

NORTH HEIGHTS DAM

STRUCTURE NO. 11

FOUNTAIN HILLS

GENERAL DATA

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<u>Section</u>	<u>Title</u>
1.	Specifications
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SPECIFICATIONS
FOR
RETARDATION STRUCTURE NO. 11
FOUNTAIN HILLS, ARIZONA
(Revised February, 1976)

McCULLOCH PROPERTIES, INC.
FOUNTAIN HILLS, ARIZONA



SPECIFICATIONS
FOR
RETARDATION STRUCTURE NO. 11

Revised
February, 1976

TRICO OF ARIZONA
Fountain Hills, Arizona

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SECTION I - CONSTRUCTION MATERIALS

1.01 PORTLAND CEMENT CONCRETE

1.01.1 General:

Concrete consisting of Portland Cement, concrete aggregate, sand and water will be designated by a symbol consisting of a number, a letter, and a number. The first number will be the number of sacks of cement per cubic yard, the letter the grading of the aggregate, and the last number the compressive strength at 28 days. A sack of cement shall be defined as 94 pounds.

1.01.1.1 Concrete Classes

Structural Concrete shall be 6.0-B-3000 and bedding concrete shall be 5.0-B-2000. Compressive strength test shall be performed in accordance with ASTM C-39.

1.01.2 Portland Cement:

All cement to be used or furnished shall be Type II, Portland Cement, conforming to ASTM C-150. The Contractor shall furnish a certificate of compliance signed by the manufacturer identifying the cement and stating that the cement delivered conforms with ASTM C-150. The cost of furnishing certified cement shall be considered as included in the Contract Bid Price.

Cement shall be stored in such a manner as to permit ready access for the purpose of inspection and sampling, and suitably protected against contamination or moisture. Should any cement delivered show evidence of contamination, or be otherwise unsuitable, the Engineer may require that it be removed from the site.

All Portland Cement used in concrete for any individual structure shall be of the same brand and type unless otherwise approved by the Engineer.

Low alkali cement shall conform to the requirements for Portland Cement as specified in ASTM C-150; and, in addition, shall contain not more than 0.60 percent by weight of total alkali calculated as sodium oxide, including all sodium oxide plus 0.658 of all potassium oxide.

1.01.3 Aggregates:

Aggregates shall be sand and concrete aggregates conforming to the requirements prescribed in Subsection 200-1 of Standard Specifications for Public Works Construction, 1970 Edition, and shall be approved by the Engineer prior to use. They shall meet the grading requirements of this subsection.

Methods of handling materials resulting in segregation, degradation or the combining of materials which results in any stockpile failing to meet specifications, shall not be permitted.

Aggregates which are found to have a silica-released to alkali-reduced ratio greater than one, when tested in accordance with ASTM C-289 may be used only with approval by the Engineer and provided low-alkali cement is used. No additional allowance will be made for the use of low-alkali cement.

1.01.4 Combined Aggregate Gradings:

The combined aggregates shall conform to the gradings specified in the following table:

COMBINED GRADINGS FOR PORTLAND CEMENT CONCRETE

PERCENTAGE PASSING SIEVES

<u>Sieve Size</u>	<u>Grading A</u>	<u>Grading B</u>	<u>Grading C</u>	<u>Grading D</u>	<u>Grading E</u>
2"	100	100			
1-1/2"	95-100	95-100	100		
1"	64- 80	80-100	95-100		
3/4"	55- 71	64- 80	75- 91	100	100
3/8"	37- 53	40- 52	48- 66	92-100	90-100
#4	32- 42	35- 45	39- 51	42- 60	60- 80
#8	25- 35	28- 38	31- 41	33- 47	50- 70
#16	18- 28	21- 31	22- 32	22- 38	33- 53
#30	10- 18	10- 20	12- 22	17- 25	19- 35
#50	3- 9	3- 9	3- 9	6- 12	5- 15
#100	0- 3	0- 3	0- 3	1- 5	2- 6
#200	0- 2	0- 2	0- 2	0- 2	0- 2

1.01.5 Water:

Water used for concrete shall be clear and free from oil, vegetable matter and other deleterious substance. Water shall not contain an amount of impurities that will cause a change in the time of setting of Portland Cement of more than 25% nor a reduction in the compressive strength of mortar at fourteen (14)

days of more than 5% compared to results obtained with distilled water.

In conventionally reinforced concrete work, water shall not contain more than 1,000 ppm of chloride calculated as Cl, nor more than 1,000 ppm of sulfates calculated as SO₄.

In non-reinforced concrete work, water shall not contain more than 2,000 ppm of chloride calculated as Cl, nor more than 1,500 ppm of sulfates calculated as SO₄.

1.01.6 Admixtures:

No admixture of any type shall be used unless authorized by the Engineer. When an admixture is permitted it shall be measured accurately into each batch or load in liquid form by a mechanical dispensing device and method approved by the Engineer.

When an air-entraining agent is used it will be limited to the extent that the amount of entrained air by volume shall not exceed 6%, and the mix shall be redesigned to adjust to yield.

1.01.6.1 Accelerator:

Use of CaCl₂, Calcium Chloride, will not be permitted.

1.01.7 Mixing:

Machine mixing will be required in all cases other than in which it would obviously prove to be impractical, in which event hand mixing will be permitted.

Mixing shall be commenced as soon as possible after the cement is placed in contact with the aggregates, but in no event shall the intervening period exceed 30 minutes.

All concrete mixers shall be of such design and construction and so operated to provide a thoroughly and properly mixed concrete in which the ingredients are uniformly distributed.

1.01.8 Concrete Consistency:

The amount of water added at the mixer shall be regulated to take into account the free water in the aggregates. Free water is defined as the total water minus the water absorbed by the aggregate in a saturated surface-dry condition.

The amount of water used in the mixture shall not exceed the minimum amount necessary to permit practical placement and

consolidation of the concrete, and unless otherwise authorized by the Engineer shall be that required to produce concrete with a slump within the range shown as nominal in the following table:

<u>Type of Work</u>	<u>NOMINAL SLUMP (inches)</u>	<u>MAXIMUM SLUMP (inches)</u>
Concrete Pavement	0-2	3
Non-reinforced Concrete	0-3	4
Reinforced Concrete Structures		
Heavy Sections	0-3	5
Thin Sections	0-4	6

The concrete used in the work shall not have a slump greater than that shown as maximum above, nor a free water content greater than 312 pounds per cubic yard of concrete.

When adverse or difficult conditions affect the placement of concrete, the Engineer may authorize a greater slump to be used, provided both the water and cement are increased.

Water shall be added at a ratio not to exceed 30 pounds per sack of added cement per cubic yard of concrete, and such additional water and cement shall be at the Contractor's expense.

The consistency of concrete shall be determined in accordance with ASTM C-143.

If slump tests of individual samples taken at approximately the 1/4 and 3/4 points of the discharge differ by more than two inches (2"), the mixer will not be acceptable for further use until the condition is corrected.

1.01.9

Transit Mixers:

The type, capacity, and manner of operation of the mixing and transporting equipment for ready-mix concrete shall conform to the current "Standards for Operation of Truck Mixers and Agitators of the National Ready-Mixed Concrete Association" and the "Truck Mixer and Agitators Standards of the Truck Mixer Manufacturers Bureau". Transit mix concrete trucks shall be equipped with an automatic device for recording the number of revolutions of the drum during the mixing period. Each mixer and agitator shall have attached thereto in a prominent place, a metal plate, or plates, installed by the manufacturer on which is plainly marked the capacity of the drum in terms of the volume of mixed concrete and the speed of rotation for the agitating and mixing speeds of the mixing drum or blades.

Each mixer shall have an identification number painted on the

truck in such a location that it can be easily read from the batching platform.

The total volume of materials introduced into the mixer shall not exceed the manufacturer's guaranteed mixing capacity. If the concrete so mixed does not meet the uniformity requirements of this subsection, the amount of materials charged into the mixer shall be reduced.

The drum of the mixer shall be completely emptied of any previously mixed load. The proper proportions of aggregate, cement, and water for each load of concrete shall be placed in the mixer and shall be mixed therein for not less than 70 nor more than 100 revolutions of the drum or blades at the speed designated by the manufacturer of the equipment as mixing speed. Additional revolutions of the drum shall be at the speed designated by the manufacturer of the equipment as agitating speed. The revolving of the drum shall be continuous until the concrete is completely emptied from the drum.

When concrete is being placed for concrete structures, all wash water shall be emptied from the mixer before any portion of the succeeding load is placed therein. For all other work, the mixer shall be empty or may carry 10 gallons of water in the drum. Adequate control of ready-mixed concrete will normally require the additional water to be added and mixed into the batch at the point of discharge. Water so added shall be mixed into the load for a minimum mixing time of three (3) minutes. Water shall not be added to the load during transit.

The total elapsed time between the addition of water at the batch plant and discharging the completed mix shall not exceed 90 minutes. Under conditions contributing to quick setting, the total elapse time permitted may be reduced by the Engineer.

The Engineer shall be provided with a legible certified weighmaster's certificate which shall contain the following information:

- Name of Vendor
- Name of Contractor
- Number of Cubic Yards in the Load
- Actual Weights of Cement and of each Size of Aggregate
- Amount of Water Added at the Plant
- Amount of Water in the Aggregate
- Brand and Type of Cement
- Brand and Amount of Admixture
- Time and Date of Batching

Space shall be provided on the certificate so that amount of water added on the job may be indicated.

1.01.10 Hand Mixing:

Hand-mixing concrete shall be mixed on a water-tight platform, or in a mortar box in batches not to exceed 1/3 cubic yards each.

The aggregates shall first be spread in a uniform layer over which the required quantity of cement shall be evenly distributed. The entire batch shall be turned with shovels until the ingredients are thoroughly blended before adding the water. After adding the proper amount of water, the batch shall again be turned with shovels until a uniform consistency is obtained. Methods of hand mixing which allow the loss of mixing water shall not be permitted.

1.02 GUNITE CONCRETE FOR GROUTED RIP-RAP

1.02.1 Gunite Sand:

Fine aggregates shall consist of washed sand and shall be hard, dense, durable, clean, and sharp, and shall conform to the gradation set forth below. The amount of deleterious substances in the fine aggregate shall not exceed the limits prescribed in ASTM C-33.

FINE AGGREGATE GRADATION

<u>Sieve Size</u>	<u>Percentage Passing Sieves</u>
3/8 inch	100
#4	95-100
#8	65-90
#16	45-75
#30	30-50
#50	10-22
#100	2-8

1.02.2 Portland Cement:

Cement shall be in accordance with Section 3.01.2 of this Specification.

1.02.3 Proportions:

The gunite shall consist of a mixture of 1 part cement to 4-1/2 parts sand. The sand shall contain not less than 3% nor more than 6% of moisture by weight.

1.03 CURING COMPOUND (FOR Concrete)

1.03.1 General:

The curing compound shall meet the requirements of ASTM Designation C-309.

Unless otherwise specified the compound shall be Type 2.

1.04 STEEL REINFORCEMENT FOR CONCRETE

1.04.1 General:

Reinforcing steel shall be either Grade 40 or Grade 60 billet steel conforming to ASTM A-615. Varying grades shall not be used interchangeably in structures.

Steel bending processes shall conform to the requirement of ACI-318.

Bending or straightening shall be accomplished so that the steel will not be damaged. Kinked bars shall not be used.

1.04.2 Tie Wires:

The wires shall be cold-drawn black annealed wire and shall have a tensile strength of not less than 40,000 pounds per square inch.

1.05 CEMENT MORTAR SEAL FOR JOINTS IN CONCRETE PIPE

1.05.1 General:

Cement mortar shall be Class C mortar, 1 part cement to 2 parts sand. The quantity of water to be used in the preparation of mortar shall be required to produce a mixture sufficiently workable for the purpose intended.

Mortar shall be used as soon as possible after mixing and shall show no visible signs of setting prior to use. Re-tempering of mortar will not be permitted.

1.05.2 Cement:

Cement shall conform to the requirements of Subsection 3.01.2 of these specifications.

1.05.3 Sand:

Sand shall conform to the requirements of Subsection 3.01.3.

In proportioning the sand it shall be measured loose (without shaking or compacting) in measuring boxes or other suitable containers of known capacity.

1.05.4 Water:

Water shall conform to the requirements of Subsection 3.01.5 of these specifications.

1.05.5 Admixtures:

No admixture shall be used in mortar unless otherwise specified or approved by the Engineer.

1.06 48" DIAMETER REINFORCED CONCRETE PRESSURE PIPE

1.06.1 General:

The reinforced concrete pressure pipe used for spillway conduit shall be designed to withstand 6000 psi external load and 45 psi internal pressure. The pipe, the materials used in its manufacture, and the methods of fabrication shall conform to the requirements for non-cylinder type, not Prestressed A.W.W.A. Standard C-302-64 Bell and Spigot Pipe.

1.06.2 Steel Reinforcement:

The steel reinforcement shall conform to the requirements of the specifications cited in Section 1.04 for the specified type of pipe.

1.06.3 Joints:

The pipe joints shall be of the bell and spigot type and shall incorporate a positive groove in the spigot to contain the gasket. The groove shall be so proportioned as to prevent the displacement of the gasket by the action of either internal or external pressures under any conditions of joint movement up to the required joint extensibility and joint deflectability.

For the purpose of this specification joint extensibility is defined as the effective watertight length of the joint measured from the center of the gasket to the point of flare of the bell.

1.06.4 Gaskets:

The pipe joint gaskets shall conform to the requirements of the specifications cited in Section 3.08 of AWWA Specification

C-302-64. The cross-sectional diameter of the gaskets shall conform to the pipe manufacturer's recommendation for the type and size of the pipe furnished.

1.06.5 Marking:

All pipe sections and special fittings shall be marked by the manufacturer with the manufacturer's name and trademark, the date of manufacture, the nominal size, design head, design external load and the structure site for which it was designed and manufactured.

1.06.6 Inspection, Testing, and Certification:

The pipe shall be inspected by methods prescribed in Section 1.8 AWWA Specifications C-302-64, except that external crushing strength tests required on a basis for certification shall be performed by the three-edge bearing method prescribed in ASTM Designation C-76.

The three-edge bearing load shall be defined as the load required to produce a 0.01" crack one foot long.

The materials certification shall include:

1.06.6.1 The pipe manufacturer's certified statement of the design strength of the pipe, consisting of:

For types of pipe for which design curves have been approved by the Engineer: (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

Results of typical external crushing strength tests performed on pipe of equivalent size and design and composed of equivalent materials, or

Results of external crushing strength tests performed on a specimen (at least three feet in length) of pipe identical in design and construction to the pipe furnished.

1.06.6.2 The pipe manufacturer's certified statement of results of the hydrostatic tests required by the reference specification appropriate to the type of the pipe furnished.

1.06.6.3 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.

1.06.6.4 Such drawings and descriptions of the pipe joints as may be necessary to show that the joint conforms to the specified requirements.

1.07 ROCK FOR GROUTED RIP-RAP PERMANENT CONSTRUCTION

1.07.1 General Requirements:

Native rock shall be used in the construction of permanent works. The rock size gradation shall be 18" maximum dimensions for the larger rocks and 1" minimum dimension for the least gradation. Individual rock fragments shall be angular, sound, durable, hard, resistant to abrasion and free from laminations, weak cleavages, and undesirable weathering, leaching, exfoliation, and slaking tendencies. It shall be of such character that it will not disintegrate from the action of air, water, or the conditions to be met in handling and placing. All material shall be clean and free from deleterious impurities, including alkali, earth, clay, refuse, and undesirable coatings. Suitable tests or service records may be used to determine the acceptability of the stone. Tests to which the material may be subjected include petrographic analysis, X-ray diffraction, specific gravity, absorption, abrasion, rock drop, soundness, wetting and drying and, such other tests as may be considered necessary to demonstrate to the Engineer that the materials are acceptable for use in the work.

1.08 DUCTILE IRON PIPE

Ductile iron pipe shall be centrifugally cast ductile iron with the pipe barrel meeting all quality requirements of AWWA Specification C-151. Ductile iron pipe shall have a bituminous coating outside and inside meeting requirements of AWWA Specification C-104, standard thickness. Fittings shall be cast iron type. The class of the pipe shall be as designated on the Plans but in no case less than Class 150.

Joints for ductile iron pipe shall be lock-type, push on joints as approved by the Engineer.

SECTION II - CONSTRUCTION METHODS

2.01 CLEARING AND GRUBBING

2.01.1 General:

This work shall consist of removing all natural and artificial objectionable material from the construction area as delineated on the plans, material sites and areas through which channels are to be constructed. Clearing and grubbing shall be performed in advance of grading operations and in accordance with the requirements herein specified.

2.01.2 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 and cactus to be left standing and uninjured will be designated by special markings placed on the trunks at a height of about six feet (6') above the ground surface.

2.01.3 Removal:

All trees and cactus not marked for preservation and all snags, logs, brush, stumps, shrubs, and rubbish shall be removed from the within limits of the marked areas. Unless otherwise specified, all stumps, roots, and root clusters having a diameter of one inch (1") or larger shall be grubbed out to a depth of at least two feet (2') below subgrade elevation for concrete structures and one foot (1') below the natural ground surface at embankment sites and other designated areas. Trees and plants that are not to be removed shall be fully protected from injury by the Contractor at his expense.

2.01.4 Disposal:

All material removed shall be disposed of outside of the construction area by burying or burning. The Contractor shall, at his expense, obtain all necessary county permits for burning and observe all county regulations pertaining to burning. Burning shall be done at such times and in such manner as to prevent the fire from spreading to areas adjoining the construction area. In case burning precedes construction operations, the piles may be placed in the most convenient location on the site. Otherwise, the piles shall be placed in the most convenient location at the side of the site and beyond slope lines where they may be burned without damage to

the surrounding area. No accumulation of flammable material shall remain on or adjacent to the construction site. The adjacent areas shall be left with a neat appearance.

2.02 EARTHWORK, EXCAVATION

2.02.1 General:

Earthwork for debris, dams, and basins shall include stripping, excavation, fill, backfill, grading, and disposal of excavated material.

2.02.2 Stripping:

The Contractor shall strip all top soil and unsuitable material to a minimum of two feet (2') in depth in (1) areas of embankments from toe of slope to toe of slope and, (2), in graded channel areas from top of slope to top of slope, as delineated on the plans.

The material obtained from stripping operations shall be disposed of away from the site unless tests conducted by a soils laboratory conclude the material is suitable for embankment fill. Suitable material shall be stockpiled at a location designated by the Engineer for use as future embankment.

Soil loosened below the stripping depth of two feet (2') shall be compacted. Soil removed below stripping depth, unless otherwise directed by the Engineer, shall be replaced and compacted to subgrade. All such filling and compacting shall be at the Contractor's expense unless otherwise directed by the Engineer.

2.02.3 Cut-Off Trench Excavation:

The Contractor shall excavate a minimum of two feet (2') in depth into cemented granular soils or to solid rock within the limits of the cut-off trench as delineated on the Plans. The final depths and extent of the cut-off trench will be determined in the field by the Engineer.

2.02.4 Basin Excavation:

Suitable excavated soils shall be incorporated into designated zones of the embankment. Such suitable excavated materials shall either be placed directly in embankment zones or initially placed in designated stockpile areas. Unsuitable excavated soils shall be placed in designated disposal areas. The Engineer may require excavation of softer more compressible soils in the outlet pipe foundation beyond the lines and grades shown on the plans to such an elevation where firmer soil is exposed throughout. Proper excavation shall be verified by inspection by the Engineer.

Rocks over six inches (6") in greatest dimension will not be permitted in compacted fills and shall be stockpiled for use in grouted Rip-Rap.

2.02.5 Borrow Excavation:

Shall consist of materials excavated and used in the construction of fills, for use as selected materials or for other construction purposes, obtained by excavating from other sources outside the authorized construction area. The source of the material shall be designated by the Engineer and shall be excavated to lines and grades established by the Engineer.

The Engineer shall perform tests of materials prior to excavations by Contractor with periodic tests thereafter to insure continuing suitability of materials.

Borrow pits shall be excavated and finally dressed in a manner to prevent the creation of residual hazards or unsightly conditions by reason of steep or unstable side slopes. Excavations below the lines and grades established by the Engineer shall be replaced with imported material at the expense of the Contractor.

2.03 EARTHWORK, FILL AND EMBANKMENT

2.03.1 General:

Fill and embankment shall consist of all earth fills and backfills necessary for the construction of the project.

2.03.2 Embankment:

Embankment shall consist of the following items:

Rolling and watering of all fill and manual compaction in the vicinity of the primary spillway outlet as hereafter specified.

Excavation of necessary materials from designated borrow areas and transport to and placement of said materials in designated embankment sections of the dam.

Excavation of necessary materials from temporary stockpile areas and transport to and placement of said materials in designated embankment sections of the dam.

2.03.2.1 Watering of Fill:

Prior to compaction all embankment fill shall be brought to within 2 percent of the optimum moisture content. This shall be accomplished by either presoaking the borrow areas or mechanically mixing water with the embankment materials on grade.

2.03.2.2 Placement and Compaction of Embankment Fill:

All embankment fill materials shall be placed in continuous horizontal lifts and properly compacted. The rolled surfaces of all layers of earth fill shall be so constructed as to provide a firm bond with the overlying layer and prevent development of stratified structure.

Under the direction of the Engineer, all embankment materials placed will be blended together, within practical limits, to assure a homogeneous embankment and to eliminate segregation and subzoning of embankment materials.

In areas adjacent to the primary spillway outlet which cannot be compacted by motorized rollers, compaction shall be accomplished by manual methods with pneumatic or similar equipment. Manual compaction shall be continuously inspected by representatives of the Engineer to insure uniform compactive effort.

The difference in elevation between adjacent areas of compacted fill materials shall not exceed 5 feet at any time during embankment construction.

2.03.2.3 Required Degree of Compaction:

2.03.2.3.1 Maximum density and optimum moisture content of soils in which accurate field density tests can be performed shall be determined in accordance with ASTM D 1557.

2.03.2.3.2 All embankment materials for which accurate field density tests can be performed shall be placed in horizontal lifts and compacted to a minimum of 95 percent of maximum density.

2.03.2.3.3 For purposes of acceptance, the in-place density shall be defined as that determined in accordance with ASTM D 1556, "Density of Soil In Place by Sand Cone Method." Appropriate "rock correction" shall be made to account for the friction of soil retained on the No. 4 sieve.

2.03.2.3.4 Compaction of coarse embankment materials which cannot be accurately tested by field tests shall be controlled on a minimum rolling basis as follows:

Lifts shall be placed so their thickness, when compacted, does not exceed 12 inches.

Compaction shall be accomplished by a specified number of passes of equipment approved by the soils engineer. The following types of pneumatic rollers will be satisfactory.

<u>Roller Type</u>	<u>Roller Rating</u>	<u>Wheel Load</u>	<u>Tire Inflation Pressure</u>
A	45 ton min.	11 ton min.	140 psi min.
B	45 ton min.	5 1/2 ton min.	90 psi min.

Each lift shall be compacted with a minimum of 3 passes of roller A or 5 passes with roller B. Other types of rollers can be evaluated as to suitability and required compactive effort established for those which are acceptable by the Engineer.

During compaction the moisture content of the - 3/4 fraction of the fill shall be maintained within 2 percent of the optimum moisture content as determined in accordance with ASTM D 1557.

2.03.2.4 Designated Embankment Materials:

2.03.2.3.1 Embankment fill materials shall come from suitable portions of excavations for the reservoir, spillway and outlet pipe and from borrow areas designated by the soils engineer. Embankment fill materials should be free of vegetation and debris and otherwise meet the following requirements:

Passing 6 inch sieve	100%
Passing No. 4 sieve	60 - 100%
Passing No. 200 sieve	10 - 50%
Plasticity Index	- 5 - 30

2.03.2.4.2 Clean sands and gravels, excavated for embankment, will be blended with designated borrow, in proportions established by the soils engineer, to provide a combined material meeting the intent of specified embankment.

2.03.2.5 Subgrade Preparation:

No fill or embankment shall be placed until the required excavation and preparation of the underlying foundation is completed, inspected, and accepted by the Engineer.

Before placing the materials for the compacted fills, the subgrade therefor shall be moistened, compacted and scarified in accordance with the requirements hereinafter set forth for subsequent layers of fill. Compaction Test shall be taken on the subgrade at the location designated by the Engineer. Areas not having a minimum density of 95% shall be removed to a depth specified by the Engineer and disposed of away from the construction area. The area shall then be rescarified, compacted, and tested.

2.03.3 Structure Fill:

Materials placed on the fill by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness prior to compaction. Adjacent to structures fill shall be placed in a manner adequate to prevent damage to the structure and to allow the structure to gradually and uniformly assume the backfill loads. Backfill shall be placed in layers not thicker than four inches (4") and shall be compacted by means of hand tamping, manually directed power tampers, or plate vibrators. Heavy equipment, except Vibrating Rollers, shall not be operated within two feet (2') of any structure. Vibrating Rollers shall not be operated within five feet (5') of any structure. The height of the backfill shall be increased at approximately the same rate on all sides of the structure during placement. No structural backfill shall be placed prior to inspection and approval of the structure by the Engineer.

Compacted fill which is to become subgrade for concrete cradles, spillways, or other hydraulic structures, shall be overfilled, sufficiently as to permit the trimming thereof to an even and firm subgrade for the concrete to be placed thereon. No direct payment will be made for such overfill. Any costs involved therefor shall be included in the price bid for the compacted fill.

On hillsides the existing ground shall be benched as the fill is brought up in layers and the material cut shall be incorporated into the fill. Areas which are inaccessible to heavy equipment shall be compacted manually.

The passage of heavy equipment will not be allowed over cradled precast conduits prior to seven (7) days after placement of the concrete cradle and until the backfill has been placed above the top surface of the pipe to a height of two feet (2').

Compaction of fill adjacent to structures may begin ten (10) days after placement of concrete.

2.03.4 Removal and Replacement 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 with acceptable fill. Removal and replacement of rejected fill shall be at the Contractor's expense.

2.03.5 Fill and Backfill of Channels:

Material for fill and backfill of channels shall be the same as embankment fill described herein and shall be placed in lifts not exceeding ten inches (10") in depth. Each lift shall be compacted in the afore-described manner to a minimum of 95% relative density.

LEFT BLANK ON PURPOSE

Grading of unlined channels shall conform to the following tolerances:

A vertical tolerance of zero above and three inches (3") below the specified grade will be allowed for grading the channel bottom and the channel side slopes in both cut and fill.

Regardless of the construction tolerances specified, the excavation and grading shall be performed so that the finished surfaces are in uniform planes with no abrupt breaks in the surface.

The construction tolerances specified herein for grading are solely for purposes of field control.

2.03.6 Slope Treatment:

After completion of embankment the side slopes of the dam shall be graded and compacted to a uniform surface. Should the Contractor maintain uniform surfaces during the embankment process and with the approval of the Engineer additional grading and compaction may not be required.

2.04 GROUTED RIP-RAP:

2.04.1 General:

Grouted Rip-Rap consisting of native rock-placed in excavated or formed areas bound together with gunite concrete shall be placed at the outlet structure, in and around principal and emergency spillways as delineated on the plans and at other locations as may be directed by the Engineer. Neither Rip-Rap nor Gunite shall be placed until subgrade and forming have been inspected and approved by the Engineer.

2.04.2 Materials:

2.04.2.1 Rock for Grouted Rip-Rap:

The rock used in the construction of rip-rap shall conform to the requirements of Material Specifications 1.07 of these specifications. The Contractor shall provide the Engineer free access to the rock source for the purpose of obtaining samples of rock for testing and approving.

2.04.2.2 Gunite Concrete for Grouted Rip-Rap:

The Gunite concrete used in grouted rip-rap shall conform to the requirements of Material Specifications 1.02 of these specifications.

2.04.3 Placement of Rock Rip-Rap:

The rock shall be placed by equipment on the surfaces and to the depths specified. The rip-rap 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 rip-rap 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. The smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge.

Rip-Rap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to the permanent work.

2.04.4 Placement of Guniting Concrete:

2.04.4.1 General:

Pneumatically applied mortar or concrete, designated herein as guniting shall consist of pre-mixed sand and Portland Cement pneumatically transported through a pipe or hose in a dry state to a nozzle where hydration takes place immediately prior to expulsion.

2.04.4.2 Equipment:

The gun mechanism should be operated at a minimum air pressure of 45 pounds per square inch on the gun tank when 100 feet or less of material hose is used and the pressure should be increased 5 pounds for each additional 50 feet of hose required. Nozzles used for guniting shall have a maximum size of 1-5/8 inches unless otherwise permitted by the Engineer.

Water used for hydration shall be maintained at a uniform pressure, which shall be at least 15 pounds per square inch above air pressure at the gun.

2.04.4.3 Proportions and Mixing:

The guniting shall consist of a mixture of cement and sand in the proportions by volume, of 1 part of cement to 4-1/2 parts of sand. The sand shall contain not less than 3% nor more than 6% of moisture by weight. The sand and cement shall be mixed thoroughly by a power mixer for at least 1-1/2 minutes before placement in the chamber of the gun mechanism. The dry mixed material shall be used promptly after mixing and any material

that has been mixed for more than 45 minutes shall be rejected and removed from the worksite.

2.04.4.4 Tests:

During the application of the gunite the Contractor shall cooperate with the Engineer in making compression tests required to determine the quality of gunite being placed in the work. The tests shall be conducted in conformity with the requirements of ASTM C-39. Test specimens shall be made so as to represent the quality of gunite being placed in the work by each nozzleman. Separate tests specimens of gunite made at the same place and time shall be tested at the age of seven (7) days and 28 days. The specimens of gunite at the age of seven (7) days shall develop a minimum compressive strength of 2,400 pounds per square inch, and at the age of 28 days the specimens shall develop a minimum compressive strength of 3,500 pounds per square inch.

2.04.4.5 Placement:

Earth surfaces to which gunite is to be applied shall be neatly trimmed to line and grade and shall be free of all loose material.

No high subgrade will be permitted. Excavation made below subgrade shall be backfilled with compacted fill or, at the Contractor's opinion, with grouted Rip-Rap. However, no additional compensation will be allowed for such compacted fill nor for increased thickness of rip-rap placed because of low subgrade.

Rock surfaces shall be examined and all loose material removed therefrom. The surfaces shall be thoroughly cleaned of all dust, dirt, mortar, grease, or other deleterious substances and then washed with water.

All surfaces shall be wetted with water before application of gunite. Gunite shall not be applied to surfaces on which free water exists.

The velocity of the material as it leaves the nozzle shall be maintained uniformly at a rate which allows the gunite to fill all voids. Material which rebounds and does not fall clear of the work, or which collects on the surfaces, shall be blown off or otherwise removed. Rebound shall not be used in any portion of the work and no payment will be made for rebound or other gunite losses.

The nozzle shall be held at such distance and position that the

stream of flowing material will impinge at approximately right angles to the surface being covered. Any portion of the placed gunite which shows soft or sandy pockets or is otherwise unsatisfactory shall be cut and replaced with new gunite.

2.04.5 Forms and Ground Wires for Grouted Rip-Rap:

The forms shall be built in accordance with applicable provisions of the specifications, except all forms shall be built so as to permit the escape of air and rebound.

Ground wires shall be installed in such a manner that they accurately outline the finished surface as indicated on the plans. They shall be located at intervals sufficient to insure proper thickness throughout. Wires shall be stretched tight and shall not be removed prior to application of the finish coat of gunite.

2.04.6 Finish:

Upon reaching the thickness and shape outlined by forms and ground wire, the surface shall be rodded off to true lines.

Any low spots or depressions shall be brought up to proper grade by placing additional gunite. Ground wires shall then be removed and the surface shall then be broom finished to secure a uniform surface texture. Rodding and working with a wood float shall be held to a minimum.

Rebound or accumulated loose sand shall be thoroughly cleaned up and disposed of by the Contractor. In no case shall it be floated into the surface of the work.

2.04.7 Curing:

The grouted rip-rap shall be cured by a pigmented sealing compound method.

Curing shall commence as soon as free water leaves the surface face of the gunite but not later than 3 hours following the depositing of the gunite upon the rock. The entire pavement surface shall be covered with Type 2 pigmented curing compound conforming to the requirements of Subsection 1.03 of these specifications.

The curing compound shall be delivered to the work ready-mixed. At the time of use the curing compound shall be thoroughly mixed with the pigment uniformly dispersed throughout the mixture.

The curing compound shall be applied to the entire pavement surface by spraying at the rate of one (1) gallon per 200 square feet of pavement surface.

Spraying equipment shall be of the fully atomizing type, equipment with a tank agitator of an approved type which provides for continual agitation of the compound during application. The use of non-agitating type hand pumped garden sprayers will not be permitted except for small and inaccessible areas as may be permitted by the Engineer.

Care shall be taken to provide adequate coverage with the compound at edges, corners, and rough concrete surfaces, and to protect the seal against damage during the curing period. Should the seal be broken or damaged from any cause within 72 hours after application those portions shall be immediately repaired with additional curing compound. No additional compensation will be allowed for such work.

2.05 CONCRETE CONSTRUCTION:

2.05.1 General:

Concrete structures shall be constructed in conformity with the plans and Special Provisions. Concrete for use in work constructed under this Section shall conform to the requirements of Subsection 1.01 hereof.

Safe and suitable ladders shall be provided to permit access to all portions of the work.

The compressive strength of the concrete referred to in this Section will be based on the average results of three (3) tests from six inch (6") x twelve inch (12") concrete test cylinders made and tested by the Engineer in accordance with ASTM C-31 and C-39. The cylinders shall be cured under conditions similar to those affecting the structure.

2.05.2 Subgrade for Concrete Structures:

Earth subgrade upon which concrete is placed shall be firm and free from water. Ground water shall be kept below subgrade until the concrete has set. When the subgrade is in dry earth, it shall be thoroughly dampened with water to insure that no moisture will be absorbed from the fresh concrete.

When the concrete is to be deposited on rock, the rock shall be fully uncovered, cleaned, and its surface shall be removed to a depth sufficient to expose sound rock. Bedrock shall

be roughly leveled-off or cut to approximately horizontal and vertical steps. Seams in the rock shall be grouted under pressure or otherwise treated as the Engineer may direct.

2.05.3

Forms:

Forms shall be of suitable material and of a type, size, shape, quality, and strength to insure construction as desired. The forms shall be true to line and grade, mortar tight, and sufficiently rigid to resist deflection during placing of the concrete. The responsibility for their adequacy shall rest with the Contractor. All dirt, chips, sawdust, nails, and other foreign matter shall be completely removed from forms before any concrete is deposited therein. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes that would deface the finished surface. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being re-used. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly treated with an approved releasing agent which will leave no objectionable film on the surface of the forms that can be absorbed by the concrete. Care shall be exercised that no releasing agent is deposited on previously placed concrete.

Forms for all surfaces that will not be completely enclosed or hidden below the permanent surface of the ground shall be made of surfaced lumber or material which will provide a surface at least equal to surfaced lumber or plywood. Any lumber or material which becomes badly checked or warped, prior to placing concrete, shall not be used.

Form clamps or bolts, approved by the Engineer, shall be used to fasten forms. The use of twisted wire loop ties to hold forms in position will not be permitted, nor shall wooden spreaders be used. Clamps or bolts shall be of sufficient strength and number to prevent spreading of the forms. They shall be of such type that they can be entirely removed or cut back one inch (1") below the finished surface of the concrete.

2.05.4

Removal of Forms:

The periods of time for form removal set forth herein are permissive only and subject to the Contractor assuming all risks that may be involved. The time periods are minimum with no allowance therein for external loads. At time of low temperatures, or other adverse conditions, the Engineer may require the forms to be kept in place for longer periods of time.

The time period is predicated on the use of concrete to which no admixtures have been added for the purpose of obtaining a high early strength, and upon the use of the same type of cement throughout the structure.

Outside forms and inside wall forms may be removed after a period of sixteen (16) hours.

2.05.5 Placing Reinforcement:

Before placing reinforcing steel, the Contractor shall submit a reinforcing steel placing plan to the Engineer for approval.

Reinforcing bars shall be accurately placed as shown on the plans and shall be firmly and securely held in position in accordance with Concrete Reinforcing Steel Institute "Recommended Practice for Placing Reinforcing Bars", and by using concrete or metal chairs, spacers, metal hangers, supporting wires and other approved devices of sufficient strength to resist crushing under full load. Metal chairs which extend to the surface of the concrete shall not be used.

Placing bars on layers of fresh concrete as the work progresses and adjusting bars during the placing of concrete will not be permitted. Before placing in the forms, all reinforcing steel shall be cleaned thoroughly of mortar, oil, dirt, loose mill scale, loose or thick rust, and coatings of any character that would destroy or reduce the bond. No concrete shall be deposited until the placing of the reinforcing steel has been inspected and approved by the Engineer.

2.05.5.1 Splicing Reinforcement:

Splices of bars shall be made only where shown on the plans or as approved by the Engineer. Where bars are spliced, they shall be lapped at least thirty (30) diameters, unless otherwise shown on the plans.

Splicing shall be accomplished by placing the bars in contact with each other and wiring them together.

Welding of reinforcing steel will not be permitted unless specifically authorized by the Engineer.

2.05.5.2 Bending Reinforcement:

Bends and hooks in bars shall be made in the manner prescribed in the "Manual of Standard Practice" of the American Concrete

Institute.

Bars shall not be bent or straightened in a manner which will injure the material. Bars with kinks or unspecified bends shall not be used.

2.05.6 Placing Concrete (General):

Concrete shall be conveyed, deposited and consolidated by any method which will preclude the segregation or loss of ingredients.

Chutes used in conveying concrete shall be sloped to permit concrete of the consistency required to flow without segregation.

2.05.6.1 Depositing:

To avoid segregation, concrete shall be deposited as near to its final position as is practicable. The use of vibrators for extensive shifting of the mass of concrete will not be permitted. Concrete that has partially hardened, has been retempered, or is contaminated by foreign materials shall not be deposited in the structure.

Concrete shall be placed in horizontal layers insofar as practical. Placing shall start at the low point and proceed up grade unless otherwise permitted by the Engineer. Concrete shall be placed in a continuous operation between construction joints and shall be terminated with square ends and level tops.

2.05.6.2 Consolidating:

Concrete shall be thoroughly consolidated in a manner that will encase the reinforcement and inserts, fill the forms, and produce a surface or even texture free of rock pockets and excessive voids.

Concrete shall be consolidated by means of high frequency internal vibrators of a type, size and number approved by the Engineer. The location, manner, and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete without separation of the mortar and coarse aggregate, and without causing water or cement paste to flush to the surface. Internal vibrators shall not be held against the forms or reinforcing steel.

The number of vibrators employed shall be sufficient to consolidate the concrete within fifteen (15) minutes after it

has been deposited in the forms. At least two (2) vibrators in good operating condition shall be available at the site of the structure in which more than twenty-five (25) cubic yards of concrete is to be placed.

2.05.6.3 Placing Concrete Under Adverse Weather Conditions:

Concrete for structures or slabs shall not be placed on frozen ground nor shall it be mixed or placed while the atmospheric temperature is below 35 degrees F., unless adequate means are employed to heat the aggregate and water, satisfactory provisions have been made for protecting the work, and with the written permission of the Engineer and only after such precautionary measures for the pavement have been taken as he may direct.

Concrete shall be effectively protected from freezing or frost for a period of five (5) days after placing.

Concrete for structures shall not be mixed or placed while the atmospheric temperature is above 115 degrees F., unless adequate means are employed to cool the aggregate and water and satisfactory provisions have been made for protecting the work. In any case, the temperature of the concrete as placed shall not exceed 90 degrees F.

Concrete placement shall be stopped when rainfall is sufficient to cause damage to the work.

2.05.7 Surface Finishes:

The classes of surface finish described herein shall be applied to various parts of concrete structures as specified.

2.05.7.1 Ordinary Surface Finish:

Immediately after the forms have been removed, all exterior form bolts shall be removed to a depth of at least one inch (1") below the surface of the concrete and the resulting holes or depressions cleaned and filled with mortar. Mortar shall consist of one (1) part by volume of cement to two (2) parts of sand. Mortar shall be mixed approximately 45 minutes in advance of use. Care shall be exercised to obtain a perfect bond with the concrete. All fins caused by form joints and other projections shall be removed and all pockets cleaned and filled. Mortar for filling pockets shall be treated as specified for bolt holes.

On surfaces which are to be buried underground the removal of

fins and form marks will not be required. Ordinary surface finish shall be considered as a final finish for exposed surfaces.

2.05.8

Curing:

As soon after the completion of the specified finishing operation as the condition of the concrete will permit without danger of consequent damage thereto, all exposed surface shall either be sprinkled with water, covered with plastic sheet, or covered with earth, sand, or burlap, sprayed with Type 1 curing compound conforming with subsection 1.01.1.

Concrete that is water cured must be kept continuously wet for at least ten (10) days after being placed. The method of water curing shall be subject to approval by the Engineer.

When an impervious membrane (curing compound) is used it shall be applied under pressure through a spray nozzle in such manner and quantity as to entirely cover and seal all exposed surfaces of the concrete with a uniform film. The membrane shall not be applied to any surface until all of the finishing operations have been completed, such surfaces being kept damp until the membrane is applied. All surfaces on which a bond is required, such as construction joints, reinforcing steel, and the like, shall be adequately covered and protected before starting the application of the curing compound in order to prevent any of the compound from being deposited thereon, and any such surface with which the compound may have come in contact shall immediately thereafter be cleaned. Care shall be exercised to prevent any damage to the membrane seal during the curing period. Should the seal be damaged before the expiration of ten (10) days after the placing of the concrete additional impervious membrane shall be immediately applied over the damaged area.

Should any forms be removed sooner than ten (10) days after the placing of the concrete, the surface so exposed shall either be immediately sprayed with a coating of the curing compound or kept continuously wet by the use of burlap or other suitable means until such concrete has cured for at least ten (10) days.

When tops of walls are cured by the curing compound method the side forms, except for metal forms, must be kept continuously wet for at least ten (10) days following the placing of the concrete.

2.06 INSTALLATION OF 48" DIAMETER REINFORCED
CONCRETE PRESSURE PIPE SPILLWAY CONDUIT

2.06.1 Trench Excavation:

2.06.2 General:

Excavation shall include the removal of all water and materials of any nature which interfere with the construction work.

Excavation for conduits shall be by open trench. Contractor shall not commence trenching operations until embankment fill is placed to minimum height of one foot (1') above the design grade of the top of the conduit.

Excavation for appurtenant structures such as seepage structures shall be deemed to be in the category of trench excavation.

2.06.2.1 Maximum and Minimum Width of Trench:

The minimum and maximum width of trench permitted shall be as indicated on the Plans. The side slopes necessary to maintain the stability of excavated surfaces may not necessarily coincide with the pay limits specified on the Plans for trench excavation. Such work shall be so excavated, braced, and supported as to safeguard the work and workmen and to provide the ground adjacent to the excavation will not slide or settle. When such bracing and supporting is required, the width of the excavation shall be adjusted to allow for the space occupied by the sheeting, bracing, or other supporting installations. The Contractor, at his expense, shall furnish, place, and subsequently remove such supporting installations.

2.06.2.2 Over Excavation of Trench:

Excavation in earth below the design grade of the trench due to Contractor's error shall be backfilled with select material as designated by the Engineer and mechanically compacted to 95% optimum density prior to installation of the conduit. The Contractor shall, at his expense, provide all material, equipment, and labor necessary to reconstruct design grade.

Excavation in rock below design grade of trench due to rock excavation shall be backfilled with concrete bedding after installation of conduit. The Contractor shall be paid the unit price bid of bedding concrete for the extra material required.

2.06.2.3 Access to Trenches:

Safe and suitable ladders which project two feet (2') above the top of the trench shall be provided. One (1) ladder shall be provided for each one hundred feet (100') of open trench, or fraction thereof; and be so located that workmen in the trench need not move more than fifty feet (50') to a ladder.

2.06.2.4 Bracing Excavations:

The manner of bracing excavations shall be as set forth in the rules, orders, and regulations of the Division of Industrial Safety of the State of Arizona.

If sheeting is used to support the excavated trench, the sheeting shall be removed by the Contractor, and no such sheeting will be permitted to remain in the trench. When field conditions, the type of sheeting or methods of construction used by the Contractor are such as to make the removal of the sheeting impracticable, the Engineer may permit portions of the sheeting to be cut off to a specified depth and remain in the trench.

2.06.3 Backfill:

Backfill shall be considered as starting at the top of concrete bedding. All material below this point shall be considered as bedding.

The Contractor shall proceed as soon as possible with backfilling operations. Care shall be exercised so that the conduit will not be damaged or displaced. The backfill above the concrete bedding shall not be placed nor sheeting pulled until at least forty (40) hours after the placement of concrete bedding.

Rocks larger than six inches (6") in any dimension will not be permitted in backfill of the pipe. Where rocks are included in the backfill they shall be mixed with suitable excavated materials so as to eliminate voids.

After the placing of backfill has been started the Contractor shall proceed as soon as practicable with densification.

Voids left by the removal of sheeting and sheeting supports shall be immediately backfilled with clean sand which shall be jetted into place to assure dense and complete filling of the voids.

2.06.3.1 Densification Methods:

Backfill shall be mechanically compacted by means of tamping with manually directed mechanical equipment. The equipment shall be of a size and type approved by the Engineer. Impact-type pavement breakers (stompers) will not be permitted.

Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will not result in damage to adjacent ground, or improvements installed under the Contract. The Contractor shall make his own determination in this regard.

Material for mechanical compacted backfill shall be placed in lift which, prior to compaction, shall not exceed the depth of four inches (4").

Mechanically compacted backfill shall be placed in horizontal layers of such depths, (not exceeding those specified above) compatible to the material being placed and the type of equipment being used. Each layer shall be evenly spread, moistened (or dried, if necessary), and then tamped until the specified 95% relative compaction has been attained.

Water densification of backfill will not be permitted.

2.06.4 Laying Reinforced Concrete Pressure Pipe, Spillway Conduit:

2.06.4.1 Bedding Material:

Bedding shall be Class 5.0-B-2000 concrete, the top of the concrete as shown on the Plans shall be considered as the top of the bedding.

If soft, spongy, unstable, or similar other material is encountered upon which the bedding material is to be placed, this unsuitable material shall be removed to a depth ordered by the Engineer and replaced with bedding material. Additional bedding so ordered over the above amount required by the Plans and Specifications will be paid for as provided in the Proposal or the Special Provisions. If the necessity for such additional bedding material has been caused by an act or failure to act on the part of the Contractor, or is required for the control of ground water, the Contractor shall bear the expense of the additional excavation and bedding.

2.06.4.1.1 Placing Bedding Material:

Bedding material shall first be placed so that the pipe is

supported for the full length of the barrel with full bearing on the bottom segment of the pipe equal to a minimum of 0.4 of the outside diameter of the barrel. Then the remainder of the bedding shall be placed in accordance with Section 2.05.6 of these Specifications.

2.06.4.2 Pipe Laying:

Pipe shall be carefully inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be subject to rejection. Any corrective work shall be approved by the Engineer and shall be at no cost to the Owner.

Pipe shall be laid upgrade with the bell end of the pipe upgrade.

2.06.4.3 Field Jointing of Gasket Type Joints for Reinforced Concrete Pipe:

- (1) The ends of the pipe shall be so formed that when the pipes are laid together and joined they shall make a continuous and uniform line of pipe with a smooth and regular surface.

Joints shall be water-tight and flexible. Each joint shall contain a solid gasket of neopane or other material approved by the Engineer. This gasket shall be circular cross section unless otherwise approved by the Engineer. The length and cross sectional diameter of the gasket, the annular space provided for the gasket, and all other joint details shall be such as to produce a water-tight joint. The slope of the longitudinal gasket contact surfaces of the joint with respect to the longitudinal axis of the pipe shall not exceed two degrees.

- (2) The work shall be scheduled so that the bell end of the pipe faces in the direction of laying. Prior to placing the spigot into the bell of the pipe previously laid, the spigot groove, the gasket and the bell shall be thoroughly cleaned. Then the spigot groove, the gasket and the first two inches (2") of the bell shall be lubricated with a soft vegetable soap compound. The gasket, after lubrication, shall be uniformly stretched when placing it in the spigot groove so that the gasket is distributed evenly around the circumference. After the joint is assembled a thin metal feeler gauge shall be inserted between the bell and the spigot and the position of the gasket checked around the complete circumference of the pipe. If the gasket is not in the proper position the pipe shall be withdrawn, the

gasket checked to see that it is not cut or damaged, the pipe relaid, and the gasket again checked.

- (3) Before placement of the bedding the exterior annular space between the ends of the pipe sections shall be cleaned and filled with Class "C" Mortar.

2.06.5 Pressure Testing:

Pressure testing of the completed conduit will not be required.

2.07 DEBRIS BARRIER:

2.07.1 General:

The Contractor shall install wooden poles for the purpose of debris barriers at locations delineated on the Plans.

2.07.2 Wood Poles:

Poles shall be hard, dense timber of sufficient length to allow for a minimum of four foot (4') bury and maintain the required height above ground as shown on the Plans. All poles shall be a minimum of eight inches (8") in diameter and shall be treated with creosote. The minimum amount of preservative to be retained in the wood shall be 12 lbs. per cubic foot to minimum depth of 3/4 inch.

Sawed surfaces shall be painted with creosote as directed by the Engineer.

With approval of the Engineer the Contractor may use utility poles as debris barriers. The Engineer shall be provided samples of the poles for testing and approving ten (10) days prior to installations.

2.07.3 Installing Wood Poles:

Poles shall be set in pre-drilled holes at as near vertical positions as possible and backfilled with a cement grout. Poles shall be held in a vertical position for a period of twenty-four (24) hours to allow grout to set up.

2.07.4 Damaged Poles:

Poles moved or otherwise damaged by construction operations after installation shall be removed and replaced at the Contractor's expense.

2.08 CLEANUP AND RESTORATION:

2.08.1 General:

Throughout all phases of construction including suspension of work and until final acceptance of the project the Contractor shall keep the worksite clean and free from rubbish and debris. Prior to the acceptance of the work, the Contractor shall remove all excess construction materials and appurtenances and perform general grading operations as directed by the Engineer to restore the construction site to an aesthetically pleasing condition.

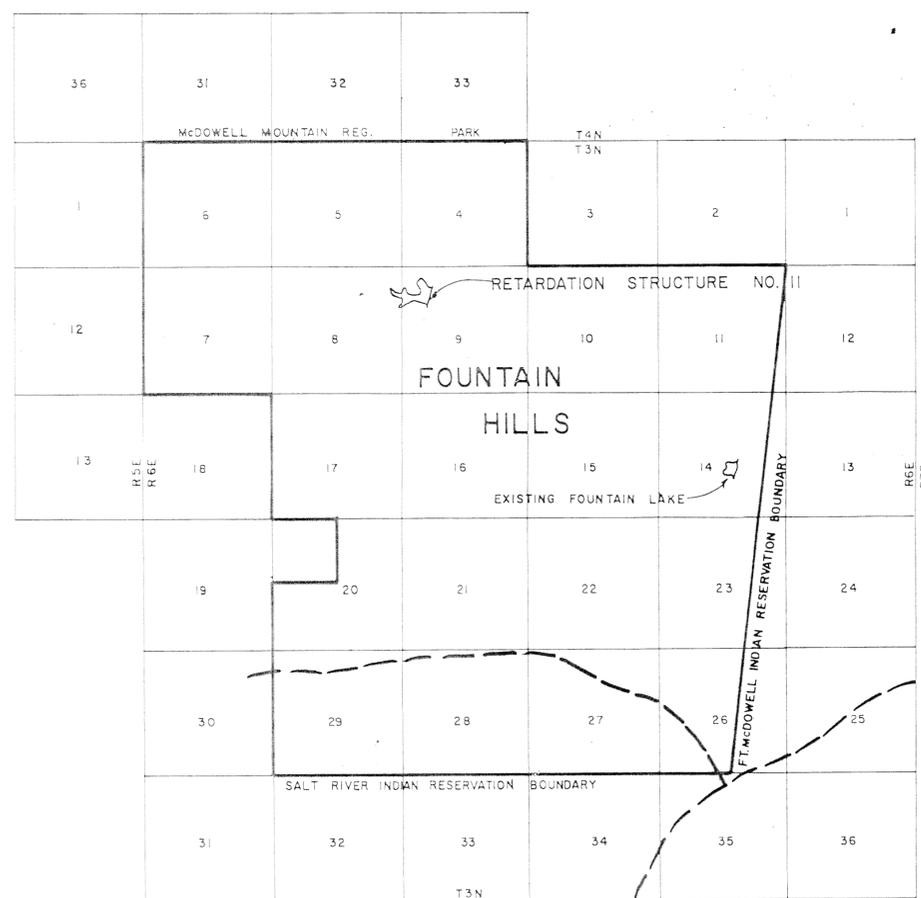
2.09 INSTALLATION OF 10" DIAMETER DUCTILE IRON SEWER PIPE:

Installation of the ductile iron sewer pipe shall conform to Section 2.06 herein except that Subsection 2.06.4.3 shall not apply to ductile iron pipe.

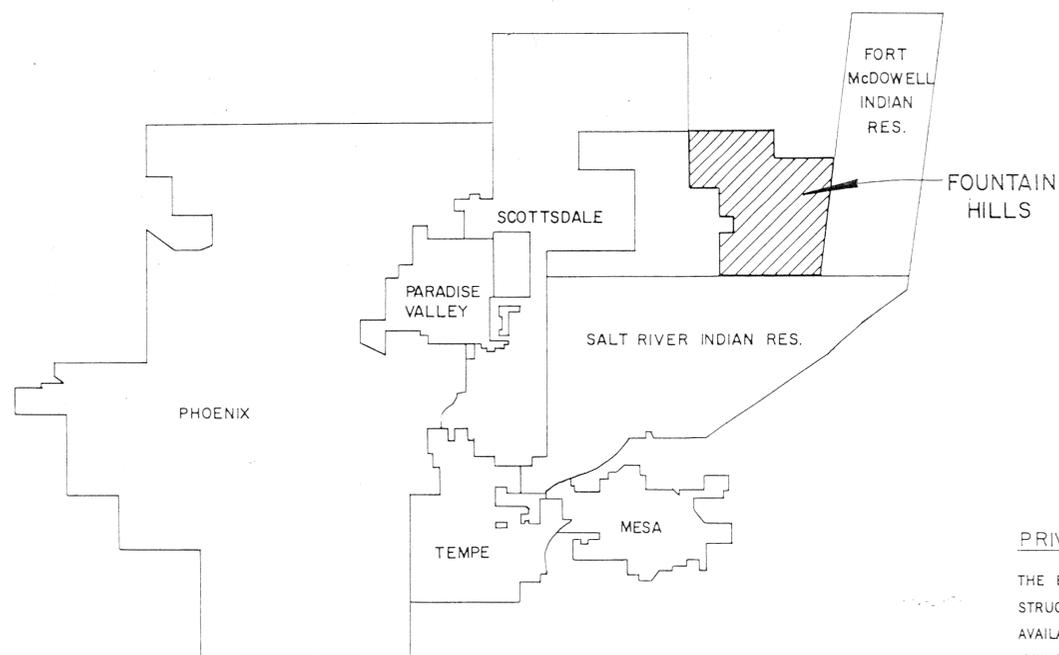
FOUNTAIN HILLS

MARICOPA COUNTY, ARIZONA

STORM WATER RETARDATION BASIN NO. II



VICINITY MAP
NO SCALE



PHOENIX - SCOTTSDALE AREA
NO SCALE

SHEET INDEX	
SHEET	DESCRIPTION
1	TITLE SHEET
2	DRAINAGE MAP
3	SITE PLAN
4	PROFILE & SECTION - DAM
5	PROFILE - SPILLWAYS
6	INLET STRUCTURE
7	OUTLET STRUCTURE
8	CAPACITY TABLES

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.

Gordon F. Freudig
GORDON F. FREUDIG REGISTERED CIVIL ENGINEER NO. 5478
12-6-72

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 THE FOUNDATION AND MATERIALS INVESTIGATION REPORT. (STRUCTURE No. II BY SERGENT, HAUSKINS AND BECKWITH.)

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 ELEV. BASED ON 19"/6 HOUR STORM
4. FLOOD WATER DAM'S FUNCTION IS TO RETARD RUNOFF.

RECEIVED
MAR - 4 1976
Arizona Water Commission

7-40

DRAWN BY	NO.	DATE	BY	REVISIONS & REMARKS
W. J. Moran				
SCALE				
DATE				
CHECKED BY				
DRAWING NUMBER				



TEMPE, ARIZONA
CIVIL ENGINEERING

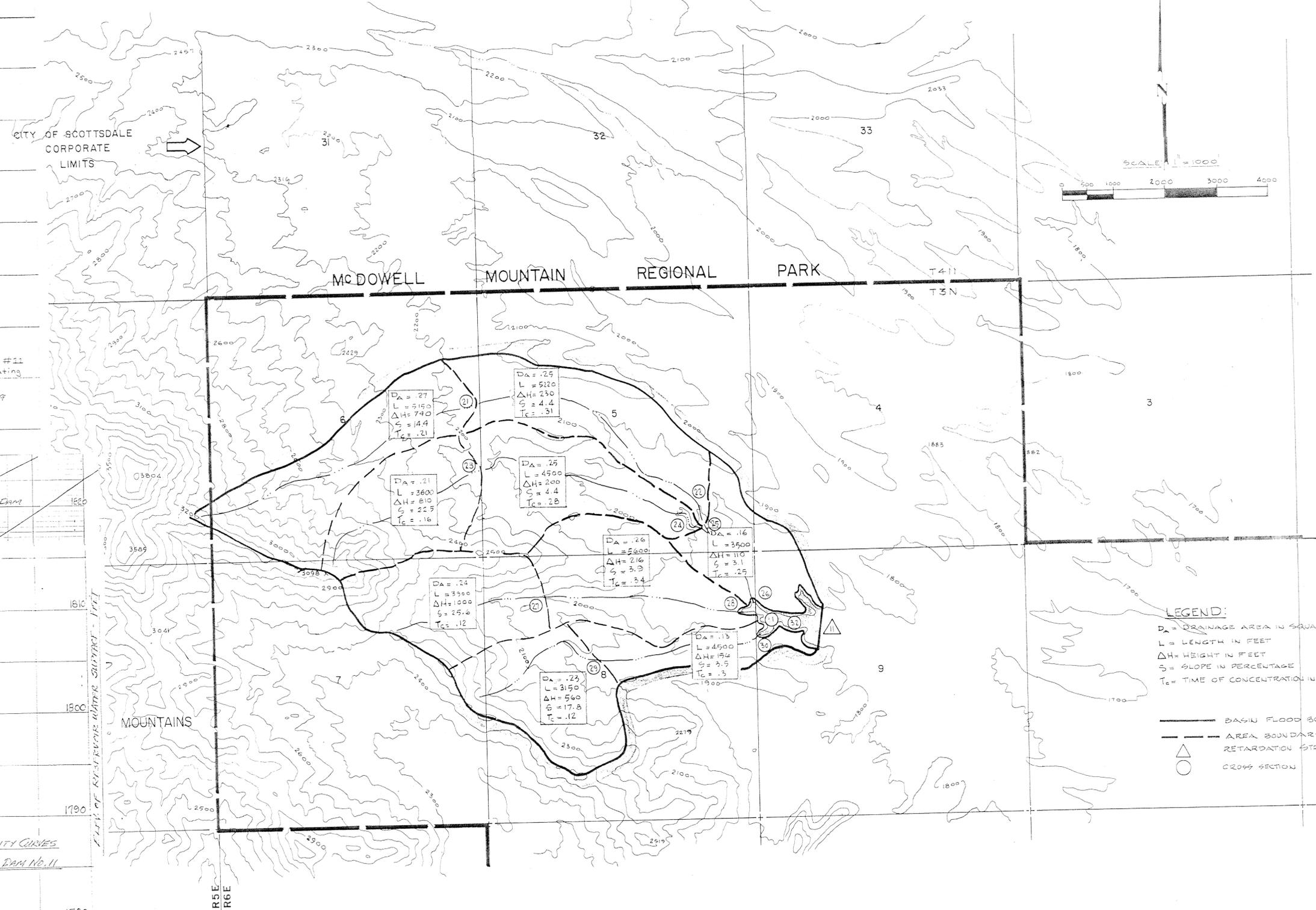
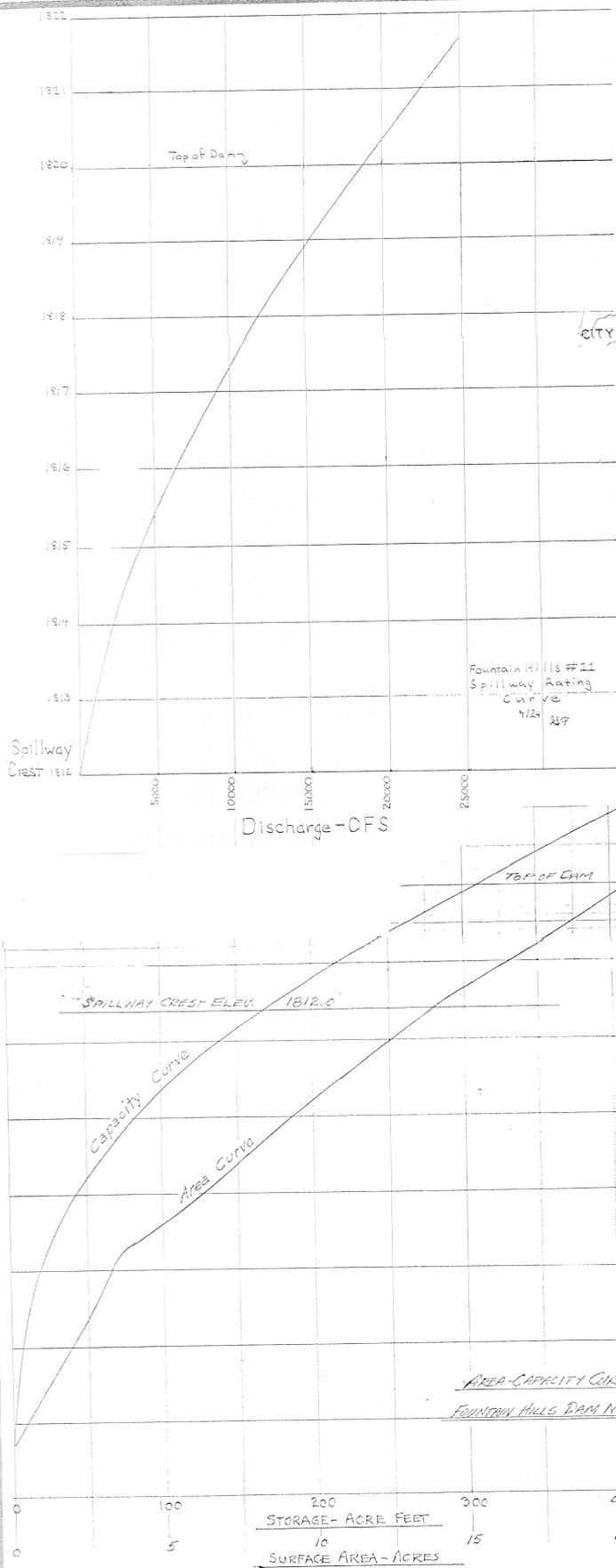
McCULLOCH PROPERTIES, INC.
FOUNTAIN HILLS, ARIZ.

STRUCTURE NUMBER II
TITLE SHEET

SHEET
1
OF 8
SHEETS

7-40

7-40



DRAWN BY A. S. Martin	NO. DATE BY	REVISIONS & REMARKS
SCALE 1" = 1000'		
DATE 1/17/72		
CHECKED BY		
DRAWING NUMBER NO. 72 P. 12-795		



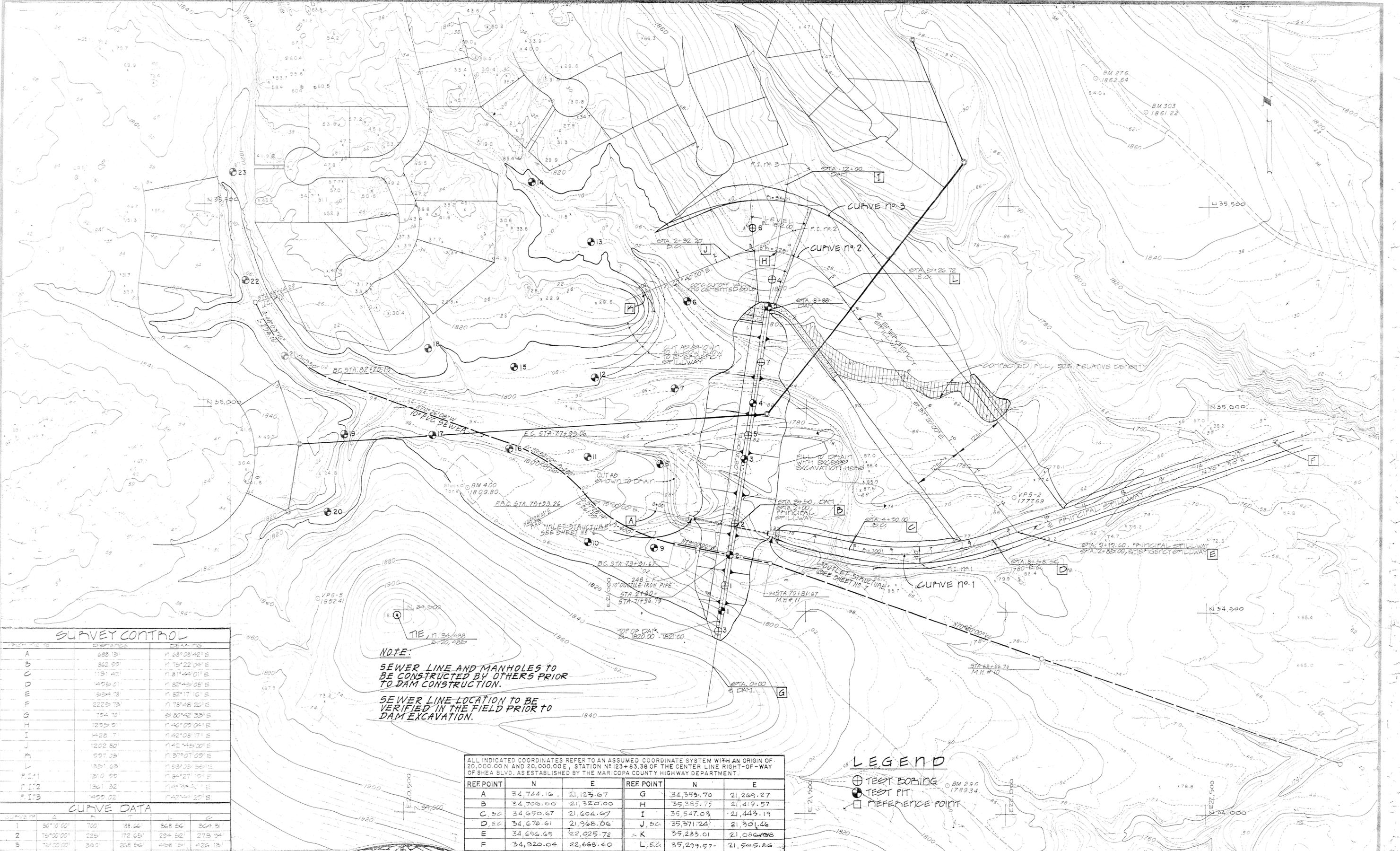
TEMPE, ARIZONA
CIVIL ENGINEERING

Mc CULLOCH PROPERTIES, INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 11
DRAINAGE MAP

SHEET
2
OF 3
SHEETS

7-40



SURVEY CONTROL		
FROM TO	DISTANCE	DEATH
A	488.19	N 68°08'42" E
B	862.97	N 75°22'04" E
C	1131.42	N 81°44'01" E
D	479.01	N 80°45'08" E
E	854.78	N 82°17'10" E
F	222.73	N 78°48'20" E
G	794.70	S 80°42'33" E
H	1275.91	N 46°00'04" E
I	442.71	N 42°08'17" E
J	1202.80	N 42°44'00" E
K	227.38	N 37°07'00" E
L	351.63	N 52°25'55" E
M	1310.95	N 84°27'10" E
N	1361.32	N 44°34'10" E
O	449.22	N 42°44'20" E

CURVE DATA				
CURVE NO.	Δ	T	L	P
1	30°10'00"	700	188.66	268.56
2	75°00'00"	225	172.65	234.52
3	75°00'00"	350	268.56	458.53

NOTE:
 SEWER LINE AND MANHOLES TO BE CONSTRUCTED BY OTHERS PRIOR TO DAM CONSTRUCTION.
 SEWER LINE LOCATION TO BE VERIFIED IN THE FIELD PRIOR TO DAM EXCAVATION.

ALL INDICATED COORDINATES REFER TO AN ASSUMED COORDINATE SYSTEM WITH AN ORIGIN OF 20,000.00 N AND 20,000.00 E, STATION N 123+83.38 OF THE CENTER LINE RIGHT-OF-WAY OF SHEA BLVD. AS ESTABLISHED BY THE MARICOPA COUNTY HIGHWAY DEPARTMENT.

REF POINT	N	E	REF POINT	N	E
A	34,744.16	21,123.67	G	34,359.70	21,249.27
B	34,706.00	21,320.00	H	35,355.75	21,419.57
C	34,650.67	21,604.67	I	35,547.03	21,443.19
D	34,676.61	21,968.06	J	35,371.24	21,301.46
E	34,696.65	22,025.72	K	35,283.01	21,086.98
F	34,920.04	22,668.40	L	35,239.57	21,545.86

LEGEND

- ⊕ TEST BORING
- ⊙ TEST PIT
- REFERENCE POINT

NO.	DATE	BY	REVISIONS & REMARKS
1	12/12	AS	Point Added Prop. 10" P.C. SEWER W/M.H.'s



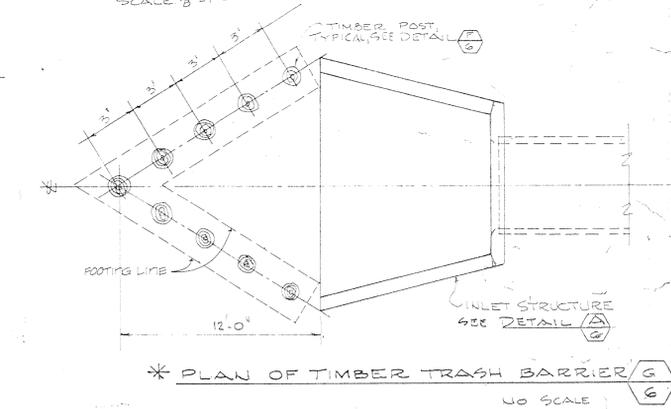
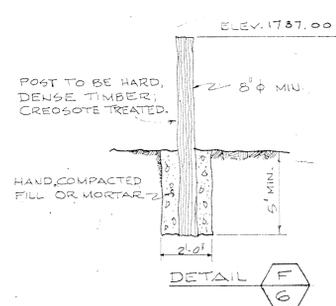
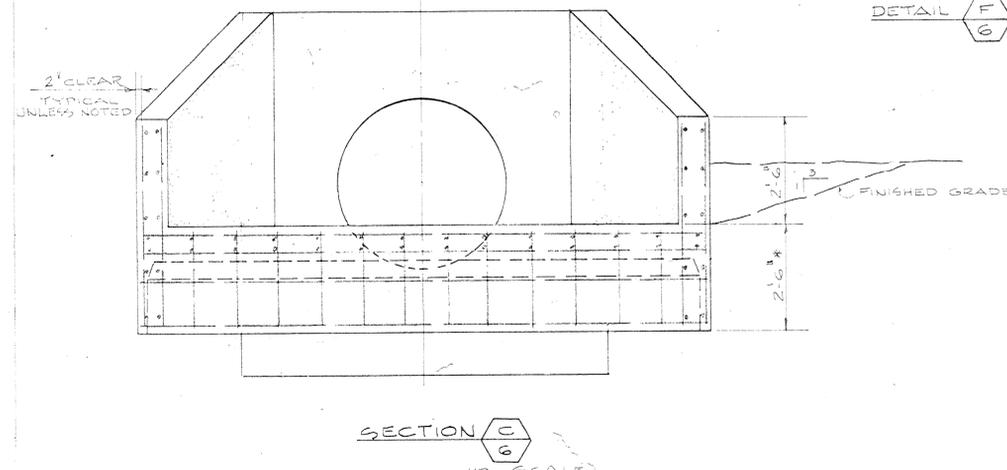
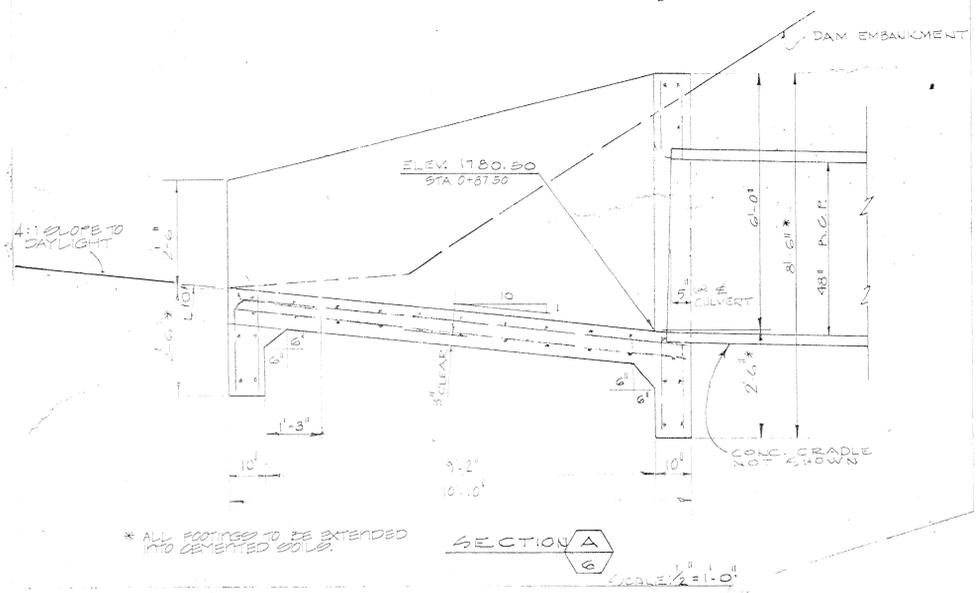
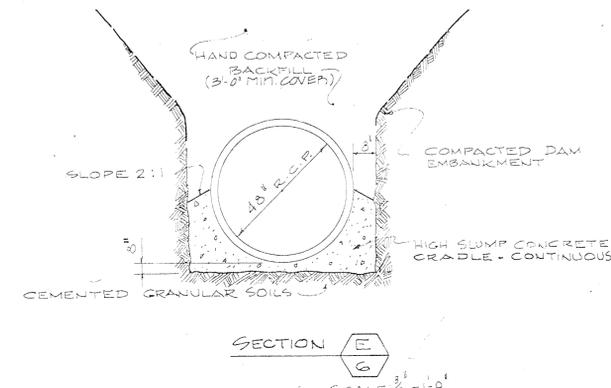
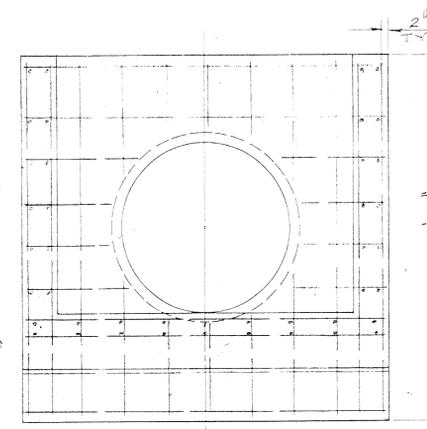
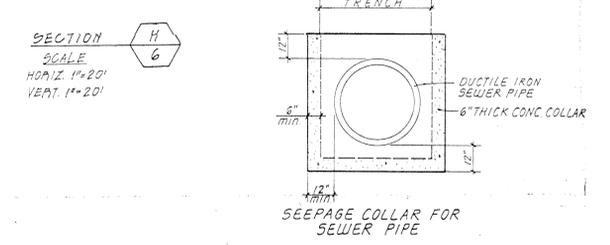
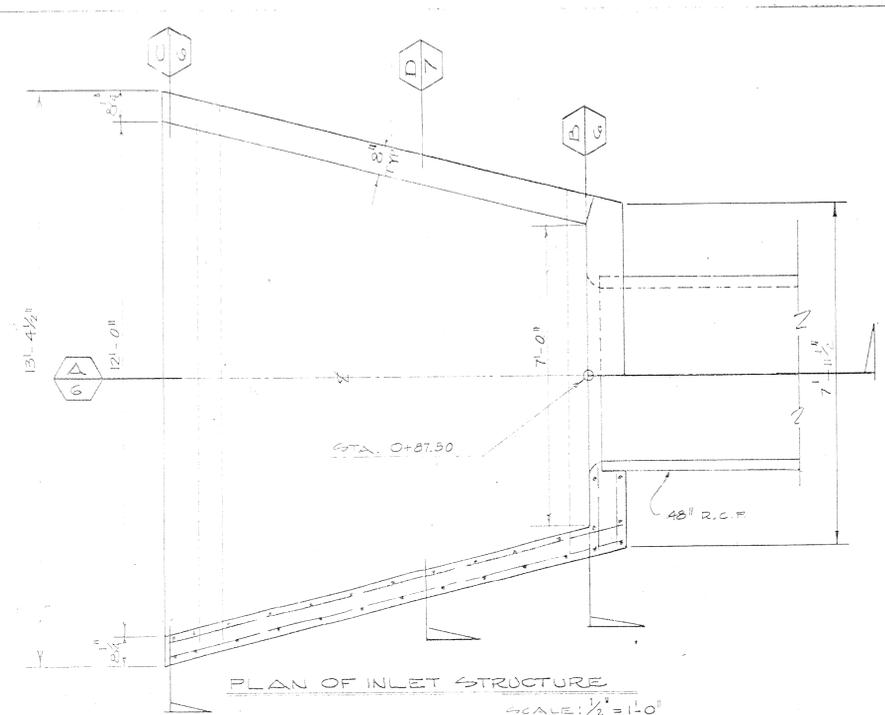
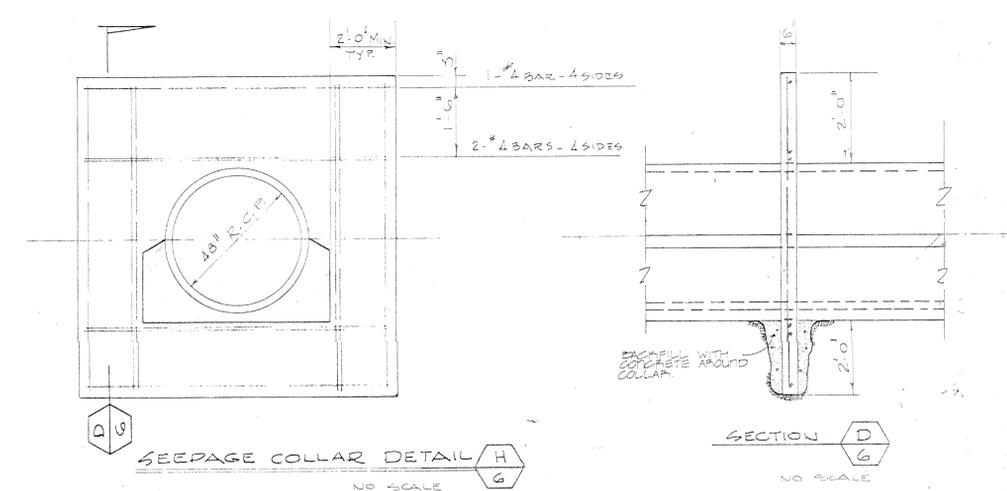
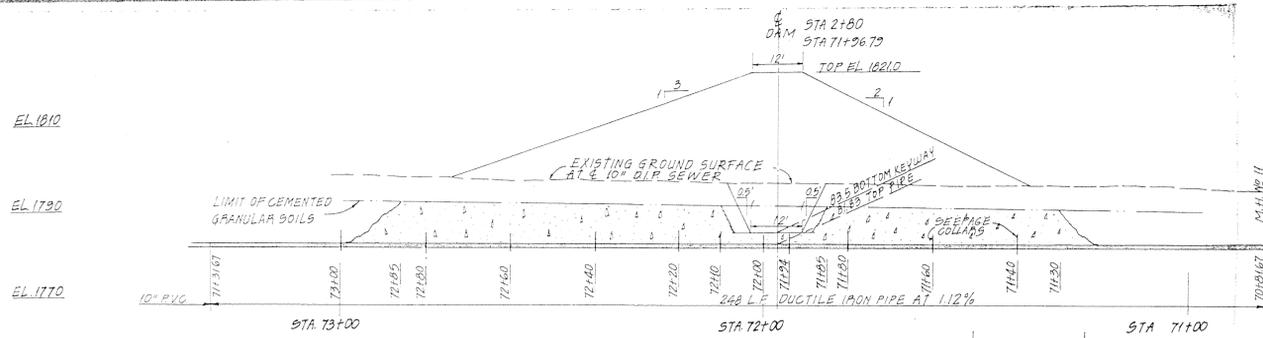
TEMPE, ARIZONA
 CIVIL ENGINEERING

MC CULLOCH PROPERTIES, INC.
 FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. II
 SITE & GRADING PLAN

SHEET
 3
 OF 8

NOTES:
 1. PIPE TRENCH BACKFILLED TO LIMIT OF CEMENTED GRANULAR SOILS FROM STA. 71+30 TO STA. 71+85 AND FROM STA. 72+10 TO STA. 72+55 WITH CLASS 90 CONCRETE.
 2. PIPE TRENCH BACKFILLED TO ELEV. 1783.5 FROM STA. 71+85 TO STA. 72+10 WITH CLASS 90 CONCRETE.



NOTES:
 PIPE SHALL BE REINFORCED CONCRETE PRESSURE PIPE AS SHOWN IN THE SPECIFICATIONS.
 OVER-EXCAVATION BEYOND MINIMUM SHOWN FOR CRADLE SHALL BE BACKFILLED WITH CLASS C CONCRETE.
 REINFORCEMENT:
 ALL REINFORCING STEEL TO BE #4 BARS.
 ALL WALLS & FLOOR TO BE REINFORCED WITH #4 BARS @ 12\"/>



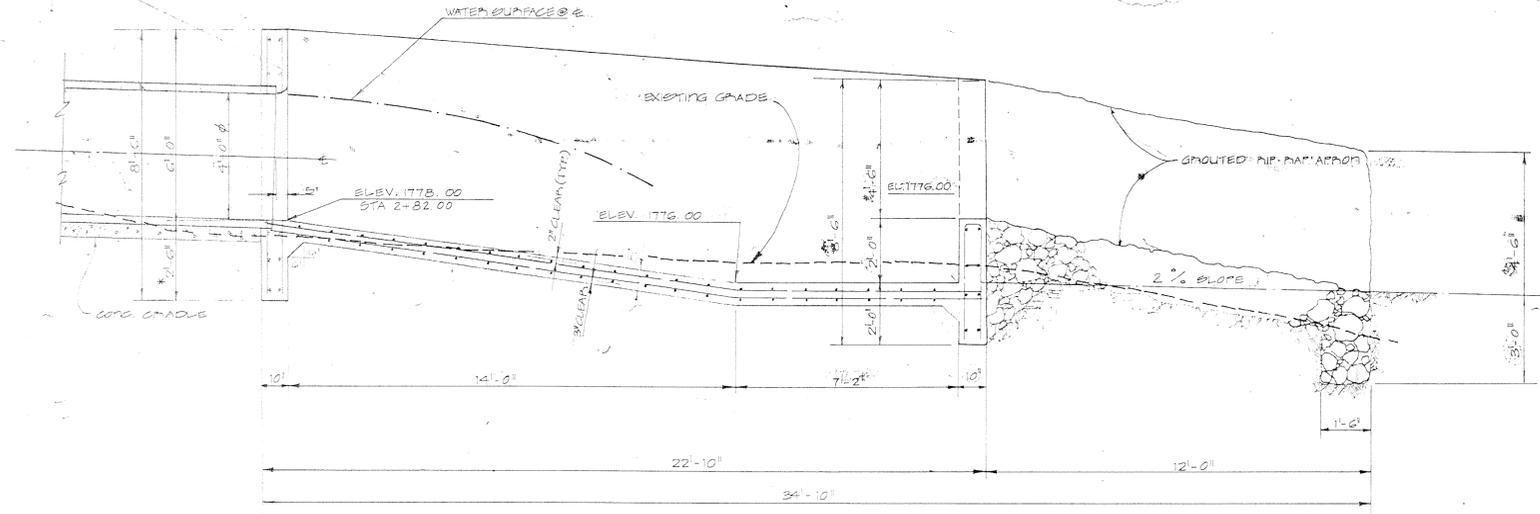
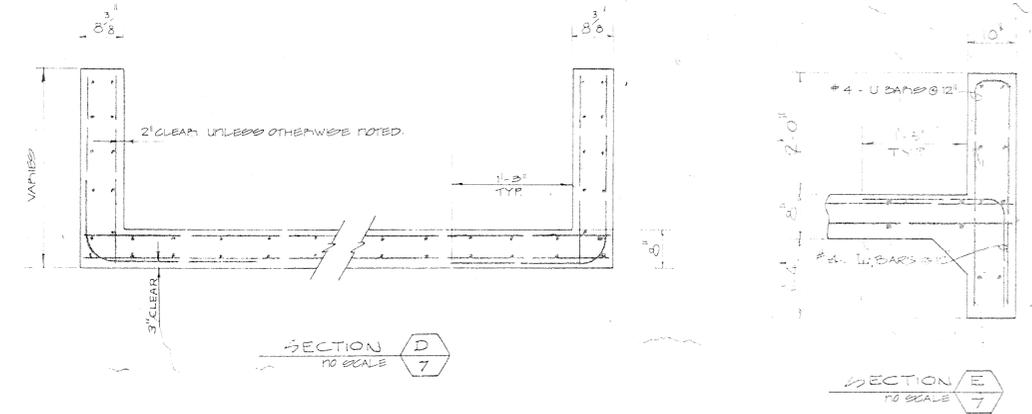
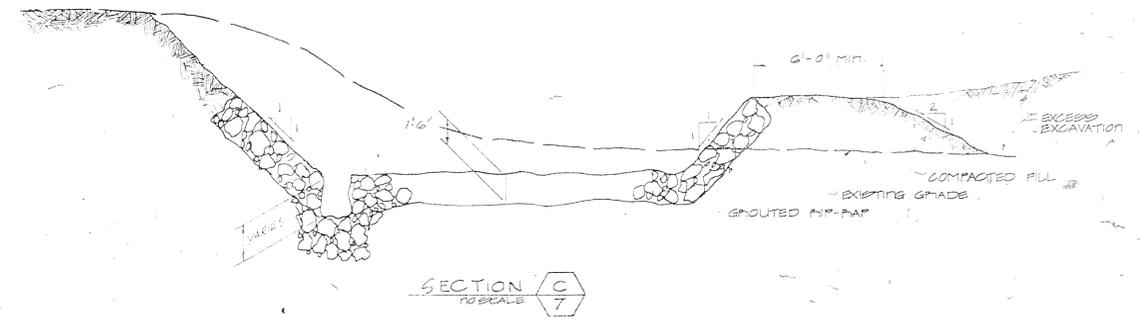
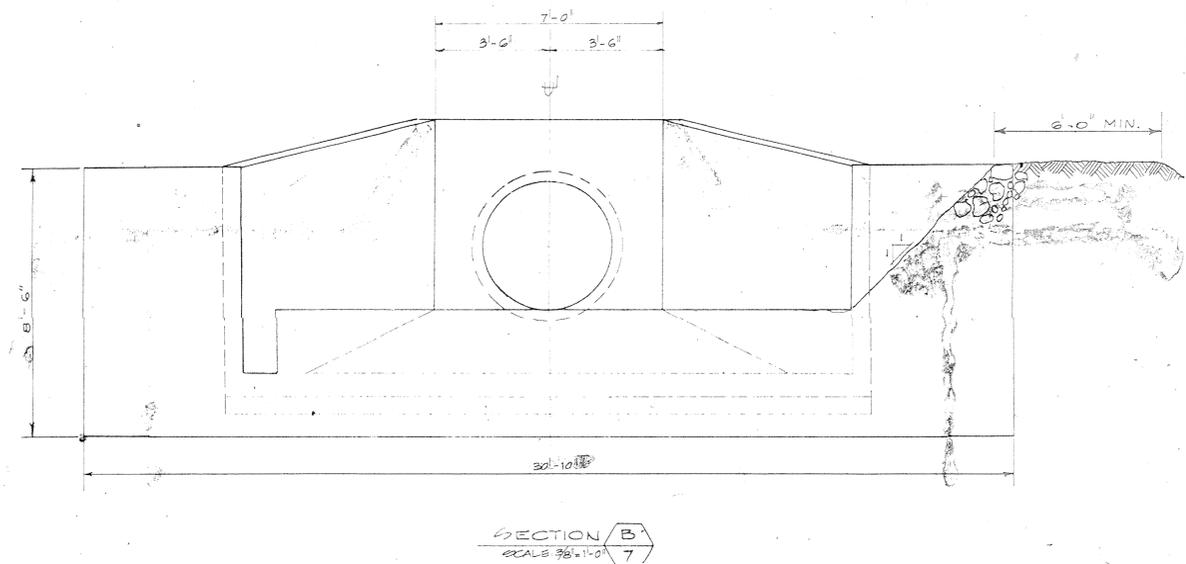
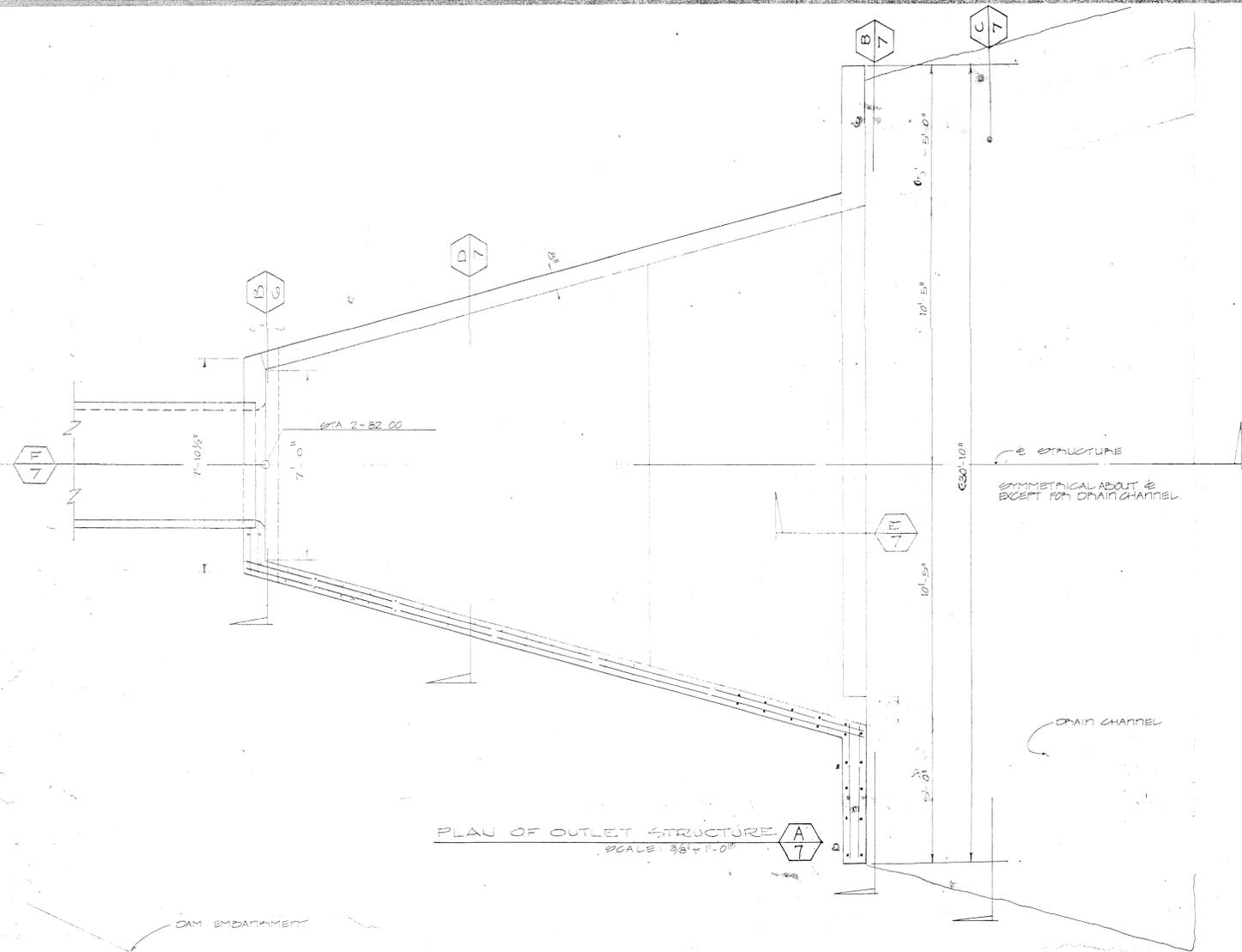
TEMPE, ARIZONA
 CIVIL ENGINEERING

MCCULLOCH PROPERTIES, INC.
 FOUNTAIN HILLS, ARIZONA

STRUCTURE NUMBER II,
 INLET STRUCTURE

SHEET
 6
 OF 8
 SHEETS

DESIGNED BY A. ST. ARNOLD	NO. DATE BY	REVISIONS & REMARKS
CHECKED BY 12/12/12	1 12/12/12	Added Sec H-G w/NOTES
DRAWING NUMBER MPE-12-12-12		



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. LAPS TO BE 15" AND MIN. BENDING RADIUS TO BE 7"

* ALL FOOTINGS TO BE EXTENDED INTO CEMENTED SOILS

NO.	DATE	BY	REVISIONS & REMARKS

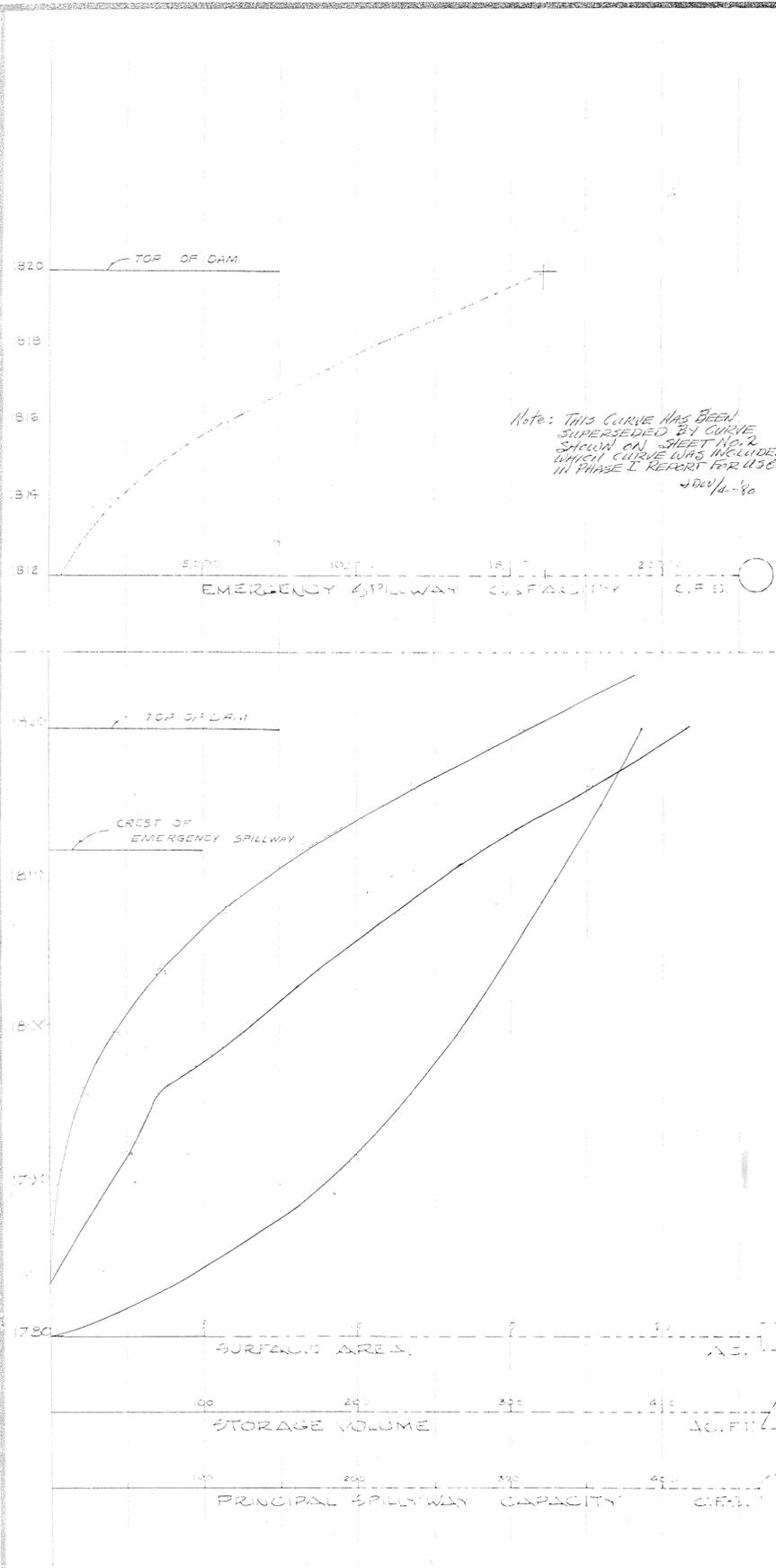


TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. II
OUTLET STRUCTURE

SHEET
7
OF 8
SHEETS



PROJECT: FOUNTAIN HILLS-STRUCTURE No. 11 LOG OF TEST BORING NO. 1

DATE: 7-28-71

Depth in Feet	Remarks	Visual Classification
0	HARD	SILTY SAND & GRAVEL, SOME COBBLES, FAIRLY WELL GRADED, NON-PLASTIC, GRAY
5		
10	HARD	CLAYEY SAND & GRAVEL, SOME COBBLES, FAIRLY WELL GRADED, STRONGLY CEMENTED, STRATIFIED, MEDIUM PLASTICITY, GRAY
15		
20		
25		
30		
35		
40		
45		
50		
55		
60		
65		
70		
75		
80		
85		
90		
95		
100		

STOPPED BORING AT 24'

PROJECT: FOUNTAIN HILLS-STRUCTURE No. 11 LOG OF TEST BORING NO. 2

DATE: 7-28-71

Depth in Feet	Remarks	Visual Classification
0	HARD	CLAYEY SAND & GRAVEL, CONSIDERABLE COBBLES, FAIRLY WELL GRADED, LOW TO MEDIUM PLASTICITY, GRAY
5	HARD	SILTY SAND & GRAVEL, SOME COBBLES, FAIRLY WELL GRADED, SLIGHTLY TO MODERATELY CEMENTED, STRATIFIED, LOW PLASTICITY, GRAY TO LIGHT BROWN
10		
15		
20		
25		
30		
35		
40		
45		
50		
55		
60		
65		
70		
75		
80		
85		
90		
95		
100		

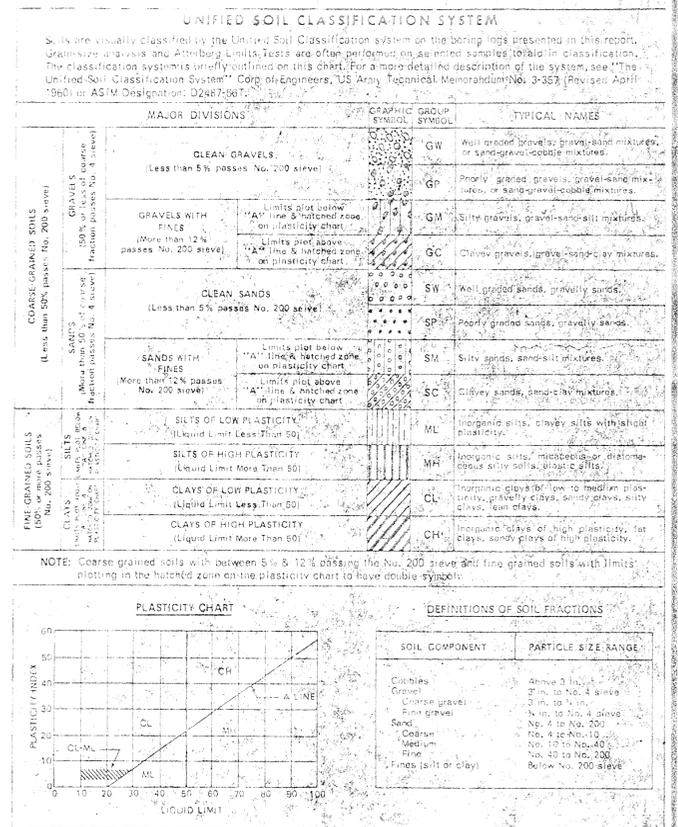
STOPPED BORING AT 20'

PROJECT: FOUNTAIN HILLS-STRUCTURE No. 11 LOG OF TEST BORING NO. 3

DATE: 7-28-71

Depth in Feet	Remarks	Visual Classification
0		
5		
10		
15		
20		
25		
30		
35		
40		
45		
50		
55		
60		
65		
70		
75		
80		
85		
90		
95		
100		

STOPPED BORING AT 38'



NO.	DATE	REVISIONS & REMARKS



TEMPE, ARIZONA
CIVIL ENGINEERING

M^o CULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NUMBER II
CAPACITY TABLES AND LOGS OF BORINGS