed with appropriate suppliers and the expected date of delivery is early enough to insure installation prior to completion of contract.

(d) The Contractor shall hold and save the Contracting Local Organization free from any claims or causes of action whatsoever resulting from the Contractor or his subcontractor proceeding without the prescribed protective canopies and rollover protective structures, even though approved by the Contracting Officer.

(e) The reference in Appendix A, No. 23, page 337 is changed to: American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.

21. LIGHTING REQUIREMENTS

When work is carried on between the hours of sunset and sunrise, the construction areas shall be adequately lighted to provide safe working conditions while work is in progress. Lighting shall be established in accordance with the manual, Construction Safety Standards.

22. WORKWEEK–CONSTRUCTION SCHEDULE

(a) The Contractor shall, prior to commencement of work, submit to the Contracting Officer, in writing for approval, the hours and days in which he proposes to carry on the work. The Contractor shall, within 10 days following the commencement of work, prepare and submit to the Contracting Officer for approval a construction schedule showing the order in which the Contractor proposes to carry on the work indicating the periods during which he will perform work on each item listed in the bid schedule. If the Contractor fails to submit the construction schedule within the time herein specified or fails to submit a revised construction schedule within the time specified by the Contracting Officer, the Contracting Officer may withhold approval of progress payment estimates and/or take such other actions as provided in this contract until such time as the Contractor submits the required construction schedule.

(b) If, in the opinion of the Contracting Officer, the Contractor falls behind the construction schedule, the Contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may require him to either increase the number of shifts, days or hours of work, or the amount of construction plant, or all of them, and to submit for approval such revised construction schedule as may be deemed necessary to show the manner in which the agreed rate of progress will be regained, all without additional cost to the Contracting Local Organization.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for determination by the Contracting Officer that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part thereof, in accordance with Clause 5 of these General Provisions.

23. SUBCONTRACTORS

(a) Work shall not be subcontracted in whole or in part without the prior written approval of the Contracting Officer. The request shall be in writing with the name of the proposed subcontractor and a description of the work to be done.

(b) If at any time the Contracting Officer determines that any subcontractor is incompetent or undesirable, he shall notify the Contractor accordingly and the Contractor shall take immediate steps for cancellation of the subcontract.

(c) Subcontracting by subcontractors shall be subject to the above requirements.

(d) Nothing contained in this contract shall create any contractual relationship between any subcontractor and the Contracting Local Organization.

24. SURVEYS

(a) Unless otherwise stated in the Invitation for Bids, only the basic staking shall be done by the Contracting Local Organization. If the Contracting Local Organization does the staking, the Contractor shall notify the Contracting Officer in advance of any staking required in order that such work can be properly scheduled.

(b) Bench marks shall be preserved by the Contractor, and in the case of their destruction or removal by him or his employees they shall be replaced by the Contracting Local Organization at the Contractor's expense.

(c) Survey stakes destroyed or removed by the carelessness of the Contractor or his employees shall be replaced by the Contracting Local Organization at the Contractor's expense. Stakes removed or destroyed in the due course of the work shall be replaced by the Contracting Local Organization without cost to the Contractor.

(d) If the Contractor finds any errors or omissions in the layout as given by survey points or staking, he shall immediately inform the Contracting Officer in writing.

25. SUSPENSION OF WORK

(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as he may determine to be appropriate for the convenience of the Contracting Local Organization.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Contracting Officer in the administration of this contract, or by his failure to act within the time specified in this contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent (1) that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or (2) for which an equitable adjustment is provided for or excluded under any other provision of this contract.

(c) No claim under this clause shall be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment under the contract.

26. WEATHER

(a) The Contracting Officer may order suspension of the work in whole or in part, commencing with the day after receipt of the Notice to Proceed by the Contractor, due to weather or the effects of weather at the site, for such time as he considers it unfavorable for satisfactory prosecution of the work.

(b) When the Contracting Officer orders suspension under (a) of this clause, the contract completion date shall be extended a full calendar day for each calendar day during suspension of the work if:

(1) All work is suspended except minor items as may be designated in this contract (work of an emergency, protective or maintenance nature may be performed at any time); and

(2) The hours lost in any one workday of the authorized workweek through suspension equal one-half or more of the hours of an authorized workday.

(c) If the Contracting Officer orders suspension of work as provided in (b) of this clause and the hours lost in the workday immediately preceding a nonworkday equal one-half or more of the hours in an authorized workday, the contract completion date shall be extended a full calendar day for each nonworkday during suspension of the work.

(d) When the Contracting Officer orders any suspension of the work under this clause, the Contractor shall not be entitled to any cost or damages resulting from such suspension.

(e) When the contract completion date is extended under this clause, the contract shall be modified in writing accordingly.

27. NONCOMPLIANCE WITH CONTRACT REQUIREMENTS

(a) The Contracting Officer may order suspension of the work in whole or in part for such time as he deems necessary because of the failure of the Contractor to comply with any of the requirements of this contract, and the contract completion date shall not be extended on account of any such suspension of the work.

(b) When the Contracting Officer orders any suspension of the work under (a) of this clause, the Contractor shall not be entitled to any costs or damages resulting from such suspension.

(c) The rights and remedies of the Contracting Local Organization provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

28. QUANTITY VARIATIONS

(a) Where the quantity of work shown for an item in the bid schedule, including any modification thereof, is estimated, no adjustment of the contract price nor of the performance time shall be made for overruns or underruns which are within 25 percent of the estimated quantity of any such item.

(b) For overruns of more than 25 percent, the Contracting Officer shall re-estimate the quantity for the item, establish an equitable contract price for the overrun of more than 25 percent, adjust contract performance time equitably, and modify the contract in writing accordingly; this clause to thereafter be applicable to the total re-estimated item quantity.

(c) For underruns of more than 25 percent, the Contracting Officer shall determine the quantity for the item, establish an equitable contract price therefor, adjust contract performance time equitably, and modify the contract in writing accordingly.

29. CLEANUP WORK

(a) During construction the Contractor shall keep the work site, areas adjacent to the work site and access roads in an orderly condition, free and clear from debris and discarded materials. Care shall be taken to prevent spillage when hauling is being done. Any spillage or debris resulting from the Contractor's operations shall be immediately removed.

(b) Upon completion of the work the Contractor shall remove from the work site, areas adjacent to the work site and access roads: all plant, buildings, debris, unused materials, concrete forms and other like material belonging to him or used under his direction during the construction. He shall grade all access roads, other than public, removing wheel tracks and smoothing up such roads.

30. ASSIGNMENT

The Contractor shall not assign in whole or in part this contract without the prior written consent of the Contracting Local Organization. The Contractor shall not assign any moneys due or to become due to him under this contract without the prior written consent of the Contracting Local Organization.

31. FEDERAL, STATE, AND LOCAL TAXES

Except as otherwise provided, contract unit prices shall include all applicable Federal, State, and local taxes.

UNITED STATES DEPARTMENT OF AGRICULTURE

INSTRUCTIONS TO CONTRACTORS

FOR COMPLIANCE WITH EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS UNDER EXECUTIVE ORDER 11246 AND EXECUTIVE ORDER 11375 FOR FEDERAL PROCUREMENT OF CONSTRUCTION, PERSONAL PROPERTY, NONPERSONAL SERVICES, AND FEDERALLY-ASSISTED CONSTRUCTION.

Your obligation under the Equal Opportunity clause of Executive Order 11246, as amended by Executive Order 11375, is to take affirmative action in providing equal employment opportunity. Reviews made by this Department as the Equal Employment Opportunity Compliance Agency for your Company or by the Office of Federal Contract Compliance, U. S. Department of Labor, may disclose the need for special commitments on your part to achieve equal employment opportunity compliance. Their proper discharge will be essential to performance of your contract.

As a minimum, your obligations under the Equal Opportunity clause of your contract requires you to observe the following:

1. NOTICE. The notice "Equal Employment Opportunity is the Law" is to be displayed in conspicuous places, available to all employees and applicants for employment. It must be similarly displayed by you in the performance of your contract. The notice is available from the contracting officer.

2. EQUAL OPPORTUNITY POLICY. Your equal employment opportunity policy is to be put in writing and communicated to all employees, offices, plants or other facilities. It is most important that this policy be fully understood by supervisory personnel and effectively implemented.

3. NOTICE TO LABOR UNIONS AND OTHER ORGANIZATIONS OF WORKERS. The requirement in paragraph (c) of the Equal Opportunity clause that you will send a notice to each labor union or representative of workers with which you have a collective bargaining agreement or other contract or understanding, will be satisfied whenever you or your subcontractors post a copy of the notice "Equal Employment Opportunity is the Law" in conspicuous places.

4. CERTIFICATE OF NON-SEGREGATED FACILITIES. If your contract exceeds $10,000 you must certify that you do not maintain or allow in a workplace under your control employee facilities which are segregated on basis of race, color, religion, or national origin, whether by directive or through custom.

5. INCLUSION OF EQUAL OPPORTUNITY CLAUSE IN SUBCONTRACTS. If your contract is in excess of $10,000 you are required to include the Equal Opportunity clause in subcontracts and purchase orders in excess of $10,000. If the subcontract is less than $50,000 the clause may be incorporated by reference.

6. APPLICATION FORMS. Application forms used in employment must not request or record information which can be used to identify an applicant's race, color, religion, sex, or national origin.

7. AFFIRMATIVE ACTION PLAN. The Equal Opportunity clause of your contract obligates you to take affirmative action to assure applicants and employees that there will be no discrimination on account of race, color, religion, sex, or national origin. Guidelines for the requirements of this plan are contained on the reverse side of this form. The plan must be updated annually.

8. REPORTS. If you employ 100 or more persons you are required to file annually, on or before the 31st day of March, complete and accurate reports on Standard Form 100 - (EEO - 1). A prime contractor is responsible for seeing that his non-exempt first tier subcontractors file the report and each prime subcontractor shall cause its subcontractors to file the report.

UNITED STATES DEPARTMENT OF AGRICULTURE

CONTRACTOR'S AFFIRMATIVE ACTION PLAN FOR EQUAL EMPLOYMENT OPPORTUNITY UNDER EXECUTIVE ORDER 11246 AND EXECUTIVE ORDER 11375 FOR FEDERAL PROCUREMENT OF CONSTRUCTION, PERSONAL PROPERTY, NONPERSONAL SERVICES, AND FEDERALLY-ASSISTED CONSTRUCTION

Employers of more than 50 persons who hold Government Contracts or subcontracts of $50,000 or more are required to have at each installation, within 120 days from the commencement of a contract, a written program (hereinafter referred to as the "plan") of affirmative action to assure that all employment and the conditions of employment at each installation are free of discrimination on account of race, color, religion, sex or national origin. Detailed requirements with which the contractor must comply are stated in Title 41, Code of Federal Regulations, Part 60, sections 2, 3, and 20. The plan must provide for the following actions:

1. Analyze all major job classifications to determine if minorities or women are currently being underutilized in any one or more job classifications (job "classification" meaning one or a group of jobs having similar content, wage rates and opportunities). "Underutilization" is defined as having fewer minorities or women in a particular job classification than would reasonably be expected by their availability. Separate work force analysis shall be made for minorities and women.

2. Establish specific goals and timetables to correct any deficiencies and record progress toward these goals.

3. Identify and analyze, by job classification, minority and female components of the labor pool available to the contractor facility. Sources of information are local Boards of Trade, Chamber of Commerce, U. S. Employment Service, minority and female group leaders, school authorities, vocational services, and women's organizations.

4. Require all personnel actions to be in accord with the plan.

5. Inform all employees and job applicants of the companies' equal employment opportunity policy.

6. Assure that personnel policies and practices are in compliance with the Sex Discrimination Guidelines (41 CFR Part 60-20).

7. Support local and national community service programs (e.g., programs of National Alliance of Businessmen, Urban Coalition and other organizations concerned with employment opportunities for minorities and women).

8. Whenever tests are used as a basis for making a decision to hire, promote, transfer, train, or to retain employees, insure that the test fairly predicts whether the applicant can perform the job for which tested and does not result in rejection for reasons unrelated to his capability to do the job. Additional detailed information concerning the use of tests and other selection procedures can be found in Title 41, Code of Federal Regulations, Part 60-3.

9. All solicitations for applicants shall include the phrase, "an equal opportunity employer." Advertisements shall be placed so as to reach all population elements in the community.

Form AD-425 (1-72)
AGPR (41 CFR) 4-12.810

SPECIAL PROVISIONS

1. Liquidated Damages: If the work, or any part thereof, is not completed within the time agreed upon in this contract or any extension thereof, the Contractor shall be liable to the Contracting Local Organization in the amount of $222.00 per day for each and every calendar day the completion of the work is delayed beyond the time provided in this contract, as fixed and agreed liquidated damages and not as a penalty; and the Contracting Local Organization shall have the right to deduct from and retain out of moneys which may be then due or which may become due and payable to the Contractor, the amount of such liquidated damages; and if the amount so retained by the Contracting Local Organization is insufficient to pay in full such liquidated damages, the Contractor shall pay to the Contracting Local Organization the amount necessary to effect payment in full of such liquidated damages.

2. Clause 20, Accident Prevention and Safety Measures, Form SCS-AS-43, General Provisions, is deleted and the following clause is substituted therefor:

   Accident Prevention and Safety Measures: The Contractor shall comply with the manual, Safety and Health Regulations for Construction, published by the United States Department of the Interior, Bureau of Reclamation, in effect on the date of issuance of the invitation for bids, with the following modifications:

   (a) Reference to the Bureau of Reclamation shall be interpreted as reference to the Contracting Local Organization.

   (b) Paragraph 3B, page ii, is changed by the addition of: "Requests shall be made in writing supported by evidence that every reasonable effort has been made to comply with the contractual requirements. The Contractor shall hold and save the Contracting Local Organization free from any claims or causes of action whatsoever resulting from the Contractor or his subcontractors proceeding under a waiver or approved adaptation."

   (c) Subsection 9.7.1 of Part II is applicable regardless of the year in which the equipment was manufactured. Subsection 9.9.1 of Part II is applicable regardless of the year in which the equipment was manufactured, or the struck capacity of the equipment. Subsection 9.9.4 of Part II is applicable regardless of the struck capacity of the equipment.

   (d) Subparagraph 1518.550(a)(3) of Part I is changed to "A boom angle indicator in good working order shall be provided."

(See Over)

3. Clause 22, Workweek-Construction Schedule, Form SCS-AS-43, General Provisions, is deleted and the following clause is substituted therefor:

   Construction Schedule: (a) If, in the opinion of the Contracting Officer, the Contractor falls behind the approved construction schedule, the Contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may require him to either increase the number of shifts, days or hours of work, or the amount of construction plant, or all of them, and to submit for approval such revised construction schedule as may be deemed necessary to show the manner in which the agreed rate of progress will be regained, all without additional cost to the Contracting Local Organization. If the Contractor fails to submit a revised construction schedule within the time specified by the Contracting Officer, the Contracting Officer may withold approval of progress payments and/or take such other actions as provided in this contract until such time as the Contractor submits the required construction schedule.

   (b) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for determination by the Contracting Officer that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part thereof, in accordance with Clause 5 of these General Provisions.

4. Minor Items of Work: The following bid items are designated as minor items of work. These items may be performed without charge to performance time during periods when all other work is suspended if such items are excepted in the Suspend Work Order:

   Item No. 1 - Clearing and Grubbing

   No. 2 - Structural Removal

5. Fence Removal: Fences to be removed and salvaged shall be limited to the construction area. On sheet 4 of the drawings the approximate length is 1000 feet instead of the 2350 feet indicated by note on the drawing.

6. Dust Abatement and Haul Road Maintenance: Water shall be applied to haul roads and other dust-producing areas as needed to prevent excessive dust and to maintain the roads in good condition for efficient operation while they are in use.

7. Utilities: All utilities will be relocated by the owners. The Contractor shall give the Engineer three weeks advance notice before doing any construction work on or near the Mountain Bell telephone cable adjacent to Palo Verde Road.

8. No bid will be accepted or Contract awarded unless the Contractor is registered under the applicable provision of Arizona statutes, with the Registrar of Contractors of the State of Arizona.

9. In no event will the 5% differential be allowed in evaluating bids as provided by Arizona revised statutes 34-241; the provisions of Arizona revised statutes 34-244 being applicable.

10. The Contractor shall not disturb Legal Survey Monuments during construction unless otherwise authorized by the Contracting Officer and after Witness Markers have been set by the Engineer.

11. Geological Report: The test pits and borings made for the geological investigations are shown on the drawings. The complete geological investigation is available for investigation at the Soil Conservation Service, Construction Office, at 3556 West Buckeye Road, Phoenix, Arizona. Following is a Standard List of Geological Abbreviations used on the Geological Sheets shown on the drawings.

ARIZONA STATE

STANDARD LIST OF GEOLOGIC ABBREVIATIONS

* National Standards

* ang.	-	angular	* cpt.	-	compact	* frac.	-	fractured
aq.	-	aquifer	* con.	-	concretion	* frg.	-	fragment
* bld.	-	boulder	cong.	-	conglomerate	* fri.	-	friable
* calc.	-	calcareous	* xln.	-	crystalline	grad.	-	graded
* cali.	-	caliche	* dns.	-	dense	* grn.	-	grain
* cav.	-	cavities	* dip.	-	dipping	G	-	gravel
* cmt.	-	cemented	* D.	-	disturbed sample	* gyp.	-	gypseous
℄	-	centerline	* d.s.	-	downstream	* hd.	-	hard
* C	-	clay	* fn.	-	fine	* h.	-	highly
* cse.	-	coarse	* frm.	-	firm	* lam.	-	laminated
* cbl.	-	cobble	flg.	-	flagstone	L.L.	-	Liquid Limit

(See Over)

ARIZONA STATE

STANDARD LIST OF GEOLOGIC ABBREVIATIONS - Continued

* National Standards

	ls.	- limestone
*	lse.	- loose
*	mas.	- massive
*	med.	- medium
*	mic.	- micaceous
*	mod.	- moderately
*	n.r.	- no recovery
*	O	- organic
*	per.	- permeable
	P.L.	- Plastic Limit
	P.I.	- Plasticity Index
*	po.	- poorly
*	p	- poorly graded
	qtz.	- quartz
	qtzite.	- quartzite
*	rdd.	- rounded
*	S	- sand
	ss	- sandstone
	sh.	- shale
	S.L.	- Shrinkage Limit
*	M	- silt
	Ms.	- siltstone
*	sl/.	- slightly
*	sft.	- soft
*	s/.	- some
*	slo.	- slowly
	Sta.	- Station
*	stf.	- stiff
*	t.b.	- thin bedded
	TD	- total depth
	t.	- tough
	tr.	- trace
*	tuff.	- tuffaceous
*	U.	- Undisturbed Sample
*	u.s.	- upstream
*	var.	- variable
*	v/.	- very
	vuq.	- vugular
*	w.l.	- water level
*	wea.	- weathered
*	W	- well graded
*	w/.	- with

12. EQUAL EMPLOYMENT OPPORTUNITY - AFFIRMATIVE ACTION REQUIREMENTS ARIZONA "HOMETOWN" PLAN.

BID CONDITIONS

AFFIRMATIVE ACTION REQUIREMENTS

EQUAL EMPLOYMENT OPPORTUNITY

For all Non-Exempt Federal and Federally-Assisted Construction Contracts to be Awarded in the Area of Jurisdiction of the Phoenix Building and Construction Trades Council.

Part I: The provisions of this Part I apply to bidders, contractors and subcontractors with respect to those construction trades for which they are parties to collective bargaining agreements with a labor organization or organizations and who together with such labor organizations have agreed to the Arizona Plan on minority employment dated November 24, 1970, (but only as to those trades as to which there are commitments by labor organizations to specific goals of minority manpower utilization) among the Phoenix Building and Construction Trades Council, general and specialty contractors associations and representatives of the minority community, together with all implementing agreements that have been and may hereafter be developed pursuant thereto, all of which documents are incorporated herein by reference and are hereinafter cumulatively referred to as the Arizona Plan.

Any bidder, contractor or subcontractor using one or more trades of construction employees must comply with either Part I or Part II of these Bid Conditions as to each such trade. Thus, a bidder, contractor or subcontractor may be in compliance with these conditions by its inclusion, with its union, in the Arizona Plan as to trade "A", provided there is set forth in the Arizona Plan a specific commitment by that union to a goal of minority manpower utilization for such trade "A", thereby meeting the provisions of this Part I, and by its commitment to Part II in regard to trade "B" in the instance in which it is not included in the Arizona Plan and, therefore, cannot meet the provisions of this Part I.

To be eligible for award of a contract under Part I of this Invitation for Bids, a bidder must execute and submit as part of its bid the following certification, which will be deemed a part of the resulting contract:

(See Over)

_____ certifies that:
(Name of Bidder)

(a) it intends to use the following listed construction trades in the work under the contract, either itself or through subcontractors at any tier _____

_____

_____

(b) the labor organizations with whom it has collective bargaining agreements who are signatories to the Arizona Plan and as to which trades there are set forth in the Arizona Plan specific commitments to goals of minority manpower utilization are as follows: _____

_____

_____

(c) the labor organizations with whom it has collective bargaining agreements who are not signatories to the Arizona Plan or who are signatories thereto but with respect to trades for which no specific commitments to goals of minority manpower utilization are set forth in the Arizona Plan are as follows: _____

_____

_____;

(d) the following is a full list of all present construction work or contracts (both federal and non-federal) to which it is a party in any capacity in the area of jurisdiction of the Phoenix Building and Construction Trades Council: _____

_____

_____;

(e) it will comply, and require its subcontractors to comply, with all of the terms of the Arizona Plan on all work (both federal and non-federal) in the area described in the preceding paragraph (d) hereof, in any trade as set forth in paragraph (b) hereof for which it or its subcontractors are committed to the Arizona Plan, and will be bound by the provisions of Part II of these Bid Conditions on all work in such area, for all other trades as set forth in paragraph (c) hereof; and (f) in the event the bidder is no longer participating in an affirmative action plan acceptable to the Director of the Office of Federal Contract Compliance, including the Arizona Plan, or it or the union with whom it maintains a collective bargaining agreement ceases to be a participating signatory to the Arizona Plan, the bidder will comply with Part II of these Bid Conditions.

_____
(Signature of authorized representative of bidder.)

The bidder shall cause the following certification to be included in all bid invitations to prospective subcontractors, regardless of whether they are signatories to the Arizona Plan and regardless of tier; and shall cause the following certification, as executed, to be made a part of all subcontracts, regardless of tier:

_____ certifies that
(Name of Subcontractor)
it understands the equal employment opportunity requirements of the Arizona Plan regarding equal employment opportunity in the construction industry in the area of jurisdiction of the Phoenix Building and Construction Trades Council; that it either individually or through an association and the labor organizations with whom it has collective bargaining agreements are signatories and agree to comply with the Arizona Plan and there are set forth in the Arizona Plan specific commitments to goals of minority manpower utilization as to such trades or if such is not the case it agrees to comply with the requirements of Part II of the Bid Conditions; that in the event the subcontractor is no longer participating in an affirmative action plan acceptable to the Director of the Office of Federal Contract Compliance, including the Arizona Plan, the subcontractor will comply with Part II of these Bid Conditions; that it shall require the execution of this certification by any of its subcontractors, regardless of tier; and that this certification shall be a part of any subcontract.

_____
(Signature of authorized representative of subcontractor)

In order to ensure that the said subcontractor certification becomes a part of all subcontracts under the prime contract of a prime contractor with respect to whom this Part I is applicable, no subcontract shall be executed until an authorized representative of the Flood Control District has determined, in writing, that the said certification has been incorporated in such subcontract, regardless of tier. Any subcontract executed without such written approval shall be void.

Part II: A. Coverage. The provisions of this Part II shall be applicable to those bidders, contractors and subcontractors, who, in regard to such construction trades:

(See Over)

1. Are not or hereafter cease to be signatories to the Arizona Plan referred to in Part 1 hereof;

2. Are signatories to the Arizona Plan but are not parties to collective bargaining agreements;

3. Are signatories to the Arizona Plan but are parties to collective bargaining agreements with labor organizations who are not or hereafter cease to be signatories to the Arizona Plan;

4. Are signatories to the Arizona Plan but as to which no specific commitment to goals of minority manpower utilization by labor organization have been executed pursuant to the Arizona Plan; or

5. Are no longer participating in an affirmative action plan acceptable to the Director, OFCC, including the Arizona Plan.

B. Requirement -- An Affirmative Action Plan. The bidders, contractors and subcontractors described in paragraphs 1 through 5 above will not be eligible for award of a contract under this Invitation for Bids, unless it has submitted as part of its bid, and has had approved by the Flood Control District a written affirmative action plan, embodying both (1) goals and timetables of minority manpower utilization, 1/ and (2) specific affirmative action steps directed at increasing minority manpower utilization by means of applying good faith efforts to carrying out such steps or is deemed to have submitted such a program pursuant to Section 3 of this Part II. Both the goals and timetables, and the affirmative action steps must meet the requirements of this Part II as set forth below for all trades which are to be utilized on the project, whether subcontracted or not.

1. Goals and Timetables. The plan must set forth goals of minority manpower utilization for the bidder and all contractors and subcontractors for those trades not otherwise bound by the provisions of Part I hereof in terms of manhours, within at least the following ranges, for the following time periods, for each trade which will be used on the project within the area of jurisdiction of the Phoenix Building and Construction Trades Council (hereinafter referred to as the Phoenix area).

1/ "Minority" is defined as including Negroes, Spanish Surnamed Americans, Orientals and American Indians.

Until 11/30/71	5.0% - 10.0%
From 12/1/71 Until 11/30/72	10.0% - 15.0%
From 12/1/72 Until 11/30/73	15.0% - 20.0%
From 12/1/73 Until 11/30/74	20.0% - 25.0%
From 12/1/74 Until 11/30/75	25.0% - 30.0%

In the event that under a contract which is subject to these Bid Conditions any work is performed in a year later than the latest year for which acceptable ranges of minority manpower utilization have been determined herein, the ranges for 1974-1975 shall be applicable to such work.

The percentages of minority manpower utilization above are expressed in terms of manhours of training and employment as a proportion of the total manhours to be worked by the bidder's, contractor's and subcontractor's entire work force in that trade on all projects (both federal and non-federal) in the Phoenix area during the performance of its contract or subcontract. The manhours for minority work and training must be substantially uniform throughout the length of the contract, on all projects and for each of the trades. Further, the transfer of minority employees or trainees from employer-to-employer or from project-to-project for the sole purpose of meeting the contractor's or subcontractor's goal shall be a violation of these conditions.

In reaching the goals of minority manpower utilization required of bidders, contractors and subcontractors pursuant to this Part II, every effort shall be made to find and employ qualified journeymen. However, where minority journeymen are not available, minority trainees in pre-apprenticeship, apprenticeship, journeyman training or other training programs may be used.

In order that the nonworking training hours of trainees may be counted in meeting the goal, such trainees must be employed by the contractor during the training period, the contractor must have made a commitment to employ the trainees at the completion of their training and the trainees must be trained pursuant to established training programs which must be the equivalent of the training programs now or hereafter provided for in the Arizona Plan with respect to the nature, extent and duration of training offered.

(See Over)

A contractor or subcontractor shall be deemed to be in compliance with the terms and requirements of this Part II by the employment and training of minorities in the appropriate percentage of his aggregate work force in the Phoenix area for each trade for which it is committed to a goal under this Part II.

However, no contractor or subcontractor shall be found to be in noncompliance solely on account of its failure to meet its goals within its timetables, but such contractor shall be given the opportunity to demonstrate that it has instituted all of the specific affirmative action steps specified in this Part II and has made every good faith effort to make these steps work toward the attainment of its goals within its timetables, all to the purpose of expanding minority manpower utilization on all of its projects in the Phoenix area.

In all cases, the compliance of a bidder, contractor or subcontractor will be determined in accordance with its respective obligations under the terms of these Bid Conditions. Therefore, contractors or subcontractors who are governed by the provisions of this Part II shall be subject to the requirements of that Part regardless of the obligations of its prime contractor or lower tier subcontractors.

All bidders and all contractors and subcontractors performing or to perform work on projects subject to these Bid Conditions hereby agree to inform their subcontractors of their respective obligations under the terms and requirements of these Bid Conditions, including the provisions relating to goals of minority employment and training.

2. Specific Affirmative Action Steps. The plans for the bidders, contractors and subcontractors must set forth specific affirmative action steps directed at increasing minority manpower utilization, which steps must be at least as extensive and as specific as the following:

a. The contractor shall notify community organizations that the contractor has employment opportunities available and shall maintain records of the organizations' responses.

b. The contractor shall maintain a file of the names and addresses of each minority worker referred to him and what action was taken with respect to each such referred worker, and if the worker was not employed, the reasons therefor. If such worker was not sent to the

union hiring hall for referral or if such worker was not employed by the contractor, the contractor's file shall document this and the reasons therefor.

c. The contractor shall promptly notify the Flood Control District when the union or unions with whom the contractor has a collective bargaining agreement has not referred to the contractor a minority worker sent by the contractor or the contractor has other information that the union referral process has impeded him in his efforts to meet his goal.

d. The contractor shall participate in training programs in the area, especially those funded by the Department of Labor.

e. The contractor shall disseminate his EEO policy within his own organization by including it in any policy manual; by publicizing it in company newspapers, annual reports, etc.; by conducting staff, employee and union representatives' meetings to explain and discuss the policy; by posting of the policy; and by specific review of the policy with minority employees.

f. The contractor shall disseminate his EEO policy externally by informing and discussing it with all recruitment sources; by advertising in news media, specifically including minority news media; and by notifying and discussing it with all subcontractors and suppliers.

g. The contractor shall make specific and constant personal (both written and oral) recruitment efforts directed at all minority organizations, schools with minority students, minority recruitment organizations and minority training organizations, within the contractor's recruitment area.

h. The contractor shall make specific efforts to encourage present minority employees to recruit their friends and relatives.

i. The contractor shall validate all man specifications, selection requirements, tests, etc.

j. The contractor shall make every effort to promote after-school, summer and vacation employment to minority youth.

k. The contractor shall develop on-the-job training opportunities and participate and assist in any association or employer-group training programs relevant to the contractor's employee needs consistent with its obligations under this Part II.

(See Over)

l. The contractor shall continually inventory and evaluate all minority personnel for promotion opportunities and encourage minority employees to seek such opportunities.

m. The contractor shall make sure that seniority practices, job classifications, etc., do not have a discriminatory effect.

n. The contractor shall make certain that all facilities and company activities are non-segregated.

o. The contractor shall continually monitor all personnel activities to ensure that his EEO policy is being carried out.

p. The contractor shall solicit bids for subcontracts from available minority subcontractors engaged in the trades covered by these Bid Conditions, including circulation to minority contractor associations.

3. Contractors and Subcontractors Deemed to be Bound by Part II. In the event a contractor or subcontractor, who is at the time of bidding eligible under Part I of these Bid Conditions, is no longer participating in an affirmative action plan acceptable to the Director of the Office of Federal Contract Compliance, including the Arizona Plan, he shall be deemed to be committed to Part II of these Bid Conditions. Further, whenever a contractor or subcontractor, who at the time of bidding is eligible under Part II of these Bid Conditions, uses trades not contemplated at the time he submits his bid, he shall be committed to Part II for those trades. Whenever a contractor or subcontractor is deemed to be committed to Part II of these Bid Conditions, he shall be considered to be committed to a manpower utilization goal of the minimum percentage range for that trade for the appropriate year.

4. Subsequent Signatory to the Arizona Plan. Any contractor or subcontractor subject to the requirements of this Part II for any trade at the time of the submission of his bid who together with the labor organization with whom it has a collective bargaining agreement subsequently becomes a signatory to the Arizona Plan, either individually or through an association, may meet its requirements under these Bid Conditions for such trade, if such contractor or subcontractor executes and submits the appropriate certification required by Part I of these Bid Conditions. No contractor or subcontractor shall be deemed to be

subject to the requirements of Part I until such certification is executed and submitted.

5. Non-discrimination. In no event may a contractor or subcontractor utilize the goals, timetables or affirmative action steps required by this Part II in such a manner as to cause or result in discrimination against any person on account of race, color, religion, sex or national origin.

6. Contractors and Subcontractors Bound. The affirmative action plan required by Part II shall be deemed a part of the resulting contract specifications. A successful bidder as to whom Part II is applicable, shall cause the affirmative action plan as established and approved, to be a part of all subcontracts, where necessary, regardless of tier, under his contract. No subcontract shall be executed until an authorized representative of the Flood Control District has determined, in writing, that such subcontractor has executed the certification required by Part I hereof, or that the affirmative action plan required by Part II, as applicable, has been incorporated into such subcontract, regardless of tier. Any subcontract executed without such written approval shall be void.

Part III: Materiality and Responsiveness

Any equal employment opportunity submission required to be made by the prospective contractor pursuant either to Part I or Part II of these Bid Conditions which is material and which will govern the contractor's performance on the project shall be made a part of his bid. Failure to submit a Part I certification or a Part II affirmative action plan, as applicable, will render the bid nonresponsive.

Part IV: Compliance and Enforcement

Contractors are responsible for informing their subcontractors (regardless of tier) as to their respective obligations under Parts I and II hereof (as applicable). Bidders, contractors and subcontractors hereby agree to refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who is determined not to be a "responsible" bidder for, Government contracts and federally assisted

(See Over)

construction contracts pursuant to the Executive Order. The bidder, contractor or subcontractor shall carry out such sanctions and penalties for violation of the equal opportunity clause including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered by the administering agency, the contracting agency or the Office of Federal Contract Compliance pursuant to the Executive Order. Any bidder, or contractor or subcontractor who shall fail to carry out such sanctions and penalties shall be deemed to be in noncompliance with these Bid Conditions and Executive Order 11246.

Nothing herein is intended to relieve any contractor or subcontractor during the term of its contract on this project from compliance with Executive Order 11246 and the Equal Employment Opportunity Clause of its contract, with respect to matters not covered in the Arizona Plan or in Part II of these Bid Conditions.

Violation of any substantial requirement in the Arizona Plan by a contractor or subcontractor covered by Part I of these Bid Conditions including the failure of such contractor or subcontractor to make a good faith effort to meet its fair share of the trade's goals of minority manpower utilization, or of the terms of the Affirmative Action Plan by a contractor or subcontractor who is covered by Part II hereof shall be deemed to be noncompliance by such contractor or subcontractor with the Equal Opportunity Clause of the contract, and shall be grounds for imposition of the sanctions and penalties provided at Section 209(a) of Executive Order 11246.

Each agency shall review its contractors' and subcontractors' employment practices during the performance of the contract. If the agency determines that the Arizona Plan no longer represents effective affirmative action, it shall so notify the Office of Federal Contract Compliance which shall be solely responsible for any final determination of that question and the consequences thereof.

In regard to Part II of these conditions if the contractor or subcontractor meets its goals or if the contractor or subcontractor can demonstrate that it has made every good faith effort to meet these goals, the contractor or subcontractor shall be presumed to be in compliance with Executive Order 11246, the implementing regulations and its obligations

under these Bid Conditions and no formal sanctions or proceedings leading toward sanctions shall be instituted unless the agency otherwise determines that the contractor or subcontractor is not providing equal employment opportunities. In judging whether a contractor or subcontractor has met its goals, the agency will consider each contractor's or subcontractor's minority manpower utilization and will not take into consideration the minority manpower utilization of its subcontractors. Where the agency finds that the contractor or subcontractor has failed to comply with the requirements of Executive Order 11246, the implementing regulations and its obligations under these Bid Conditions, the agency shall take such action and impose such sanctions as may be appropriate under the Executive Order and the regulations. When the agency proceeds with such formal action it has the burden of proving that the contractor has not met the requirements of these Bid Conditions, but the contractor's failure to meet his goals shall shift to him the requirement to come forward with evidence to show that he has met the "good faith" requirements of these Bid Conditions by instituting at least the Specific Affirmative Action steps listed above and by making every good faith effort to make those steps work toward the attainment of its goals within its timetables. The pendency of such formal proceedings shall be taken into consideration by Federal agencies in determining whether such contractor or subcontractor can comply with the requirements of Executive Order 11246 and is therefore a "responsible prospective contractor" within the meaning of the Federal procurement regulations.

It shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.

The procedures set forth in these conditions shall not apply to any contract when the head of the contracting or administering agency determines that such contract is essential to the national security and that its award without following such procedures is necessary to the national security. Upon making such a determination, the agency head will notify, in writing, the Director of the Office of Federal Contract Compliance within thirty days.

(See Over)

Requests for exemptions from these Bid Conditions must be made in writing, with justification, to the Director, Office of Federal Contract Compliance, U. S. Department of Labor, Washington, D.C. 20210, and shall be forwarded through and with the endorsement of the agency head.

Contractors and subcontractors must keep such records and file such reports relating to the provisions of these Bid Conditions as shall be required by the contracting or administering agency or the Office of Federal Contract Compliance.

For the information of bidders, a copy of the Arizona Plan may be obtained from the contracting officer.

SCS-AS-85
Rev. 2-71

APPLICABILITY OF THE EQUAL OPPORTUNITY CLAUSE

Equal Opportunity (Federally Assisted Construction) is applicable in any contract which exceeds $10,000 and any contract for less than $10,000 which is later increased by modification to more than $10,000.

EQUAL OPPORTUNITY (FEDERALLY ASSISTED CONSTRUCTION)

During the performance of this contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this Equal Opportunity (Federally Assisted Construction) clause.

2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

3. The Contractor will send to each labor union or representative of workers, with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representative of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

6. In the event of the Contractor's noncompliance with the Equal Opportunity (Federally Assisted Construction) clause of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as provided by law.

7. The Contractor will include this Equal Opportunity (Federally Assisted Construction) clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

SCS-AS-818
Rev. 4-70
File Code AS-14

CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to federally assisted construction contracts and related subcontracts exceeding $10,000 which are not exempt from the Equal Opportunity clause.)

The federally assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. The federally assisted construction contractor agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certifications in his files.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

_____
Contractor

_____
Signature

_____
Title Date

SCS-158
Rev. 12-64

BID BOND (See Instructions on reverse)	Date Bond Executed (Must not be later than bid opening date)
Principal (Legal name and business address)	Type of Organization ("X" one) ☐ Individual ☐ Partnership ☐ Joint Venture ☐ Corporation State of Incorporation
Surety(ies) (Name and business address)	

Penal Sum of Bond					Bid Identification	
Percent of Bid Price	Amount not to exceed				Bid Date	Invitation No. FCD-73-2
	Million(s)	Thousand(s)	Hundred(s)	Cents	For (Construction, Supplies or Services)	

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the Flood Control District of Maricopa County (Name of Contracting Local Organization), hereinafter called the Contracting Local Organization, in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally: Provided, That where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the bid identified above.

NOW, THEREFORE, if the Principal, upon acceptance by the Contracting Local Organization of his bid identified above, within the period specified therein for acceptance (sixty (60) days if no period is specified), shall execute such further contractual documents, if any, and give such bond(s) as may be required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms by him, or in the event of failure so to execute such further contractual documents and give such bonds, if the Principal shall pay the Contracting Local Organization for any cost of procuring the work which exceeds the amount of his bid, then the above obligation shall be void and of no effect.

Each Surety executing this instrument hereby agrees that its obligation shall not be impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to the Contracting Local Organization, notice of which extension(s) to the Surety(ies) being hereby waived; provided that such waiver of notice shall apply only with respect to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this bid bond and have affixed their seals on the date set forth above.

Principal		
Signature(s)	1. (Seal)	2. (Seal)
Name(s) & Title(s) (Typed)	1.	2.

Corporate Surety(ies)				
SURETY A	Name & Address		State of Inc.	Liability Limit
	Signature(s)	1. (Seal)	2. (Seal)	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY B	Name & Address		State of Inc.	Liability Limit
	Signature(s)	1. (Seal)	2. (Seal)	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY C	Name & Address		State of Inc.	Liability Limit
	Signature(s)	1. (Seal)	2. (Seal)	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY D	Name(s) & Address		State of Inc.	Liability Limit
	Signature(s)	1. (Seal)	2. (Seal)	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY E	Name(s) & Address		State of Inc.	Liability Limit
	Signature(s)	1. (Seal)	2. (Seal)	
	Name(s) & Title(s) (Typed)	1.	2.	

INSTRUCTIONS

1. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.

2. The penal sum of the bond may be expressed as a percentage of the bid price if desired. In such cases, a maximum dollar limitation may be stipulated (e.g., 20% of the bid price but the amount not to exceed _____ dollars).

3. The name of each person signing this bid bond should be typed in the space provided.

4. The person signing the bond for the surety must submit evidence of his authority to act for the surety.

5. The corporate surety must be approved by the state in which the services or supplies are to be delivered or in which construction is to be performed.

CONSTRUCTION SPECIFICATION

2. CLEARING AND GRUBBING

1. SCOPE

The work shall consist of the clearing and grubbing of designated areas by removal and disposal of trees, snags, logs, stumps, shrubs and rubbish.

2. MARKING

The limits of the areas to be cleared and grubbed will be marked by means of stakes, flags, tree markings or other suitable methods. Trees to be left standing and uninjured will be designated by special markings placed on the trunks at a height of about six feet above the ground surface.

3. REMOVAL

All trees not marked for preservation and all snags, logs, brush, stumps, shrubs and rubbish shall be removed from within the limits of the marked areas. Unless otherwise specified, all stumps, roots and root clusters having a diameter of one inch or larger shall be grubbed out to a depth of at least two feet below subgrade elevation for concrete structures and one foot below the ground surface at embankment sites and other designated areas.

4. DISPOSAL

All materials removed from the cleared and grubbed areas shall be burned or buried at locations approved by the Engineer, or otherwise disposed of as approved by the Engineer.

5. MEASUREMENT AND PAYMENT

(Method 1) For items of work for which specific unit prices are established in the contract, the cleared and grubbed areas will be measured to the nearest 0.1 acre. Payment for clearing and grubbing will be made at the contract unit price and shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

(Method 2) For items of work for which specific unit prices are established in the contract, each tree, stump and snag having a diameter of 4 inches or greater and each log having a diameter of 4 inches or greater and a length of 10 feet or greater will be measured prior to removal. The size of each tree and snag will be determined by measuring its trunk at breast height above the natural ground surface. The size of each log will be determined by measuring the butt and by measuring its length from butt to tip. The size of each stump will be measured at the top. Diameter shall be determined by dividing the measured circumference by 3.14.

Payment for clearing and disposal of each tree, stump and snag having a diameter of 4 inches or greater and each log having a diameter of 4 inches or greater and a length of 10 feet or greater will be made at the contract unit price for its size designation as determined by the following schedule:

Measured Diameter	Size Designation
4 inches to 8 inches	6-inch size
Over 8 inches to 12 inches	10-inch size
Over 12 inches to 24 inches	18-inch size
Over 24 inches to 36 inches	30-inch size
Over 36 inches to 60 inches	48-inch size
Over 60 inches	60-inch size

The sum of such payments shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the work of completely clearing and grubbing the designated areas, including clearing, grubbing and disposal of smaller trees, stumps, snags and logs and brush, shrubs, roots and rubbish.

(Method 3) For items of work for which specific lump sum prices are established in the contract, payment for clearing and grubbing will be made at the contract lump sum price. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to completion of the work.

(Use with all Methods) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 6 of this specification.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 1, Clearing and Grubbing

(1) This item shall consist of clearing and grubbing the foundation area of all dikes, areas designated for compacted earth fill, all areas designated for channel or pipe trench excavation and the area required for borrow excavation.

(2) It is planned to salvage some of the cacti in the construction area. The contractor will give the engineer two weeks advance notice before any clearing and grubbing is started in any area.

(3) Clearing and grubbing operations shall be limited to reaches of not more than one mile ahead of excavation operations.

(4) The contractor's construction operations shall be conducted in a manner to avoid the unnecessary destruction of brush, trees or cacti.

(5) If waste materials are disposed of by burying, they shall be covered by a minimum of 18 inches of soil. After disposal, the waste areas shall be smoothed and graded to blend into the surrounding terrain.

(6) If materials removed from the cleared and grubbed area are to be burned, burning must be carried out in accordance with Maricopa County Health Department regulations.

(7) Measurement and payment will be made by Method 1.

CONSTRUCTION SPECIFICATION

3. STRUCTURE REMOVAL

1. SCOPE

The work shall consist of the removal, salvage and disposal of structures (including fences) from the designated areas.

2. MARKING

(Method 1) Each structure unit to be removed will be marked by means of stakes, flags, painted markers or other suitable methods.

(Method 2) The limits of the areas from which structures must be removed will be marked by means of stakes, flags or other suitable methods. Structures to be preserved in place or salvaged will be designated by special markings.

3. REMOVAL

(Method 1) All structures designated in the contract for removal shall be removed to the specified extent and depth.

(Method 2) Within the areas so marked all visible structures and attachments and all buried structures located and identified by survey stakes shall be removed to the specified extent and depth.

4. SALVAGE

Structures that are designated to be salvaged shall be carefully removed and neatly placed in the specified storage areas. Salvaged structures that are capable of being disassembled shall be dismantled into individual members or sections. Such structures shall be neatly matchmarked with paint prior to disassembly. All pins, nuts, bolts, washers, plates and other loose parts shall be marked or tagged to indicate their proper locations in the structure and shall be fastened to the appropriate structural member or packed in suitable containers. Materials from fences designated to be salvaged shall be placed outside the work area on the property from which they were removed. Wire shall be rolled into uniform rolls of convenient size. Posts and rails shall be neatly piled.

5. DISPOSAL OF REFUSE MATERIALS

Refuse materials resulting from structure removal shall be burned or buried at locations approved by the Engineer or otherwise disposed of as specified or as approved by the Engineer.

6. MEASUREMENT AND PAYMENT

(Method 1) For items of work for which specific unit prices are established in the contract, payment for the removal of each structure unit, except fences, will be made at the contract unit price. Fences removed or removed and salvaged will be measured to the nearest linear foot. Payment for fence removal or removal and salvage will be made at the contract unit prices appropriate to each type and size of fence. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

(Method 2) For items of work for which specific lump sum prices are established in the contract, payment for structure removal will be made at the contract lump sum price. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

(Use with Either Method) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 2, Structure Removal and Salvage

(1) This item shall consist of the removal and salvage of all fences within the construction area as shown on sheets 2, 3, 4, and 6 of the drawings.

(2) In Section 2, Marking, Method 1 shall apply.

(3) In Section 3, Removal, Method 1 shall apply.

(4) All fencing materials, including posts, shall be salvaged and stockpiled in areas on the site designated by the engineer.

(5) Measurement and payment will be made by Method 1.

CONSTRUCTION SPECIFICATION

8. MOBILIZATION

1. SCOPE

The work shall consist of the mobilization of the Contractor's forces and equipment necessary for performing the work required under the contract.

It shall include the purchase of contract bonds; transportation of personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary facilities at the site; and other preparatory work at the site.

It shall not include mobilization for any specific item of work for which payment for mobilization is provided elsewhere in the contract.

The specification covers mobilization for work required by the contract at the time of award. If additional mobilization costs are incurred during performance of the contract as a result of change or added items of work for which the Contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the items of work changed or added.

2. PAYMENT

Payment will be made as the work proceeds, after presentation of invoices by the Contractor showing his own mobilization costs and evidence of the charges of suppliers, subcontractors, and others for mobilization work performed by them. If the total of such payments is less than the contract lump sum for mobilization, the unpaid balance will be included in the final contract payment. Total payment will be the lump sum contract price for mobilization, regardless of actual cost to the Contractor.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated in the project, or the purchase costs of operating supplies.

Payment of the lump sum contract price for mobilization will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 3 of this specification.

3. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 3, Mobilization

(1) This item shall consist of the mobilization of the contractor's forces and equipment for performing the work required in this contract.

(2) Payment will be made in accordance with Section 2.

CONSTRUCTION SPECIFICATION

11. REMOVAL OF WATER

1. 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.

2. 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 drainageway in which its headworks are located.

Unless otherwise specified, the Contractor shall furnish to the Engineer, in writing, his plan for diverting surface water before beginning the construction work for which the diversion is required. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

3. DEWATERING THE CONSTRUCTION SITE

Foundations, 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, and other equipment needed to perform the dewatering as specified. Dewatering methods that cause a loss of fines from foundation areas will not be permitted.

Unless otherwise specified, the Contractor shall furnish to the Engineer, in writing, his plan for dewatering before beginning the construction work for which the dewatering is required. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

4. DEWATERING BORROW AREAS

Unless otherwise specified in Section 7, the Contractor shall maintain the borrow areas in drainable condition or otherwise provide for timely and effective removal of surface waters that accumulate, for any reason, within the borrow areas.

5. 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.

6. MEASUREMENT AND PAYMENT

For items of work for which specific lump sum prices are established in the contract, payment for diverting surface water, dewatering construction sites, and dewatering borrow areas will be made at the contract lump sum prices. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Removal of Water

(1) This item shall consist of the removal of surface and ground water from the construction area as shown on the drawings.

(2) In Section 2, Diverting Surface Water, and Section 3, Dewatering the Construction Site, no written plan for accomplishing the work will be required. This shall not relieve the Contractor of his responsibility for completing the work as specified.

(3) No separate payment will be made for the removal of water. Compensation for this work will be included in the payment for Bid Items 4, 5, and 6, as appropriate.

CONSTRUCTION SPECIFICATION

21. EXCAVATION

1. SCOPE

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials.

2. CLASSIFICATION

Excavation will be classified as common excavation or rock excavation in accordance with the following definitions or will be designated as unclassified.

Common excavation shall be defined as the excavation of all materials that can be excavated, transported, and unloaded by the use of heavy ripping equipment and wheel tractor-scrapers with pusher tractors or that can be excavated and dumped into place or loaded onto hauling equipment by means of excavators having a rated capacity of one cubic yard and equipped with attachments (such as shovel, bucket, backhoe, dragline or clam shell) appropriate to the character of the materials and the site conditions.

Rock excavation shall be defined as the excavation of all hard, compacted or cemented materials the accomplishment of which requires blasting or the use of excavators larger than defined for common excavation. The excavation and removal of isolated boulders or rock fragments larger than one cubic yard in volume encountered in materials otherwise conforming to the definition of common excavation shall be classified as rock excavation.

Excavation will be classified according to the above definitions by the Engineer, based on his judgment of the character of the materials and the site conditions.

The presence of isolated boulders or rock fragments larger than one cubic yard in size will not in itself be sufficient cause to change the classification of the surrounding material.

For the purpose of this classification, the following definitions shall apply:

Heavy ripping equipment shall be defined as a rear-mounted, heavy duty, single-tooth, ripping attachment mounted on a tractor having a power rating of at least 200 net horsepower (at the flywheel).

Wheel tractor-scraper shall be defined as a self-loading (not elevating) and unloading scraper having a struck bowl capacity of at least 12 yards.

Pusher tractor shall be defined as a track type tractor having a power rating of at least 200 net horsepower (at the flywheel) equipped with appropriate attachments.

3. UNCLASSIFIED EXCAVATION

Items designated as "Unclassified Excavation" shall include all materials encountered regardless of their nature or the manner in which they are removed. When excavation is unclassified, none of the definitions or classifications stated in Section 2 of this specification shall apply.

4. BLASTING

The transportation, handling, storage, and use of dynamite and other explosives shall be directed and supervised by a person of proven experience and ability in blasting operations.

Blasting shall be done in such a way as to prevent damage to the work or unnecessary fracturing of the foundation and shall conform to any special requirements in Section 12 of this specification.

5. USE OF EXCAVATED MATERIALS

(Method 1) To the extent they are needed, all suitable materials from the specified excavations shall be used in the construction of required permanent earth fill or rock fill. The suitability of materials for specific purposes will be determined by the Engineer. The Contractor shall not waste or otherwise dispose of suitable excavated materials.

(Method 2) Suitable materials from the specified excavations may be used in the construction of required earth fill or rock fill. The suitability of materials for specific purposes will be determined by the Engineer.

6. DISPOSAL OF WASTE MATERIALS

(Method 1) All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of at the locations shown on the drawings.

(Method 2) All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of by the Contractor at sites of his own choosing away from the site of the work.

7. BRACING AND SHORING

Excavated surfaces too steep to be safe and stable if unsupported shall be supported as necessary to safeguard the work and workmen, to prevent sliding or settling of the adjacent ground, and to avoid damaging existing improvements. The width of the excavation shall be increased if necessary to provide space for sheeting, bracing, shoring, and other supporting installations. The Contractor shall furnish, place and subsequently remove such supporting installations.

8. STRUCTURE AND TRENCH EXCAVATION

Structure or trench excavation shall be completed to the specified elevations and to sufficient length and width to include allowance for forms, bracing and supports, as necessary, before any concrete or earth fill is placed or any piles are driven within the limits of the excavation.

9. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified fills, additional materials shall be obtained from the designated borrow areas. The extent and depth of borrow pits within the limits of the designated borrow areas shall be as directed by the Engineer.

Borrow pits shall be excavated and finally dressed in a manner to eliminate steep or unstable side slopes or other hazardous or unsightly conditions.

10. OVEREXCAVATION

Excavation in rock beyond the specified lines and grades shall be corrected by filling the resulting voids with portland cement concrete made of materials and mix proportions approved by the Engineer. Concrete that will be exposed to the atmosphere when

construction is completed shall contain not less than 6 sacks of cement per cubic yard of concrete. Concrete that will be permanently covered shall contain not less than 4½ sacks of cement per cubic yard. The concrete shall be placed and cured as specified by the Engineer.

Excavation in earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved compacted earth fill, except that, if the earth is to become the subgrade for riprap, rock fill, sand or gravel bedding, or drain fill, the voids may be filled with material conforming to the specifications for the riprap, rock fill, bedding or drain fill.

11. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type and class of excavation within the specified pay limits will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Regardless of quantities excavated, the measurement for payment will be made to the specified pay limits, except that excavation outside the specified lines and grades directed by the Engineer to remove unsuitable material will be included, but only to the extent that the unsuitable condition is not a result of the Contractor's operations.

(Method 1) The pay limits shall be as designated on the drawings.

(Method 2) The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or fill the upper limit shall be modified ground surface resulting from the specified previous excavation or fill.

b. The lower and lateral limits shall be the neat lines and grades shown on the drawings.

(Method 3) The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated

for previous excavation or fill the upper limit shall be the modified ground surface resulting from the specified previous excavation or fill.

b. The lower and lateral limits shall be the true surface of the completed excavation as authorized by the Engineer.

(Method 4) The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or fill the upper limit shall be the modified ground surface resulting from the specified previous excavation or fill.

b. The lower limit shall be at the bottom surface of the proposed structure.

c. The lateral limits shall be 18 inches outside of the outside surfaces of the proposed structure or shall be vertical planes 18 inches outside of and parallel to the footings, whichever gives the larger pay quantity, except as provided in d, below.

d. For trapezoidal channel linings or similar structures that are to be supported upon the sides of the excavation without intervening forms, the lateral limits shall be at the under side of the proposed lining or structure.

e. For the purpose of the definitions in b, c, and d, above, any specified bedding or drain fill directly beneath or beside the structure will be considered to be a part of the structure.

(Use with **all Methods**) Payment for each type and class of excavation will be made at the contract unit price for that type and class of excavation. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work, except that extra payment for backfilling required overexcavation will be made in accordance with the following provisions:

a. Payment for backfilling overexcavation, as specified in Section 10 of this specification, will be made only if the excavation outside specified lines and grades is directed by the Engineer to remove unsuitable material and if the unsuitable condition is not a result of the Contractor's operations.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 12 of this specification.

12. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. All Excavation will be considered common excavation in accordance with Section 2.

b. Bid Item 4, Channel Excavation

(1) This item shall consist of all excavation required to construct the following portions of the works to the lines and grade shown on the drawings:

(a) Excavation to construct the earth channel outlet as shown on sheets 7 and 14 of the drawings.

(b) Excavation to construct the inlet channel from Station 832+00 to Station 907+72.14, as shown on sheets 6, 7, 15 and 21 of the drawings.

(c) Excavation of pipe trench for the 60-inch outlet conduit from Station 907+72.14 to Station 918+82.69, as shown on sheets 7, 15, 16 and 21 of the drawings.

(d) Excavation to construct outlet channel from Station 918+82.69 to approximate Station 928+50 as shown on sheets 15 and 21 of the drawings.

(e) Excavation for placement of all rock riprap as shown on sheets 12, 13, 17, 20 and 21 of the drawings.

(f) Excavation required to construct the protection diversion channels as shown on sheets 10 and 11 of the drawings.

(g) Excavation required to remove materials from the minimum borrow channel which are determined by the Engineer to be unsuitable for earth fill.

(h) Excavation required to construct the irrigation border channel as shown on sheet 22.

(i) Excavation of pipe trenches for the gated and ungated irrigation border outlets at Stations 710+00, 817+00, 764+00 and 796+50 as shown on sheets 22 and 23 of the drawings.

(2) In Section 5, Use of Excavated Materials, Method 1 shall apply.

(3) In Section 6, Disposal of Waste Material, Method 1 shall apply.

(4) Measurement and payment will be made by Method 2.

c. Bid Item 5, Foundation Excavation:

(1) This item shall consist of all excavation required for the foundation and cut off trenches of dikes No. 1 and No. 2 to the lines and grades shown on sheets 2, 3, 4, 5, 6, 7, 8, 9, 12 and 13 of the drawings or as directed by the Engineer and for the foundation stripping of the Palo Verde and Johnson Road ramps as shown on sheets 12 and 13 of the drawings or as directed by the Engineer.

(2) In Section 5, Use of Excavated Materials, Method 1 shall apply except that the top six inches of the foundation excavation for both dikes shall be stock-piled and used in Bid Item 9, Salvaging and Spreading Topsoil.

(3) In Section 6, Disposal of Waste Material, Method 1 shall apply.

(4) Measurement and payment will be made by Method 3.

d. Bid Item 6, Structure Excavation

(1) This item shall consist of the excavation required for the construction and placement of (a) the inlet and outlet structures of the R/C outlet conduits, as shown on sheets 16, 17, 20, 21, 23, 24, 25 and 26 of the drawings, (b) the corrugated metal pipes to the lines and grades as shown on sheets 12, 13 and 22 of the drawings, and (c) "Anti-seep" collars as shown on sheets 16 and 23 of the drawings.

(2) In Section 5, Use of Excavated Materials, Method 1 shall apply.

(3) In Section 6, Disposal of Waste Materials, Method 1 shall apply.

(4) Measurement and payment will be made by Method 4. The upper limits of structure excavation will be the lower limits of pipe trench and channel excavation as appropriate and as shown on the drawings.

e. Subsidiary Item, Borrow Excavation

(1) This item shall consist of all borrow excavation required to obtain the earth fill materials not obtained under Excavation Bid Items 4, 5, and 6 and required to construct all earth fill under Bid Items 7, 8 and 9.

(2) The borrow area shall be excavated to construct a graded minimum borrow channel as shown on the drawings. Borrow material required in excess of material from this minimum borrow channel shall be obtained by extending the width of the channel away from the embankment or excavating on the upstream side of the protection dikes and not by excavating below the bottom of the borrow channel grade unless specifically authorized by the Engineer. Borrow excavated upstream of the protection dikes shall be excavated to provide surface drainage.

(3) The borrow limits shown on the drawings outline the general borrow area. No clearing or excavation will be done in the more wooded areas as staked in the field by the engineer within these borrow limits.

(4) No separate payment will be made for borrow excavation. Compensation for this work will be included in the payment for earth fill Bid Items 7, 8, and 9, as appropriate, except that when material excavated from the minimum borrow channel is determined by the Engineer to be unsuitable for earth fill it will be measured and paid for as Channel Excavation, Bid Item 4.

CONSTRUCTION SPECIFICATION

23. EARTH FILL

1. SCOPE

The work shall consist of the construction of earth embankments and other earth fills required by the drawings and specifications.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated borrow areas. The selection, blending, routing and disposition of materials in the various fills shall be subject to approval by the Engineer.

Fill materials shall contain no sod, brush, roots or other perishable materials. Rock particles larger than the maximum size specified for each type of fill shall be removed prior to compaction of the fill.

The types of materials used in the various fills shall be as listed and described in the specifications and drawings.

3. FOUNDATION PREPARATION

Foundations for earth fill shall be stripped to remove vegetation and other unsuitable materials or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the earth fill, and the surface materials of the foundation shall be compacted and bonded with the first layer of earth fill as specified for subsequent layers of earth fill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of two inches in depth normal to the slope and shall be at such a moisture content that the earth fill can be compacted against them to effect a good bond between the fill and the abutments.

Rock foundation and abutment surfaces shall be cleared of all loose materials by hand or other effective means and shall be

free of standing water when fill is placed upon them. Occasional rock outcrops in earth foundations for earth fill, except in dams and other structures designed to restrain the movement of water, shall not require special treatment if they do not interfere with compaction of the foundation and initial layers of the fill or the bond between the foundation and the fill.

Foundation and abutment surfaces shall be not steeper than 1 horizontal to 1 vertical unless otherwise specified. Test pits or other cavities shall be filled with compacted earth fill conforming to the specifications for the earth fill to be placed upon the foundation.

4. PLACEMENT

Fill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the Engineer. Fill shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

Fill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed the maximum thickness specified. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness before being compacted. Hand compacted fill, including fill compacted by manually directed power tampers, shall be placed in layers not more than 4 inches thick before compaction.

Adjacent to structures, fill shall be placed in a manner which will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly. The height of the fill adjacent to a structure shall be increased at approximately the same rate on all sides of the structure.

Earth fill in dams, levees and other structures designed to restrain the movement of water shall be placed so as to meet the following additional requirements:

a. The distribution of materials throughout each zone shall be essentially uniform, and the fill shall be free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material.

b. If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed.

c. The top surfaces of embankments shall be maintained approximately level during construction, except that a crown or cross-slope of not less than 2 percent shall be maintained to insure effective drainage, and except as otherwise specified for drain fill zones. If the drawings or specifications require or the Engineer directs that fill be placed at a higher level in one part of an embankment than another, the top surface of each part shall be maintained as specified above.

d. Dam embankments shall be constructed in continuous layers from abutment to abutment except where openings to facilitate construction or to allow the passage of stream flow during construction are specifically authorized in the contract.

e. Embankments built at different levels as described under c or d above shall be constructed so that the slope of the bonding surfaces between embankment in place and embankment to be placed is not steeper than 3 feet horizontal to 1 foot vertical. The bonding surface of the embankment in place shall be stripped of all loose material, and shall be scarified, moistened and recompacted when the new fill is placed against it as needed to insure a good bond with the new fill and to obtain the specified moisture content and density in the junction of the in place and new fill.

5. CONTROL OF MOISTURE CONTENT

During placement and compaction of fill, the moisture content of the materials being placed shall be maintained within the specified range.

The application of water to the fill materials shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the materials after placement on the fill, if necessary. Uniform moisture distribution shall be obtained by discing, blading or other approved methods prior to compaction of the layer.

Material that is too wet when deposited on the fill shall either be removed or be dried to the specified moisture content prior to compaction.

If the top surface of the preceding layer of compacted fill or a foundation or abutment surface in the zone of contact with the fill becomes too dry to permit suitable bond it shall be scarified and moistened by sprinkling to an acceptable moisture content prior to placement of the next layer of fill.

6. COMPACTION

Earth fill shall be compacted according to the following requirements for the class of compaction specified:

Class A compaction. Each layer of fill shall be compacted as necessary to make the density of the fill matrix not less than the minimum density specified. The fill matrix is defined as the portion of the fill material finer than the maximum particle size used in the compaction test method specified.

Class B compaction. Each layer of fill shall be compacted to a mass density not less than the minimum density specified.

Class C compaction. Each layer of fill shall be compacted by the specified number of passes of the type and weight of roller or other equipment specified, or by an approved equivalent method. Each pass shall consist of at least one passage of the roller wheel or drum over the entire surface of the layer.

Fill adjacent to structures shall be compacted to a density equivalent to that of the surrounding fill by means of hand tamping or manually directed power tampers or plate vibrators. Heavy equipment shall not be operated within 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure. Compaction by means of drop weights operating from a crane or hoist will not be permitted.

The passage of heavy equipment will not be allowed: (1) over cast-in-place conduits prior to 14 days after placement of the concrete; (2) over cradled precast conduits prior to 7 days after placement of the concrete cradle; or (3) over any type of conduit until the backfill has been placed above the top surface of the structure to a height equal to one-half the clear span width of the structure or pipe or 2 feet, whichever is greater.

Compacting of fill adjacent to structures shall not be started until the concrete has attained the strength specified in Section 10 for this purpose. The strength will be determined by compression testing of test cylinders cast by the Engineer for this purpose and cured at the work site in the manner specified in ASTM Method C 31 for determining when a structure may be put into service.

When the required strength of the concrete is not specified as described above, compaction of fill adjacent to structures shall not be started until the following time intervals have elapsed after placement of the concrete.

Structure	Time Interval
Retaining walls and counterforts	14 days
Walls backfilled on both sides simultaneously	7 days
Conduits and spillway risers, cast-in-place (with inside forms in place)	7 days
Spillway risers (inside forms removed)	14 days
Conduits, precast, cradled	2 days
Conduits, precast, bedded	1 day
Antiseep collars and cantilever outlet bents	3 days

7. REMOVAL AND PLACEMENT OF DEFECTIVE FILL

Fill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable fill. The replacement fill and the foundation, abutment and fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control and compaction.

8. TESTING

During the course of the work, the Engineer will perform such tests as are required to identify materials, to determine compaction characteristics, to determine moisture content, and to determine density of fill in place. These tests performed by the Engineer will be used to verify that the fills conform to the requirements of the specifications. Such tests are not intended to provide the Contractor with the information required by him for the proper execution of the work and their performance shall not relieve the Contractor of the necessity to perform tests for that purpose.

Densities of fill requiring Class A compaction will be determined by the Engineer in accordance with ASTM Method D 1556 (or by equivalent methods), except that the volume and moist weight of included rock particles larger than those used in the compaction test method specified for the type of fill will be determined and deducted from the volume and moist weight of the total sample prior to computation of density. The density so computed will be used to determine the percent compaction of the fill matrix.

9. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type and compaction class of earth fill within the specified zone boundaries and pay limits will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Unless otherwise specified, no deduction in volume will be made for embedded conduits and appurtenances.

The pay limits shall be as defined below, with the further provision that earth fill required to fill voids resulting from overexcavation of the foundation, outside the specified lines and grades, will be included in the measurement for payment only where such overexcavation is directed by the Engineer to remove unsuitable material and where the unsuitable condition is not a result of the Contractor's operations.

(Method 1) The pay limits shall be as designated on the drawings.

(Method 2) The pay limits shall be the measured surface of the foundation when approved for placement of the fill and the specified neat lines of the fill surface.

(Method 3) The pay limits shall be the measured surface of the foundation when approved for placement of the fill and the measured surface of the completed fill.

(Method 4) The pay limits shall be the specified pay limits for excavation and the specified neat lines of the fill surface.

(Method 5) The pay limits shall be the specified pay limits for excavation and the measured surface of the completed fill.

(Use method 6 or 7 with all methods 1 through 5)

(Method 6) Payment for each type and compaction class of earth fill will be made at the contract unit price for that type and compaction class of fill. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work.

(Method 7) Payment for each type and compaction class of earth fill will be made at the contract unit price for that type and compaction class of fill. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work, except furnishing, transporting, and applying water to the foundation and fill materials.

Water applied to the foundation and fill materials will be measured and payment will be made as specified in Construction Specification 10.

(Use with All Methods) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 7, Earth Fill, Compacted

(1) This item shall consist of moisture conditioning, placing and compacting earth fill required to construct all protection diversion dikes, dikes No. 1 and No. 2, irrigation border dike, and the Palo Verde and Johnson road ramps as shown on the drawings.

(2) The materials shall be the well graded silty sands, obtained from the required excavations, the minimum borrow channel, and other sources approved by the Engineer.

(3) Compaction for earth fill shall be Class A. The materials shall be compacted to 95% of maximum dry density as determined by laboratory procedures outlined in ASTM Designation D-698, Method A.

(4) During the filling operations, the materials being placed shall be maintained within a moisture content range of 2 percentage points above to 3 percentage points below optimum.

(5) The maximum size of rock fragments incorporated in the fill shall be six (6) inches.

(6) The thickness of each layer of fill placed shall not be greater than eight (8) inches before compaction.

(7) After foundation excavation, the foundations shall be brought within the moisture range specified for earth fill for a minimum depth of three feet. Unless otherwise directed by the Engineer, the foundation areas shall be loosened thoroughly by scarifying or discing to a maximum depth of eight (8) inches. Roots and rocks over six (6) inches in nominal diameter shall be removed, and the foundation surface areas shall then be compacted to the same density as specified for earth fill. Compaction operations or placing of earth fill shall be conducted only when the moisture range in the foundations are within the moisture range specified for earth fill.

(8) Sectional construction will be permitted in accordance with Section 4.e of this specification.

(9) Measurement and payment will be made by Method 2 and Method 6.

b. Bid Item 8, Earth Fill Uncompacted:

(1) This item shall consist of placing the uncompacted earth fill over the 60-inch RCP conduit outlet to the lines and grades shown on sheets 15, 16 and 21 of the drawings.

(2) Materials shall be silty sands and gravels obtained from the required excavations.

(3) Measurement and payment will be made by Method 1 and Method 6.

c. Bid Item 9, Structure Backfill:

(1) This item shall consist of moisture conditioning, placing, and compacting earth backfill around and over the outlet conduits, the inlet and outlet structures around the anti-seep collars, and around the corrugated metal pipes through the Palo Verde, Johnson Road crossings, and irrigation border dikes as shown on sheets 12, 13, 15, 16, 21, 22, and 23 of the drawings.

(2) The material and placing of material shall meet all of the requirements set forth in Bid Item 6 except as follows: (a) the maximum lift before compaction shall be four (4) inches and the maximum size of rock fragments incorporated in the fill shall be two (2) inches within two feet of any concrete surface and four (4) inches elsewhere; (b) sand bedding material under the outlet conduit from station 909+55.50 to 918+76.69 shall be selected pit run sand from the Hassayampa River bed or other sources approved by the Engineer.

(3) Measurement and payment will be made by Method 1 and Method 6. Space occupied by pipes, structures or other embedded items will not be included in the measurement for payment.

d. Subsidiary Item. Waste Fill:

(1) This item shall consist of the disposal of excess or unsuitable materials from the required excavations shown on the drawings or staked in the field.

(2) No compaction will be required for waste fill.

(3) Waste fill shall be placed in areas shown on the drawings or as directed by the Engineer.

(4) After waste areas are filled, they shall be smoothed and graded to drain and blend into the terrain.

(5) No separate payment will be made for waste fill. Compensation for this work will be included in the payment for Bid Items 4, 5, and 6.

CONSTRUCTION SPECIFICATION

24. DRAIN FILL

1. SCOPE

The work shall consist of furnishing, placing and compacting drain fill required in the construction of structure drains and filters.

2. MATERIALS

(Method 1) Drain fill materials shall conform to the requirements of Material Specification 521. At least 30 days prior to delivery of the materials to the site the Contractor shall inform the Contracting Officer in writing of the source from which he intends to obtain them. The Contractor shall provide the Engineer free access to the source for the purpose of obtaining samples for testing.

(Method 2) Drain fill materials shall be sand, gravel or crushed stone or mixtures thereof obtained from the specified sources. They shall be selected as necessary to avoid the inclusion of organic matter, clay balls, excessive fine particles or other substances that would interfere with their free-draining properties.

3. BASE PREPARATION

Foundation surfaces and trenches shall be clean and free of organic matter, loose soil, foreign substances, and standing water when the drain fill is placed. Earth surfaces upon or against which drain fill will be placed shall not be scarified.

4. PLACEMENT

Drain fill shall not be placed until the subgrade has been inspected and approved by the Engineer. Drain fill shall not be placed over or around pipe or drain tile until the installation of the pipe or tile has been inspected and approved.

Drain fill shall be placed uniformly in layers not more than 12 inches deep before compaction. When compaction is accomplished by manually controlled equipment, the layers shall be not more than 8 inches deep. The material shall be placed in a manner to avoid segregation of particle sizes and to insure the continuity and integrity of all zones. No foreign materials shall be allowed to become intermixed with or otherwise contaminate the drain fill.

Traffic shall not be allowed to cross over drains at random. Equipment crossovers shall be maintained, and the number and location of such crossovers shall be established and approved prior to the beginning of drain fill placement. Each crossover shall be cleaned of all contaminating materials and shall be inspected and approved by the Engineer before additional drain fill is placed.

Any damage to the foundation surface or to the sides or bottoms of trenches occurring during placement of drain fill shall be repaired before drain fill placement is continued.

The upper surface of drain fill constructed concurrently with adjacent zones of earth fill shall be maintained at an elevation at least one foot above the upper surface of the adjacent fill.

Drain fill over or around pipe or drain tile shall be placed in a manner to avoid any displacement of the pipe or tile in line or grade.

5. CONTROL OF MOISTURE

The moisture content of drain fill materials shall be controlled as specified in Section 8. When the addition of water is required, it shall be applied in such a way as to avoid excessive wetting of adjacent earth fill. Except as specified in Section 8, control of the moisture content will not be required.

6. COMPACTION

Drain fill shall be compacted according to the following requirements for the class of compaction specified:

Class A compaction. Each layer of drain fill shall be compacted to a relative density of not less than 70 percent as determined by ASTM Method D 2049-64T.

Class I compaction. Each layer of drain fill shall be compacted by at least 2 passes, over the entire surface, of a steel-drum vibrating roller weighing not less than 5 tons and exerting a vertical vibrating force of not less than 20,000 pounds at least 1200 times per minute, or by an approved equivalent method.

Class II compaction. Each layer of drain fill shall be compacted by one of the following methods or by an approved equivalent method:

a. At least 2 passes, over the entire surface, of a pneumatic-tired roller exerting a pressure of not less than 75 pounds per square inch.

b. At least 4 passes, over the entire surface, of the track of a crawler-type tractor weighing not less than 20 tons.

c. Controlled movement of the hauling equipment so that the entire surface is traversed by not less than one tread track of the loaded equipment.

Class III compaction. No compaction will be required beyond that resulting from the placing and spreading operations.

When compaction other than Class III compaction is specified materials placed in trenches or other locations inaccessible to heavy equipment shall be compacted by means of manually controlled pneumatic or vibrating tampers or by approved equivalent methods.

7. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of drain fill within the neat lines shown on the drawings or limits established by the Engineer will be measured and computed to the nearest cubic yard. Where the Engineer directs placement of drain fill outside the neat lines to replace unsuitable foundation material, the volume of such drain fill will be included, but only to the extent that the unsuitable condition is not a result of the Contractor's operations.

Payment for drain fill will be made at the contract unit price for each type of drain fill, complete in place. Except as otherwise specified in Section 8, such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8 of this specification.

8. Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Drain Fill

(1) This item shall consist of furnishing and placing the drain fill against the outlet structure as shown on sheets 20 and 21 of the drawings.

(2) In Section 2, Materials, Method 1 shall apply.

(3) The drain fill shall meet the requirements of Material Specification 521 and the following gradation:

Sieve Size	% Passing
1½"	100
No. 4	80-100
No. 10	25-70
No. 40	5-20
No. 200	0-3

(4) In Section 6, Compaction, Class III, Compaction shall apply.

(5) No separate payment will be made for drain fill. Compensation for this work will be included in the payment for Bid Item 8, concrete.

CONSTRUCTION SPECIFICATION

26. SALVAGING AND SPREADING TOPSOIL

1. SCOPE

The work shall consist of salvaging topsoil from borrow pits or required excavations and spreading it on the areas shown on the drawings to the specified depths.

2. QUALITY OF TOPSOIL

Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, stones or other foreign materials.

3. EXCAVATION

After the site has been cleared and grubbed the topsoil shall be removed from the designated areas and shall be stockpiled at locations approved by the Engineer. Objectionable materials encountered during excavation shall be removed and buried at locations approved by the Engineer or otherwise removed from the construction site.

4. SPREADING

(Method 1) Spreading shall not be done when the ground or topsoil is frozen, excessively wet or otherwise in a condition detrimental to the work. Surfaces designated to be covered shall be lightly scarified just prior to the spreading operation.

After placement is completed the surface of the topsoil shall be finished to a reasonably smooth surface.

(Method 2) Spreading shall not be done when the ground or topsoil is frozen, excessively wet or otherwise in a condition detrimental to the work. Surfaces designated to be covered shall be lightly scarified just prior to the spreading operation. Where compacted fills are designated to be covered by topsoil, the topsoil shall be placed concurrently with the fill and shall be bonded to the compacted fill with the compacting equipment.

After placement is completed the surface of the topsoil shall be finished to a reasonably smooth surface.

5. MEASUREMENT AND PAYMENT

(Method 1) The total area of the surfaces covered by topsoil will be computed to the nearest square yard. Payment for salvaging and placing topsoil will be made at the contract unit price. Such payment will constitute full compensation for all materials, labor and equipment and all other items necessary and incidental to the completion of the work, including excavating, stockpiling, hauling, and spreading.

(Method 2) The total area of the surfaces covered by topsoil will be computed to the nearest square yard except that the areas of the surfaces of embankments, levees, dikes and other earth fills will not be included for payment. Payment for salvaging and placing topsoil will be made at the contract unit price. Such payment will constitute full payment for all materials, labor and equipment and all other items necessary and incidental to the completion of the work, including excavating, stockpiling, hauling, and spreading.

Payment for topsoil spread on the surfaces of embankments, levees, dikes and other earth fills will be considered as included in the payment for the item of earth fill under which the embankment, levee, dike or other earth fill is constructed.

(Method 3) For items of work for which specific unit prices are established in the contract, the volume of topsoil salvaged and spread will be measured by cross section surveys of the stockpile from which it is taken if it is stockpiled; otherwise, of the area from which it is borrowed; and will be computed to the nearest cubic yard by the method of average cross-sectional end areas. Payment for salvaging and spreading topsoil will be made at the contract unit price. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work, including excavating, stockpiling, hauling, and spreading.

(Use with All Methods) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 6 of this specification.

6. Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 10, Salvaging and Spreading Topsoil

(1) This item shall consist of the salvaging of the top six inches of the foundation excavation for dike Number 1 and Number 2 and spreading and compacting this material over the downstream face of Dike No. 1 and Dike No. 2, as shown on sheets 8, 9, and 16 of the drawings.

(2) Sections 2 and 3 shall apply with the following modifications:

Alternate 1. The larger trees, shrubs, and cacti shall be removed from the topsoil as directed by the Engineer. Weeds, small shrubs, and other small vegetation shall then be incorporated into the topsoil by discing or other methods approved by the Engineer. The topsoil will then be excavated and stockpiled along the downstream toe of the dam. Only enough water for dust abatement shall be applied to the soil during this operation.

Alternate 2. In lieu of stockpiling the topsoil from the foundation excavation, topsoil may be placed directly on the finished sections of the dam from the top six inches of the foundation excavation or borrow excavation. In such case the larger trees, shrubs and cacti will be removed and weeds, small shrubs and other small vegetation shall be incorporated into the topsoil as in Alternate 1. The area to be used for topsoil shall then be watered. The soil shall be excavated and placed as soon as the soil is dry enough to be worked with equipment. Seeding and compacting shall proceed immediately after placement.

(3) In Section 4, Spreading, Method 1 shall apply with the following modifications. The topsoil shall be spread over the downstream face of the dikes and seeded in accordance with specification 100. After spreading and seeding, the topsoil shall be compacted with two passes with tracklaying equipment or other equipment approved by the Engineer.

(4) Measurement and payment will be made by Method 1.

CONSTRUCTION SPECIFICATION

31. CONCRETE

1. SCOPE

The work shall consist of furnishing, forming, placing, finishing and curing portland cement concrete as required to build the structures named in Section 26 of this specification.

2. MATERIALS

Portland cement shall conform to the requirements of Material Specification 531 for the specified type. One brand only of any type of cement shall be used in any single structure as defined in Section 26.

Aggregates shall conform to the requirements of Material Specification 522 unless otherwise specified. The grading of coarse aggregates shall be as specified in Section 26.

Water used in mixing or curing concrete shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter or other deleterious substances.

Air-entraining admixtures shall conform to the requirements of Material Specification 532. If air-entraining cement is used, any additional air-entraining admixture shall be of the same type as that in the cement.

Water-reducing, set-retarding admixtures shall conform to the requirements of Material Specification 533.

Shear plates shall conform to the requirements of Material Specification 581 for structural quality or commercial or merchant quality steel. Structural quality shall be used if specifically designated in the drawings or specifications.

Preformed expansion joint filler shall conform to the requirements of Material Specification 535.

Waterstops shall conform to the requirements of Material Specifications 537 and 538 for the specified kinds.

Curing compound shall conform to the requirements of Material Specification 534.

3. CLASSES OF CONCRETE

(Method 1)

Concrete shall be classified according to the required compressive strength. The strength of the concrete at 28 days shall equal or exceed the Minimum Compressive Strength tabulated below for the class of concrete specified.

Class of Concrete	Minimum Compressive Strength at 28 days (psi)
5000	5000
4000	4000
3000	3000
2500	2500

(Method 2)

Concrete shall be classified as follows:

Class of Concrete	Maximum Net Water Content (gallons/bag)	Minimum Cement Content (bags/cu. yd.)
5000X	5	7
4000X	6	6
3000X	7	5
2500X	8	4 1/2

4. AIR CONTENT AND CONSISTENCY

Unless otherwise specified the air content (by volume) of the concrete at the time of placement shall be:

Maximum Size Aggregate	Air Content (%)
3/8 inch to 1/2 inch	6 to 9
Over 1/2 inch to 1 inch	5 to 8
Over 1 inch to 2 1/2 inches	4 to 7

The consistency of the concrete shall be such as to allow it to be worked into place without segregation or excessive laitance. Unless otherwise specified, the slump shall be:

Type of Structure	Slump (inches)
Massive sections, pavements, footings	2 ± 1/2
Heavy beams, thick slabs, thick walls (over 12 in.)	3 ± 1/2
Columns, light beams, thin slabs, thin walls (12 in. or less)	4 ± 1

5. DESIGN OF THE CONCRETE MIX

(Method 1)(For use with Method 1 in Section 3.)

The Contractor will be responsible for the design of the concrete mixtures. At least 5 days prior to any placement of concrete he shall furnish the Contracting Officer a statement of the materials and mix proportions (including admixtures, if any) he intends to use for each specified class of concrete. The statement shall include evidence satisfactory to the Engineer that the materials and proportions selected will produce concrete of the quality, consistency and strength specified. The materials and proportions so stated shall constitute the "job mix." After a job mix has been designated, neither the source, character or grading of the aggregates nor the type or brand of cement or admixture shall be changed without prior notice to the Engineer.

When specified, a water-reducing, set-retarding admixture shall be used. When conditions are such that the temperature of the concrete at the time of placement is consistently above 75°F, a water-reducing, set-retarding admixture may be used, at the option of the Contractor. The cement content shall be same as that required in the mix without the admixture.

The use of calcium chloride or other accelerators or antifreeze compounds will not be allowed.

Before placing concrete containing a water-reducing, set-retarding admixture, the Contractor shall furnish test results to the Engineer showing that its performance in the job mix meets the requirements of Material Specification 533, Section 4.

(Method 2)(For use with Method 2 in Section 3.)

At least 35 days prior to any placement of concrete the Contractor shall inform the Contracting Officer in writing of the source and grading of aggregates and the brand and type of cement and the brand and type of admixture, if any, he proposes to use for each class of concrete, and shall furnish certifications or other

evidence satisfactory to the Engineer that the proposed materials meet the requirements of the specifications.

When acceptable sources, types and gradings of aggregates are designated in the contract, certifications for such aggregates will not be required.

Job mix proportions and batch weights will be determined by the Engineer. During the course of the work, the Engineer will adjust the job mix proportions and batch weights whenever necessary.

After the job mix has been designated, neither the source, character or grading of the aggregates nor the type or brand of cement or admixture shall be changed without prior notice to the Engineer.

If such changes are necessary, no concrete containing such new or altered materials shall be placed until the Engineer has designated a revised job mix.

When specified, a water reducing, set-retarding admixture shall be used. When conditions are such that the temperature of the concrete at the time of placement is consistently above 75°F, a water-reducing, set-retarding admixture may be used, at the option of the Contractor. The cement content shall be same as that required in the mix without the admixture.

The use of calcium chloride or other accelerators or antifreeze compounds will not be allowed.

When it is anticipated that a water-reducing, set-retarding admixture will be used, the Contractor shall furnish to the Engineer a sample of the admixture he proposes to use sufficient for the tests required by Material Specification 533, Section 4. Concrete containing the admixture shall not be placed until test results have been obtained showing that its performance in the job mix meets the requirements of Material Specification 533, Section 4.

6. INSPECTING AND TESTING

The following tests will be performed by the methods indicated:

Test	Method (ASTM Designation)
Sampling	C 172[1]
Slump Test	C 143[1]

Test	Method (ASTM Designation)
Air Content	C 231[1] or C 173[1]
Compression Test Specimens	C 31[1] or C 42
Compressive Strength	C 39[2] or C 42
Unit Weight	C 138

[1]Tests of a portion of a batch may be made on samples representative of that portion for any of the following purposes:

(1) Determining uniformity of the batch.

(2) Checking compliance with requirements for slump and air content when the batch is discharged over an extended period of time.

(3) Checking compliance of the concrete with the specifications when the whole amount being placed in a small structure, or a distinct portion of a larger structure, is less than full batch.

[2]For each strength test of specimens made according to ASTM Designation C 31, 3 standard test specimens shall be made. The test result shall be the average of the strengths of the 3 specimens, except that if one specimen in the test shows manifest evidence of improper sampling, molding or testing, it shall be discarded and the strengths of the remaining 2 specimens shall be averaged. Should more than one specimen representing a test show such defects, the entire test shall be discarded.

The Engineer shall have free entry to the plant and equipment furnishing concrete under the contract. Proper facilities shall be provided for the Engineer to inspect materials, equipment and processes and to obtain samples of the concrete. All tests and inspections will be conducted so as not to interfere unnecessarily with the manufacture and delivery of the concrete.

7. HANDLING AND MEASUREMENT OF MATERIALS

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size will be avoided and that various sizes will not become intermixed before proportioning. Methods of handling and transporting aggregates shall be such as to avoid contamination, excessive breakage, segregation or degradation, or intermingling of various sizes.

Scales for weighing aggregates and cement shall be beam type or springless dial type. They shall be accurate within 1 percent under operating conditions. All exposed fulcrums, clevises and similar working parts of scales shall be kept clean.

The quantities of cement and aggregates in each batch of concrete, as indicated by the scales, shall be within the following percentages of the required batch weights:

Cement - plus or minus 1.0 percent

Aggregates - plus or minus 2.0 percent

Measuring tanks for mixing water shall be of adequate capacity to furnish the maximum amount of mixing water required per batch and shall be equipped with outside taps and valves to provide for checking their calibration unless other means are provided for readily and accurately determining the amount of water in the tank.

Cement shall be measured by weight or in bags of 94 lbs. each. When cement is measured by weight, it shall be weighed on a scale separate from that used for other materials, and in a hopper entirely free and independent of the hopper used for weighing the aggregates. When cement is measured in bags, no fraction of a bag shall be used unless weighed.

Aggregates shall be measured by weight. Mix proportions shall be based on saturated, surface-dry weights. The batch weight of each aggregate shall be the required saturated, surface-dry weight plus the weight of surface moisture it contains.

Mixing water shall consist of water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates and water introduced in the form of admixtures. The added water shall be measured by weight or volume to an accuracy of 1 percent of the required total mixing water. Added ice shall be measured by weight. Wash water shall not be used as a portion of the mixing water for succeeding batches.

Dry admixtures shall be measured by weight, and paste or liquid admixtures by weight or volume, within a limit of accuracy of 3 percent.

8. MIXERS AND MIXING

Concrete may be furnished by batch mixing at the site of the work or by ready-mix methods.

Mixers shall be capable of thoroughly mixing the concrete ingredients into a uniform mass within the specified mixing time and

of discharging the mix without segregation. Each mixer or agitator shall bear a manufacturer's rating plate indicating the rated capacity and recommended speeds of rotation, and shall be operated in accordance with these recommendations.

Concrete shall be uniform and thoroughly mixed when delivered to the work. Variations in slump of more than 1 inch within a batch will be considered evidence of inadequate mixing and shall be corrected by changing batching procedures, increasing mixing time, changing mixers or other means. Mixing time shall be within the limits specified below unless the Contractor demonstrates by mixer performance tests that adequate uniformity is obtained by different times of mixing. For this purpose the testing program and uniformity requirements shall be as set forth in ASTM Designation C 94.

No mixing water in excess of the amount called for by the job mix shall be added to the concrete during mixing or hauling or after arrival at the delivery point.

Batch mixing at the site. For concrete mixed at the site of the work with paving mixers or stationary construction mixers, the time of mixing after all cement and aggregates are in the mixer drum shall be not less than 1-1/2 minutes.

The batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates and all mixing water shall be introduced into the drum before one-fourth of the mixing time has elapsed.

Controls shall be provided to insure that the batch cannot be discharged until the required mixing time has elapsed.

If truck mixers are used, the requirements below for truck mixers and truck-mixed concrete shall apply.

Ready-mixed concrete. Ready-mixed concrete shall be mixed and delivered to the site of the work by one of the following methods:

a. Truck-mixed concrete--Mixed completely in a truck mixer.

b. Shrink-mixed concrete--Mixed partially in a stationary mixer, and the mixing completed in a truck mixer.

c. Central-mixed concrete--Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in a truck agitator or in a truck mixer operating at agitating speed or in nonagitating equipment.

Truck mixers and agitators shall be equipped with revolution counters by which the number of revolutions of the drum or blades may be readily verified.

When ready-mixed concrete is furnished, the Contractor shall furnish the Engineer a statement-of-delivery ticket showing the time of loading, the revolution counter reading at the time of loading and the quantities of materials used for each load of concrete.

Truck-mixed concrete. When concrete is mixed in a truck mixer loaded to its maximum capacity, the number of revolutions of the drum or blades at mixing speed shall be not less than 70 nor more than 100. If the batch is at least 1/2 cubic yard less than maximum capacity, the number of revolutions at mixing speed may be reduced to not less than 50. Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer of the equipment as agitating speed. The mixing operation shall begin within 30 minutes after the cement has been added to the aggregates and the water shall be added during mixing. When mixing is begun during or immediately after charging, a portion of the mixing water shall be added ahead of, or with, the other ingredients.

Shrink-mixed concrete. When concrete is partially mixed at a central plant and the mixing is completed in a truck mixer, the mixing time in the central plant mixer shall be the minimum required to intermingle the ingredients and shall be not less than 30 seconds. The mixing shall be completed in a truck mixer and the number of revolutions of the drum or blades at mixing speed shall be not less than 50 nor more than 100. Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer of the equipment as agitating speed.

Central-mixed concrete. For central-mixed concrete, mixing in the stationary mixer shall meet the same requirements as batching mixing at the site.

When an agitator, or truck mixer used as an agitator, transports concrete that has been completely mixed in a stationary mixer, mixing during transportation shall be at the speed designated by the manufacturer of the equipment as agitating speed.

The use of nonagitating equipment to transport concrete to the site of the work will be permitted only if the consistency and uniformity of the concrete as discharged

at the point of delivery meet the requirements of this specification. Bodies of nonagitating hauling equipment shall be so constructed that leakage of the concrete mix, or any part thereof, will not occur. Concrete hauled in open-top vehicles shall be protected against access of rain, and against exposure to the sun of more than 20 minutes when the air temperature is above 75° F.

9. FORMS

Forms shall be of wood, plywood, steel or other approved material and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours. Form surfaces shall be smooth and free from holes, dents, sags or other irregularities. Forms shall be coated with a nonstaining form oil before being set into place.

Metal ties or anchorages within the forms shall be equipped with cones, she-bolts or other devices that permit their removal to a depth of at least one inch without injury to the concrete. Ties designed to break off below the surface of the concrete shall not be used without cones.

All edges that will be exposed to view when the structure is completed shall be chamfered, unless finished with molding tools as specified in Section 20.

10. PREPARATION OF FORMS AND SUBGRADE

Prior to placement of concrete the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar or other harmful substances or coatings. Any oil in the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. Rock surfaces shall be cleaned by air-water cutting, wet sandblasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Earth surfaces shall be firm and damp. Placement of concrete on mud, dried earth, uncompacted fill or frozen subgrade will not be permitted.

Unless otherwise specified, when concrete is to be placed over drain fill, the contact surface of the drain fill shall be covered with a layer of asphalt-impregnated building paper or polyvinyl sheeting prior to placement of the concrete. Forms for weepholes shall extend through this layer into the drain fill.

Items to be embedded in the concrete shall be positioned accurately and anchored firmly.

Weepholes in walls or slabs shall be formed with nonferrous materials.

11. CONVEYING

Concrete shall be delivered to the site and discharged into the forms within 1-1/2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85° F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. The Engineer may allow a longer time, provided the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case, concrete shall be conveyed from the mixer to the forms as rapidly as practicable, by methods that will prevent segregation of the aggregates or loss of mortar. Concrete shall not be dropped more than 5 feet vertically unless suitable equipment is used to prevent segregation.

12. PLACING

Concrete shall not be placed until the subgrade, forms and steel reinforcement have been inspected and approved.

The Contractor shall have all equipment and materials required for curing available at the site ready for use before placement of concrete begins.

No concrete shall be placed except in the presence of the Engineer. The Contractor shall give reasonable notice to the Engineer each time he intends to place concrete. Such notice shall be far enough in advance to give the Engineer adequate time to inspect the subgrade, forms, steel reinforcement and other preparations for compliance with the specifications before concrete is delivered for placing.

The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. The depositing of concrete shall be regulated so that the concrete may be consolidated with a minimum of lateral movement.

Internal stays and braces, serving temporarily to hold the forms in correct shape and alignment prior to placement of concrete at their locations, shall be removed when the concrete has been placed to an elevation such as to render their service unnecessary.

13. LAYERS

Unless otherwise specified, slab concrete shall be placed to design thickness in one continuous layer. Formed concrete shall be placed in horizontal layers not more than 20 inches thick. Hoppers and chutes, pipes or "elephant trunks" shall be used as necessary to prevent splashing of mortar on the forms and reinforcing steel above the layer being placed.

Successive layers shall be placed at a fast enough rate to prevent the formation of "cold joints." If the surface of a layer of concrete in place sets to the degree that it will not flow and merge with the succeeding layer when vibrated, the Contractor shall discontinue placing concrete and shall make a construction joint according to the procedure specified in Section 15.

If placing is discontinued when an incomplete layer is in place, the unfinished end of the layer shall be formed by a vertical bulkhead.

14. CONSOLIDATING

Unless otherwise specified, concrete shall be consolidated with internal type mechanical vibrators capable of transmitting vibration to the concrete at frequencies not less than 6000 impulses per minute.

The location, manner and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete without causing segregation of the mortar and coarse aggregate, and without causing water or cement paste to flush to the surface.

The Contractor shall provide a sufficient number of vibrators to properly consolidate the concrete immediately after it is placed in the work. Vibration shall be applied in the freshly deposited concrete by slowly inserting and removing the vibrator at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective. The vibrator shall extend into the previously placed layer of fresh concrete, at all points, to insure effective bond between layers.

Vibration shall not be applied directly to the reinforcement steel or the forms nor to concrete that has hardened to the degree that it does not become plastic when vibrated.

The use of vibrators to transport concrete in the forms or conveying equipment will not be permitted.

Vibration shall be supplemented by spading and hand tamping as necessary to insure smooth and dense concrete along form surfaces, in corners and around embedded items.

15. CONSTRUCTION JOINTS

Construction joints shall be made at the locations shown on the drawings. If construction joints are needed which are not shown on the drawings, they shall be placed in locations approved by the Engineer.

Where a feather edge would be produced at a construction joint, as in the top surface of a sloping wall, an insert form shall be used so that the resulting edge thickness on either side of the joint is not less than 6 inches.

In walls and columns as each lift is completed, the top surfaces shall be immediately and carefully protected from any condition that might adversely affect the hardening of the concrete.

Steel tying and form construction adjacent to concrete in place shall not be started until the concrete has cured at least 12 hours. Before new concrete is deposited on or against concrete that has hardened, the forms shall be retightened. New concrete shall not be placed until the hardened concrete has cured at least 12 hours.

(Method 1)

Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains or debris by either wet sandblasting after the concrete has gained sufficient strength to resist excessive cutting, or air-water cutting as soon as the concrete has hardened sufficiently to prevent the jet from displacing the coarse aggregates, or both. The surface of the concrete in place shall be cut to expose clean, sound aggregate but not so deep as to undercut the edges of larger particles of the aggregate. After cutting, the surface shall be thoroughly washed to remove all loose material. If the surface is congested by reinforcing steel, is relatively inaccessible, or it is considered undesirable to disturb the concrete before it is hardened, cleaning of the joint by air-water jets will not be permitted and the wet sandblasting method will be required after the concrete has hardened.

(Method 2)

Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains, or debris by washing and scrubbing with a wire brush or wire broom or by other means approved by the Engineer.

(Use with Either Method)

The surfaces shall be kept moist for at least one hour prior to placement of new concrete. The new concrete shall be placed directly on the cleaned and washed surface.

16. EXPANSION AND CONTRACTION JOINTS

Expansion and contraction joints shall be made only at locations shown on the drawings.

Exposed concrete edges at expansion and contraction joints shall be carefully tooled or chamfered, and the joints shall be free of mortar and concrete. Joint filler shall be left exposed for its full length with clean and true edges.

When open joints or weakened plane "dummy" joints are specified, the joints shall be constructed by the insertion and subsequent removal of a wood strip, metal plate or other suitable template in such a manner that the corners of the concrete will not be chipped or broken. The edges of the concrete at the joints shall be finished with an edging tool prior to removal of the joint strips.

Preformed expansion joint filler shall be held firmly in the correct position as the concrete is placed.

17. WATERSTOPS

Waterstops shall be held firmly in the correct position as the concrete is placed. Joints in metal waterstops shall be brazed or welded. Joints in rubber or plastic waterstops shall be cemented, welded or vulcanized as recommended by the manufacturer.

18. REMOVAL OF FORMS

Forms shall be removed only when the Engineer is present and shall not be removed without his approval. Forms shall be removed in such a way as to prevent damage to the concrete. Supports shall be removed in a manner that will permit the concrete to take the stresses due to its own weight uniformly and gradually.

(Method 1)

Forms shall not be removed before the expiration of the following minimum time intervals after placement of the concrete, exclusive of days when the minimum temperature of air adjacent to the concrete is below 40°F:

Element	Time
Arch or beam bottom forms and temporary supports	14 days
Deck slabs; conduits (inside forms)	14 days
Spillway risers (inside forms) unless otherwise specified,	14 days
Conduits and spillway risers (outside forms); small structures	3 days
Columns, bearing walls	7 days
Nonbearing walls with no side load; sides of beams	24 hours

(Method 2)

Forms, supports and housings shall not be removed until the concrete has attained the strength specified in Section 26 for this purpose. The strength will be determined by compression testing of test cylinders cast by the Engineer for this purpose and cured at the work site in the manner specified in ASTM Method C 31 for determining form removal time.

19. FINISHING FORMED SURFACES

All concrete surfaces shall be true and even, and shall be free from open or rough spaces, depressions or projections.

Immediately after the removal of forms:

All bulges, fins, form marks or other irregularities which in the judgment of the Engineer will adversely affect the appearance or function of the structure shall be removed. All form bolts and ties shall be removed to a depth at least 1 inch below the surface of the concrete. The cavities produced by form ties and all other holes of similar size and depth shall be thoroughly cleaned and, after the interior surfaces have been kept continuously wet for at least 3 hours, shall be carefully packed with a dry patching mortar (preshrunk) mixed not richer than 1 part cement to 3 parts sand.

Holes left by form bolts or straps which pass through the wall shall be filled solid with mortar.

Patching mortar shall be thoroughly compacted into place to form a dense, well-bonded unit, and the in-place mortar shall be sound and free from shrinkage cracks.

All patched areas shall be cured as specified in Section 21.

20. FINISHING UNFORMED SURFACES

All exposed surfaces of the concrete shall be accurately screeded to grade and then wood float finished, unless specified otherwise.

Excessive floating or troweling while the concrete is soft will not be permitted.

The addition of dry cement or water to the surface of the screeded concrete to expedite finishing will not be allowed.

Joints and edges on unformed surfaces that will be exposed to view shall be chamfered or finished with molding tools.

21. CURING

Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period or until curing compound is applied as specified below. Moisture shall be maintained by sprinkling, flooding or fog spraying, or by covering with continuously moistened canvas, cloth mats, straw, sand or other approved material. Wood forms (except plywood) left in place during the curing period shall be kept wet. Formed surfaces shall be thoroughly wetted immediately after forms are removed and shall be kept wet until patching and repairs are completed. Water or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged.

Water for curing shall be clean and free from any substances that will cause discoloration of the concrete.

Except as otherwise specified in Section 24, and except for construction joint surfaces, concrete may be coated with curing compound in lieu of the continued application of moisture.

The compound shall be sprayed on the moist concrete surfaces as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs and finishing of that surface are completed.

The curing compound shall be thoroughly mixed immediately before applying, and shall be applied at a uniform rate of not less than one gallon per 150 square feet of surface. It shall form a uniform, continuous, adherent film that shall not check, crack or peel, and shall be free from pin holes or other imperfections.

Curing compound shall not be applied to surfaces requiring bond with subsequently placed concrete, such as construction joints, shear plates, reinforcing steel and other embedded items.

Surfaces subjected to heavy rainfall or running water within 3 hours after the compound has been applied, or surfaces damaged by subsequent construction operations during the curing period shall be resprayed in the same manner as for the original application.

22. REMOVAL OR REPAIR

When concrete is honeycombed, damaged or otherwise defective, the Contractor shall remove and replace the structure or structural member containing the defective concrete, or correct or repair the defective parts. The Engineer will determine the required extent of removal, replacement or repair.

Prior to starting repair work the Contractor shall obtain the Engineer's approval of his plan for making the repair. Such approval shall not be considered a waiver of the Contracting Officer's right to require complete removal of defective work if the completed repair does not produce concrete of the required quality and appearance.

Repair work shall be performed only when the Engineer is present.

Repair of formed surfaces shall be started within 24 hours after removal of the forms.

Except as otherwise approved by the Engineer, the appropriate methods described in Chapter VII of the Concrete Manual, Bureau of Reclamation, U. S. Department of the Interior, shall be used. If approved in writing by the Contracting Officer, proprietary compounds for adhesion or as patching ingredients may be used. Such compounds shall be used in accordance with the manufacturer's recommendations.

Curing as specified in Section 21 shall be applied to repaired areas immediately after the repairs are completed.

23. CONCRETING IN COLD WEATHER

When the atmospheric temperature may be expected to drop below 40°F at the time concrete is delivered to the work site, during placement, or at any time during the curing period, the following provisions also shall apply:

a. The temperature of the concrete at time of placing shall not be less than 50°F nor more than 90°F. The temperature of neither aggregates nor mixing water shall be more than 100°F just prior to mixing with the cement.

b. When the daily minimum temperature is less than 40°F, concrete structures shall be insulated or housed and heated after placement. The temperature of the concrete and air adjacent to the concrete shall be maintained at not less than 50°F nor more than 90°F for the duration of the curing period.

c. Methods of insulating, housing and heating the structure shall conform to "Recommended Practice for Cold Weather Concreting," ACI Standard 306.

d. When dry heat is used to protect concrete, means of maintaining an ambient humidity of at least 40 percent shall be provided unless the concrete has been coated with curing compound as specified in Section 21 or is covered tightly with an approved impervious material.

24. CONCRETING IN HOT WEATHER

When climatic or other conditions are such that the temperature of the concrete may reasonably be expected to exceed 90°F at the time of delivery at the work site, during placement, or during the first 24 hours after placement, the following provisions also shall apply;

a. The Contractor shall maintain the temperature of the concrete below 90°F during mixing, conveying, and placing. Methods used shall conform to "Recommended Practice for Hot Weather Concreting," ACI Standard 605.

b. The concrete shall be placed in the work immediately after mixing. Truck mixing shall be delayed until only time enough remains to accomplish it before the concrete is placed.

c. Exposed concrete surfaces which tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or otherwise protected from drying during the time between placement and finishing, and after finishing.

d. Finishing of slabs and other exposed surfaces shall be started as soon as the condition of the concrete allows and shall be completed without delay.

e. Concrete surfaces exposed to the air shall be covered as soon as the concrete has hardened sufficiently and shall be kept continuously wet for at least the first 24 hours of the curing period, and for the entire curing period unless curing compound is applied as specified in subsection g, below.

f. Formed surfaces shall be kept completely and continuously wet for the duration of curing period (prior to, during and after form removal) or until curing compound is applied as specified in subsection g, below.

g. If moist curing is discontinued before the end of the curing period, white pigmented curing compound shall be applied immediately, following the procedures specified in Section 21.

25. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, concrete will be measured to the neat lines or pay limits shown on the drawings, and the volume of concrete will be computed to the nearest 0.1 cubic yard. No deduction in volume will be made for chamfers, rounded or beveled edges, or for any void or embedded item that is less than five cubic feet in volume. Where concrete is placed against the sides or bottom of an excavation without intervening forms, drain fill, or bedding, the volume of concrete required to fill voids resulting from overexcavation outside the neat lines or pay limits will be included in the measurement for payment where such overexcavation is directed by the Engineer to remove unsuitable foundation material; but only to the extent that the unsuitable condition is not a result of the Contractor's operations.

(Method 1)

Payment for each item of concrete will be made at the contract unit price for that item. The payment for concrete will constitute full compensation for all labor, materials, equipment, transportation, tools, forms, falsework, bracing and all other items necessary and incidental to completion of the concrete work, such as joint fillers, waterstops, dowels or dowel assemblies and shear plates, but not including reinforcing steel or other items listed for payment elsewhere in the contract.

Measurement and payment for furnishing and placing reinforcing steel will be made as specified in Construction Specification 34.

(Method 2)

Payment for each item of concrete will be made at the contract unit price for that item. The payment for concrete will constitute full compensation for all labor, materials, equipment, transportation, tools, forms, falsework, bracing and all other items necessary and incidental to completion of the concrete work, such as joint fillers, waterstops, dowels or dowel assemblies, and shear plates, but not including furnishing and placing reinforcing steel or furnishing and handling cement or other items listed for payment elsewhere in the contract.

Measurement and payment for furnishing and placing reinforcing steel will be made as specified in Construction Specification 34.

Cement will be measured by dividing the volume of concrete accepted for payment by the yield of the applicable job mix. The yield will be determined by the procedure specified in ASTM Designation C 138. If the amount of cement actually used per batch exceeds the amount in the job mix specified by the Engineer, the measurement will be based on the latter. One barrel of cement will be considered equal to 4 bags or 376 pounds. Payment for each type of cement will be made at the contract unit price for furnishing and handling that type of cement and such payment will constitute full compensation for all materials, labor, equipment, storage, transportation and all other items necessary and incidental to furnishing and handling the cement.

(Use with Either Method)

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 26 of this specification.

26. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

(a) Bid Item 11, Concrete

(1) This item shall consist of the furnishing and placing of concrete for the construction of the inlet structures and outlet structures, concrete cradles, anti-seep collars, and gate stem and lift pedestals for the outlet conduits and the irrigation outlets as shown on sheets 15 through 25 of the drawings.

(2) In Section 2, Materials:

(a) Coarse aggregate shall be size 467 (1½ inch to No. 4).

(b) Pre-formed joint filler shall be Type I.

(3) In Section 3, Classes of Concrete, Method 2 shall apply. Concrete shall be Class 3000X.

(4) In Section 5, Design of Concrete Mix, Method 2 shall apply.

(5) In Section 15, Construction Joints, Method 2 shall apply.

(6) In Section 18, Removal of Forms, Method 1 shall apply.

(7) Measurement and Payment will be by Method 2.

(b) Bid Item 12, Cement

(1) This item shall consist of furnishing and handling all cement required to construct the concrete items listed under Bid Item 11, Concrete.

(2) Cement shall be Type II or IIa.

(3) Measurement and payment will be by Method 2.

CONSTRUCTION SPECIFICATION

34. STEEL REINFORCEMENT

1. SCOPE

The work shall consist of furnishing and placing steel reinforcement for reinforced concrete or pneumatically applied mortar.

2. MATERIALS

Steel reinforcement shall conform to the requirements of Material Specification 539. Before reinforcement is placed the surfaces of the bars and fabric and any metal supports shall be cleaned to remove any loose, flaky rust, mill scale, oil, grease or other coatings or foreign substances. After placement the reinforcement shall be maintained in a clean condition until it is completely embedded in the concrete.

3. BAR SCHEDULE, LISTS AND DIAGRAMS

Any supplemental bar schedules, bar lists or bar-bending diagrams required to accomplish the fabrication and placement of reinforcement shall be provided by the Contractor. Prior to placement of reinforcement, the Contractor shall furnish three prints or copies of any such lists or diagrams to the Contracting Officer. Acceptance of the reinforcement will not be based on approval of these lists or diagrams but will be based on inspection of the reinforcement after it has been placed.

4. BENDING

Reinforcement shall be cut and bent in compliance with the requirements of the American Concrete Institute Standard 315. Bars shall not be bent or straightened in a manner that will injure the material. Bars with kinks, cracks or improper bends will be rejected.

5. SPLICING BAR REINFORCEMENT

Unless otherwise specified on the drawings, splices of reinforcing bars shall provide an overlap equal to at least 30 times the diameter of the smaller bar in the splice but not less than 12 inches.

6. SPLICING WELDED WIRE FABRIC

Welded wire fabric shall be spliced in the following manner:

a. Adjacent sections shall be spliced end to end by either:

(1) Overlapping the two pieces of fabric one full mesh (measured from the ends of the longitudinal wires in one piece to the ends of the longitudinal wires in the other piece) and securing the two pieces together with wire ties placed at intervals of 18 inches; or,

(2) Overlapping the two pieces of fabric so that the end crosswire of each piece comes in contact with the next-to-end crosswire of the other piece and securing the two pieces together only as required to keep the fabric in place and to prevent it from curling.

b. Adjacent sections of fabric shall be spliced side to side by either:

(1) Placing the two selvage wires (the longitudinal wires at the edges of the fabric) one along side and overlapping the other and securing the two pieces together with wire ties placed at intervals of 3 feet; or,

(2) Placing each selvage wire in the middle of the first mesh of the other section of fabric and securing it to the other section at intervals of 10 feet by means of wire ties placed on the selvage wires alternately at intervals of 5 feet.

(3) Placing each selvage wire in contact with the next-to-edge longitudinal wire and securing them together only as required to keep the fabric in place or to prevent it from curling.

7. PLACING

Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. Tack welding of bars will not be permitted. Metal chairs, metal hangers, metal spacers and concrete chairs

may be used to support the reinforcement. Metal hangers, spacers and ties shall be placed in such a manner that they will not be exposed in the finished concrete surface. The legs of metal chairs that may be exposed at the lower face of slabs or beams shall be galvanized as specified for iron and steel hardware in Material Specification 582. Precast concrete chairs shall be manufactured of the same class of concrete as that specified for the structure and shall have tie wires securely anchored in the chair or a V-shaped groove at least 3/4 inch in depth molded into the upper surface to receive the steel bar at the point of support. Precast concrete chairs shall be moist at the time concrete is placed.

Reinforcement shall not be placed until the prepared site has been inspected and approved by the Engineer. After placement of the reinforcement, concrete shall not be placed until the reinforcement has been inspected and approved by the Engineer.

8. MEASUREMENT AND PAYMENT

(Method 1) For items of work for which specific unit prices are established in the contract, the weight of reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest pound by computation from the placing drawings. Measurement of hooks and bends will be based on the requirements of ACI Standard 315. Computation of weights of reinforcement will be based on the unit weights established in Tables 34-1, 34-2, and 34-3. The area of welded wire fabric reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest square foot by computation from the placing drawings with no allowance for laps. The weight of steel reinforcing in extra splices or extra-length splices approved for the convenience of the Contractor or the weight of supports and ties will not be included in the measurement for payment.

Payment for furnishing and placing reinforcing steel will be made at the contract unit price. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work including preparing and furnishing bar schedules, lists or diagrams; furnishing and attaching ties and supports; and furnishing, transporting, cutting, bending, cleaning and securing all reinforcement.

(Method 2) For items of work for which specific unit prices are established in the contract, the weight of bar reinforcement placed in the concrete in accordance with the drawings will be determined

to the nearest pound by computation from the placing drawings. Measurement of hooks and bends will be based on the requirements of ACI Standard 315. Computation of weights of bar reinforcement will be based on the unit weights established in Table 34-1. The weight of steel reinforcing in extra splices or extra-length splices approved for the convenience of the Contractor or the weight of supports and ties will not be included in the measurement for payment.

The area of welded wire fabric reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest square foot by computation from the placing drawings with no allowance for laps.

Payment for furnishing and placing bar reinforcing steel will be made at the contract unit price for bar reinforcement. Payment for furnishing and placing welded wire fabric reinforcing steel will be made at the contract unit price for welded wire fabric reinforcement. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work including preparing and furnishing bar schedules, lists or diagrams; furnishing and attaching ties and supports; and furnishing, transporting, cutting, bending, cleaning and securing all reinforcement.

(Use with Either Method) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in Section 9 of this specification.

TABLE 34-1. STANDARD REINFORCING BARS

Bar Size No.	2	3	4	5	6	7	8	9	10	11
Wt. (lb./ft.)	0.167	0.376	0.668	1.043	1.502	2.044	2.670	3.400	4.303	5.313

TABLE 34-2. RECTANGULAR WELDED WIRE FABRIC [1]

Style Designation	Wt. in Lb. Per 100 Sq. Ft.	Style Designation	Wt. in Lb. Per 100 Sq. Ft.	Style Designation	Wt. in Lb. Per 100 Sq. Ft.
24-1414	16	312- 711	39	48- 912	23
212- 04	169	312- 812	32	48-1012	20
212- 15	144	412- 26	69	48-1112	17
212- 26	124	412- 37	59	48-1212	14
212- 37	107	412- 48	51	48-1214	12
212- 48	91	412- 59	43	612-3/04	91
212- 59	77	412- 610	36	612-2/04	78
212- 610	66	412- 711	31	612- 00	81
212- 711	56	412- 810	27	612- 03	72
312- 04	119	412- 812	25	612- 11	69
312- 15	102	412- 912	22	612- 14	61
312- 26	87	412-1012	19	612- 22	59
312- 37	75	412-1112	16	612- 25	52
312- 48	64	412-1212	13	612- 33	51
312- 59	54	48- 711	33	612- 44	44
312- 610	46	48- 812	27	612- 66	32
				612- 77	27

[1] Style designation is defined in ACI Standard 315 of the American Concrete Institute.

TABLE 34-3. SQUARE WELDED WIRE FABRIC[1]

Style Designation	Wt. in Lb. Per 100 Sq. Ft.	Style Designation	Wt. in Lb. Per 100 Sq. Ft.
2 x 2 - 10/10	60	4 x 4 - 14/14	11
2 x 2 - 12/12	37	6 x 6 - 0/0	107
2 x 2 - 14/14	21	6 x 6 - 1/1	91
2 x 2 - 16/16	13	6 x 6 - 2/2	78
3 x 3 - 8/8	58	6 x 6 - 3/3	68
3 x 3 - 10/10	41	6 x 6 - 4/4	58
3 x 3 - 12/12	25	6 x 6 - 4/6	50
3 x 3 - 14/14	14	6 x 6 - 5/5	49
4 x 4 - 4/4	85	6 x 6 - 6/6	42
4 x 4 - 6/6	62	6 x 6 - 7/7	36
4 x 4 - 8/8	44	6 x 6 - 8/8	30
4 x 4 - 10/10	31	6 x 6 - 9/9	25
4 x 4 - 12/12	19	6 x 6 - 10/10	21
4 x 4 - 13/13	14		

[1]Style designation is defined in ACI Standard 315 of the American Concrete Institute.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 13, Steel Reinforcement

(1) This item shall consist of furnishing and placing of reinforcing steel in all reinforced concrete structures as shown on the drawings.

(2) Measurement and payment will be made by Method 1.

CONSTRUCTION SPECIFICATION

41. REINFORCED CONCRETE PRESSURE PIPE SPILLWAY CONDUITS

1. SCOPE

The work shall consist of furnishing and installing reinforced concrete pressure pipe, fittings and accessories in principal spillway conduits appurtenant to earth dams.

2. MATERIALS

Reinforced concrete pressure pipe, fittings and accessories shall conform to the requirements of Material Specification 541.

Portland cement concrete for bedding and cradles shall conform to the requirements of Construction Specification 31 for the specified class of concrete.

Joint sealing compound shall conform to the requirements of Material Specification 536.

Preformed expansion joint filler shall conform to the requirements of Material Specification 535.

3. LAYING THE PIPE

The pipe shall be set to the specified line and grade and temporarily supported on precast concrete blocks or wedges. Bell and spigot pipe shall be laid with the bell upstream.

Just before each joint is connected the connecting surfaces of the bell and spigot or spigots and sleeve shall be thoroughly cleaned and dried, and the rubber gasket and the inside surface of the bell or sleeve shall be lubricated with a light film of soft vegetable soap compound (flax soap). The rubber gasket shall be stretched uniformly as it is placed in the spigot groove to insure a uniform volume of rubber around the circumference of the pipe.

(Method 1) The joint shall be connected by means of a pulling or jacking force so applied to the pipe that the spigot enters squarely into the bell.

(Method 2) The joint shall be connected in accordance with the manufacturer's instructions.

(Use with Either Method) When the spigot has been seated to within 1/2-inch of its final position, the position of the gasket in the joint shall be checked around the entire circumference of the pipe by means of a metal feeler gage. In any case where the gasket is found to be displaced, the joint shall be disengaged and properly reconnected. After the position of the gasket has been checked, the spigot shall be completely pulled into the bell and the section of pipe shall be adjusted to line and grade.

4. FILLING JOINTS

Before the placement of the bedding or cradle, the exterior annular space between the ends of the pipe sections shall be cleaned and completely filled with joint sealing compound. Before the compound is applied, the surfaces against which it is to be placed shall be cleaned of all dust, lubricant and other substances that would interfere with a bond between the compound and the pipe. If recommended by the manufacturer of the compound, the concrete surfaces shall be coated with a primer in accordance with the manufacturer's recommendations. Primers shall be applied to the concrete surfaces only and shall not come in contact with the gasket or gasket sealing surfaces. Unless the compound or primer is specifically recommended for use on moist concrete, the surfaces shall be dry when it is applied.

The joint sealing compound shall be allowed to cure until it is sufficiently firm to prevent the entry of concrete or earth into the joint before concrete, bedding or backfill is placed against it. Unless otherwise specified, where bedding or backfill containing particles larger than one-fourth inch in maximum dimension is to be placed within 6 inches of the joint sealing compound, the compound shall be covered before the bedding or backfill is placed with a strip of 16-gage to 24-gage metal at least 2 inches wider than the space between the ends of the pipe sections.

5. PRESSURE TESTING

(Method 1) Pressure testing of the completed conduit will not be required.

(Method 2) Prior to the placement of any concrete or earth fill around the conduit or filling of the pipe joints, the conduit shall be tested for leaks in the following manner: The ends of the conduit shall be plugged and a standpipe with a minimum diameter of two (2) inches shall be attached to the upstream plug. The conduit shall be braced at each end to prevent slippage. The conduit and the standpipe shall be filled with water. The water level in the standpipe shall be maintained by continuous pumping a minimum of

10 feet above the invert of the upstream end of the conduit for a period of not less than two hours. Any leaks that occur during this period shall be repaired by a method satisfactory to the Engineer. After repair, the conduit shall be tested again as described above and the procedure shall be repeated until the conduit is accepted as watertight by the Engineer.

The pipe joints shall show no leakage. Damp spots developing on the surface of the pipe will not be considered as leakage.

6. MEASUREMENT AND PAYMENT

(Method 1) For items of work for which specific unit prices are established in the contract, the quantity of each size, type and class of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of pipe along the invert centerline of the conduit. Payment for each size, type and class of reinforced concrete pressure pipe will be made at the contract unit price for that size, type and class of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe complete in place including accessories such as wall fittings, joint gaskets, coupling bands, sleeves or collars and all other items necessary and incidental to the completion of the work.

(Method 2) For items of work for which specific unit prices are established in the contract, the quantity of each size, type and class of pipe will be determined as the sum of the nominal laying lengths of the pipe sections used. Payment for each size, type and class of reinforced concrete pressure pipe will be made at the contract unit price for that size, type and class of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe complete in place including accessories such as wall fittings, joint gaskets, coupling bands, sleeves or collars and all other items necessary and incidental to the completion of the work.

(Use with Either Method) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 14, Reinforced Concrete Pipe (Sta. 907+79.14 to 909+55.50)

(1) This item shall consist of furnishing and installing the reinforced concrete pipe for construction of the outlet conduit between stations 907+79.14 to 909+55.50 as shown on sheets 15, 16 and 19 of the drawings.

(2) In Section 2 of Material Specification 541, Design and Fabrication, the pipe shall be Steel Cylinder Type, Pre-stressed, AWWA Standard C301 or Steel Cylinder Type, Not Prestressed, AWWA Standard C300. The pipes shall be reinforced to withstand the external loads shown on sheet 19 of the drawings when tested in accordance with Section 7, Inspection, Testing and Certification, of Material Specification 541.

(3) In Section 4, Joints, the pipe shall have a minimum joint extensibility of 2 inches and the maximum length of each section shall be 16 feet. Joints shall be steel bell and spigot ring as shown on sheet 19 of the drawings.

(4) In Section 3, Laying the Pipe, Method 2 shall apply.

(5) In Section 5, Pressure Testing, Method 1 shall apply.

(6) Measurement and payment will be made by Method 1.

a. Bid Item 15, Reinforced Concrete Pipe 60-Inch Diameter (Sta. 909+55.50 to 918+82.69)

(1) This item shall consist of the furnishing and installing of the reinforced concrete pipe for the construction of the outlet conduit from Station 909+55.50 to Station 918+82.69 as shown on sheets 15, 16 and 19 of the drawings.

(2) In Section 2 of Material Specification 541, Design and Prefabrication, the pipe shall be as specified in Bid Item 13 or shall be Non-Cylinder Type, Not Prestressed, AWWA Standard C302. The pipe shall be reinforced to withstand the external load shown on sheet 19 of the drawings when tested in accordance with Section 7, Inspection, Testing and Certification, of Material Specification 541.

(3) In Section 4, Joints, the pipe shall have a joint extensibility of 2 inches and the maximum length of each section shall be 16 feet. Joints shall be steel bell and spigot as shown on sheet 19 of the drawings.

(4) In Section 3, Laying the Pipe, Method 2 shall apply.

(5) In Section 5, Pressure Testing, Method 1 shall apply.

(6) Measurement and Payment will be by Method 1.

b. Bid Item 16, Reinforced Concrete Pipe 12-Inch Diameter (Sta. 710+00 and 817+00 Center Line of Dam)

(1) This item shall consist of the furnishing and installing of the reinforced concrete pipe for the construction of the gated outlets at Stations 710+00 and 817+00 on the center line of the dam as shown on sheet 23 of the drawings.

(2) In Section 2 of Material Specification 541, Design and Prefabrication, the pipe shall be Non-Cylinder type, Not prestressed, AWWA Standard C302. The pipe shall be reinforced to withstand the external load shown on sheet 23 of the drawings when tested in accordance with Section 7, Inspection, Testing and Certification, of Material Specification 541.

(3) In Section 4, Joints, the pipe shall have a joint extensibility of 1¼ inches and the maximum length of each section shall be 16 feet. Joints shall be bell and spigot as shown on sheet 23 of the drawings.

(4) In Section 3, Laying the Pipe, Method 2 shall apply.

(5) In Section 5, Pressure Testing, Method 1 shall apply.

(6) Measurement and payment will be by Method 1.

CONSTRUCTION SPECIFICATION

51. CORRUGATED METAL PIPE CONDUITS

1. SCOPE

The work shall consist of furnishing and placing circular, arched or eliptical corrugated metal pipe and the necessary fittings.

2. MATERIALS

Pipe and fittings shall conform to the requirements of Material Specification 551 or Material Specification 552, whichever is specified.

3. LAYING AND BEDDING THE PIPE

Unless otherwise specified, the pipe shall be installed in accordance with the manufacturer's recommendations. The pipe shall be laid with the outside laps of circumferential joints pointing upstream and with longitudinal laps at the sides at about the vertical midheight of the pipe. Field welding of corrugated galvanized iron or steel pipe will not be permitted. Unless otherwise specified, the pipe sections shall be joined with standard coupling bands. The pipe shall be firmly and uniformly bedded throughout its entire length to the depth and in the manner specified on the drawings.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about a vertical center line. Perforations shall be clear of any obstructions at the time the pipe is laid.

The pipe shall be loaded sufficiently during backfilling around the sides to prevent its being lifted from the bedding.

4. STRUTTING

When required, struts or horizontal ties shall be installed in the manner specified on the drawings. Struts and ties shall remain in place until the backfill has been placed to a height of 5 feet above the top of the pipe, or has been completed if the finished height is less than 5 feet above the top of the pipe, at which time they shall be removed by the Contractor.

5. HANDLING THE PIPE

The Contractor shall furnish such equipment as is necessary to place the pipe without damaging the pipe or coatings. The pipe shall be transported and handled in such a manner as to prevent bruising, scaling or breaking of the spelter coating or bituminous coating.

6. REPAIR OF DAMAGED COATINGS

Any damage to the zinc coating shall be repaired by thoroughly wire brushing the damaged area, removing all loose and cracked coating, removing all dirt and greasy material with solvent, and painting with two coats of zinc dust-zinc oxide primer conforming to the requirements of Federal Specification TT-P-641, Type III. If the coating is damaged in any individual area larger than 12 square inches, or if more than 0.2 percent of a total surface area of a length of pipe is damaged, the length will be rejected.

Breaks or scuffs in bituminous coatings that are less than 36 square inches in area shall be repaired by the application of two coats of hot asphaltic paint or a coating of cold-applied bituminous mastic. The repair coating shall be at least 0.05 inches thick after hardening and shall bond securely and permanently to the pipe. The material shall meet the physical requirements for bituminous coatings contained in the references cited in Material Specifications 551 and 552. Whenever individual breaks exceed 36 square inches in area or when the total area of breaks exceeds 0.5 percent of the total surface area of the pipe, the pipe will be rejected.

Bituminous coating damaged by welding of coated pipe or pipe fittings shall be repaired as specified in this section for breaks and scuffs in bituminous coatings.

7. MEASUREMENT AND PAYMENT

(Method 1) For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gage of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of pipe along the centerline of the pipe. Payment for each type, class, size and gage of pipe will be made at the contract unit price for that type, class, size and gage of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work.

(Method 2) For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gage of pipe will be determined as the sum of the nominal laying lengths of the pipe sections and fittings used. Payment for each type, class, size and gage of pipe will be made at the contract unit price for that type, class, size and gage of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work.

(Method 3) For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gage of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of pipe along the centerline of the pipe. Payment for each type, class, size and gage of pipe will be made at the contract unit price for that type, class, size and gage of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work except items designated as "special fittings." Payment for special fittings will be made at the contract lump sum price for special fittings (CMP).

(Method 4) For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gage of pipe will be determined as the sum of the nominal laying lengths of the pipe sections and fittings used. Payment for each type, class, size and gage of pipe will be made at the contract unit price for that type, class, size and gage of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work except items designated as "special fittings." Payment for special fittings will be made at the contract lump sum price for special fittings (CMP).

(Method 5) For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gage of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of pipe along the centerline of the pipe. Payment for each type, class, size and gage of pipe will be made at the contract unit price for that type, class, size and gage of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe, including the necessary fittings and all other items necessary and incidental to the completion of the work except the special

fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract unit price for that type and size of fitting or appurtenance.

(Method 6) For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gage of pipe will be determined as the sum of the nominal laying lengths of the pipe sections used. Payment for each type, class, size and gage of pipe will be made at the contract price for that type, class, size and gage of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe, including the necessary fittings and all other items necessary and incidental to the completion of the work except the special fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract unit price for that type and size of fitting or appurtenance.

(Use with All Methods) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8 of this specification.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 17, Corrugated Metal Arch Pipe, 84-Inch by 54-Inch
Bid Item 18, Corrugated Metal Arch Pipe, 29-Inch by 18-Inch
Bid Item 19, Corrugated Metal Pipe, 15-Inch Diameter

(1) These items shall consist of the furnishing and placing of corrugated metal arch pipe for the Johnson Road and Palo Verde Road crossings, as shown on sheets 12, 13 and 22 of the drawings and the corrugated metal pipes for the irrigation border outlets shown on sheet 22 of the drawings.

(2) In Section 2, Materials, Material Specifications 551 shall apply. Smooth stab or dimpled type band connectors shall not be used.

(3) The corrugated metal pipe shall be Class I or II, Series A, and Coating A in accordance with Federal Specification WW-P-405. Shape shall be as shown on sheets 12, 13 and 22 of the drawings.

(4) Measurement and payment will be made by Method 3.

b. Bid Item 20, Special Fittings

(1) This item shall consist of the furnishing and placing of the metal arch pipe flared end sections on both ends of each corrugated metal arch pipe as shown on sheets 12 and 13 of the drawings, the prefabricated tee fittings, and 24-inch diameter pipe sections for the irrigation border outlets shown on sheet 22 of the drawings.

(2) The material for end sections shall be 10/12-gage galvanized steel fabricated and installed as recommended by the pipe manufacturer.

(3) Tee sections shall be shop fabricated and 16-gage thickness.

(4) Measurement and payment will be made by Method 3.

c. Detours (Subsidiary Item)

(1) Detours shall be provided for traffic on Palo Verde Road and Johnson Road during the installation of the corrugated metal arch pipe under Bid Item 17 and construction of the ramps shown on sheets 12 and 13 of the drawings. Signs and barricades shall conform to the latest edition of "Safety and Health Regulations for Construction," published by the United States Department of the Interior, Bureau of Reclamation.

(2) No separate payment will be made for constructing detours. Compensation for this work will be included in the payment for Bid Item 17, Corrugated Metal Arch Pipe.

CONSTRUCTION SPECIFICATION

61. LOOSE ROCK RIPRAP

1. SCOPE

The work shall consist of the construction of loose rock riprap revetments and blankets, including filter layers or bedding where specified.

2. MATERIALS

Rock for loose rock riprap shall conform to the requirements of Material Specification 523 or, if so specified, shall be obtained from designated sources.

Rock from designated sources shall be excavated, selected and handled as necessary to meet the quality and grading requirements in Section 8 of this specification. The rock shall conform to the specified grading limits when installed in the riprap.

Filter material shall conform to the requirements of Material Specification 521 unless otherwise specified.

Bedding shall be obtained from the designated sources and shall be selected to meet the quality and grading requirements in Section 8 of this specification.

At least 30 days prior to delivery of material from other than designated sources, the Contractor shall notify the Contracting Officer in writing of the sources from which he intends to obtain the material. The Contractor shall provide the Engineer free access to the sources for the purpose of obtaining samples for testing.

3. SUBGRADE PREPARATION

The subgrade surfaces on which the riprap or bedding course is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of the specified class of fill.

Riprap shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved by the Engineer.

4. EQUIPMENT-PLACED ROCK RIPRAP

The rock shall be placed by equipment on the surfaces and to the depths specified. The riprap shall be constructed to the full course thickness in one operation and in such a manner as to avoid serious 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 extend necessary to prevent damage to the permanent works.

5. HAND-PLACED RIPRAP

The rock shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger rocks 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.

6. FILTER LAYERS OR BEDDING

When the drawings specify filter layers or bedding beneath riprap, the filter or bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth specified. Compaction of filter layers or bedding will not be required, but the surface of such layers shall be finished reasonably free of mounds, dips or windrows.

7. MEASUREMENT AND PAYMENT

(Method 1) For items of work for which specific unit prices are established in the contract, the volume of each type of riprap, including filter layers and bedding, will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. Payment for each type of riprap, including filter layers and bedding, will be made at the contract unit price for that type of riprap. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the riprap, filter layers and bedding.

(Method 2) For items of work for which specific unit prices are established in the contract, the volume of each type of riprap and the volume of each type of filter layer or bedding will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. Payment for each type of riprap will be made at the contract unit price for that type of riprap. Payment for each type of filter or bedding will be made at the contract unit price for that type of filter or bedding. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the riprap, filter layers and bedding.

(Method 3) For items of work for which specific unit prices are established in the contract, the quantity of each type of riprap placed within the specified limits will be measured to the nearest ton by actual weight, and the volume of each type of filter layer or bedding will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. For each load of rock placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight, to the nearest 0.1 ton, of rock in the load.

Payment for each type of riprap will be made at the contract unit price for that type of riprap. Payment for each type of filter or bedding will be made at the contract unit price for that type of filter or bedding. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the riprap, filter layers and bedding.

(Method 4) For items of work for which specific unit prices are established in the contract, the quantity of each type of riprap placed within the specified limits will be measured to the nearest ton by actual weight, and the volume of each type of filter material or bedding delivered and placed within the specified limits will be measured to the nearest cubic yard by measurement of the hauling equipment. For each load of material placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight, to the nearest 0.1 ton, of rock in the load; or the volume, to the nearest 0.1 cubic yard, of filter material or bedding in the load.

Payment for each type of riprap will be made at the contract unit price for that type of riprap. Payment for each type of filter or bedding will be made at the contract unit price for that type

of filter or bedding. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to completion of the riprap, filter layers and bedding.

(Use with all Methods) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8 of this specification.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 21, Loose Rock Riprap

(1) This item shall consist of furnishing and placing loose rock riprap at the following locations:

(a) Adjacent to the inlet and outlet structure for the outlet conduit as shown on sheets 17, 20, and 21 of the drawings.

(b) Adjacent to the ends of the corrugated metal pipe conduits as shown on sheets 12 and 13 of the drawings.

(c) Adjacent to the outlet structure for the gated conduit at Sta. 710+00 as shown on sheet 23 of the drawings.

(2) The size of rock shall conform to the sizes shown on the following table:

Screen Opening (Inches)	Percent Passing (By Weight)
18	100
12	65-90
6	20-40
1½	0-10

(3) Rock shall be either equipment or hand placed.

(4) Measurement and payment will be made by Method 1.

CONSTRUCTION SPECIFICATION

71. WATER CONTROL GATES

1. SCOPE

The work shall consist of furnishing and installing water control gates including gate stems, hoists, lifts and other appurtenances.

2. MATERIALS

The gates furnishes shall conform to the requirements specified in Section 8 or on the drawings. All gates shall be furnished complete with hoisting equipment and other specified appurtenances.

3. INSTALLING GATES

The Contractor shall install the gates in a manner that will prevent leakage around the seats and binding of the gates during operation.

Surfaces of metal against which concrete will be placed shall be free from oil, grease, loose mill scale, loose paint, surface rust, and other debris or objectionable coatings.

Anchor bolts, thimbles and spigot frames shall be secured in true position in the forms and held in alignment during the placement of concrete.

Concrete surfaces against which rubber seals will bear or against which flat frames or plates are to be installed shall be finished to provide a smooth and uniform contact surface.

When a flat frame is installed against concrete, a layer of bedding mortar shall be placed between the frame and the concrete.

When a gate is attached to a wall thimble, a mastic or resilient gasket shall be applied between the gate frame and the thimble, in accordance with the recommendation of the gate manufacturer.

For radial gates, wall plates, sills and pin brackets shall be adjusted and fastened by grouting and bolting after the gates have been completely assembled in place.

4. INSTALLING HOISTS AND LIFTS

Gate stems, stem guides and gate lifts shall be carefully aligned so that the stem shall be parallel to the guide bars or angles on the gate frame after installation.

Radial gate hoists shall be installed in correct alignment with relation to the gate shaft.

5. RADIAL GATE SEALS

The rubber seals on radial gates shall be installed so that the seals contact the walls or wall plates throughout their entire length when the gates are closed.

6. OPERATIONAL TESTS

After the gate and hoist (or lift) have been installed, they shall be cleaned, lubricated and otherwise serviced by the Contractor in accordance with the manufacturer's instructions. The Contractor shall test the gate and hoist by operating the system several times throughout its full range of operation. He shall make any changes and adjustments necessary to insure satisfactory operation of the gate system.

7. MEASUREMENT AND PAYMENT

The number of each type, size and class of gate will be counted. Payment for furnishing and installing each type, size and class of gate shall be made at the contract unit price for that type, size and class of gate. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work including furnishing and installing anchor bolts and all specified appurtenances and fittings.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in Section 8 of this specification.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 22, Water Control Gates

(1) This item shall consist of the furnishing and installing of the Water Control Gate assemblies on the gated outlets at Station 710+00 and 817+00 of the center line of the dam as shown on sheets 23 and 24 of the drawings.

(2) Each Water Control Gate assembly shall be defined as including:

(a) Gate, complete with frame and anchor bolts.

(b) Stem, stem splices, encasement, weather seals, oil, straps, supports, anchor bolts and all other miscellaneous hardware required to complete the installation.

(c) Handwheel, anchor bracket, anchor bolts, bronze nut, and all other miscellaneous hardware required to complete the installation.

(3) The gates shall conform to material specification 572, Class 50-10, Type MMS-2.

(4) The frame shall be the flat back type.

(5) Measurement and Payment will be made in conformance with Section 7.

CONSTRUCTION SPECIFICATION

81. METAL FABRICATION AND INSTALLATION

1. SCOPE

The work shall consist of furnishing, fabricating and erecting metalwork, including the metal parts of composite structures.

2. MATERIALS

Unless otherwise specified, materials shall conform to the requirements of Material Specification 581. Steel shall be structural quality unless otherwise specified. Castings shall be thoroughly cleaned and subjected to careful inspection before installation. Finished surfaces shall be smooth and true to assure proper fit. Galvanizing shall conform to the requirements of Material Specification 582.

3. FABRICATION

Fabrication of structural steel shall conform to the requirements of Section 1.23 of the "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Riveted, Bolted and Arc-Welded Construction)," American Institute of Steel Construction.

Fabrication of structural aluminum shall conform to the requirements in the Aluminum Construction Manual, "Specifications for Aluminum Structures," Section 6 and Section 7, The Aluminum Association, November 1967.

4. ERECTION

The frame of metal structures shall be carried up true and plumb. Temporary bracing shall be placed wherever necessary to resist all loads to which the structure may be subjected, including those applied by the installation and operation of equipment. Such bracing shall be left in place as long as may be necessary for safety.

As erection progresses the work shall be securely bolted up, or welded, to resist all dead load, wind and erection stresses. The Contractor shall furnish such fitting up bolts, nuts and washers as may be required.

No riveting or welding shall be done until as much of the structure as will be stiffened thereby has been properly aligned.

Rivets driven in the field shall be heated and driven with the same care as those driven in the shop.

All field welding shall be done in conformance to the requirements for shop fabrication, except those that expressly apply to shop conditions only.

Galvanized items shall not be cut, welded or drilled after the zinc coating is applied.

5. PROTECTIVE COATINGS

Items specified to be galvanized shall be completely fabricated for field assembly before the application of the zinc coatings.

Items specified to be painted shall be painted in conformance to the requirements of Construction Specification 82 for the specified paint systems.

6. MEASUREMENT AND PAYMENT

(Method 1) The work will not be measured. Payment for metal fabrication and installation will be made at the contract lump sum price. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work, including connectors and appurtenances such as rivets, bolts, nuts, pins, studs, washers, hangers and weld metal.

(Method 2) The weight of metal installed complete in place shall be determined to the nearest pound. Unless otherwise provided, the weight of metal shall be computed by the method specified in Section 3 of the "Code of Standard Practice for Steel Buildings and Bridges," American Institute of Steel Construction, except that the following unit weights shall also be used, as appropriate, as the basis of computation:

Material	Unit Weight Pounds per Cubic Foot
Aluminum alloy	173.0
Bronze or copper alloy	536.0
Iron, malleable	470.0
Iron, wrought	487.0

Payment for furnishing, fabricating and installing metalwork will be made at the contract unit price for the specified types of metals. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

(Method 3) The work will not be measured. Payment for furnishing, fabricating and installing each item of metalwork will be made at the contract price for that item. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work, including connectors and appurtenances such as rivets, bolts, nuts, pins, studs, washers, hangers and weld metal.

(Use with **all Methods**) Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS:

Items of work to be performed in conformance with this specification and the construction details are:

a. Bid Item 23, Trash Racks and Animal Guards

(1) This item shall consist of the fabrication and installation of the metal trash racks as shown on sheets 17 and 24 of the drawings and the animal guards as shown on sheet 17 of the drawings.

(2) The trash racks shall be cleaned and painted in accordance with construction specification 82.

(3) Measurement and payment will be made by Method 1.

b. Subsidiary Item, Steel Pipe Form

(1) This item consists of the furnishing and placing of the 12" diameter, 18-gage sheet steel pipe form in the inlets of the gated outlets shown on sheet 24 of the drawings.

(2) No separate payment will be made for the inlet pipe forms. Payment for this item will be included in payment for Bid Item 22, Water Control Gates.

CONSTRUCTION SPECIFICATION

82. CLEANING AND PAINTING METALWORK

1. SCOPE

The work shall consist of cleaning metal surfaces and applying paints and protective coatings.

2. PAINTS

For the purposes of this specification paints shall be designated by types as defined below:

Type 1 paint shall conform to the requirements of Federal Specification TT-P-86, Type IV, Red Lead Base Paint.

Type 2 paint shall conform to the requirements of Federal Specification TT-P-86, Type II or Type III, Red Lead Base Paint.

Type 3 paint shall conform to the requirements of Federal Specification TT-P-86, Type I, Red Lead Base Paint.

Type 4 paint shall conform to the requirements of Federal Specification TT-P-636, Synthetic Primer.

Type 5 paint shall be prepared by mixing aluminum paste conforming to the requirements of Federal Specification TT-P-320, Type II, Class 2 with phenolic resin spar varnish conforming to the requirements of Federal Specification TT-V-119 at the rate of two pounds of aluminum paste per gallon of varnish. The paint shall be mixed at the time of use.

Type 6 paint shall be prepared by mixing aluminum paste conforming to Federal Specification TT-P-320, Type II, Class 2 with mixing varnish conforming to the requirements of Federal Specification TT-V-81, Type II, Class B (Class 2) at the rate of two pounds of aluminum paste per gallon of varnish. The paint shall be mixed at the time of use.

Type 7 paint shall conform to the requirements of Federal Specification TT-E-489, Class A, Alkyd Gloss Enamel.

Type 8 paint shall conform to the requirements of Federal Specification TT-E-529, Alkyd Semi-Gloss Enamel.

Type 9 paint shall conform to the requirements of Federal Specification TT-P-641, Type I or Type II, Zinc Dust-Zinc Oxide Primer.

Type 10 paint shall conform to the requirements of Federal Specification TT-P-641, Type III, Zinc Dust-Zinc Oxide Primer.

Type 11 paint shall conform to the requirements of Material Specification 583. The paint shall be mixed at the time of use.

Paints of Types 1, 2, 3, 5 and 6 may be thinned with mineral spirits as necessary for proper application but the amount of thinner used shall not exceed one pint per gallon of paint. Other paints may be thinned in accordance with the manufacturer's instructions only if such thinning is approved by the Engineer.

When tinting is required, it shall be accomplished by the addition of pigment-in-oil tinting colors conforming to the requirements of Federal Specification TT-P-381.

Mineral spirits shall conform to the requirements of Federal Specification TT-T-291, Grade 1, Light Thinner.

3. SURFACE PERPARATION

Surfaces to be painted shall be thoroughly cleaned prior to the application of the paint. For the purposes of this specification methods of surface preparation shall be designated as defined below:

Method 1 surface preparation shall consist of the removal of all grease and oil by means of steam cleaning or solvent cleaning methods and removal of all dirt, rust, mill scale and other coatings by means of sandblasting, grit blasting or pickling. The finished surface shall uniformly expose the base metal and shall present an etched, but not polished or peened, appearance. Not more than 5 percent of the surface may exhibit very light shadows, light streaks, or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coating.

Method 2 surface preparation shall consist of the removal of all grease and oil by means of steam cleaning or solvent cleaning and the removal of all dirt, surface rust and loose scale by means of wire brushing, flame cleaning, use of rotary abrading tools or light sandblasting.

Method 3 surface preparation shall consist of the treatment of the surface with a dilute acid solution. The surface shall be thoroughly wetted with a dilute (about 5 percent strength) phosphoric acid solution. After the acid has dried, the surface shall be thoroughly rinsed with clear water and allowed to dry. Dirt, grease and oil shall be removed from the surface by solvent cleaning prior to the acid treatment.

Cleaning solvent shall be mineral spirits. Cleaning cloths and solvents shall be discarded before they become contaminated to the extent that a greasy film would remain on the surface being cleaned. The final cleaning and wiping shall be done with clean solvent and clean cloths. Grit blasting shall be accomplished using compressed air blast nozzles and grit made of steel, malleable iron or cast iron crushed shot. Abrasives used shall have a maximum particle size that will pass the No. 16 sieve (U. S. Standard) and a minimum size that will be retained on the No. 50 sieve (U. S. Standard). The equipment used for sandblasting shall be equipped with adequate separators and traps to insure that the compressed air shall be free of detrimental amounts of water and oil. Blast cleaned surfaces shall be brushed, blown or vacuum cleaned to remove any trace of blast products or abrasives prior to painting.

Surfaces that are not to be painted immediately after cleaning shall be treated with one brush coat of metal conditioner conforming to the requirements of Military Specification MIL-M-10578, except that surfaces cleaned by pickling in phosphoric acid solution shall not require such treatment.

Surfaces shall be thoroughly dry when paint is applied.

No field coats of paint shall be applied until the prepared surfaces have been inspected and approved by the Engineer.

4. PAINT SYSTEMS

For the purposes of this specification, systems of preparing and painting metalwork will be designated as defined below:

Paint System A shall consist of the preparation of the surfaces to be painted by Method 1 and the application of two priming coats of Type 1 paint and two or more top coats of Type 5 paint as necessary to provide a total dry paint film thickness of 6 mils.

Paint System B shall consist of the preparation of the surfaces to be painted by Method 1 and the application of one priming coat of Type 1 paint and two top coats of Type 5 paint.

Paint System C shall consist of the preparation of the surfaces to be painted by Method 2 and the application of one priming coat of Type 2, Type 3 or Type 4 paint and two top coats of Type 6 paint.

Paint System D shall consist of the preparation of the surfaces to be painted by Method 2 and the application of one priming coat of Type 2 paint and two top coats of Type 7 paint.

Paint System E shall consist of the preparation of the surfaces to be painted by Method 2 and the application of one priming coat of Type 2 paint and two top coats of Type 8 paint.

Paint System F shall consist of the preparation of the surfaces to be painted by Method 3 and the application of two coats of Type 9 paint.

Paint System G shall consist of the preparation of the surfaces to be painted by Method 3 and the application of two coats of Type 10 paint.

Paint System H shall consist of the preparation of the surfaces to be painted by Method 1 and the application of four or more coats of Type 1 paint as necessary to provide a total dry paint film thickness of 6 mils.

Paint System I shall consist of the preparation of the surfaces to be painted by Method 1 and the application of two or more coats of Type 11 paint as necessary to provide a total dry paint film thickness of at least 16 mils.

5. APPLICATION OF PAINT

Surfaces shall be painted immediately after preparation (or within two days after preparation and treatment with metal conditioner) with at least one coat of the type of priming paint required by the specified paint system. Surfaces not required to be painted shall be protected against contamination and damage during the cleaning and painting operation.

Paints shall be thoroughly mixed at the time of application.

After erection or installation of the metalwork, all damage to shop applied coats shall be repaired and all bolts, nuts, welds and field rivet heads shall be cleaned and painted with one coat of the specified priming paint.

Except on surfaces accessible only to spray equipment, initial priming coats shall be applied by brush. All other coats may be applied by brush or spray. Each coat shall be applied in such a manner as to produce a paint film of uniform thickness with a rate of coverage within the limits recommended by the paint manufacturer.

The drying time between coats shall be as prescribed by the manufacturer of the paint but not less than that required for the paint film to dry through. The elapsed time between the application of the first and second prime coats of Paint System A shall not exceed 60 hours. In the application of Paint System I, if, for any reason, the first coat dries hard before the second coat is applied or the elapsed time between coats exceeds 48 hours, the method of application must be modified in any of the following ways: (1) the first coat must be wiped down with MIBK with the application of the second coat following the wipedown by not more than 6 feet; or (2) the first coat must be lightly brush blasted or given a fog coat of the paint before application of the full second coat; or (3) a special bonding additive supplied by the paint manufacturer must be mixed with the paint applied in the second coat.

The finished surface of each coat shall be free from runs, drops, ridges, laps or excessive brushmarks and shall present no variation in color, texture and finish.

The surface of each dried coat shall be cleaned as necessary before application of the next coat.

Except for Paint System I, the first coat of each two-coat system shall be tinted for contrast. The first coat of red-lead paint shall be tinted by the addition of 3 ounces per gallon of 1B

black pigment. The first coat of machinery paint shall be tinted off color with 3 ounces per gallon of a pigment suitable to the color of the paint.

6. ATMOSHPERIC CONDITIONS

Paint shall not be applied when the temperature of the item to be painted or of the surrounding air is less than 50°F. For Paint System I, the temperature of the coated surface must be maintained at not less than 50°F for 6 hours after the application of each coat. Painting shall be done only when the humidity and temperature of the surrounding air and the temperature of the metal surfaces are such that evaporation rather than condensation will result during the period of time required for application and drying. Surfaces protected from adverse atmospheric conditions by special cover, heating or ventilation shall remain so protected until the paint is dry.

7. TESTS

Acceptance of dry paint film thickness for Paint Systems A, H, and I will be based on the measurement of paint film thickness by means of an Elcometer or other suitable dry film thickness gage.

8. PAYMENT

For items of work for which specific lump sum prices are established in the contract, payment for painting metalwork will be at the contract lump sum price. Such payment will constitute full compensation for furnishing, preparing and applying all materials and for the cleaning, painting and coating of metalwork including labor, tools, equipment and all other items necessary and incidental to the completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 9 of this specification.

9. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Cleaning and Painting

(1) This item shall consist of cleaning and painting the trash racks in Bid Item 23.

(2) In Section 3, Surface Preparation, Method 2 shall apply.

(3) In Section 4, Paint Systems, Paint System C shall apply.

(4) No separate payment will be made for cleaning and painting. Compensation for this work will be included in the payment for Bid Item 23, Trash Racks.

CONSTRUCTION SPECIFICATION

100. SEEDING (BID ITEM 24)

1. Scope

The work shall consist of the furnishing of seed and the seeding of the downstream surface of the dikes covered with topsoil under Bid Item 10 and as described in Specification 26, Salvaging and Spreading Topsoil.

2. Materials and Seeding Rate

Seed - Four-wing saltbush (seed source from southwestern United States) - Seeding Rate: 5 lbs. (PLS) per acre.

3. Seeding

Immediately following the spreading of the topsoil under Bid Item 10, the seed will be broadcast over the surface at the specified rate. The surface will then be compacted with two passes of tracklaying equipment or other approved equipment as specified in Specification 26.

4. Irrigation

a. If the topsoil is placed dry in accordance with Alternate 1 of Section 6 of Specification 26, after the topsoil is placed, seeded and compacted it shall be irrigated with portable pipe and sprinklers to moisten the soil to an approximate depth of 10 inches. The application rate shall be slow enough to prevent erosion.

b. If the topsoil is placed moist in accordance with Alternate 2 of Section 6 of Specification 26 no irrigation will be required.

5. Measurement and Payment

The surface designated for seeding will be measured to the closest 0.1 acre. Payment will be made at the contract unit price per acre and will constitute full compensation for all labor, materials, equipment, irrigation and all other items necessary and incidental to the performance of the work.

MATERIAL SPECIFICATION

521. AGGREGATES FOR DRAIN FILL AND FILTERS

1. SCOPE

This specification covers the quality of mineral aggregates for the construction of drain fill and filters.

2. QUALITY

Drain fill and filter aggregates shall be sand, gravel or crushed stone or mixtures thereof. They shall be composed of clean, hard, durable mineral particles free from organic matter, clay balls, soft particles or other substances that would interfere with their free-draining properties. Not more than 15 percent, by weight, shall be flat, elongated particles.

Unless otherwise specified, not more than 5 percent of the material finer than a No. 4 sieve shall be crushed limestone.

When tested for soundness according to ASTM Method C 88, the aggregates shall have a weighted average loss in five cycles of not more than 12 percent when sodium sulfate is used or 18 percent when magnesium sulfate is used.

3. GRADING

Drain fill and filter aggregates shall conform to the specified grading limits after being placed in the work, and after being compacted if compaction is specified. Grading shall be determined by ASTM Method C 136, but the percentage of material finer than a No. 200 sieve shall be not more than 3 percent when determined by ASTM Method C 117.

4. STORING AND HANDLING

Drain fill and filter aggregates shall be stored and handled by methods that prevent segregation of particle sizes or contamination by mixing with other materials.

MATERIAL SPECIFICATION

522. AGGREGATE FOR PORTLAND CEMENT CONCRETE

1. SCOPE

This specification covers the quality of fine aggregate and coarse aggregate for use in the manufacture of portland cement concrete.

2. QUALITY

Aggregate shall conform to the requirements of ASTM Specification C-33 for the specified sizes. Aggregates that fail to meet any requirement may be accepted only when: (1) the specified alternate conditions of acceptance can be proved prior to the use of the aggregates on the job and within a period of time such that no work under the contract will be delayed by the requirements of such proof; or, (2) the specification for concrete expressly contains a provision of special mix requirements to compensate for the effects of the deficiencies.

3. REACTIVITY WITH ALKALIES

The potential reactivity of aggregates with the alkalies in cement shall be evaluated by petrographic examination and, where applicable, the chemical method of test, ASTM Designation C 289, or by the results of previous tests or service records of concrete made from similar aggregates from the same source. The standards for evaluating potential reactivity shall be as described in ASTM Specification C 33, Appendix A1.

Aggregates indicated by any of the above to be potentially reactive shall not be used, except under one of the following conditions:

a. Applicable test results of mortar bar tests, made according to ASTM Method C 227, are available which indicate an expansion of less than 0.10 percent at six months in mortar bars made with cement containing not less than 0.8 percent alkalies expressed as sodium oxide; or

b. Concrete made from similar aggregates from the same source has been demonstrated to be sound after 3 years or more of service under conditions of exposure to moisture and weather similar to those anticipated for the concrete under these specifications.

Aggregates indicated to be potentially reactive, but within acceptable limits as determined by mortar bar test results or service records, shall be used only with "low alkali" cement, containing less than 0.60 percent alkalies expressed as sodium oxide.

4. STORING AND HANDLING

Aggregate of each class and size shall be stored and handled by methods that prevent segregation of particle sizes or contamination by intermixing with other materials.

MATERIAL SPECIFICATION

523. ROCK FOR RIPRAP

1. SCOPE

This specification covers the quality of rock to be used in the construction of rock riprap.

2. QUALITY

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock fragments shall be angular to subrounded in shape. The least dimension of an individual rock fragment shall be not less than one-third the greatest dimension of the fragment.

Except as provided below, the rock shall have the following properties:

a. Bulk specific gravity (saturated surface-dry basis) not less than 2.5.

b. Absorption not more than 2 percent.

c. Soundness: Weight loss in 5 cycles not more than 10 percent when sodium sulfate is used or 15 percent when magnesium sulfate is used.

The bulk specific gravity and absorption shall be determined by ASTM Method C 127. The test for soundness shall be performed according to the procedure for ledge rock in Federal Specification SS-R-406c, Method 203.01.

Rock that fails to meet the requirements stated in a, b, and c above, may be accepted only if similar rock from the same source has been demonstrated to be sound after 5 years or more of service under conditions of weather, wetting and drying, and erosive forces similar to those anticipated for the rock to be installed under this specification.

3. GRADING

The rock shall conform to the specified grading limits after it has been placed in the riprap.

MATERIAL SPECIFICATION

531. PORTLAND CEMENT

1. SCOPE

This specification covers the quality of portland cements.

2. QUALITY

Portland cement shall conform to the requirements of ASTM Specification C 150 or ASTM Specification C 175 for the specified types of cement, except that, whenever Type I portland cement is specified, portland blast furnace slag cement conforming to the requirements of ASTM Specification C 595 may be used in lieu thereof.

If air-entraining cement is to be used, the Contractor shall furnish the manufacturer's written statement giving the source, amount and brand name of the air-entraining addition.

3. STORAGE AT THE CONSTRUCTION SITE

Cement shall be stored in such a manner as to be protected from weather, dampness or other destructive agencies. Cement that is partially hydrated or otherwise damaged will be rejected.

MATERIAL SPECIFICATION

532. AIR-ENTRAINING ADMIXTURES (FOR CONCRETE)

1. SCOPE

This specification covers the quality of air-entraining admixtures for concrete.

2. QUALITY

Air-entraining admixtures shall conform to the requirements of ASTM Specification C 260, except that the relative durability factor in the freezing and thawing test shall be not less than 95.

MATERIAL SPECIFICATION

533. WATER-REDUCING AND SET-RETARDING ADMIXTURES FOR PORTLAND CEMENT CONCRETE

1. SCOPE

This specification covers the quality of water-retarding and set-retarding admixtures for portland cement concrete.

2. QUALITY

Water-reducing and set-retarding admixtures shall conform to the requirements of ASTM Specification C 494, except that resistance to freezing and thawing shall be determined in all cases, and the minimum relative durability factor shall be 95.

3. TYPES

Admixtures shall be Type A, Water-Reducing or Type D, Water-Reducing and Retarding, as defined in ASTM Specification C 494.

4. PERFORMANCE IN THE JOB MIX

When added in the manner and amount recommended by the manufacturer to the concrete used on the job, with no change in the cement content or proportions of the aggregates, admixtures shall have the following effects:

Type A or Type D: The water content at the required slump shall be at least 5 percent less with the admixture than without. The air content shall remain within the range specified, but shall not exceed 8 percent in any case.

Type D: The time of initial setting, determined as prescribed in ASTM C 494, shall be from 1 to 3 hours longer with the admixture than without.

MATERIAL SPECIFICATION

534. CURING COMPOUND (FOR CONCRETE)

1. SCOPE

This specification covers the quality of liquid membrane-forming compounds suitable for spraying on concrete surfaces to retard the loss of water during the curing process.

2. QUALITY

The curing compound shall meet the requirements of ASTM Specification C 309.

Unless otherwise specified the compound shall be Type 2.

3. DELIVERY AND STORAGE

All curing compound shall be delivered to the site of the work in the original container bearing the name of the manufacturer and the brand name. The compound shall be stored in a manner to prevent damage to the containers and to protect water-emulsion types from freezing.

MATERIAL SPECIFICATION

535. PREFORMED EXPANSION JOINT FILLER

1. SCOPE

This specification covers the quality of preformed expansion joint fillers for concrete.

2. QUALITY

Preformed expansion joint filler shall conform to the requirements of ASTM Specification D 1752, Type I, Type II or Type III, unless bituminous type is specified. Bituminous type preformed expansion joint filler shall conform to the requirements of ASTM Specification D 994.

536. SEALING COMPOUND FOR JOINTS IN CONCRETE AND CONCRETE PIPE

1. SCOPE

This specification covers the quality of sealing compound for filling joints in concrete pipe and concrete structures.

2. TYPE

The compound shall be a cold-application mastic, single component or multiple component type.

The single component type shall be a ready-mixed nondrying compound furnished in troweling consistency or in preformed rope or strip form.

The multiple component type shall be composed of two or more substances that are to be mixed prior to application.

3. QUALITY

Sealing compound shall conform to the requirements of one of the following specifications:

ASTM Specification D 1850; Concrete Joint Sealer, Cold-Application Type. Penetration, determined as specified in ASTM D 1850, shall be not greater than 120.

Federal Specification SS-S-00210; Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.

Federal Specification TT-S-227; Sealing Compound; Rubber Base, Two Component (For Calking, Sealing and Glazing in Building Construction), Type II.

The compound shall be capable of being applied at a temperature of 70°F and shall be of such nature that it will adhere to dry, dust free concrete when applied either directly or over a suitable primer. After curing it shall be a resilient, adhesive material that is capable of filling joints and firm enough to prevent the entry of subsequently placed concrete or of earth during the bedding, cradling or backfilling operations.

4. COMPOSITION AND PROPERTIES

The compound, if used for pipe having rubber gaskets, shall have a composition such that it will not cause deterioration of the rubber gaskets.

MATERIAL SPECIFICATION

537. NON-METALLIC WATERSTOPS

1. SCOPE

This specification covers non-metallic waterstops for use in joints of concrete structures.

2. CLASSIFICATION

a. Classes. Non-metallic waterstops shall be of the following classes, as specified:

Class I shall be made of either natural or synthetic rubber.

Class II shall be made of vinyl chloride polymer or copolymer.

b. Types. Non-metallic waterstops may be either split or solid and shall conform to the following types, as specified (see Figure 1):

Type A shall have ribbed anchor flanges and a smooth web. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges.

Type B shall have ribbed anchor flanges and a smooth web containing a hollow tubular center bulb having: (1) a wall thickness equal to at least one-half the web thickness and (2) the inside diameter (D) specified in the contract. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges.

Type C shall have a single, circular, bulb-type anchor flange at each edge and a smooth web.

Type D shall have a single, circular, bulb-type anchor flange at each edge and a smooth web containing a hollow tubular center bulb having: (1) a wall thickness equal to at least one-half the thickness of the web and (2) the inside diameter (D) specified in the contract.

Type E shall have ribbed anchor flanges and a web molded or extruded in the form of a round or U-shaped bulb of the dimensions specified in the contract. The web bulb shall be connected at the open end of the "U" by a thin membrane (having a thickness of not less than 1/64-inch or more than 1/5 the web thickness) designed to: (1) prevent infiltration of wet concrete into the bulb and (2) tear when expansion of the joint occurs. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges. Auxilliary positioning or nailing flanges may be provided so long as they do not interfere with the functioning of the web bulb.

Type F shall have ribbed anchor flanges with at least two extra heavy ribs (designed to resist displacement of the waterstop during placement of concrete) on each flange and a smooth web having a positioning or nailing flange attached at the center.

Type G shall be of special design conforming to the details shown on the drawings.

c. Sizes. Waterstops of Types A through F shall be of the sizes listed herein, as specified (see Table 1). Type G waterstops shall have the dimensions shown on the drawings.

3. PHYSICAL REQUIREMENTS

The extruded or molded materials shall exhibit the properties specified herein when tested by the methods specified in Section 4 of this specification.

a. Class I Waterstops

(1) The hardness (Shore A durometer) shall be not less than 60.

(2) The specific gravity shall be not more than 1.2.

(3) The tensile strength shall be not less than 2500 pounds per square inch.

(4) The ultimate elongation shall be not less than 450 percent.

(5) The compression set shall be not more than 30 percent.

(6) The water absorption (by weight) shall be not more than 5 percent.

(7) The decrease in tensile strength and ultimate elongation after aging shall be not more than 20 percent.

(8) There shall be no sign of failure due to brittleness at a temperature of minus 35°F.

b. Class II Waterstops

(1) The hardness (Shore A durometer) shall be not less than 60.

(2) The specific gravity shall be not more than 1.4.

(3) The tensile strength shall be not less than 1400 pounds per square inch.

(4) The ultimate elongation of the web shall be not less than 280 percent and that of the flanges shall be not less than 200 percent.

(5) The water absorption (by weight) shall be not more than one percent.

(6) There shall be no sign of failure due to flange brittleness at a temperature of 0°F. nor of web brittleness at a temperature of minus 35°F.

(7) The decrease in either tensile strength or ultimate elongation after accelerated extraction shall be not greater than 15 percent.

(8) As a result of the effects of alkalies:

(a) After immersion for 7 days, the sample shall exhibit no loss of weight and not more than 0.25 percent increase in weight, and the hardness (Shore A) of the treated sample shall differ from that of the untreated sample by not more than plus 5 points or minus 5 points.

(b) After immersion for 30 days, the sample shall exhibit no loss of weight and not more than 0.40 percent increase in weight, and the dimensions of the treated sample shall not differ from those of the untreated sample by more than one percent.

4. TEST METHODS

Testing shall be done by the methods cited herein. All cited test methods are included in Federal Test Method Standard No. 601.

a. Hardness shall be determined by Method 3021.

b. Specific gravity shall be determined by Method 14011.

c. Tensile strength shall be determined by Method 4111.

d. Ultimate elongation shall be determined by Method 4121.

e. Compression set shall be determined by Method 3311.

f. Water absorption shall be determined by Method 6631.

g. Tensile strength and ultimate elongation after aging shall be determined by Method 7111.

h. Brittleness shall be determined by Method 5311.

i. Accelerated extraction shall be accomplished by Method 6111 under the following conditions:

(1) Samples shall be not less than 1/16-inch nor more than 1/8-inch in thickness;

(2) The immersion medium shall be a solution made by dissolving 5 grams of chemically pure sodium hydroxide and 5 grams of chemically pure potassium hydroxide in one liter of distilled water;

(3) The samples shall be immersed in the medium for 14 days at a temperature of $145^{\circ} \pm 5^{\circ}F$;

(4) During the immersion period, air shall be gently bubbled through the medium from a 1/4-inch glass tube at a rate of about one bubble per second;

(5) Fresh medium shall be susbtituted every day;

(6) Samples need not be dipped in acetone.

j. The effects of alkalies shall be determined by Method 6251 under the following conditions:

(1) Samples shall be not more than 1/4-inch in thickness;

(2) The immersion medium shall be as described in (i), above;

(3) Fresh medium shall be substituted every 7 days.

(4) The samples shall be immersed in the medium for a period of 30 days;

(5) Samples need not be dipped in acetone.

5. CONDITION

Waterstops shall be extruded or molded in such a manner that the material is dense and homogeneous throughout and free from voids, tears, thins, indentations, or other imperfections. Unless otherwise specified, waterstops shall be symetrical in shape and uniform in dimensions and shall be furnished in continuous strips at least 50 feet long. Factory splices shall have a tensile strength equal to at least one-half that of the unspliced section.

6. PACKAGING AND STORING

Waterstops shall be package and stored by methods that will protect them from prolonged exposure to direct sunlight or excessive heat.

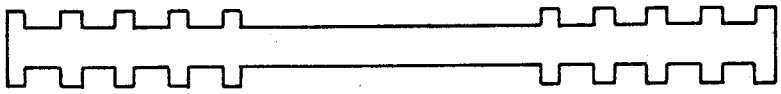
TABLE 1. SIZES OF WATERSTOPS

Size Designation	Web Thickness (T) (Inches)	Width (W) (Inches)
1	1/16	5 1/4
2	3/32	3 3/4
3	3/32	4
4	3/32	5 1/4
5	3/32	6
6	1/8	4
7	1/8	5 1/4
8	1/8	6
9	5/32	4
10	5/32	4 1/2
11	5/32	9
12	3/16	4
13	3/16	5
14	3/16	6
15	3/16	9
16	1/4	6
17	1/4	9
18	3/8	5
19	3/8	6
20	3/8	9
21	1/2	6
22	1/2	9
23	1/2	12

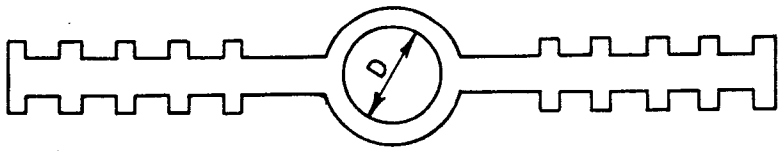
FIGURE 1

TYPES OF NON-METALLIC WATERSTOPS

TYPE A



TYPE B



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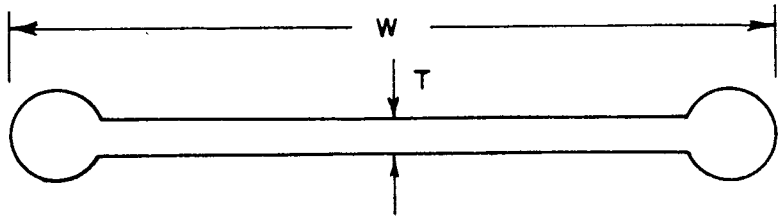

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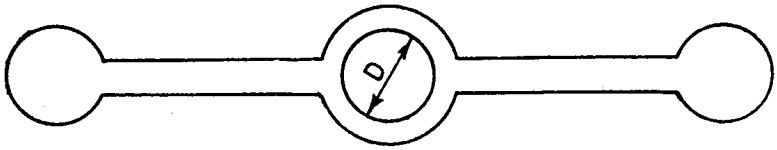

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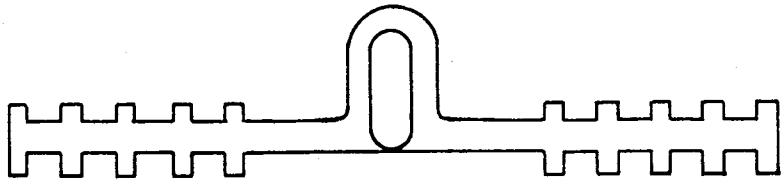
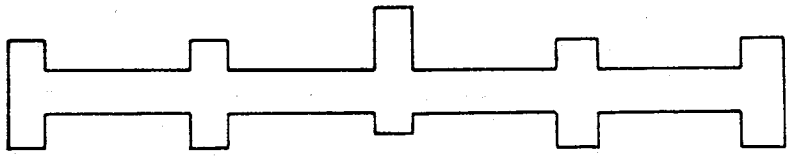


TYPE F



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MATERIAL SPECIFICATION

539. STEEL REINFORCEMENT (FOR CONCRETE)

1. SCOPE

This specification covers the quality of steel reinforcement for reinforced concrete.

2. QUALITY

All reinforcement shall be free from rust, oil, grease, paint or other deleterious matter.

Steel bars for concrete reinforcement requiring bends shall be deformed billet-steel bars conforming to ASTM Specification A 615, Grade 40.

Straight steel bars shall be deformed bars conforming to one of the following specifications:

Deformed Billet-Steel Bars for Concrete Reinforcement (Grade 40 or Grade 60) - ASTM Designation A 615.

Rail-Steel Deformed Bars for Concrete Reinforcement (Grade 50 or Grade 60) - ASTM Designation A 616.

Axle-Steel Deformed Bars for Concrete Reinforcement (Grade 40 or Grade 60) - ASTM Designation A 617.

Fabricated steel bar mats shall conform to the requirements of ASTM Specification A 184.

Welded steel wire fabric reinforcement shall conform to the requirements of ASTM Specification A 185.

Welded deformed steel wire fabric for concrete reinforcement shall conform to the requirements of ASTM Specification A 497.

Cold-drawn steel wire reinforcement shall conform to the requirements of ASTM Specification A 82.

Deformed steel wire for concrete reinforcement shall conform to the requirements of ASTM Specification A 496.

3. DIMENSIONS OF WELDED WIRE FABRIC

Gages, spacing and arrangement of wires in welded steel wire fabric shall be as defined in ACI Standard 315 of the American Concrete Institute for the specified style designations.

4. STORAGE

Steel reinforcement stored at the site of the work shall be stored above the ground surface on platforms, skids or other supports and shall be protected from mechanical injury and corrosion.

MATERIAL SPECIFICATION

541. REINFORCED CONCRETE PRESSURE PIPE

1. SCOPE

This specification covers the quality of reinforced concrete pressure pipe and fittings.

2. DESIGN AND FABRICATION

The pipe and fittings shall be designed to withstand the specified external load and internal pressure. The pipe, the materials used in its manufacture, and the methods of fabrication shall conform to the requirements of the following specifications applicable to the specified type of pipe.

a. Steel Cylinder Type, Prestressed: AWWA Standard C301, except that Section 2.6, Steel for Cylinders, paragraph 2.6.1 shall be:

> 2.6.1 Steel sheets for cylinders may be in coils or cut lengths, and shall meet the requirements of (1) the "Specification for Hot-Rolled Carbon Steel Sheets and Strip, Commercial Quality" (ASTM Designation A 569), except that the maximum carbon content may be 0.25 percent and minimum yield point shall be 27,000 psi or (2) the "Specifications for Flat-Rolled Carbon Steel Sheets of Structural Quality," Grade B or C (ASTM Designation A 245 or A 570).

b. Steel Cylinder Type, Not Prestressed: AWWA Standard C300, except that Section 2.6, Steel for Cylinders, paragraph 2.6.1 shall be:

> 2.6.1 Steel sheets for cylinders may be in coils or cut lengths, and shall meet the requirements of (1) the "Specification for Hot-Rolled Carbon Steel Sheets and Strip, Commercial Quality" (ASTM Designation A 569), except that the maximum carbon content may be 0.25 percent and the minimum yield point shall be 27,000 psi or (2) the "Specifications for Flat-Rolled Carbon Steel Sheets of Structural Quality," Grade B or C (ASTM Designation A 245 or A 570).

c. Noncylinder Type, Not Prestressed: AWWA Standard C302;

d. Low Head Pressure Pipe: ASTM Specifications C 361.

Sections 1.6 and 1.7 of AWWA Standards C300, C301 and C302 shall not apply.

3. STEEL REINFORCEMENT

The steel reinforcements shall conform to the requirements of the specifications cited in Section 2 for the specified type of pipe, except that elliptical reinforcing cages or other reinforcements that require special orientation of the pipe during placement will not be allowed.

4. JOINTS

The pipe joints shall conform to the requirements of the applicable specification for the pipe. They shall be bell-and-spigot type or double-spigot-and-sleeve type and shall have a positive groove in the spigot to contain the rubber gasket. The size and shape of the groove shall be such that it will prevent displacement of the gasket by either internal or external water pressure when the joint is in any position within the required range of movement capability. Joint sleeves, also referred to as "collars" or "coupling bands," shall conform to the requirements for bell rings in the applicable pipe specification.

The joints shall be constructed so as to permit relative movement of the adjoining pipe sections with no reduction of watertightness. The joint length and the limiting angle defining the required capability of relative movement at each joint shall be no less than specified.

Joint length refers to the permissible axial movement in the joint, and is defined as the maximum distance through which the spigot can move, relative to the bell or sleeve, from the fully engaged to the fully extended condition of the joint when the adjoining pipe sections are in parallel, concentric alignment. The joint is considered to be fully engaged when the spigot is inserted as far as it will go into the bell or sleeve, and fully extended when it is inserted the least amount that will insure full confinement of the gasket and complete watertightness. Joint length specified for double-spigot joints refers to the permissible movement in each of the spigot-to-sleeve connections, not the sum of the two.

The limiting angle of the joint is defined as the maximum deflection angle between adjoining pipe sections the joint will permit before the outer surface of the spigot comes into direct contact with inside of the mating bell or sleeve. If both spigot-to-sleeve connections of a double-spigot joint permit angular movement, the limiting angle of the joint is the sum of the two deflection angles permitted by the two connections.

5. GASKETS

The pipe joint gaskets shall conform to the requirements of the specifications cited in Section 2 of this specification. They shall be endless rubber gaskets having circular cross section. The cross-sectional diameter of the gaskets shall conform to the pipe manufacturer's recommendation for the type and size of pipe furnished.

6. MARKING

All pipe sections and special fittings shall be marked by the manufacturer with the manufacturer's name or trademark, the date of manufacture, the nominal size, design head, design external load and the structure site for which it was designed and manufactured.

7. INSPECTION, TESTING AND CERTIFICATION

The pipe shall be inspected by methods prescribed in the specifications cited herein, except that external crushing strength tests required as a basis for certification shall be performed by the three-edge bearing method described in ASTM Methods C 497.

The three-edge bearing load shall be defined as:

a. For pipe conforming to ASTM Specifications C 361, AWWA Standard C300 for AWWA Standard C302, the load required to produce a 0.01-inch crack one foot long; or,

b. For pipe conforming to AWWA Standard C301, the load required to produce a 0.001-inch crack one foot long.

The material certification will include:

a. The pipe manufacturer's certified statement of the design strength of the pipe, consisting of:

(1) For types of pipe for which design curve have been approved by the Soil Conservation Service, (a) a copy of the appropriate design curve marked

to show the resultant concrete core stress and corresponding three-edge bearing load of the pipe furnished; and (b) a specification sheet for the pipe furnished showing all data and dimensions needed to compute the resultant concrete core stress; or

(2) Results of typical external crushing strength tests performed on pipe of equivalent size and design and composed of equivalent materials, or

(3) Results of external crushing strength tests performed on a specimen (at least two feet in length) of pipe identical in design and construction to the pipe furnished.

b. The pipe manufacturer's certified statement of results of the hydrostatic tests required by the reference specification appropriate to the type of pipe furnished.

c. The pipe manufacturer's certified statement of current typical test reports on steel and steel wire reinforcing and compression tests of the concrete used in the manufacture of the pipe.

d. Such drawings and descriptions of the pipe joint as may be necessary to show that the joint conforms to the specified requirements.

MATERIAL SPECIFICATION

551. ZINC-COATED IRON OR STEEL CORRUGATED PIPE

1. SCOPE

This specification covers the quality of zinc-coated iron or steel corrugated pipe and fittings.

2. PIPE

Zinc-coated or steel corrugated pipe and fittings shall conform to the requirements of Interim Federal Specification WW-P-405 for the specified classes and shapes of pipe, and to the following additional requirements:

a. Unless otherwise specified, circumferential shop riveted seams shall have a maximum rivet spacing of 6 inches, except that 6 rivets will be sufficient for 12-inch diameter pipe;

b. When close riveted pipe is specified: (1) the pipe shall be fabricated so that the rivet spacing in the circumferential seams shall not exceed 3 inches, except that 12 rivets will be sufficient to secure the circumferential seams in 12-inch pipe, and (2) in those portions of the longitudinal seams that will be covered by the coupling bands the rivets shall have finished flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating of the coupling bands.

c. Double riveting or double spot welding of pipe less than 42 inches in diameter may be required. When double riveting or double spot welding is specified, the riveting or welding shall be done in the manner specified for pipe 42 inches or greater in diameter.

3. COATINGS

Coatings shall conform to the requirements of Interim Federal Specification WW-P-405 for the specified types of coatings.

MATERIAL SPECIFICATION

572. SLIDE GATES (SLUICE GATES), METAL, MODERATE DUTY

1. SCOPE

This specification covers the quality of moderate duty, metal slide gates (sluice gates) for water control.

2. CLASS AND TYPE OF GATE

The class of gate will be expressed as a numerical symbol composed of the seating head and unseating head which the gate must be built to withstand. The two numbers will be separated by a hyphen with the seating head listed first. For this purpose the heads shall be expressed in terms of feet of water.

The gates shall be of the specified types as defined below:

Type MMS-1 gates shall be cast iron with bronze seat facings, cast iron or galvanized structural steel guides, and galvanized steel, bronze, or stainless steel fasteners.

Type MMS-2 gates shall be cast iron with bronze seat facings and stainless steel guides and fasteners.

3. QUALITY OF MATERIALS

Materials in slide gates and appurtenances shall conform to the requirements of the applicable specifications listed below for the alloy, grade, type, or class of material and the condition and finish appropriate to the structural and operational requirements:

Material	Specification (ASTM)
Cast iron	A 48, Class 30, or A 126, Class B
Structural steel shapes, plates, and bars	A 36
Carbon steel bars	A 108 or A 575
Stainless steel	A 276, Type 302, 303, or 304
Naval bronze	B 21

Material	Specification (ASTM)
Cast bronze	B 147
Rubber for gaskets and seals	D 2000, AA805 material

Galvanizing (zinc coating) shall conform to the requirements of Material Specification 582.

4. FRAME (OR SEAT)

The frame shall be cast iron and of the specified type. The front face shall be machined to receive the gate guides and the rear face shall be machined as required to match the specified attaching means.

5. GATE SLIDE

The gate slide shall be cast iron, rectangular in shape and shall have horizontal and vertical stiffening ribs of sufficient section to withstand the seating and unseating heads expressed by the gate class designation, as defined in Section 2 of this specification.

Tongues or grooves shall be cast or machined on the vertical sides of the slide along its entire height to match the guide grooves or angles.

A nut pocket with reinforcing ribs shall be integrally cast on the vertical centerline and above the horizontal centerline of the slide. The pocket shall be of a shape adequate to receive a flat-backed thrust nut or stem block and shall be built to withstand the opening and closing thrust of the stem.

6. GATE GUIDES

The gate guides shall be built to withstand the total thrust of the gate slide due to water pressure and wedge action.

Grooves shall be machined in cast iron guides to receive the tongue on the gate slide throughout the entire length of the guide.

The guides shall be of such length as to retain at least one-half the height of the gate slide when the gate is fully opened.

7. WEDGES AND WEDGE SEATS (OR BLOCKS)

Pads for supporting wedges, wedge seats and wedge loops (or stirrups) shall be cast as integral parts of the slide, frame or guides.

Wedges and wedge seats shall have smooth bearing surfaces. Wedges may be cast as integral parts of the slide. Removable wedges and wedge seats shall be fastened to the slide, frame or guides by means of suitable studs, screws, or bolts and shall be firmly locked in place after adjustment. Each interacting set of wedge and wedge seat shall be adjustable as needed to insure accurate and effective contact.

8. SEAT FACINGS

Seat facings shall be machined to a smooth finish to insure proper watertight contact. Bronze facings shall be securely attached by welding or by another approved method.

9. YOKE

When a self-contained gate is specified, the yoke shall be galvanized structural steel or cast iron and of such design as to capably withstand the loads resulting from operation of the gate. Cast iron yokes shall be provided with machined pads for connecting to the ends of the gate guides and to receive the stem thrust cap or handwheel lift.

10. GATE STEM AND LIFT (OR HOIST)

The gate stem and lift (or hoist) shall be of the specified type, size and capacity and, if hand operated, shall be capable of moving the gate slide under normal conditions, after it is unseated from its wedging device, with a pull on the handwheel or crank of not more than 25 pounds with the specified seating or unseating head of water against the gate.

Unless otherwise specified, the stem shall be carbon steel and shall be furnished in sections as necessary to permit reasonable ease in installation. Couplings shall be bolted, pinned or keyed to the stem. The stem shall be furnished with rolled or machine-cut right-hand 29° Acme threads of sufficient length to completely open the gate. The threads shall be smooth and of uniform lead and cross section, such that the nut can travel the full length without binding or excessive friction. The stem shall be threaded for connection to the stem block or thrust nut on the gate slide.

The lift shall be compatible with the type of stem furnished. Unless otherwise specified, the lift nut shall be cast bronze and shall be fitted with ball or roller thrust bearings designed to withstand the normal thrust developed during opening and closing

of the gate at the maximum operating heads. All gears, sprockets and pinions shall be machine-cut, with ratios and strength adequate to withstand operating loads. Sufficient grease fittings shall be provided to allow lubrication of all moving parts. An arrow and the word "open" shall be cast on the rim of the headwheel or on the lift housing to indicate the direction of opening. Unless otherwise specified, the lift for a non-rising-stem gate shall be provided with an indicator capable of showing both when the gate is fully open and when it is fully closed.

Provision shall be made to prevent stem rotation within the thrust nut at the connection with the gate slide.

Stop collars shall be provided on rising stems to prevent over-travel in opening and closing the gate.

11. STEM GUIDES

Unless otherwise specified, stem guides shall be cast iron with bronze bushed collars and adjustable in two directions.

12. WALL THIMBLE

When a wall thimble is specified it shall be cast iron and of the section, type and depth specified. The front flange shall be machined to match the gate frame and drilled and tapped to accurately receive the gate attachment studs.

Gaskets or mastic to be installed between the thimble and the gate frame shall conform to the recommendation of the gate manufacturer and shall be furnished with the thimble.

13. FASTENERS

All anchor bolts and other fasteners shall be galvanized or stainless steel or bronze, according to the type of gate specified as defined in Section 2 of this specification.

14. INSTALLATION INSTRUCTIONS

The Contractor shall supply the manufacturer's complete installation data, instructions for adjustments and drawings or templates showing the location of anchor bolts for each gate.

15. PAINTING

When specified, gates and accessories shall be painted by the designated systems.

16. CERTIFICATION

The material certification shall include the name of the manufacturer, and manufacturer's model number (for standard catalog items) or the seating and unseating heads for which the gate is designed together with such drawings and specifications as may be necessary to show that the gate conforms to the requirements of this specification.

MATERIAL SPECIFICATION

581. METAL

1. SCOPE

This specification covers the quality of steel and aluminum alloys.

2. STRUCTURAL STEEL

Structural steel shall conform to the requirements of ASTM Specification A 36.

Carbon steel plates of structural quality to be bent or formed cold shall conform to ASTM Specification A 283, Grade C.

Carbon steel sheets of structural quality shall conform to ASTM Specification A 245, Grade D, or A 570, Grade D.

Carbon steel strip of structural quality shall conform to ASTM Specification A 570, Grade C.

3. COMMERCIAL OR MERCHANT QUALITY STEEL

Commercial or merchant quality steel shall conform to the requirements of the applicable ASTM specifications listed below:

Product	ASTM Specification
Carbon steel bars	A 575, Grade M 1015 to Grade M 1031
Carbon steel sheets	A 569
Carbon steel strip	A 569
Zinc-coated carbon steel sheets	A 526

4. ALUMINUM ALLOY

Aluminum alloy products shall conform to the requirements of the applicable ASTM specifications listed below. Unless otherwise specified, Alloy 6061-T6 shall be used.

Product	ASTM Specification
Standard structural shapes	B 308
Extruded structural pipe and tube	B 429
Extruded bars, rods, shapes and tubes	B 221
Drawn seamless tubes	B 210
Rolled or cold-finished bars, rods and wire	B 211
Sheet and plate	B 209

5. BOLTS

Steel bolts shall conform to the requirements of ASTM Specification A 307. If high-strength bolts are specified they shall conform to the requirements of ASTM Specification A 325.

When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to the requirements of ASTM Specification A 153; except that bolts 1/2 inch or less in diameter may be coated with electrodeposited zinc or cadmium coating conforming to the requirements of ASTM Specification A 164, Type RS, or ASTM Specification A 165, Type TS, unless otherwise specified.

6. RIVETS

Unless otherwise specified, steel rivets shall conform to the requirements of ASTM Specification A 502, Grade 1.

Unless otherwise specified, aluminum alloy rivets shall be Alloy 6061-T6 conforming to the requirements of ASTM Specification B 316.

7. WELDING ELECTRODES

Steel welding electrodes shall conform to the requirements of American Welding Society specification AWS A5.1, "Specification for Mild Steel Covered Arc-Welding Electrodes," except that they shall be uniformly and heavily coated (not washed) and shall be of such a nature that the coating will not chip or peel while being used with the maximum amperage specified by the manufacturer.

Aluminum welding electrodes shall conform to the requirements of American Welding Society specification AWS A5.10, "Specification for Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes."

MATERIAL SPECIFICATION

582. GALVANIZING

1. SCOPE

This specification covers the quality of zinc coatings applied to iron and steel products.

2. QUALITY

Zinc coatings shall conform to the requirements of the following specifications.

Zinc coatings on fabricated or assembled steel products shall conform to the requirements of ASTM Specification A 386 and shall be applied in conformance with the Recommended Practice for Providing High Quality Zinc Coatings (Hot-Dip) on Assembled Products (ASTM Designation A 385).

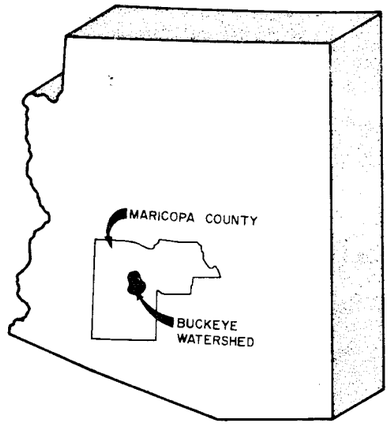
Zinc coatings on iron and steel hardware shall conform to the requirements of ASTM Specification A 153 except that bolts, screws and other fasteners 1/2 inch or less in diameter may be coated with electrodeposited zinc or cadmium coating conforming to the requirements of ASTM Specification A 164, Type RS, or ASTM Specification A 165, Type TS, unless otherwise specified.

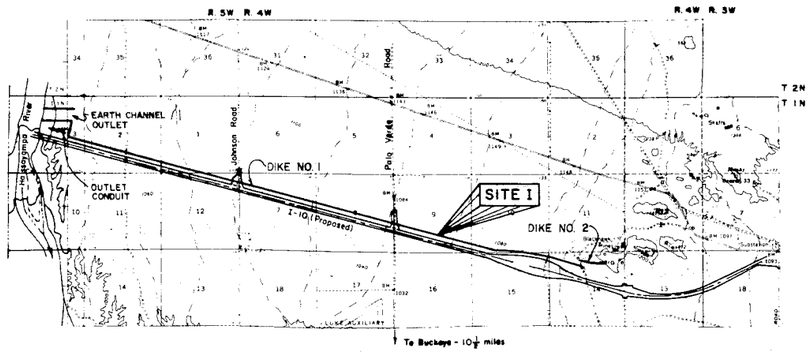
BUCKEYE WATERSHED
PROTECTION AND FLOOD PREVENTION PROJECT
MARICOPA COUNTY, ARIZONA

PLANS FOR THE CONSTRUCTION OF

SITE I DIVERSION STRUCTURE

PREPARED FOR THE FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
BY
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE





LOCATION MAP

INDEX OF DRAWINGS

DRWG. NO.	SHT. NO.	TITLE
7-E-22084	1.	INDEX OF DRAWINGS
	2-7.	PLAN & PROFILE OF DIKE NO. 1
	8.	TYPICAL & MAXIMUM CROSS SECTIONS OF DIKE NO. 1
	9.	DETAILS OF DIKE NO. 2
	10.	PROTECTION DIVERSION STA 562+00 TO STA 605+00
	11.	PROTECTION DIVERSION STA 830+00 TO STA 910+00
	12.	PALO VERDE ROAD RAMP DETAILS
	13.	JOHNSON ROAD RAMP DETAILS
	14.	EARTH CHANNEL OUTLET DETAILS
	15.	PLAN AND PROFILE ℄ OUTLET CONDUIT
	16.	ANTISEEP COLLAR LAYOUT AND DETAILS
	17.	INLET STRUCTURE LAYOUT
	18.	INLET STRUCTURE DETAILS
	19.	OUTLET CONDUIT DETAILS
	20.	PWD OUTLET STRUCTURE AND LAYOUT DETAILS
	21.	CROSS SECTIONS OF INLET CHANNEL, OUTLET CONDUIT AND OUTLET CHANNEL
	22.	IRRIGATION BORDER PLAN & PROFILE DETAILS OF OUTLETS
	23-24.	GATED OUTLET DETAILS AT DIKE NO. 1 STA. 710+00 & STA 817+00
	25.	GATE STEM ASSEMBLY DETAILS AT DIKE NO. 1 STA. 710+00 & STA. 817+00
	26.	PWD OUTLET STRUCTURES AT DIKE NO. 1 STA. 710+00 & STA. 817+00
	27.	PLAN & PROFILE OF GEOLOGIC INVESTIGATIONS ON CONDUIT & EARTH CHANNEL OUTLETS
	28-29	PLAN & PROFILE OF GEOLOGIC INVESTIGATIONS ON ℄ OF DIKE NO. 1
	30-31.	PLAN & PROFILE OF GEOLOGIC INVESTIGATIONS ON BORROW

GENERAL NOTES

1. Elevations are in feet above mean sea level U.S.G.S. datum.
2. All stationing refers to centerline of construction and is the measured horizontal distance.
3. Soils are classified in accordance with the Unified Soils Classification System. Field logs are available in the Project Office, in Buckeye, Arizona.
4. All bearings are referenced to True North.

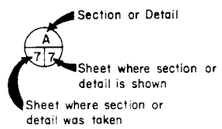
STRUCTURAL NOTES

1. Exposed concrete edges shall be chamfered one inch or rounded.
2. Reinforcing bar spacing is center to center of bars. Bar cover is clear distance between surface of bar and face of concrete and shall be two inches for formed and top surfaces and three inches for surfaces placed against the earth unless otherwise shown.
3. In sections with a single mat of reinforcing, the steel shall be positioned in the center of the section unless otherwise shown.
4. Reinforcing bars shall be continuous or spliced from floor and walls into adjacent floor and walls.
5. Bar splices shall be lapped a minimum of 30 bar diameters but not less than 12 inches, unless specifically shown otherwise.
6. All metal including anchor bolts, nuts, washers, etc. shall be galvanized steel unless otherwise noted.

DESIGN DATA

Class 3,000 concrete
f_c' = 3,000 psi
f_c = 1,200 psi
f_s = 20,000 psi
n = 9
v = 60 psi

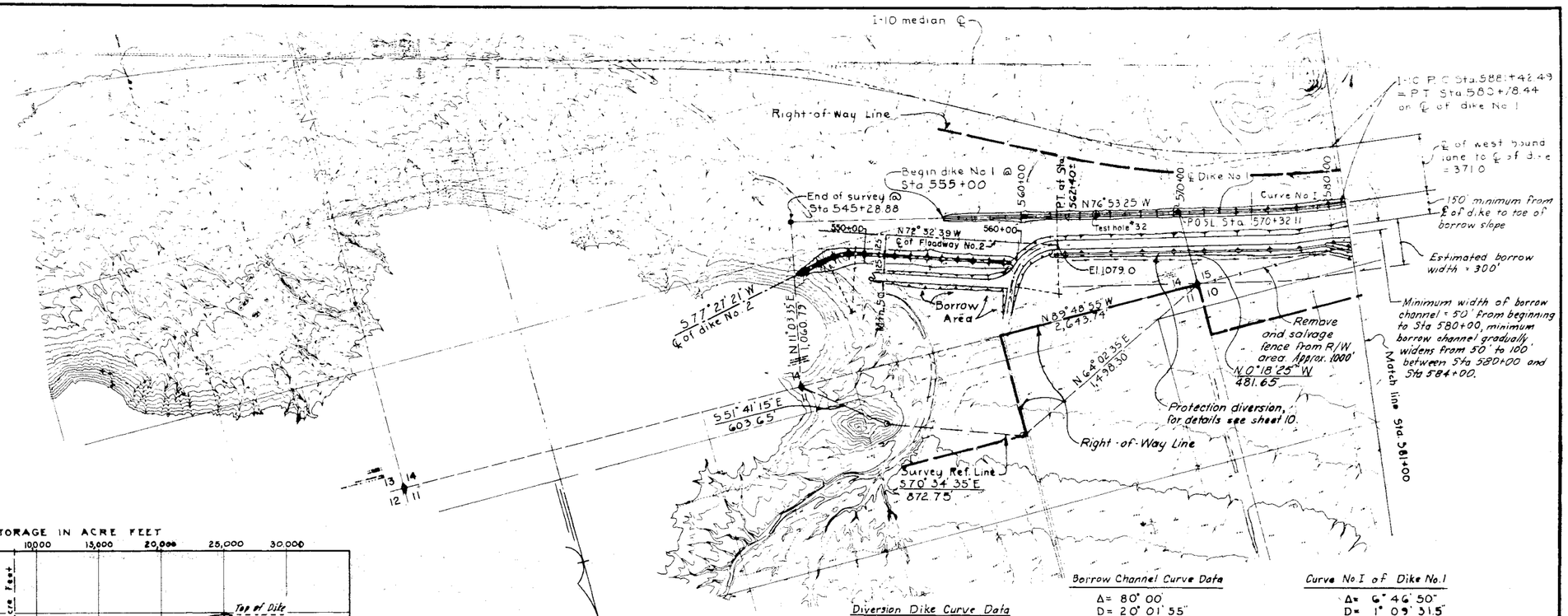
LEGEND

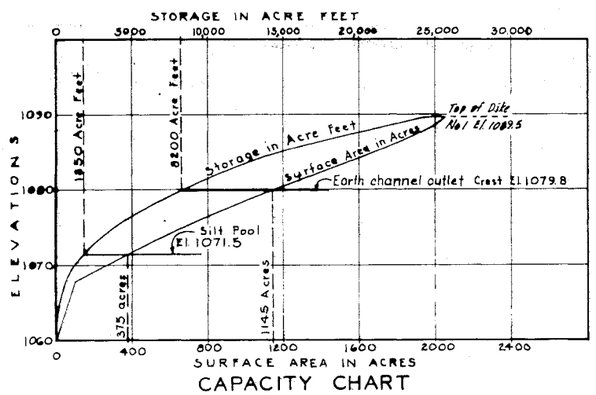


INDEX OF DRAWINGS
BUCKEYE WATERSHED
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed Soil Conservation Service	7-71	Approved by Paul Pillsbury	
		Title Hydr. E.P.W.P. Unit	
Drawn Soil Conservation Service	7-71	Walter M. Amme	
		Title State Conservation Engineer	
Traced		Sheet No. 1 of 31	Drawing No. 7-E-22084
Checked HWF	1-73		





CAPACITY CHART

Diversion Dike Curve Data

Δ = 30°00'
D = 15°21'07"
R = 373.21'
T = 100.00'
L = 195.41'
P.C. Sta. 547+44.59, P.T. Sta. 549+40

Borrow Channel Curve Data

Δ = 80°00'
D = 20°01'55"
R = inside curve = 286.02'
T = " " = 240.00'
L = " " = 399.36'

Curve No. I of Dike No. 1

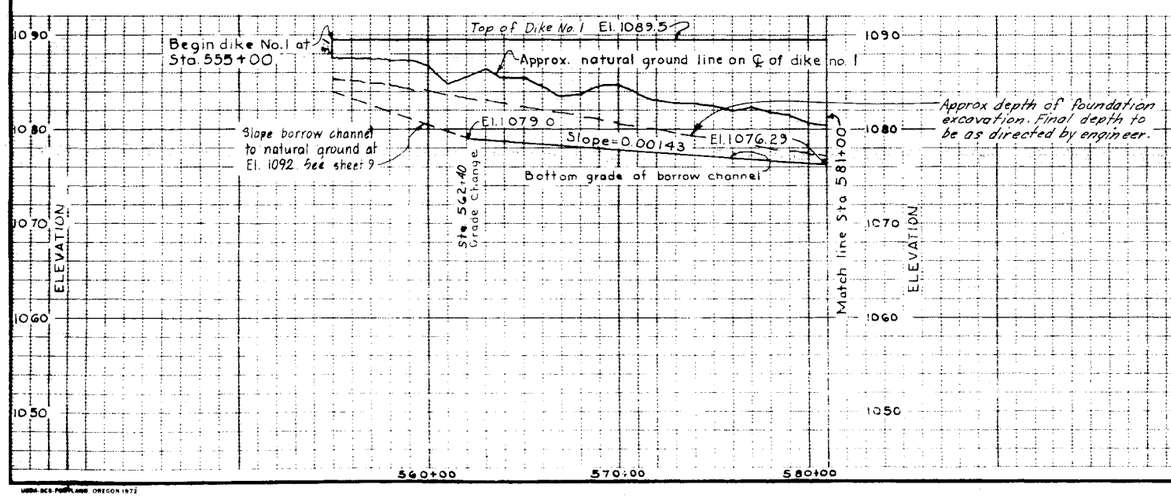
Δ = 6°46'50"
D = 1°09'31.5"
R = 4,944.66'
T = 292.91'
L = 585.28'
PT Sta. 580+78.44
PI Sta. 577+86.07
PC Sta. 574+93.16

PLAN

0 400 800 1200
Scale in feet

Notes:

1. For geologic profile on ℄ Dike No. 1 see sheet 28
2. For test hole locations and geologic profile of borrow see sheet 30
3. For details of Dike No. 2 see sheet-9



PLAN & PROFILE OF DIKE NO. 1

SITE 1

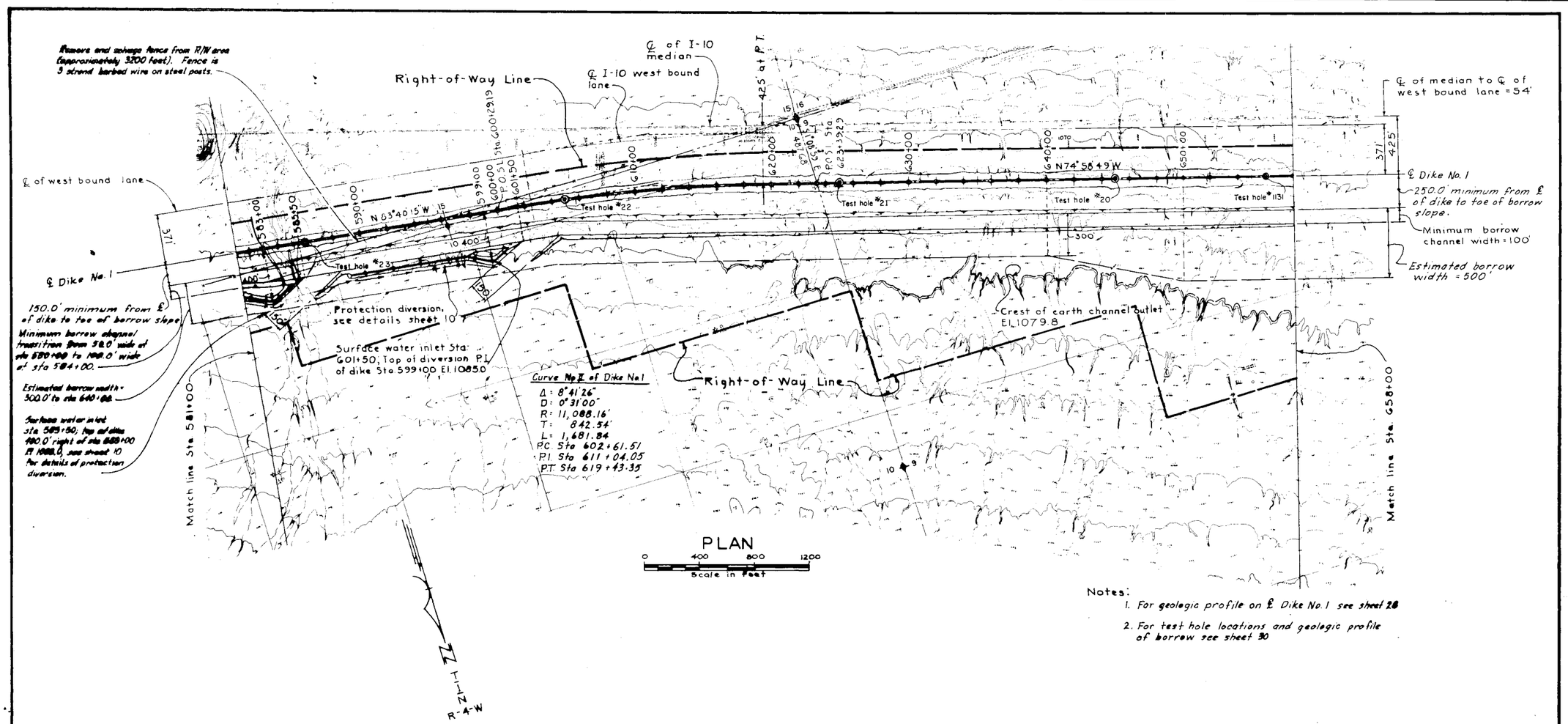
BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT	Date	Approved by	
Drawn G. HANLEY 4-28-71		Title	
Traced		Title	
Checked G.MC. DEW. 1-73		Sheet No. 2 of 31	Drawing No. 7-E-22084

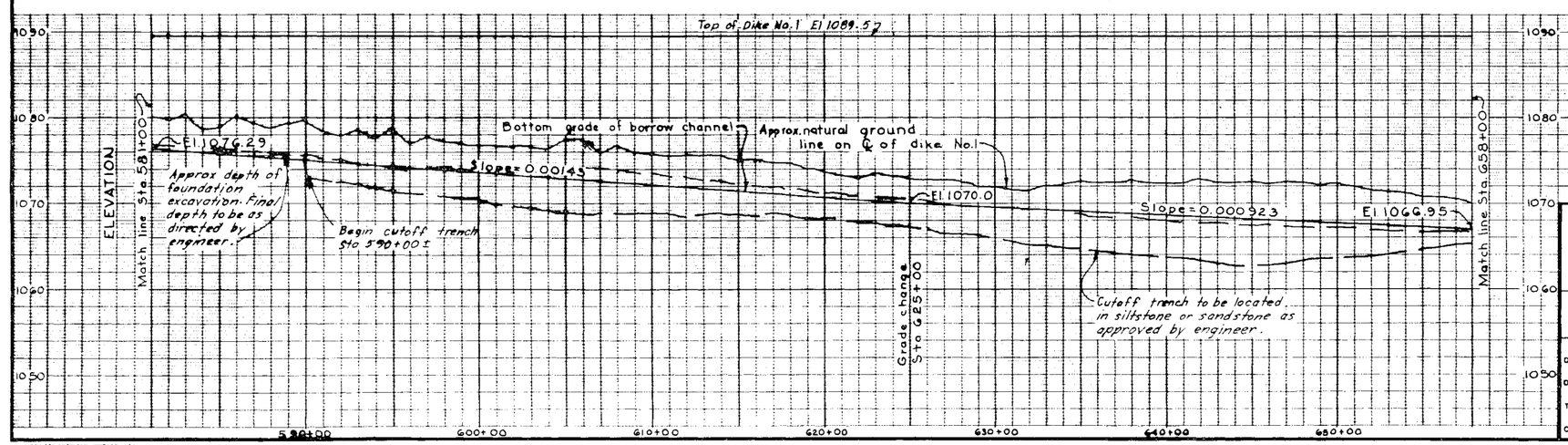
USDA-SCS-PORTLAND, OREGON 1972

Form SCS-318 (November 1955)



Notes:

1. For geologic profile on ℄ Dike No. 1 see sheet 28
2. For test hole locations and geologic profile of borrow see sheet 30



PLAN & PROFILE OF DIKE NO. 1

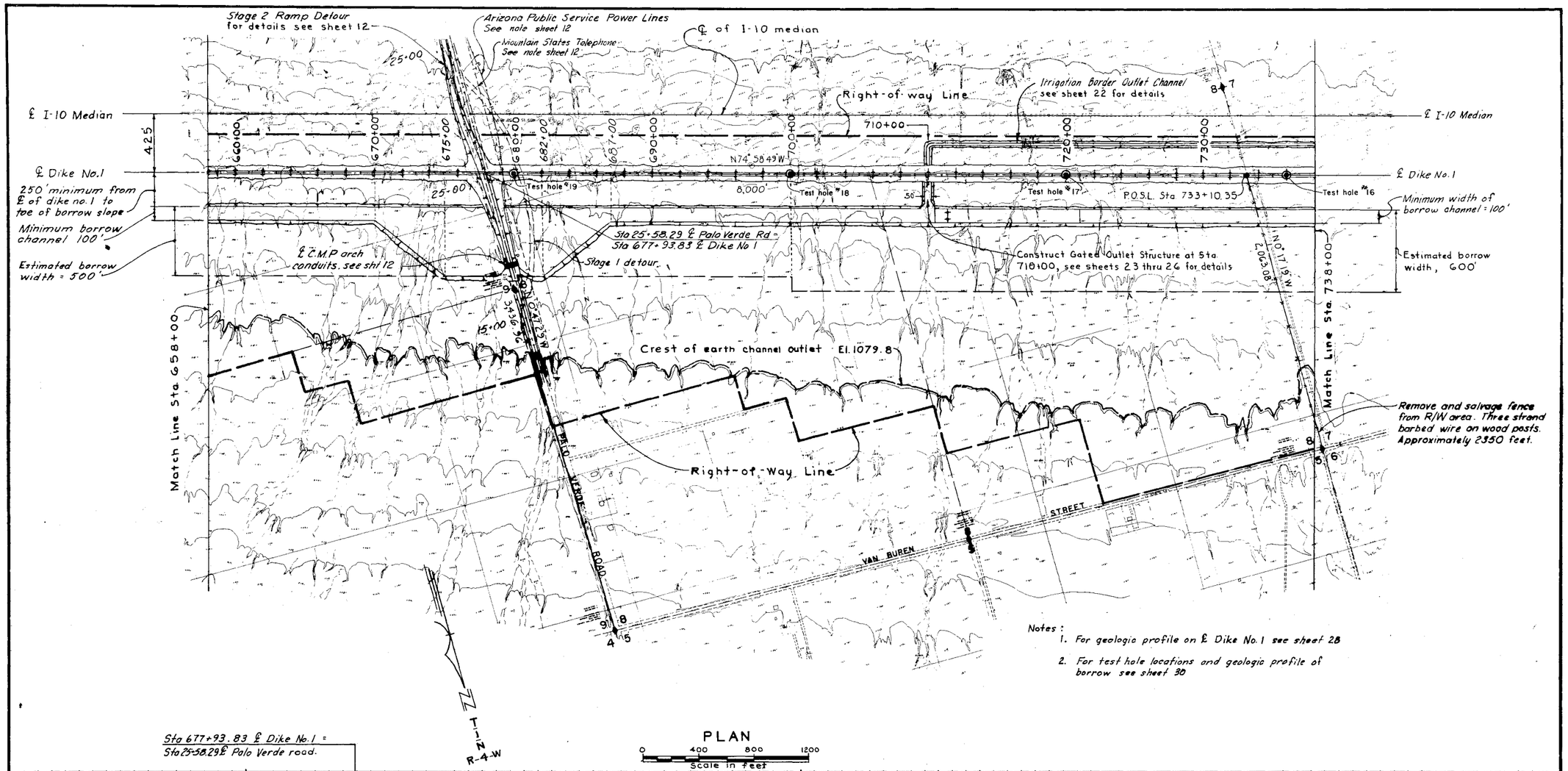
SITE 1

BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT	Date	Approved by	
Drawn G. HANLEY 4-23-71		Title	
Traced		Title	
Checked GMC DEW 1-73		Sheet No. 3 of 31	Drawing No. 7-E-22084

Form SCS-318 (November 1955)



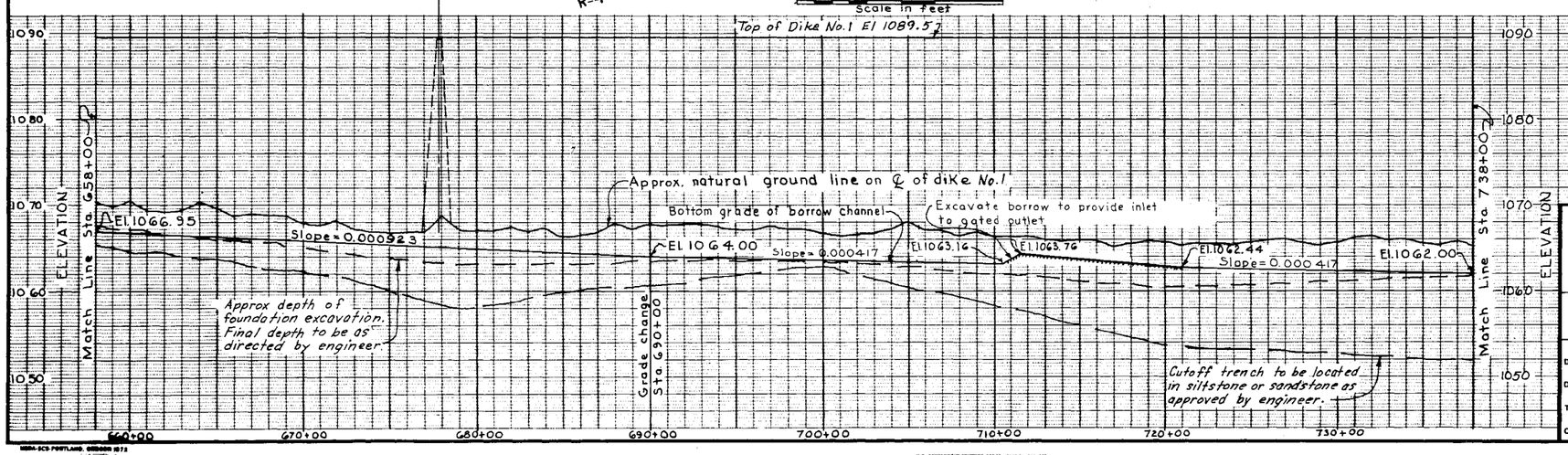
Notes:

1. For geologic profile on ℄ Dike No. 1 see sheet 28
2. For test hole locations and geologic profile of borrow see sheet 30

PLAN

0 400 800 1200

Scale in feet



PLAN & PROFILE ON DIKE NO. 1

SITE 1

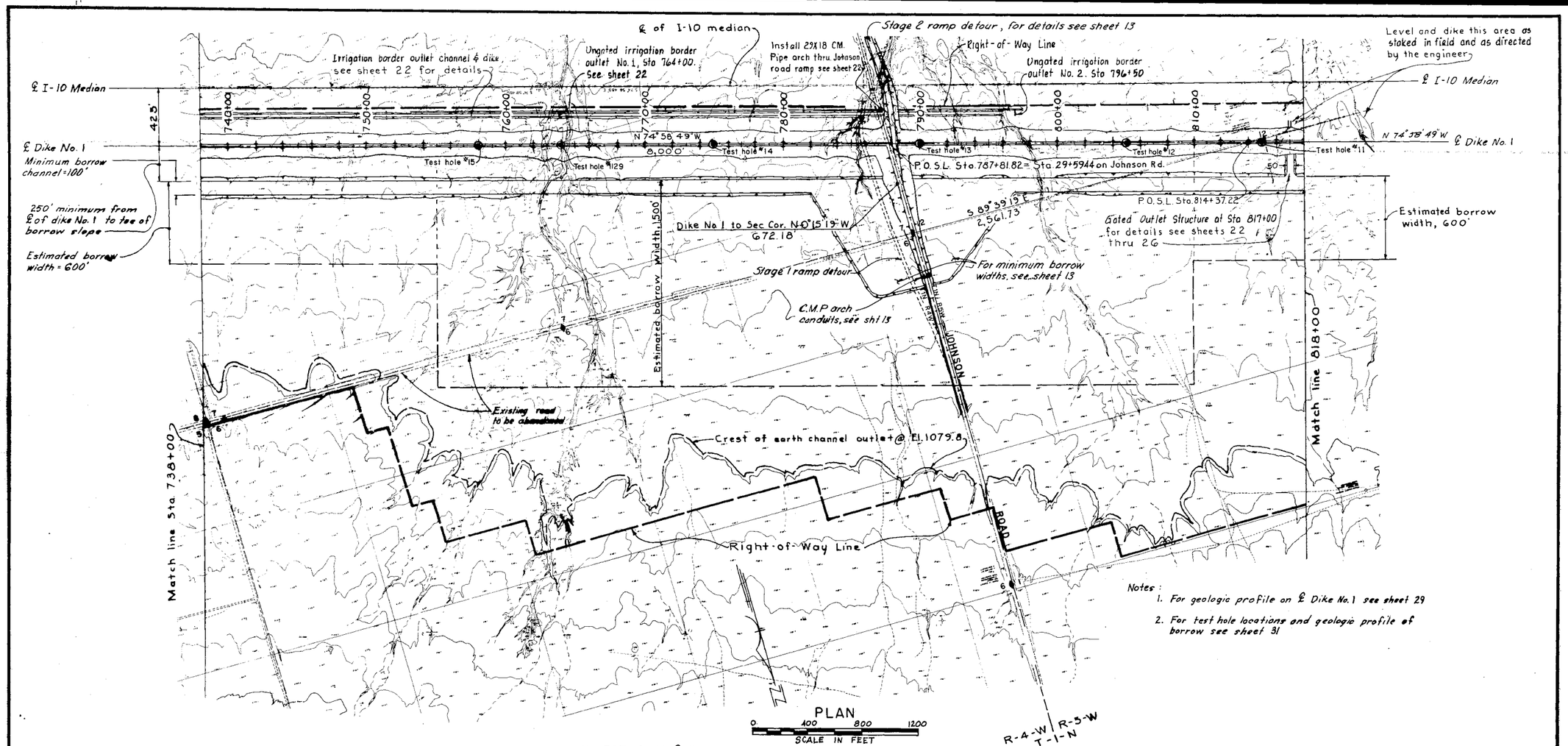
BUCKEYE W. P. P.

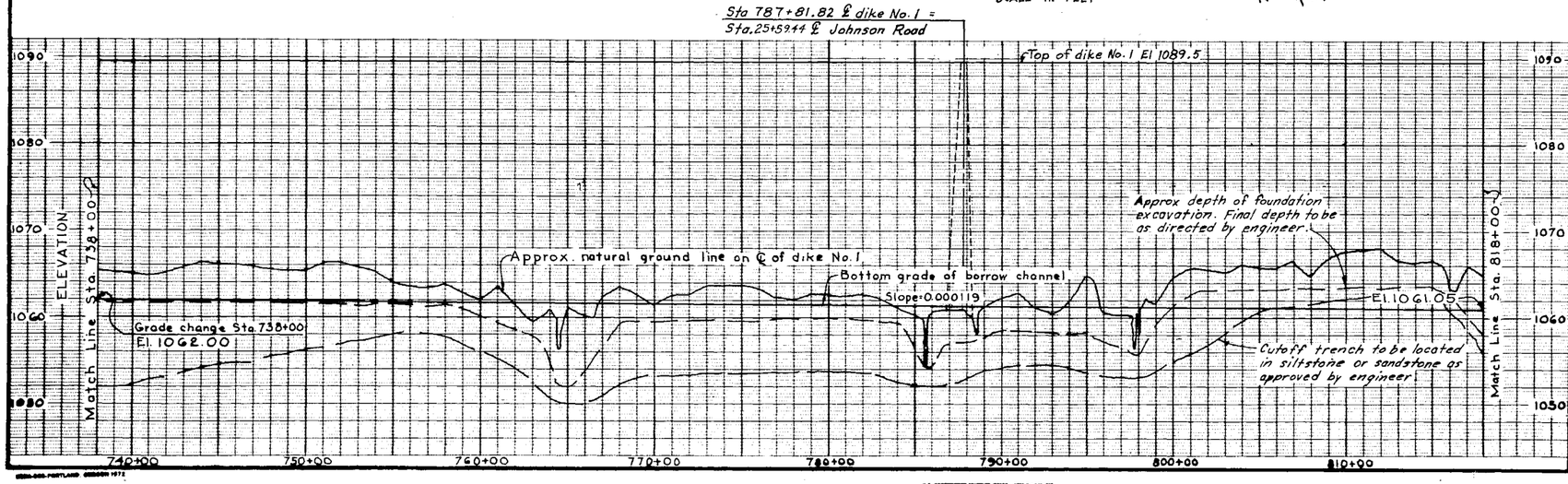
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT	Date	Approved by	
Drawn G. HANLEY 3-30-71		Title	
Traced		Title	
Checked GMC, DEW 1-73		Sheet No. 4 of 31	Drawing No. 7-E-22084

Form SCS-318 (November 1955)





PLAN & PROFILE ON DIKE NO. 1

SITE 1

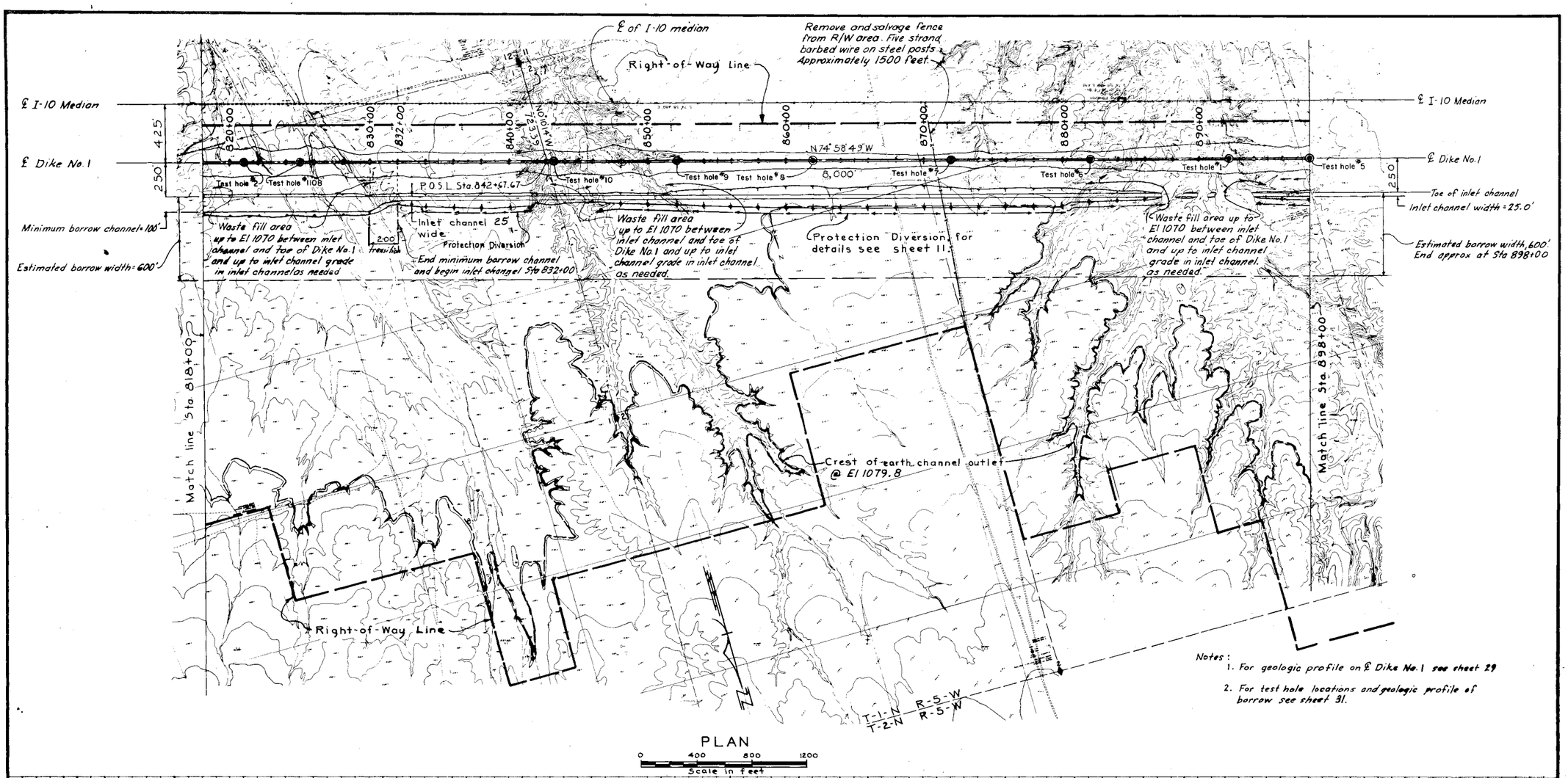
BUCKEYE W.P.P.

MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT	Date	Approved by	
Drawn G. HANLEY	3-29-71	Title	
Traced		Title	
Checked GMC DEW	1-73	Sheet No. 5 of 31	Drawing No. 7-E-22084

Form SCS-318 (November 1955)

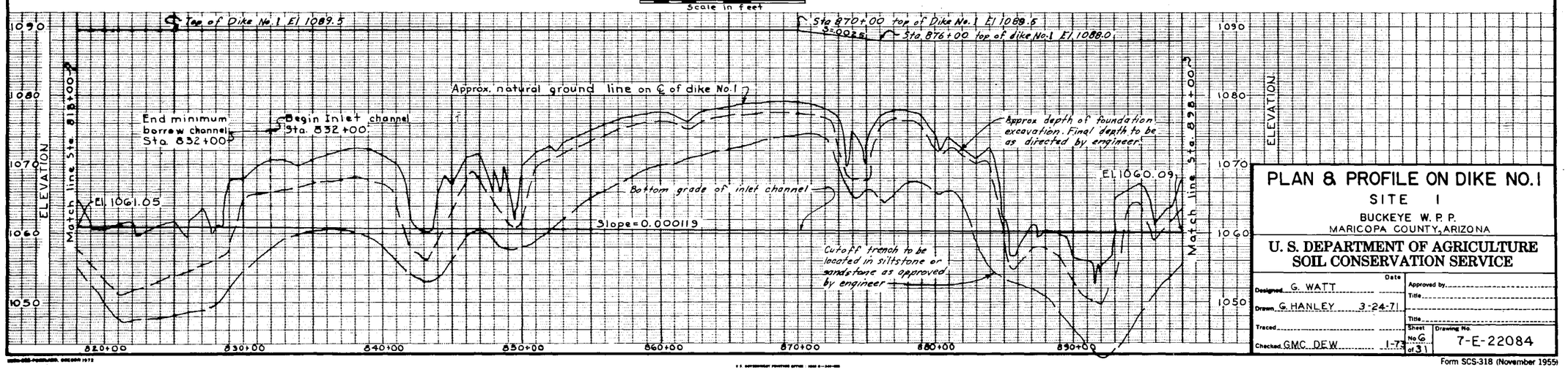


Notes:

1. For geologic profile on ℄ Dike No. 1 see sheet 29
2. For test hole locations and geologic profile of borrow see sheet 31.

PLAN

0 400 800 1200
Scale in feet



PLAN & PROFILE ON DIKE NO. 1

SITE 1

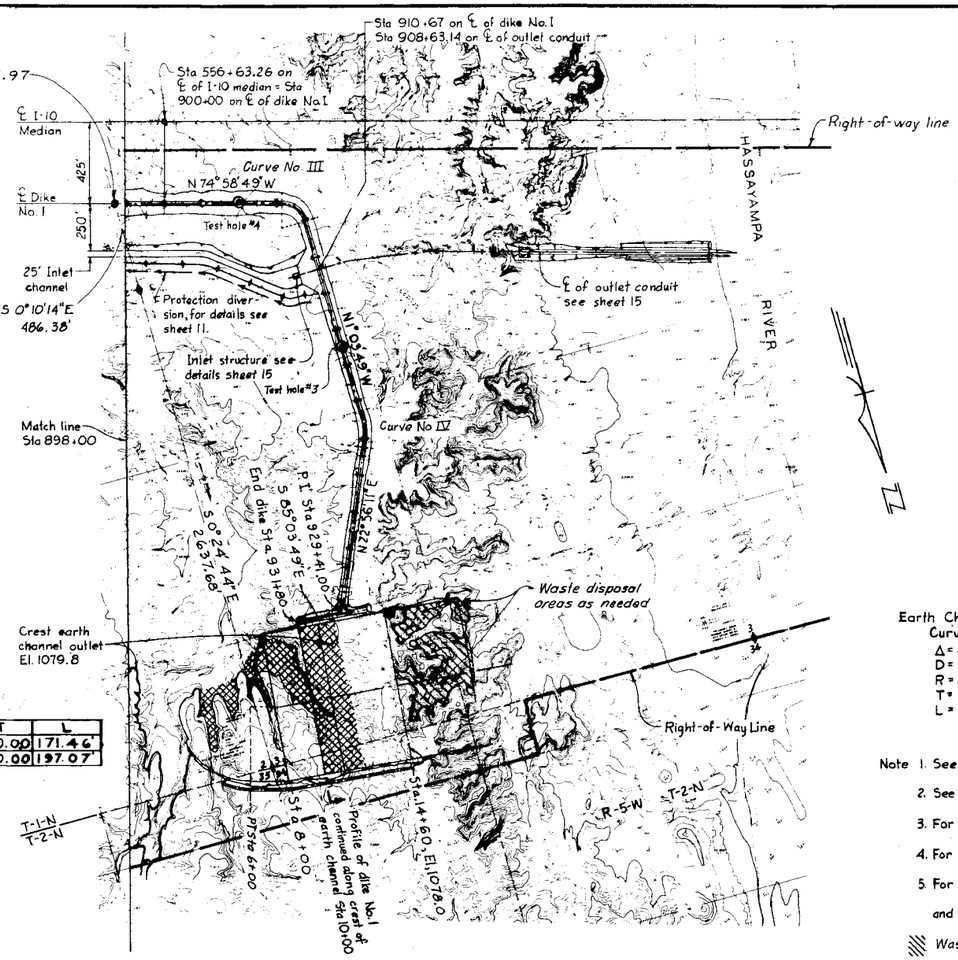
BUCKEYE W. P. P.

MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed G. WATT		Approved by	
Drawn G. HANLEY	3-24-71	Title	
Traced		Title	
Checked GMC DEW	1-73	Sheet No. 6 of 31	Drawing No. 7-E-22084

Form SCS-318 (November 1955)



PLAN

0 400 800 1200

Scale in Feet

Earth Channel Outlet
Curve Data
Δ = 80°00'
D = 14°19'26"
R = 400.00'
T = 335.64'
L = 558.51'

Note 1. See sheet 14 for details of earth channel outlet.

2. See sheet 15 for details of inlet channel and outlet conduit.

3. For geologic profile on ℄ Dike No. 1, see sheet 29

4. For test hole locations and geologic profile of borrow, see sheet 31

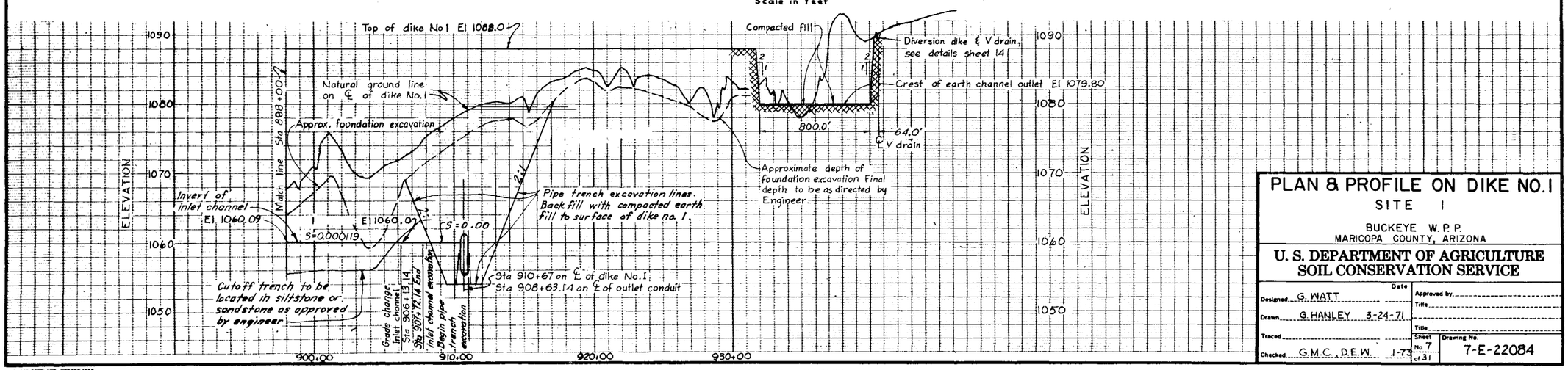
5. For test hole locations and geologic profile of ℄ of outlet conduit and earth channel outlet, see sheet 27

Waste disposal areas as needed (see sheet 14)

Compacted earth fill

DIKE No I ℄ CURVE DATA

Curve No.	P.C. Sta.	P.I. Sta.	P.T. Sta.	Δ	D	R	T	L
III	906+30.00	907+30.00	908+01.46	73°55'00"	43°06'31"	132.91	100.00	171.46'
IV	918+51.46	919+51.46	920+48.53	24°00'00"	12°10'43"	470.46	100.00	197.07'



PLAN & PROFILE ON DIKE NO. I

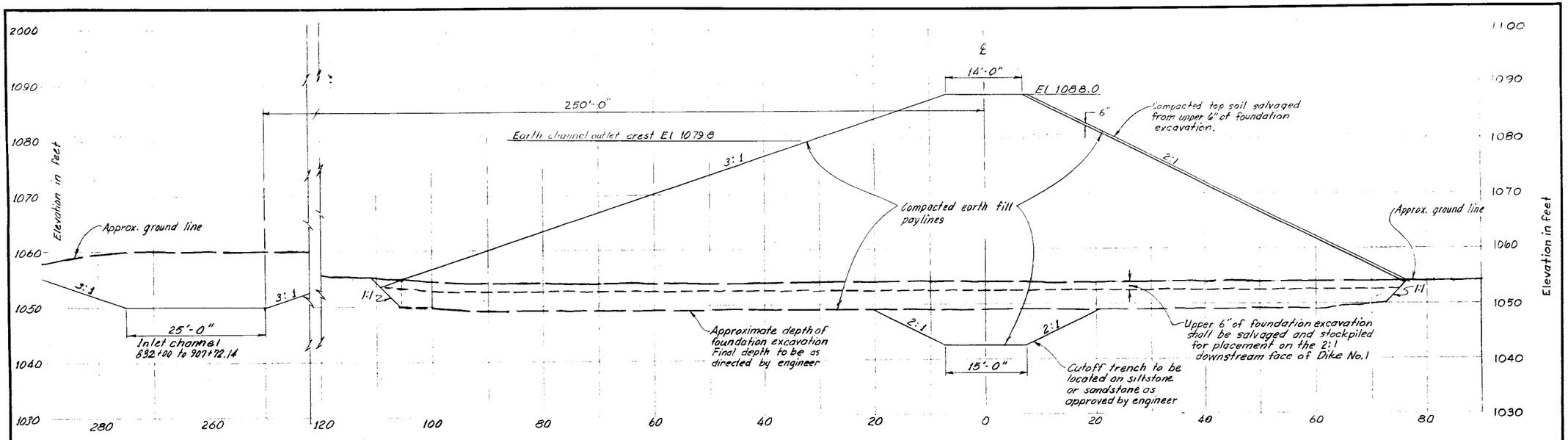
SITE I

BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

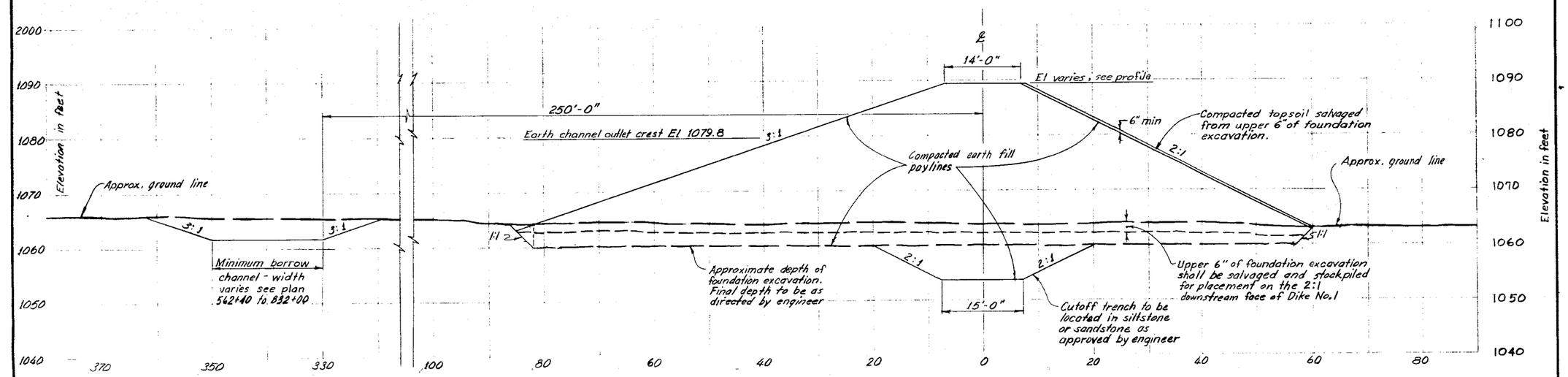
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date		
Designed	G. WATT		Approved by	
Drawn	G. HANLEY	3-24-71	Title	
Traced			Title	
Checked	G.M.C., D.E.W.	1-73	Sheet No. 7 of 31	Drawing No. 7-E-22084

USDA-SCS PORTLAND, OREGON 1972



MAXIMUM CROSS SECTION
STA 892+00 ±
DIKE NO. 1

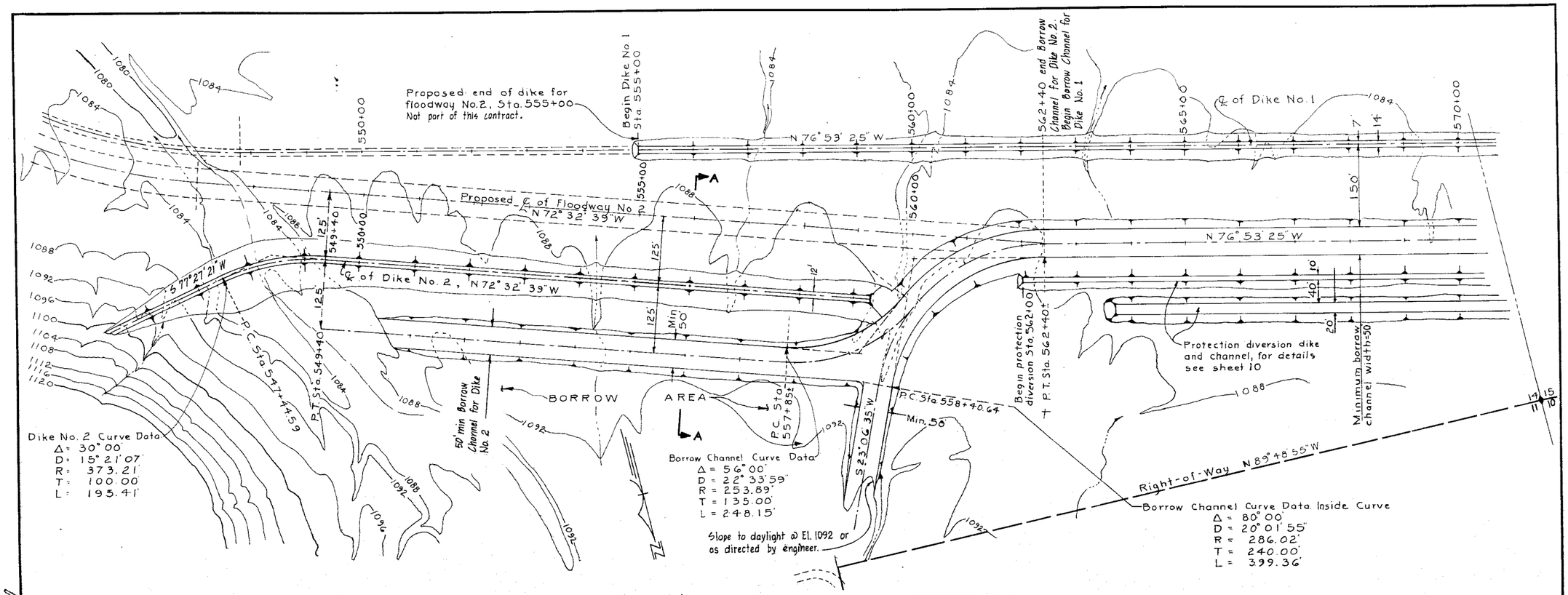


TYPICAL CROSS SECTION
DIKE NO. 1

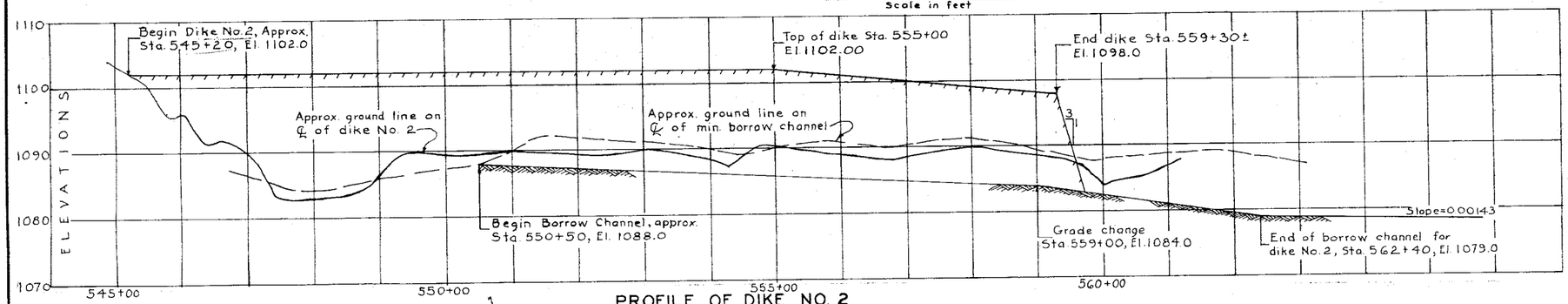
TYPICAL & MAXIMUM
CROSS SECTIONS OF DIKE NO 1
SITE I, BUCKEYE W.P.P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

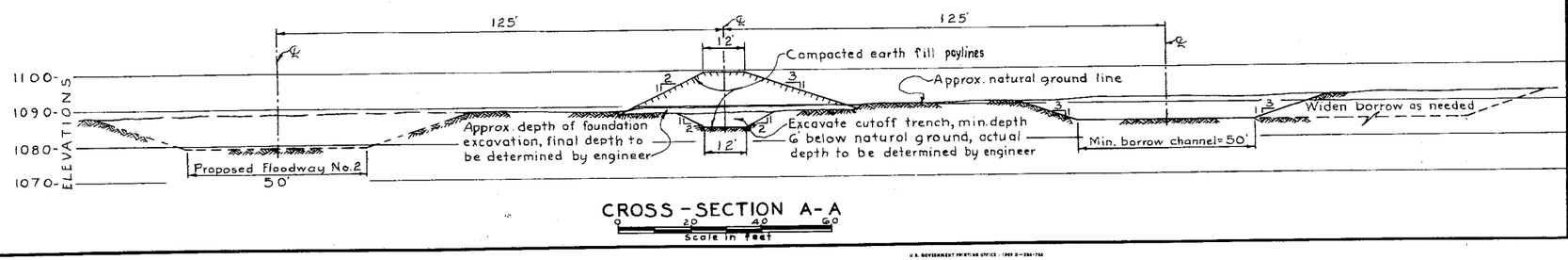
Designed D.E. Wollin	Date 7-71	Approved by	
Drawn J. E. Barnes	7-71	Title	
Traced		Title	
Checked G.M.C., D.E.W.	1-73	Sheet No. 8 of 21	Drawing No. 7-E-22084



DETAIL PLAN OF END OF DIKE NO. 1 & DETAILS OF DIKE NO. 2



PROFILE OF DIKE NO. 2



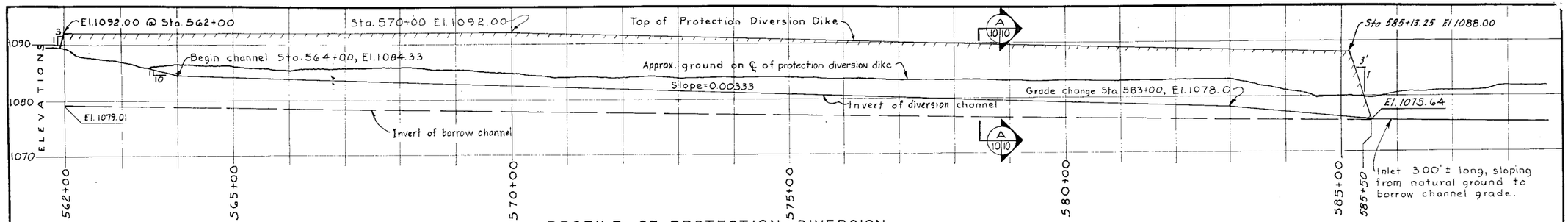
CROSS-SECTION A-A

DETAILS OF DIKE NO. 2
SITE 1
BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

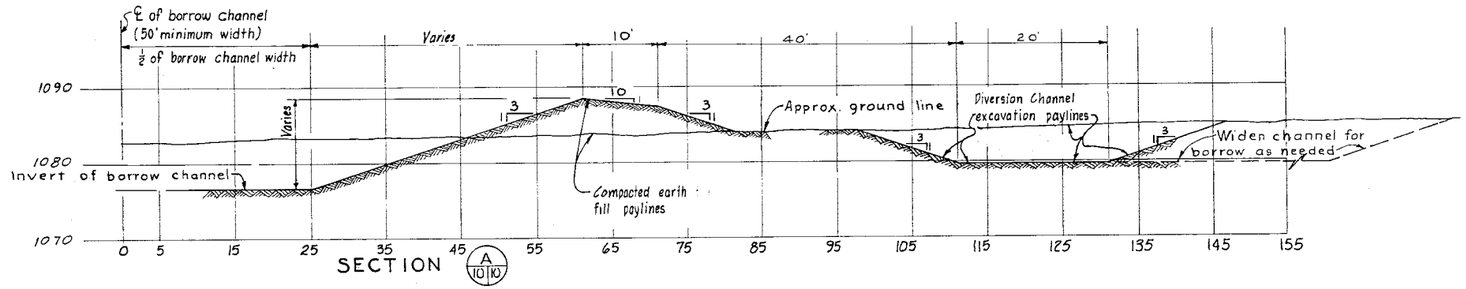
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT	Date	Approved by	
Drawn G. HANLEY 5-31-72		Title	
Traced		Sheet No. 9 of 31	Drawing No. 7-E-22084
Checked G.M.C.	1-73		

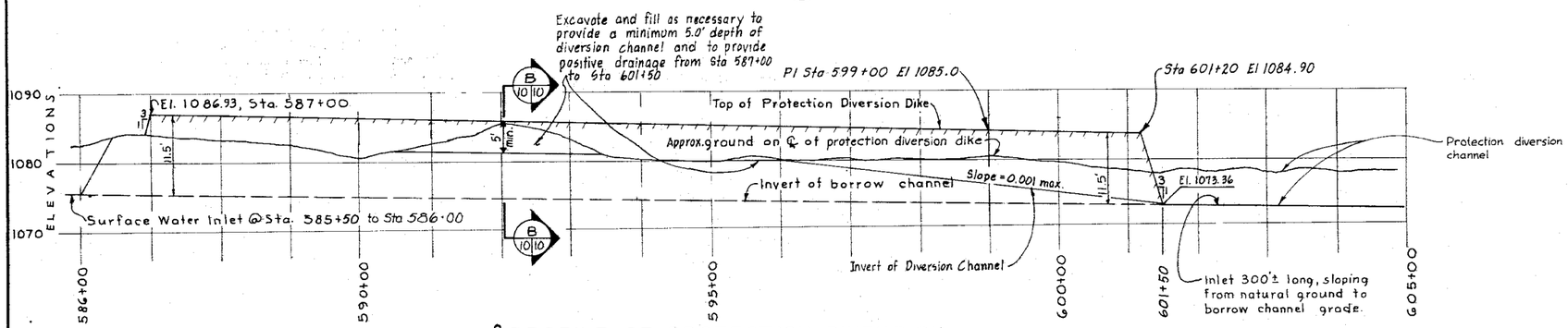
SCS-ENG-313-B Rev. 7-69



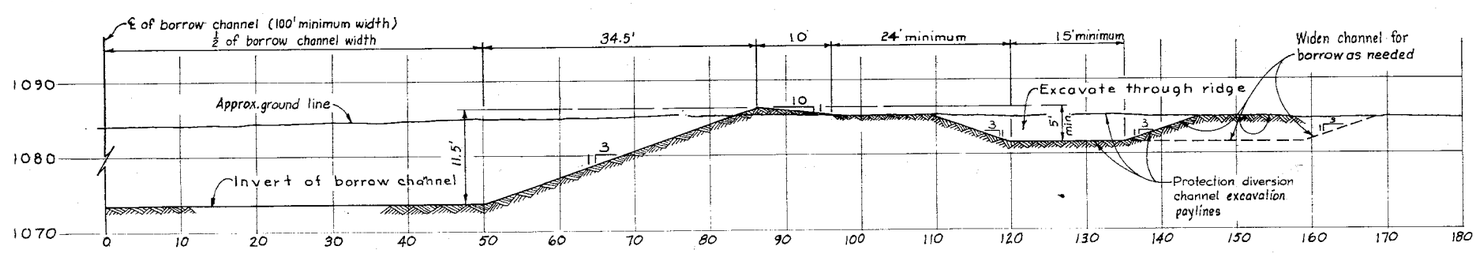
PROFILE OF PROTECTION DIVERSION
(Stations are on ℄ Dike No. 1)



SECTION A 10|10



℄ PROFILE OF PROTECTION DIVERSION
(Stations are on ℄ Dike No. 1)



SECTION B 10|10

Note:
1. For plans of protection diversions see sheets 2 and 3.

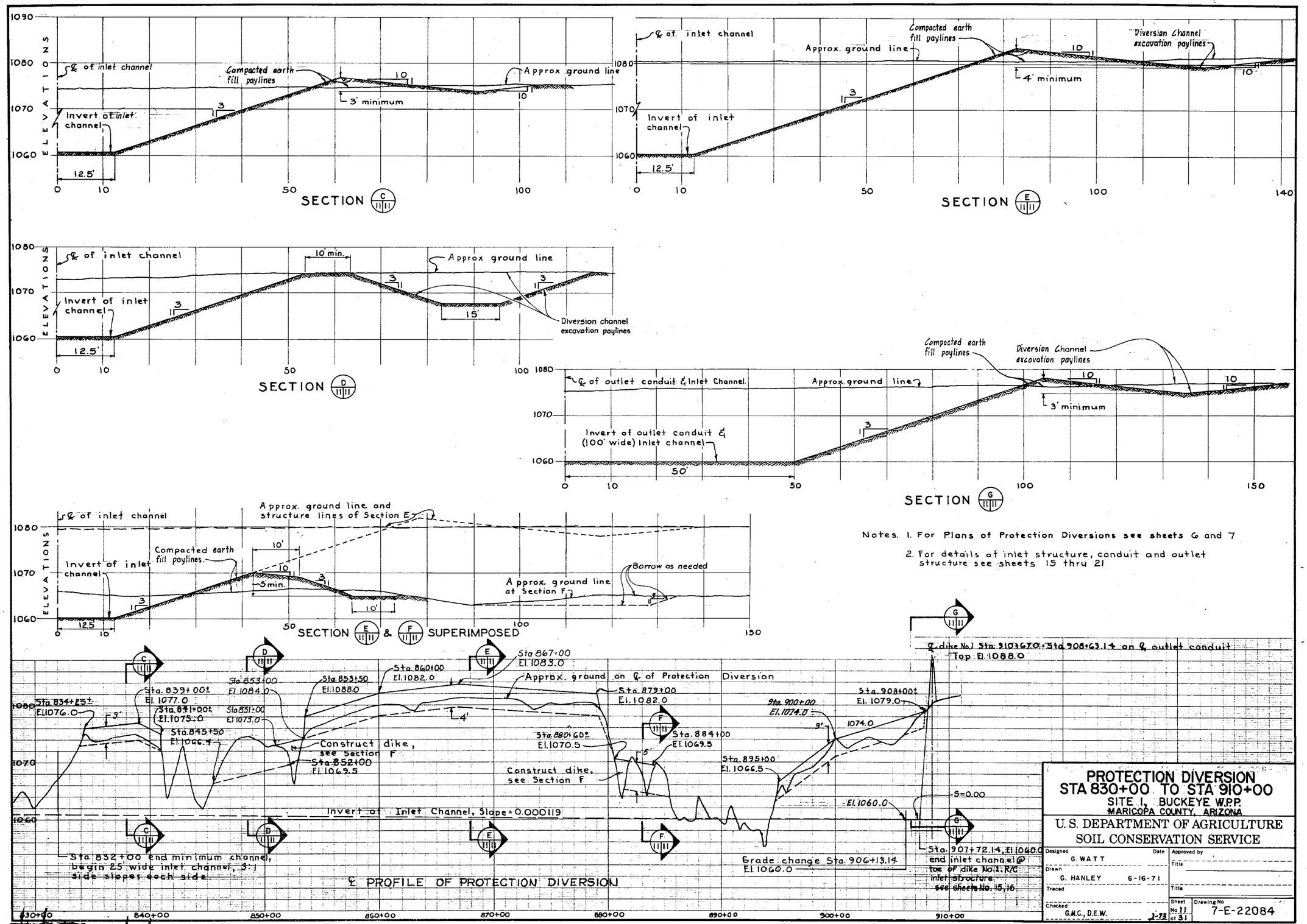
PROTECTION DIVERSION
STA 562+00 TO STA605+00

SITE 1, BUCKEYE W.P.P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed G. WATT		Approved by	
Drawn G. HANLEY	6-15-71	Title	
Traced		Title	
Checked G.M.C., D.E.W.	1-73	Sheet No. 10 of 31	Drawing No. 7-E-22084

SCS-313B (APRIL 1963)



Notes. 1. For Plans of Protection Diversions see sheets 6 and 7

2. For details of inlet structure, conduit and outlet structure see sheets 15 thru 21

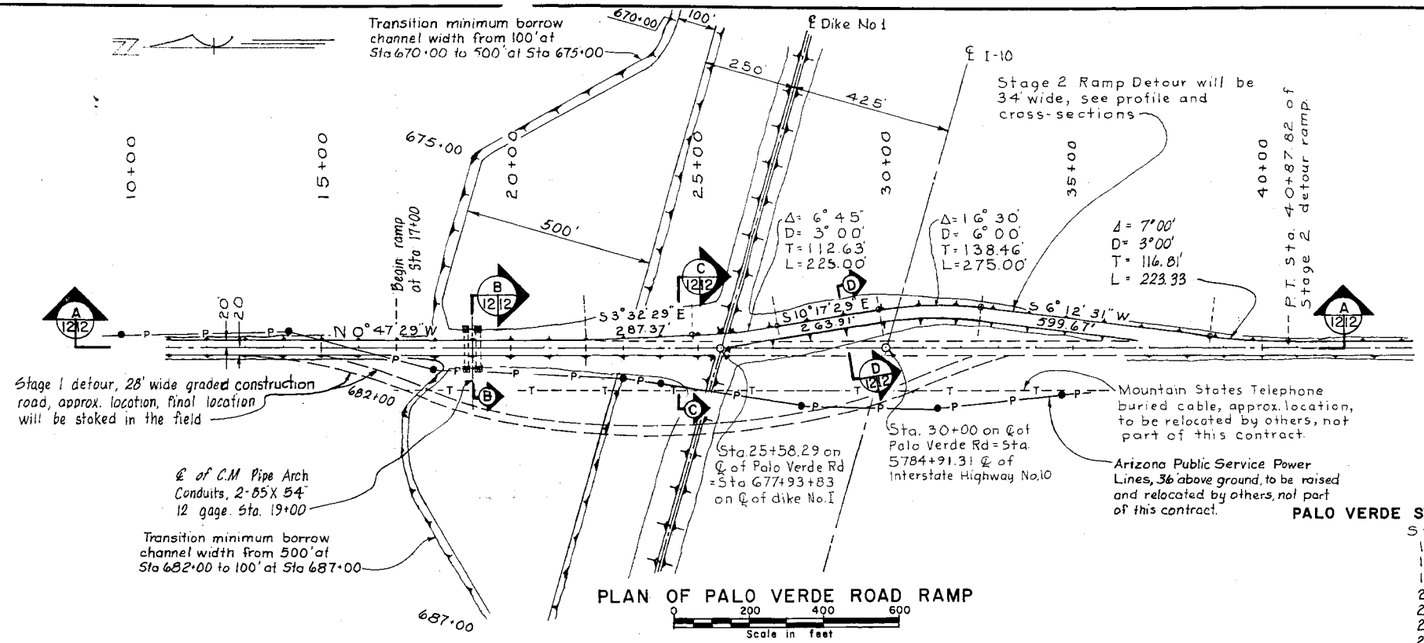
PROTECTION DIVERSION
STA 830+00 TO STA 910+00

SITE 1, BUCKEYE W.P.P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT	Date	Approved by	Title
Drawn G. HANLEY	6-16-71		
Traced			Title
Checked G.M.C., D.E.W.		Sheet No. 11 of 31	Drawing No. 7-E-22084

U.S. GOVERNMENT PRINTING OFFICE: 1961 O - 599266



PLAN OF PALO VERDE ROAD RAMP

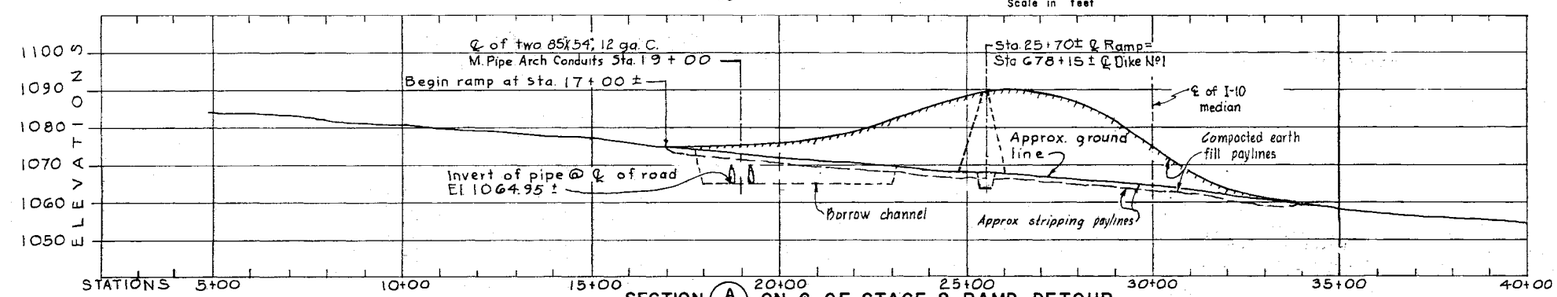
Scale in feet: 0, 200, 400, 600

Note:
Stage 1 detour to be used during construction of Stage 2 detour under this contract.

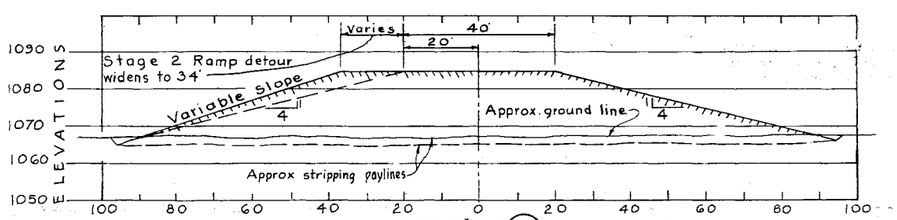
Stage 2 detour is the completed Palo Verde Road ramp for this project.

PALO VERDE STAGE 2 RAMP DETOUR VERTICAL CURVES

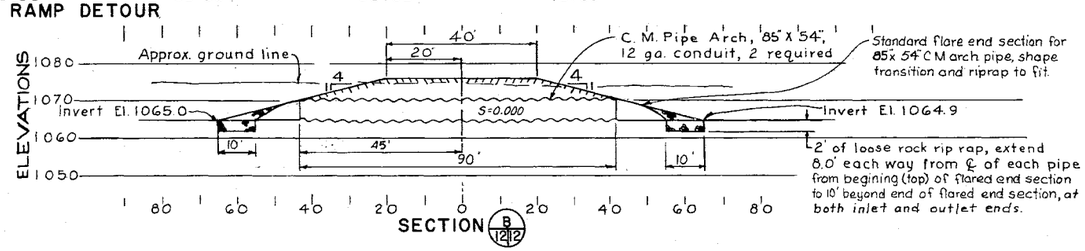
Stations	Elevations
17+00	1075.00
18+00	1075.30
19+00	1075.70
20+00	1076.00
21+00	1076.69
22+00	1078.76
23+00	1082.21
24+00	1085.89
25+00	1088.64
25+60	1089.83
26+00	1090.31
27+00	1089.98
28+00	1087.37
29+00	1082.49
30+00	1075.32
31+00	1068.27
32+00	1063.72
33+00	1061.67
34+00	1060.00



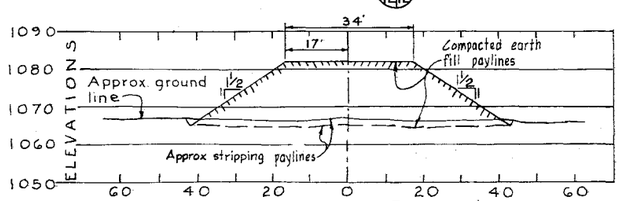
SECTION A/12|2 ON ℄ OF STAGE 2 RAMP DETOUR



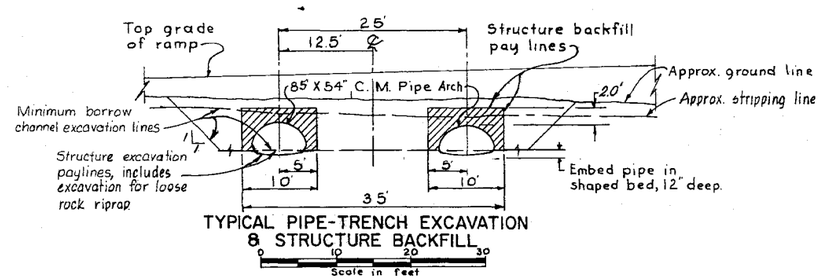
SECTION C/12|2



SECTION B/12|2



SECTION D/12|2



TYPICAL PIPE-TRENCH EXCAVATION & STRUCTURE BACKFILL

Scale in feet: 0, 10, 20, 30

PALO VERDE ROAD RAMP DETAILS

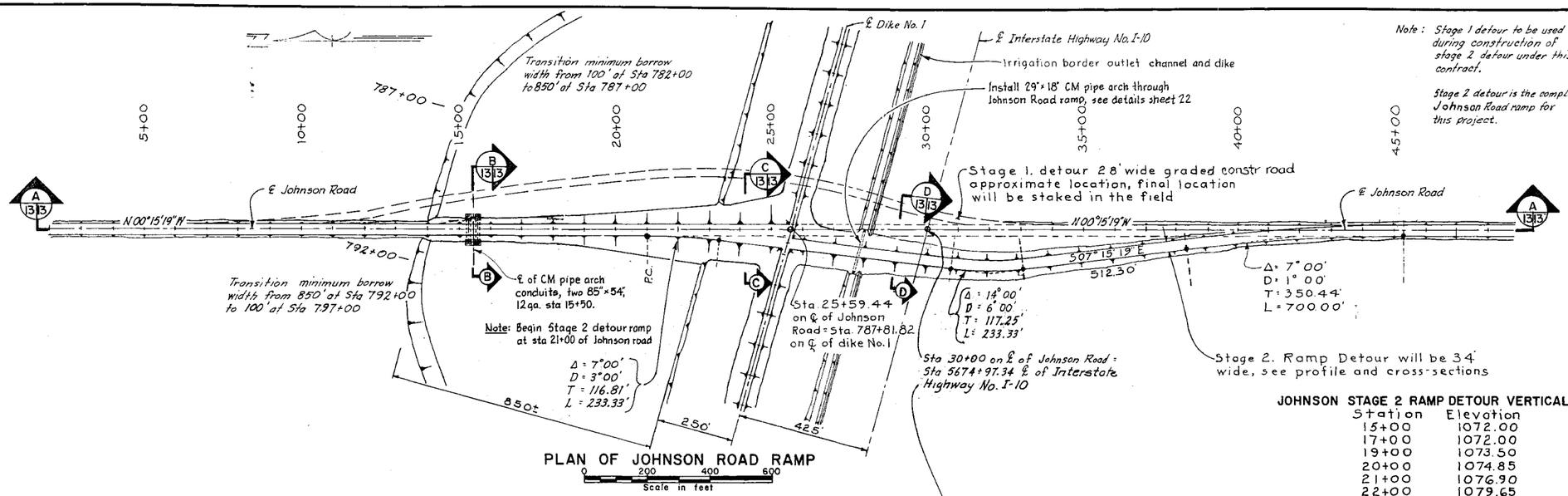
SITE I

BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT	Date	Approved by	
Drawn G. HANLEY	2-8-72	Title	
Traced		Title	
Checked G.M.C.	1-73	Sheet No. 12 of 31	Drawing No 7-E-22084

SCS-313B (APRIL 1963)

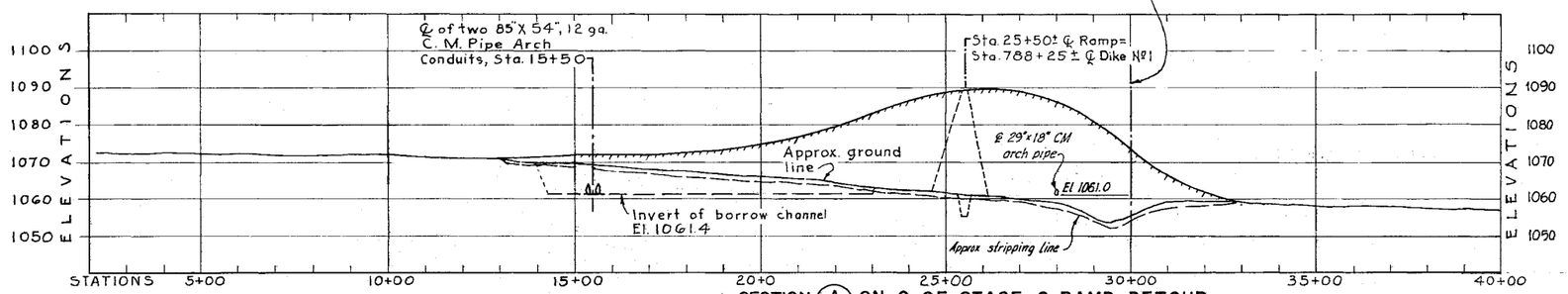


PLAN OF JOHNSON ROAD RAMP

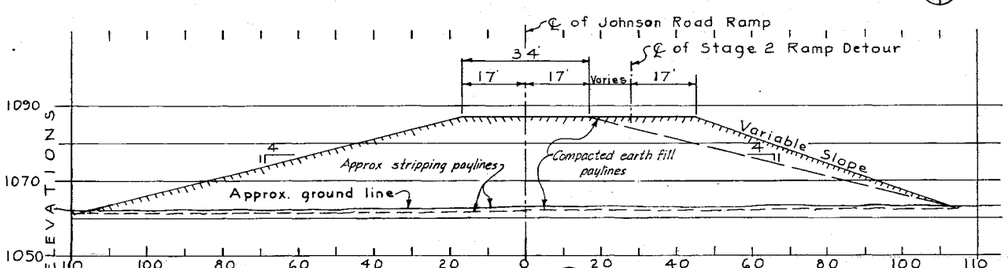
0 200 400 600
Scale in feet

JOHNSON STAGE 2 RAMP DETOUR VERTICAL CURVES

Station	Elevation
15+00	1072.00
17+00	1072.00
19+00	1073.50
20+00	1074.85
21+00	1076.90
22+00	1079.65
23+00	1083.10
24+00	1086.41
25+00	1088.74
25+50	1089.53
26+00	1089.94
27+00	1089.10
28+00	1086.07
29+00	1080.86
30+00	1073.45
31+00	1066.20
32+00	1061.45
33+00	1059.20



SECTION (A/13/3) ON ℄ OF STAGE 2 RAMP DETOUR



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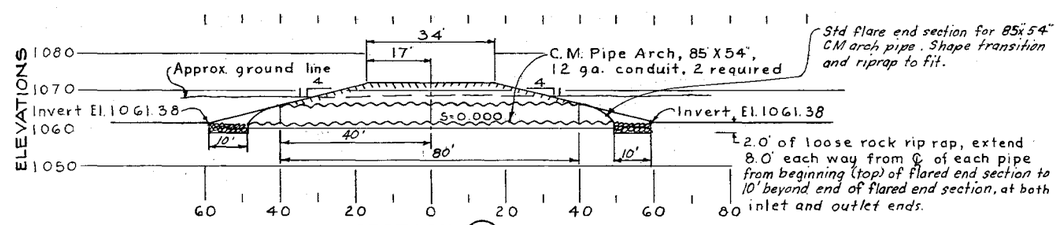

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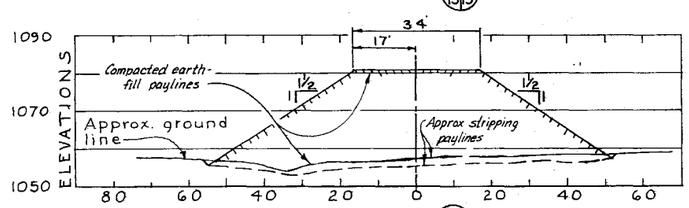

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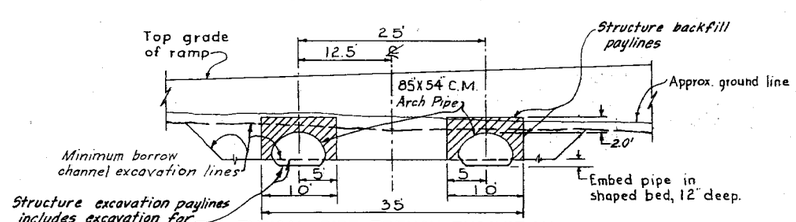


TYPICAL PIPE-TRENCH EXCAVATION & STRUCTURE BACKFILL

0 10 20 30
Scale in feet

JOHNSON ROAD RAMP DETAILS

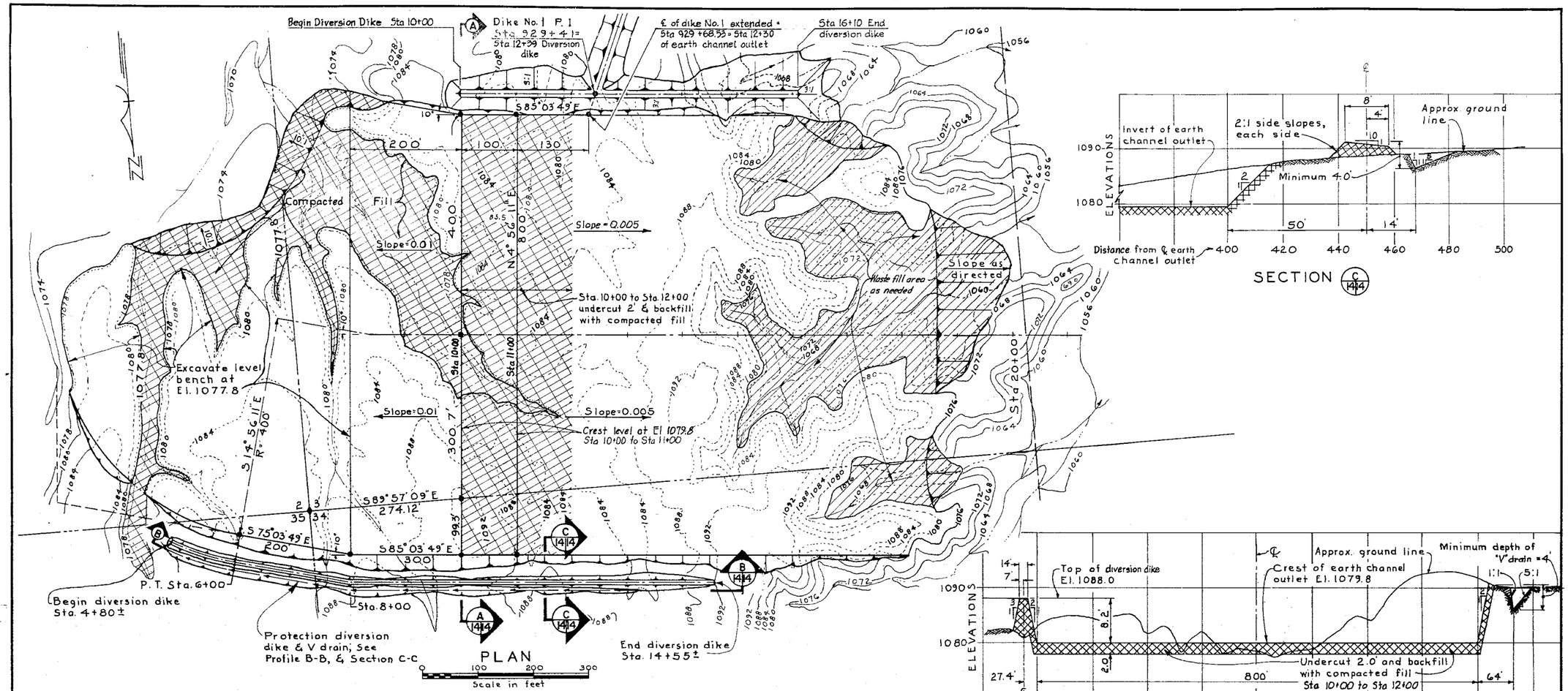
SITE I

BUCKEYE W. P. P.

MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT	Date	Approved by	
Drawn G. HANLEY	2-8-72	Title	
Traced		Title	
Checked G.M.L., D.E.W.	1-73	Sheet No. 13 of 31	Drawing No. 7-E-22084



EARTH CHANNEL OUTLET DETAILS

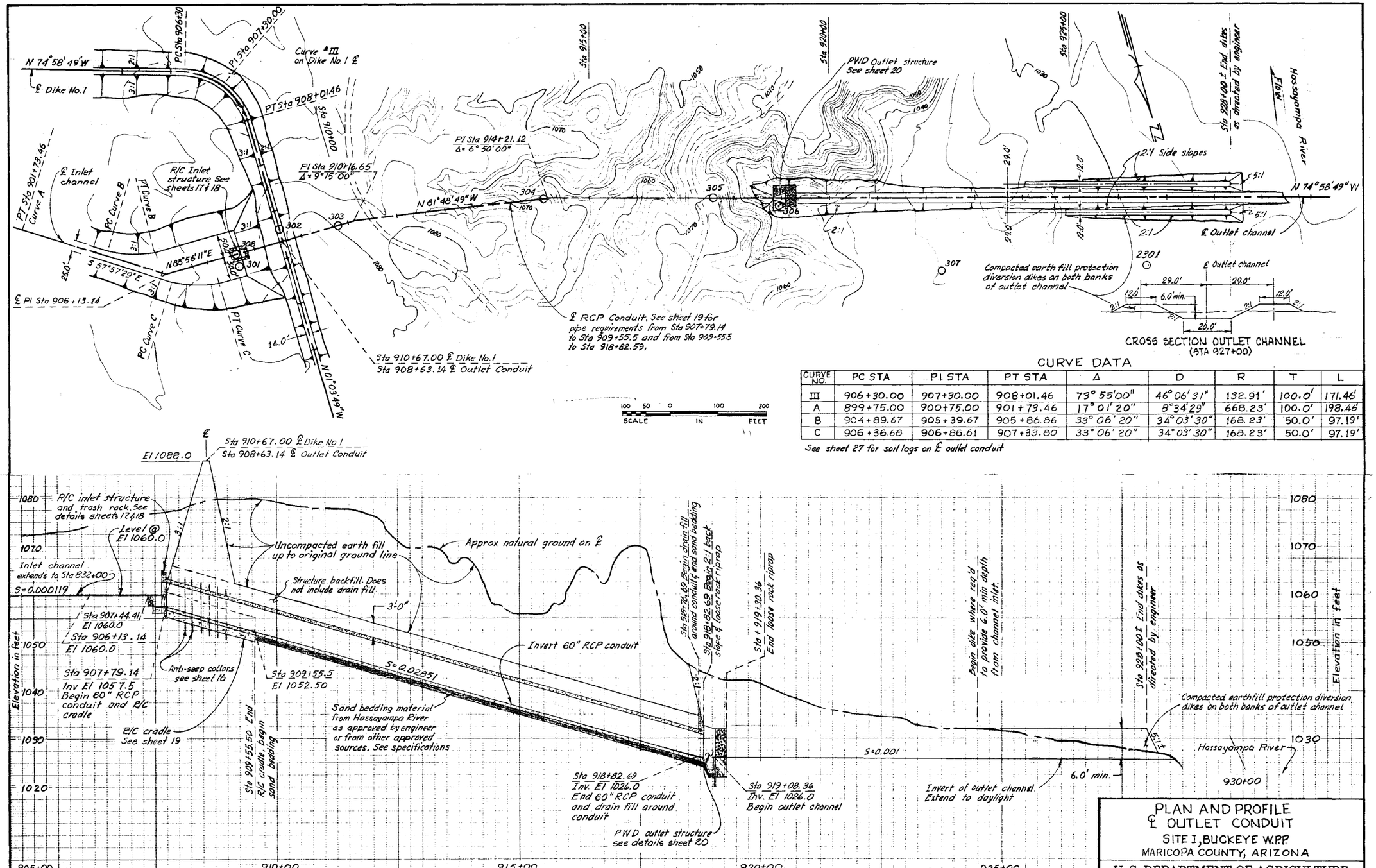
SITE 1

BUCKEYE W.P.P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT	Date	Approved by	
Drawn G. HANLEY	3-11-71	Title	
Traced		Title	
Checked G.M.C., D.E.W.	1-78	Sheet No. 14 of 31	Drawing No. 7-E-22084

SCS-313B (APRIL 1963)



CURVE DATA

CURVE NO.	PC STA	PI STA	PT STA	Δ	D	R	T	L
III	906+30.00	907+30.00	908+01.46	73° 55'00"	46° 06' 31"	132.91'	100.0'	171.46'
A	899+75.00	900+75.00	901+73.46	17° 01' 20"	8° 34' 29"	668.23'	100.0'	198.46'
B	904+89.67	905+39.67	905+86.86	33° 06' 20"	34° 03' 30"	168.23'	50.0'	97.19'
C	906+36.68	906+86.61	907+33.80	33° 06' 20"	34° 03' 30"	168.23'	50.0'	97.19'

See sheet 27 for soil logs on ℄ outlet conduit

ITEM	SEE SHEET
INLET STRUCTURE LAYOUT	17 & 18
R/C CONDUIT	19
OUTLET STRUCTURE LAYOUT	20
CROSS SECTIONS ON CONDUIT OUTLET	21
SOIL LOGS	22

PLAN AND PROFILE ℄ OUTLET CONDUIT

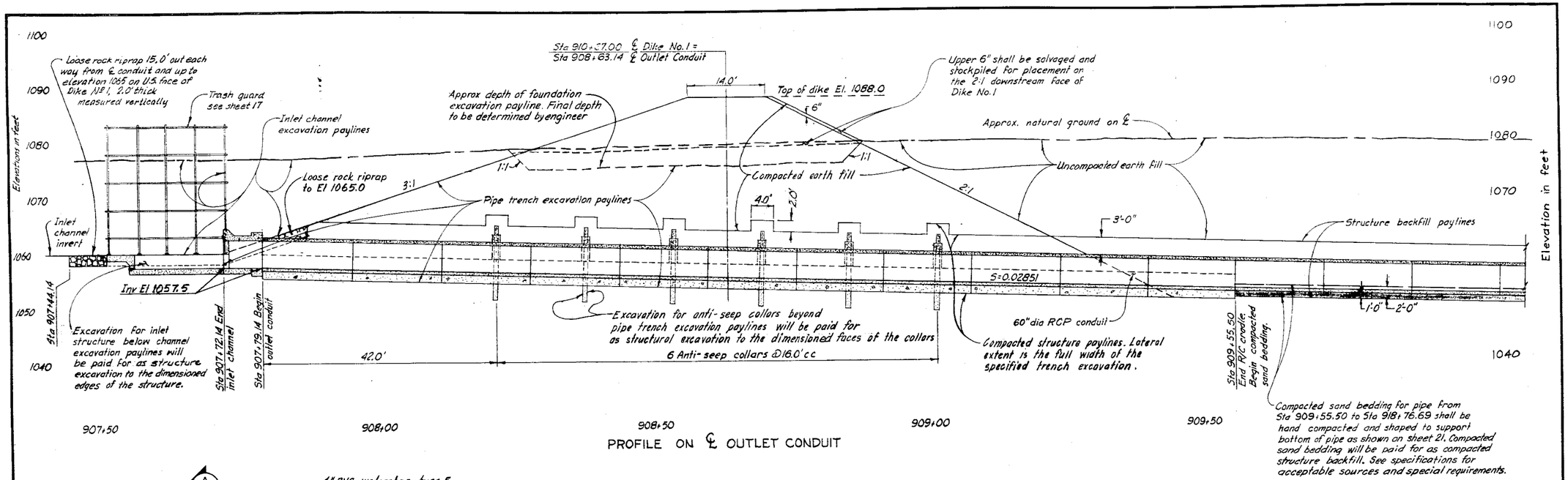
SITE I, BUCKEYE W.P.P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

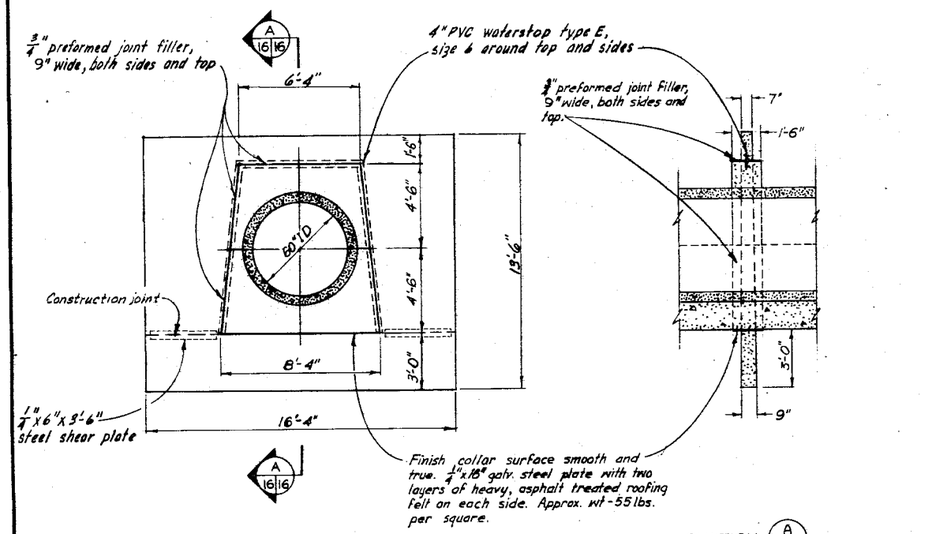
		Date	
Designed	G.M. Cunningham	6-71	Approved by ____ Title ____
Drawn	D.T. Briones, Jr	6-71	
Traced	J.W. McClintock	6-71	Title ____
Checked	G.M.C. D.E.W.	1-72	Sheet No 15 of 31 — Drawing No. 7-E-22084

USDA-SCS-PORTLAND, OREGON 1972

SCS-ENG-317 Rev. 5-69



PROFILE ON ℄ OUTLET CONDUIT

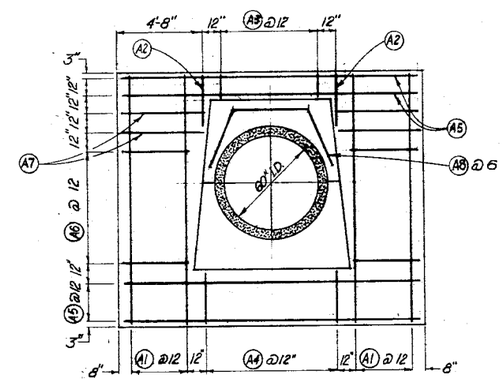


ELEVATION

SECTION (A 16 16)

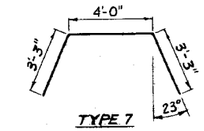
ANTI-SEEP COLLAR DETAILS

SCALE 0 5 10 IN FEET



ELEVATION

STEEL SCHEDULE - PER COLLAR						
LOCATION	MARK	SIZE	QUAN	LENGTH	TYPE	TOTAL LENGTH
Anti-seep collar	A1	4	8	13'-2"	St	105'-4"
	A2	4	2	2'-10"	St	5'-8"
	A3	4	6	1'-2"	St	7'-0"
	A4	4	8	2'-7"	St	20'-8"
	A5	4	5	16'-0"	St	80'-0"
	A6	4	14	3'-6"	St	49'-0"
	A7	4	4	4'-6"	St	18'-0"
	A8	4	3	10'-6"	T	31'-6"



St

BAR TYPES

*ANTI-SEEP COLLAR QUANTITIES	
CONCRETE	30.2 cu. yds.
STEEL	1273.9 lbs

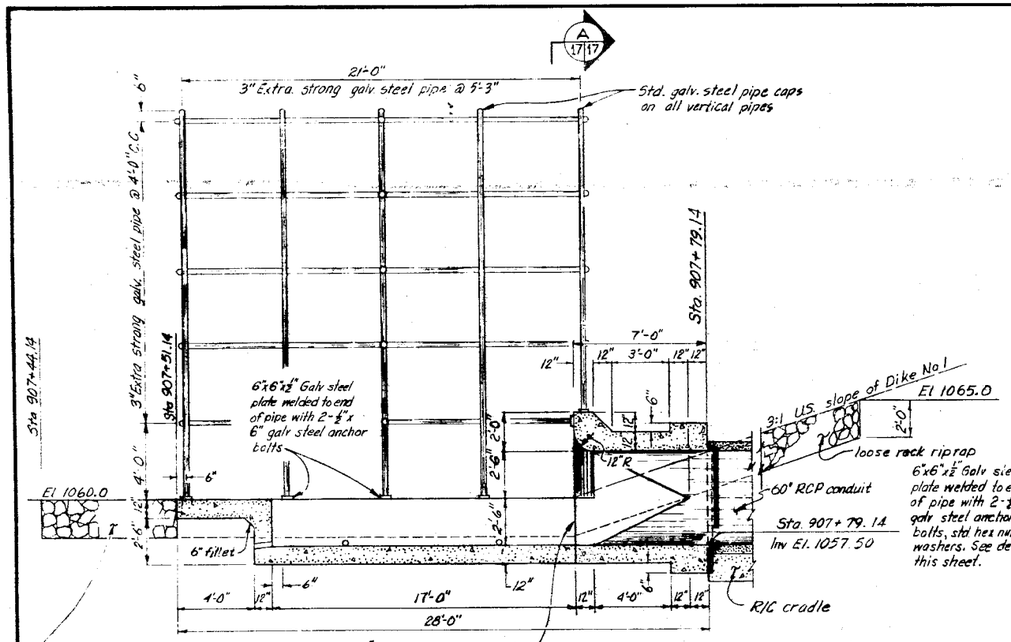
* Total for all six collars

ANTI-SEEP COLLAR LAYOUT AND DETAILS
SITE 1 BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

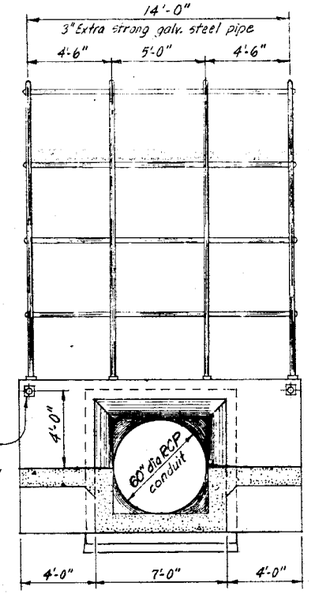
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G.M. Cunningham	Date 9-71	Approved by	
Drawn S. A. Brown	9-71	Title	
Traced		Title	
Checked G.M.C., D.E.W.	1-72	Sheet No 16 of 31	Drawing No T-E-22084

SCS-ENG-313-B Rev. 7-69

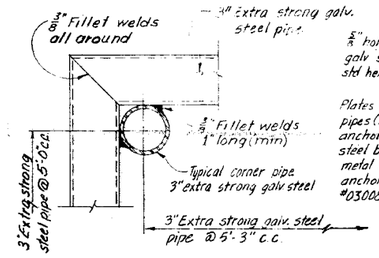


SECTIONAL ELEVATION



SECTION A 17/17

Note:
Plates for horizontal pipes (2 req'd) to be anchored with 1/2"x6" galv steel bolts and threaded metal drop-in screw anchors, Omark #03008 or equal.



DETAIL A 17/17

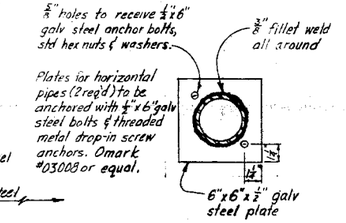
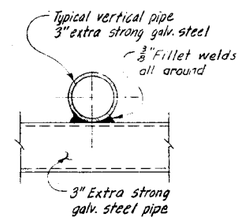
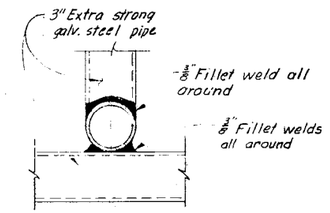


PLATE DETAIL

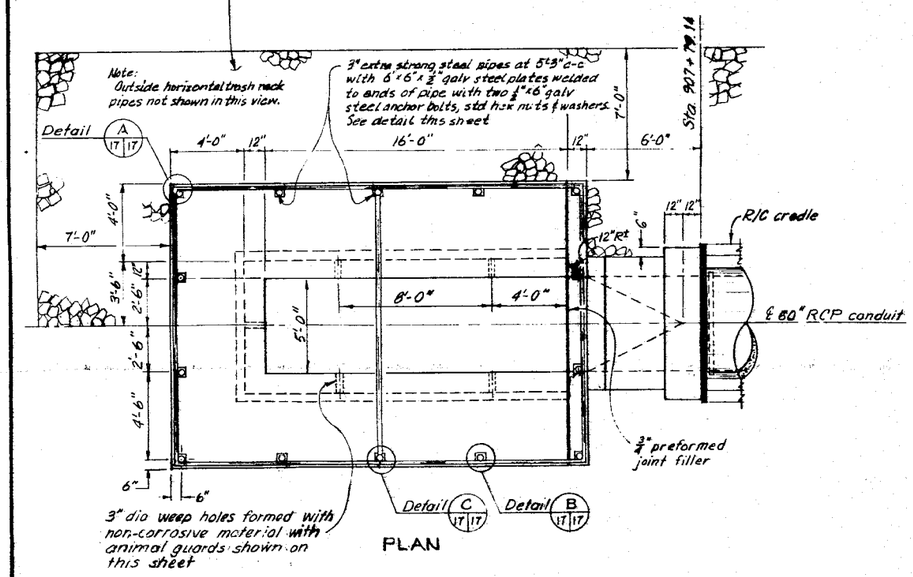


DETAIL B 17/17

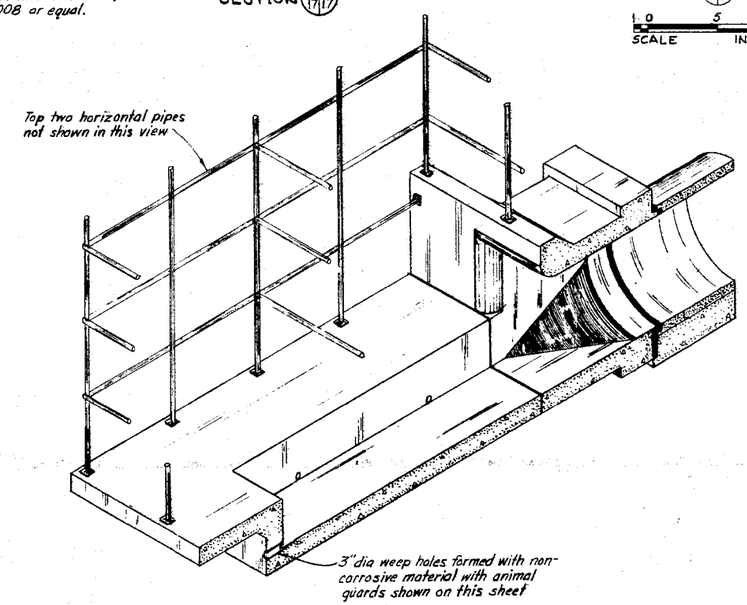


DETAIL C 17/17

SCALE 1 0 5 10 15 IN. FEET

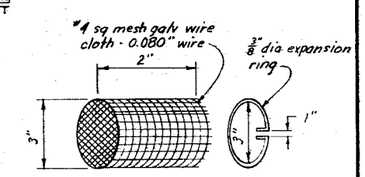


PLAN



HALF-ISOMETRIC

SCALE 2 1 0 5 10 FEET



3" ANIMAL GUARD DETAIL
(NOT TO SCALE)
(Set guards in pipe 2" from exposed end of pipe, 5 req'd)

Note:
All metal shall be galvanized steel, except that the extra strong steel pipe shall be welded and painted as required in specification B2.

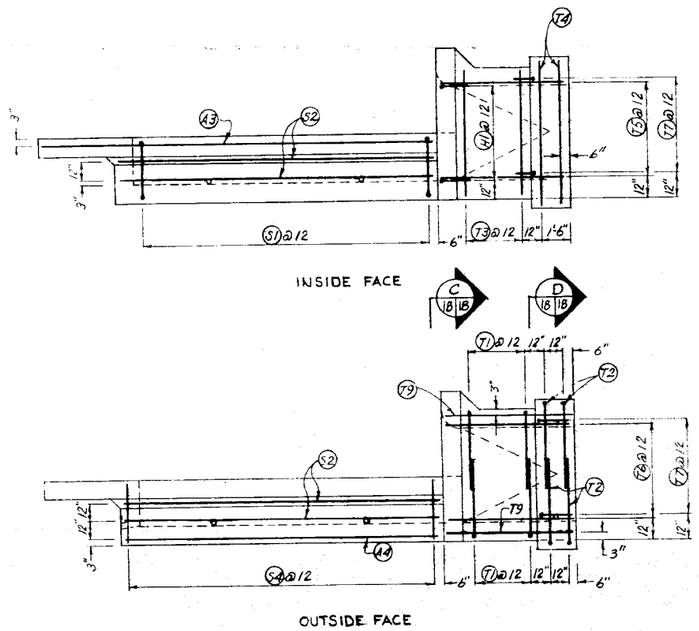
ITEM	SEE SHEET
R/C CRADLE & PIPE JOINT	19
REINFORCING STEEL	18

INLET STRUCTURE LAYOUT
SITE I
BUCKEYE W.P.P.
MARICOPA COUNTY, ARIZONA

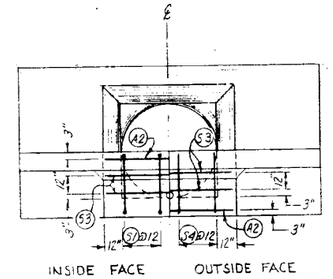
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G.M. CUNNINGHAM	Date 6-71	Approved by	
Drawn D.T. BRIONES, JR.	6-71	Title	
Traced		Title	
Checked G.M.C.	1-73	Sheet No 17 of 31	Drawing No T-E-22084

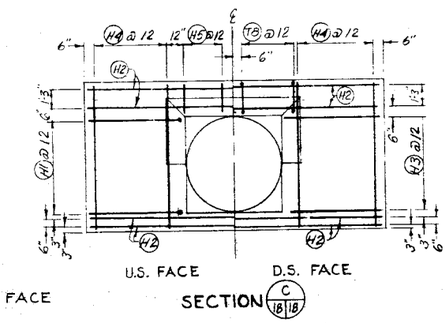
SCS-ENG-313-B Rev. 7-69



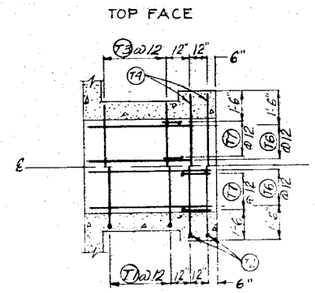
SIDEWALL ELEVATION



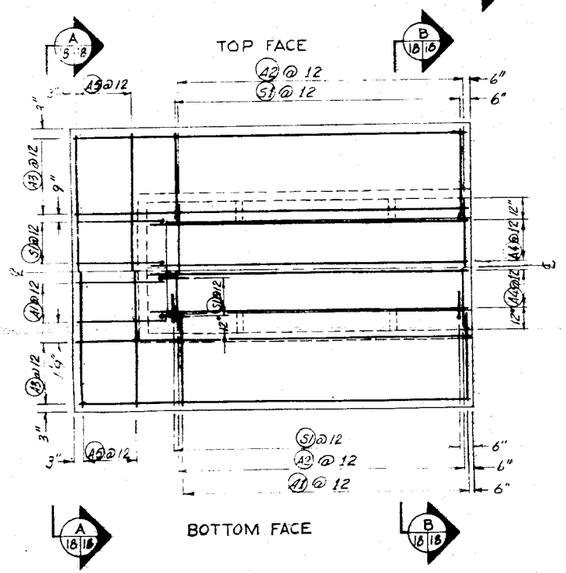
SECTION A 18 18



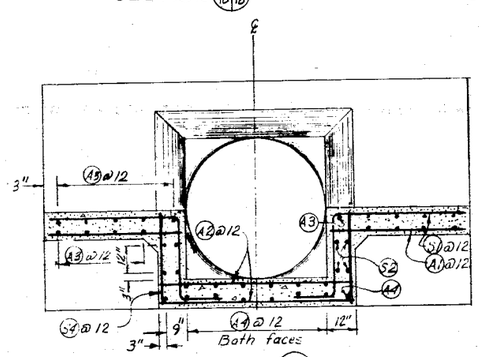
SECTION C 18 18



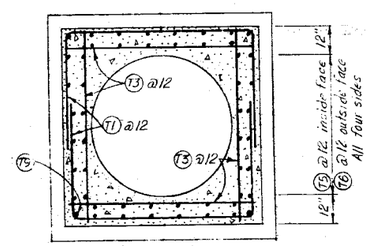
SECTION E 18 18



APRON PLAN



SECTION B 18 18

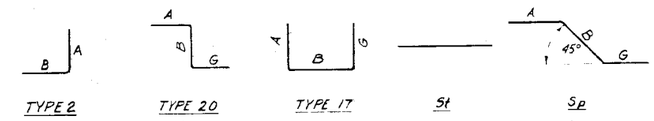


SECTIONAL ELEVATION

SECTION D 18 18

STEEL SCHEDULE

Location	Mark	Size	Number	Length	Type	A	B	C	Total Length
Apron	A1	5	38	4'-9"	st				[illegible]
"	A2	5	33	6'-8"	st				220'-0"
"	A3	5	[illegible]	20'-8"	st				
"	A4	5	14	6'-8"	st				233'-2"
"	A5	5	9	15'-8"	st				141'-0"
Headwall	H1	5	12	6'-9"	2	5'-2"	1'-7"		81'-0"
"	H2	5	8	15'-8"	st				125'-4"
"	H3	5	12	5'-2"	st				62'-4"
"	H4	5	20	7'-4"	st				153'-4"
"	H5	5	6	1'-3"	st				[illegible]
Sidewall	S1	5	38	9'-4"	20	4'-1"	3'-"	1'-7"	[illegible]
"	S2	5	8	16'-8"	st				133'-4"
"	S3	5	4	7'-8"	st				30'-8"
"	S4	5	20	3'-2"	st				126'-[illegible]
Transition Bar	T1	5	[illegible]	12'-10"	17	4'-7"	6'-8"	4'-1"	118'-8"
"	T2	5	4	16'-10"	17	4'-7"	7'-8	4'-7"	67'-4"
"	T3	5	16	6'-8"	st				106'-8"
"	T4	5	16	7'-8"	st				122'-8"
"	T5	5	24	6'-6"	st				156'-0"
"	T6	5	24	6'-8"	st				160'-0"
"	T7	5	24	4'-11"	20	1'-7"	1'-8"	1'-8"	118'-0"
"	T8	5	6	4'-7"	sp	0'-8"	2'-4"	1'-7"	27'-6"
"	T9	5	4	6'-8"	st				26'-6"



BAR TYPES

TABLE OF QUANTITIES*	
Concrete	27.1 c.y.
Reinf steel	3222.0 lbs

*Total for inlet structure only

ITEM	SEE SHEET
INLET STRUCTURE LAYOUT	17

SCALE IN FEET

INLET STRUCTURE DETAILS

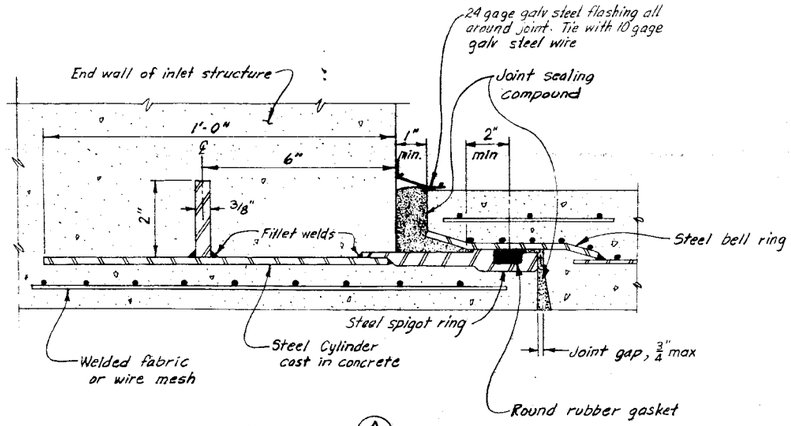
SITE I

BUCKEYE W.P.P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

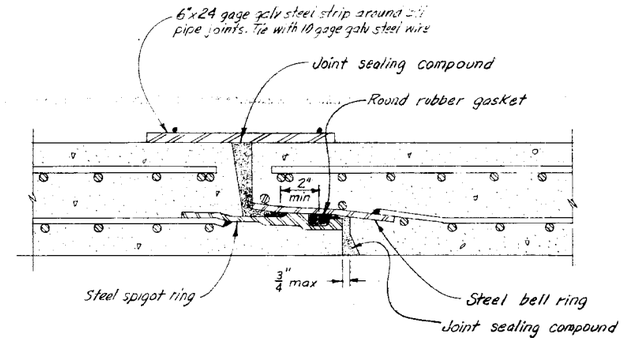
Designed G.M. Cunningham 6-71
Drawn D.T. BRIONES, JR. 6-71
Traced
Checked G.M.C. 1-73
Approved by
Title
Sheet No. 18 of 31
Drawing No. 7-E-22084

SCS-ENG-313-B Rev. 7-69



DETAIL (A 19|19)

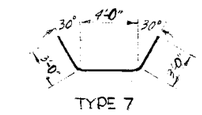
(NOT TO SCALE)



DETAIL (B 19|19)

(NOT TO SCALE)

STEEL SCHEDULE					
MARK	SIZE	QUANTITY	LENGTH	TYPE	TOTAL LENGTH
C1	4	154	10-0	7	1540
C2	6	66	15-8	St	1032
C3	6	22	9-1	St	200

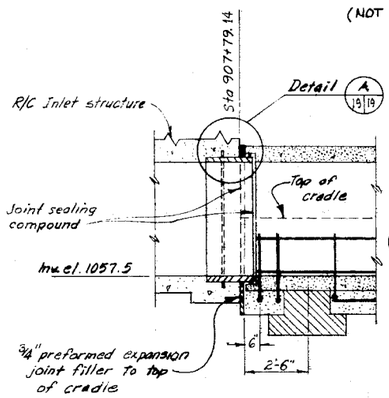


St

TYPE 7

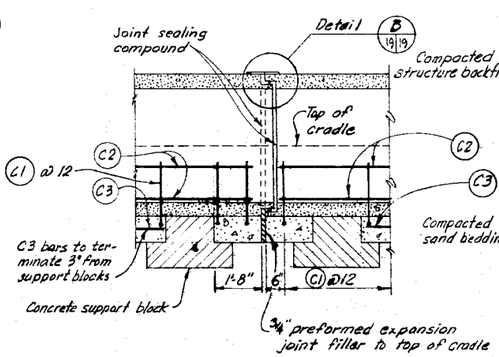
BAR TYPES

CRADLE QUANTITIES	
Concrete	138.0 cu yds
Steel	2880.0 lbs.



DETAIL OF SPIGOT WALL FITTING AT INLET

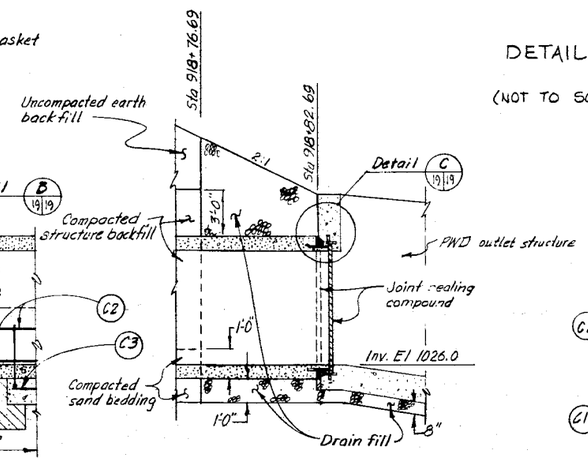
(NOT TO SCALE)



DETAIL OF PIPE & CRADLE JOINTS

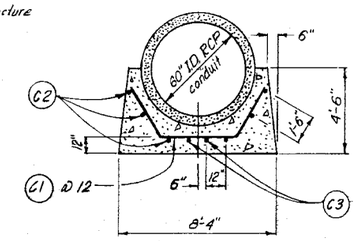
(16'-0" O.C.)

(NOT TO SCALE)



DETAIL OF SPIGOT WALL FITTING AT PWD OUTLET STRUCTURE

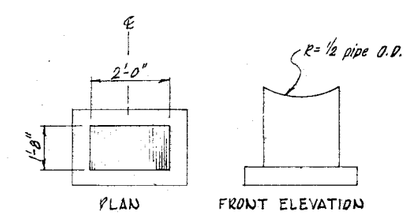
(NOT TO SCALE)



DETAIL OF CRADLE

STA 907+79.14 to 909+55.50

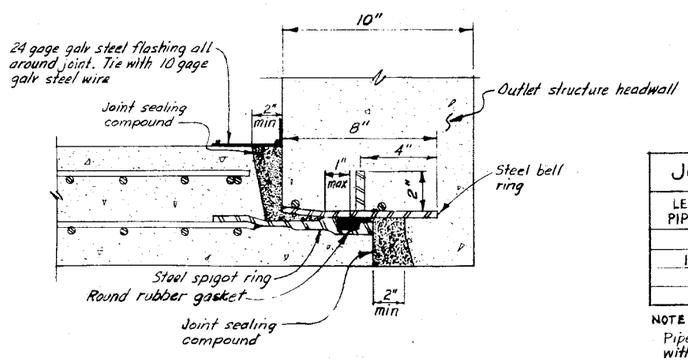
(NOT TO SCALE)



SUGGESTED CONCRETE SUPPORT BLOCKS

(NOT TO SCALE)

Note: Sufficient blocks shall be provided to support the pipe to the required line and grade. The contractor shall determine the number and size of blocks required. Wedges may be used as an alternate. Two blocks per 16'-0' section have been assumed in determining the cradle reinforcing schedule. If other sizes or numbers are used the schedule must be revised accordingly



DETAIL (C 19|19)

(NOT TO SCALE)

JOINT REQUIREMENTS			
LENGTH OF PIPE SECTION	MIN. WATERTIGHT JOINT EXTENSIBILITY	MIN. JOINT LIMITING ANGLE	
FEET	INCHES	RADIANS	DEGREES
16-0	2.0		0°45'

NOTE:

Pipe bends at PI stations may be made with deflected straight pipe, beveled end pipe or precast elbows meeting the internal and external strength and joint requirements.

STATION	STRENGTH REQUIREMENTS				
		INTERNAL LOAD	EXTERNAL LOAD		
			Minimum 3-edge bearing strength in pounds per lineal foot of pipe		
			Applicable Standard Specification		
			AWWA C-301	AWWA C-300	AWWA C-302
	Inside Diameter of pipe	Minimum Hydrostatic Pressure	Load to produce 0.001 inch crack one foot long	Load to produce 0.01 inch crack one foot long	
	INCHES	FEET			
907+79.14 to 909+55.5	60	50-0	8,000	11,000	
909+55.5 to 916+80.0	60	50-0	16,000	21,000	21,000
916+80.0 to 918+82.69	60	50-0	22,000	29,000	29,000

R/C pipe from sta 907+79.14 to 909+55.50 shall be AWWA C-300 or C-301.
R/C pipe from sta 909+55.50 to 918+52.69 shall be AWWA C-300, C-301 or C-302.

OUTLET CONDUIT DETAILS

SITE I

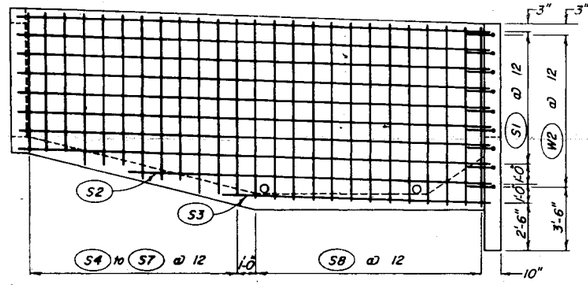
BUCKEYE W.P.P.

MARICOPA COUNTY, ARIZONA

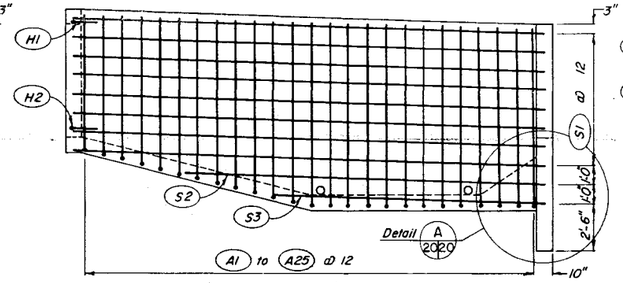
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G.M. Cunningham	Date 6-71	Approved by	
Drawn J. Cooke	7-71	Title	
Traced		Title	
Checked G.M.C. R.E.W.	1.73	Sheet No. 19 of 31	Drawing No. 7-E-22084

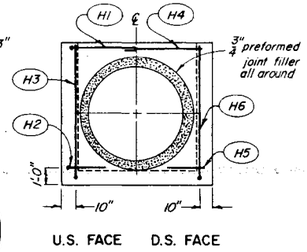
SCS-ENG-313-B Rev. 7-69



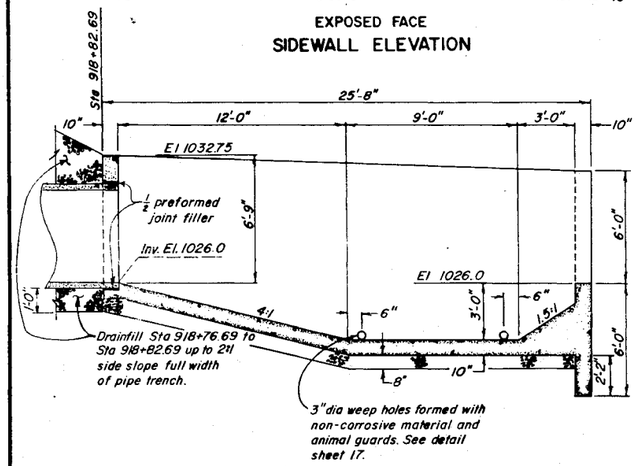
EXPOSED FACE
SIDEWALL ELEVATION



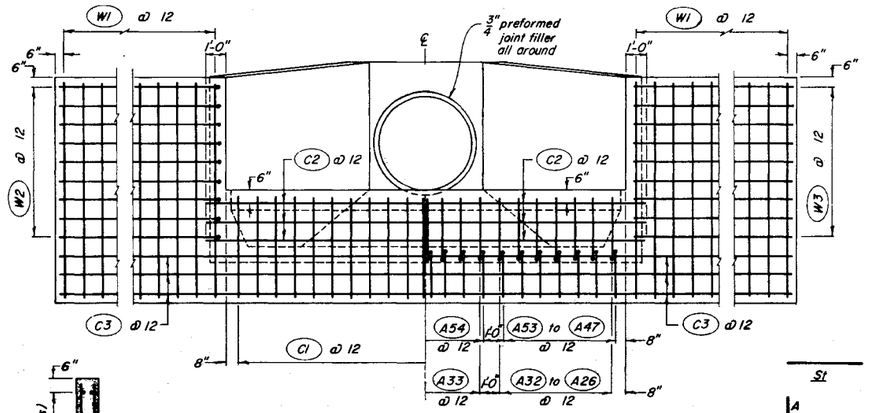
UNEXPOSED FACE
SIDEWALL ELEVATION



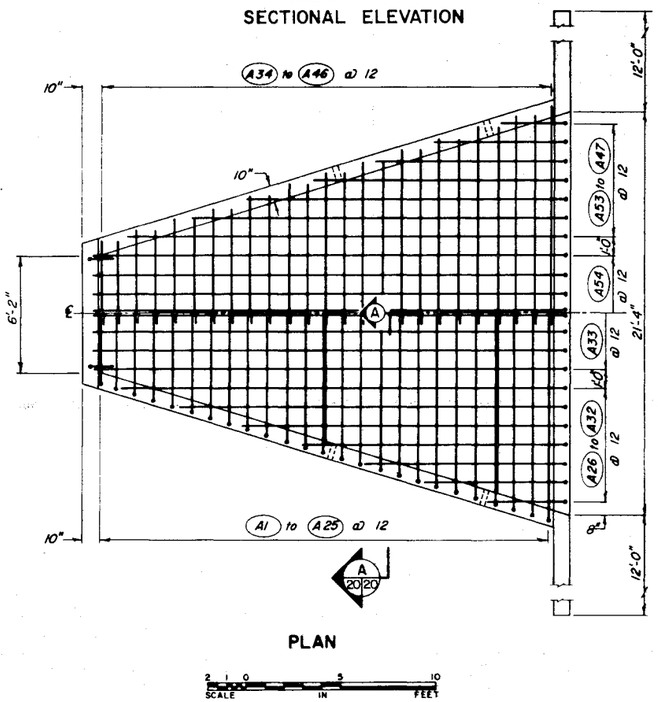
U.S. FACE D.S. FACE
HEADWALL ELEVATION



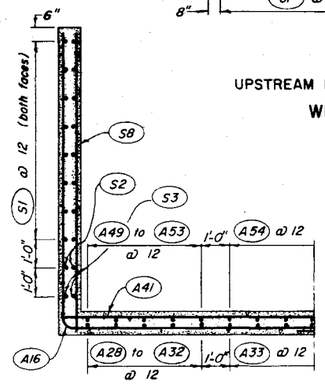
SECTIONAL ELEVATION



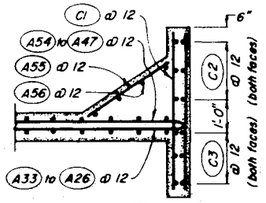
UPSTREAM FACE DOWNSTREAM FACE
WINGWALL ELEVATION



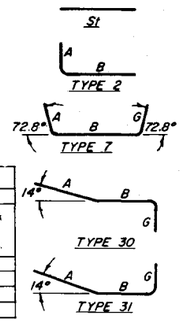
PLAN



SECTION A 2020

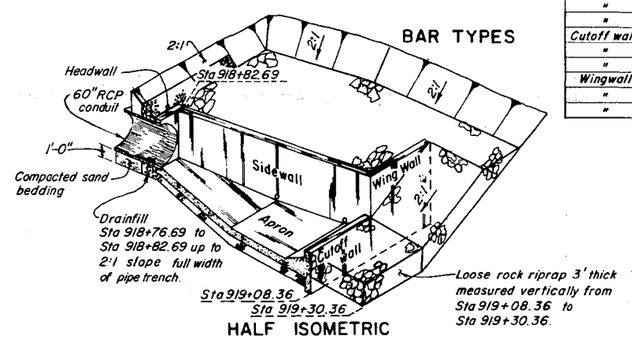


DETAIL A 2020



BAR TYPES

TABLE OF QUANTITIES				
	I.D. of pipe in.	Type of pipe		
		ASTM 76 & AW WA C 302 Cu. Yds.	AW WA C 300 & C 301 Cu. Yds.	Steel & C.M.P. Cu. Yds.
Concrete	60	40.73	40.73	
Reinf Steel		3490 lbs		
Rock Riprap		211 cu yds		



HALF ISOMETRIC

STEEL SCHEDULE

Location	Mark	Size	Quan.	Length	Type	A	B	G	Total Length
Apron	A1	4	2	11'-3"	2	7'-0"	4'-3"		22'-6"
"	A2	4	2	11'-9"	2	7'-3"	4'-6"		23'-6"
"	A3	4	2	12'-3"	2	7'-6"	4'-9"		24'-6"
"	A4	4	2	12'-9"	2	7'-9"	5'-0"		25'-6"
"	A5	4	2	13'-6"	2	8'-0"	5'-6"		27'-0"
"	A6	4	2	14'-0"	2	8'-3"	5'-9"		28'-0"
"	A7	4	2	14'-6"	2	8'-6"	6'-0"		29'-0"
"	A8	4	2	15'-0"	2	8'-9"	6'-3"		30'-0"
"	A9	4	2	15'-6"	2	9'-0"	6'-6"		31'-0"
"	A10	4	2	16'-3"	2	9'-3"	7'-0"		32'-6"
"	A11	4	2	16'-9"	2	9'-6"	7'-3"		33'-6"
"	A12	4	2	17'-3"	2	9'-9"	7'-6"		34'-6"
"	A13	4	2	17'-6"	2	9'-9"	7'-9"		35'-0"
"	A14	4	2	18'-0"	2	9'-9"	8'-3"		36'-0"
"	A15	4	2	18'-3"	2	9'-9"	8'-6"		36'-6"
"	A16	4	2	18'-6"	2	9'-9"	8'-9"		37'-0"
"	A17	4	2	18'-6"	2	9'-6"	9'-0"		37'-0"
"	A18	4	2	18'-9"	2	9'-6"	9'-3"		37'-6"
"	A19	4	2	19'-3"	2	9'-6"	9'-9"		38'-6"
"	A20	4	2	19'-6"	2	9'-6"	10'-0"		39'-0"
"	A21	4	2	19'-9"	2	9'-6"	10'-3"		39'-6"
"	A22	4	2	20'-0"	2	9'-6"	10'-6"		40'-0"
"	A23	4	2	20'-6"	2	9'-6"	11'-0"		41'-0"
"	A24	4	2	20'-9"	2	9'-6"	11'-3"		41'-6"
"	A25	4	2	21'-0"	2	9'-6"	11'-6"		42'-0"
"	A26	4	2	7'-6"	2	3'-3"	4'-3"		15'-0"
"	A27	4	2	10'-9"	2	3'-3"	7'-6"		21'-6"
"	A28	4	2	13'-9"	2	3'-3"	10'-6"		27'-6"
"	A29	4	2	17'-3"	31	1'-6"	12'-6"	3'-3"	34'-6"
"	A30	4	2	20'-3"	31	4'-6"	12'-6"	3'-3"	40'-6"
"	A31	4	2	23'-6"	31	7'-9"	12'-6"	3'-3"	47'-0"
"	A32	4	2	26'-9"	31	11'-0"	12'-6"	3'-3"	53'-6"
"	A33	4	7	28'-3"	31	12'-6"	12'-6"	3'-3"	197'-9"
"	A34	4	2	7'-3"	S1				14'-6"
"	A35	4	2	8'-6"	S1				17'-0"
"	A36	4	2	9'-9"	S1				19'-6"
"	A37	4	2	11'-0"	S1				22'-0"
"	A38	4	2	12'-3"	S1				24'-6"
"	A39	4	2	13'-6"	S1				27'-0"
"	A40	4	2	14'-6"	S1				29'-0"
"	A41	4	2	16'-0"	S1				32'-0"
"	A42	4	2	17'-0"	S1				34'-0"
"	A43	4	2	18'-6"	S1				37'-0"
"	A44	4	2	19'-6"	S1				39'-0"
"	A45	4	2	20'-9"	S1				41'-6"
"	A46	4	1	22'-0"	S1				22'-0"
"	A47	4	2	6'-9"	2	2'-6"	4'-3"		13'-6"
"	A48	4	2	10'-0"	2	2'-6"	7'-6"		20'-0"
"	A49	4	2	13'-0"	2	2'-6"	10'-6"		26'-0"
"	A50	4	2	16'-6"	30	1'-6"	12'-6"	2'-6"	33'-0"
"	A51	4	2	19'-6"	30	4'-6"	12'-6"	2'-6"	39'-0"
"	A52	4	2	22'-9"	30	7'-9"	12'-6"	2'-6"	45'-6"
"	A53	4	2	26'-0"	30	11'-0"	12'-6"	2'-6"	52'-0"
"	A54	4	7	27'-6"	30	12'-6"	12'-6"	2'-6"	192'-6"
"	A55	4	21	4'-6"	S1				94'-6"
"	A56	4	4	20'-0"	S1				80'-0"
Headwall	H1	4	4	5'-6"	7	4'-0"	1'-6"		22'-0"
"	H2	4	2	3'-9"	7	2'-3"	1'-6"		7'-6"
"	H3	4	2	8'-6"	2	7'-0"	1'-6"		17'-0"
"	H4	4	2	6'-6"	S1				13'-0"
"	H5	4	2	2'-3"	S1				4'-6"
"	H6	4	2	7'-0"	S1				14'-0"
Sidewall	S1	4	32	25'-0"	S1				800'-0"
"	S2	4	4	20'-0"	S1				80'-0"
"	S3	4	4	15'-0"	S1				60'-0"
"	S4	4	6	7'-0"	S1				42'-0"
"	S5	4	6	7'-9"	S1				46'-6"
"	S6	4	6	8'-6"	S1				51'-0"
"	S7	4	6	9'-3"	S1				55'-6"
"	S8	4	26	9'-6"	S1				247'-0"
Cutoff wall	C1	4	22	5'-6"	S1				121'-0"
"	C2	4	6	23'-3"	S1				139'-6"
"	C3	4	12	23'-0"	S1				276'-0"
Wingwall	W1	4	48	11'-6"	S1				552'-0"
"	W2	4	18	13'-0"	7	11'-6"	1'-6"		234'-0"
"	W3	4	18	11'-6"	S1				207'-0"

P. W. D. BASIN 7-E-20463 SIZE H
E & WP UNIT PORTLAND, OREGON

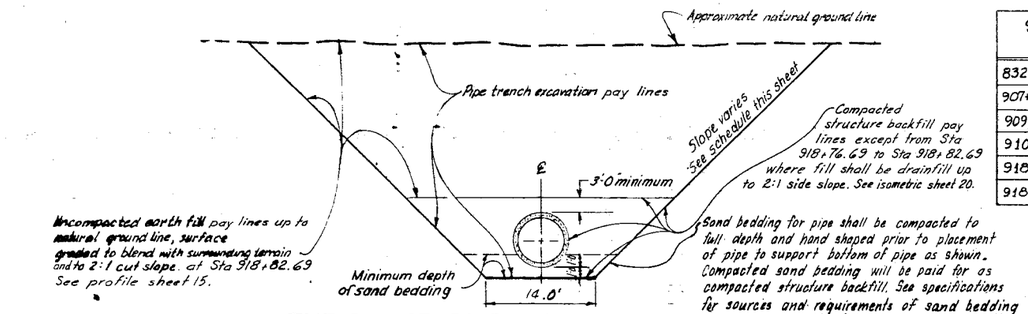
P.W.D. OUTLET STRUCTURE AND LAYOUT DETAILS

SITE I BUCKEYE W.P.P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date		
Designed	G.M. Cunningham	6-71	Approved by	
Drawn	J.E. Cooke	4-72	Title	
Traced			Title	
Checked	G.M.C., D.E.W	1-73	Sheet No. 20 of 31	Drawing No. 7-E-22084

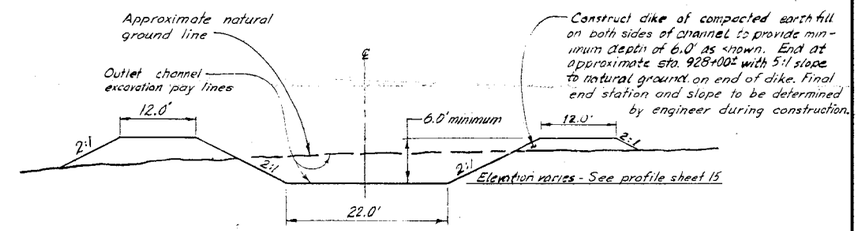
SCS-ENG-313-B Rev. 7-69



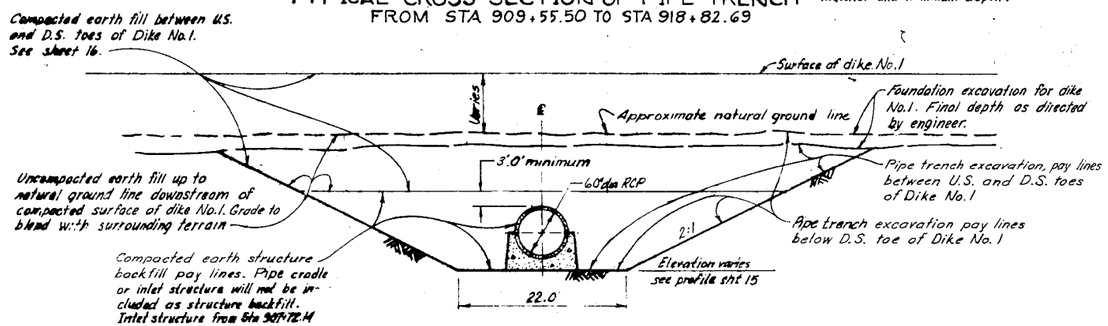
TYPICAL CROSS SECTION OF PIPE TRENCH
FROM STA 909+55.50 TO STA 918+82.69

SIDESLOPE SCHEDULE	
832+00 to 907+72.14	3 : 1
907+79.14 to 909+55.50	2 : 1
909+55.50 to 910+00	transition from 2:1 to 1:1
910+00 to 918+00	1 : 1
918+00 to 918+50	transition from 1:1 to 2:1
918+50 to 928+50±	2 : 1

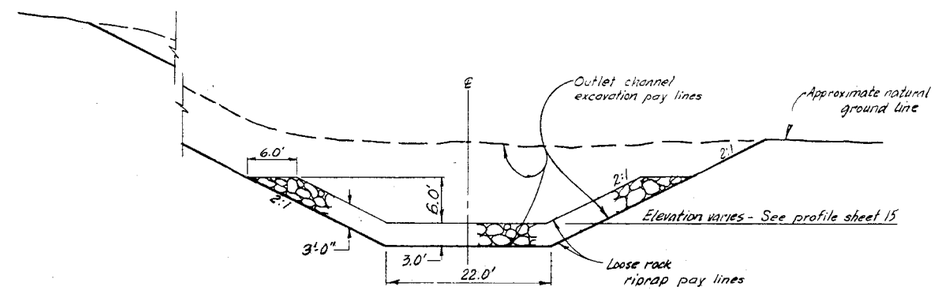
Pipe volume will not be included as structure backfill.



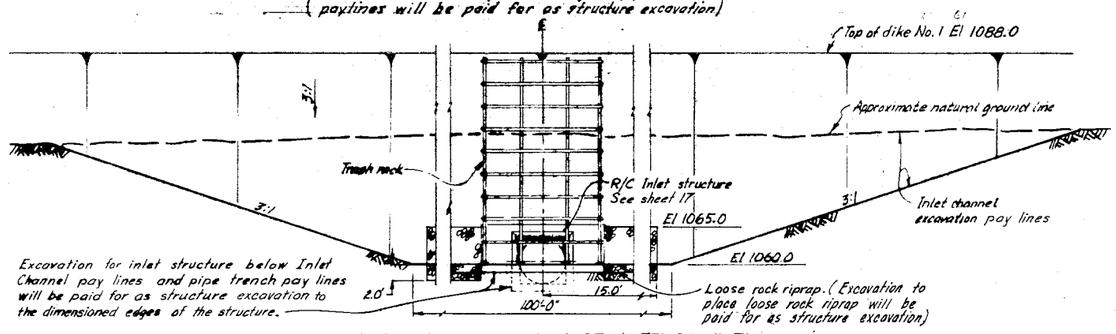
TYPICAL CROSS SECTION OF OUTLET CHANNEL
STA 919+30.36 TO DAYLIGHT AT STA. 928+50±



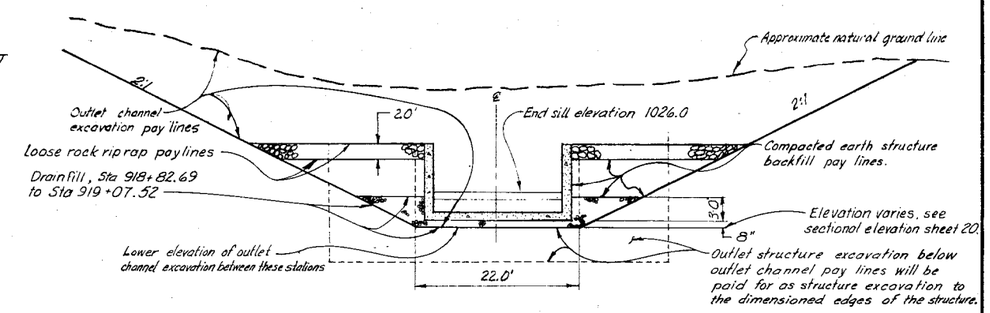
TYPICAL CROSS SECTION OF PIPE TRENCH
STA 907+72.14 TO STA 909+55.50
(Excavation for antiseep collars beyond pipe trench paylines will be paid for as structure excavation)



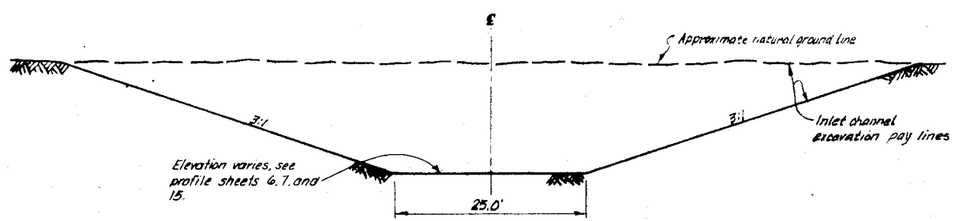
TYPICAL CROSS SECTION OF OUTLET CHANNEL RIPRAP
STA 919+08.36 TO STA. 919+30.36



TYPICAL CROSS SECTION OF INLET CHANNEL
PT OF CURVE C TO STA 907+72.14



TYPICAL CROSS SECTION OF PWD OUTLET STRUCTURE
STA 918+82.69 TO STA. 919+08.36



TYPICAL CROSS SECTION OF INLET CHANNEL
STA 832+00 TO P.C. OF CURVE B
(SEE SHEET 15 FOR P.C. OF CURVE B TO PT OF CURVE C
This section will be included for payment as inlet channel excavation)

ITEM	SEE SHEET
PLAN & PROFILE	15
INLET STRUCTURE & TRASH RACK	17
R/C CONDUIT & CRADLE	19
OUTLET STRUCTURE	20

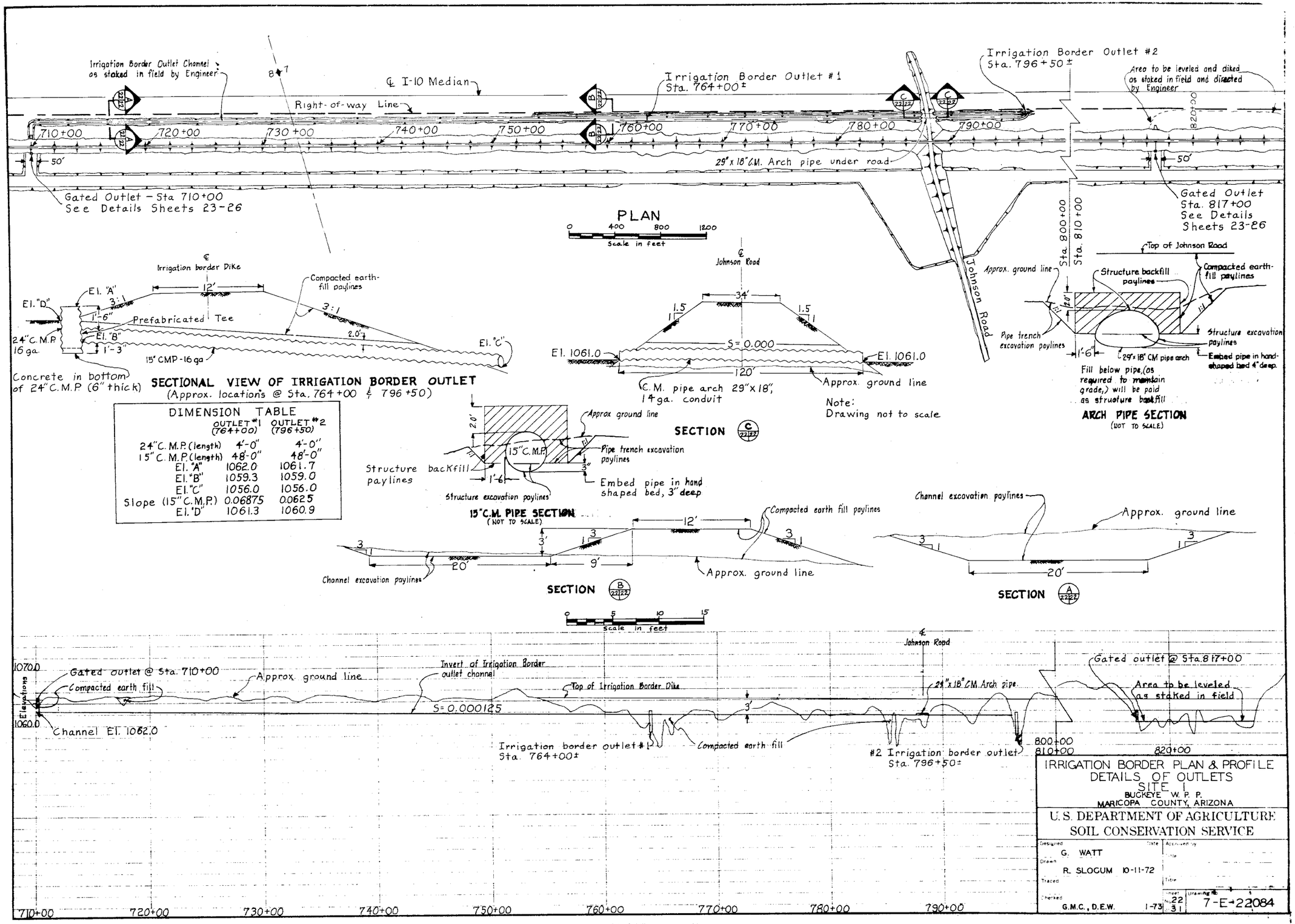
10 5 0 20
SCALE IN FEET

CROSS SECTIONS OF INLET CHANNEL, OUTLET CONDUIT, AND OUTLET CHANNEL
SITE I, BUCKEYE W.P.P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G.M. Cunnigham	Date 6-71	Approved by	
Drawn P.D. Clough	6-71	Title	
Traced		Title	
Checked G.M.C., D.E.W	1-73	Sheet No 21 of 31	Drawing No 7-E-22084

SCS-ENG-313-B Rev. 7-69



DIMENSION TABLE	OUTLET #1 (764+00)	OUTLET #2 (796+50)
24" C.M.P. (length)	4'-0"	4'-0"
15" C.M.P. (length)	48'-0"	48'-0"
El. "A"	1062.0	1061.7
El. "B"	1059.3	1059.0
El. "C"	1056.0	1056.0
Slope (15" C.M.P.)	0.06875	0.0625
El. "D"	1061.3	1060.9

IRRIGATION BORDER PLAN & PROFILE
DETAILS OF OUTLETS
SITE 1
BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT
Drawn R. SLOGUM 10-11-72
Traced
Checked G.M.C., D.E.W. 1-73
Approved by
Title
Sheet No. 22 of 31
Drawing No. 7-E-22084

Form SCS 318 (November 1955)

PIPE INVERT VERTICAL CURVE ELEVATIONS

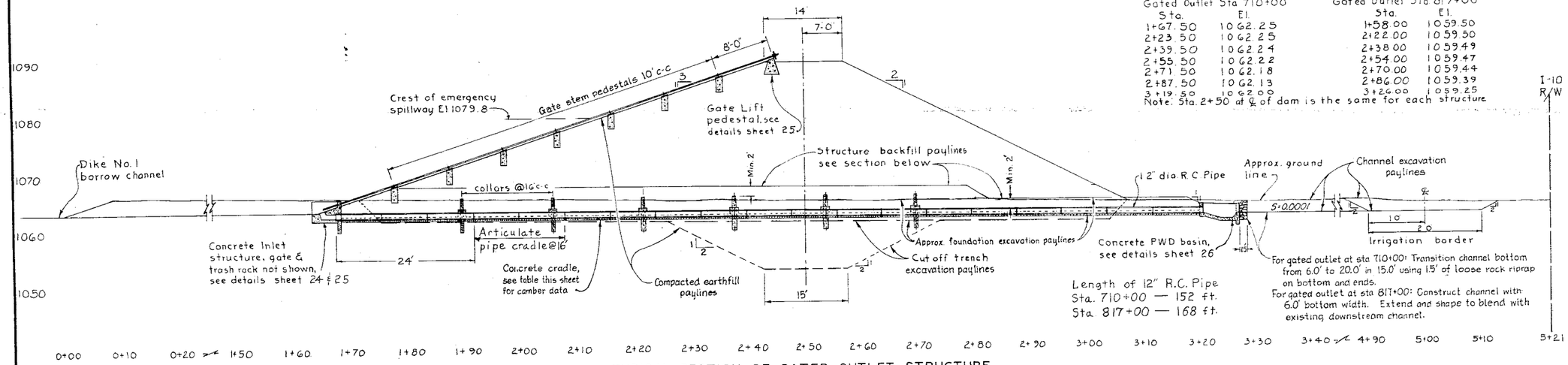
Gated Outlet Sta 710+00

Sta.	El.
1+67.50	1062.25
2+23.50	1062.25
2+39.50	1062.24
2+55.50	1062.22
2+71.50	1062.18
2+87.50	1062.13
3+19.50	1062.00

Gated Outlet Sta 817+00

Sta.	El.
1+58.00	1059.50
2+22.00	1059.50
2+38.00	1059.49
2+54.00	1059.47
2+70.00	1059.44
2+86.00	1059.39
3+26.00	1059.25

Note: Sta. 2+50 at ℄ of dam is the same for each structure.

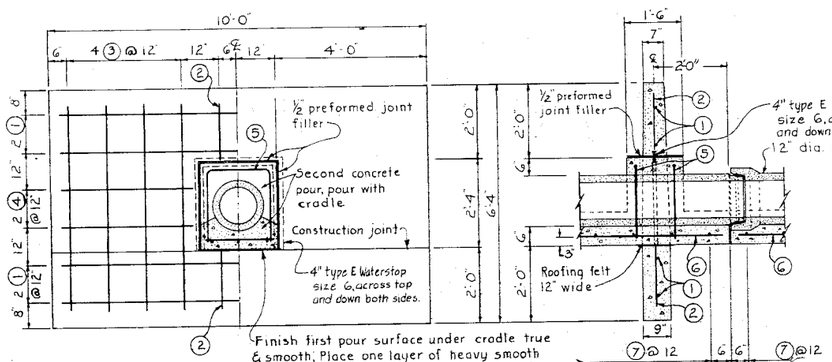


For gated outlet at sta 710+00: Transition channel bottom from 6.0' to 20.0' in 15.0' using 15' of loose rock riprap on bottom and ends.
For gated outlet at sta 817+00: Construct channel with 6.0' bottom width. Extend and shape to blend with existing downstream channel.

Length of 12" R.C. Pipe
Sta. 710+00 — 152 ft.
Sta. 817+00 — 168 ft.

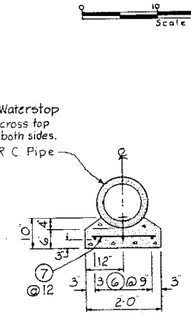
TYPICAL SECTION OF GATED OUTLET STRUCTURE
SEE TABLES BELOW FOR LOCATIONS & QUANTIES

Scale in feet 0 10 20 30



DETAILS OF CRADLE & ANTI-SEEP COLLARS

Scale in feet 0 2 4 6



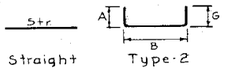
STEEL SCHEDULE

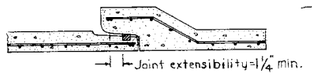
	Location	Mark	Size	Quantity	Length	Type	A	B	G	Total Length
Sta 710+00 Structure	Anti-Seep Collars	A-1	4	24	9-6	Str				228-0
	" " "	A-2	4	24	1-6	Str				36-0
	" " "	A-3	4	48	5-6	Str.				264-0
	" " "	A-4	4	24	3-6	Str				84-0
	Pipe Cradle	C-5	4	12	5-0	2	1-9	1-6	1-9	60-0
	" "	C-6	6			Str				440-0
	" "	C-7	4	152	1-9	Str				266-0
Sta 817+00 Structure	Anti-Seep Collars	A-1	4	24	9-6	Str				228-0
	" " "	A-2	4	24	1-6	Str				36-0
	" " "	A-3	4	48	5-6	Str				264-0
	" " "	A-4	4	24	3-6	Str				84-0
	Pipe Cradle	C-5	4	12	5-0	2	1-9	1-6	1-9	60-0
	" "	C-6	6			Str				486-0
	" "	C-7	4	168	1-9	Str				294-0

CONCRETE STRUCTURE QUANTITIES

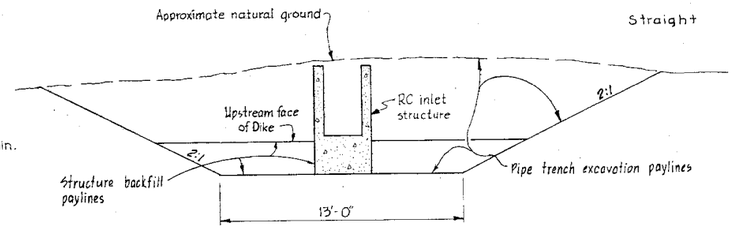
	Structure	Concrete Cu. Yd.	Reinforcing Steel Lbs
Sta. 710+00 Structure	Inlet	1.36	108
	Cradle	7.71	879
	Anti-Seep Collars	9.02	409
	PWD Basin	1.94	146
	Gate lift pedestal	0.37	11
	Stem pedestals	(7) 0.74	(7) 94
Sta. 817+00 Structure	Inlet	1.36	108
	Cradle	8.44	956
	Anti-Seep Collars	9.02	409
	PWD Basin	1.94	146
	Gate lift pedestal	0.37	11
	Stem pedestals	(8) 0.84	(8) 107

BAR TYPES





DETAIL OF PIPE JOINT

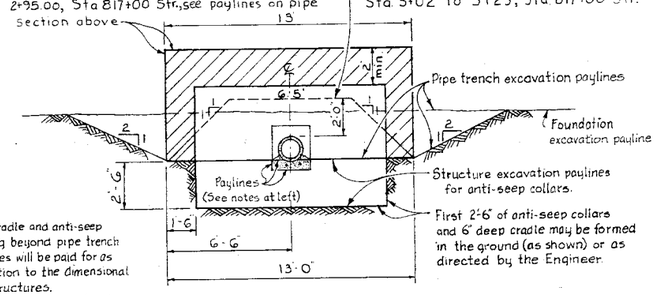


INLET STRUCTURE EXCAVATION AND BACKFILL
(STA 1+62.0 to 1+67.5 FOR GATED OUTLET AT STA 710+00
STA 1+53.0 to 1+58.0 FOR GATED OUTLET AT STA 817+00)

Note:
Excavation required beyond the limits of pipe trench excavation will be paid for as structure excavation to the dimensioned edges of the structure.

Structure backfill paylines Sta 1+68.50 to 2+78.50, Sta. 710+00 Str., Sta. 1+60.00 to 2+95.00, Sta 817+00 Str., see paylines on pipe section above.

Structure backfill paylines Sta 2+83 to 3+19, Sta. 710+00 Str. Sta. 3+02 to 3+25, Sta. 817+00 Str.



1. Excavation for cradle and anti-seep collars extending beyond pipe trench excavation paylines will be paid for as structure excavation to the dimensional edges of the structures.
2. If the foundation excavation extends below the bottom of the cradle the compacted earth fill shall be placed up to 6" above the bottom of the cradle and then excavated to form the cradle. This excavation will be paid for as structure excavation.

PIPE TRENCH EXCAVATION & BACKFILL DIAGRAM
(STA 1+67.5 to 3+25.5 FOR GATED OUTLET AT STA 710+00
STA 1+58.0 to 3+19.0 FOR GATED OUTLET AT STA 817+00)

Scale in feet 0 4 8 12

PIPE STRENGTH REQUIREMENTS

Inside dia. of pipe in inches.....12

Minimum Hydrostatic Pressure (head ft) = ...50

Standard Specification AWWA-C-302,
Load to produce 0.01" crack one foot long ....3,000 lbs.

GATED OUTLET DETAILS AT DIKE NO. 1 STA. 710+00 & STA. 817+00 SITE 1

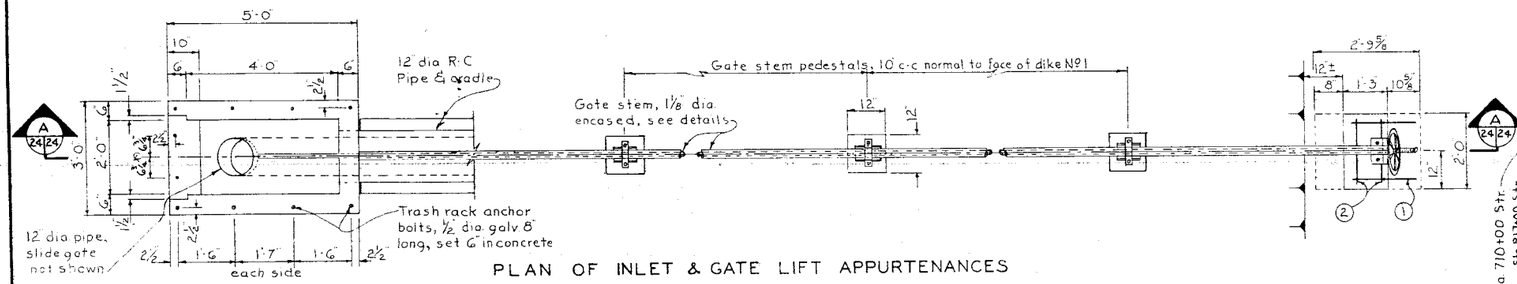
BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

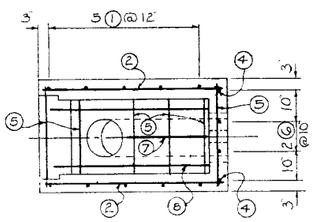
	Date		
Designed G. WATT		Approved by	
Drawn G. HANLEY	10-3-72	Title	
Traced		Title	
Checked GMC	1-7-73	Sheet No. 23 of 31	Drawing No. 7-E-22084

SCS-ENG-313-B Rev. 7-69

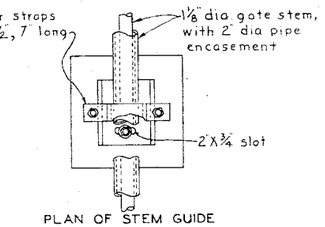
U.S. GOVERNMENT PRINTING OFFICE : 1969 O—354-783



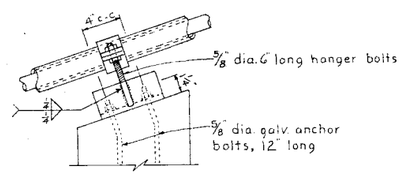
PLAN OF INLET & GATE LIFT APPURTENANCES



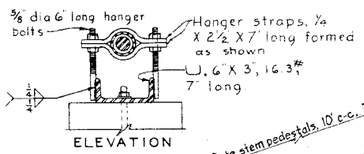
PLAN OF INLET REINFORCING



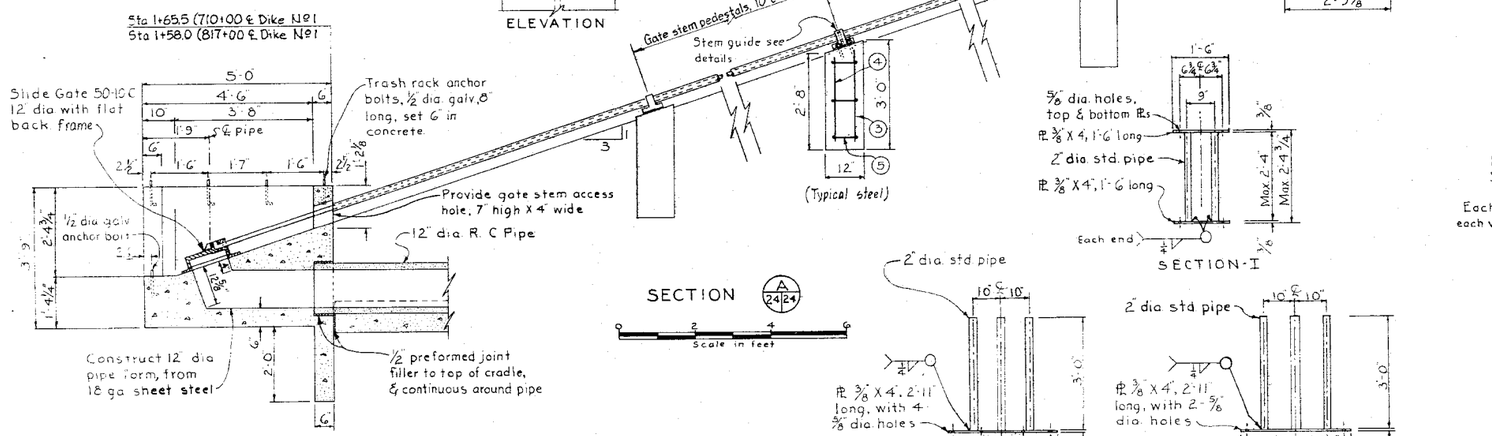
PLAN OF STEM GUIDE



SIDE VIEW



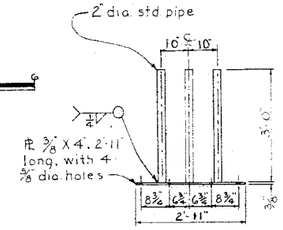
ELEVATION



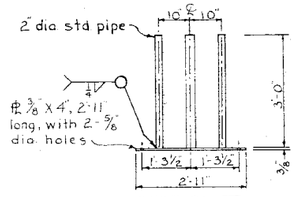
SECTION

Scale in feet

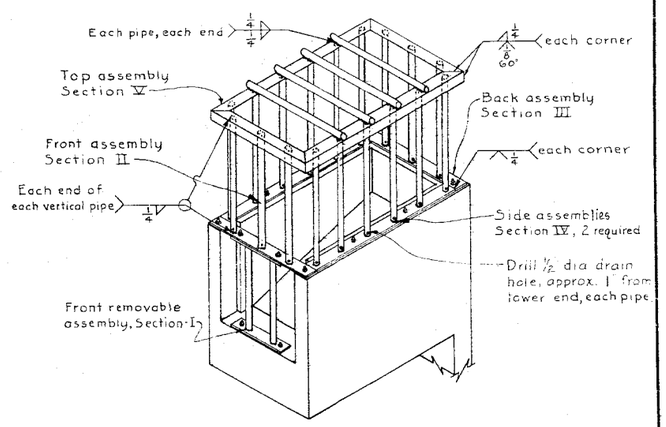
SECTION-I



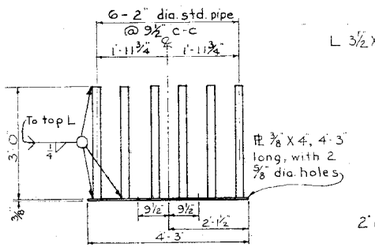
SECTION-II



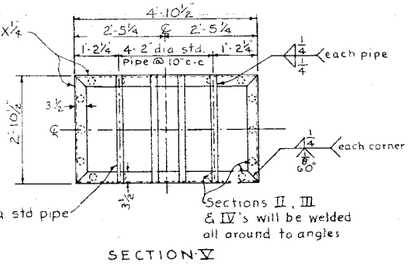
SECTION-III



ISOMETRIC VIEW OF INLET WITH TRASH RACK ATTACHED



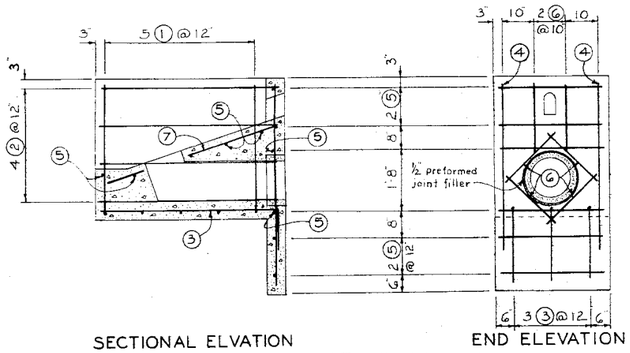
SECTION-IV
(Two Required)



SECTION-V

DETAILS OF TRASH RACK ASSEMBLIES

Scale in feet



SECTIONAL ELVATION

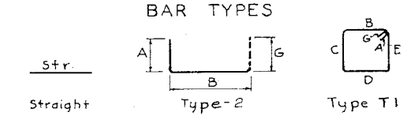
END ELEVATION

DETAILS OF INLET REINFORCING

Scale in feet

Location	Mark	Size	Quantity	Length	Type	A	B	C	D	E	G	Total Length
Gate lift Pedestal	G1	4	3	3-0	2	1-0					2-0	9-0
" " "	G2	4	4	1-9	Str.							7-0
Stem pedestal	S3	4	14	2-6	"							35-0
" "	S4	4	14	2-3	"							31-6
" "	S5	4	21	3-6	T1	0-3	0-9	0-9	0-9	0-9	0-3	73-6
Sta. 710+00 Str.												
Gate lift Pedestal	G1	4	3	3-0	2	1-0					2-0	9-0
" " "	G2	4	4	1-9	Str.							7-0
Stem pedestal	S3	4	16	2-6	"							40-0
" "	S4	4	16	2-3	"							36-0
" "	S5	4	24	3-6	T1	0-3	0-9	0-9	0-9	0-9	0-3	84-0
Sta. 817+00 Str.												
Reinforcing Two Inlets												
Inlet Structures	I-1	4	10	9-3	2	3-4	2-7				3-4	92.6
" "	I-2	4	16	4-6	Str.							72-0
" "	I-3	4	6	6-6	2	2-0	4-6					39.0
" "	I-4	4	4	3-6	Str.							14-0
" "	I-5	4	22	2-9	"							60-6
" "	I-6	4	12	1-9	"							21-0
" "	I-7	4	2	2-6	"							5-0
" "	I-8	4	4	5-0	"							20-0

BAR TYPES



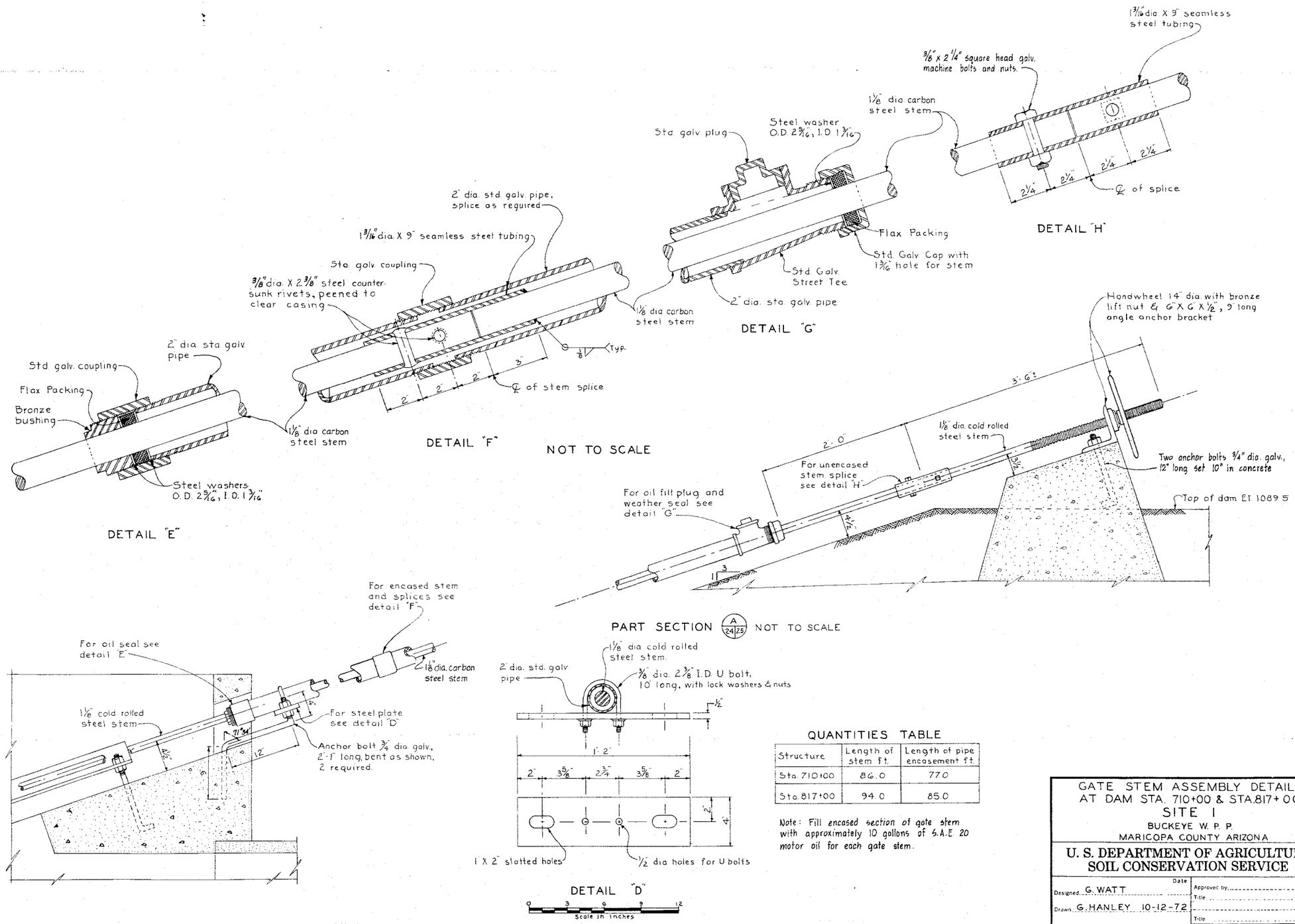
GATED OUTLET DETAILS AT
DIKE NO. 1 STA. 710+00 & STA. 817+00
SITE 1
BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed G. WATT — Date
Drawn G. HANLEY 10-10-72
Traced
Checked G.M.C., D.E.W. 1-73
Approved by
Title
Sheet No. 24 of 31
Drawing No. 7-E-22084

SCS-ENG-313-B Rev. 7-69

U.S. GOVERNMENT PRINTING OFFICE : 1969 O—354-783



QUANTITIES TABLE

Structure	Length of stem ft.	Length of pipe encasement ft.
Sta. 710+00	86.0	77.0
Sta. 817+00	94.0	85.0

Note: Fill encased section of gate stem with approximately 10 gallons of S.A.E 20 motor oil for each gate stem.

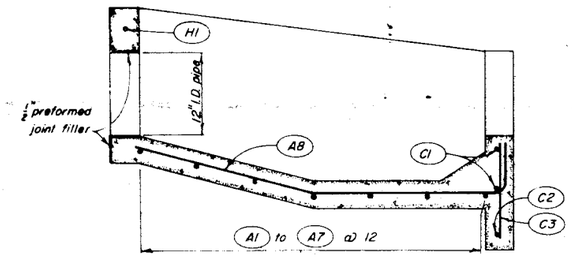
GATE STEM ASSEMBLY DETAILS
AT DAM STA. 710+00 & STA. 817+00
SITE 1
BUCKEYE W. P. P.
MARICOPA COUNTY ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

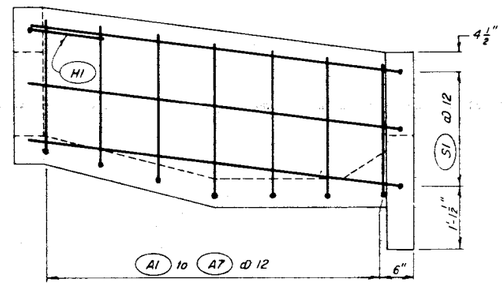
Designed G. WATT	Date	Approved by
Drawn G. HANLEY 10-12-72		Title
Traced		Title
Checked G.M.C., D.E.W. 1-73	Sheet No. 25 of 31	Drawing No. 7-E-22084

U.S. GOVERNMENT PRINTING OFFICE 1969-O-354-783

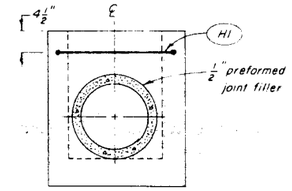
SCS-ENG-313-B Rev. 7-69



SECTIONAL ELEVATION



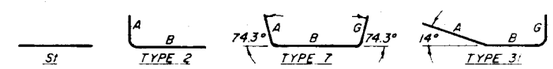
SIDEWALL ELEVATION



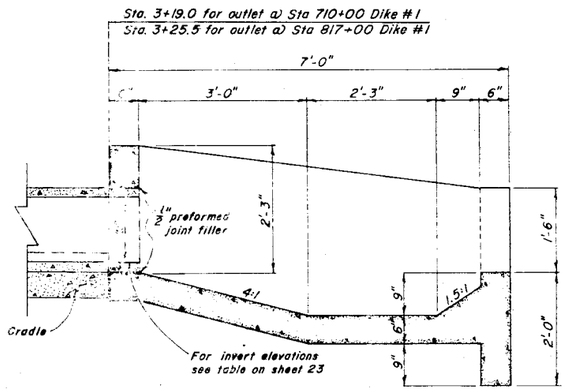
HEADWALL ELEVATION

STEEL SCHEDULE

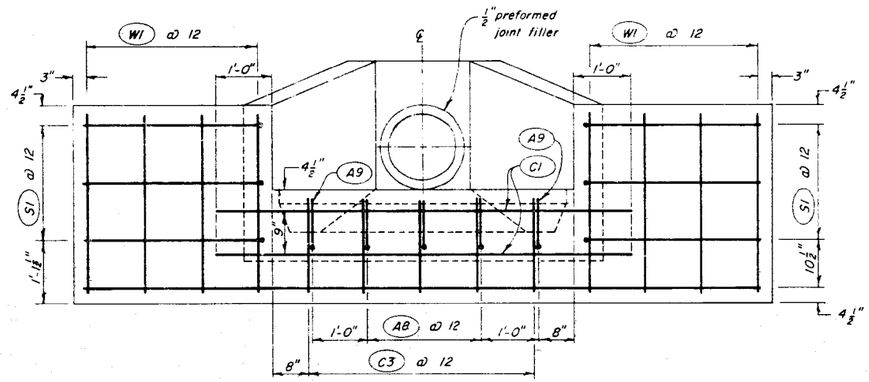
Location	Mark	Size	Quan.	Length	Type	A	B	G	Total Length
Apron	A1	4	2	4'-0"	2	2'-3"	1'-9"		8'-0"
"	A2	4	2	4'-6"	2	2'-6"	2'-0"		9'-0"
"	A3	4	2	4'-9"	2	2'-6"	2'-3"		9'-6"
"	A4	4	2	5'-3"	2	2'-9"	2'-6"		10'-6"
"	A5	4	2	5'-3"	2	2'-6"	2'-9"		10'-6"
"	A6	4	2	5'-6"	2	2'-6"	3'-0"		11'-0"
"	A7	4	2	5'-6"	2	2'-3"	3'-3"		11'-0"
"	A8	4	3	7'-0"	31	3'-0"	3'-3"	9"	21'-0"
"	A9	4	2	4'-0"	2	3'-3"	9"		8'-0"
Headwall	H1	4	1	4'-6"	7	1'-3"	2'-0"	1'-3"	4'-6"
Sidewall	S1	4	6	9'-6"	7	3'-0"	6'-6"		57'-0"
Cutoff wall	C1	4	2	7'-3"	S1				14'-6"
"	C2	4	1	12'-0"	S1				12'-0"
"	C3	4	5	1'-6"	S1				7'-6"
Wing wall	W1	4	8	3'-0"	S1				24'-0"



BAR TYPES



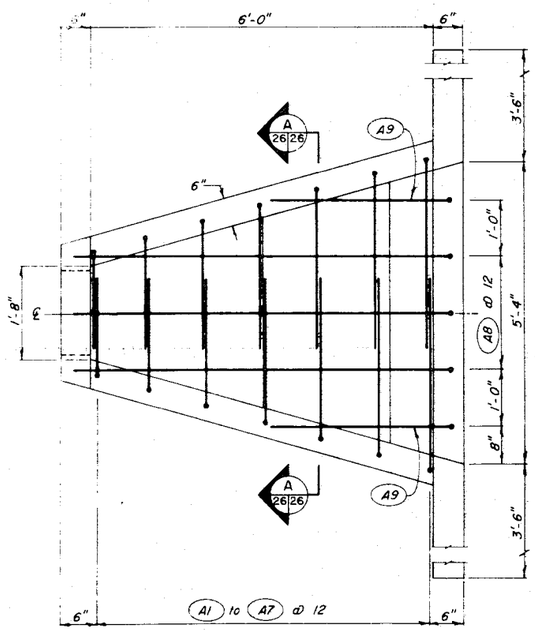
SECTIONAL ELEVATION



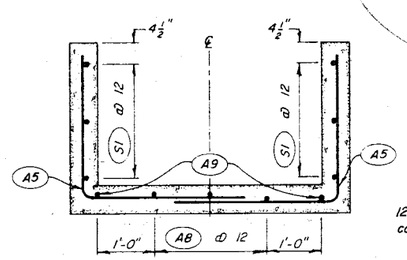
WINGWALL ELEVATION

TABLE OF QUANTITIES

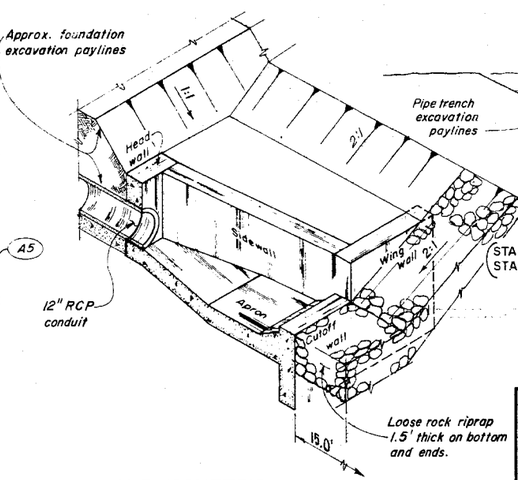
	I.D. of pipe in.	Type of pipe: ASTM 76 & AWWA C 302 Cu. Yds.	AWWA C 300 & C 301 Cu. Yds.	Steel & C.M.P. Cu. Yds.
Concrete	12	1.94		1.96
	15	1.93		1.95
	18	1.92	1.91	1.94
Reinf Steel		146 lbs.		



PLAN



SECTION A 26 26



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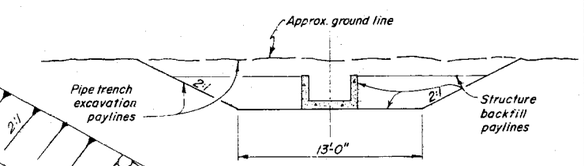


OUTLET STRUCTURE
EXCAVATION AND BACKFILL

STA 3+19.0 TO 3+26.0 FOR GATED OUTLET AT STA 710+00 DIKE #1
STA 3+25.5 TO 3+32.5 FOR GATED OUTLET AT STA 817+00 DIKE #1

Note:
Excavation required beyond the limits of pipe trench excavation will be paid for as structure excavation to the dimensional edges of the structure.

P. W. D. BASIN 7-E-20463 SIZE C
E & WP UNIT PORTLAND, OREGON

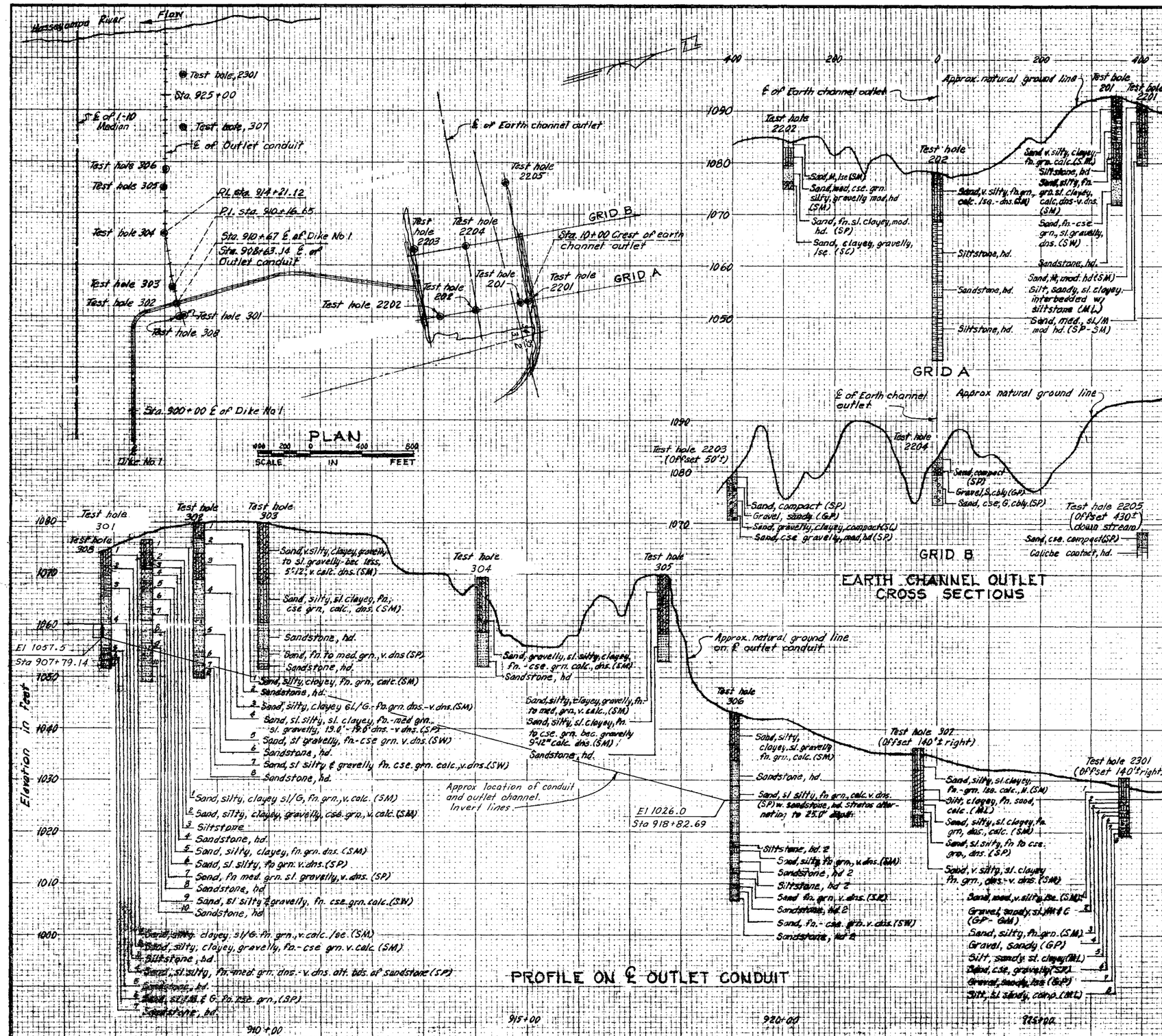
SCALE 0 1 2 3 IN FEET

P.W.D. OUTLET STRUCTURES AT DIKE STA. 710+00 & STA. 817+00 SITE 1

BUCKEYE W. P. P.
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date		
Designed	G. WATT		Approved by	
Drawn	R. SLOCUM	10-12-72	Title	
Traced			Title	
Checked			Sheet No. 26 of 31	Drawing No. 7-E-22084



LEGEND

SYMBOLS

UNCONSOLIDATED MATERIAL

gravel; sand; silt; clay; cobbles, boulders
gravel, sandy; sand, gravelly; silt, gravelly; clay, gravelly; peat
gravel, silty; sand, silty; silt, sandy; clay, sandy; gypsiferous *
gravel, clayey; sand, clayey; silt, clayey; clay, silty; calcareous *
gravel, sand, silt; sand, silt, clay; organic silt; organic clay

* to be added to Standard Symbol when significant amounts of dispersed gypsum or calcified zones are present in the section.

CONSOLIDATED MATERIAL

Sedimentary Rocks

shale; sandstone; limestone; chalk; coal
calcareous shale; calcareous sandstone; cherty limestone; marl; gypsum
sandy shale; shaley sandstone; sandy limestone; chert; conglomerate
siltstone; breccia; dolomite

Metamorphic Rocks

quartzite; slate; gneiss; schist; marble; soapstone talc serpentine

Igneous Rocks

intrusive; extrusive; pyroclastic

Undifferentiated

Other Symbols

○ hole logged only
◉ hole sampled
dip and strike
pit or trench

ABBREVIATIONS

aq	aquifer	fri	friable
cav.	cavities	lam	laminated
℄	centerline	mas	massive
con	concretions	TD	total depth
US	undisturbed samples	v.	very
DS	disturbed samples	w/	with
dip	dipping	wea	weathered
frac	fractured	WL	(date) groundwater level on a specified date

TEST HOLE NUMBERING SYSTEM

Centerline of dam	1 - 99
Borrow area	101 - 199
Emergency spillway	201 - 299
Centerline of outlet structure	301 - 399
Stream channel	401 - 499
Relief wells	501 - 599
	601 - 699
	701 - 799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels; gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels; gravel-sand-silt mixtures
GC	Clayey gravels; gravel-sand-clay mixtures
SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sand
SC	Clayey sands; sand-clay mixtures
ML	Silts; silty, v. fine sands; sandy or clayey silts
CL	Clays of low to medium plasticity; silty, sandy or gravelly clays
CH	Inorganic clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays of medium to high plasticity

PLAN & PROFILE OF GEOLOGIC INVESTIGATIONS ON CONDUIT & EARTH CHANNEL OUTLETS SITE 1, BUCKEYE W.P.P.

MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by C.D. CLARKE	Date 3-15-71	Approved by	
Title GEOLOGIST		Title	
Checked by G.M. Cunningham	7-71	Title	
Title Civil Engineer		Sheet No. 27 of 31	Drawing No. 7-E-22084

ES 900 Sheet 3 of 3 SCS-56C (April 1969)

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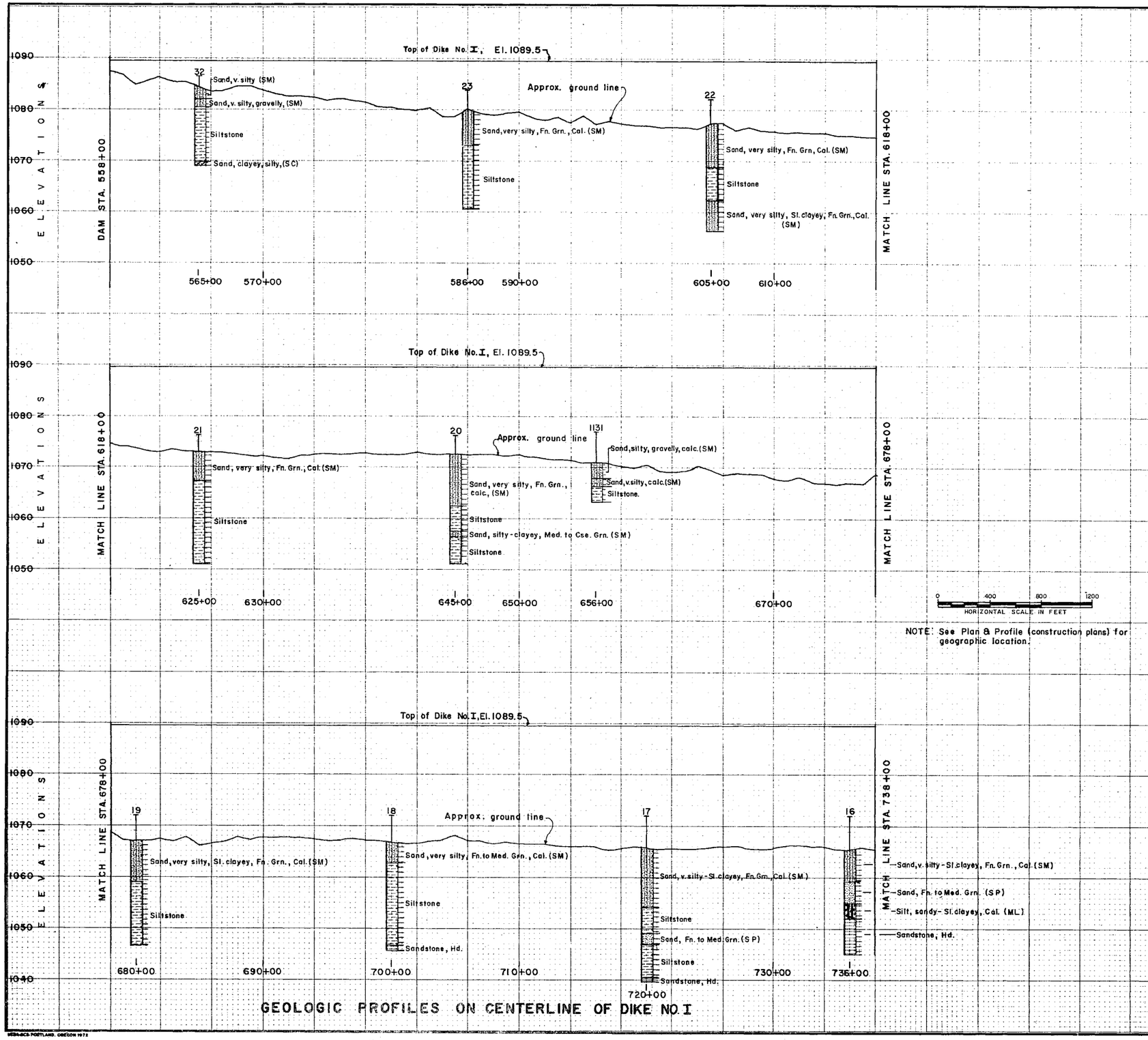
U. S. GOVERNMENT PRINTING OFFICE: 1971 O - 441-164



GEOLOGIC PROFILES ON CENTERLINE OF DIKE NO. I

LEGEND

SYMBOLS

UNCONSOLIDATED MATERIAL

gravel; sand; silt; clay; cobbles, boulders
gravel, sandy; sand, gravelly; silt, gravelly; clay, gravelly; peat
gravel, silty; sand, silty; silt, sandy; clay, sandy; gypsiferous *
gravel, clayey; sand, clayey; silt, clayey; clay, silty; calcareous *
gravel, sand, silt; sand, silt, clay; organic silt; organic clay

* to be added to Standard Symbol when significant amounts of dispersed gypsum or calcified zones are present in the section.

CONSOLIDATED MATERIAL

Sedimentary Rocks

shale; sandstone; limestone; chalk; coal
calcareous shale; calcareous sandstone; cherty limestone; marl; gypsum
sandy shale; shaley sandstone; sandy limestone; chert; conglomerate
siltstone; breccia; dolomite

Metamorphic Rocks

quartzite; slate; gneiss; schist; marble; soapstone talc serpentine

Igneous Rocks

intrusive; extrusive; pyroclastic

Undifferentiated

Other Symbols

● hole logged only
◉ hole sampled
dip and strike
pit or trench

ABBREVIATIONS

aq	aquifer	fri	friable
cav.	cavities	lam	laminated
℄	centerline	mas	massive
con	concretions	TD	total depth
US	undisturbed samples	v.	very
DS	disturbed samples	w/	with
dip	dipping	wea	weathered
frac	fractured	WL	(date) groundwater level on a specified date

TEST HOLE NUMBERING SYSTEM

Centerline of dam	1 - 99
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Relief wells	501 - 599
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	701 - 799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

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GM	Silty gravels; gravel-sand-silt mixtures
GC	Clayey gravels; gravel-sand-clay mixtures
SW	Well graded sands; sand-gravel mixtures
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CL	Clays of low to medium plasticity; silty, sandy or gravelly clays
CH	Inorganic clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays of medium to high plasticity

PLAN & PROFILE OF GEOLOGIC INVESTIGATIONS ON ℄ OF DIKE NO. I

SITE I, BUCKEYE W. P. P.

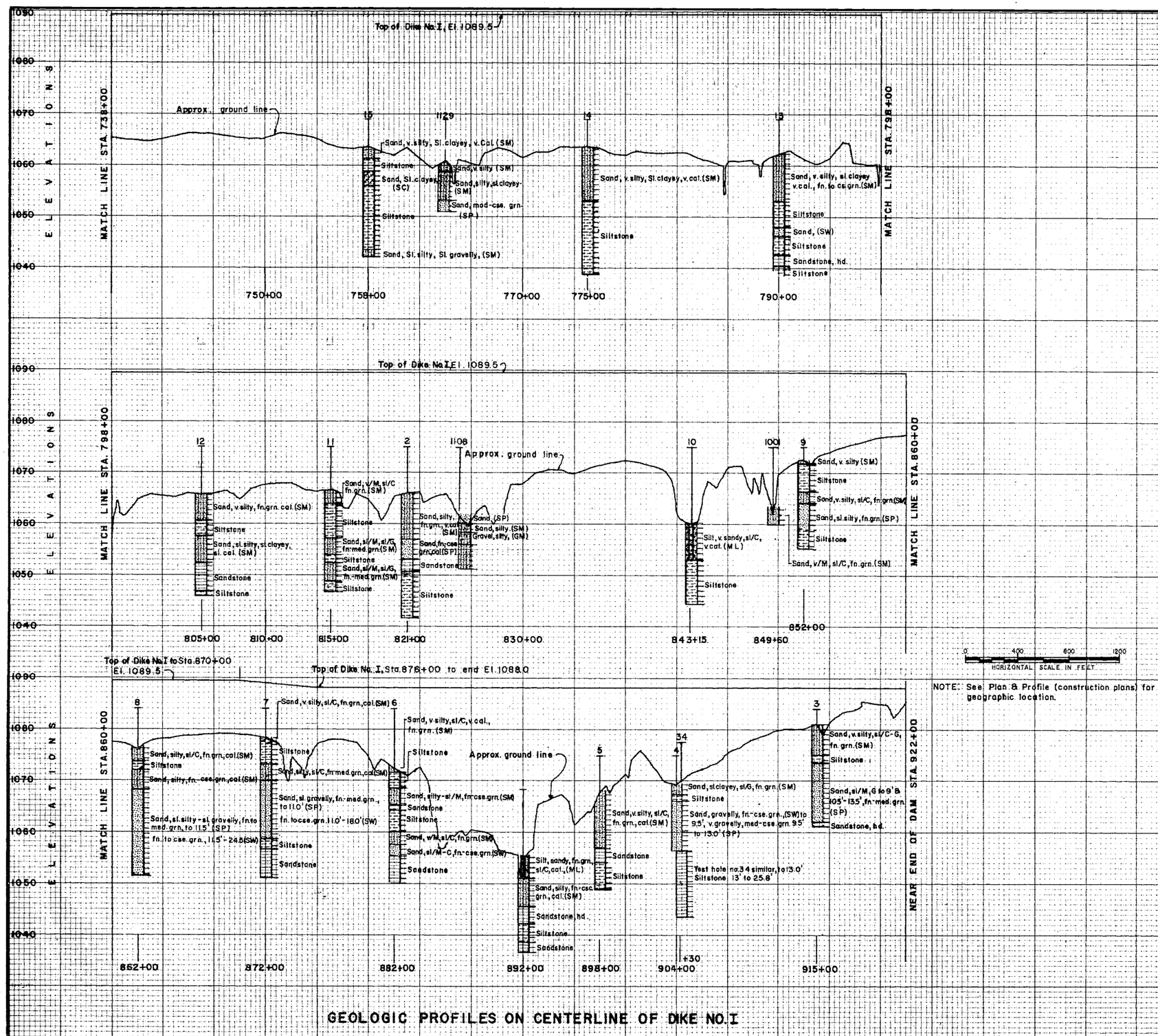
MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by C. D. CLARKE	Date 3-30-71	Approved by	
Title GEOLOGIST		Title	
Checked by G. M. CUNNINGHAM	10-71	Title	
D. E. WALLIN			
Title CIVIL ENGINEERS		Sheet No. 28 of 31	Drawing No. 7-E-22084

ES 900 Sheet 4 of 4 SCS-35D (6-59)

USDA-SCS PORTLAND, OREGON 1972
U.S. GOVERNMENT PRINTING OFFICE: 1959 O—571162



NOTE: See Plan & Profile (construction plans) for geographic location.

GEOLOGIC PROFILES ON CENTERLINE OF DIKE NO.I

LEGEND

SYMBOLS

UNCONSOLIDATED MATERIAL

gravel; sand; silt; clay; cobbles, boulders
gravel, sandy; sand, gravelly; silt, gravelly; clay, gravelly; peat
gravel, silty; sand, silty; silt, sandy; clay, sandy; gypsiferous *
gravel, clayey; sand, clayey; silt, clayey; clay, silty; calcareous *
gravel, sand, silt; sand, silt, clay; organic silt; organic clay

* to be added to Standard Symbol when significant amounts of dispersed gypsum or calcified zones are present in the section.

CONSOLIDATED MATERIAL

Sedimentary Rocks

shale; sandstone; limestone; chalk; coal
calcareous shale; calcareous sandstone; cherty limestone; marl; gypsum
sandy shale; shaley sandstone; sandy limestone; chert; conglomerate
siltstone; breccia; dolomite

Metamorphic Rocks

quartzite; slate; gneiss; schist; marble; soapstone talc serpentine

Igneous Rocks

intrusive; extrusive; pyroclastic

Undifferentiated

Other Symbols

● hole logged only
◉ hole sampled
dip and strike
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PLAN & PROFILE OF GEOLOGIC INVESTIGATIONS ON ℄ OF DIKE NO.I

SITE I, BUCKEYE W. P. P.

MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by C. D. CLARKE	Date 4-13-71	Approved by	
Title GEOLOGIST		Title	
Checked by G. M. CUNNINGHAM	10-71	Title	
D. E. WALLIN			
Title CIVIL ENGINEERS		Sheet No. 24 of 31	Drawing No. 7-E-22084

ES 900 Sheet 4 of 4 SCS-35D (6-59)

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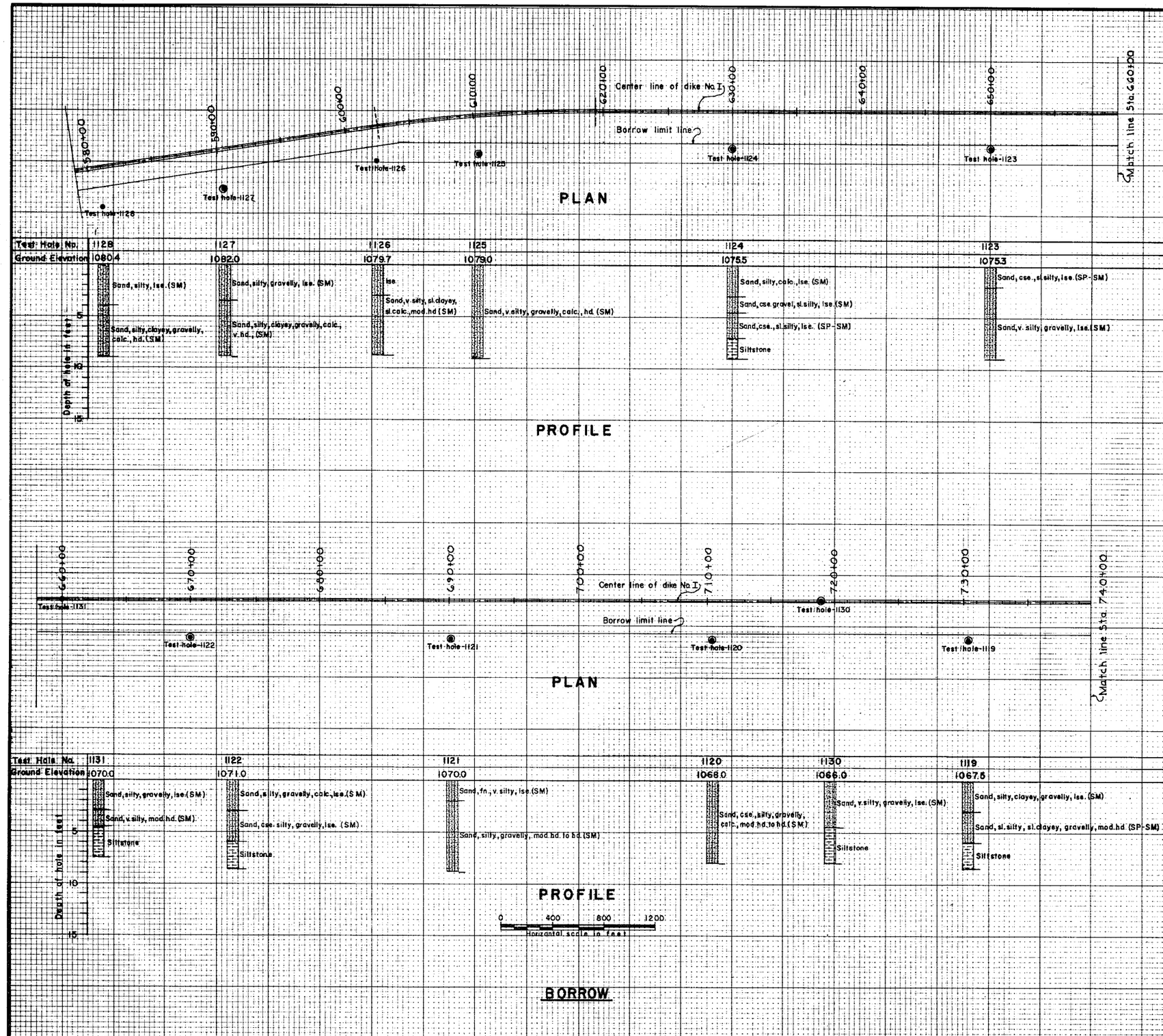

LEGEND

SYMBOLS

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gravel; sand; silt; clay; cobbles, boulders
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gravel, sand, silt; sand, silt, clay; organic silt; organic clay

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CONSOLIDATED MATERIAL

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calcareous shale; calcareous sandstone; cherty limestone; marl; gypsum
sandy shale; shaley sandstone; sandy limestone; chert; conglomerate
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Metamorphic Rocks

quartzite; slate
gneiss; schist
marble; soapstone talc serpentine

Igneous Rocks

intrusive; extrusive
pyroclastic

Undifferentiated

Other Symbols

● hole logged only
◉ hole sampled
dip and strike
pit or trench

ABBREVIATIONS

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OH	Organic clays of medium to high plasticity

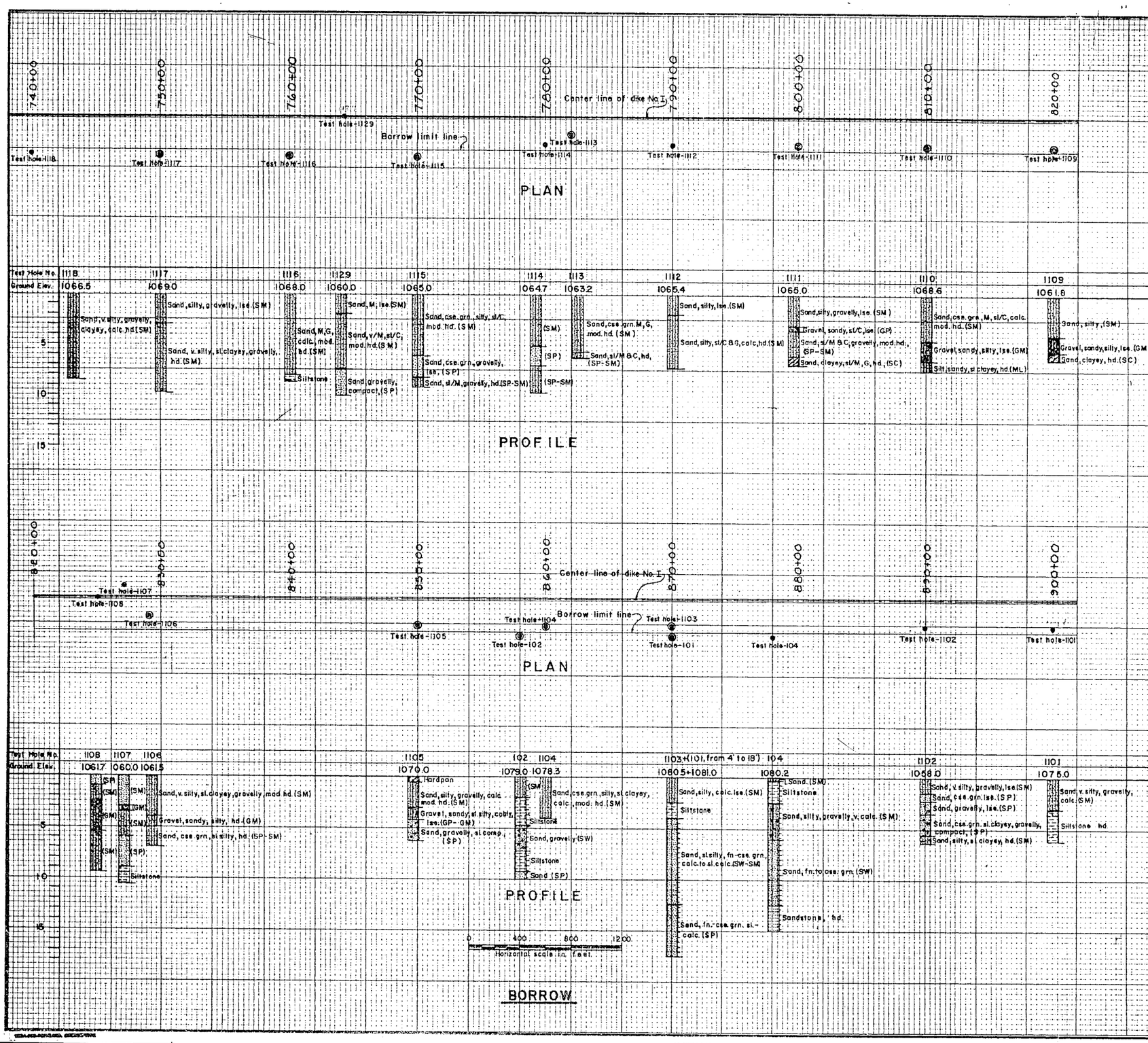
PLAN & PROFILE OF GEOLOGIC INVESTIGATIONS ON BORROW

SITE I, BUCKEYE W.P.P.

MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by C. D. CLARKE	Date 4-25-71	Approved by	
Title GEOLOGIST		Title	
Checked by G. M. CUNNINGHAM, D. E. WALLIN	10-71	Title	
Title CIVIL ENGINEERS		Sheet No. 30 of 31	Drawing No. 7-E-22084



LEGEND

SYMBOLS

UNCONSOLIDATED MATERIAL

gravel; sand; silt; clay; cobbles, boulders
gravel, sandy; sand, gravelly; silt, gravelly; clay, gravelly; peat
gravel, silty; sand, silty; silt, sandy; clay, sandy; gypsiferous *
gravel, clayey; sand, clayey; silt, clayey; clay, silty; calcareous *
gravel, sand, silt; sand, silt, clay; organic silt; organic clay

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CONSOLIDATED MATERIAL

Sedimentary Rocks

shale; sandstone; limestone; chalk; coal
calcareous shale; calcareous sandstone; cherty limestone; marl; gypsum
sandy shale; shaley sandstone; sandy limestone; chert; conglomerate
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Metamorphic Rocks

quartzite; slate; gneiss; schist; marble; soapstone talc serpentine

Igneous Rocks

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Undifferentiated

Other Symbols

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dip and strike
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ABBREVIATIONS

aq	aquifer	fri	friable
cav.	cavities	lam	laminated
℄	centerline	mas	massive
con	connections	TD	total depth
US	undisturbed samples	v.	very
DS	disturbed samples	w/	with
dip	dipping	wea	weathered
frac	fractured	WL	(date) groundwater level on a specified date

TEST HOLE NUMBERING SYSTEM

Centerline of dam	1 - 99
Borrow area	101 - 199
Emergency spillway	201 - 299
Centerline of outlet structure	301 - 399
Stream channel	401 - 499
Relief wells	501 - 599
	601 - 699
	701 - 799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels; gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels; gravel-sand-silt mixtures
GC	Clayey gravels; gravel-sand-clay mixtures
SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sand
SC	Clayey sands; sand-clay mixtures
ML	Silts; silty, v. fine sands; sandy or clayey silts
CL	Clays of low to medium plasticity; silty, sandy or gravelly clays
CH	Inorganic clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays of medium to high plasticity

PLAN & PROFILE OF GEOLOGIC INVESTIGATIONS ON BORROW

SITE 1, BUCKEYE W.P.P.

MARICOPA COUNTY, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by C. D. CLARKE Date 4-25-71	Approved by
Title GEOLOGIST	Title
Checked by G. M. CUNNINGHAM 10-71	Title
D. E. WALLIN	
Title CIVIL ENGINEERS	Sheet No. 31 of 31 — Drawing No. 7-E-22084

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