



USDA - SCS - FT. WORTH, TEXAS



FLOODWATER RETARDING DAM NO. 4 SANDERSON CANYON WATERSHED PROJECT BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

DRAINAGE AREA 6669 ACRES
TOTAL STORAGE 1906 AC.FT.
HEIGHT OF DAM 51 FEET
VOLUME OF FILL 538,048 CU. YDS.

SPONSORED BY
RIO GRANDE-PECOS RIVER, BIG BEND AND TRANS-PECOS SOIL AND WATER CONSERVATION DISTRICTS
TERRELL, PECOS AND BREWSTER COUNTY COMMISSIONERS COURTS

AS BUILT PLANS

CONTRACT NO. 50-7442-4-3029
CONTRACTOR West Texas Roads, Inc.
CONSTRUCTION COMMENCED 10/27/84
GOV. REPRESENTATIVE John W. Jackson
GOV. INSPECTOR Thad W. Sansing
BID PRICE \$ 1,690,272.82
FINAL PRICE \$ 1,786,489.24

COOPERATING WITH
SOIL CONSERVATION SERVICE
OF THE
U.S. DEPARTMENT OF AGRICULTURE
1979

CONSTRUCTION DRAWINGS REVISED
1980
REVISIONS APPROVED
191 Robert A. Frank, Jr. Approved by letter dated 2-26-80
HEAD ENGINEERING STAFF, S.C.S. DATE
FT. WORTH, TEXAS
Kevin C. Vittoria Approved by letter dated 2-26-80
STATE CONSERVATION ENGR. S.C.S. DATE
TEMPLE, TEXAS

191 Robert A. Frank, Jr.
Approved by letter dated 8/30/79
HEAD ENGINEERING STAFF, S.C.S. DATE
FT. WORTH, TEXAS

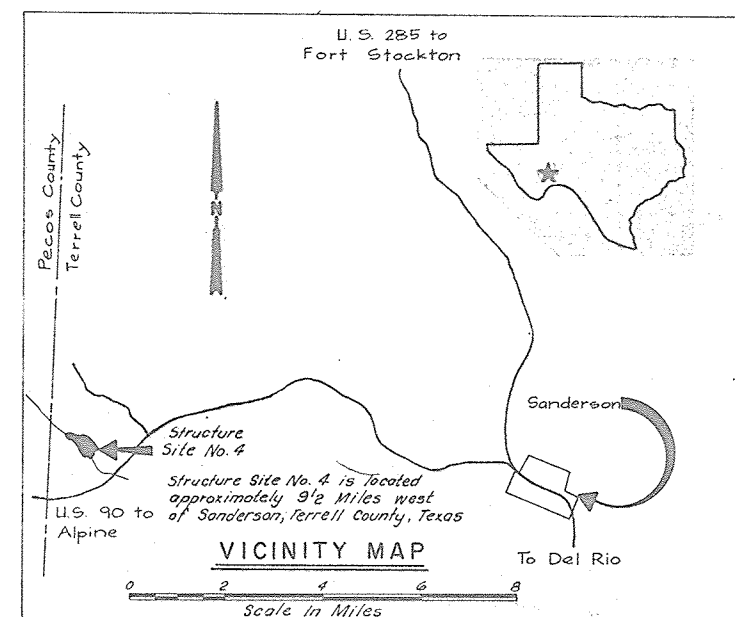
CONSTRUCTION DRAWINGS APPROVED
Kevin C. Vittoria Approved by letter dated 8-30-79
STATE CONSERVATION ENGR. S.C.S. DATE
TEMPLE, TEXAS

John S. Almon, P.E.
BENHAM-BLAIR & AFFILIATES, INC. DATE
SAN ANTONIO, TEXAS



REPRINTED W/MINOR REVISIONS BY SCS - 6/84

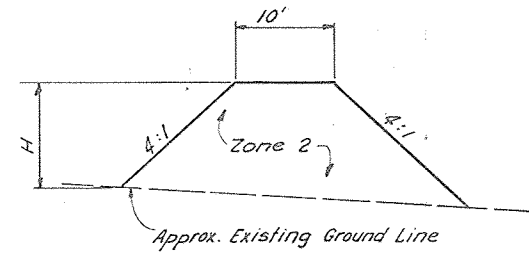
INDEX OF DRAWINGS	
Sheet No.	Title
1	General Plan of Reservoir
2	Plan of Embankment and Spillways
3	Embankment Plan and Profile
4	Material Placement
5-6	Principal Spillway - Plan and Section
7	Emergency Spillway - Plan and Profile
8	Plan and Sections of Drains
9	Embankment Foundation Drain
10	Pipe Details
11	Principal Spillway Inlet
12-14	Steel Placement - Principal Spillway Inlet
15	Trash Rack, Slide Gate & Pipe Cantilever Support Details
16	Principal Spillway Inlet Scour Apron
17	Port Trash Rack
18-24	Plan and Profile for Geologic Investigations



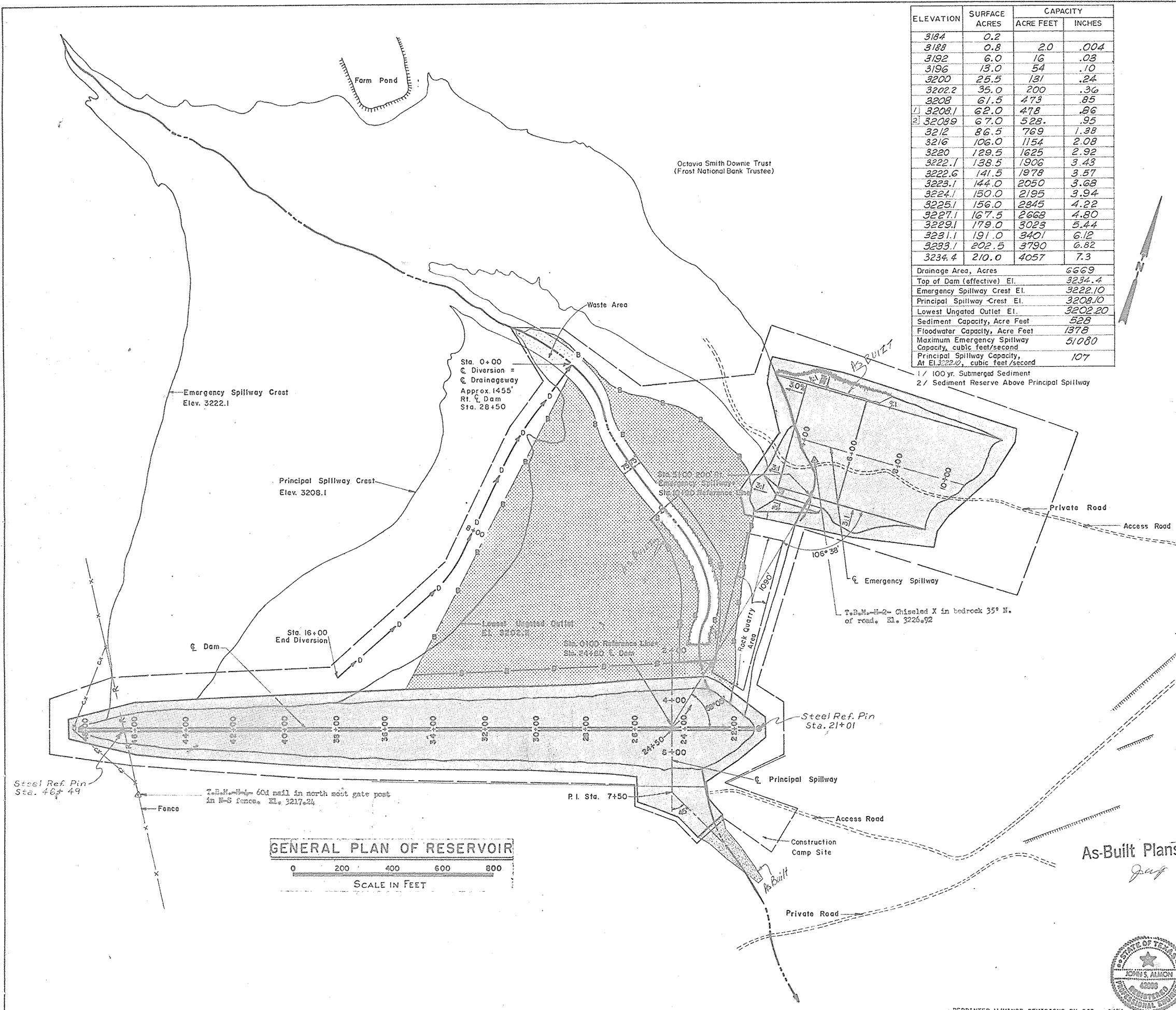
BENHAM - BLAIR & AFFILIATES, INC.
ARCHITECTS ENGINEERS PLANNERS CONSULTANTS
SUITE 470 SOUTH TOWER S.P.M. LIFE BUILDING SAN ANTONIO, TEXAS

Drawing No
4-E-36,853

ELEVATION	SURFACE ACRES	CAPACITY	
		ACRE FEET	INCHES
3184	0.2		
3188	0.8	2.0	.004
3192	6.0	16	.03
3196	13.0	54	.10
3200	25.5	131	.24
3202.2	35.0	200	.36
3208	61.5	473	.85
3208.1	62.0	478	.86
3208.9	67.0	528	.95
3212	86.5	769	1.38
3216	106.0	1154	2.08
3220	129.5	1625	2.92
3222.1	138.5	1906	3.43
3222.6	141.5	1978	3.57
3223.1	144.0	2050	3.68
3224.1	150.0	2195	3.94
3225.1	156.0	2345	4.22
3227.1	167.5	2668	4.80
3229.1	179.0	3023	5.44
3231.1	191.0	3401	6.12
3233.1	202.5	3790	6.82
3234.4	210.0	4057	7.3
Drainage Area, Acres		6669	
Top of Dam (effective) El.		3234.4	
Emergency Spillway Crest El.		3222.10	
Principal Spillway Crest El.		3208.10	
Lowest Ungated Outlet El.		3202.20	
Sediment Capacity, Acre Feet		528	
Floodwater Capacity, Acre Feet		1378	
Maximum Emergency Spillway Capacity, cubic feet/second		51080	
Principal Spillway Capacity, At El. 3222.10, cubic feet/second		107	
1 / 100 yr. Submerged Sediment			
2 / Sediment Reserve Above Principal Spillway			



TYPICAL DIVERSION SECTION
 From Sta. 0+00 to 8+00, H = 3.5'
 From Sta. 8+00 to 16+00, H = 3.0'



LEGEND

-----	Limits of Area to be Cleared, and Grubbed.
-----	Limits of Area to be Cleared, and Grubbed.
-----	Limits of Work Area.
-----	Limits of Borrow Area.
-----	Fence to be Removed By Contractor
-----	Fence to be Constructed by S.C.S.
-----	Existing Spreader Terrace
-----	Diversion to be Constructed

As-Built Plans
guy

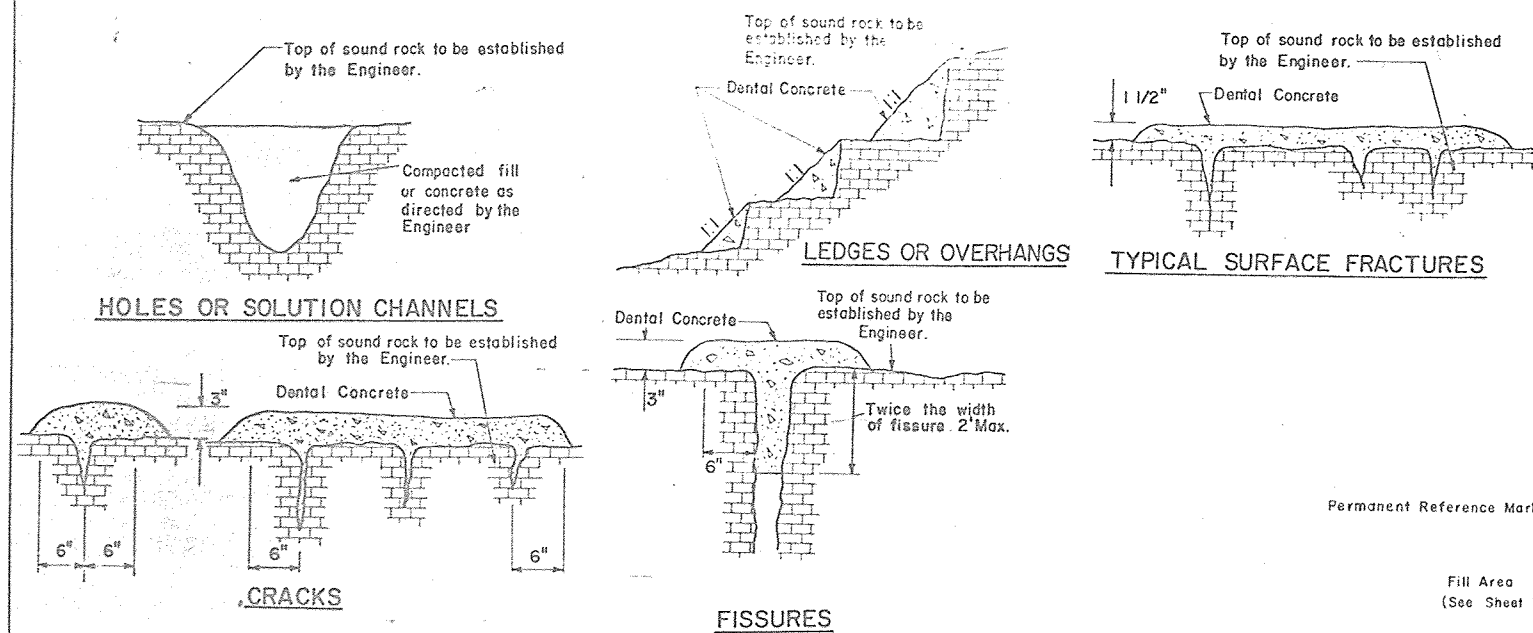
GENERAL PLAN OF RESERVOIR
 FLOODWATER RETARDING STRUCTURE SITE NO. 4
 SANDERSON CANYON WATERSHED
 IN
 BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

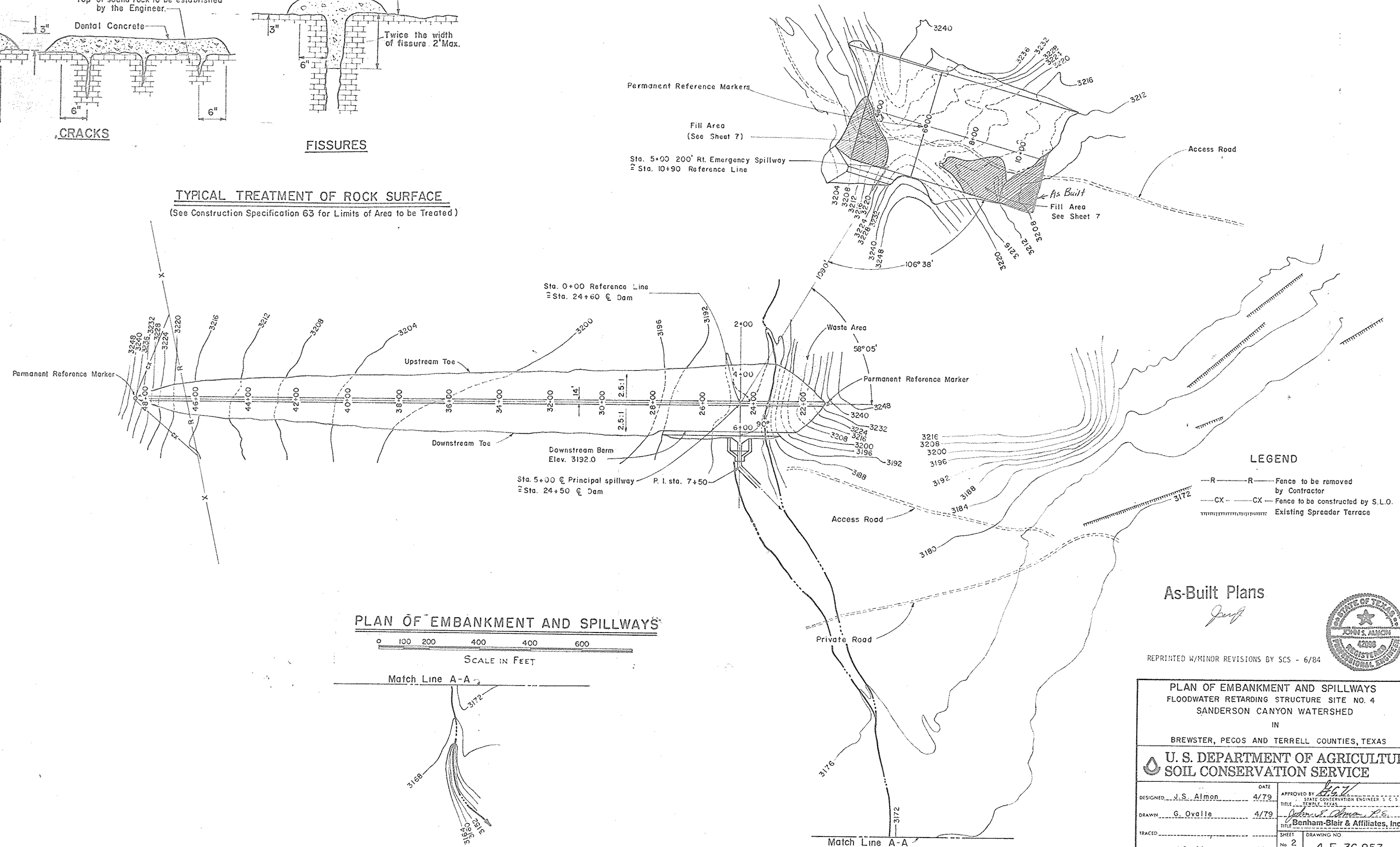
DESIGNED BY	J.S. Almon	DATE	4/79	APPROVED BY	<i>[Signature]</i>
DRAWN BY	G. O'ville	DATE	4/79	TITLE	STATE CONSERVATION ENGINEER S. C. S.
TRACED BY		DATE		TITLE	<i>[Signature]</i> Benham-Blair & Affiliates, Inc.
CHECKED BY	J.S. Almon	DATE	4/79	SHEET	No. 1 of 24
				DRAWING NO.	4-E-36,853



REPRINTED W/MINOR REVISIONS BY SCS - 6/84

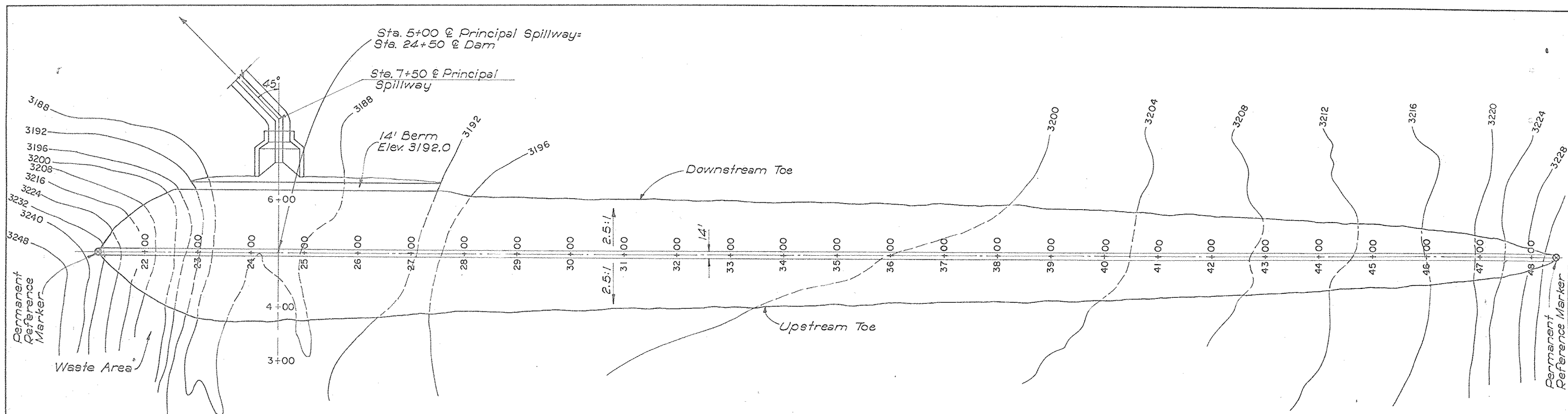


TYPICAL TREATMENT OF ROCK SURFACE
(See Construction Specification 63 for Limits of Area to be Treated)

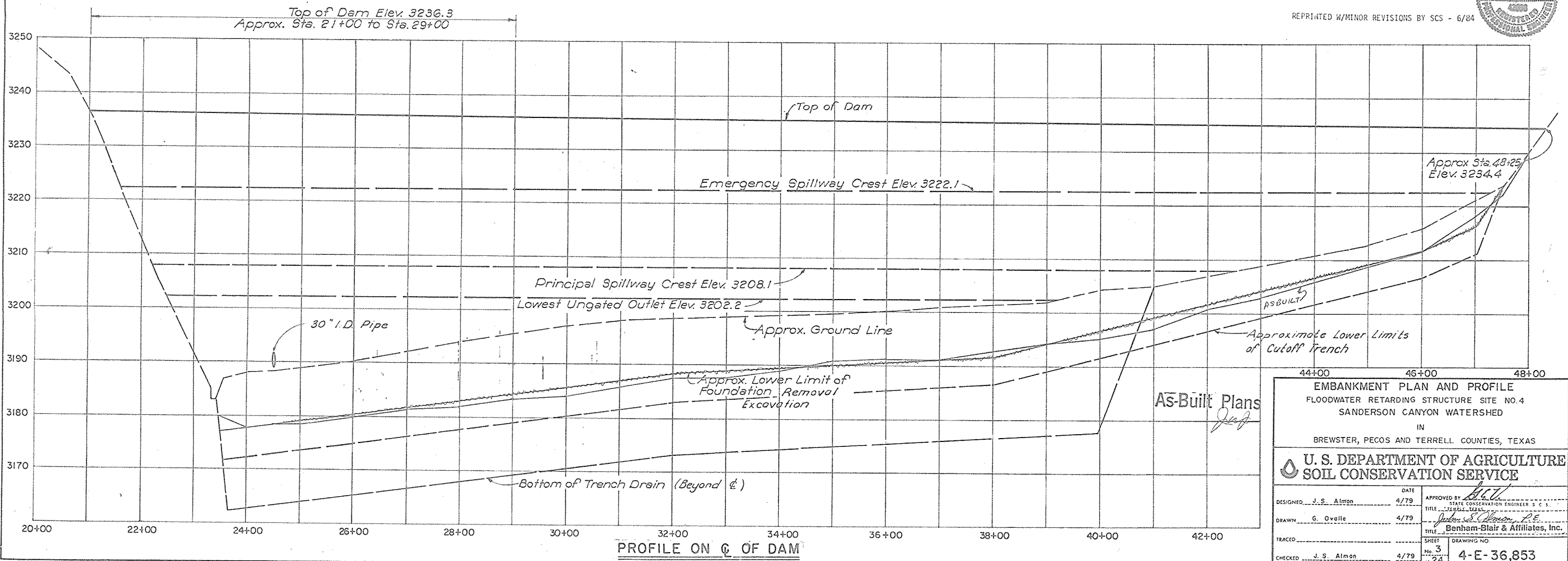
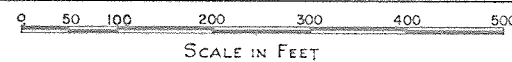


REPRINTED W/MINOR REVISIONS BY SCS - 6/84

PLAN OF EMBANKMENT AND SPILLWAYS FLOODWATER RETARDING STRUCTURE SITE NO. 4 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS			
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
DESIGNED	J. S. Almon	DATE	4/79
DRAWN	G. Ovalle	DATE	4/79
CHECKED	J. S. Almon	DATE	4/79
APPROVED BY		DATE	
John S. Almon, P.E.		4/79	
Benham-Blair & Associates, Inc.		DRAWING NO.	
SHEET		DRAWING NO.	
No. 2		4-E-36,853	
of 24			

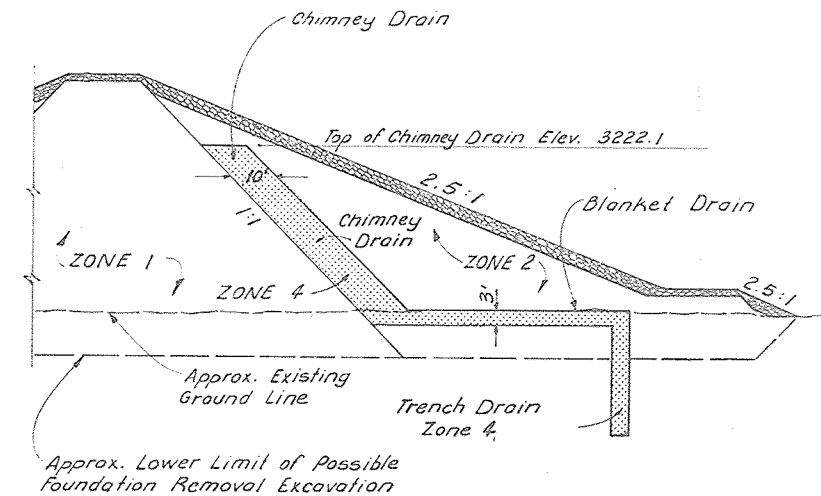
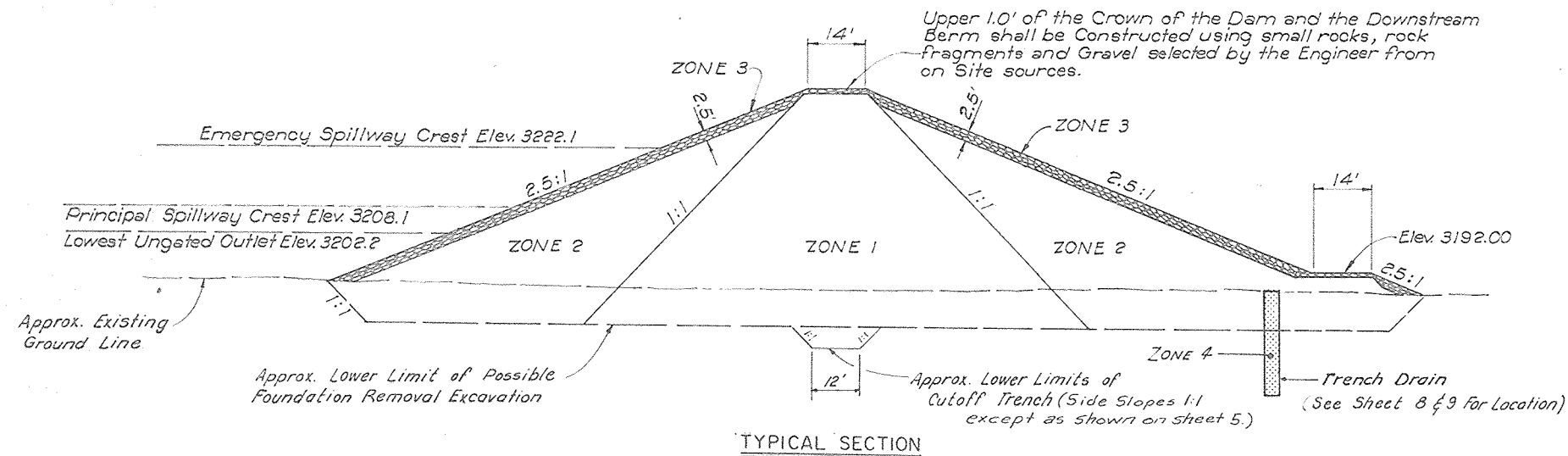


PLAN OF EMBANKMENT AND SPILLWAYS



REPRINTED W/MINOR REVISIONS BY SCS - 6/84

EMBANKMENT PLAN AND PROFILE FLOODWATER RETARDING STRUCTURE SITE NO. 4 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
DESIGNED BY	J. S. Almon	DATE	4/79
DRAWN BY	G. Oville	DATE	4/79
CHECKED BY	J. S. Almon	DATE	4/79
APPROVED BY	J. S. Almon	DATE	4/79
TITLE Benham-Blair & Associates, Inc.		SHEET No. 3 of 24	
DRAWING NO. 4-E-36,853		DATE 4/79	



TYPICAL SECTION
LEFT ABUTMENT TO DAM STA 25+50

MATERIALS PLACEMENT DATA

Embankment Zone No.	Type or Unified Classification	Field Control Test		Placement and Compaction Requirements					
		ASTM Test		Max. Allowable Particle Size	Max. Uncompacted Layer Thickness	Specified Compaction Class	Min. Dry Density, Percent of Field Test Max. Dry Density	Moisture Limits, Relative to Field Test Optimum %	
		Number	Method					From	To
1	CL; Silty Clay	D-698	A or B	6"	9"	A	95	Opt.	Up
1	CL; Gravelly Sandy Clay	D-698	A or B	6"	9"	A	95	Opt.	Up
2	SC/GC; Clayey Gravelly Sand	D-698 Moisture Only	A or B	6"	9"	2/C	-	Opt.	Up
3	Rockfill	-	-	24"	36"	III	-	-	-
4	Drains - Sand and Gravel	-	-	-	-	5/	-	-	-

ZONED EMBANKMENT DATA

1/ The zone boundaries shown in the typical section are approximate. They may be varied as permitted by the Engineer, to allow the use of all suitable and needed materials from the required excavations.

2/ Class C compaction shall be accomplished by a minimum of 4 complete passes per layer of tamping roller weighing not less than 1200 pounds per foot of roller width at a towing or traveling speed of 2 mph or greater.

3/ Rock shall be reasonably well graded from a maximum particle size of 24" down to the 6" size with not less than 50% by weight larger than 12". Sizing of oversized rock materials from the required excavations or quarry area to meet the specified gradations will be required. No special compaction or moisture control will be required. Up to 5% of materials finer than the 6" size will be permitted. (See Construction Specification 25A)

4/ Gradation Requirements shown on sheet 9.

5/ Refer to Construction Specification 24 for drain fill compaction requirements.

As-Built Plans

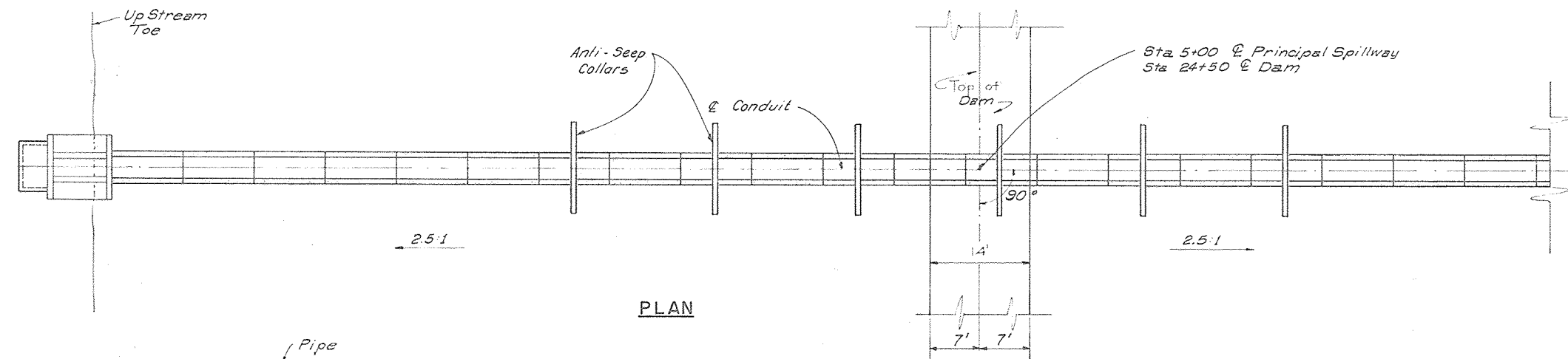
NO CHANGES IN CONSTRUCTION

guf

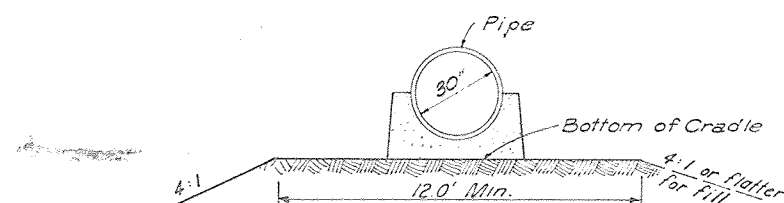


REPRINTED W/MINOR REVISIONS BY SCS - 6/84

MATERIAL PLACEMENT FLOODWATER RETARDING STRUCTURE SITE NO. 4 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS			
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
DESIGNED	J. S. Almon	DATE	4/79
DRAWN	G. Ovalle	DATE	4/79
CHECKED	J. S. Almon	DATE	4/79
APPROVED BY		APPROVED BY	
STATE CONSERVATION ENGINEER S. C. S.		STATE CONSERVATION ENGINEER S. C. S.	
TITLE		TITLE	
Bonham-Blair & Associates, Inc.		Bonham-Blair & Associates, Inc.	
SHEET		DRAWING NO.	
No. 4		4-E-36,853	

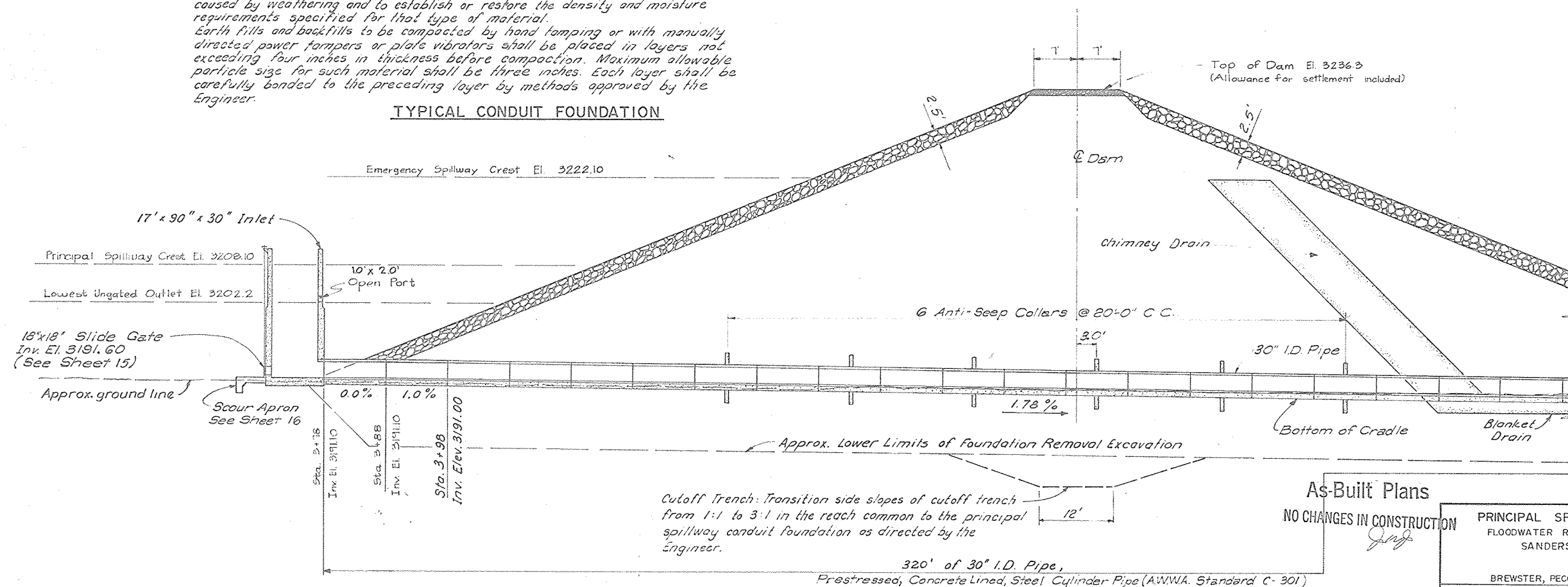


PLAN



Prior to placing fill material around the completed conduit, the exposed earth surfaces shall be reworked as necessary and to the depth necessary to remove all cracks caused by weathering and to establish or restore the density and moisture requirements specified for that type of material. Earth fills and backfills to be compacted by hand tamping or with manually directed power tampers or plate vibrators shall be placed in layers not exceeding four inches in thickness before compaction. Maximum allowable particle size for such material shall be three inches. Each layer shall be carefully bonded to the preceding layer by methods approved by the Engineer.

TYPICAL CONDUIT FOUNDATION

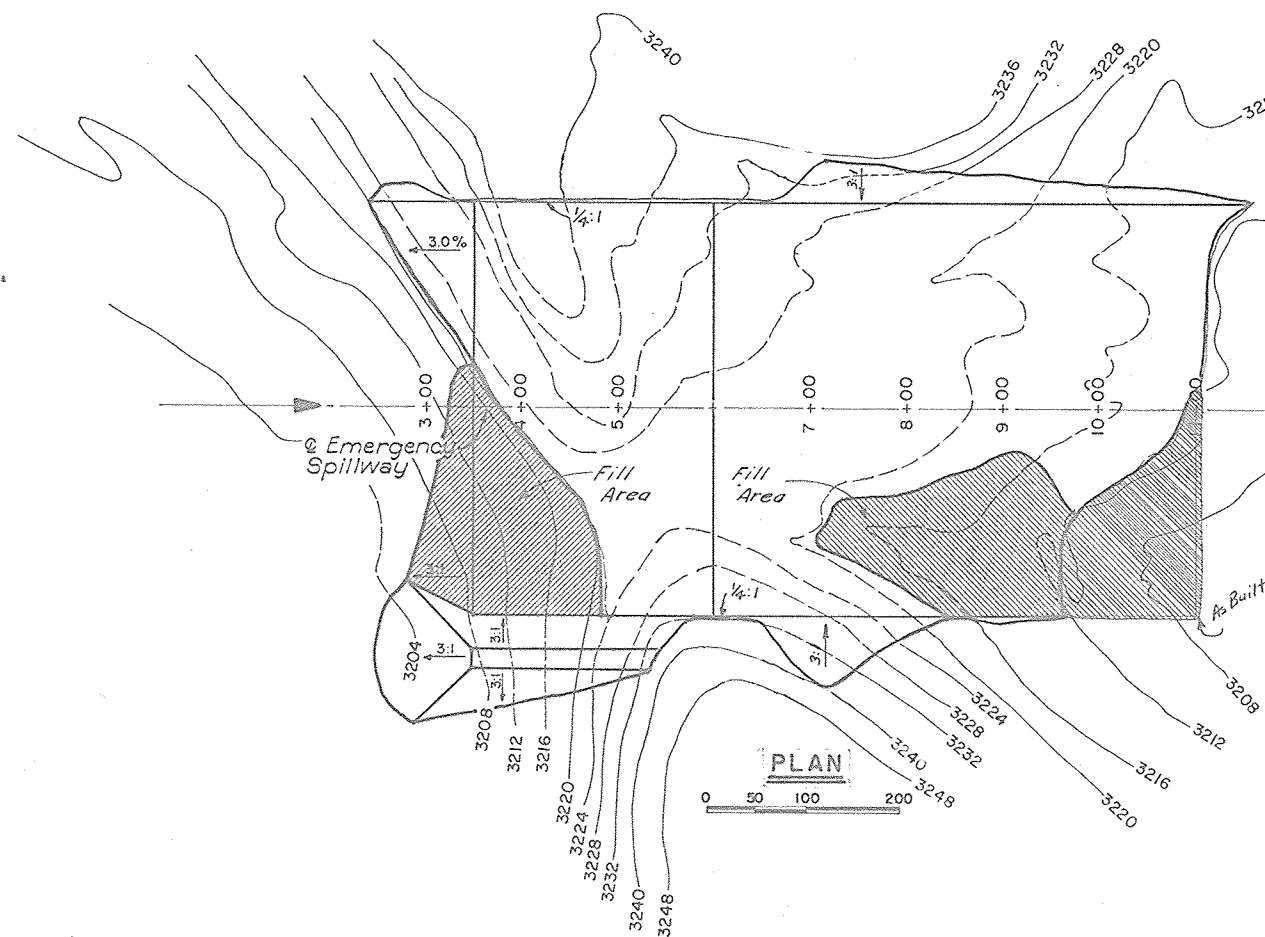


SECTION
PRINCIPAL SPILLWAY

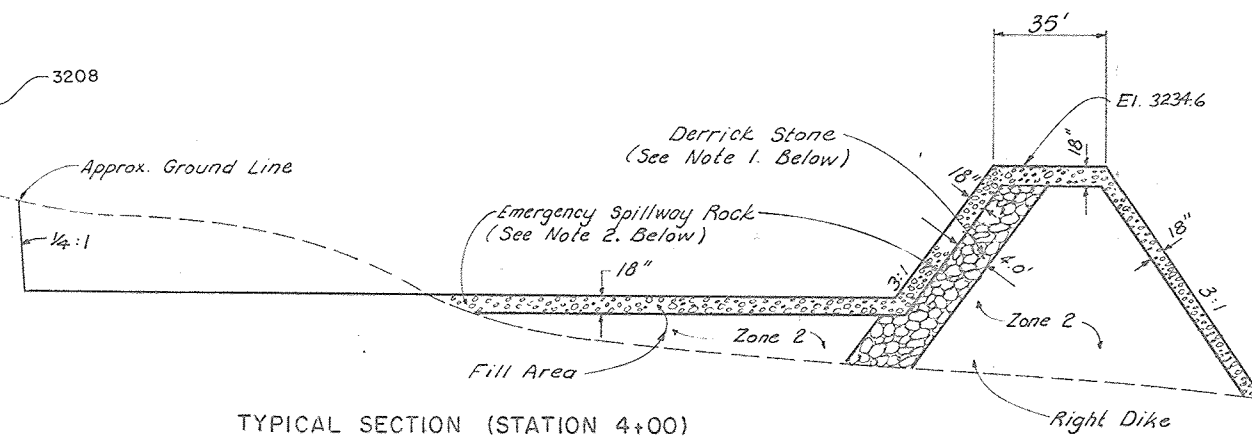
As-Built Plans
NO CHANGES IN CONSTRUCTION

PRINCIPAL SPILLWAY- PLAN AND SECTION FLOODWATER RETARDING STRUCTURE SITE NO. 4 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS			
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
DESIGNED	J. S. Almon	DATE	4/79
DRAWN	G. Ovalle	DATE	4/79
CHECKED	J. S. Almon	DATE	4/79
APPROVED BY J. S. Almon, P.E. Benham-Blair & Associates, Inc.		SHEET No. 5 of 24	
DRAWING NO. 4-E-36,853		REPRINTED W/MINOR REVISIONS BY SCS - 6/84	



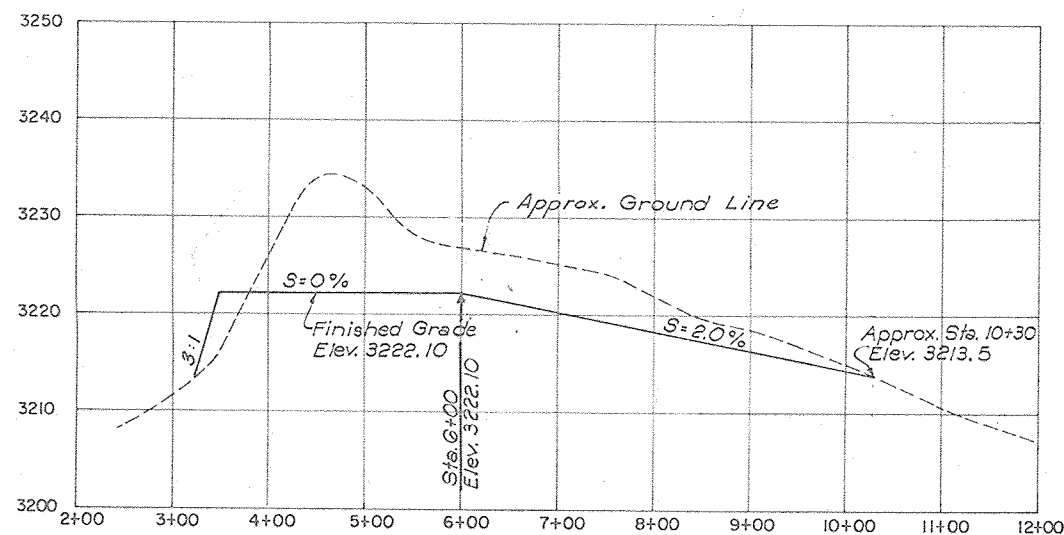


Note: Presplitting of the Emergency Spillway Side Slopes will be required. (See Construction Specification 484.)



TYPICAL SECTION - EMERGENCY SPILLWAY

- Notes:
- 1) The rock used for the derrick stone shall be harvested or produced stone that shall have individual or stone weights ranging from 1400 to 4000 pounds. The derrick stone shall be placed so as to produce a reasonably dense fill with a minimum of voids. (See Construction Specification 61.) Approx. 2,660 cubic yards Derrick Stone required.
 - 2) Areas of Emergency Spillway floor and side slopes where durable rock is not exposed at grade shall be overexcavated a minimum of 18" and brought back to grade with rock riprap material. Emergency Spillway rock shall be reasonably well graded from a max. rock size of 18 inches down to the 4 inch size with not more than 50% by weight smaller than 12 inches. Sizing of oversized rock materials from the required excavations or quarry area to meet the specified gradation will be required. No special compaction or moisture control will be required. See Construction Specification 25. Approximately 4,536 cubic yards Emergency Spillway rock required.



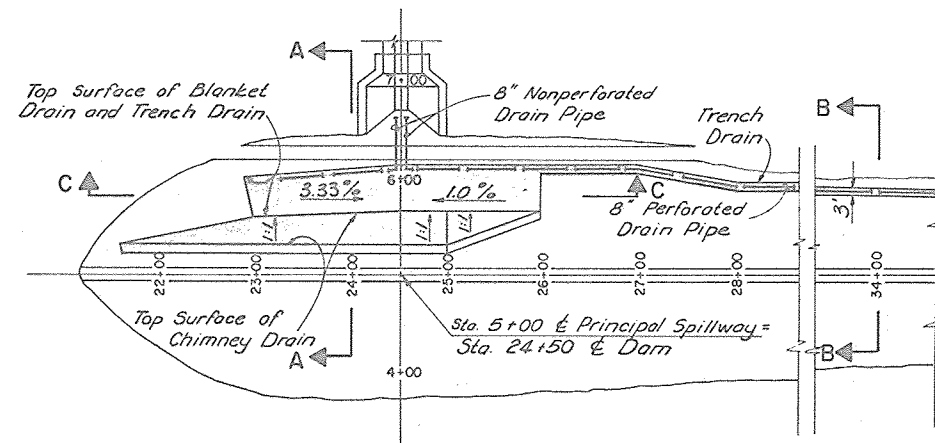
PROFILE ON C OF EMERGENCY SPILLWAY

As-Built Plans

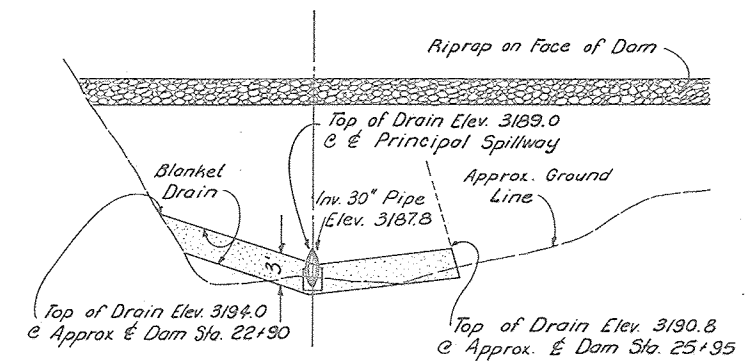


REPRINTED W/MINOR REVISIONS BY SCS - 6/84

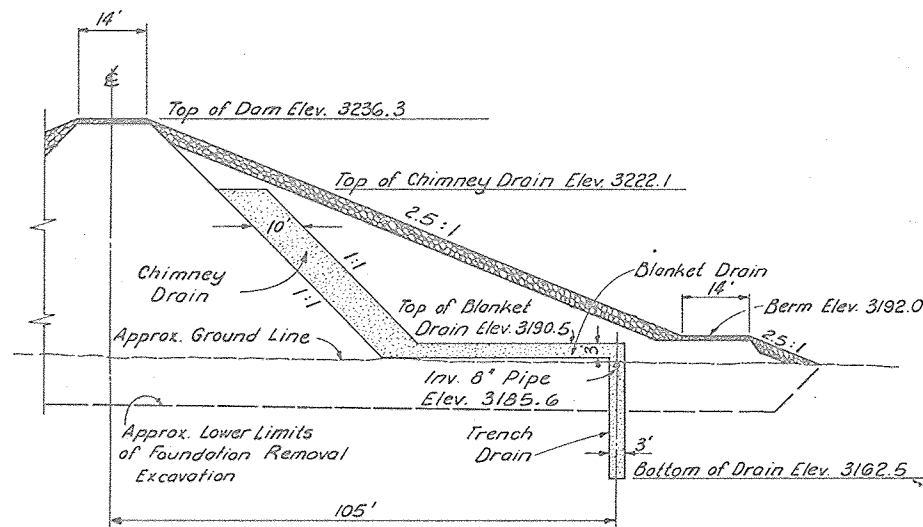
EMERGENCY SPILLWAY PLAN AND PROFILE FLOODWATER RETARDING STRUCTURE SITE NO.4 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS			
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
DESIGNED	J. S. Almon	DATE	4/79
DRAWN	G. Ovalle	DATE	4/79
CHECKED	J. S. Almon	DATE	4/79
APPROVED BY		DATE	
[Signature]		4/79	
TITLE		DRAWING NO.	
Benham-Blair & Associates, Inc.		4-E-36, 853	



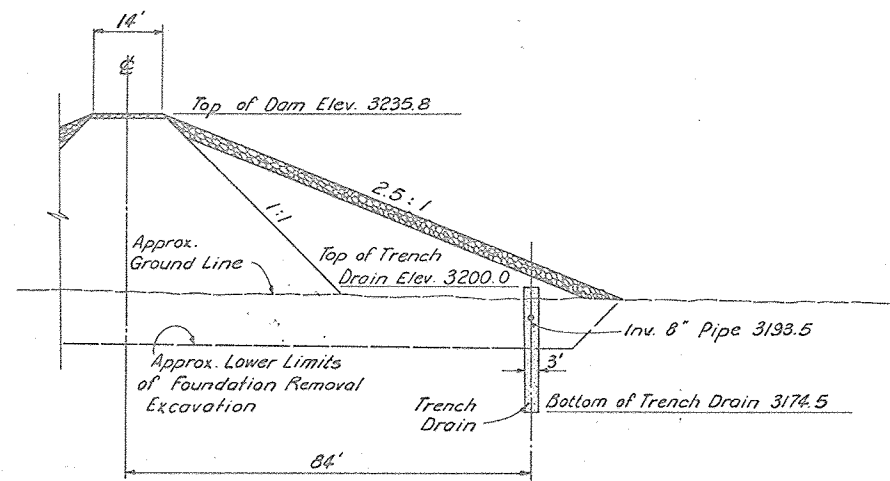
PLAN OF DRAINS



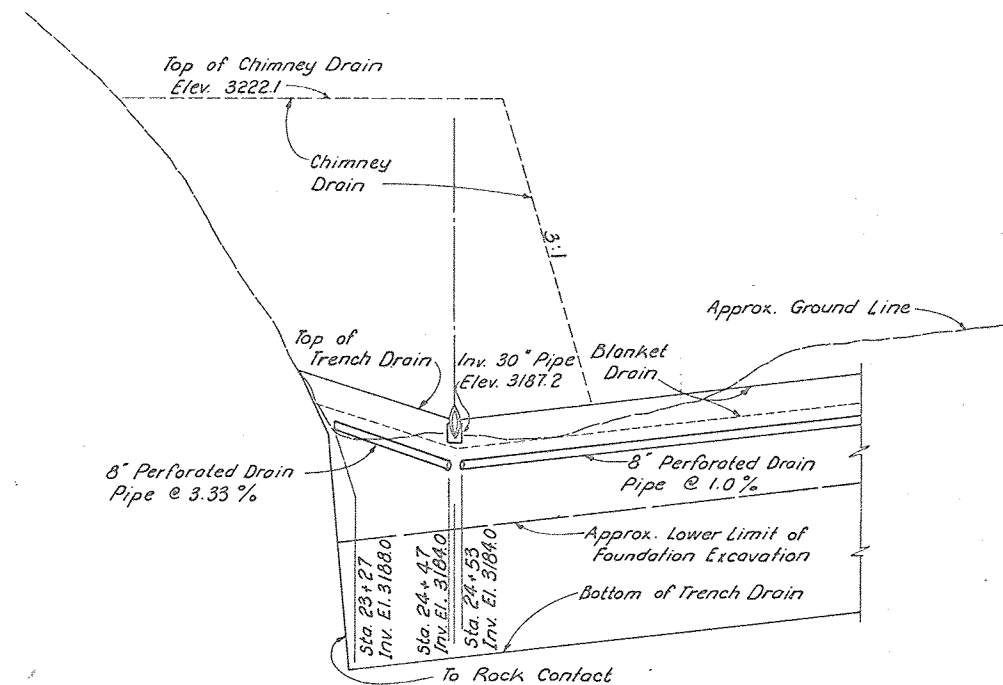
SECTION C-C
@ PRINCIPAL SPWY. STA. 5+80



SECTION A-A
@ DAM STA. 24+00



SECTION B-B
@ DAM STA. 34+00

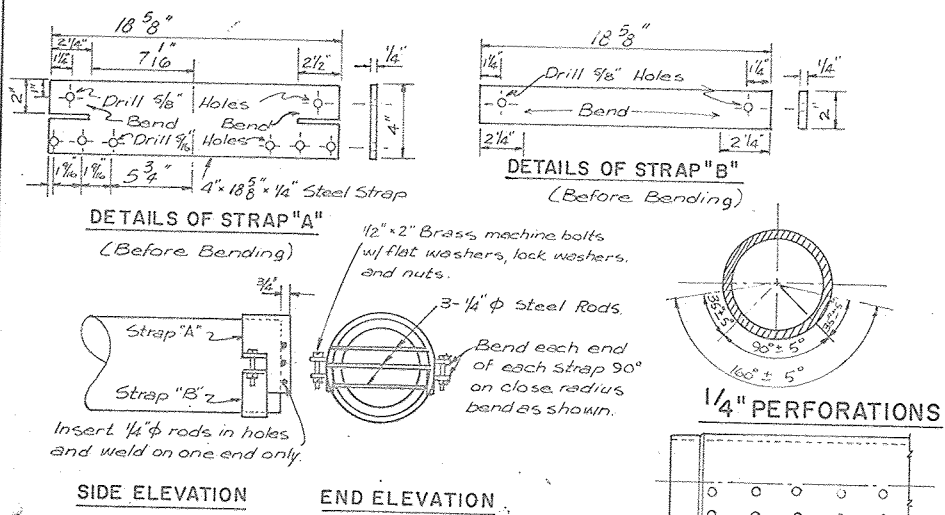
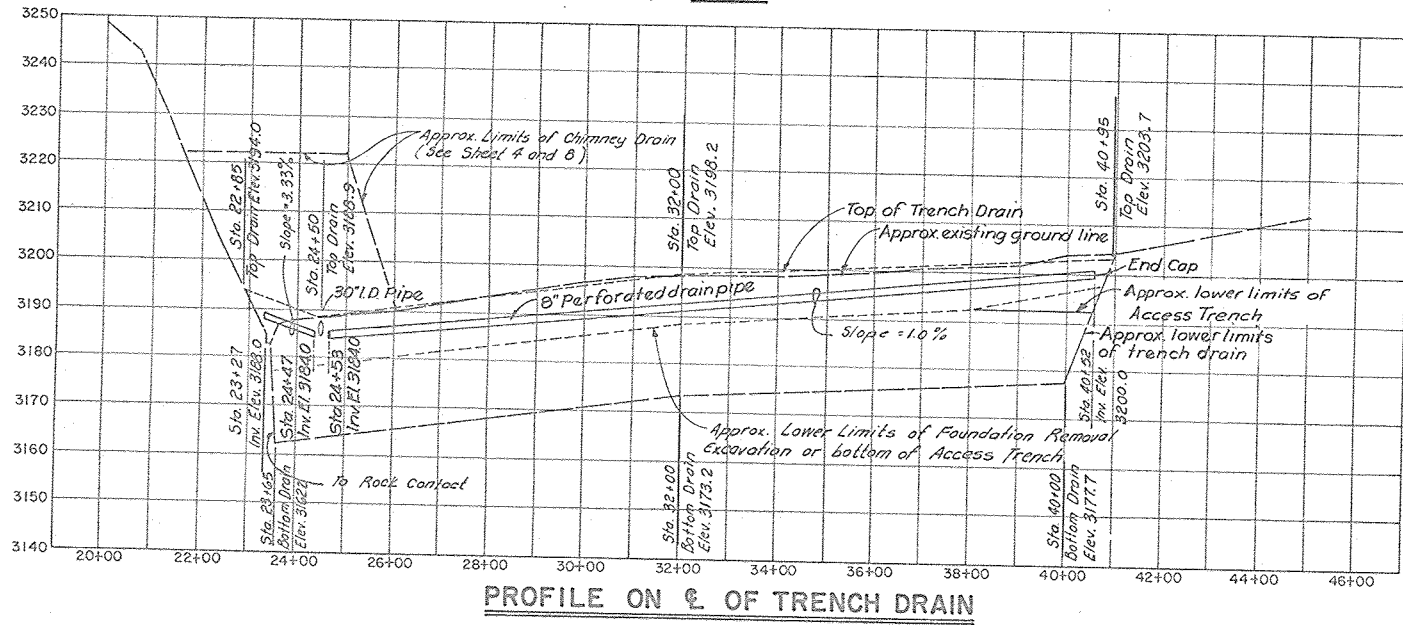
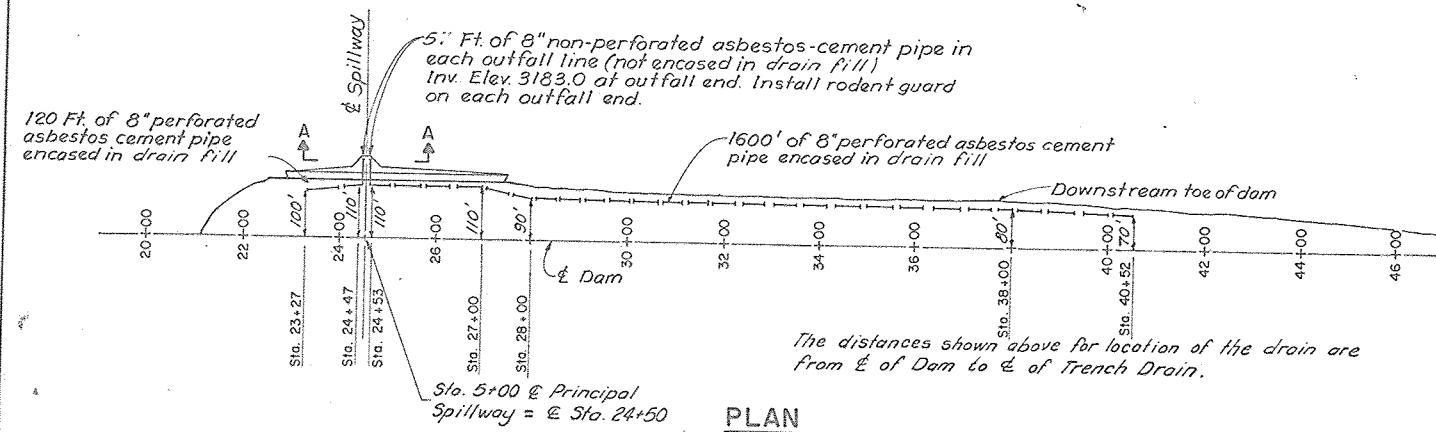


SECTION AT @ OF TRENCH DRAIN
As-Built Plans
NO CHANGES IN CONSTRUCTION

REPRINTED W/MINOR REVISIONS BY SCS - 6/84



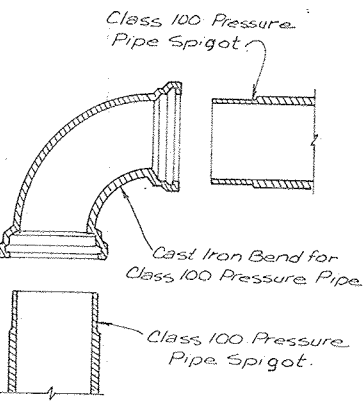
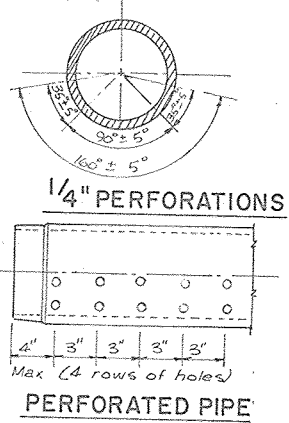
PLAN AND SECTIONS OF DRAINS FLOODWATER RETARDING STRUCTURE SITE NO. 4 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS			
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
DESIGNED	J. S. Almon	DATE	4/79
DRAWN	G. O'valle	DATE	4/79
TRACED		SHEET	8 of 24
CHECKED	J. S. Almon	DATE	4/79
APPROVED BY			
TITLE		John S. Almon, P.E. Title: Engineer & Affiliates, Inc.	
DRAWING NO.		4-E-36,853	



Note: Bend Straps A and B on a radius 1/16" larger than the outside diameter of the asbestos cement pipe. Cut off tapered end of the asbestos cement pipe and install the rodent guard so that the asbestos cement pipe has full wall thickness at point of installation. Install with rods horizontal. All materials (except brass) shall be galvanized after fabrication.

RODENT GUARD DETAILS
(2 REQUIRED)

NOTE: The bottom of the Access Trench shall not be excavated closer than 15' to the bottom of the Trench Drain unless otherwise approved by the Engineer.



NOTE:

Sectional or phase construction of the trench drain will be permitted. Where the existing ground line or where the lower limits of previous excavations is below the elevation of the top of the trench drain, earth fill shall be placed to the top of the trench drain prior to excavation of the trench drain. Backfill shall be of relatively pervious site materials selected by the Engineer and shall be measured and paid for as "Earth Fill, Embankment".

Backfill of the access trench and fill adjacent to or above the top of the trench drain shall be relatively pervious onsite material, as selected by the Engineer. The Engineer may require stockpiling of these materials. The fill shall be placed and paid for as "Earth Fill, Embankment".

DRAIN FILL REQUIREMENTS

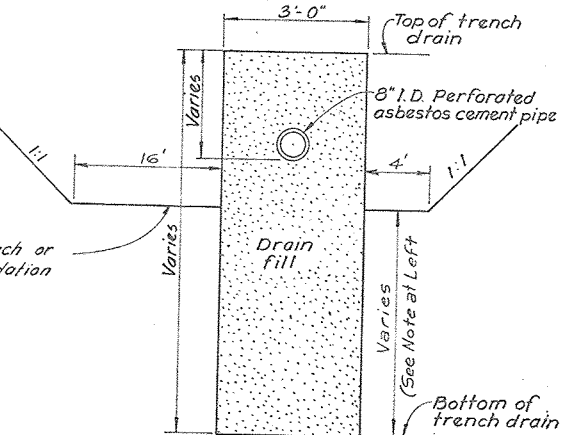
Installation and materials quality shall comply with the requirements of Construction Specification 24 and Materials Specification 521.

The drain fill shall comply with the gradation requirements for one of the following:

- ASTM, C-33, Coarse Concrete Aggregate, Size No. 7
- ASTM, C-33, Coarse Concrete Aggregate, Size No. 57
- ASTM, C-33, Coarse Concrete Aggregate, Size No. 67

Or any other aggregate that will grade within the following limits:

SIEVE SIZE	% PASSING BY WEIGHT
1-1/2"	100
1"	95 - 100
1/2"	25 - 100
3/8"	20 - 75
No. 4	0 - 25
No. 8	0 - 10
No. 16	0 - 5
No. 200	0 - 5



Note: Bends shall be 90°, 45°, 22 1/2°, or 11 1/4° as designated on the Plan and shall comply with the requirements of Material Specification 545.

For changes in horizontal or vertical alignment which are less than 10° or which differ from the standard bends mentioned above, the alignment change not taken up by the standard bend, shall be made by deflection of an equal number of pipe sections on either side of the point of intersection of the alignment shown. No angle of deflection for a single pipe joint shall exceed 4° or 7 1/2°.

Tees, Crosses, Wyes, and Reducers, if required, shall be the same as specified for Bends. Deflection of pipe sections, if required to complete alignment changes shall be the same as specified for Bends.

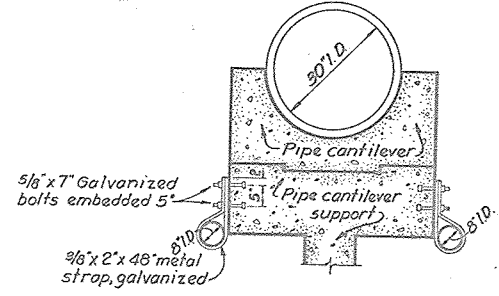
Notes:

Excavations for the Trench Drain shall have vertical sides and be 3.0' wide as shown in the Typical Section. (See Construction Specification 24.)

Place a minimum 2.0 ft. thickness of fill immediately above and adjacent to the top of the trench drain using relatively pervious site materials selected by the Engineer. This fill to be placed and paid for as "Earth Fill, Embankment".

Approximately 2,058 Cu.Yds. of drain fill are required for the chimney and blanket drain.

Approximately 4,758 Cu.Yds. of drain fill are required for the trench drain.



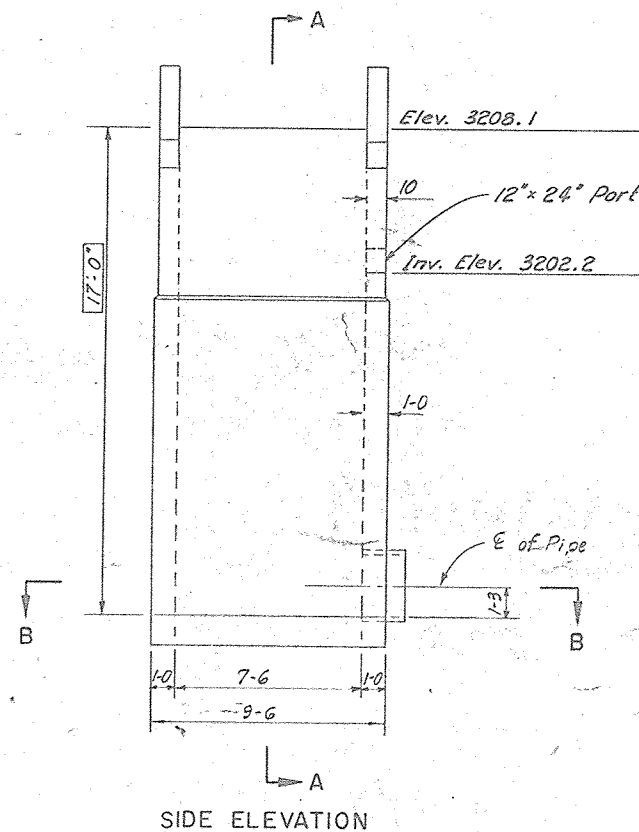
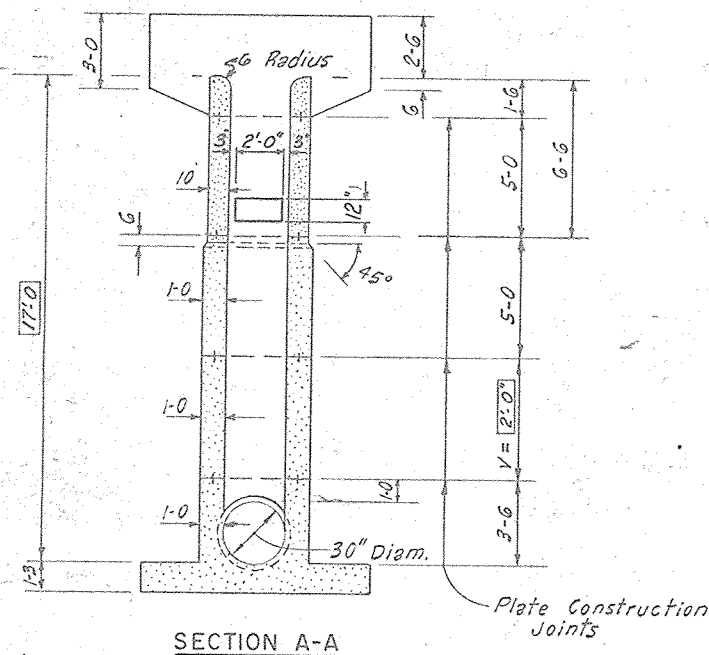
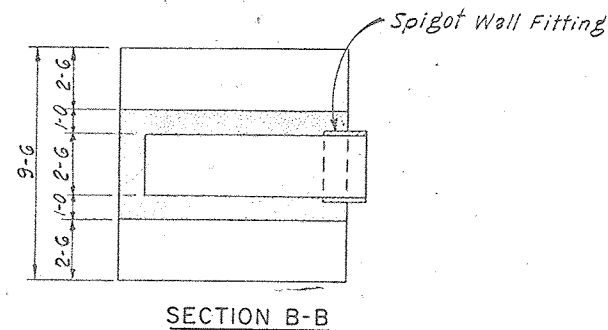
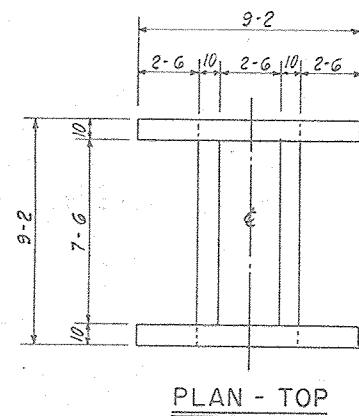
The last section of each outfall pipe shall be fastened to the pipe cantilever support with a strap and 2 bolts as shown. Each of the last two sections in each outfall line shall be a minimum 10 ft. in length. 1 strap and 2 bolts are required for each outfall line. The straps and bolts shall be galvanized. The end of the drain pipe will extend approx. 4 ft. beyond the E of the pipe cantilever support, located at Sta. 6+63 @ Principal Spillway.

Note: All Asbestos-Cement Pipe and Couplings shall be Class 100, Pressure Pipe and shall conform to the requirements of Materials Specification 545.

The bedding of perforated pipe, installed in the drain fill shall be ordinary bedding providing uniform and continuous bedding contact throughout the entire line. Joining shall be in accordance with the manufacturer's recommendations. Tamping of the drain fill under and on the sides and top of the pipe will be required only to the extent necessary to eliminate voids or empty pockets. The installation of the non-perforated pipe shall be with ordinary bedding that provides uniform and continuous bedding contact throughout the entire line. Joining shall be in accordance with the manufacturer's recommendations. Backfill and compaction shall be as specified in Construction Specification 23A.

As-Built Plans
NO CHANGES IN CONSTRUCTION

EMBANKMENT FOUNDATION DRAIN			
FLOODWATER RETARDING STRUCTURE SITE NO. 4 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS, AND TERRELL COUNTIES, TEXAS			
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
DESIGNED BY J. S. Almon	DATE 4/79	APPROVED BY [Signature]	DATE 4/79
DRAWN BY G. Oyalls	DATE 4/79	TITLE	Benham-Blair & Associates, Inc.
CHECKED BY J. S. Almon	DATE 4/79	SHEET No. 9 of 24	DRAWING NO. 4-E-36,853

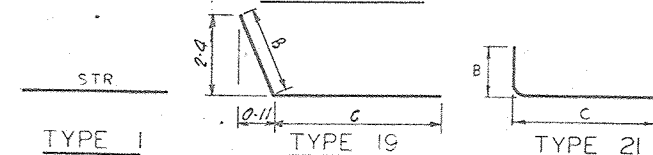


STEEL SCHEDULE

Mark	Size	Quantity	Length	Type	B	C	Total Length	Mark	Size	Quantity	Length	Type	B	C	Total Length
B 1	# 6	10	9-0	1			90-0	T1	# 5	14	6-2	1			86-4
B 2	# 6	10	9-0	1			90-0	T2	# 5	14	6-4	1			88-8
B 3	# 7	34	9-3	21	3-3	6-0	314-6	T3	# 5	8	3-3	1			26-0
B 4	# 6	10	9-0	1			90-0	T4	# 5	12	8-9	1			105-0
B 5	# 6	10	9-0	1			90-0	T5	# 5	36	8-0	21	2-9	5-3	288-0
B 6	# 6	2	3-9	1			7-6	T6	# 5	14	8-3	1			115-6
B 7	# 5	6	7-0	21	1-0	6-0	42-0	T7	# 5	4	6-8	1			26-8
B 8	# 6	3	7-0	21	1-0	6-0	21-0	T8	# 5	12	8-10	1			106-0
B 9	# 5	16	7-0	21	1-0	6-0	112-0	T9	# 5	8	5-3	19	2-6	2-9	42-0
B 10	# 6	10	8-6	1			85-0	T10	# 5	8	3-2	1			25-4
B 11	# 5	5	3-6	1			17-6	T11	# 5	8	3-7	1			28-8
B 12	# 6	3	2-3	1			6-9								
B 13	# 5	2	2-3	1			4-6								
B 14	# 6	10	8-3	21	0-8	5-7	62-6								
B 15	# 6	18	8-9	21	3-1	5-8	157-6								

R 1	# 5	22	8'-7"	1																										
R 2	# 6	6	8-6	1																										
R 3	# 5	4	3-6	1																										
R 4	# 5	26	6'-6"	1																										
R 5	# 5	16	8-3	21	2-10	5-4																								
R 6	# 5	14	8-3	1																										
R 7	# 5	10	3-6	1																										
R 8	# 5	20	3-8	1																										
R 9	# 4	36	8-0	21	2-9	5-3																								
R 10	# 4	4	7-9	21	2-7	5-2																								

BAR TYPES



- Notes:
1. Bar dimensions are out to out of bar.
 2. Radius of bends equals 3 bar diameters for sizes equal to or less than #7.
 3. The 2" and 3" dimensions from face of concrete to steel are clear distances.

As-Built Plans
NO CHANGES IN CONSTRUCTION

- Notes:
1. For Spigot Wall Fitting, See Detail Sheet 10.
 2. For Trash Rack, Grating, Sleeves and Bolts, See Detail Sheet 15.
 3. For Construction Joints, See Detail Sheet 15.
 4. For Port Trash Rack Details, See Sheet 17.



STANDARD OPEN RISER	
STANDARD DWG. NO.	ES-3130-2020R
DATE 3-67	SHEET 1 OF 4
ADAPTED FROM	
STANDARD COVERED RISER	
DESIGN CONSTANTS	$f_c = 4000 \text{ psi}$ $f_s = 1600 \text{ psi}$
	$n = 8$ $f_s = 20,000 \text{ psi}$
STANDARD DWG. NO.	ES-3030-2520R
DATE 5-65	SHEET 1 OF 4

QUANTITIES

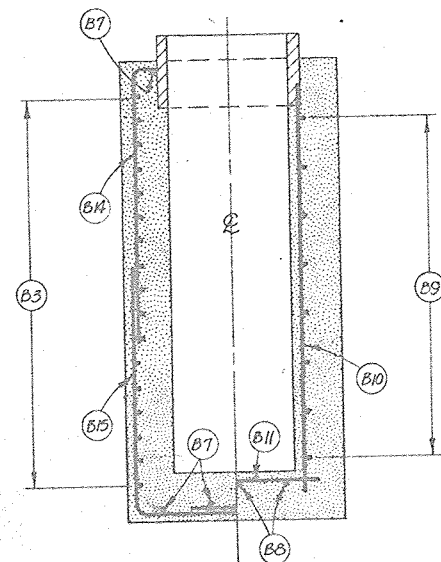
Steel:			
# 4 Bars	319-0	Lin. Ft.	213 Lbs.
# 5 Bars	1841'-10"	Lin. Ft.	1921 Lbs.
# 6 Bars	751'-3"	Lin. Ft.	1128 Lbs.
# 7 Bars	314-6	Lin. Ft.	643 Lbs.
Total			3,905 Lbs.
Length of # 5 Bars = (1338-0) + (Length of Bars R1, R3, R4, and R5).			
Length of # 6 Bars = (700-3) + (Length of Bars R2).			
Total Concrete = (18.03) + (0.89V) = 19.81 Cu. Yds.			

PRINCIPAL SPILLWAY INLET
FLOODWATER RETARDING STRUCTURE SITE NO. 4
SANDERSON CANYON WATERSHED
IN
BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

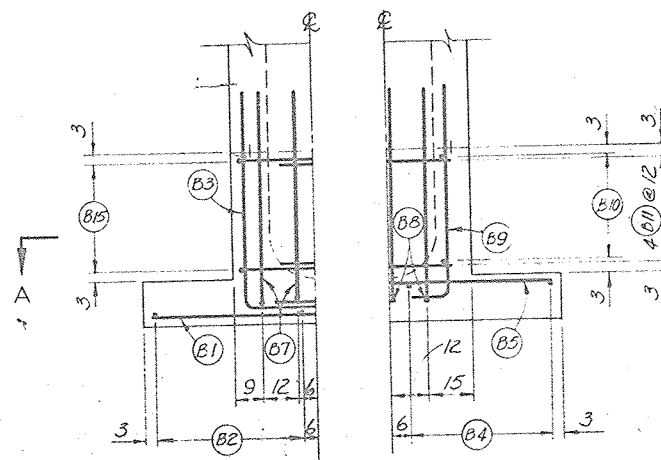
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed J.S. Almon 4/79
Drawn G. Ovalle 4/79
Checked J.S. Almon 4/79

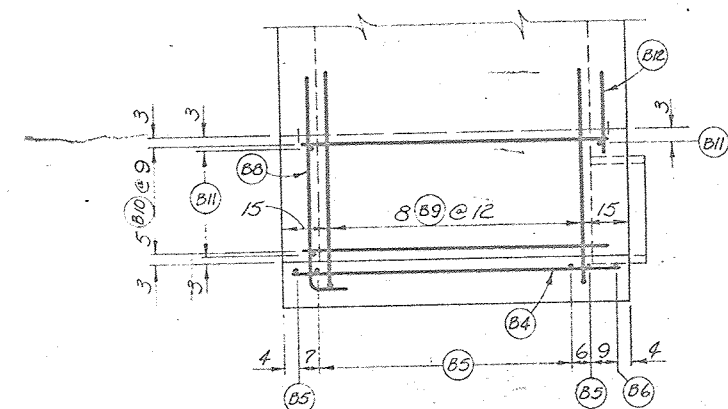
Date 4/79
Approved by John S. Almon, P.E.
Title STATE CONSERVATION ENGINEER'S & C.
Firm Benham-Blair & Associates, Inc.
Sheet 24 of 24
Drawing No. 4-E-36,853



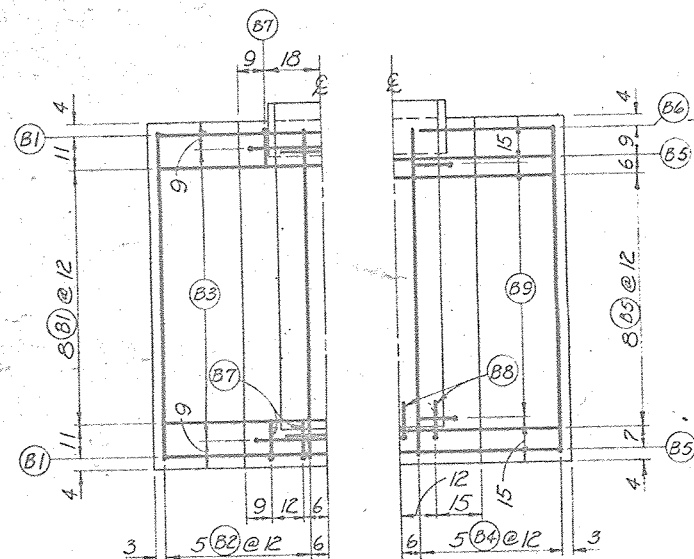
Outside Steel Inside Steel
SECTION A-A
0 1 2 3
Scale in Feet



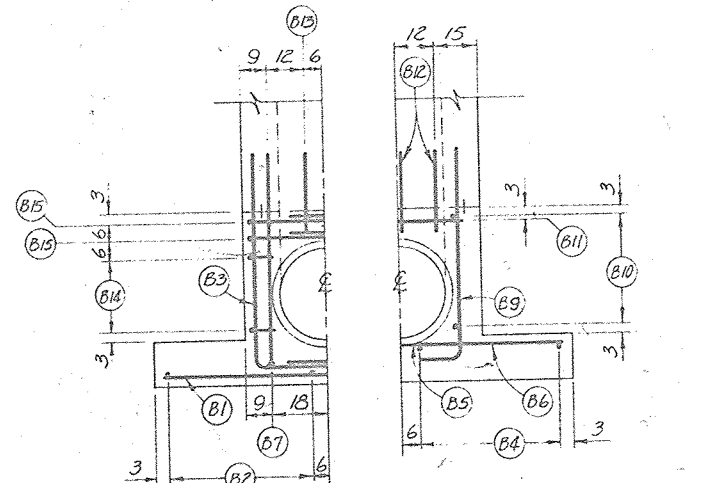
Steel 2" From Outside Face Steel 2" From Inside Face
UPSTREAM ELEVATION

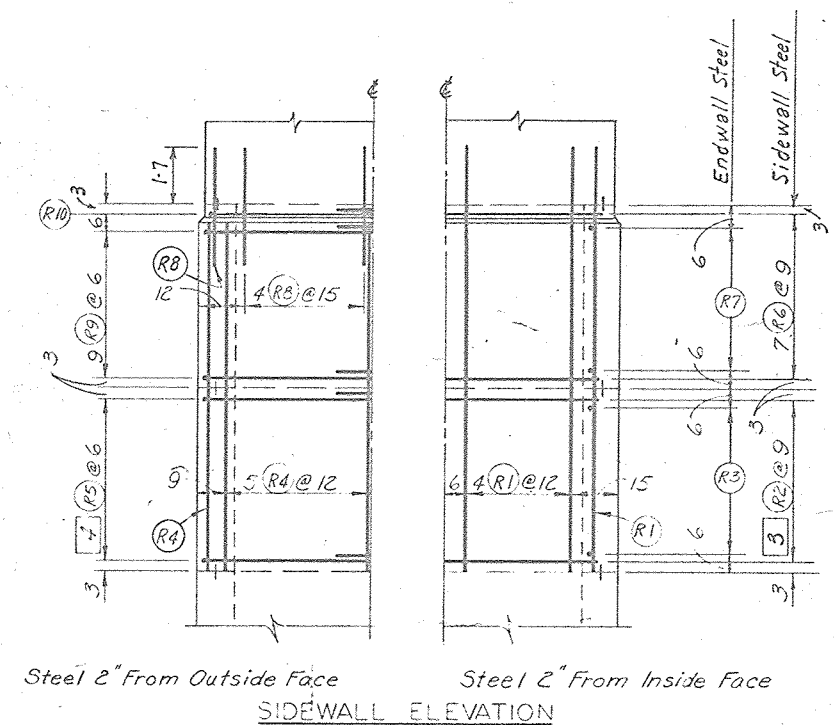


Steel 2" From Inside Face and 2" From Top of Footing
SIDEWALL ELEVATION



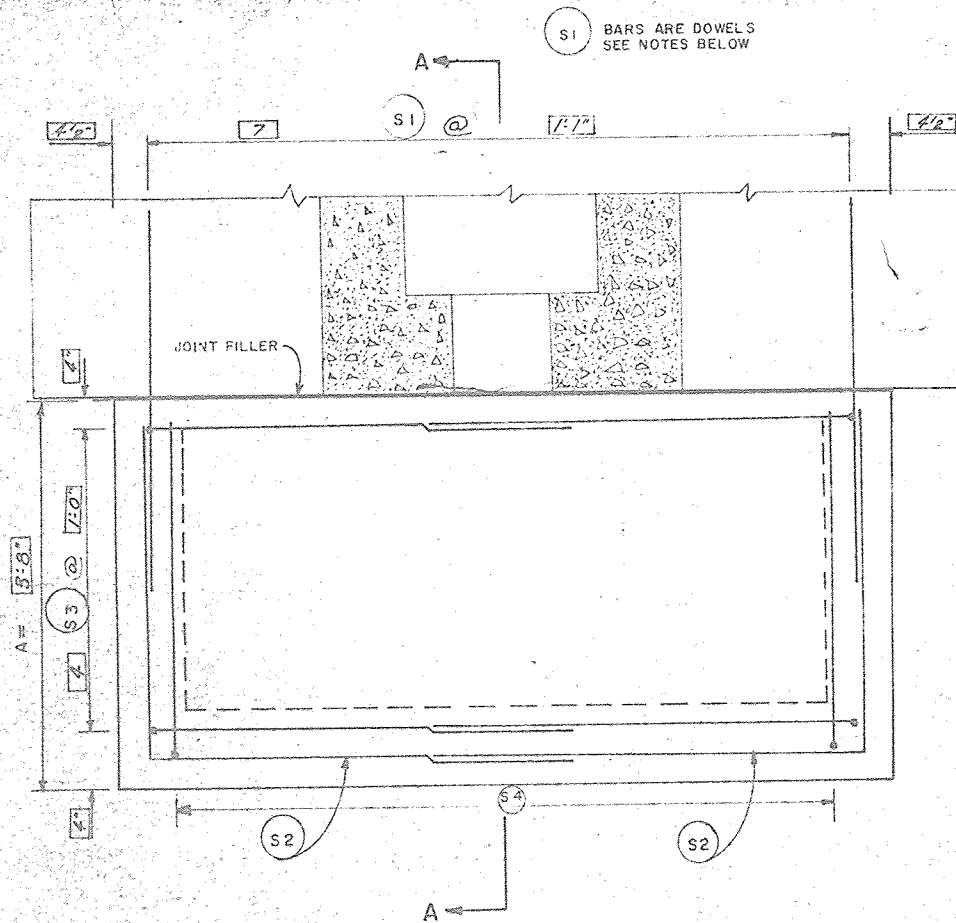
Steel 3" From Bottom of Footing Steel 2" From Top of Footing
PLAN-FOOTING



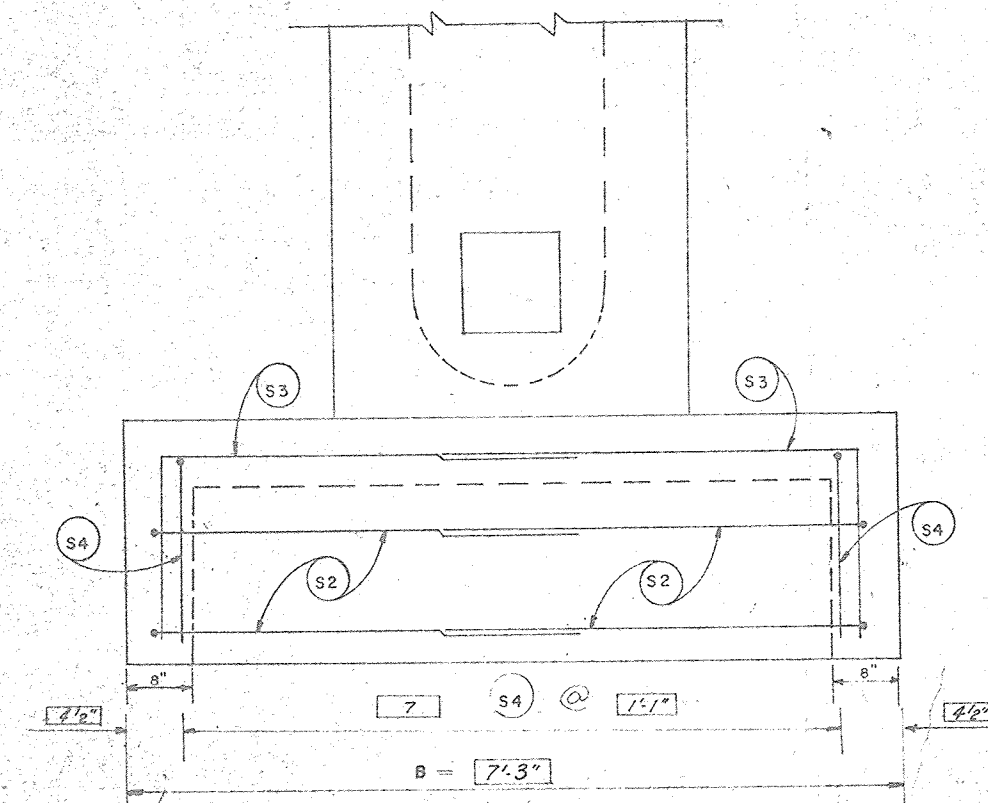


0 2 4
Scale in Feet
Unless Otherwise Shown

STEEL PLACEMENT—PRINCIPAL SPILLWAY INLET FLOODWATER RETARDING STRUCTURE SITE NO. 4 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS			
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
Designed	J. S. Almon	Date	4/79
Drawn	G. Ovalle	Date	4/79
Traced			
Checked	J. S. Almon	Date	4/79
Approved by <i>ECU</i> STATE CONSERVATION ENGINEER, S. C. S. Title: <i>John S. Almon, P. E.</i> Benham-Blair & Affiliates, Inc.		Sheet No. 13 of 24 Drawing No. 4-E-36,853	

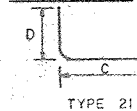


PLAN



UPSTREAM ELEVATION

BAR TYPE



MARK	SIZE	QUANTITY	LENGTH	TYPE	D	C	TOTAL LENGTH	BAR NO.	C. LENGTH EQUALS	D. LENGTH EQUALS
S2	4	4	7'-2 1/2"	21	3'-2"	4'-0 1/2"	28'-10"	S2	8'-5"	A-6
S3	4	8	5'-10 1/2"	21	1'-11"	3'-11 1/2"	47'-0"	S3	8'-4"	
S4	4	7	5'-1"	21	1'-11"	3'-2"	35'-7"	S4	A-6	
TOTAL STEEL (SIZE 4) 111'-5" Lin. Ft.										
TOTAL STEEL 74.43 Lbs.										
TOTAL REINFORCED CONCRETE 1.26 Cu. Yds.										

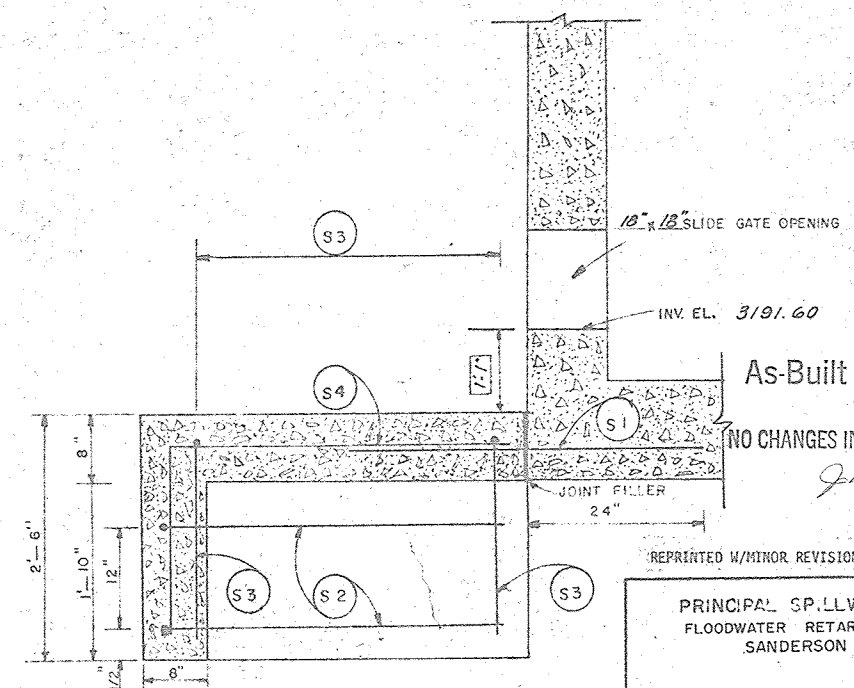
CU YDS. CONCRETE = $B(A)(B) + 176(B) + 352(A) - 2816$
 A=INCHES 46656
 B=INCHES

NOTES: MAXIMUM CENTER SPACING OF NO. 4 BARS SHALL NOT EXCEED 12"

THE SCOUR APRON SHALL BE FASTENED TO THE INLET BASE WITH DOWELS OF NO. 6 DEFORMED REINFORCING STEEL 4 FEET LONG; 7 ARE REQUIRED. CENTER SPACING OF NO. 6 S4 BARS SHALL BE 15" OR LESS. ALL CONCRETE SHALL EQUAL OR EXCEED CLASS 4000.

MINIMUM STEEL CLEARANCE AGAINST EARTH SHALL BE 3" EXCEPT S1 DOWELS AND S4 BARS SHALL BE CENTERED IN THE TOP SLAB.

JOINT FILLER SHALL BE 3/4" PREFORMED EXPANSION JOINT FILLER (TYPE 1)



SECTION A-A

As-Built Plans

NO CHANGES IN CONSTRUCTION

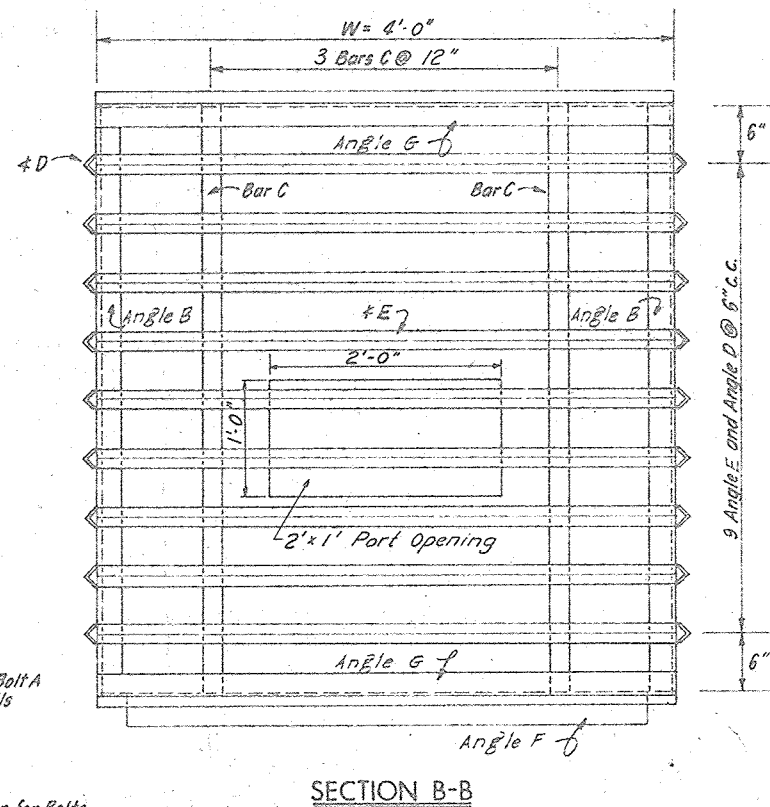
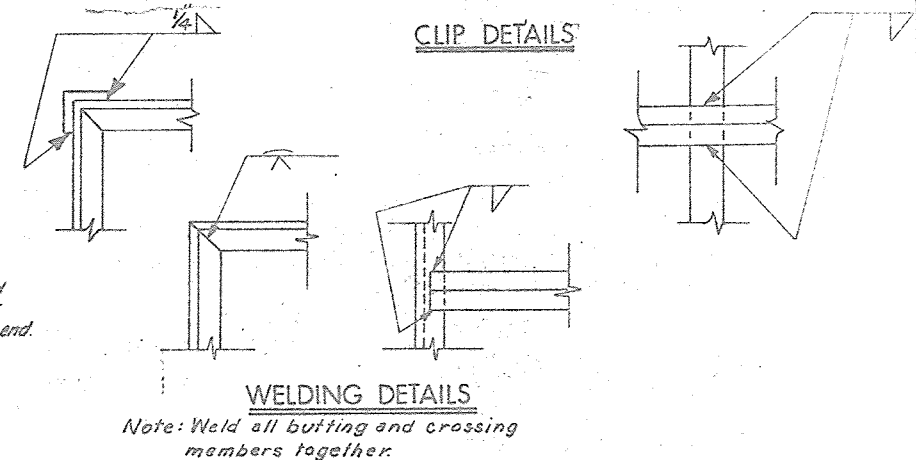
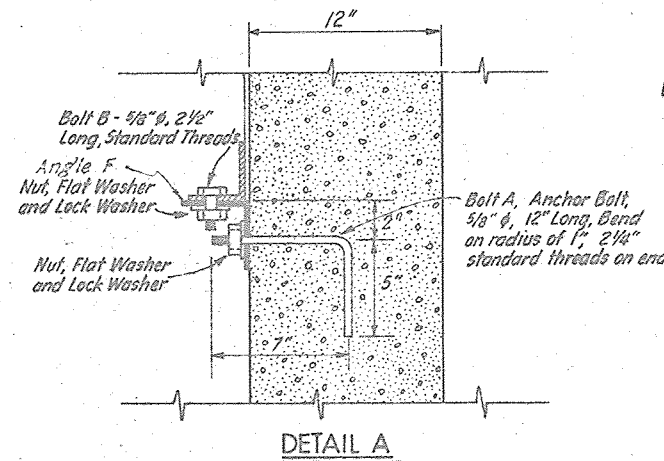
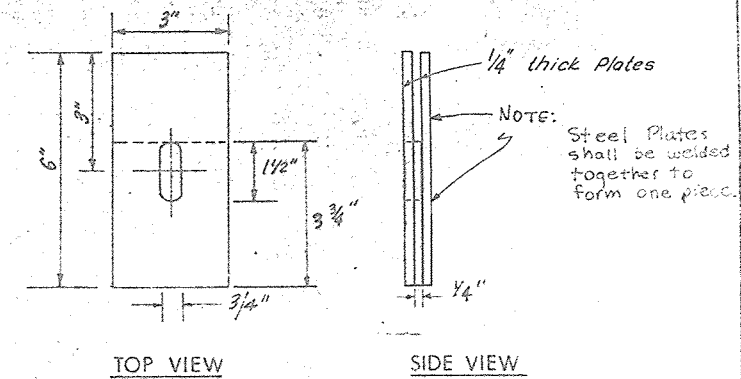
REPRINTED WITHIN REVISIONS BY SCS - 6/84

PRINCIPAL SPILLWAY INLET SCOUR APRON
 FLOODWATER RETARDING STRUCTURE SITE NO. 4
 SANDERSON CANYON WATERSHED
 IN

BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

DESIGNED	J.S. Almon	DATE	4/79	APPROVED BY	J.S. Almon
DRAWN	G. O'valle	DATE	4/79	STATE CONSERVATION ENGINEER, S.C.S.	Benham-Blair & Associates, Inc.
TRACED					
CHECKED	J.S. Almon	DATE	4/79	SHEET	16
				DRAWING NO.	4-E-36,853



QUANTITY	ITEM	DESCRIPTION
4	Angle A	2½" x 2½" x ¼" x 2'0" Cut and weld
4	Angle B	2½" x 2½" x ¼" x 5'-0" Cut and weld
2	Angle C*	3" x 3" x ¼" x 3'-11½" Weld
18	Angle D	1½" x 1½" x ¼" x 1'11" Weld
11	Angle E	1½" x 1½" x ¼" x 4'-0" Weld
1	Angle F*	3½" x 3½" x ¼" x 3'-6"
2	Angle G	2½" x 2½" x ¼" x 4'-0" Weld
2	Bar A	¼" x 2" x 4'-7" Weld
6	Bar B	¼" x 2" x 2'0" Weld
3	Bar C	¼" x 2" x 4'-11¼" Weld
4	Bolt A	5/8" Ø Anchor Bolt, See Detail A
3	Bolt B	5/8" Ø, See Detail A
4	Bolt C	5/8" Ø, Anchor Bolt, See Detail B
4	Clip	See Clip Details
11	Nuts Flat & Lock Washers	See Detail A and Detail B

*Angle C and Angle F shall have slots punched to allow Balls A, B and C to pass through.

Trash Rack shall be galvanized after Fabrication.

Number of Racks Required: One

All bolts, nuts, washers and other parts of trash rack shall be galvanized.



REPRINTED W/MINOR REVISIONS BY SCS - 6/84

As-Built Plans
NO CHANGES IN CONSTRUCTION

As-Built Plans

CHANGES IN CONSTRUCT

CHANGES IN CONSTRUCTION

Jan J.

Jan 7

100

AR DATA

$$C = W - 1/2''$$
$$E = W$$
$$G = W$$

Q = W

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

Journal of Management Studies, 36(7), 809-826.

Downloaded from <http://www.jstor.org/stable/2346190> by University of California, San Diego on Tue, 20 Jun 2017 12:02:04 UTC
All use subject to <http://about.jstor.org/terms>

PORT TRASH RACK

FLOODWATER RETARDING STRUCTURE SITE NO. 4

SANDERSON CANYON WATERSHED

IN

BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

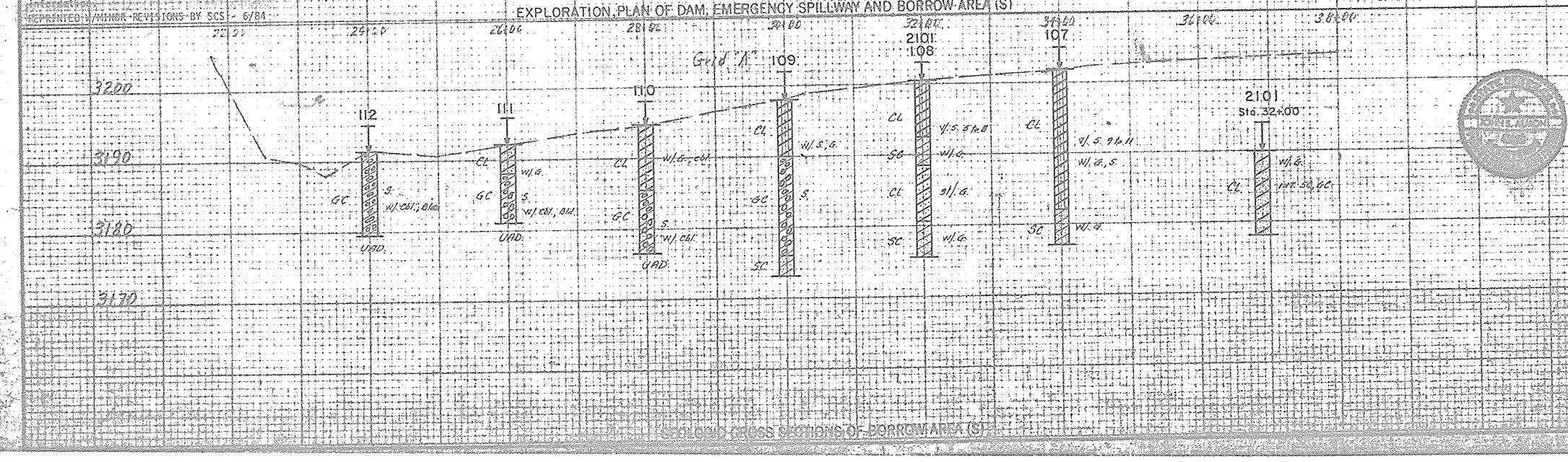
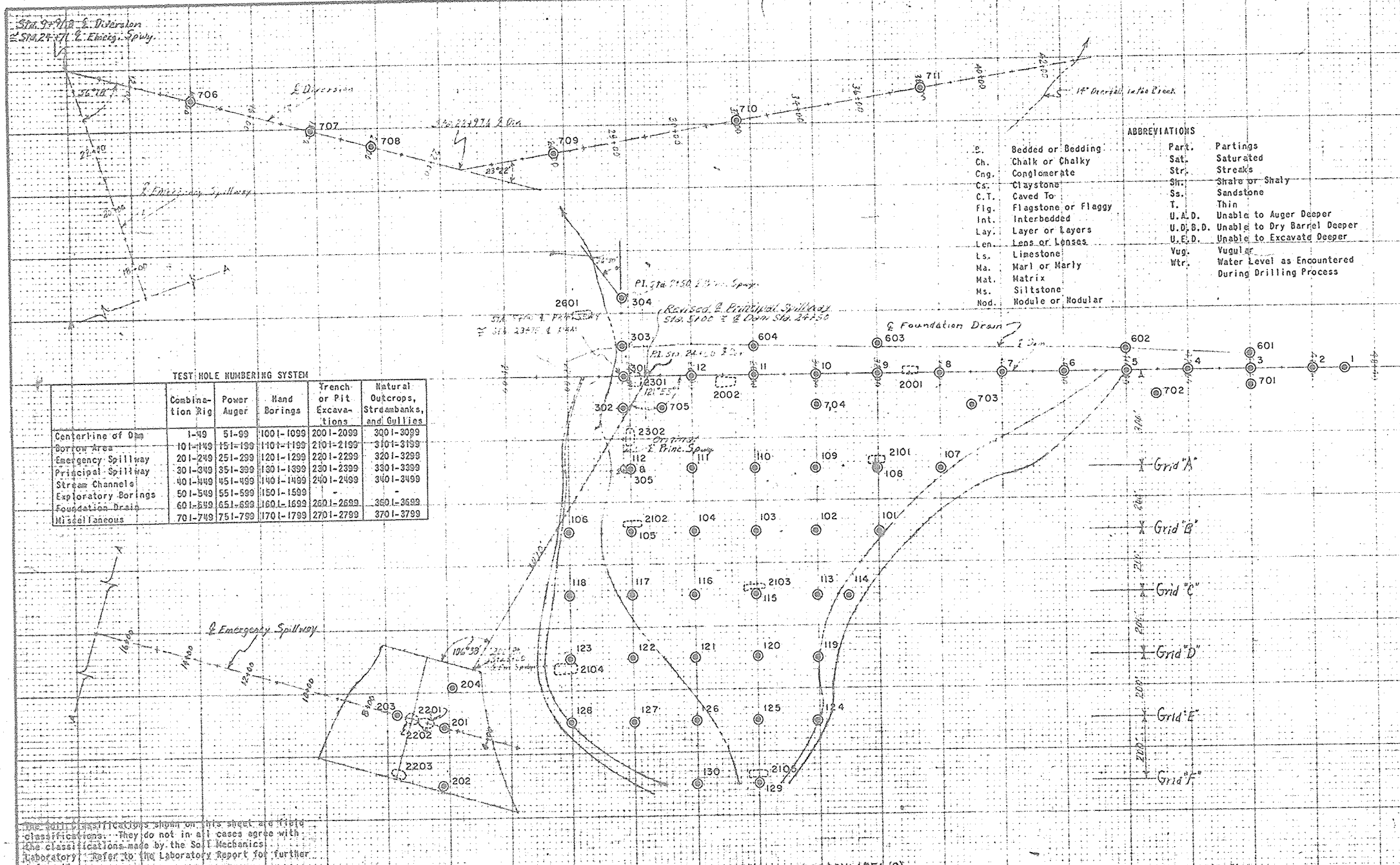
DATE 4/79 APPROVED BY J.C.V.
STATE CONSERVATION ENGINEER S.C.

G. Dyalla 4/79 John S. Brown, P.E.

Benham-Blair & Associates, Inc.

4/79 No. 17 4-E-36.853

of 24



LEGEND SYMBOLS

UNCONSOLIDATED MATERIAL

gravel	sand	silt	clay	cobbles, boulders
gravel, sandy	sand, gravelly	silt, gravelly	clay, gravelly	peat or muck
gravel, silty	sand, silty	silt, sandy	clay, sandy	
gravel, clayey	sand, clayey	silt, clayey	clay, silty	

CONSOLIDATED MATERIAL

Sedimentary Rocks

conglomerate	shale	limestone	coal
breccia	siltstone	dolomite	gypsum
sandstone	marl	chalk	chert

Metamorphic Rocks

gneiss	schist	intrusive	extrusive
quartzite	slate	pyroclastic	
marble	soapstone	undifferentiated	

Other Symbols

- hole logged only
- hole sampled
- strike and dip
- pit or trench

ABBREVIATIONS

ang.	angular	lam.	laminated	G	gravel, gravelly
bld.	boulders (> 12")	lse.	loose	S	sand, sandy
calc.	calcareous	mas.	massive	M	silt, silty
cali.	caliche	med.	medium	C	clay, clayey
cav.	cavities	mic.	micaceous	O	organic
cmt.	cemented	mod.	moderately	W	well graded
cse.	coarse	n. r.	no recovery	P	poorly graded
cbl.	cobbles (3" - 12")	per.	permeable		
cpt.	compact	po.	poorly		
con.	concretions	rd.	rounded		
xln.	crystalline	sl.	slightly		
ds.	dense	stf.	soft		
dip.	dipping	st.	some		
d.s.	downstream	sl.	slowly		
fn.	fine	stf.	stiff		
frm.	firm	t.b.	thin-bedded		
frac.	fractured	tuff.	tuffaceous		
frg.	fragments	u.s.	upstream		
fr.	friable	var.	variable		
grn.	grain	v.	very		
gyp.	gypseous	w.	with		
hd.	hard	wea.	weathered		
h.	highly	w.l.	(date) static water level		

TEST HOLE NUMBERING SYSTEM

Centerline of Dam	1-49	51-99	101-1099	2001-2099	3001-3099
Borrow Area	101-149	151-199	1101-1199	2101-2199	3101-3199
Emergency Spillway	201-249	251-299	1201-1299	2201-2299	3201-3299
Principal Spillway	301-349	351-399	1301-1399	2301-2399	3301-3399
Stream Channels	401-449	451-499	1401-1499	2401-2499	3401-3499
Exploratory Borings	501-549	551-599	1501-1599	2501-2599	3501-3599
Foundation Drains	601-649	651-699	1601-1699	2601-2699	3601-3699
Miscellaneous	701-749	751-799	1701-1799	2701-2799	3701-3799

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 with liquid limit of 50 or less
MH	Silts with liquid limit above 50
CL	Clays with liquid limit of 50 or less
CH	Clays with liquid limit above 50
OL	Organic silts and clays with liquid limit of 50 or less
OH	Organic silts and clays with liquid limit above 50

As-Built Plans

NO CHANGES IN CONSTRUCTION

PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS

FLOODWATER RETARDING STRUCTURE SITE No. 4

SANDERSON CANYON WATERSHED

IN

TERRELL COUNTY, TEXAS

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Investigated by: L. Engle, A. J. Ireland, J. H. Stettin, E. A. Slay, J. E. Seal

Checked by: J. H. Stettin, E. A. Slay, J. E. Seal

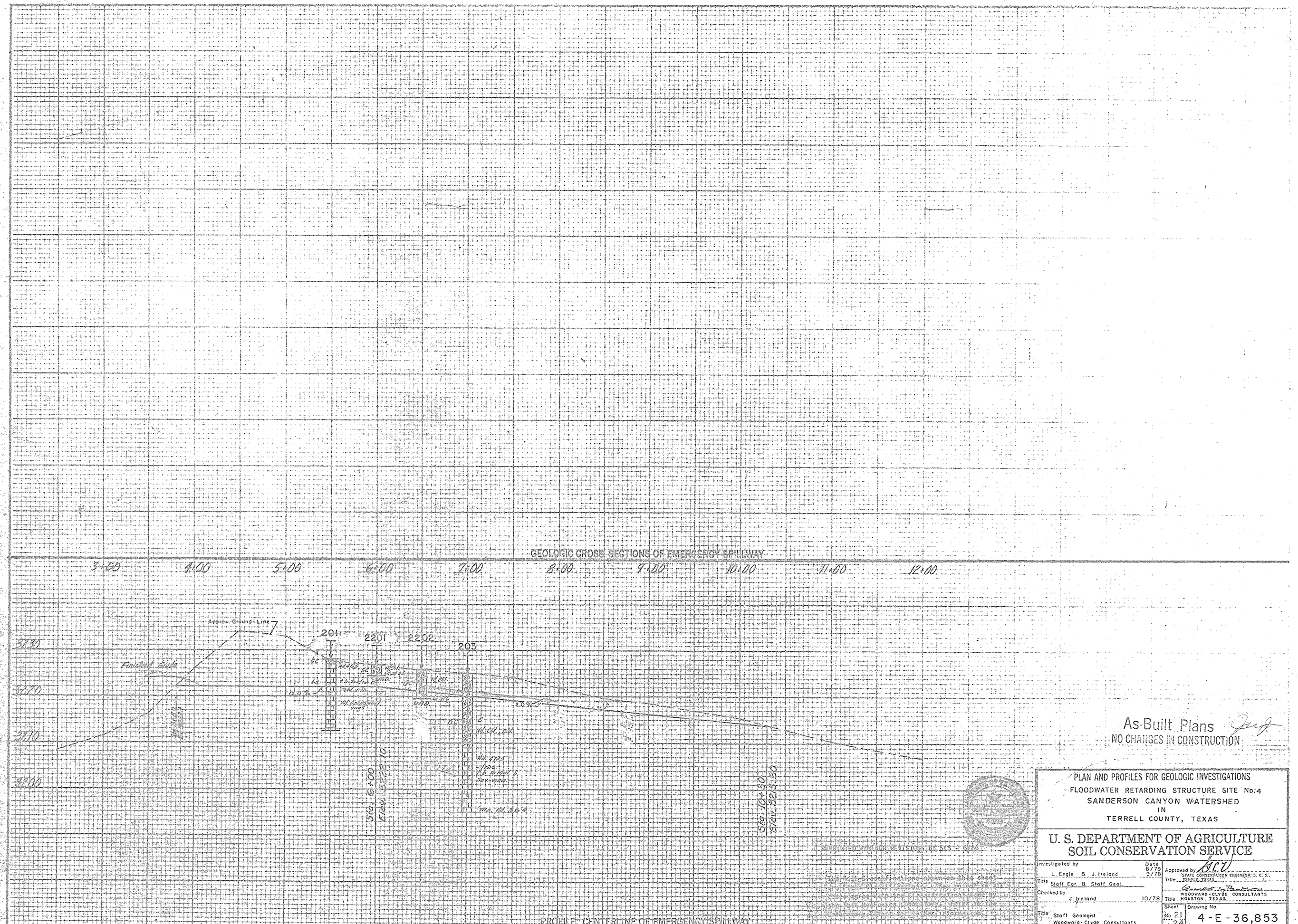
Approved by: J. H. Stettin, E. A. Slay, J. E. Seal

Sheet No. 18 of 24

Scale: 1" = 100'

Date: 10/76

Project: Floodwater Retarding Structure Site No. 4, Sanderson Canyon Watershed, Terrell County, Texas

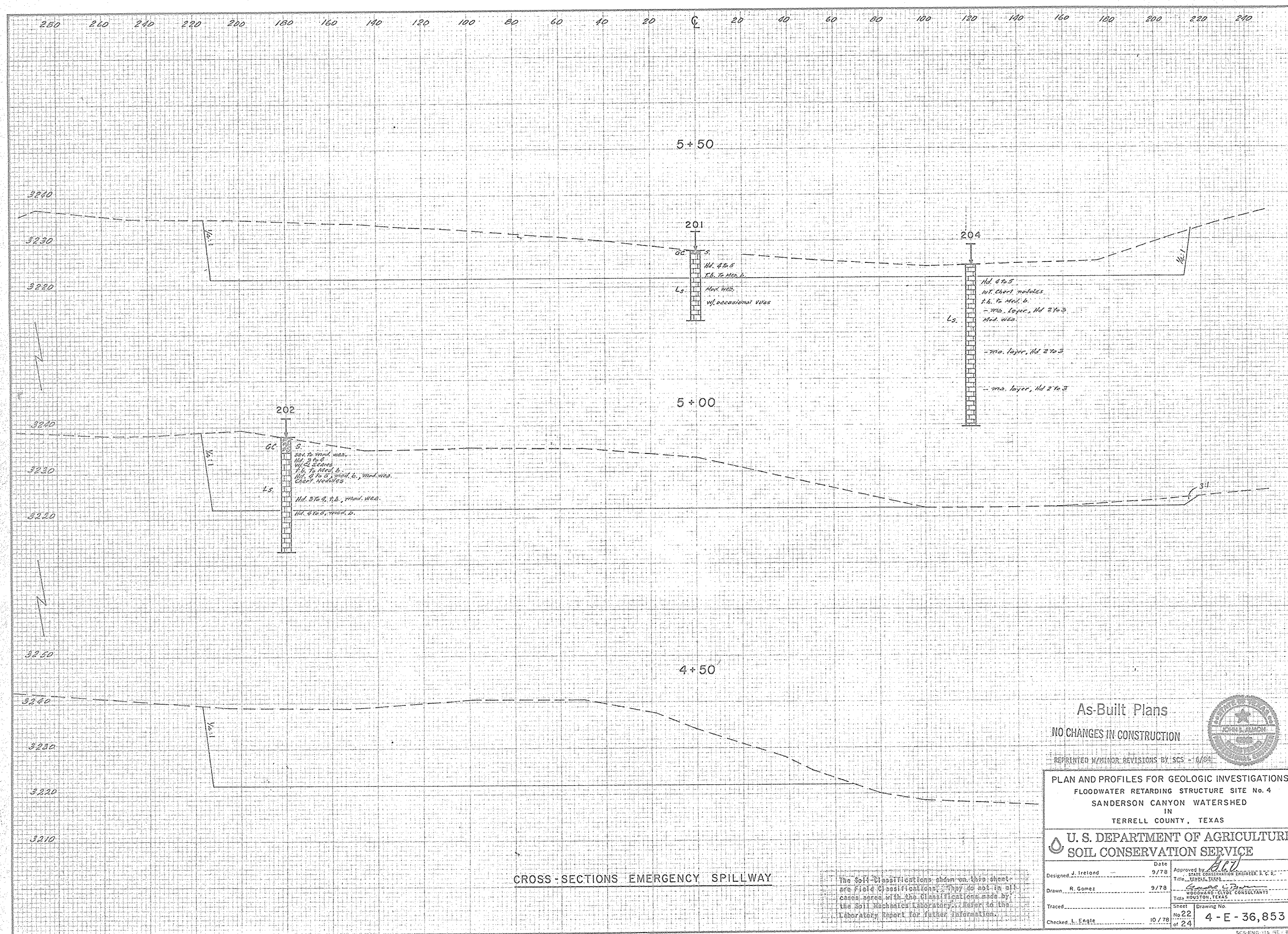


As-Built Plans
NO CHANGES IN CONSTRUCTION

PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS
FLOODWATER RETARDING STRUCTURE SITE No.4
SANDERSON CANYON WATERSHED
IN
TERRELL COUNTY, TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by L. Engle, B. J. Ireland	Date 8/78	Approved by <i>[Signature]</i>	Date 9/78
Title Staff Egr. & Staff Geol.		Title STATE CONSERVATION ENGINEER, S. C. S.	
Checked by J. Ireland	10/78	Title WOODWARD-CLYDE CONSULTANTS	
Title Staff Geologist Woodward-Clyde Consultants		Sheet No 21 of 24	Drawing No. 4-E-36,853



As-Built Plans
NO CHANGES IN CONSTRUCTION



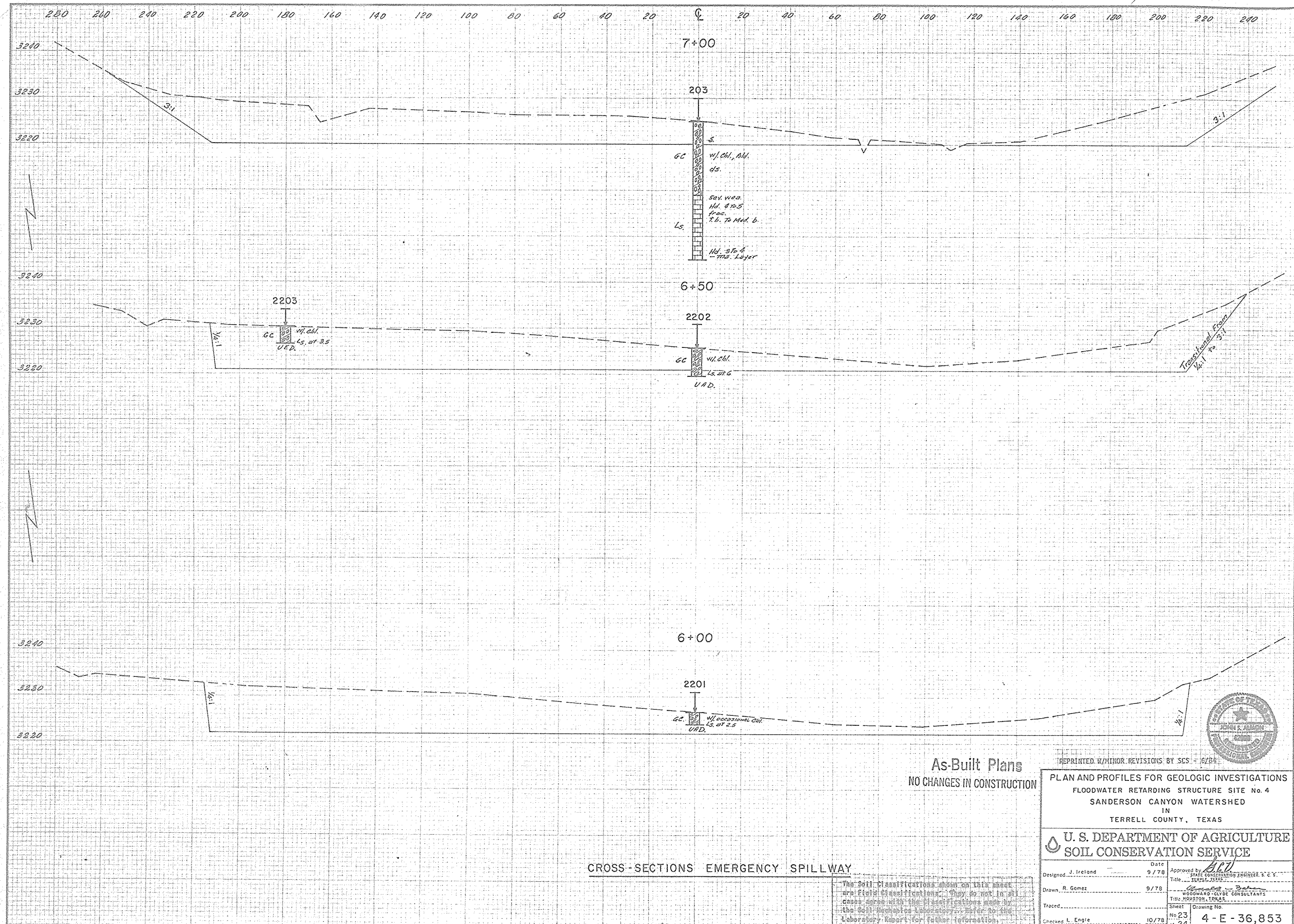
REPRINTED W/MINOR REVISIONS BY SCS - 6/84

PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS
FLOODWATER RETARDING STRUCTURE SITE No. 4
SANDERSON CANYON WATERSHED
IN
TERRELL COUNTY, TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date	Approved by
Designed <u>J. Ireland</u>	9/78	<u>[Signature]</u> STATE GEOLOGICAL ENGINEER 1-3-C
		Title <u>TEMPLE TEXAS</u>
Drawn <u>R. Gomez</u>	9/78	<u>[Signature]</u> WOODWARD-CLYDE CONSULTANTS
		Title <u>HOUSTON, TEXAS</u>
Traced		Sheet _____ Drawing No. _____
Checked <u>L. Engle</u>	10 / 78	No <u>22</u> of <u>24</u>
		4 E - 36,853

SCS-ENG-715 REV 8



As-Built Plans
NO CHANGES IN CONSTRUCTION

CROSS-SECTIONS EMERGENCY SPILLWAY

The soil classifications shown on this sheet are field classifications. They do not in all cases agree with the classifications made by the Soil Mechanics Laboratory. Refer to the Laboratory Report for further information.

REPRINTED W/MINOR REVISIONS BY SCS - 6/84

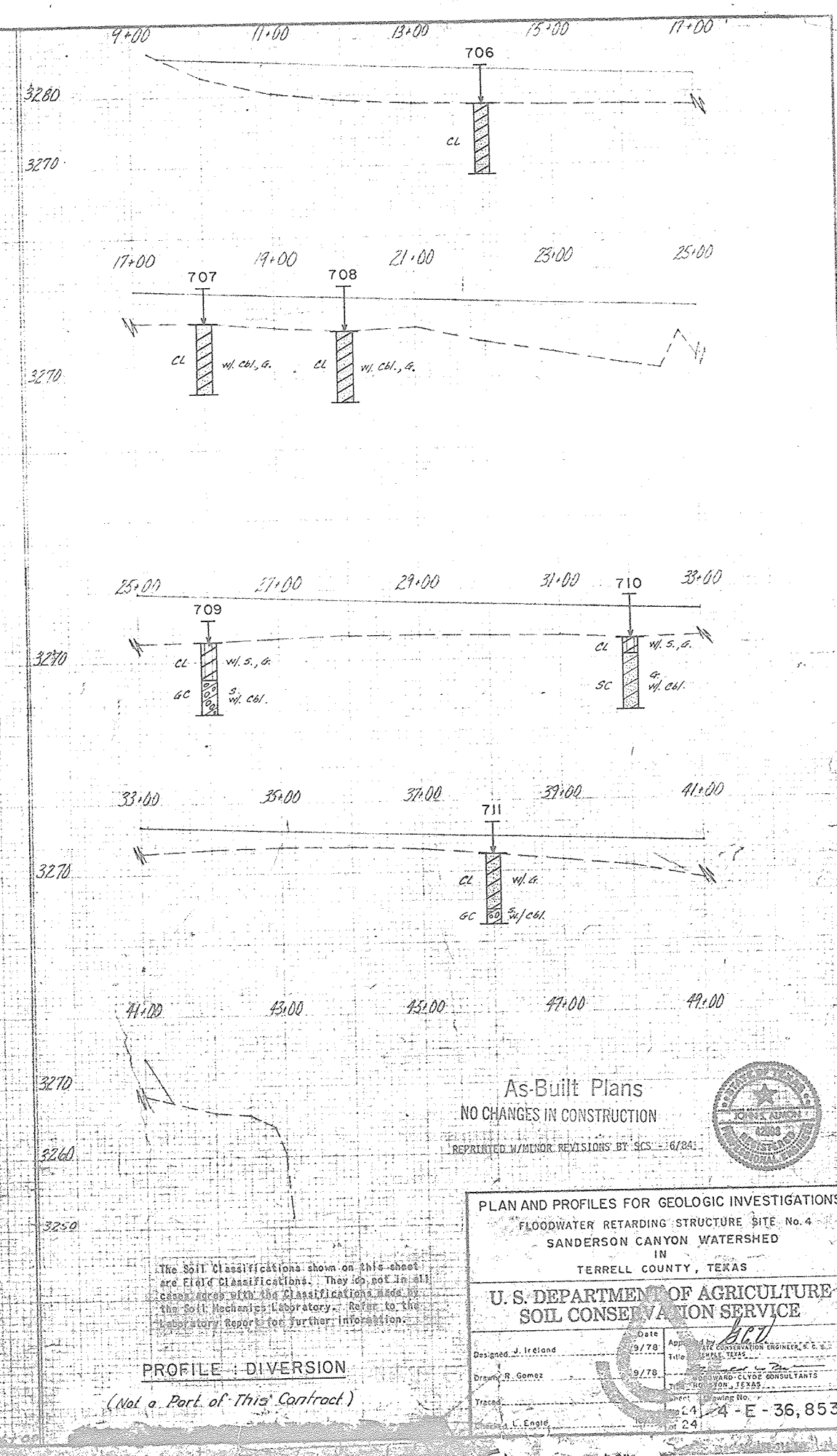
PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS
FLOODWATER RETARDING STRUCTURE SITE No. 4
SANDERSON CANYON WATERSHED
IN
TERRELL COUNTY, TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed J. Ireland	Date 9/78	Approved by [Signature]
Drawn R. Gomez	Date 9/78	Title STATE CONSERVATION ENGINEER, S.C.S.
Traced	Date 10/78	Title [Signature]
Checked L. Engle	Date 10/78	Title [Signature]

Sheet No. 23 of 24
Drawing No. 4-E-36,853

SCS-ENG-315 REV 4-75



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PROFILE : DIVERSION
(of a Part of This Contract)

Designated	J. Ireland	Date	9/78	Approved by	BY COOPERATION ENGINEER, C.E. E.
Drafted	R. Gomez	Date	9/78	Title	EMPLE TEXAS
Traced				by	WARD & SONS CONSULTANTS
Checked	L. Engle			by	WARD & SONS, TEXAS
				Next Drawing No.	2414-E-36,853
					2414

