# SYCAMORE DAM STRUCTURE NO. 19

# FOUNTAIN HILLS GENERAL DATA

Flood Control District of MC Library
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# SYCAMORE DAM

# STRUCTURE NO. 19

# FOUNTAIN HILLS

# GENERAL DATA

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| Section | Title |
|---|---|
| 1. | Hydrology and Hydraulic Calculations |
| 2. | License of Approval |
| 3. | Photos |
| 4. | Plans |

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING & LAND PLANNING
TEMPE, ARIZONA

| | BY | DATE |
|---|---|---|
| CAL'D. | | |
| CHK'D. | | |
| JOB NO. | | |
| SHEET | OF | |

FOUNTAIN HILLS, ARIZ

STRUCTURE NO. 19

REFERENCE

RETARDATION STRUCTURE

NO. 19

FOUNTAIN HILLS, ARIZONA

HYDROLOGY & HYDRAULIC

CALCULATIONS

31.0 - 00 - 1 - 04 / 73

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING & LAND PLANNING
TEMPE, ARIZONA

| | BY | DATE |
|---|---|---|
| CAL'D. | HIGG | |
| CHK'D. | | |
| JOB NO. | | |
| SHEET 1 OF | | |

FOUNTAIN HILLS

STRUCTURE NO. 4

See new sheet 19

REFERENCE

METHOD OF ANALYSIS

1. USE SOIL CONSERVATION SERVICE COMPUTER PROGRAM TR-20 "PROJECT- FORMULATION" FOR STREAM FLOW ROUTING AND TO ESTABLISH INVERT OF EMERG. SPILLWAY, SIZE OF PRINCIPAL SPILLWAY PIPE, CAPACITY OF EMERG. SPILLWAY, TOP OF DAM AND FREEBOARD.

2. GENERAL CRITERIA - STORMS FOR CLASS "C" DAMS

THE FOLLOWING STORMS ARE TO BE USED AS THE BASIS OF DESIGN OF THE DAM

STORM "A" - 100 YR / 24 HR PRECIP = 4.2"

STORM "B" - 100 YR / 6 HR PRECIP = 3.2"

U.S. WEATHER BUREAU PRECIPITATION MAPS FOR ARIZONA DATED 1970 (ATTACHED)

STORM "C" - 100 YR 6HR + 0.26 (PMP - 100YR 6HR)

@ PMP = 19"

= 3.2 + 0.26 (19.0 - 3.2) = 3.2 + 4.1 = 7.3

PER SCS DESIGN CRITERIA FOR EARTH DAMS (ATTACHED)

U.S. WEATHER BUREAU

STORM "D" - PMP = 19.0"

(PMP MEANS PROBABLE MAX. PRECIPITATION)

U.S. WEATHER BUREAU & SOIL CONSER.

3. GENERAL CRITERIA - BASIS OF DESIGN

1. POOL BEHIND DAM MUST HAVE SUFFICIENT STORAGE TO CONTAIN RUNOFF FROM STORM "A" OR STORM "B" (WHICHEVER IS GREATER) WITH DISCHARGE FROM PRINCIPAL SPILLWAY BUT NO DISCHARGE FROM EMERGENCY SPILLWAY.

2. TOP OF DAM SET TO CONTAIN POOL GENERATED BY STORM "D" WITH BOTH PRINCIPAL & EMERGENCY SPILLWAYS OPERATING

3. FREEBOARD (POOL ELEV. TO TOP OF DAM) BASED UPON STORM "C". FREEBOARD TO BE AT LEAST 1.0 FT.

BASED UPON GENERAL CRITERIA OF S.C.S. FOR EARTHFILL DAMS (ATTACHED)

TRICO INTERNATIONAL INC.
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TEMPE, ARIZONA

| | BY | DATE |
|---|---|---|
| CAL'D. | HIGG | |
| CHK'D. | | |
| JOB NO. | | |
| SHEET | 2 OF | |

FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 15

REFERENCE

## VOLUME OF STORAGE POND

| ELEV. | ΔV (AC-FT) | ΣV (AC-FT) |
|---|---|---|
| 1680 | 0.0 | 0.0 |
| 1682 | 0.17 | 0.17 |
| 1684 | 0.18 | 0.35 |
| 1688 | 3.32 | 3.60 |
| 1692 | 7.05 | 10.65 |
| 1696 | 11.85 | 22.50 |
| 1700 | 21.50 | 44.00 |
| 1704 | 31.39 | 75.39 |
| 1705 | 10.31 | 85.80 |
| 1706 | 10.50 | 96.30 |
| 1708 | 20.90 | 117.20 |
| 1710 | 26.30 | 143.80 |
| 1712 | 26.20 | 170.00 |

## PRINCIPAL SPILLWAY DISCHARGE

USE ONE 30" ϕ PIPE (RCP)

$Q = 0.62 \cdot A \cdot \sqrt{2GH}$

$A = \frac{\pi D^2}{4} = \frac{\pi \cdot 2.5^2}{4}$

$= 4.91$ ✓

$G = 32.2$

H IS MEASURED FROM ℄ PIPE TO WATER SURFACE

$4.91 \times .62 = 3.04$

KING'S HANDBOOK OF HYDRAULICS PG. 3-5 (4TH EDITION)

| ELEV | H | Q |
|---|---|---|
| 1680 | 0.0 | 0.0 |
| 1682 | 0.75 | 53.0 * |
| 1684 | 2.75 | 63.2 * full pipe = 40.5 |
| 1688 | 6.75 | 63.5 ✓ |
| 1692 | 10.75 | 80.1 |
| 1696 | 14.75 | 93.8 ✓ |
| 1700 | 18.75 | 105.8 |
| 1704 | 22.75 | 116.5 |
| 1705 | 23.75 | 119.1 |
| 1706 | 24.75 | 121.5 |
| 1708 | 26.75 | 126.3 ✓ |
| 1710 | 28.75 | 131.0 |
| 1712 | 30.75 | 135.4 |

* FOR FLOW LESS THAN FULL PIPE TREAT AS CULVERT FLOW

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TEMPE, ARIZONA

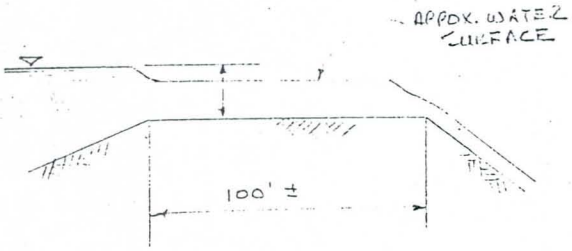
| | BY | DATE |
|---|---|---|
| CAL'D. | HIGG | |
| CHK'D. | | |
| JOB NO. | | |
| SHEET 3 OF | | |

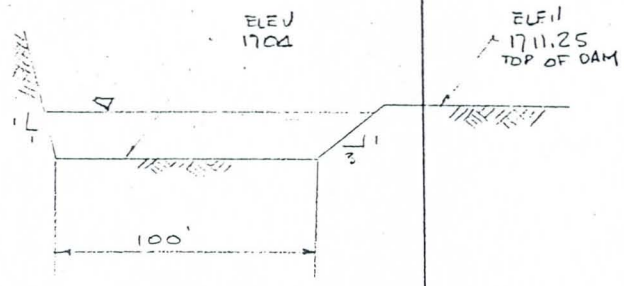
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 19

REFERENCE

EMERGENCY SPILLWAY CHARACTERISTICS




$Q = CLH^{3/2}$ $C = 2.63$

KING'S HANDBOOK OF HYDRAULICS PG 3-5 5-4 (4TH EDITION)

| ELEV | H | L | Q EMER. | Q PRINC. | Q TOT |
|---|---|---|---|---|---|
| 1704 | 0 | 100 | 0 | 116.5 | 116.5 |
| 1705 | 1.0 | 102 | 268 | 119.0 | 387.0 |
| 1706 | 2.0 | 104 | 774 | 122.0 | 896.0 |
| 1708 | 4.0 | 108 | 2272 | 126.0 | 2398.0 |
| 1710 | 6.0 | 112 | 4329 | 131.0 | 4460.0 |
| 1712 | 8.0 | 116 | 6903 | 135.0 | 7038.0 |

*State of Arizona*
DEPARTMENT OF WATER RESOURCES
*Division of Safety of Dams*

# *LICENSE OF APPROVAL*

*Pursuant to Chapter 3, Title 45-Waters, of the Arizona Revised Statutes, the DIRECTOR, Department of Water Resources authorizes the use of:* FOUNTAIN HILLS FRS #19 *Dam and Reservoir, Application Number* 07.41 *Located in Sec.* 22 *, Tp.* 3N *, R.* 6E *, G. & S. R. B. & M.* Maricopa *County, State of Arizona to impound water in accordance with and subject to the following terms and conditions:*

(1) Use shall be only as a flood retarding structure, limited to temporary storage during periods of flood and for such additional time as may be required to completely evacuate the flood waters through the outlet conduit, (2) The owner shall take reasonable actions toward removal of deficiencies present at the dam in a timely manner.

*This license of approval supersedes every previous consent for use issued by the State of Arizona relative to said dam and reservoir.*

*Witness my hand and seal of the Arizona Department of Water Resources*

6th *day of* December *, 19* 84 *.*

Wesley E. Steiner

WESLEY E. STEINER
DIRECTOR

*State of Arizona*
OFFICE OF THE STATE WATER ENGINEER
*Supervision of Safety of Dams*

# *License of Approval*

*Pursuant to Chapter 3, Title 45 (Waters), of the Arizona Revised Statutes, the STATE WATER ENGINEER has found that the* FOUNTAIN HILLS DAM #19 *Dam and Reservoir, State Application Number* 7-41, *located in Sec.* 22, *Tp.* 3N, *R.* 6E, *G. & S. R. B & M,* Maricopa *County, State of Arizona, are safe to impound water; and the use of said dam and reservoir to impound water in accordance with and subject to the following terms and conditions is hereby authorized:* Use shall be only as a flood retarding structure, limited to temporary storage during periods of flood and for such additional time as may be required to completely evacuate the flood waters through the outlet conduit.

*This license of approval supersedes every previous consent for use issued by the State of Arizona relative to said dam and reservoir.*

*Witness my hand and the seal of the Arizona Water Commission of the State of Arizona this* 13th *day of* December, *19*73

*STATE WATER ENGINEER*

Benson G. Scott

*By Chief, Supervision of Safety of Dams*

C-LINE #52584
35MM PRINTS

FOUNTAIN HILL 4/10/75
DAM # 19

LOOKING AT DAM FROM
EMERGENCY SPILLWAY

945

FOUNTAIN HILLS 4/10/75
DAM # 19
RAIN GULLYING IN
SPILLWAY, RIGHT SIDE

945

FOUNTAIN HILLS 4/10/75

DAM #19

LOOKING AT DAM FROM
EMERGENCY SPILLWAY

945

FOUNTAIN HILLS 4/10/75

DAM #19

RAIN GULLYING IN
SPILLWAY, RIGHT SIDE

945

19

Frame 20

19

Frame 19

AN ORIGINAL POLAROID® LAND PHOTOGRAPH

SUBJECT FOUNTAIN HILLS DATE 3/13/75

NAME DAM #19

ADDRESS RAINWASH IN EMERG.

SPILLWAY, LOOKING DOWN FROM CREST

For your convenience when ordering copies, indicate the number of copies desired in the appropriate box for the size(s) you select. You can get quality work by Polaroid Copy Service through your dealer or by mail.

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| 5 x 7 ENLARGEMENTS | |
| 8 x 10 ENLARGEMENTS | |
| 35mm SLIDES | |

P558B-1 4/72

Printed in U.S.A.

Structure No. 19

Spillway - looking upstream. Non-right abutment.
Wide concrete sill. level.
Left slope probably concrete
Right slope is hard caliche - will probably not erode.
During prolong flows over spillway heavy erosion likely to occur below concrete sill.

Structure No. 19.

Trash Rack. Few tumbleweeds.
Reservoir drains good.

Structure #19
MADE IN U.S.A.

Right Abutment

4/75

21

Structure #19
MADE IN U.S.A.

Overall view

4/75

9.

Structure #19

MADE IN U.S.A.

4/75 Spillway & sill

Structure #19
MADE IN U.S.A.

Spillway - concrete sill

4/75

17

Structure #19
MADE IN U.S.A.

Inlet & trash rack

4/75

61

Structure ~~#38~~ #19
MADE IN U.S.A.

Spillway looking downstream

4/75

81

Structure #19

MADE IN U.S.A.

4/75 Erosion below sill

Structure #19
MADE IN U.S.A.

Inlet & trash rack

4/75

Fountain Hills
structure #19

5

5-78

from downstream

MADE IN U.S.A.

Fountain Hills
Structure #19

4

5-78

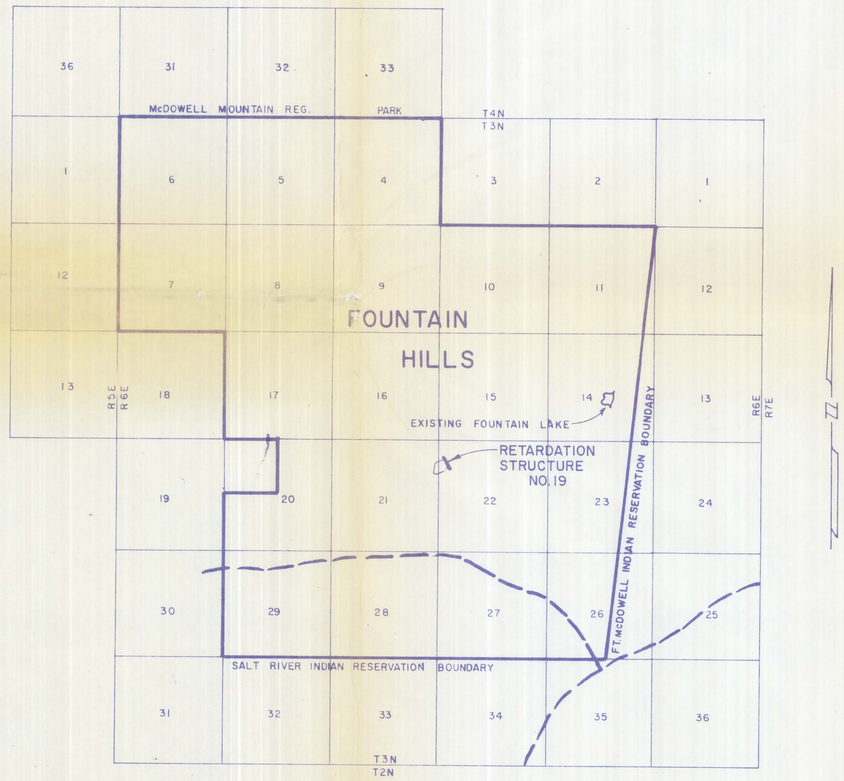
Looking east
from ~~back~~ of dam

MADE IN U.S.A.

# FOUNTAIN HILLS

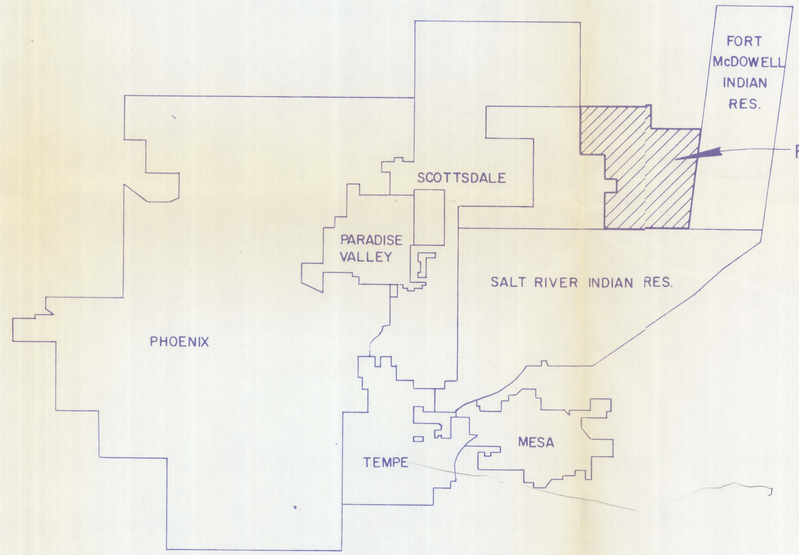
## MARICOPA COUNTY, ARIZONA

## STORM WATER RETARDATION BASIN NO. 19




VICINITY MAP

NO SCALE




PHOENIX - SCOTTSDALE AREA

NO SCALE

SHEET INDEX

| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | DRAINAGE AREA |
| 3 | SITE & GRADING PLAN |
| 4 | PLANS & PROFILES, DAM & SPILLWAYS |
| 5 | INLET STRUCTURE |
| 6 | OUTLET STRUCTURE |
| 7 | CAPACITY TABLES & SHT. 1-LOGS OF BORINGS |
| 8 | SHT. 2 OF LOGS OF BORINGS |

### PRIVATE ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS.

THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN, AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

REGISTERED CIVIL ENGINEER 5478 GORDON F. FREUDIG ARIZONA U.S.A. 1-9-1973

GORDON F. FREUDIG REGISTERED CIVIL ENGINEER NO. 5478

### GENERAL NOTES

1. THE DAM CONSTRUCTION WILL BE FIELD INSPECTED BY CONSULTING SOIL AND FOUNDATION ENGINEERS.
2. THE DAM CONSTRUCTION TO BE IN ACCORDANCE WITH THESE PLANS AND THE SPECIFICATIONS FOR STRUCTURE NO. 19.

### DESIGN CRITERIA

1. CREST ELEVATION IS BASED ON 100 YEAR STORM.
2. EMERGENCY & FREEBOARD DESIGN BASED ON 6 HOUR P.M.P.
3. TOP OF DAM ELEVATION IS BASED ON 19"/6 HOUR STORM.
4. FLOOD WATER DAM'S FUNCTION IS TO RETARD RUNOFF.

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

As built

| | | | |
|---|---|---|---|
| DRAWN BY | A. ST. MARTIN | | |
| SCALE | NONE | | |
| DATE | 1/8/73 | | |
| CHECKED BY | | | |
| DRAWING NUMBER | 73 MPIP P-1-21 | | |

| NO | DATE | BY | REVISIONS & REMARKS |
|---|---|---|---|
| 1 | 7-1-74 | J.P. | AS BUILT |

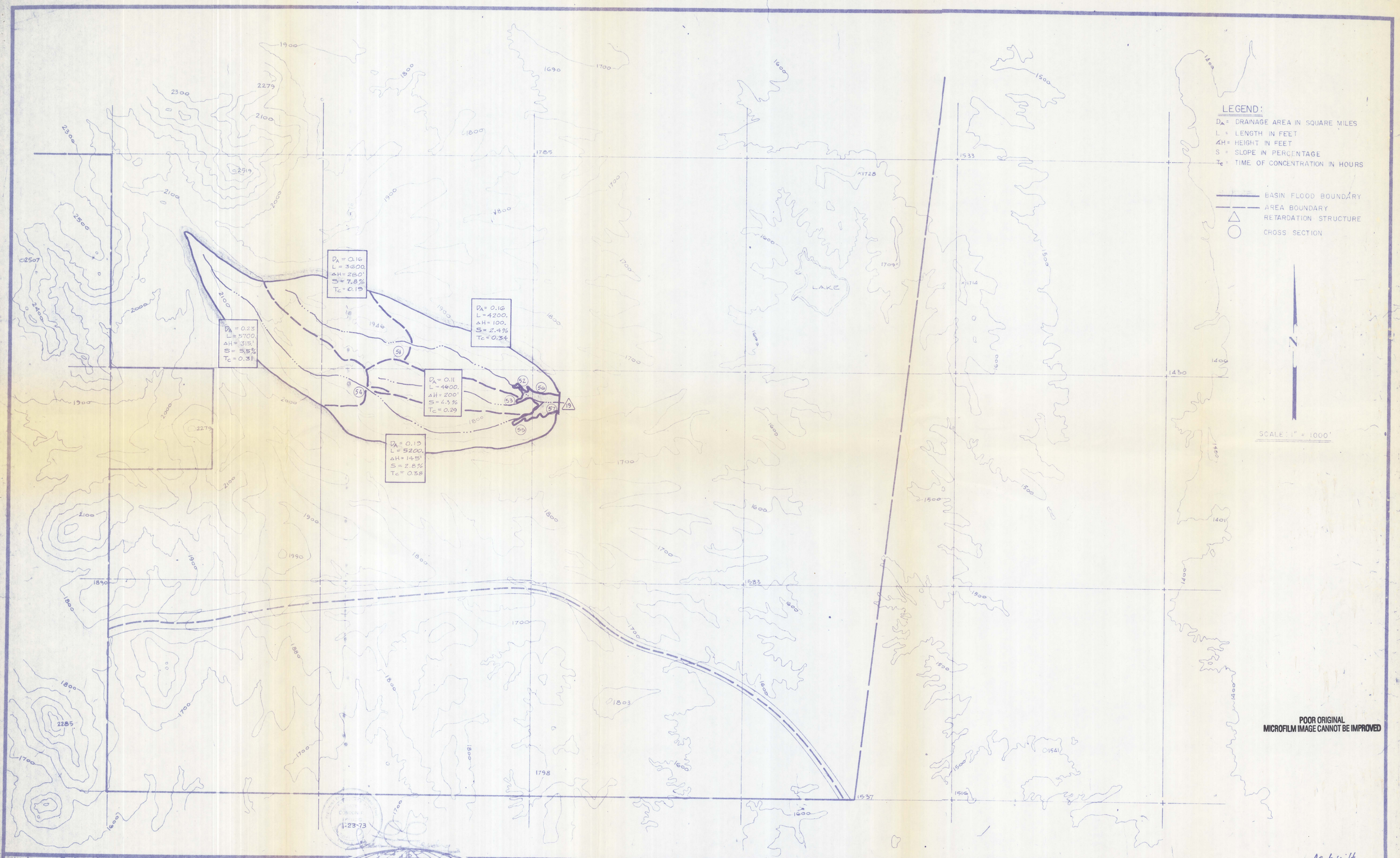
TRICO INTERNATIONAL INC.

TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES, INC.
FOUNTAIN HILLS, ARIZ.

STRUCTURE NO. 19
TITLE SHEET

SHEET 1 OF 8 SHEETS




POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

As built.

| DRAWN BY | NO | DATE | BY | REVISIONS & REMARKS |
|---|---|---|---|---|
| A. ST. MARTIN | 1 | 7-1-74 | U.P. | As Built |
| SCALE 1" = 1000' | | | | |
| DATE 1/8/73 | | | | |
| CHECKED BY | | | | |
| DRAWING NUMBER 73 MPE D-1-21 | | | | |

TRICO INTERNATIONAL INC.

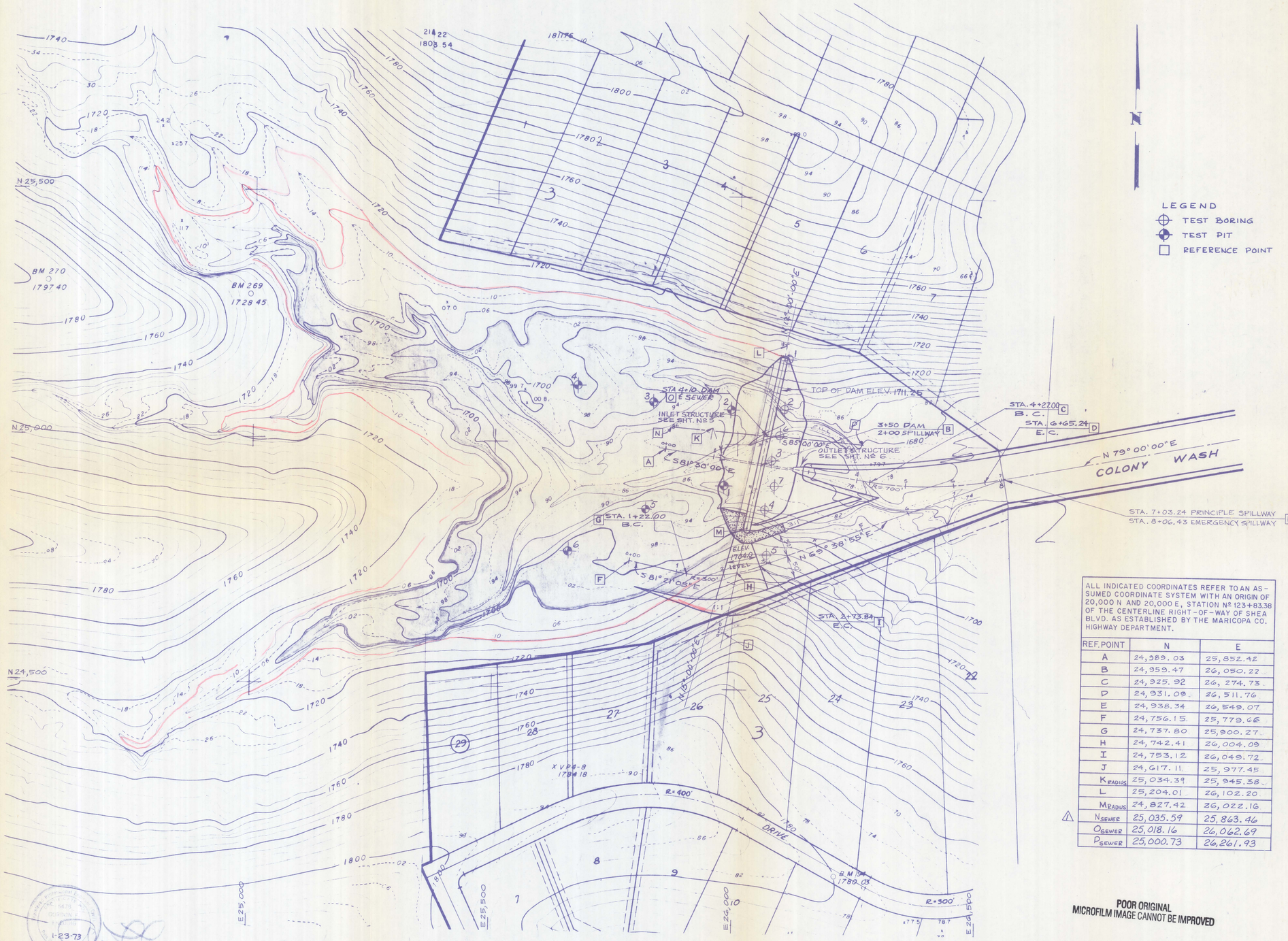
TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 19
DRAINAGE AREA

SHEET 2 OF 8 SHEETS

BRINING 40-105




ALL INDICATED COORDINATES REFER TO AN ASSUMED COORDINATE SYSTEM WITH AN ORIGIN OF 20,000 N AND 20,000 E, STATION No 123+83.38 OF THE CENTERLINE RIGHT-OF-WAY OF SHEA BLVD. AS ESTABLISHED BY THE MARICOPA CO. HIGHWAY DEPARTMENT.

| REF. POINT | N | E |
|---|---|---|
| A | 24,389.03 | 25,852.42 |
| B | 24,959.47 | 26,050.22 |
| C | 24,925.92 | 26,274.73 |
| D | 24,931.09 | 26,511.76 |
| E | 24,938.34 | 26,549.07 |
| F | 24,756.15 | 25,779.66 |
| G | 24,737.80 | 25,900.27 |
| H | 24,742.41 | 26,004.09 |
| I | 24,753.12 | 26,049.72 |
| J | 24,617.11 | 25,977.45 |
| K RADIUS | 25,034.39 | 25,945.38 |
| L | 25,204.01 | 26,102.20 |
| M RADIUS | 24,827.42 | 26,022.16 |
| N SEWER | 25,035.59 | 25,863.46 |
| O SEWER | 25,018.16 | 26,062.69 |
| P SEWER | 25,000.73 | 26,261.93 |

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

1-23-73

| | | | | |
|---|---|---|---|---|
| DRAWN BY K.G. | NO | DATE | BY | REVISIONS & REMARKS |
| SCALE 1" = 100' | 1 | 5-2-73 | Sgp | Sewer Line Added. |
| DATE 9-7-72 | 2 | 7-1-74 | U.P. | As Built |
| CHECKED BY | | | | |
| DRAWING NUMBER 73 MPIE P.1-21 | | | | |

TRICO INTERNATIONAL INC.

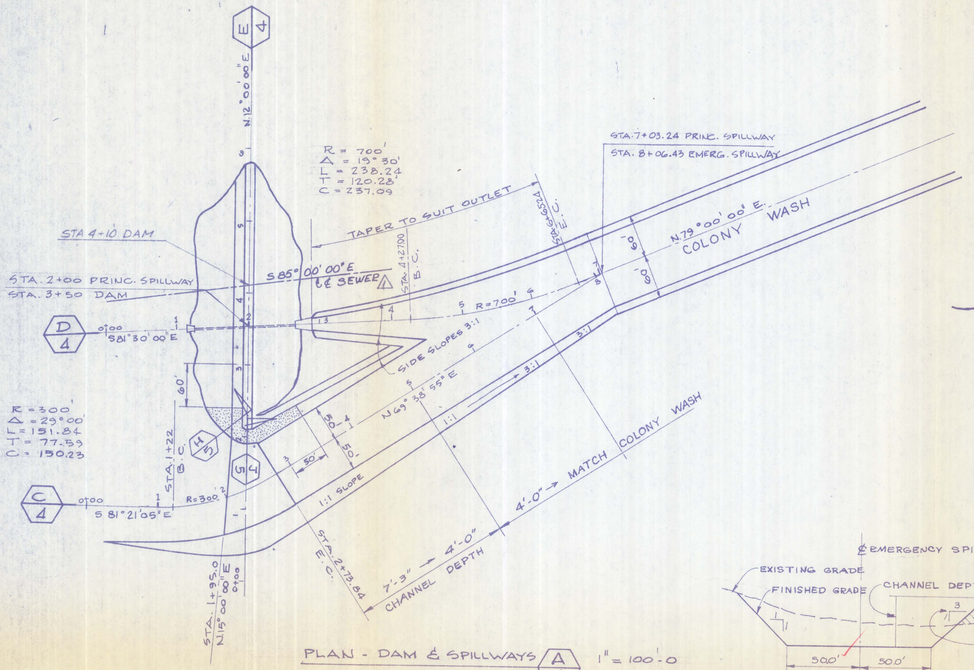
TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES, INC.
FOUNTAIN HILLS, ARIZ.

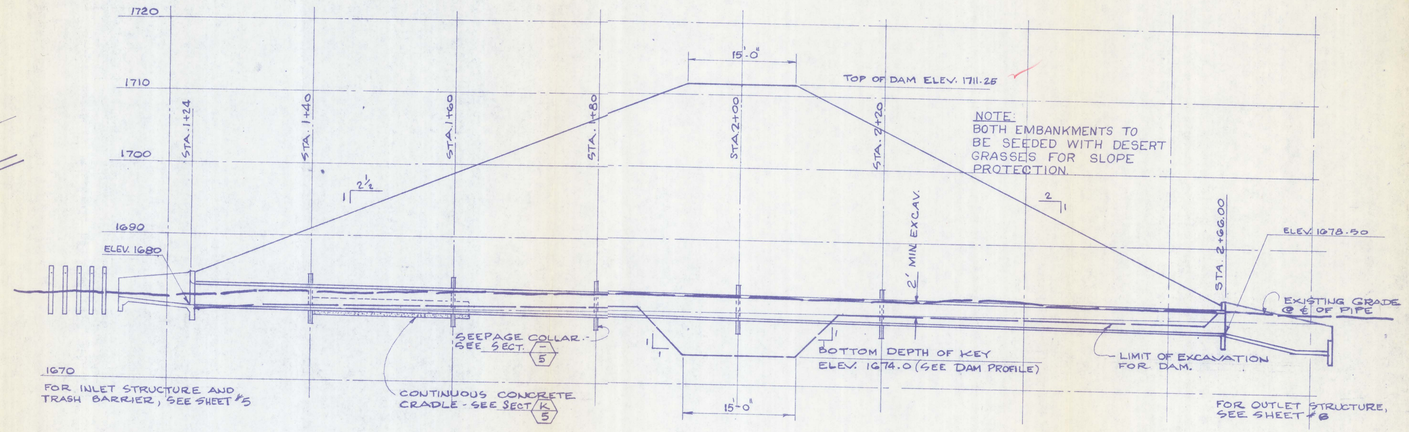
As built

STRUCTURE NO. 19
SITE & GRADING PLAN —

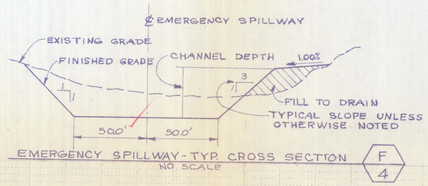
SHEET 3 OF 8 SHEETS



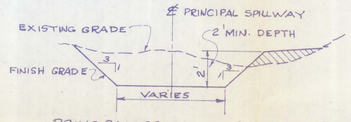

PLAN - DAM & SPILLWAYS (A/4) 1" = 100'-0



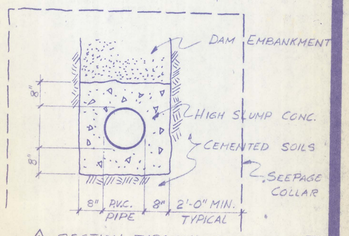

DAM SECTION (B/4) SCALE: 1" = 10'-0




EMERGENCY SPILLWAY - TYP. CROSS SECTION (F/4)
NO SCALE

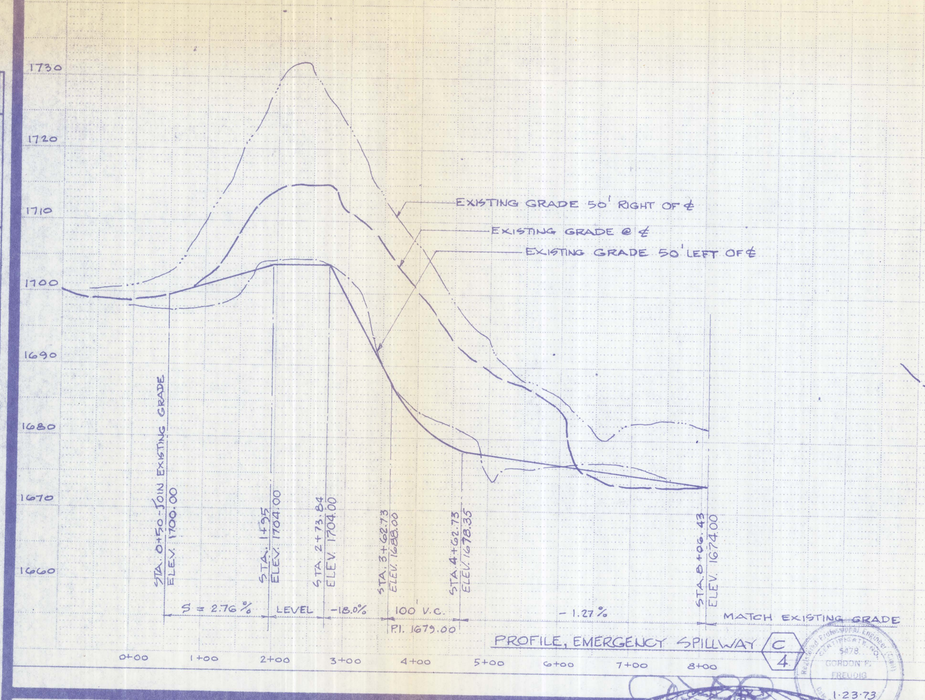



PRINCIPAL SPILLWAY - TYP. CROSS SECTION (G/4)
NO SCALE

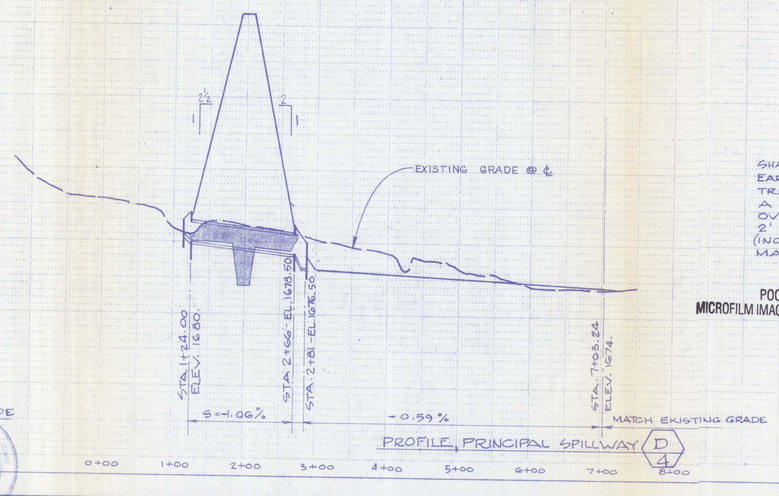



⚠ SECTION THROUGH SEWER LINE (H/4)
SCALE 1/8" = 1'-0"

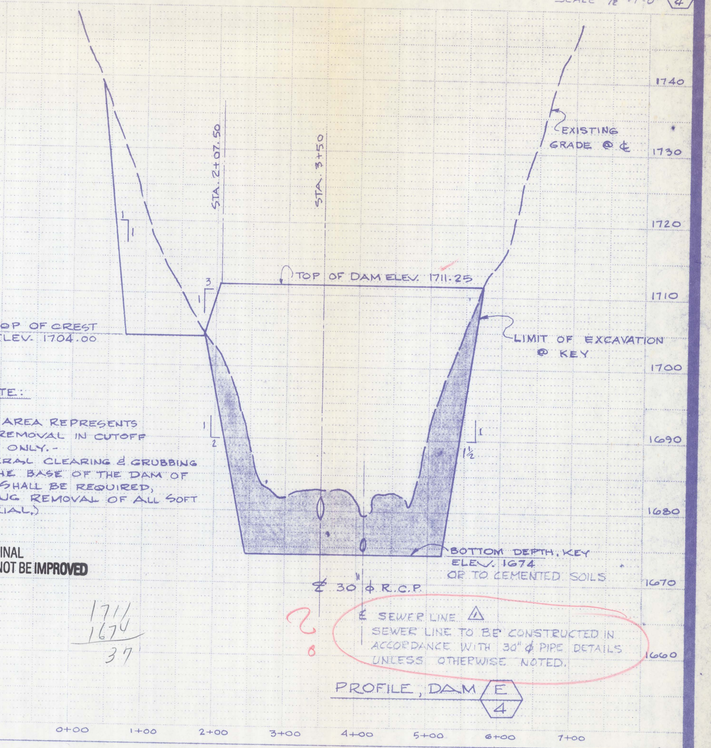
PROFILE SCALES
VERT: 1" = 10'-0
HORIZ: 1" = 100'-0




PROFILE, EMERGENCY SPILLWAY (C/4)




PROFILE, PRINCIPAL SPILLWAY (D/4)




NOTE:
SHADED AREA REPRESENTS EARTH REMOVAL IN CUTOFF TRENCH ONLY.-
A GENERAL CLEARING & GRUBBING OVER THE BASE OF THE DAM OF 2' MIN. SHALL BE REQUIRED, (INCLUDING REMOVAL OF ALL SOFT MATERIAL.)

℄ SEWER LINE ⚠
SEWER LINE TO BE CONSTRUCTED IN ACCORDANCE WITH 30" ϕ PIPE DETAILS UNLESS OTHERWISE NOTED.

PROFILE, DAM (E/4)

As built

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

1711
1670
37

| PLAN | SURVEYED | BY | DATE |
|---|---|---|---|
| NOTE BOOK | PLOTTED | | |
| NO. | ALIGNMENT CHECKED | | |
| | RIT OF WAY CHECKED | | |

| PROFILE | SURVEYED | BY | DATE |
|---|---|---|---|
| NOTE BOOK | PLOTTED | | |
| NO. | GRADES CHECKED | | |
| | ALIGNMENT | | |
| | STRUCTURE NOTATNS CH'KD | | |

| DRAWN BY | A.J.T. MARTIN |
|---|---|
| SCALES: | 1" = 10'-0" / 1" = 100'-0" |
| DATE | 1/1/73 |
| CHECKED BY | |
| DRAWING NUMBER | PS MPIF D.1-21 |

| NO | DATE | BY | REVISIONS & REMARKS |
|---|---|---|---|
| 1 | 5-2-73 | W.P. | SEWER LINE ADDED |
| 2 | 7-1-74 | W.P. | AS BUILT |

TRICO INTERNATIONAL INC.

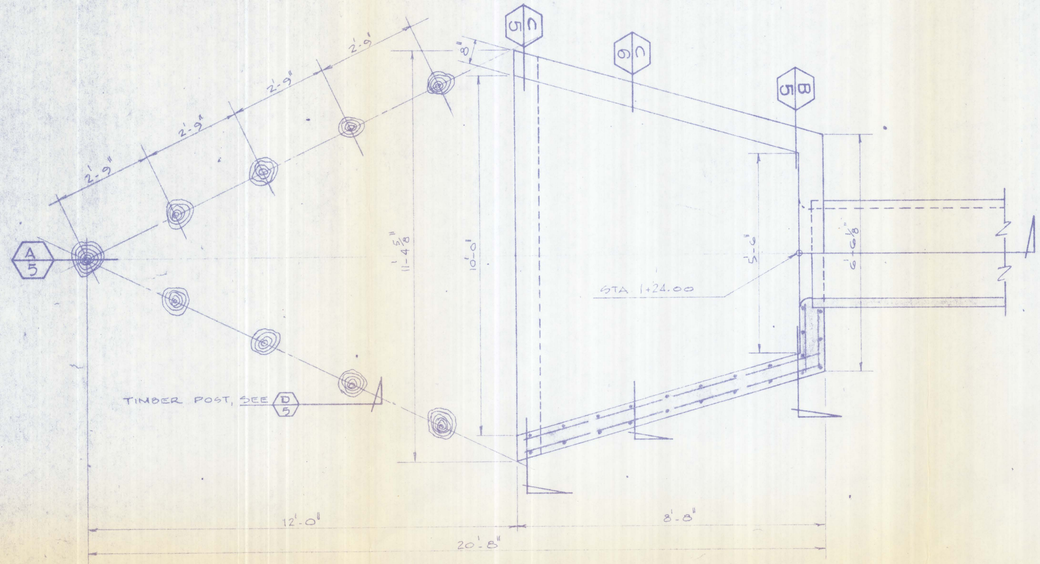
TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NUMBER 19
PLAN & PROFILE, SPILLWAYS - DAM SECTION

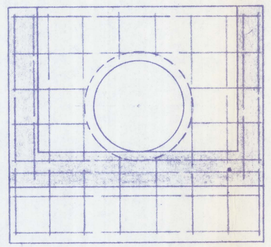
SHEET 4 OF 8 SHEETS

BRUNING 40-105

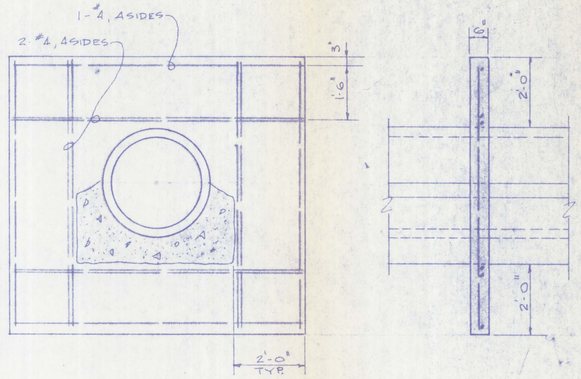



PLAN OF INLET STRUCTURE & TRASH BARRIER

SCALE: ½"=1'-0"



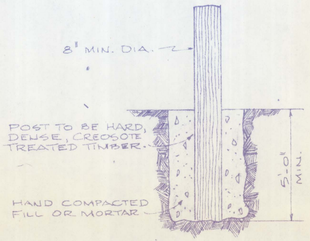
SECTION B 5 SCALE: ½"=1'-0"




FRONT VIEW

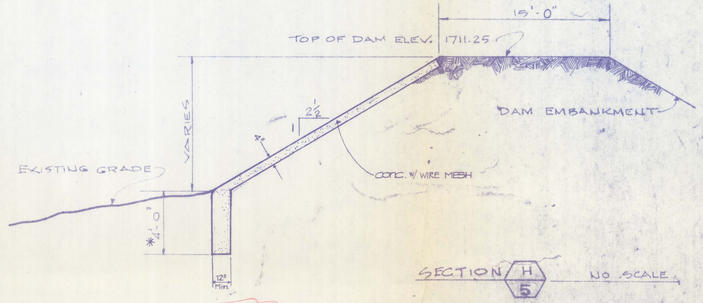
SIDE VIEW

SEEPAGE COLLAR DETAIL SCALE: ½"=1'-0"

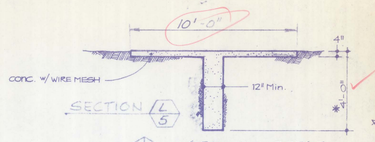



SECTION D 5

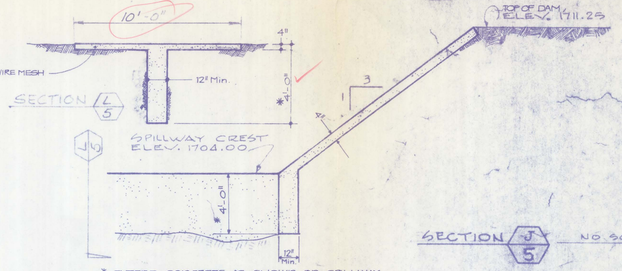
NO SCALE




SECTION H 5 NO SCALE

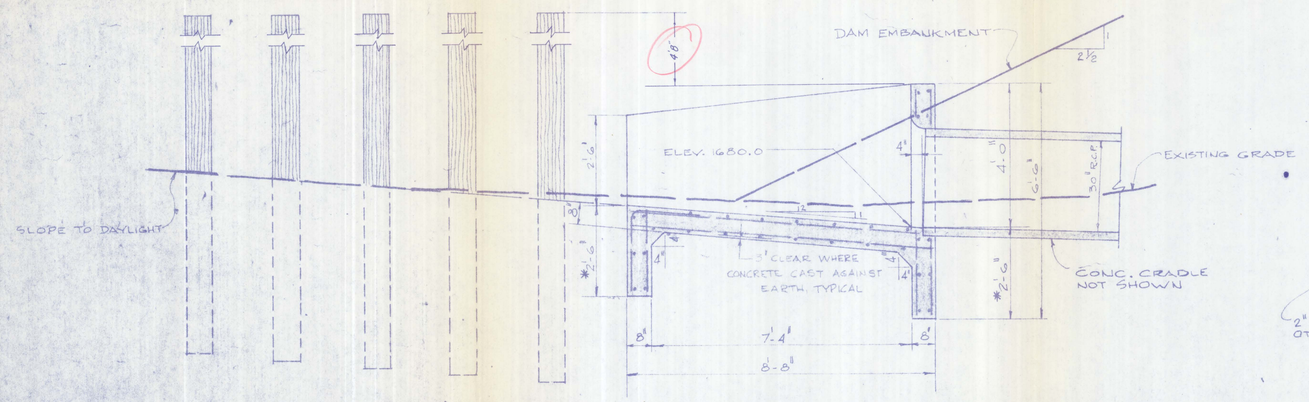



SECTION L 5

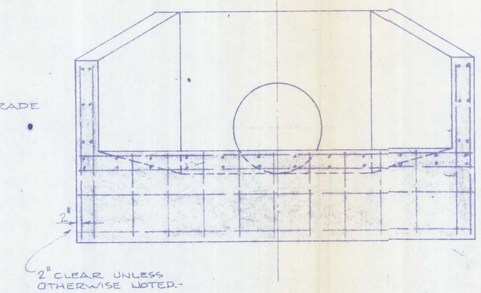



SECTION J 5 NO SCALE

* EXTEND CONCRETE AS SHOWN ON SPILLWAY CREST INTO CEMENTED SOILS.

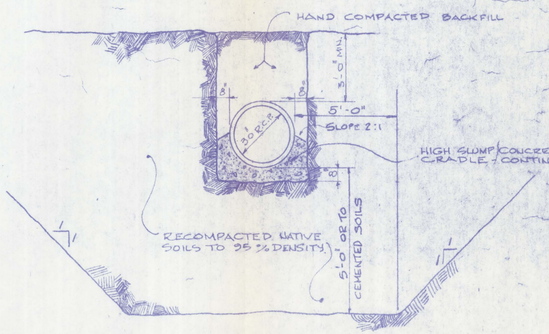



SECTION A 5 SCALE: ½"=1'-0"




2" CLEAR UNLESS OTHERWISE NOTED.

SECTION C 5 SCALE: ½"=1'-0"




SECTION K 5 NO SCALE

NOTES:

PIPE SHALL BE REINFORCED CONCRETE PRESSURE PIPE AS SHOWN IN THE SPECIFICATIONS.-

ALL REINFORCING STEEL TO BE #4 BARS @ 12" EACH WAY, EACH FACE UNLESS OTHERWISE NOTED. ALL REBARS TO EXTEND INTO ADJOINING WALLS OR FLOOR.-

MIN. LAP TO BE 15" AND MIN. RADIUS TO BE 5"

*DIMENSIONS ARE MINIMUM. EXTEND ALL FOUNDATIONS TO CEMENTED SOILS.

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

As built

| | | | |
|---|---|---|---|
| DRAWN BY A. ST. MARTIN | NO | DATE | BY | REVISIONS & REMARKS |
| SCALE AS SCALE ½"=1'-0" | 1. | 8-7-73 | DM | Rev. details H-5, J-5, L-5 |
| DATE 1/8/73 | 2. | 7-1-74 | J.P. | AS BUILT |
| CHECKED BY | | | | |
| DRAWING NUMBER 73 MPIP 21-21 | | | | |

TRICO INTERNATIONAL INC.

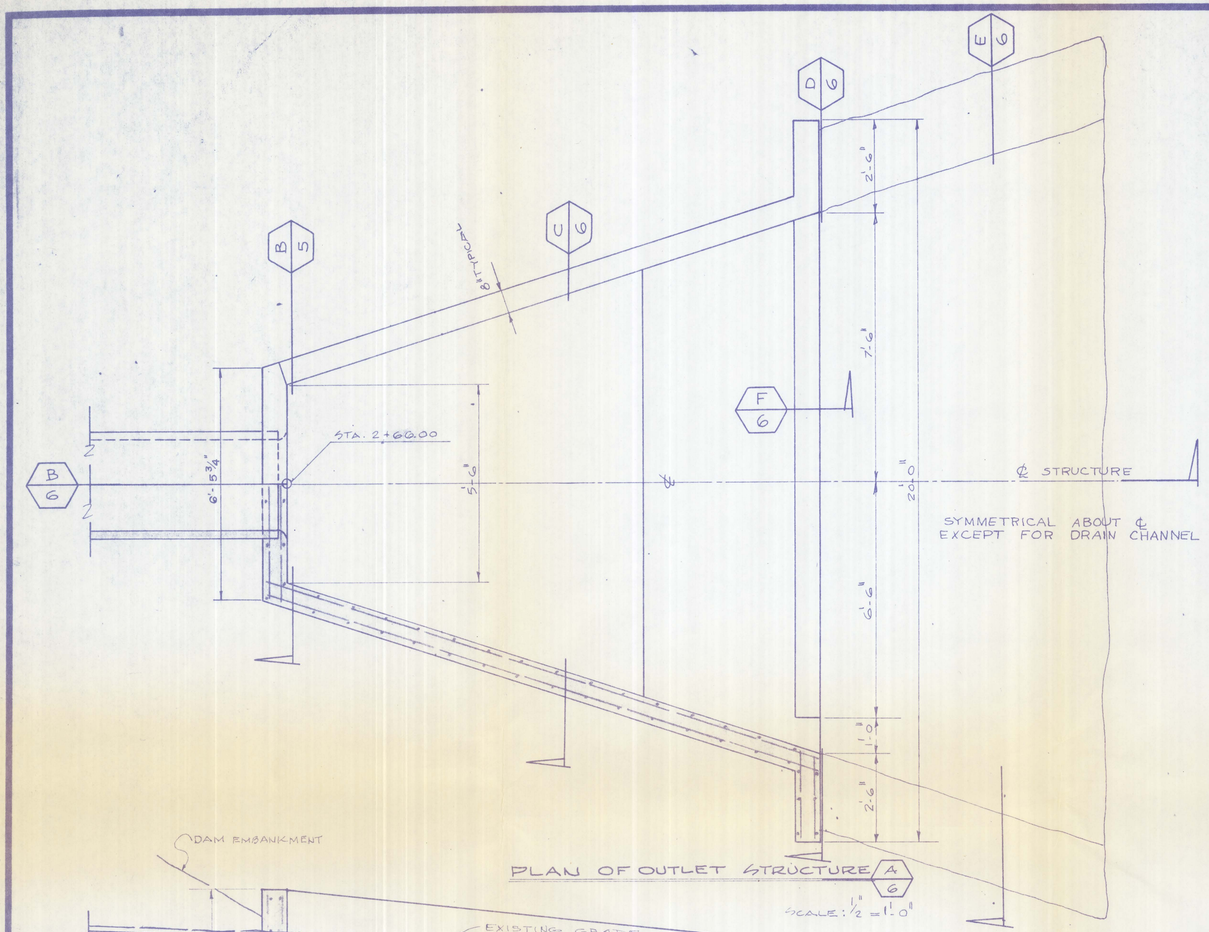
TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 19
INLET STRUCTURE, SEEPAGE COLLAR

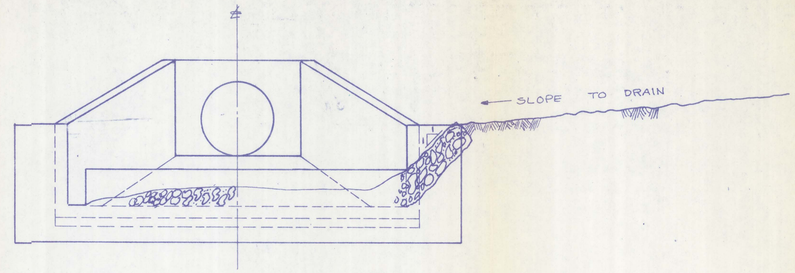
SHEET 5 OF 8 SHEETS

DRAWING 40-105



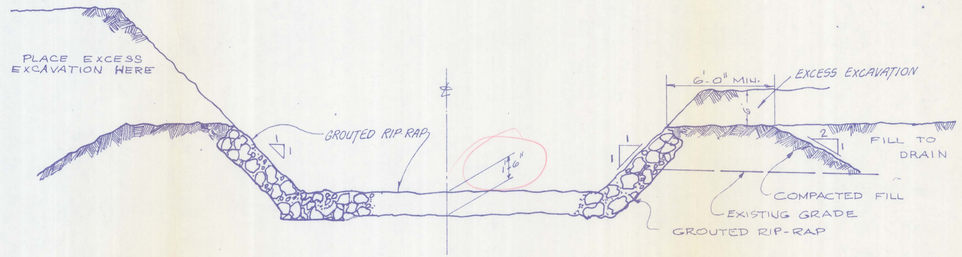

PLAN OF OUTLET STRUCTURE (A/6)

SCALE: 1/2" = 1'-0"



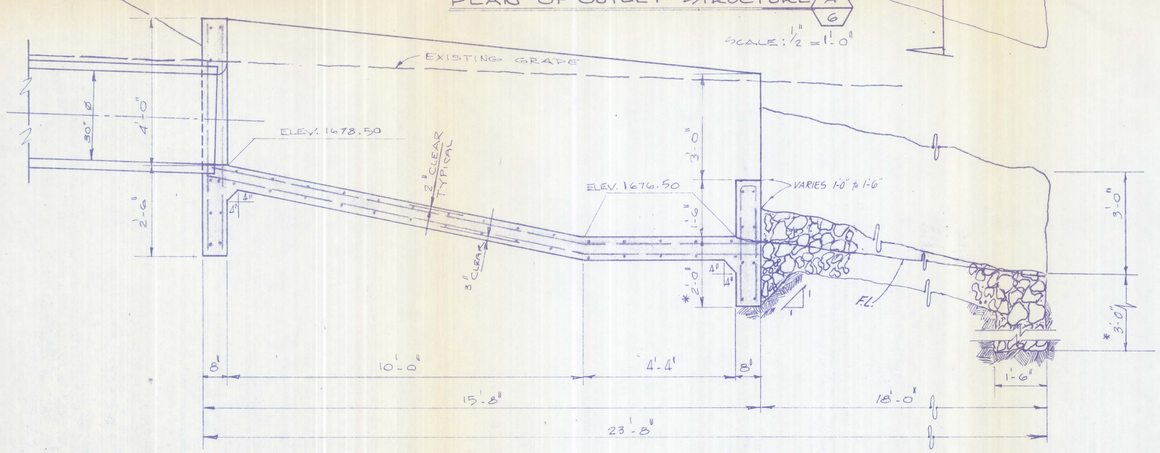

SECTION (D/6)

NO SCALE



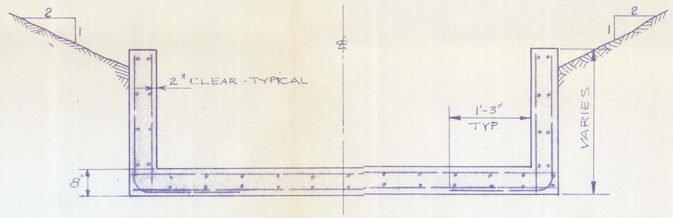

SECTION (E/6)

NO SCALE



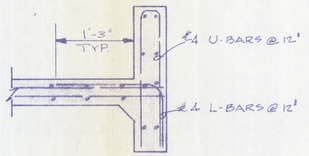

SECTION (B/6)

SCALE: 1/2" = 1'-0"




SECTION (C/6)

NO SCALE




SECTION (F/6)

NO SCALE

**NOTE:**

ALL REINFORCING STEEL TO BE #4 BARS @ 12" EACH WAY, EACH FACE, UNLESS OTHERWISE NOTED.

ALL REINFORCING STEEL TO BE EXTENDED INTO ADJOINING WALLS OR FLOOR.

MIN. LAP TO BE 15" & MIN. BENDING RADIUS TO BE 5".

* DIMENSION IS MINIMUM. EXTEND ALL FOUNDATIONS TO CEMENTED SOILS

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

1-23-73

As Built

| DRAWN BY | NO | DATE | BY | REVISIONS & REMARKS |
|---|---|---|---|---|
| A St. Martin | 1 | 7-1-74 | W.P. | As Built |
| SCALE None 1/2" = 1'-0" | | | | |
| DATE 1/8/73 | | | | |
| CHECKED BY | | | | |
| DRAWING NUMBER 13MPIF 2-1-2-1 | | | | |

BRUNING 40-105

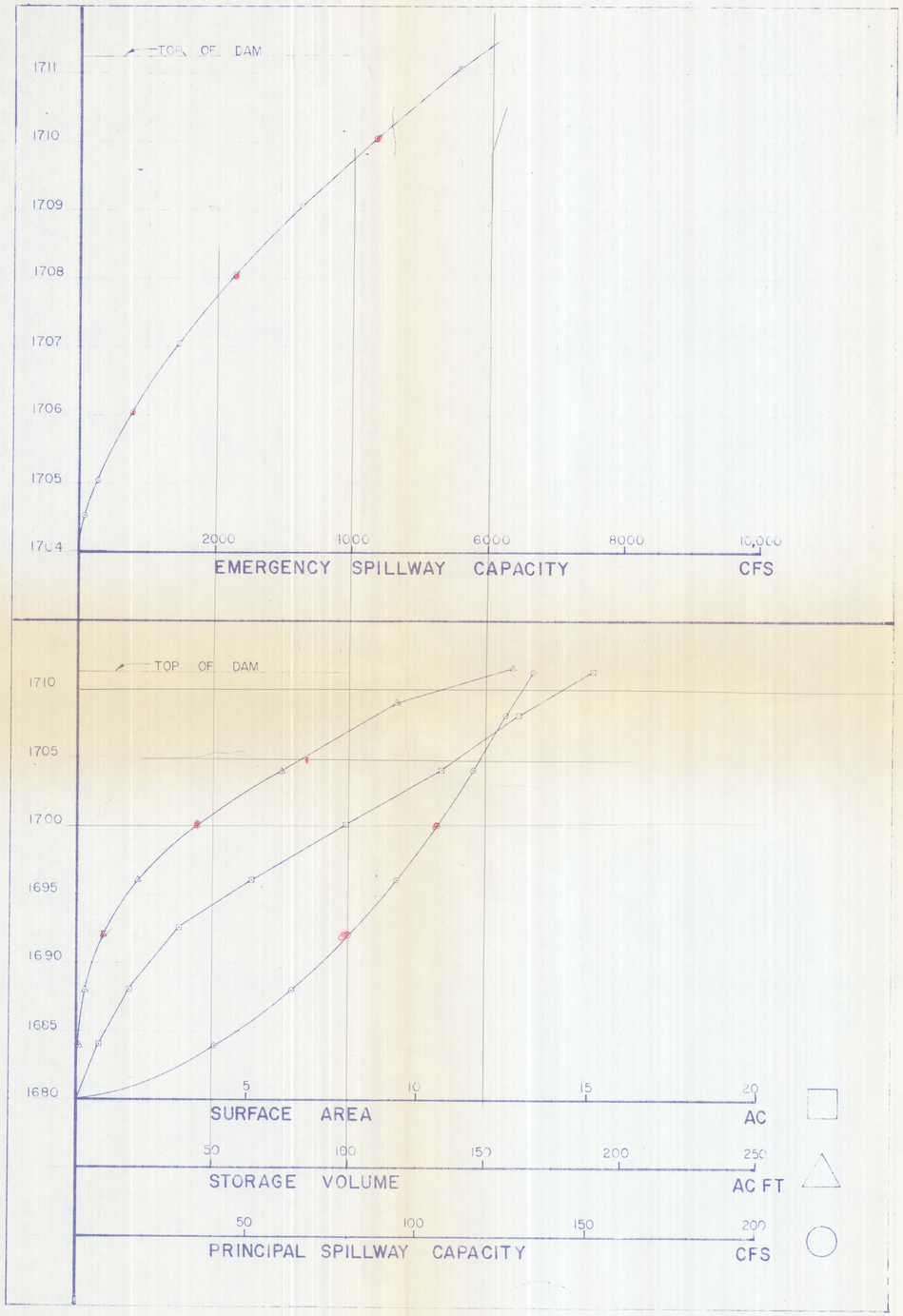
TRICO INTERNATIONAL INC.

TEMPE, ARIZONA
CIVIL ENGINEERING

Mc CULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 19
OUTLET STRUCTURE

SHEET 6 OF 8 SHEETS




STRUCTURE No. 19
PROJECT RETENTION BASIN PROGRAM
JOB NO. E72-357 DATE 9-26-72

## LOG OF TEST BORING NO. 1

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER
SURFACE ELEV. 1710.0'
DATUM TRICO INTERNATIONAL

| Depth in Feet | Continuous Penetration Resistance | Graphical Log | Sample | Sample Type | Blows per foot Lbs. 30" fall Lbs. 30" drop hammer | Dry Density Lbs. per cu. ft. | Moisture Content % Dry Wt. | Unified Soil Classification | Remarks | Visual Classification |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | DRY HARD | CLAYEY SAND, GRAVEL & COBBLES, SOME BOULDERS, SKIP GRADED, SLIGHTLY STRATIFIED, MODERATELY TO STRONGLY CEMENTED, LOW PLASTICITY, WHITE |
| 5 | | | | S | 50/2" | | 1 | SM-SC | | |
| 10 | | | X | S | 50/4" | | 3 | | | |
| 15 | | | | S | 50/5½" | | 4 | CL | DRY HARD | SILTY CLAY, CONSIDERABLE GRAVEL & SOME COARSE SAND, STRATIFIED, SLIGHTLY CEMENTED, MEDIUM PLASTICITY, LIGHT GRAY & BROWN |
| 20 | | | X | S | 50/5" | | 4 | SM-SC | DRY HARD | CLAYEY SAND, SOME SILT & GRAVEL, SOME COBBLES AT 25', SKIP GRADED, STRATIFIED, MODERATELY TO STRONGLY CEMENTED, LOW PLASTICITY, LIGHT GRAY |
| 25 | | | | S | 50/1" | | 4 | SM-SC | | |
| 30 | | | | S | 50/2" | | 5 | SP-SC | DRY HARD | SAND, SOME CLAY & GRAVEL, SKIP GRADED, STRATIFIED, MODERATELY TO STRONGLY CEMENTED, LOW PLASTICITY, LIGHT GRAY |
| 35 | | | | S | 50/2" | | 5 | SC | DRY HARD | CLAYEY SAND, SOME GRAVEL, SKIP GRADED, MODERATELY TO STRONGLY CEMENTED, LOW PLASTICITY, LIGHT TAN<br>NOTE: THINLY INTERBEDDED WITH SILTY CLAY, MODERATELY TO STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| 40 | | | | S | 50/1" | | 7 | SC | DRY HARD | CLAYEY SAND, CONSIDERABLE GRAVEL, SKIP GRADED, STRATIFIED, MODERATELY TO STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| 45 | | | | S | 50/1" | | 5 | SM | DRY HARD | SILTY SAND, TRACE OF GRAVEL, PREDOMINANTLY MEDIUM TO COARSE, STRATIFIED, MODERATELY CEMENTED, NONPLASTIC, LIGHT GRAY |
| | | | | | | | | CL | SLIGHTLY MOIST HARD | SANDY CLAY, TRACE OF GRAVEL, STRATIFIED, STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| 50 | | | | S | 50/1" | | 8 | | | STOPPED AUGER AT 49'6"<br>SAMPLER REFUSED AT 49'7" |

STRUCTURE No. 19
PROJECT RETENTION BASIN PROGRAM
JOB NO. E72-357 DATE 9-29-72

## LOG OF TEST BORING NO. 2

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER
SURFACE ELEV. 1681.0'
DATUM TRICO INTERNATIONAL

| Depth in Feet | Continuous Penetration Resistance | Graphical Log | Sample | Sample Type | Blows per foot Lbs. 30" fall Lbs. 30" drop hammer | Dry Density Lbs. per cu. ft. | Moisture Content % Dry Wt. | Unified Soil Classification | Remarks | Visual Classification |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | DRY HARD | CLAYEY SAND, SOME SILT & GRAVEL, FEW COBBLES, SKIP GRADED, STRATIFIED, MODERATELY CEMENTED TO 2', LOW PLASTICITY, LIGHT TAN |
| 5 | | | X | S | 50/4" | | | SM-SC | | |
| 10 | | | X | S | 50/4" | | | | DRY HARD | SANDY CLAY, SOME GRAVEL, STRONGLY CEMENTED, STRATIFIED, MEDIUM PLASTICITY, LIGHT TAN<br>NOTE: INTERBEDDED WITH LENSES OF CLAYEY SAND, SOME SILT & GRAVEL, SKIP GRADED, STRONGLY CEMENTED, LOW PLASTICITY, LIGHT GRAY |
| 15 | | | | S | 50/1" | | 5 | CL | | |
| 20 | | | | S | 50/1½" | | 5 | | | |
| 25 | | | | S | 50/2½" | | 7 | | | STOPPED AUGER AT 24'6"<br>SAMPLER REFUSED AT 24'8½" |

STRUCTURE No. 19
PROJECT RETENTION BASIN PROGRAM
JOB NO. E72-357 DATE 9-29-72

## LOG OF TEST BORING NO. 3

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER
SURFACE ELEV. 1680.0'
DATUM TRICO INTERNATIONAL

| Depth in Feet | Continuous Penetration Resistance | Graphical Log | Sample | Sample Type | Blows per foot Lbs. 30" fall Lbs. 30" drop hammer | Dry Density Lbs. per cu. ft. | Moisture Content % Dry Wt. | Unified Soil Classification | Remarks | Visual Classification |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | SC | DRY FIRM | CLAYEY SAND, GRAVEL & SOME COBBLES, SKIP GRADED, MEDIUM PLASTICITY, LIGHT BROWN |
| 5 | | | X | S | 105 | | 2 | SM-SC | DRY HARD | CLAYEY SAND, GRAVEL & COBBLES, MINOR SILTY CLAY LENSES, SKIP GRADED, STRATIFIED, WEAKLY CEMENTED, LOW PLASTICITY, LIGHT GRAY |
| 10 | | | | S | 50/3½" | | 7 | | DRY HARD | CLAYEY SAND, SOME STRATIFIED GRAVEL, MODERATELY TO STRONGLY CEMENTED, LOW PLASTICITY, LIGHT BROWN |
| 15 | | | | S | 50/3½" | | | SC | | |
| 20 | | | | S | 50/2½" | | 9 | | DRY HARD | CLAYEY SAND, SOME GRAVEL, SKIP GRADED, STRATIFIED, MODERATELY TO STRONGLY CEMENTED, LOW PLASTICITY, LIGHT GRAY |
| | | | | | | | | SC | | STOPPED AUGER AT 24'6"<br>SAMPLER REFUSED AT 24'11½" |
| 25 | | | | S | 50/5½" | | 5 | | | |

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

As built

1-23-73

RBC
AS NOTED
1-8-73

TRICO INTERNATIONAL INC.

TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 19
CAPACITY TABLES AND
SHT. I OF LOGS OF BORINGS

7
8

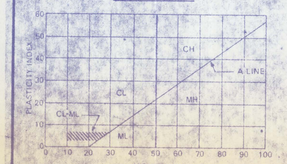
## UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System", Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designations: D2487-66T.

| MAJOR DIVISIONS | | | GRAPHIC SYMBOL | GROUP SYMBOL | TYPICAL NAMES |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS (More than 50% passes No. 200 sieve) | GRAVELS (50% or less of coarse fraction passes No. 4 sieve) | CLEAN GRAVELS (Less than 5% passes No. 200 sieve) | | GW | Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures. |
| | | | | GP | Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures. |
| | | GRAVELS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot below "A" line & hatched zone on plasticity chart | | GM | Silty gravels, gravel-sand-silt mixtures. |
| | | Limits plot above "A" line & hatched zone on plasticity chart | | GC | Clayey gravels, gravel-sand-clay mixtures. |
| | SANDS (More than 50% of coarse fraction passes No. 4 sieve) | CLEAN SANDS (Less than 5% passes No. 200 sieve) | | SW | Well graded sands, gravelly sands. |
| | | | | SP | Poorly graded sands, gravelly sands. |
| | | SANDS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot below "A" line & hatched zone on plasticity chart | | SM | Silty sands, sand-silt mixtures. |
| | | Limits plot above "A" line & hatched zone on plasticity chart | | SC | Clayey sands, sand-clay mixtures. |
| FINE-GRAINED SOILS (50% or more passes No. 200 sieve) | SILTS (Liquid limit less than 50) | SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50) | | ML | Inorganic silts, clayey silts with slight plasticity. |
| | | SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50) | | MH | Inorganic silts, micaceous or diatomaceous silty soils, elastic silts. |
| | CLAYS (Liquid limit less than 50 — Liquid limit more than 50) | CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50) | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. |
| | | CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50) | | CH | Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity. |

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

### PLASTICITY CHART




### DEFINITIONS OF SOIL FRACTIONS

| SOIL COMPONENT | PARTICLE SIZE RANGE |
|---|---|
| Cobbles | Above 3 in. |
| Gravel | 3 in. to No. 4 sieve |
| Coarse gravel | 3 in. to 3 in. |
| Fine gravel | 3 in. to No. 4 sieve |
| Sand | No. 4 to No. 200 |
| Coarse | No. 4 to No. 10 |
| Medium | No. 10 to No. 40 |
| Fine | No. 40 to No. 200 |
| Fines (silt or clay) | Below No. 200 sieve |

STRUCTURE No. 19
PROJECT RETENTION BASIN PROGRAM
JOB NO. F72-357 DATE 9-29-72

### LOG OF TEST BORING NO. 4

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER
SURFACE ELEV. 1684.0'
DATUM TRICO INTERNATIONAL

| Depth in Feet | Continuous Penetration Resistance | Graphical Log | Sample | Sample Type | Blows per foot 140 lb. 30" free fall drop hammer | Dry Density Lbs. per cu. ft. | Moisture Content Per Cent of Dry Wt. | Unified Soil Classification | REMARKS | VISUAL CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | SC | DRY FIRM | CLAYEY SAND, SOME GRAVEL & COBBLES, PREDOMINANTLY FINE TO MEDIUM, LIGHT BROWN |
| 5 | | | | S | 49 | 3 | | SM-SC | DRY HARD | CLAYEY SAND, GRAVEL & COBBLES, SOME SILT, SUBANGULAR, STRATIFIED, SKIP GRADED, SLIGHTLY CEMENTED, LOW PLASTICITY, LIGHT GRAY |
| 10 | | | | S | 50/5" | 6 | | CL | DRY HARD | SILTY CLAY, SOME GRAVEL, STRATIFIED, MODERATELY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| 15 | | | | S | 50/3" | 5 | | SM & CL | DRY HARD | SILTY SAND, CONSIDERABLE GRAVEL, PREDOMINANTLY MEDIUM TO COARSE, STRATIFIED, MODERATELY CEMENTED, LOW PLASTICITY, LIGHT GRAY<br>NOTE: INTERBEDDED WITH LENSES OF SILTY CLAY, SOME GRAVEL, MODERATELY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| 20 | | | | S | 50/2" | 7 | | | | |
| 25 | | | | S | 50/3" | 6 | | | | STOPPED AUGER AT 24'6"<br>SAMPLER REFUSED AT 24'9" |

STRUCTURE No. 19
PROJECT RETENTION BASIN PROGRAM
JOB NO. F72-357 DATE 9-27-72

### LOG OF TEST BORING NO. 5

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER
SURFACE ELEV. 1709.0'
DATUM TRICO INTERNATIONAL

1707±

gulley crest

| Depth in Feet | Continuous Penetration Resistance | Graphical Log | Sample | Sample Type | Blows per foot 140 lb. 30" free fall drop hammer | Dry Density Lbs. per cu. ft. | Moisture Content Per Cent of Dry Wt. | Unified Soil Classification | REMARKS | VISUAL CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | SM-SC | DRY VERY FIRM | SILTY SAND, SOME CLAY & GRAVEL, PREDOMINANTLY FINE TO MEDIUM, STRATIFIED, (SLIGHTLY) CEMENTED NONPLASTIC TO VERY LOW PLASTICITY, LIGHT GRAY |
| 5 | | | | S | 47 | 2 | | | | |
| 10 | | | | S | 50/5½" | 7 | | CL | DRY HARD | SILTY CLAY, TRACE OF GRAVEL, MODERATELY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| | | | | | | | | CL | DRY HARD | SILTY CLAY, STRATIFIED GRAVEL LENSES, MODERATELY TO STRONGLY CEMENTED, LOW TO MEDIUM PLASTICITY, LIGHT BROWN |
| 15 | | | | S | 50/1" | 5 | | | DRY HARD | SANDY CLAY, TRACE OF GRAVEL, STRATIFIED, MODERATELY TO STRONGLY CEMENTED, LOW PLASTICITY, LIGHT BROWN |
| | | | | | | | | CL | | |
| 20 | | | | S | 50/5" | 7 | | | | |
| | | | | | | | | CL | DRY HARD | SILTY CLAY, SOME STRATIFIED GRAVEL, MODERATELY TO STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| 25 | | | | S | 50/2" | 16 | | | | |
| | | | | | | | | CL | | |
| 30 | | | | S | 50/1" | 5 | | SM | DRY HARD | SILTY SAND, SOME GRAVEL, WELL GRADED, STRATIFIED, MODERATELY TO STRONGLY CEMENTED, NONPLASTIC TO LOW PLASTICITY, LIGHT GRAY |
| 35 | | | | S | 50/4" | 8 | | SC | DRY HARD | CLAYEY SAND, SOME STRATIFIED GRAVEL, PREDOMINANTLY FINE, STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| | | | | | | | | CL | DRY HARD | SANDY CLAY, SOME GRAVEL, STRATIFIED, STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT GRAY |
| 40 | | | | S | 50/1" | 6 | | | | |
| 45 | | | | S | 50/1" | 4 | | SC | DRY HARD | CLAYEY SAND, SOME GRAVEL, SKIP GRADED, STRATIFIED, STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| 50 | | | | S | 50/3" | 14 | | | | STOPPED AUGER AT 49'6"<br>SAMPLER REFUSED AT 49'9" |

1-23-73

STRUCTURE No. 19
PROJECT RETENTION BASIN PROGRAM
JOB NO. F72-357 DATE 9-20-72

### LOG OF TEST BORING NO. 6

RIG TYPE CME-55
BORING TYPE 6¾" FLIGHT AUGER
SURFACE ELEV. 1682.0'
DATUM TRICO INTERNATIONAL

| Depth in Feet | Continuous Penetration Resistance | Graphical Log | Sample | Sample Type | Blows per foot 140 lb. 30" free fall drop hammer | Dry Density Lbs. per cu. ft. | Moisture Content Per Cent of Dry Wt. | Unified Soil Classification | REMARKS | VISUAL CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | SM-SC | DRY FIRM | SILTY SAND, CONSIDERABLE CLAY, GRAVEL & COBBLES, PREDOMINANTLY FINE TO MEDIUM, LOW PLASTICITY, LIGHT BROWN |
| 5 | | | | | | | | | DRY HARD | SANDY CLAY, SOME GRAVEL, MODERATELY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN<br>NOTE: INTERBEDDED WITH LENSES OF CLAYEY SAND, CONSIDERABLE GRAVEL, SKIP GRADED, MODERATELY CEMENTED, MEDIUM PLASTICITY, LIGHT GRAY |
| 10 | | | | | | | | CL & SC | | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | DRY HARD | CLAYEY SAND & GRAVEL, SOME COBBLES, SKIP GRADED, STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT GRAY |
| | | | | | | | | SC | | |
| 25 | | | | | | | | | | |
| | | | | | | | | SC | | |
| 30 | | | | | | | | | | STOPPED AUGER AT 30' |

STRUCTURE No. 19
PROJECT RETENTION BASIN PROGRAM
JOB NO. F72-357 DATE 9-29-72

### LOG OF TEST BORING NO. 7

RIG TYPE CME-55
BORING TYPE 4½" FLIGHT AUGER
SURFACE ELEV. 1679.0'
DATUM TRICO INTERNATIONAL

| Depth in Feet | Continuous Penetration Resistance | Graphical Log | Sample | Sample Type | Blows per foot 140 lb. 30" free fall drop hammer | Dry Density Lbs. per cu. ft. | Moisture Content Per Cent of Dry Wt. | Unified Soil Classification | REMARKS | VISUAL CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | SM-SC | DRY VERY FIRM | SILTY SAND, SOME CLAY, GRAVEL & COBBLES, PREDOMINANTLY FINE TO MEDIUM, LOW PLASTICITY, LIGHT BROWN |
| 5 | | | | | | | | | DRY HARD | CLAYEY SAND, CONSIDERABLE GRAVEL, SKIP GRADED, MODERATELY TO STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT GRAY<br>NOTE: INTERBEDDED WITH LENSES OF SANDY CLAY, SOME GRAVEL, STRATIFIED, MODERATELY TO STRONGLY CEMENTED, MEDIUM PLASTICITY, LIGHT BROWN |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | SC & CL | | |
| 20 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | STOPPED AUGER AT 30' |

NOTE

CONSULT REPORT BY SERGENT, HAUSKINS AND BECKWITH DATED DECEMBER 19, 1972 FOR ADDITIONAL INFORMATION ON SOILS INVESTIGATION.

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

As built

| DRAWN BY | NO. | DATE | BY | REVISIONS & REMARKS |
|---|---|---|---|---|
| T.G.C. | 1 | 1-7-73 | J.P. | AS BUILT |
| NONE | | | | |
| DATE 1-8-73 | | | | |
| REVIEWED BY | | | | |
| DRAWING NUMBER 73 MPIF D1-21 | | | | |

TRICO INTERNATIONAL INC.

TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 19
SHT. 2 OF LOGS OF BORINGS

8

8