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B. H. SWINBURNE, CHAIRMAN
WILLIAM V. HEREFORD, VICE-CHAIRMAN
REX FUNK, SECRETARY-TREASURER
R. WARD HUNNICUTT, DIRECTOR
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LARRY A. BLAIR
EXECUTIVE ENGINEER

**A**lbuquerque
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2600 PROSPECT N.E. - ALBUQUERQUE, N.M. 87107
TELEPHONE (505) 884-2215

RECEIVED
SEP 22 1988
HYDROLOGY SECTION

September 19, 1988

Victor Chavez, P.E.
Chavez-Grieves/Consulting Engineers, Inc.
4600 Montgomery NE, Building C, #101
Albuquerque, New Mexico 87104

Re: Elena Gallegos Grant, Pino Arroyo Crossing

Dear Vic:

I understand that the Pino Arroyo Road Crossing at the Elena Gallegos Picnic Area is not yet completed by the City of Albuquerque. I also understand that the City of Albuquerque, Parks and Recreation is doing all construction and construction inspection of this project.

From Item 3 of your letter dated April 22, 1988. I understand that flows to downstream areas, including flows which breach the crossing, will not be measurably increased as a result of building the crossing per your design.

By copy of this letter, I am requesting that the City of Albuquerque, Parks and Recreation Department, notify AMAFCA when the Pino Arroyo crossing structure is complete.

Sincerely,
AMAFCA

Clifford E. Anderson, PE & LS
Drainage Engineer

cc: Carlos Montoya, City of Albuquerque, Hydrology
Jay Hart, City of Albuquerque, Open Space Division

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**CHAVEZ—GRIEVES / CONSULTING ENGINEERS, INC.**

4600 MONTGOMERY N.E., BUILDING C, #101
ALBUQUERQUE, NEW MEXICO 87109
(505) 881-7376

LETTER OF TRANSMITTAL

TO: City of Albuq. PWD
Hydrology Section
Attn: Carlos Montoya

DATE: 4/22/88
JOB NO.
RE: Elena Gallegos Grant
Pino Arroyo Crossing

GENTLEMEN:

We are sending you X ATTACHED ___ UNDER SEPARATE COVER the following items:

__ SHOP DRAWINGS __ CHANGE ORDER __ SPECIFICATIONS
__ COPY OF LETTER __ PLANS __
__ PRINTS __ SAMPLES

RECEIVED APR 22 1988 HYDROLOGY SECTION

| COPIES | DATE | NO. | DESCRIPTION |
|---|---|---|---|
| 1 | | | Drainage Report - Revised 4/20/88 |
| 1 | | | Copies of letters from AMAFCA & City Hydrology & Response to comments |
| 1 | | | CTB Specifications |

THESE ARE TRANSMITTED as checked below:

X FOR APPROVAL
X FOR YOUR USE
__ AS REQUESTED
__ FOR REVIEW AND COMMENT
__ APPROVED AS SUBMITTED
__ APPROVED AS NOTED
__ RETURNED FOR CORRECTIONS
__ RESUBMIT ___ COPIES FOR APPROVAL
__ SUBMIT ___ COPIES FOR DISTRIBUTION
__ RETURN ___ CORRECTED PRINTS
__ PRINTS RETURNED AFTER LOAN TO US
__ FOR BIDS DUE _____ 19___

REMARKS:

COPY TO: File
AMAFCA - Cliff Anderson
City Parks & Rec - Sandy Zuschlag

SIGNED: John S. McDowell

If enclosures are not as noted, kindly notify us at once.

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CHAVEZ—GRIEVES / CONSULTING ENGINEERS, INC.
4600 MONTGOMERY N.E., BUILDING C, #101
ALBUQUERQUE, NEW MEXICO 87109
(505) 881-7376

April 22, 1988

Mr. Clifford Anderson
Drainage Engineer
A M A F C A
P.O. Box 25851
Albuquerque, N.M. 87125

RECEIVED
APR 22 1988
HYDROLOGY SECTION

RE: ELENA GALLEGOS GRANT, PINO ARROYO CROSSING

Dear Cliff:

In response to your comments dated April 11, 1988, I offer the following:

1. The date on the report has been corrected to 1988.

2. The height of the culvert segment left is 2.5 feet and has been corrected in the report.

3. Maintenance of this facility will be a continual requirement for the City of Albuquerque Parks and Recreation Department, Open Space Division. Minor maintenance should be planned bi-annually during the rainy season. Major maintenance should be planned every 2 years to include a detailed inspection of the structure to determine its condition. If major destruction of the facility occurs, another solution should be analyzed, i.e., grading the road to match the existing invert of the channel and exclude the culverts. Should the crossing be breached, downstream flows will not be measurably increased at downstream crossing structures.

   Additional reinforcement has been included with the construction of this facility, over and above what is called for in the report.

Response to additional comments from the City/County Floodplain Administrator:

1. 3.6 percent of the 100-year storm frequency will pass through the two culverts if flowing full with no head.

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2. The limits of the back-up flooding due to the road embankment for a 100-year storm has been added to Sheet No. 2 of the calculations.

3. The culverts are burried 18 inches into the channel invert to minimize the volume of "back-up flooding" behind the road embankment and maximize cover over the culverts to increase the structural capacity.

4. A. The width of the road is approximately 20 feet.

   B. The limits of the CTB are measured from the top of the road.

   C. Enclosed is a copy of the specifications given to Parks & Recreation by the City. These specifications are going to be followed during the construction of the road section from the limits shown on Sheet No. 2 of the calculations.

5. A. The length along the top of the road of the 4" thick, reinforced concrete headwalls is 16 1/2 feet.

   B. The length of the headwall below the culverts is approximately 16 feet. The headwall was installed 1 1/2 feet deep and 1 foot thick, both sides.

   C. The compressive strength of the concrete used was 3000 psi.

   D. A writing error was on Sheet No. 4; the thickness of the 2 headwalls was 4".

   E. Reinforcement in the concrete headwalls was used; #4's @ 16" o.c. each way.

If you have any further questions or concerns, please call.

Your timely additional review of this report is appreciated.

Cordially yours,

CHAVEZ-GRIEVES CONSULTING ENGINEERS, INC.

Jackie S. McDowell

JSM:mf

CC: City of Albuquerque:
PWD, Hydrology Section, Carlos Montoya
Parks & Recreation Dept., Sandy Zuschlag

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B. H. SWINBURNE, CHAIRMAN
WILLIAM V. HEREFORD, VICE-CHAIRMAN
REX FUNK, SECRETARY-TREASURER
R. WARD HUNNICUTT, DIRECTOR
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**C**ontrol
**A**uthority

P. O. BOX 25851 - ALBUQUERQUE, N.M. 87125
TELEPHONE (505) 884-2215

APR 13 1988

April 11, 1988

Victor Chavez, PE
Chavez-Grieves/Consulting Engineers, Inc.
4600 Montgomery NE Building C, #101
Albuquerque, NM 87109

RECEIVED
APR 22 1988
HYDROLOGY SECTION

Re: Elena Gallegos Grant, Pino Arroyo Crossing

Dear Vic:

I have reviewed the Drainage Report for the City of Albuquerque, Parks & Recreation Department, Open Space Division, Elena Gallegos Grant, Pino Arroyo Crossing (dated March 15, 1987) and present the following comments:

1. Is the correct date for this report 1988 and not 1987?

2. Page 4, Paragraph 2, Line 5. Should the height of culvert segment be 2.5 feet?

3. Page 7. A requirement for approval of this report is that "flows to downstream areas, including flows caused by any washing out of the road, will not be increased as a result of the construction of the arroyo crossing proposed herein". This condition should be one of the report conclusions. If the crossing proposed cannot meet this requirement, additional reinforcement of the crossing should be accomplished.

Additional written comments from the City/County Floodplain Administrator are enclosed for your consideration. If you have any questions concerning these comments please contact me or Mr. Montoya at the City of Albuquerque, Public Works Department.

Sincerely,

Clifford E. Anderson, PE & LS
Drainage Engineer

CEA/blb

xc: Carlos Montoya, City of Albuquerque, Public Works, Hydrology
Sandy Zuschlag, City of Albuquerque, Parks & Recreation Dept.

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**City of Albuquerque**
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

APR 13 1988

MAYOR KEN SCHULTZ | CHIEF ADMINISTRATIVE OFFICER GENE ROMO | DEPUTY CAO PUBLIC SERVICES FRANK MARTINEZ | DEPUTY CAO PLANNING/DEVELOPMENT BILL MUELLER

March 24, 1988

Cliff Anderson
AMAFCA
Post Office Box 25851
Albuquerque, New Mexico 87125

RE: DRAINAGE PLAN FOR ELENA GALLEGOS GRANT PINO ARROYO CROSSING (D-24) RECEIVED MARCH 16, 1988

Dear Mr. Anderson:

I have reviewed the referenced plan and forward the following comments:

1. What design storm will be passed in the two culverts?

2. Please show the limits of the back-up flooding due to the road embankment.

3. Why were the culverts buried 18 inches into the channel invert?

4. Refer to sheet 2 drawing:

   A. What is the width of the road?
   B. The limits of the CTB is ten feet on each side of the road. Would this be measured from the toe of the bank or the top of the road?
   C. Please submit specifications for the road compaction and the CTB.

5. Refer to Sheet 4 drawing:

   A. What is the length along the top of the road of the two inch to four inch concrete headwall?
   B. What is the length of the six inch thick head wall at both ends of the culvert?
   C. What is the compressive strength of the concrete?
   D. Two inches of concrete does not appear to be appropriate for such large quantities of runoff.

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AMAFCA



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E. Will there be any rebar included in the concrete?

Should you have any questions regarding these comments, please call me at 768-2650.

Cordially,

Carlos A. Montoya, P.E.
City/County Floodplain Administrator

CAM/bsj

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STS 605.1. GENERAL

This Section governs the construction of the soil cement mixture for the lining of channels, dikes or dams on a prepared subgrade in substantial compliance with lines, grades, thickness and typical cross sections and testing shown on the Contract Documents or established by the ENGINEER

STS 605.2 REFERENCES

RECEIVED
APR 22 1988
HYDROLOGY SECTION

STS 605.2.2 ASTM
D559 C-150
D560 C-595

STS 605.2.3 AASHTO
T135 M-85
T136 M-240

STS 605.2.4 This publication
Section 102
Section 107

STS 605.3 MATERIALS

STS 605.3.1 SOIL

STS 605.3.1.1 Soil shall consist of material locally available at the site, from other borrow areas as approved by the Engineer, to conform with the following gradation.

| Sieve Size | Percent Passing (by dry weight) |
|---|---|
| 2 inch | 100% |
| N.4 | 55%-85% |
| N.10 | 35%-95% |
| N.200 | 5%-25% |

The distribution and gradation of material in the soil cement lining shall not result in lenses, pockets, streaks, or layers differing substantially in texture or gradation from the surrounding materials. Clay lumps, larger than 1 inch in diameter, shall be pulverized to pass a N.4 sieve or screened out of the raw soil mixture prior to mixing.

STS 605.3.2 AGGREGATES

STS 605.3.2.1 Portland Cement: Portland cement shall meet the requirements of ASTM C-150 for Type I and Type II cements or ASTM C 595 or AASHTO M240 for blended hydraulic cements, excluding slag cements types S and SA.

STS 605.3.3 Water: Water shall be clean and free from injurious amounts of oil, acid, alcali, organic matter or any other deleterious substances.



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STS 605.3.4 Fly Ash: Fly ash may be used at the option of the Contractor. A maximum of twenty (20) percent of the total weight of cement may be replac with fly ash, in accordance th the following requirements: Fly ash shall conform to the requirements of ASTM C 618 for Class F. The Blain fineness shall have an average value of at least 2,800 with a minimum value of 2,600 for any one sample. The average value will be determined on the last five consecutive samples. The loss on ignition shall not exceed 3.0 percent.

STS 605.4 MATERIALS HANDLING

STS 605.4.1 Soil: Soil shall be stockpiled to minimize the accumulation of moisture and to promote runoff and drying of any accumulated moisture. The Engineer may reject soil if the optimum moisture content immediately prior to mixing exceeds the optimum moisture content for the soil cement.

STS 605.4.2 Cementiteous Material: Portland cement and fly ash, whether in bags, or bulk, shall be stored in such a way as to maintain it in a dry condition. Material in bags shall be withdrawn for use in the chronology of the delivery to the site with the oldest material being used at all times.

STS 605.5 EQUIPMENT

STS 605.5.1 Mixing Plant: Soil cement shall be mixed in an approved, twin shaft, continuous flow or batch type pugmill. Facilities for efficiently storing, handling, and proportioning shall be provided at the plant. The plant shall be equipped with metering and feeding devices that will allow the addition of soil, cement, and water in the proportions indicated in this specification to a tolerance of ±2.0%.

STS 605.5.2 Compaction: Soil cement shall be compacted with one or a combination of the following such that compaction requirements presented elsewhere in this specification are met: tamping or grid roller pneumatic tire roller, steel wheel roller, vibrating roller or vibrating plate compactor.

STS 605.6 CONSTRUCTION

STS 605.6.1 Preparation of Subgrade: Before soil cement processing begins, the area to be lined shall be graded and shaped to the lines and grades shown on the plans. The base of the subgrade shall not be over-excavated. If over-excavated, subgrades shall be brought to grade and compacted to a minimum of 95% of the maximum density by the standard Proctor method. If soft, yielding or unsuitable subgrade material is uncovered during construction, the Contractor shall immediately notify the Engineer. Removal and replacement of unsuitable material shall be at the discretion of the Engineer. The Contractor shall consider that all costs incurred for correcting unsuitable subgrade shall be the Contractor's responsibility. Preparation of the subgrade will be completed no more than twenty-four (24) hours prior to the beginning of soil cement placement. The subgrade shall be maintained in a moist condition until placement of the soil cement. Soil cement shall not be placed until subgrade preparation has been tested by the Engineer.



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hours of beginning soil cement preparation, mixing plan scales and metering devices shall be tested, calibrated and certified in writing to the Engineer. Soil shall be pulverized so that, at the completion of moist mixing, 100% (by dry weight) passes a 2-inch sieve and at least 55%, by dry weight passes a No. 4 sieve. Stockpiled soil shall be thoroughly mixed throughout its length, width, and depth immediately before utilization. Moisture in the soil at the time of cement application shall not exceed the optimum content for that mixture according to the moisture-density curve. Should this occur, aeration of the stockpile is necessary. The material on top may be pushed to one side, while the drier, underlying soil is used.

If fly ash is used, the equipment and procedures used to measure and dispense fly ash into the soil-cement mixture shall be approved by the Engineer prior to their use. Separate dial scales, positioned so as to be easily visible to the Engineer and accurate to ±0.2 percent of scale capacity, shall be provided to weight all fly ash admixtures. The batch accuracy shall be with ±1.0 percent of the weight required. Weighing of a fly ash admixture may be accomplished by the use of the cement scales if proposed by the Contractor and approved, in writing, by the Engineer. The fly ash admixture shall be conveyed by means of an enclosed conveying system and the weighing hopper shall be equipped with one or more vibrators, as required, to insure the complete discharge of all fly ash from the hopper after each batch is weighed.

STS 605.6.1 Proportions of Soil and Cement: The Contractor shall be responsible for the soil cement design mix. The Engineer shall approve the mix upon verifying compliance with these specifications. The design required for this project should employ standard laboratory procedures outlined in ASTM D558, D559 and D560 to determine proper cement content, optimum moisture content and maximum density of the soil-cement mixture. These test should be performed using the on-site soils and pre-approved cement sources.

The proper moisture (optimum moisture) and density (maximum density) for molding laboratory testing specimens will be determined using the moisture-density test (ASTM D558). Test specimens should then be molded at several cement contents and subjected to the ASTM wet-dry test and freeze-thaw testing, ASTM D559 and ASTM D560, respectively. Accumulated weight loss shall not exceed 6 percent when tested in accordance with ASTM D559 and 8 percent when tested in accordance with D560.

After proper cement content has been determined using the above referenced procedures, 2% additional cement should be added to the previously determined cement content. The moisture-density testing and durability testing should then be repeated. The mix design has been estimated to utilize from 10 to 12 percent cement by weight, however, specific cement content should be determined during the mix design procedures.



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The percent cement to be incorporated shall be calculated as the weight of cement divided by the total weight of the dry compacted soil. The design mix may require adjustment by the engineer based on field tests conducted immediately prior to the first soil cement mixture and placement. The design mix may also be modified through the job by the engineer if field testing indicates a need for such adjustments.

In addition to the testing outlined above, a minimum compressive strength of 700 psi after a 7 day cure period is required. Compressive strength specimens should be prepared at 98 percent of the laboratory maximum dry unit weight. A minimum of twelve specimens should be prepared for the design mix cement content so that three can be tested at 3, 7, 28 and 90 days.

The mix design shall be submitted at least 28 days prior to commencement of work. The mix design must include appropriate aggregate testing such as grain size analysis and sand equivalence (ASTM 2419-74) determination.

STS 605.6.3 <u>Proportion of Water</u>: Optimum moisture and maximum density for the material being processed shall be determined during construction by moisture density test ASTM D558 or AASHTO T134 on representative samples of soil cement mixture obtained from the area being processed. When the mean air temperature during construction is 90 F or less, the moisture content at the time of compaction shall be between 1.0% dry and 2.0% wet of optimum moisture. When the mean air temperature exceeds 90 F or when there is a breeze that promotes rapid drying of the soil cement the moisture content shall be increased as needed but shall be less than that quantity of moisture which will cause the soil cement to become unstable during compaction and finishing operations (determined by laboratory mix design).

STS 605.6.4 <u>Transportation of the Soil Cement Mixture</u>: The soil cement mixture shall be transported from the mixing area to the embankment in clean equipment. The total elapsed time between the addition of water to the mixture and the start of compaction shall be the minimum possible. In no case should the total elapsed time exceed thirty (30) minutes. (This time may be reduced by the Engineer when the air temperature exceeds 90 F or when there is a breeze or wind which promotes rapid drying of the soil cement mixture.)

The Contractor shall protect the soil cement mixture if transported during unfavorabe weather. Any loads wet excessively by rain will be subject to rejection.

STS 605.6.5 <u>Placing</u>: The mixture shall be placed on the moistened subgrade, embankment, or previously completed soil cement with spreading equipment that will produce layers of such widths and thicknesses as are necessary for compaction to the required dimensions of the completed soil cement layers. The compacted layers of soil cement shall not exceed nine (9) inches in thickness.



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Mixing and placement shall not proceed when the soil-aggregate or the area on which the soil cement is to be placed is frozen. Soil cement shall not be mixed or placed when the air temperature is below 45 F (7 C), unless the air temperature, being at least 40 F (5 C) is rising. Soil cement shall not be mixed or placed if the weather conditions are such that the material being processed cannot be completely compacted or protected before the advent of damaging weather, (such as overnight lows below 40 F, cold fronts, rainstorms, etc.). The soil cement shall be protected from temperatures below 32 F for seven (7) days after placement.

Soil cement shall not be placed in the presence of water. The Contractor shall submit a water control plan to be reviewed and approved by the Engineer and must be designed to place soil cement in dry conditions.

If, in the best interest of the City and at the discretion of the Engineer, placement of soil cement may be deemed acceptable in wet conditions in limited working areas. Placement of any soil cement in wet conditions will require written approval by the Engineer prior to placement. Soil cement placement in wet conditions shall be done according to the following conditions, or as directed by the Engineer.

Cementiteous material content shall be increased to at least six hundred and fifty (650) pounds of cementateous material per cubic yard. Slump shall be between six (6) and eight (8) inches so as to insure that the moisture is plastic and will flow into place without puddling or segregation. Placement shall be by the tremie method. Tremie pipe diameter shall be at least eight times (8) the size of the larges aggregate. A seal shall be used to start placement. After the initiation of placement, the tremie pipe shall be kept full of soil cement and the end of the pipe shall always be embedded in the mixture. If the seal is lost, the tremie pipe shall be withdrawn, resealed and the charing operation started again. Placement shall be continuous until the soil cement layer is brought above the water surface. The continuous layer shall be grought up at least one (1) foot per hour. Placement shall only be made in quiescent water (flows less than ten (10) feet per minute) to avoid laitance. Soil cement placed in water shall be protected from the motion of water for at least four (4) days.

<u>Compaction</u>: Soil cement shall be uniformly compacted to a running average for 10 consecutive tests of 98% of standard proctor density with no single test below 95% as determined by field density tests. Moisture and density shall be determined in the field during construction by moisture-density test ASTM D558 or AASHTO T134. Wheel rolling with hauling equipment shall not be an acceptable method of compaction.

At the start of compaction, the mixture shall be in a uniform, loose condition throughout its full depth. Its moisture content shall be as specified in other portions of this specification. No section shall be left undisturbed for longer than thirty (30) minutes during compaction operations.



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Compaction of each layer shall be completed in such a manner as to produce dense surface free of compaction planes in not longer than one (1) hour from the time water is added to the mixture. Whenever the Contractor's operation is interrupted for more than two (2) hours, the top surface of the completed layer, if smooth, shall be scarified to a depth of at least one (1) inch with a spiketooth instrument prior to placement of the next lift. The surface, after said scarifying, shall be swept using a power broom or other method approved by the Engineer to completely free the surface of all loose material prior to actual placement of the soil cement mixture for the next lift.

STS 605.6.7 Finishing of the Soil Cement: After completion, the soil shall be further shaped, if necessary, to the required lines, grades, and cross sections and rolled to a reasonably smooth surface, satisfactory to the Engineer. This includes compacting and rounding the exposed edges of the soil cement layers as shown on the Plans.

STS 605.6.8 Placement, Compaction, and Finishing of Subsequent Layers: Each successive layer of soil cement shall be placed and compacted as soon as practicable after the proceeding layer is completed and tested.

All soil cement surfaces that will be in contact with succeeding layers of soil cement shall be kept continuously moist until placement of the subsequent layer, provided that the Contractor will not be required to keep such surfaces continuously moist for a period longer than seven (7) days.

The Contractor shall take all necessary precautions to avoid damage to completed soil cement by the equipment and to avoid the deposition of raw earth or foreign materials between between layers of soil cement. All extraneous material shall be swept using a power broom or other method approved by the Engineer to completely free the surface of foreign material before the next layer of soil cement is placed. The surface should be moistened by fog spraying immediately before placement of the next layer. Earth ramps crossing completed soil cement must be at least 2-feet in compacted thickness. Additional thickness may be required by the Engineer to insure that the soil cement below does not yield or deform under wheel loads. Where ramps are constructed over soil cement that is not to grade or where new soil cement is to overlap the face of existing soil cement, all foreign materials and the uppermost one (1) inch of the previously placed soil cement mixture must be removed prior to continuation of the soil cement construction.

STS 605.6.9 Curing: Temporarily exposed surfaces will be kept moist as set forth in other sections of this specification. Care must be exercised to ensure that no curing material other than water is applied to the surfaces that will be in contact with succeeding layers.

Permanently exposed surfaces shall be kept in a moist condition for seven days, or they may be covered with a suitable curing material, subject to the Engineer's approval. Any damage to the protective covering within seven (7) days shall be required to the satisfaction of the Engineer. The Contractor is responsible for the clean up of all curing material.

Regardless of the curing material used, the permanently exposed surfaces shall be kept continuously moist until the protective cover is applied. Such protective cover is to be applied as soon as practible, with a maximum time limit of twenty-four (24) hours between the finishing of the surface and the application of the protective cover or membrane.

When necessary, the soil cement shall be protected from freezing for seven (7) days after its construction by a covering of loose earth, straw, or other suitable material approved by the Engineer. The Contractor is responsible for the clean-up of this material.

STS 605.6.10 Construction Joints: At the end of each day's work, or whenever construction operations are interrupted for more than two (2) hours, a transverse construction joint shall be formed by cutting back into the completed work to form a full-depth vertical face.

STS 605.6.11 Maintenance: The Contractor shall be responsible within the limits of this contract, to maintain the placed soil cement in good condition until work is completed and accepted by the City. Maintenance shall include immediate repairs of deffective work or damage that may occur during construction. All deffective work shall be replaced for the entire depth of the layer.

STS 605.7 INSPECTION AND TESTING

The Engineer, with the assistance and cooperation of the Contractor, shall make such observations and tests as he deems necessary to ensure the compliance of the work with the contract documents. These observations and tests may include, but shall not be limited to, (1) the soil cement and its individual components at all stages of processing and after completion, and (2) the operation of all equipment used on the work. Only those materials, machines, and methods meeting the requirements of the Contract Documents shall be approved by the Engineer.

All testing of soil cement and its individual components, unless otherwise provided for specifically in the Contract Documents, shall be in accordance with the latest applicable ASTM or AASHTO specifications in effect as of the date of advertisement for bids on the project.

Testing for proper compaction shall be done on at least every other lift of compacted soil cement at any location chosen by the testing personnel. If the lift being tested does not pass the density requirements, additional passes with compaction equipment must be made as required to increase density of the in-place material until it does pass or the material must be removed at the Contractor's expense.

The Contractor shall not be permitted to continue placing lifts of soil cement on any lift which has failed the compaction test, until such time as that lift has been reworked, retested, and passed meeting density requirements.

The initial acceptance of material shall in no way preclude further examination and testing at any time the Engineer suspects tha the material is no longer properly represented by the acceptance sample. The acceptance at any time of any material shall not bar its future rejection if it is subsequently found to be defective in quality or uniformity.

STS 605.8 MEASUREMENT AND PAYMENT

STS 605.8.1 Measurement: The work shall be measured: by the cubic yard of soil cement channel lining, complete and in-place as determined by the specific lines, grades, cross section and compaction shown on the Plans. Any waste of cementiteous material and/or soil cement by the Contractor during the handling, mixing, placing, or other operations shall not be measured. No measurement will be made for additional cementiteous material required to place soil cement in wet conditions.

STS 605.8.2 Payment: This work shall be paid for at the contract unit price per cubic yard, for soil cement channel lining. Such payment shall constitute full reimbursement for all work necessary to complete the soil cement channel lining, including excavation required for constructing the soil cement, compacting, curing, inspection and testing assistance, and all other incidental operations.

No payment will be made for additional work necessary to place soil cement channel lining in wet conditions.

/ns
(ID8907E)

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B. H. SWINBURNE, CHAIRMAN
WILLIAM V. HEREFORD, VICE-CHAIRMAN
REX FUNK, SECRETARY-TREASURER
R. WARD HUNNICUTT, DIRECTOR
SHEILAH GARCIA, DIRECTOR

RICHARD E. LEONARD
EXECUTIVE ENGINEER

Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

P. O. BOX 25851 - ALBUQUERQUE, N. M. 87125
TELEPHONE (505) 884-2215

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APR 14 1988
HYDROLOGY SECTION

D24-D1

April 11, 1988

Victor Chavez, PE
Chavez-Grieves/Consulting Engineers, Inc.
4600 Montgomery NE Building C, #101
Albuquerque, NM 87109

Re: Elena Gallegos Grant, Pino Arroyo Crossing

Dear Vic:

I have reviewed the Drainage Report for the City of Albuquerque, Parks & Recreation Department, Open Space Division, Elena Gallegos Grant, Pino Arroyo Crossing (dated March 15, 1987) and present the following comments:

1. Is the correct date for this report 1988 and not 1987?

2. Page 4, Paragraph 2, Line 5. Should the height of culvert segment be 2.5 feet?

3. Page 7. A requirement for approval of this report is that "flows to downstream areas, including flows caused by any washing out of the road, will not be increased as a result of the construction of the arroyo crossing proposed herein". This condition should be one of the report conclusions. If the crossing proposed cannot meet this requirement, additional reinforcement of the crossing should be accomplished.

Additional written comments from the City/County Floodplain Administrator are enclosed for your consideration. If you have any questions concerning these comments please contact me or Mr. Montoya at the City of Albuquerque, Public Works Department.

Sincerely,

Clifford E. Anderson, PE & LS
Drainage Engineer

CEA/blb

xc: Carlos Montoya, City of Albuquerque, Public Works, Hydrology
Sandy Zuschlag, City of Albuquerque, Parks & Recreation Dept.

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FILE COPY

# City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR KEN SCHULTZ | CHIEF ADMINISTRATIVE OFFICER GENE ROMO | DEPUTY CAO PUBLIC SERVICES FRANK MARTINEZ | DEPUTY CAO PLANNING/DEVELOPMENT BILL MUELLER

March 24, 1988

Cliff Anderson
AMAFCA
Post Office Box 25851
Albuquerque, New Mexico 87125

RE: DRAINAGE PLAN FOR ELENA GALLEGOS GRANT PINO ARROYO CROSSING (D-24) RECEIVED MARCH 16, 1988

Dear Mr. Anderson:

I have reviewed the referenced plan and forward the following comments:

1. What design storm will be passed in the two culverts?

2. Please show the limits of the back-up flooding due to the road embankment.

3. Why were the culverts buried 18 inches into the channel invert?

4. Refer to sheet 2 drawing:

   A. What is the width of the road?
   B. The limits of the CTB is ten feet on each side of the road. Would this be measured from the toe of the bank or the top of the road?
   C. Please submit specifications for the road compaction and the CTB.

5. Refer to Sheet 4 drawing:

   A. What is the length along the top of the road of the two inch to four inch concrete headwall?
   B. What is the length of the six inch thick head wall at both ends of the culvert?
   C. What is the compressive strength of the concrete?
   D. Two inches of concrete does not appear to be appropriate for such large quantities of runoff.



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E. Will there be any rebar included in the concrete?

Should you have any questions regarding these comments, please call me at 768-2650.

Cordially,

Carlos A. Montoya, P.E.
City/County Floodplain Administrator

CAM/bsj

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RECEIVED
MAR 17 1988
HYDROLOGY SECTION

# CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE March 10, 1988 REF. NO._____

TO: Andre Houle, DRC Chairman, Public Works Dept.
Roger Green, DRC Representative - Hydrology
FROM: Sandy Zuschlag, Asst. Superintendent, Parks - Design

SUBJECT: **Pino Arroyo Crossing at Elena Gallegos Park**

On February 24, 1988 a meeting was held with AMAFCA to discuss the above captioned project. In attendence at the meeting were:

- Rex Funk, Superintendent, Open Space Division
- Jay Hart, Assistant Superintendent, Open Space Division
- Tony Barron, Supervisor, Open Space Division
- Dan Sabo, Drainage Engineer, AMFCA
- Sandy Zuschlag, Assistant Superintendent, Design and Development Division
- Diane Scena, Assistant Planner, Design and Development Division
- Jackie McDowell, Engineer Intern, Chavez Grieves Consulting Engineers

Results of the meeting were as follows:

1. A Drainage Plan will be submitted to AMFCA and to the City's Hydrology and Special Planning Division for review and approval.
2. The six foot culvert was removed from the channel.
3. The final design solution for the arroyo crossing will be as identified in the approved Drainage Plan. In the interim a simpler arroyo crossing was installed to provide access to the picnic area on the north side of the channel (See attached sketches). The design that Chavez Grieves Engineering submitted will hopefully be the final solution, but if any changes are necessary as part of the Drainage Plan those changes will be implemented.

Since this facility is within Open Space boundaries the plans will only be submitted to AMFCA and to the Hydrology and Special Planning Division and not to the DRC. If there are any problems with this approach please let me know.

SCZ/scz

cc: Attendants of the meeting
Mike Walker, Director, Parks and Recreation
Dan Duran, Assistant Director, Parks and Recreation
Pat Westbrook, Superintendent, Design and Development Div.
Dan Martinez/Pete Pena/Project File
Clifford Anderson, Drainage Engineer, AMAFCA
**Fred Aquirre**, City Hydrologist, Public Works Department
Walter H. Nickerson, Assistant Director/PWD-Engineering
Carlos Montoya, Flood Plain Administrator, Public Works Dept.

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Job Elena Gallegos Channel Crossing
Subject Profile of New Road
Client AMI - City PWB

Sheet No. 1 of
Job. No.
By JSM Date 2/26/88

CHAVEZ - GRIEVES CONSULTING ENGINEERS, Inc. Albuquerque, NM




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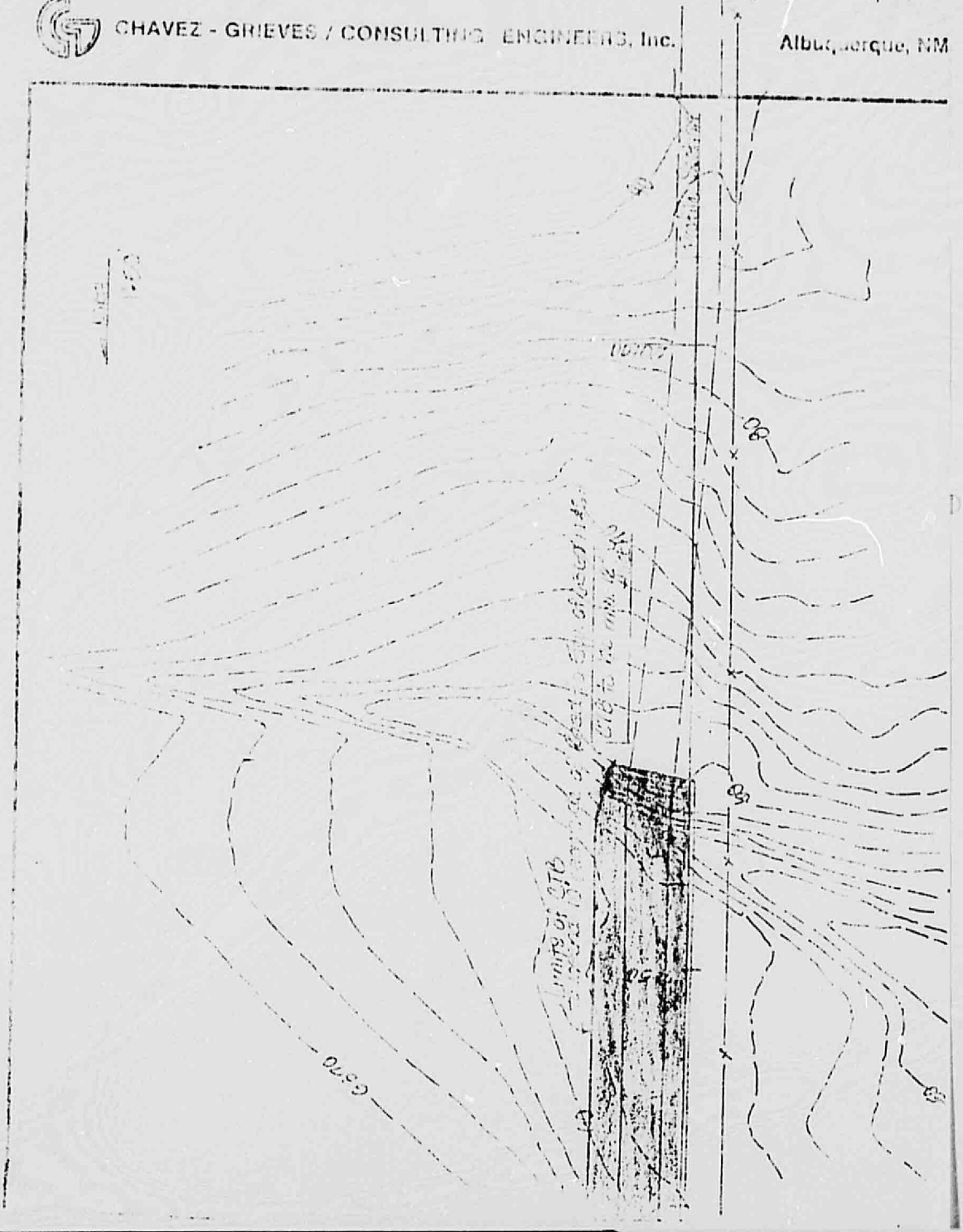
Job [illegible]
Subject [illegible]
Client [illegible]

Sheet No. [illegible] of
Job. No.
By [illegible] Date [illegible]

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

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Job Elena Gallegos Grade Crossing
Subject Road Section
Client AR. City Park

Sheet No. 3
Job. No.
By Date

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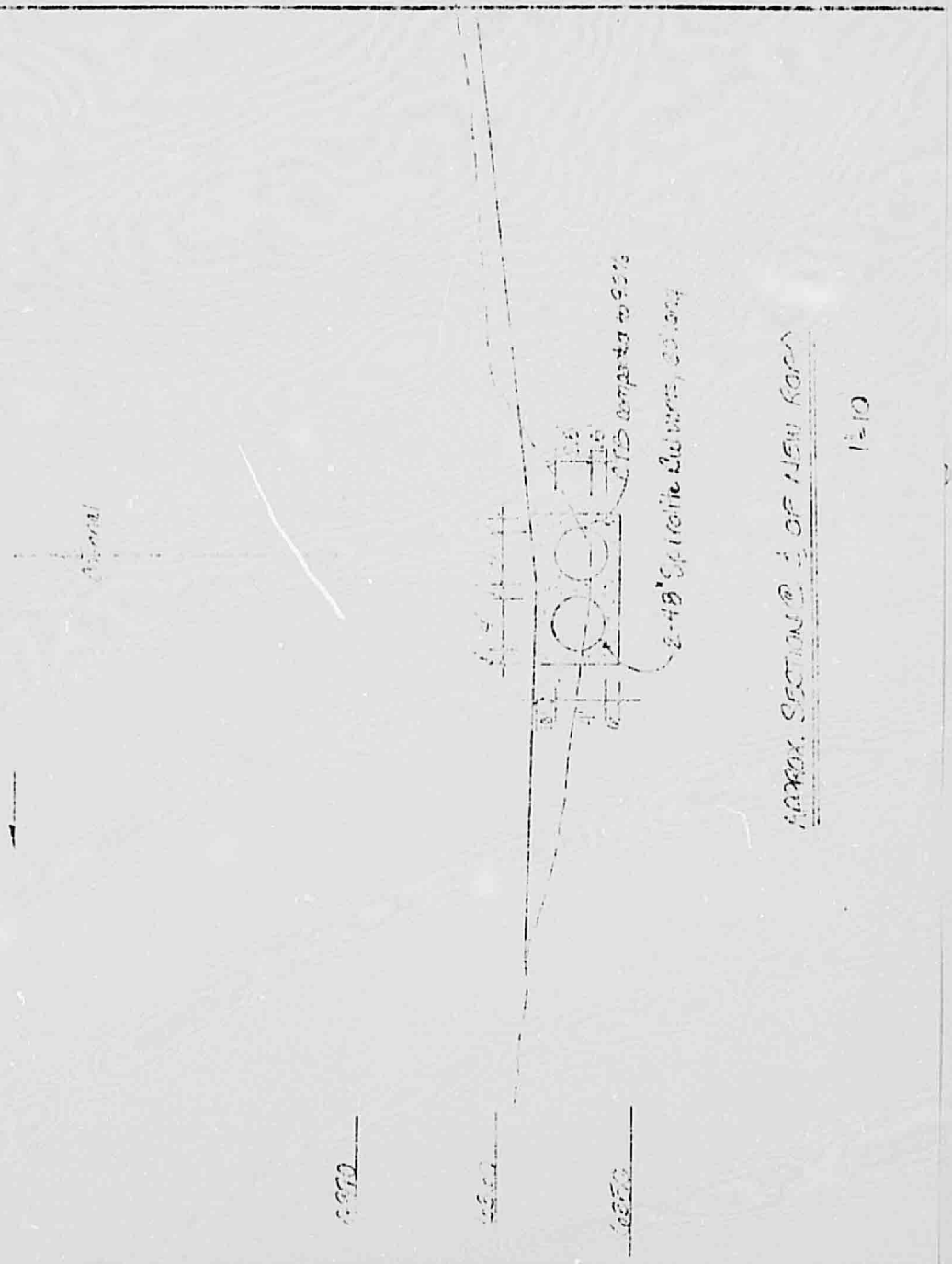


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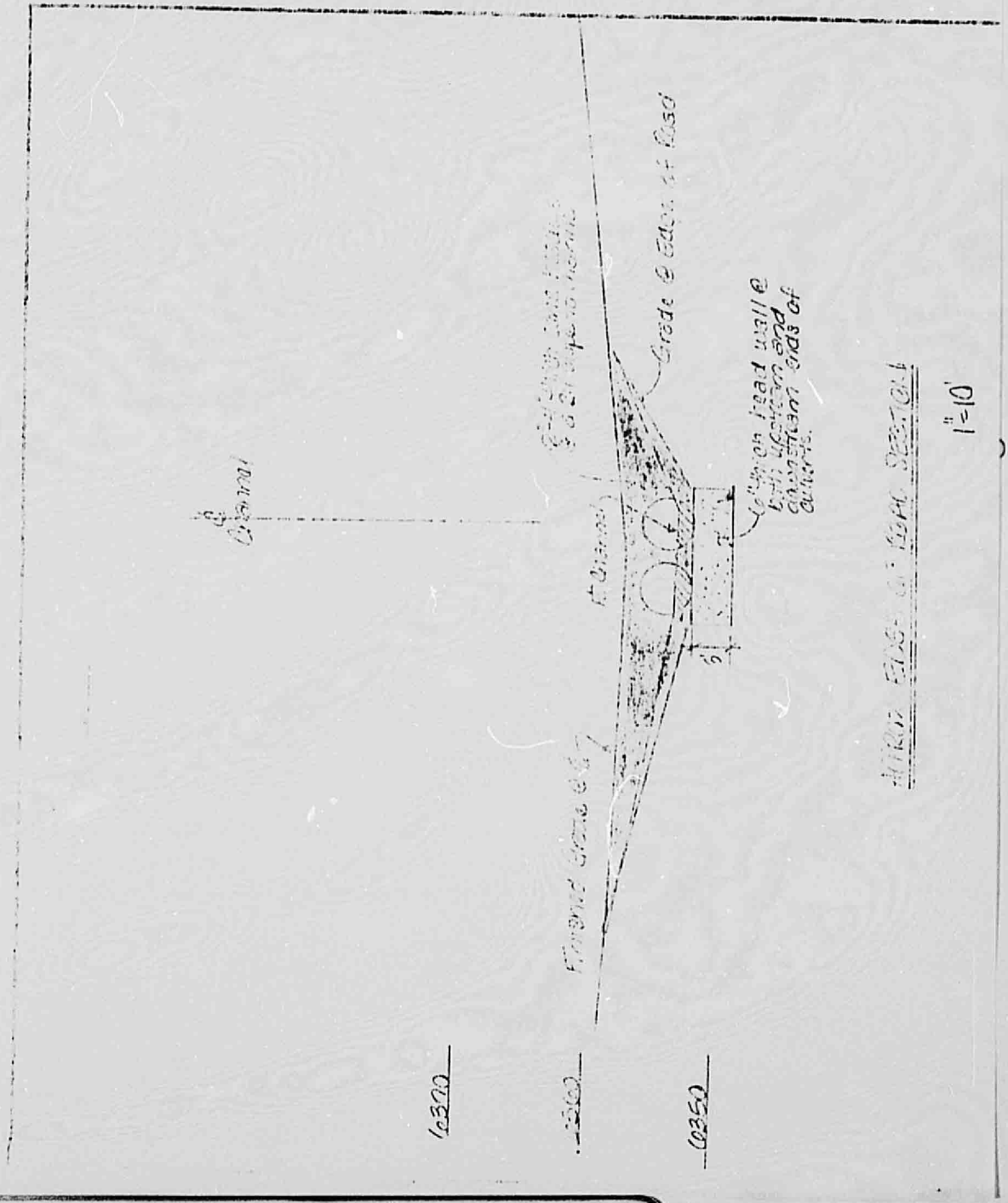
Job: Alma Arroyo Channel Crossing
Subject: Edge of Road Section
Client: AMAFCA - City PWR

Sheet No. 1 of
Job. No.
By SJM Date 9/20/82

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, N.M.

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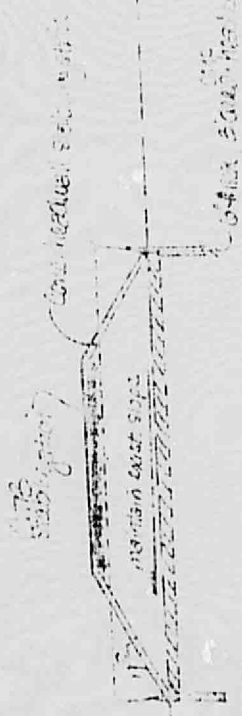
Job Elena Gallegos Channel Crossing
Subject Road Crossing Channel Section
Client AST - City Pole

Sheet No. 5 of
Job. No.
By DAM Date 2/25/88

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

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NATURAL CHANNELS 17:22:17

ABLES LIST:
Y - FLOW ELEVATION Q - FLOWRATE S - CHANNEL SLOPE

ABLE TO BE SOLVED (Y,Q OR S) ? Y

Q(CFS) ? 4500
S(FT/FT) ? .057

Enter up to 20 cross-section points.
Enter <Return> only for distance to end.

CROSS-SECTION POINTS

| DIST | ELEV | COEFF | DIST | ELEV | COEFF |
|---|---|---|---|---|---|
| 1635 | 62 | .04 | | | |
| 1655 | 60 | .04 | | | |
| 1700 | 58 | .04 | | | |
| 1750 | 58 | .04 | | | |
| 1790 | 55.5 | .04 | | | |
| 1805 | 56 | .04 | | | |
| 1825 | 58 | .04 | | | |
| 1840 | 60 | .04 | | | |
| 1860 | 62 | .04 | | | |

RESULTS

59.47 FT
302.23 SF
168.09 FT
14.87 FPS
1.95 SUPER-CRITICAL FLOW

<Prt Sc> print <Return> repeat <Space Bar> back to menu

ORIFICES 17:25:00

up to 10 orifices.
<Return> only for flowrate and area to end.

| FLOWRATE (CFS) | AREA (SF) | COEFF (-) | ELEVATIONS HEADWATER (FT) | CENTER (FT) | TAILWATER (FT) |
|---|---|---|---|---|---|
| | 16.54 | 0.610 | 6.75 | 0.00 | 0.00 |

<Prt Sc> print <Return> repeat <Space Bar> back to menu

25×10

0000 0000 1255

**CHAVEZ—GRIEVES / CONSULTING ENGINEERS, INC.**

4600 MONTGOMERY N.E., BUILDING C, #101
ALBUQUERQUE, NEW MEXICO 87109
(505) 881-7376

LETTER OF TRANSMITTAL

TO: City of Albuq. DWP
Hydrology Section
Attn: Roger Green

DATE: 3/16/88
JOB NO.
RE: Gena Gallegos
Channel Crossing

GENTLEMEN:

We are sending you X ATTACHED ___ UNDER SEPARATE COVER the following items:

__ SHOP DRAWINGS __ CHANGE ORDER __ SPECIFICATIONS
__ COPY OF LETTER __ PLANS __
__ PRINTS __ SAMPLES

| COPIES | DATE | NO. | DESCRIPTION |
|---|---|---|---|
| 1 | | | Drainage Report |

RECEIVED
MAR 16 1988
HYDROLOGY SECTION

THESE ARE TRANSMITTED as checked below:

X FOR APPROVAL
X FOR YOUR USE
X AS REQUESTED
__ FOR REVIEW AND COMMENT
__ APPROVED AS SUBMITTED
__ APPROVED AS NOTED
__ RETURNED FOR CORRECTIONS
__ RESUBMIT ___ COPIES FOR APPROVAL
__ SUBMIT ___ COPIES FOR DISTRIBUTION
__ RETURN ___ CORRECTED PRINTS
__ PRINTS RETURNED AFTER LOAN TO US
__ FOR BIDS DUE _____ 19__

REMARKS:

COPY TO: file
AMAFCA - Attn: Dan Sabo/Cliff Richardson
City P&R - Attn: Sandy Zuschlag/Diane Senz

SIGNED: [signature]

If enclosures are not as noted, kindly notify us at once.

25 x

0000 0000 1256

D24/D

**CHAVEZ—GRIEVES / CONSULTING ENGINEERS, INC.**

4600 MONTGOMERY N.E., BUILDING C, #101
ALBUQUERQUE, NEW MEXICO 87109
(505) 881-7376

RECEIVED
FEB 9 1988
HYDROLOGY SECTION

LETTER OF TRANSMITTAL

TO: City of Albuq AWD
Hydrology Section
Attn: Roger Green

DATE: 2/ee/88
JOB NO.
RE: Elena Gallegos
Channel Crossing

GENTLEMEN:

We are sending you X ATTACHED ___ UNDER SEPARATE COVER the following items:

__ SHOP DRAWINGS __ CHANGE ORDER __ SPECIFICATIONS
__ COPY OF LETTER __ PLANS __
__ PRINTS __ SAMPLES

| COPIES | DATE | NO. | DESCRIPTION |
|---|---|---|---|
| 1 | | | 2/ea 6 sheets Construction Sketches & Prelim Calcs. |

THESE ARE TRANSMITTED as checked below:

X FOR APPROVAL
X FOR YOUR USE
X AS REQUESTED
X FOR REVIEW AND COMMENT
__ APPROVED AS SUBMITTED
__ APPROVED AS NOTED
__ RETURNED FOR CORRECTIONS
__ RESUBMIT ___ COPIES FOR APPROVAL
__ SUBMIT ___ COPIES FOR DISTRIBUTION
__ RETURN ___ CORRECTED PRINTS
__ PRINTS RETURNED AFTER LOAN TO US
__ FOR BIDS DUE _____ 19__

REMARKS:

COPY TO: file
AMAFCA
City Park

SIGNED: [signature]

If enclosures are not as noted, kindly notify us at once.

25 X

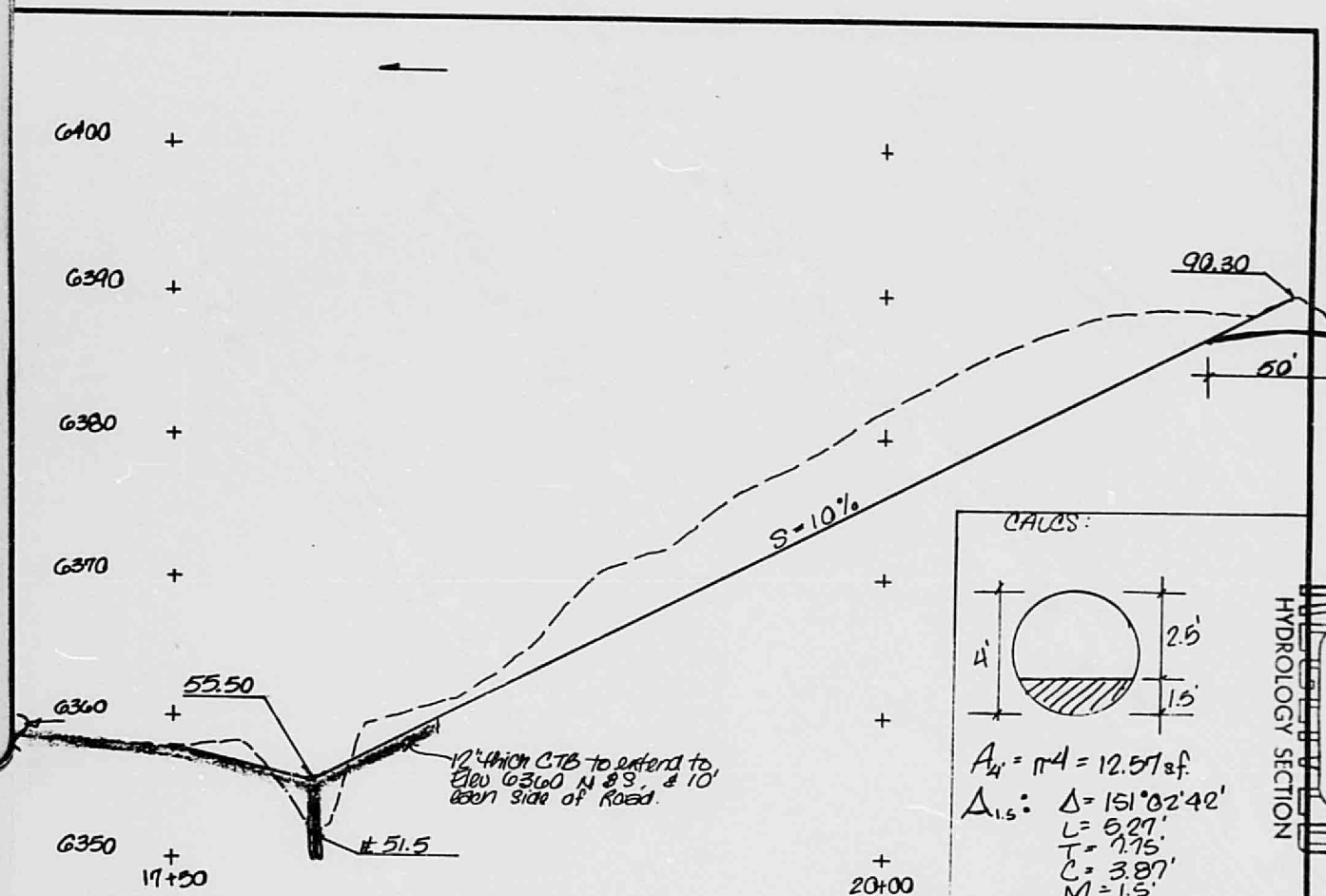
Job Elena Gallegos Channel Crossing
Subject Profile of New Road
Client AST - City P&R

CHAVEZ - GRIEVES CONSULTING ENGINEERS, INC.

Sheet No. 1 of
Job. No.
By CSM Date 2/25/88

Albuquerque, NM

HYDROLOGY SECTION




SCALE: Horiz: 1"=50'
Vert: 1"=10'

CALCS:




$A_{4'} = \pi 4 = 12.57$ sf.

$A_{1.5}$: $\Delta = 151°02'42''$
$L = 5.27'$
$T = 1.75'$
$C = 3.87'$
$M = 1.5'$
$E = 6$
$SEG = 4.30$ sf

$\therefore A_{25} = 12.57 - 4.3 = 8.27$ sf.

$2A_{25} = 16.54$ sf.

$H = 6.75'$, $Q = 200$

RECEIVED FEB 29 1988

25 X

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Job Elena Gallegos Channel Crossing
Subject Plan of New Road
Client ASI - City P&R

Sheet No. 2 of
Job. No.
By JBM Date 2/25/88

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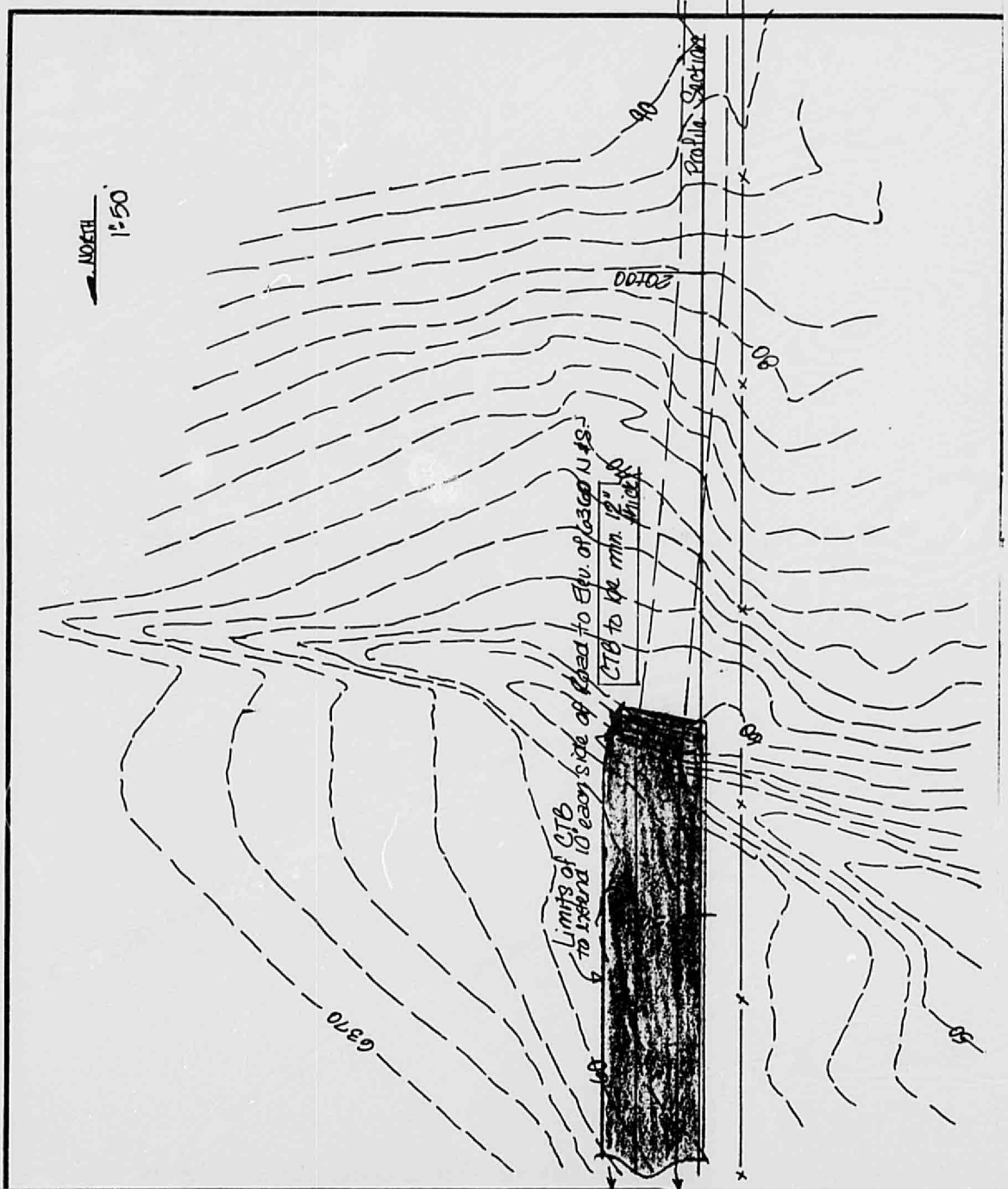


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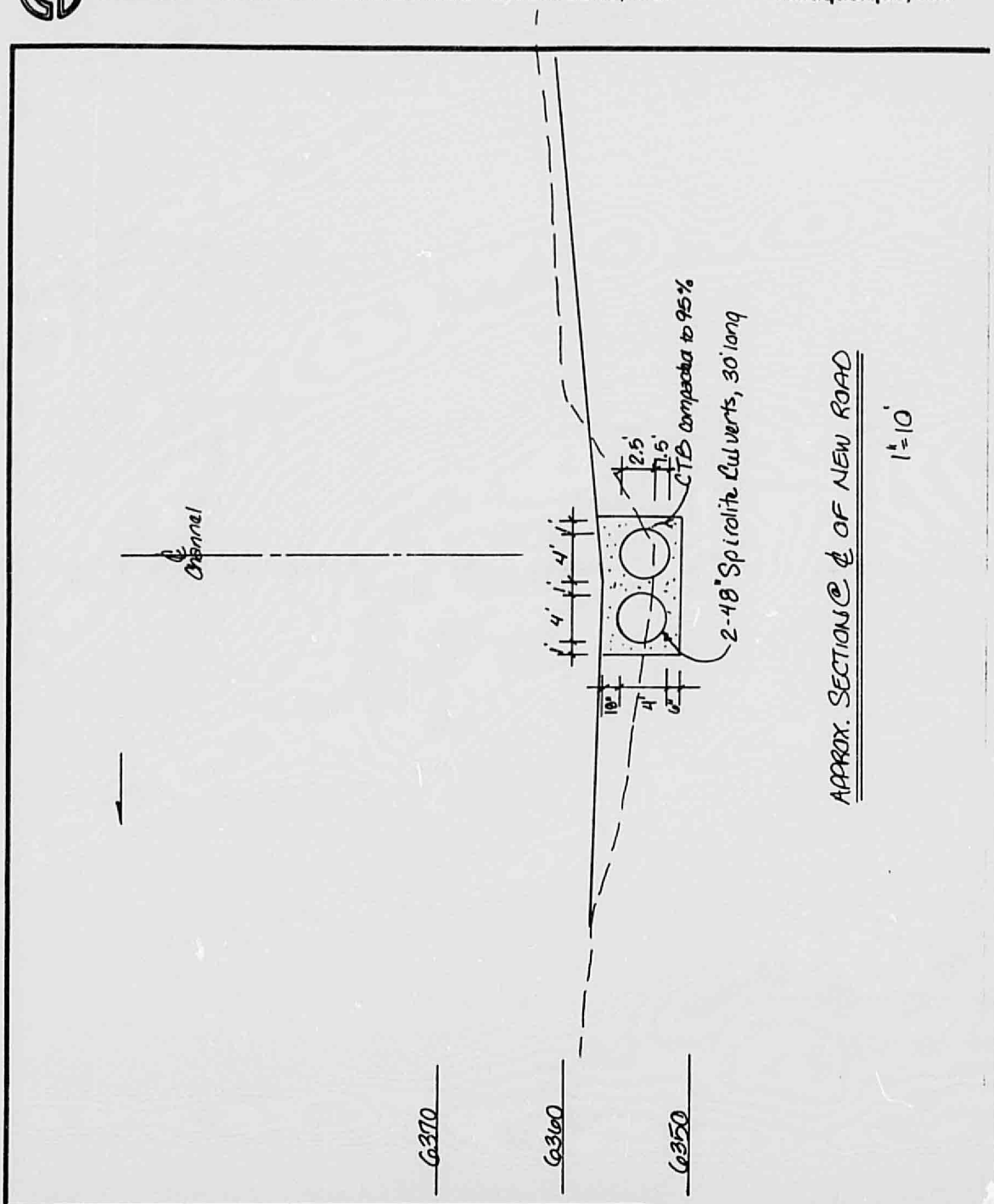
Job Elena Gallegos Channel Crossing
Subject Road Section
Client ASI - City P&R

Sheet No. 3 of
Job. No.
By JSM Date 2/25/88

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM




APPROX. SECTION @ ℄ OF NEW ROAD

1" = 10'

25 × 10

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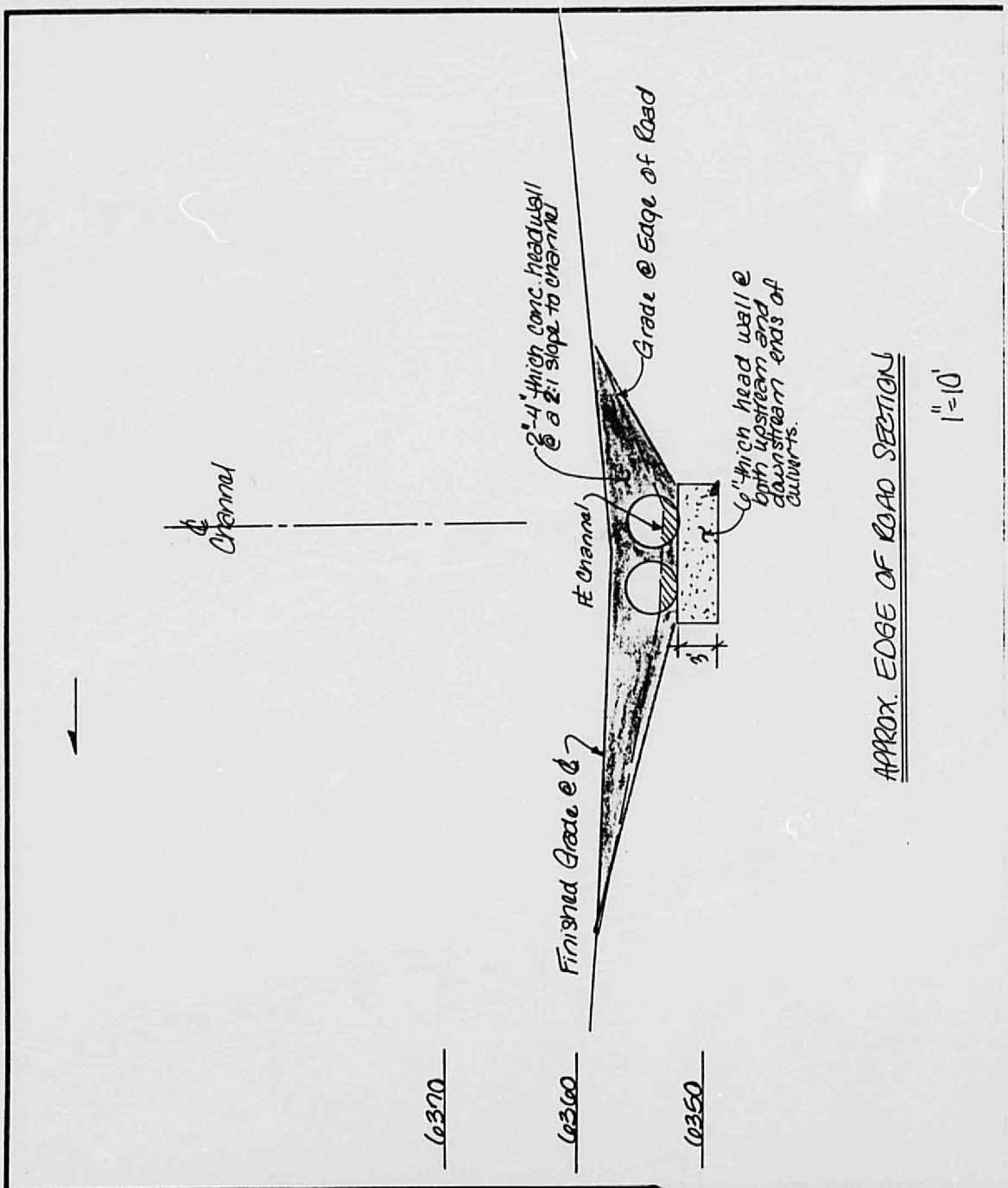
Job Elena Gallegos Channel Crossing
Subject Edge of Road Section
Client ASI - City P&R

Sheet No. 4 of
Job. No.
By JSM Date 2/25/88

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM




APPROX. EDGE OF ROAD SECTION
1"=10'

25×

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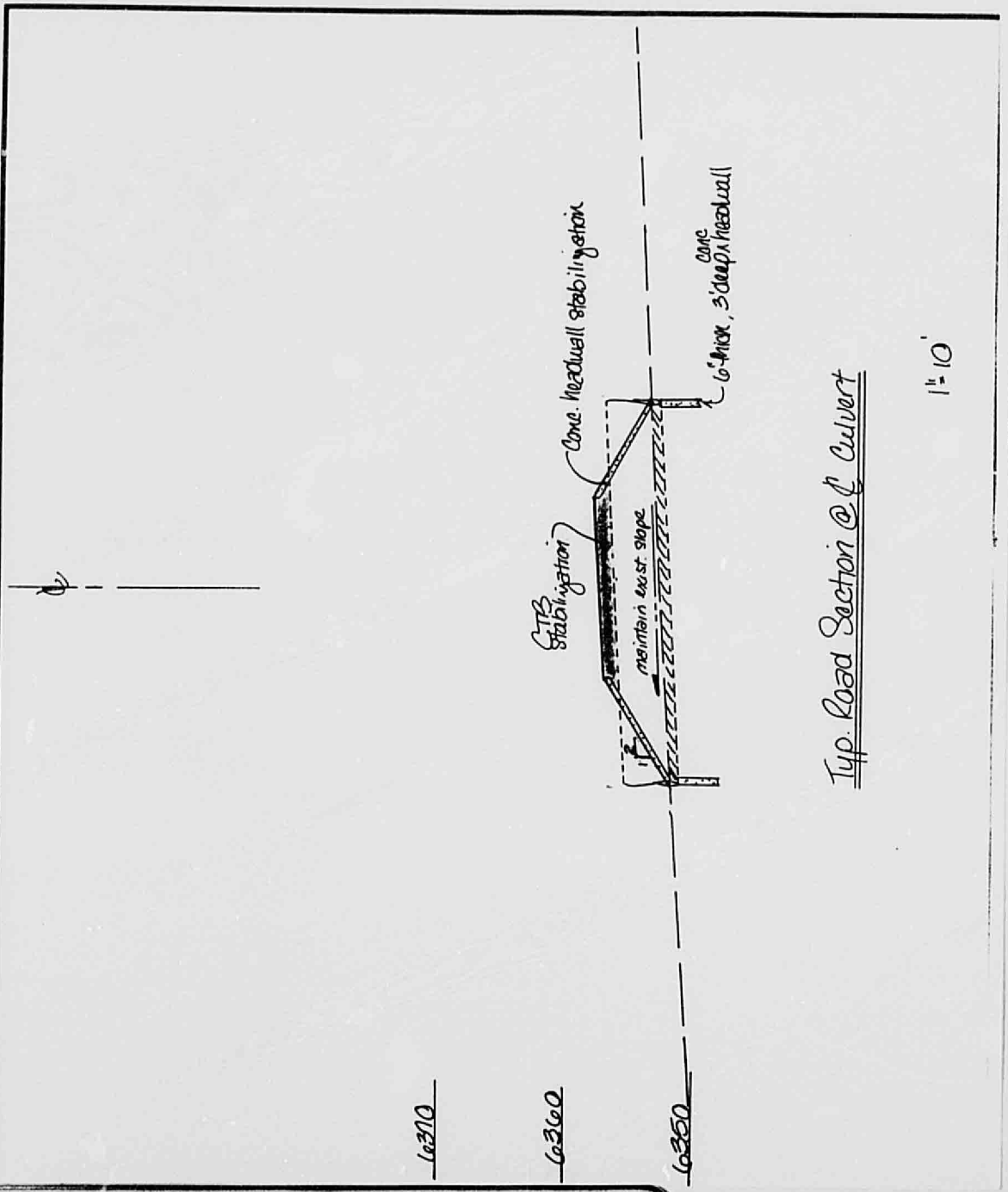
Job Elena Gallegos Channel Crossing
Subject Road Crossing Channel Section
Client ASI - City P&R

Sheet No. 5 of
Job. No.
By JDM Date 2/25/88

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

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NATURAL CHANNELS 17:22:19

VARIABLES LIST:
Y - FLOW ELEVATION  Q - FLOWRATE  S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y

Q (CFS) ? 4500
S (FT/FT) ? .057

Enter up to 20 cross-section points.
Enter <Return> only for distance to end.

CROSS-SECTION POINTS

| DIST | ELEV | COEFF | DIST | ELEV | COEFF |
|---|---|---|---|---|---|
| 1635 | 62 | .04 | | | |
| 1655 | 60 | .04 | | | |
| 1700 | 58 | .04 | | | |
| 1750 | 58 | .04 | | | |
| 1798 | 55.5 | .04 | | | |
| 1805 | 56 | .04 | | | |
| 1820 | 58 | .04 | | | |
| 1840 | 60 | .04 | | | |
| 1860 | 62 | .04 | | | |

RESULTS

Y= 59.47 FT
A= 302.23 SF
P= 168.09 FT
V= 14.89 FPS
F= 1.95 SUPER-CRITICAL FLOW

<Shift> <Prt Sc> print  <Return> repeat  <Space Bar> back to menu

ORIFICES 17:25:00

Enter up to 10 orifices.
Enter <Return> only for flowrate and area to end.

| FLOWRATE (CFS) | AREA (SF) | COEFF (-) | ELEVATIONS HEADWATER (FT) | CENTER (FT) | TAILWATER (FT) |
|---|---|---|---|---|---|
| 210.36 | 16.54 | 0.610 | 6.75 | 0.00 | 0.00 |

<Shift> <Prt Sc> print  <Return> repeat  <Space Bar> back to menu

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# MEMORANDUM:

February 19, 1988

CITY OF ALBUQUERQUE PUBLIC WORKS DEPT.
ENGINEERING GROUP

TO: Sandy Zuschlag, Parks & Recreation Dept./Design & Development

FROM: Andre Houle, DRC Chairman/Design Review Section

SUBJECT: PINO ARROYO CROSSING AT SIMMS PARK

I have reviewed the drawing. It is my engineering opinion that you are creating a time bomb on the Pino Arroyo which could adversely affect downstream residents located in the Sandia Heights area. I would like to draw your attention to a few problems.

1. I do not have enough information to really review the adequacy of the design provided. I feel the the broad crested weir should pass the entire 4700 cfs. I do not have adequate geometry or grade controls to verify this. This is required in the event the pipe is plugged. Since this is not a high traffic area, maintenance will become a problem and I feel that having a pipe plugged is going to occur.

2. There are no specifications on construction of the dam. The native soils are highly prone to piping and should not be used for enbankment construction. Select fill material should be provided. A key trench should be excavated and constructed for this dam. The slopes are at 2:1 and the slope limits appear to go to an elevation of approximately 51, with the top of road at 60, possibly higher. The potential for having a 10 ft. enbankment exists and I feel a letter from the State Engineer's office is required stating that their review of this project is not required.

3. There is no curve data on the road to be constructed. The road section is not provided. What is the limits of replacement? The road width is not provided. Are there any shoulders over the crossing? If there are no shoulders, it will be required to have guard rails with 5 ft. shoulders. If no guard rail is provided, then 13 ft. shoulders should be provided on each side of the road for traffic safety.

4. The slope limits are not correct at the upstream or the downstream end of the pipe. It appears that 40 additional feet of RCP will probably be required or wing walls to hold the enbankment back will be required.

5. Provide the geometry for the inlet and the erosion control for that inlet. Provide the geometry for the outlet and show the erosion and energy dissipator facility that is required for this pipe.

6. Provide the hydraulic and hydrology calculations used for this design.

AH/trs
(WP+772)

cc: Walter H. Nickerson, Assistant Director/PWD-Engineering
Fred Aquirre, City Hydrologist
Carlos Montoya, Flood Plain Administrator

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# DRAINAGE REPORT
# FOR
# THE CITY OF ALBUQUERQUE
# PARKS & RECREATION DEPARTMENT
# OPEN SPACE DIVISION

## ELENA GALLEGOS GRANT
## PINO ARROYO CROSSING

PREPARED BY:

CHAVEZ-GRIEVES CONSULTING ENGINEERS, INC.

4600-C MONTGOMERY BLVD. NE

ALBUQUERQUE, NEW MEXICO 87109

RECEIVED
APR 22 1988
HYDROLOGY SECTION

MARCH 15, 1988

REVISED APRIL 20, 1988

VICTOR J CHAVEZ
STATE OF
NO. 5713
NEW MEXICO
REGISTERED PROFESSIONAL ENGINEER

Victor J Chavez



25×10

0200 0000 1265

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## EXHIBITS


A. INFORMATION SHEET

B. VICINITY MAP

C. FLOOD BOUNDARY AND FLOODWAY MAP

D. USGS MAP-WATERSHED BOUNDARIES

E. CALCULATIONS AND SKETCHES




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## I. PURPOSE

The purpose of this report is to provide information as to the compatibility of the project site within drainage, flood hazard and erosion control constraints as dictated by on site physical features.

## II. SITE LOCATION AND EXISTING CONDITION

The Elena Gallegos Grant Pino Arroyo Crossing is located approximately 7000 feet east of Tramway Boulevard crossing the Pino Canyon in a north-south direction. See Exhibits "B", "C", and "D", Vicinity Map, Flood Boundary and Floodway Map, and USGS Map, respectively.

Slopes range from 5 to 80 percent and the road crossing location is approximately 4500 feet below the alluvial fan boundary from the Sandia Mountains. This alluvial fan boundary causes a sudden decrease in velocities allowing sediment to deposit forming the alluvail fans.

Where the slopes range from 25 to 80 percent, the soils are composed mostly of stones, cobbles and gravel; are well drained soils; little or no vegitation exists; runoff is very rapid; and the hazard of water erosion is moderate. See Reference No. 4.



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Where the slopes range from 0 to 9 percent, the soils are well drained; vegitation density is sparse to moderate; runoff is moderate; and the hazard of water erosion is moderate. See Reference Nc. 4.

III. PROPOSED CONDITION

Proposed development of the site includes 2-48" Spirolite culverts, 30 feet long under the new dirt road crossing the Pino Arroyo in a north-south direction. These culverts will be buried into the existing ground elevation approximately 18 inches, leaving a 2.5 foot high segment of culvert area left to drain small amounts of storm water runoff. Fill material will be placed in the new road alignment to provide for approximately 18 inches of cover above the culverts. The existing slope of the Pino Arroyo is to be maintained in the alignment of the upstream and downstream ends of the culverts to minimize erosion during small storms.

IV. FLOOD ZONE

The road alignment crosses a flood zone as shown on the Flood Boundary and Floodway Map, Exhibit "C". Developments downstream have dedicated the 100 year flood plains to the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA).



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## V. EROSION CONTROL

Erosion control of the road is limited to concrete headwalls at the upstream and downstream faces of the culvets, and soil cement embankements. Limits of the soil cement are to be located at the 100 year flood depth above the road. Maintenance of this facility is going to be a constant requirement and is realized by the City of Albuquerque, Parks and Recreation Department. (Maintenance is to be provided by the City of Albuquerque, Parks and Recreation Department, Open Space Division.)

## VI. DESIGN CRITERIA

Two design criterion were used in the analysis, A. The Rational Method and B. Runoff values from Reference No. 4.

A. The six hour, 100 year rainfall value of 2.8 inches was used for computing runoff values.

The Rational Formula was used to compute the rate of runoff.

The Rational Formula is as follows:

$$Q=CiA$$

Q = Rate of runoff in cubic feet per second

C = Coefficient of runoff (dimensionless)

i = Rainfall intensity in inches per hour

A = Drainage area in acres



25×10

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The value for i for a 100 year rainfall is determined by the following formula:

i = Rainfall value X I

$I = 6.84\ Tc^{-0.51}$

Tc = Time of concentration in minutes

$Tc = 0.0078\ L^{0.77}/S^{0.385}$ (Kirpich Equation)

where L = the length of the basin in feet measured from the most hydraulically remote point to the anaysis point in question and s = watershed slope determined by dividing the differences in elevation from the most hydraulically remote point to the analysis point in question by the length (L). The minimum Tc will be 10 minutes for the calculation of peak runoff.

B. The values calculated from criteria A. were compared with values from the "Drainage Report for Tramway Boulevard to Tramway Road" prepared by Resource Technology, Inc., September, 1987. Reference No. 4.

The comparisons were very close and, therefore, the design values should be valid for the 100 year rainfall event.

## VII. CALCULATIONS

Q = CiA

C = 0.53

i = 2.8 x I

$I = 6.84\ Tc^{-0.51}$



25x

0000 0000 1270

$$Tc = 0.0078\ L^{0.77}/S^{0.385}$$

L = 18500 feet

S = 0.16

Tc = 30.5 min.

I = 1.20

i = 2.8 (1.2)=3.35 inches per hour

A = 2492 acres (See Exhibit "D")

Q = (0.53)(3.35)(2492) = 4425 cfs

The value from Reference No. 4 at an analysis point upstream is 4280 cfs, Table 6.

The value of 4425 cfs was used for additional calculations.

## VIII. CONCLUSION

1. The 100 year storm design flowrate is 4425 cfs. 3.6 percent of the 100 year storm frequency will pass through the two culverts if flowing full with no head.
2. The approximate road surface elevation is 6355.5 feet at the low elevation.
3. The culverts used for the channel crossing were 2-48" Spirolite culverts, 30 feet long.
4. These culverts will handle approximately 185 cfs.
5. The road will act as a broad crested weir and the flow depth over the road is approximately 3.89 feet.
6. Since the road section is to act as a weir, both the upstream and the downstream faces must be protected.



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7. Approximately 6500 cu. ft. (0.148 ac. ft.) of runoff could be backed up behind the road during a 100 year storm. Additional water depth created by the construction of the road is 1.16 feet as shown on calculations for existing and proposed conditions. The incremental change in volume of water stored is approximately 2500 c.f.

8. Maintenance of this facility will be a continual requirement for the City of Albuquerque Parks and Recreation Department, Open Space Division. Minor maintenance should be planned bi-annually during the rainy season. Major maintenance should be planned every 2 years to include a detailed inspection of the structure to determine its condition. If major destruction of the facility occurs, another solution should be analyzed i.e., grading the road to match the existing invert of the channel and exclude the culverts.

9. If the road washes out, the flow pattern will revert back to the existing pattern before runoff gets to the existing residential development located approximately 2000 feet west of the new road. Normal dam safety analysis methods do no account for a system similar to this crossing where a very small portion of the storm volume is impounded. If it is assumed that one minute would be required to erode enough of the roadway to allow the restrained 100-year flows to return to existing conditions, the



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average flow required to drain the ponded volume will be 41.7 cfs or a 0.0094 increase in the total flow rate. If it was assumed that the road could be eroded instantaneously, the flows at the high water surface could increase from 4400 cfs to approximately 8300 cfs. This increase would drain the ponded volume and return the stream to the original flow conditions in approximately 1.28 seconds. It is reasonable to conclude that due to the small volume of impounded water, any breach of the new roadway will have an insignificant affect on existing downstream crossings and facilities.



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## IX. REFERENCES


1. City of Albuquerque, Development Process Manual, Volume II, Design Criteria.
2. Handbook of Hydraulics, 6th Editon, by Ernest F. Brater and Horace Williams King.
3. Standard Handbook for Civil Engineers, 3rd Edition, by Fredrick S. Merritt.
4. Drainage Report for Tramway Boulevard Improvements from Montgomery Boulevard to Tramway Road by Resource Technology, Inc., September 1987.
5. Civil Tools software by CAW, Inc. 1986.
6. Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico, U.S. Department of Agriculture Soil Conservation Service and Forest Service, June 1977.




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## DRAINAGE INFORMATION SHEET

PROJECT TITLE: Elena Gallegos - Piño Crossing ZONE ATLAS/DRNG.FILE #: D.E-23,24

LEGAL DESCRIPTION: Tract B, Albert G. Simms Park Site, Elena Gallegos Grant

CITY ADDRESS: N/A

ENGINEERING FIRM: Chavez-Grieves CONTACT: Jackie McDowell

ADDRESS: 4600 "C" Montgomery PHONE: 881-7376

OWNER: City of Albuquerque, P&R Dept. CONTACT: Jay Hart

ADDRESS: P.O. Box 1293 PHONE: 823-4016

ARCHITECT: N/A CONTACT:

ADDRESS: PHONE:

SURVEYOR: City of Albuquerque Survey Dept. CONTACT: LeMonte Urban

ADDRESS: P.O. Box 1293 PHONE: 764-1619

CONTRACTOR: N/A CONTACT:

ADDRESS: PHONE:

RECEIVED APR 22 1988 HYDROLOGY SECTION

PRE-DESIGN MEETING:

___ YES

X NO

___ COPY OF CONFERENCE RECAP SHEET PROVIDED

DRB NO.

EPC NO.

PROJ. NO.

TYPE OF SUBMITTAL:

X DRAINAGE REPORT

___ DRAINAGE PLAN

___ CONCEPTUAL GRADING & DRAINAGE PLAN

___ GRADING PLAN

___ EROSION CONTROL PLAN

___ ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL SOUGHT:

___ SKETCH PLAT APPROVAL

___ PRELIMINARY PLAT APPROVAL

___ SITE DEVELOPMENT PLAN APPROVAL

___ FINAL PLAT APPROVAL

___ BUILDING PERMIT APPROVAL

___ FOUNDATION PERMIT APPROVAL

___ CERTIFICATE OF OCCUPANCY APPROVAL

X ROUGH GRADING PERMIT APPROVAL

___ GRADING/PAVING PERMIT APPROVAL

___ OTHER ___ (SPECIFY)

DATE SUBMITTED: 3-15-88

BY: Jackie S. McDowell

EXHIBIT "A"

25 X

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**EXHIBIT "B"**

**VICINITY MAP**

APPROX. SCALE: 1"=1000'

25×10 32×10 25×10

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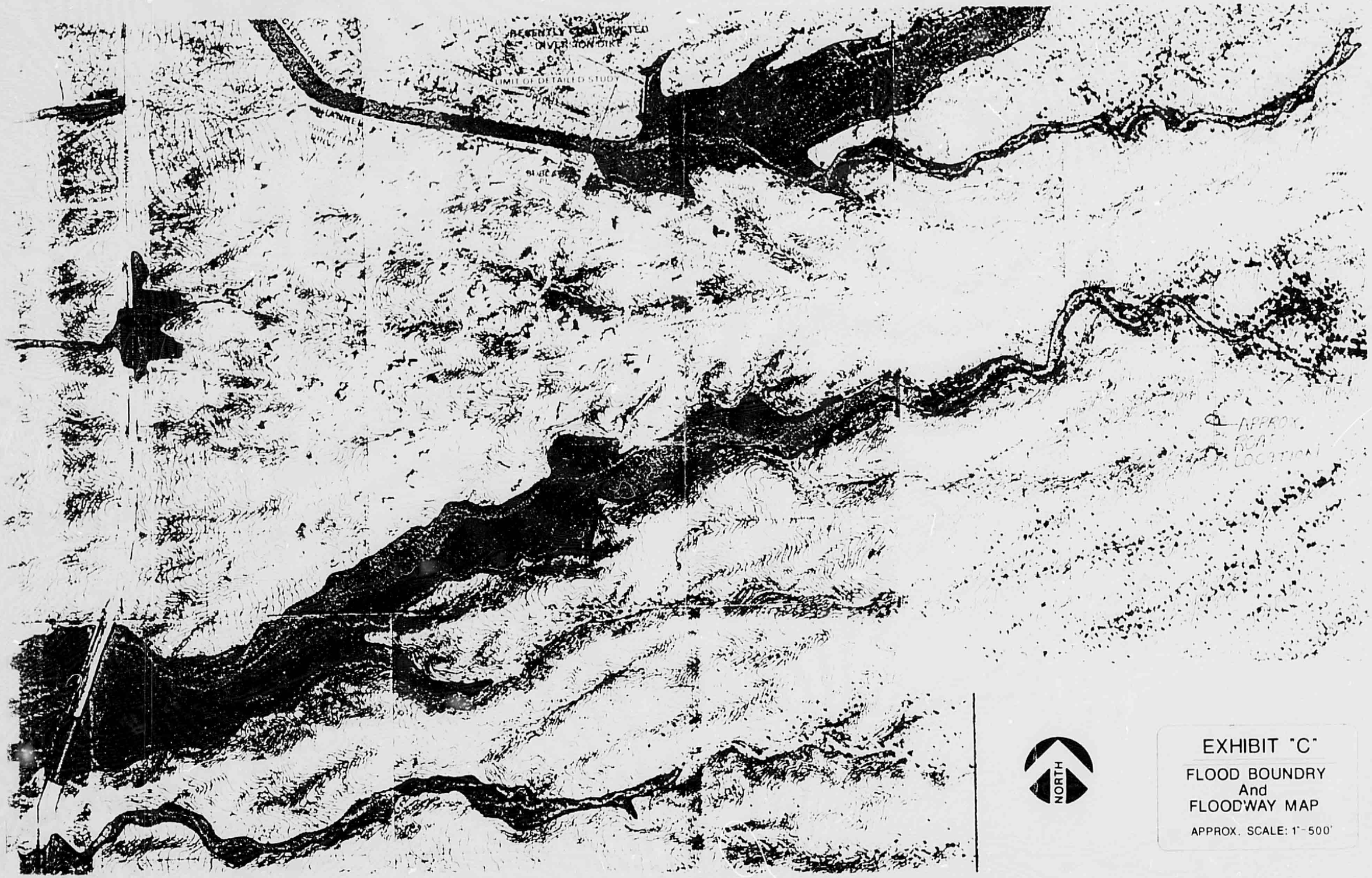


NORTH

EXHIBIT "C"

FLOOD BOUNDRY
And
FLOOD'WAY MAP

APPROX. SCALE: 1"=500'

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THIS MICROIMAGE IS THE BEST POSSIBLE REPRODUCTION DUE TO THE POOR QUALITY OF THE ORIGINAL DOCUMENT.

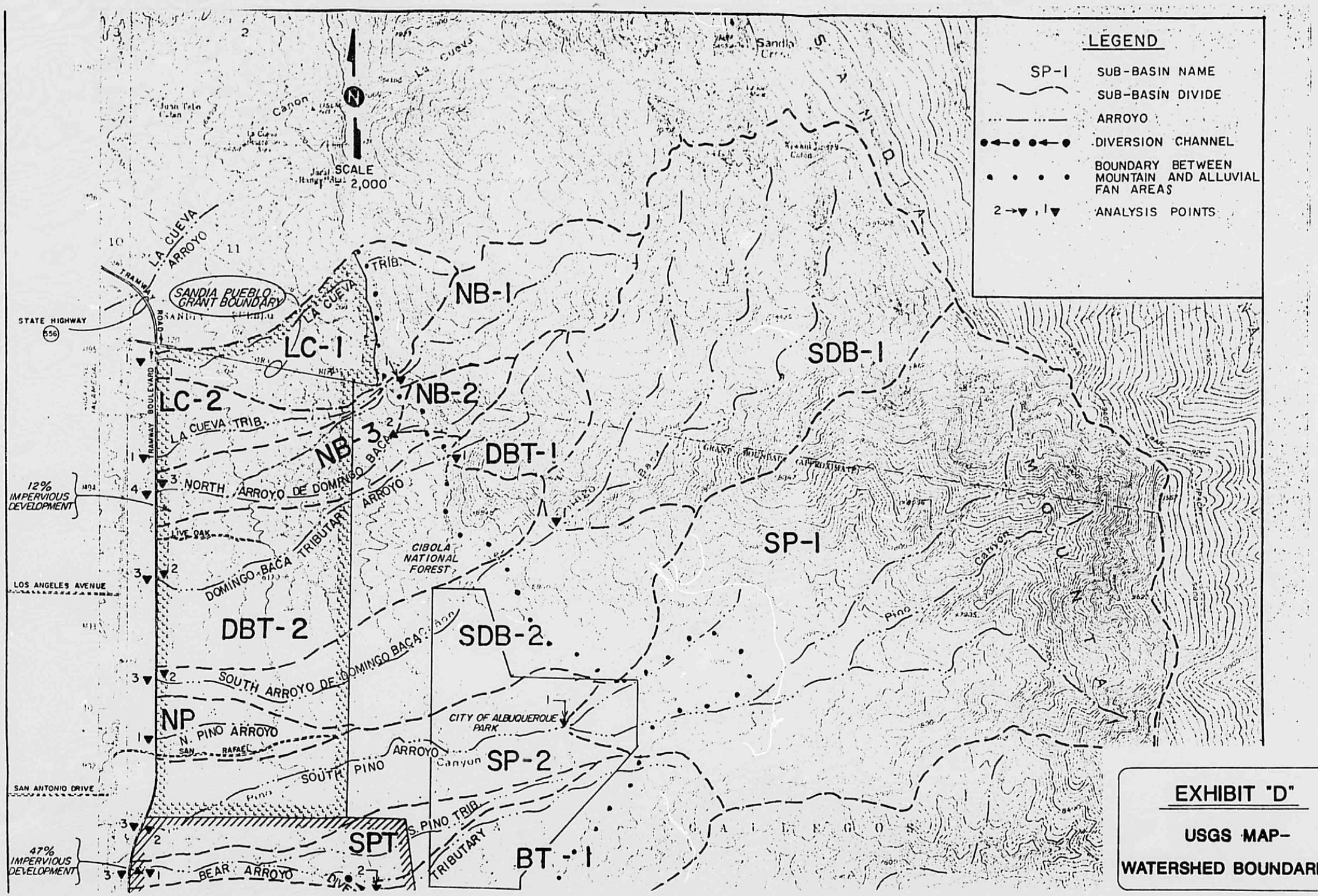


**EXHIBIT "D"**

**USGS MAP–**

**WATERSHED BOUNDARIES**

25×10 32×10 25×10

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EXHIBIT "E"

CALCULATIONS
And
SKETCHES

25×10

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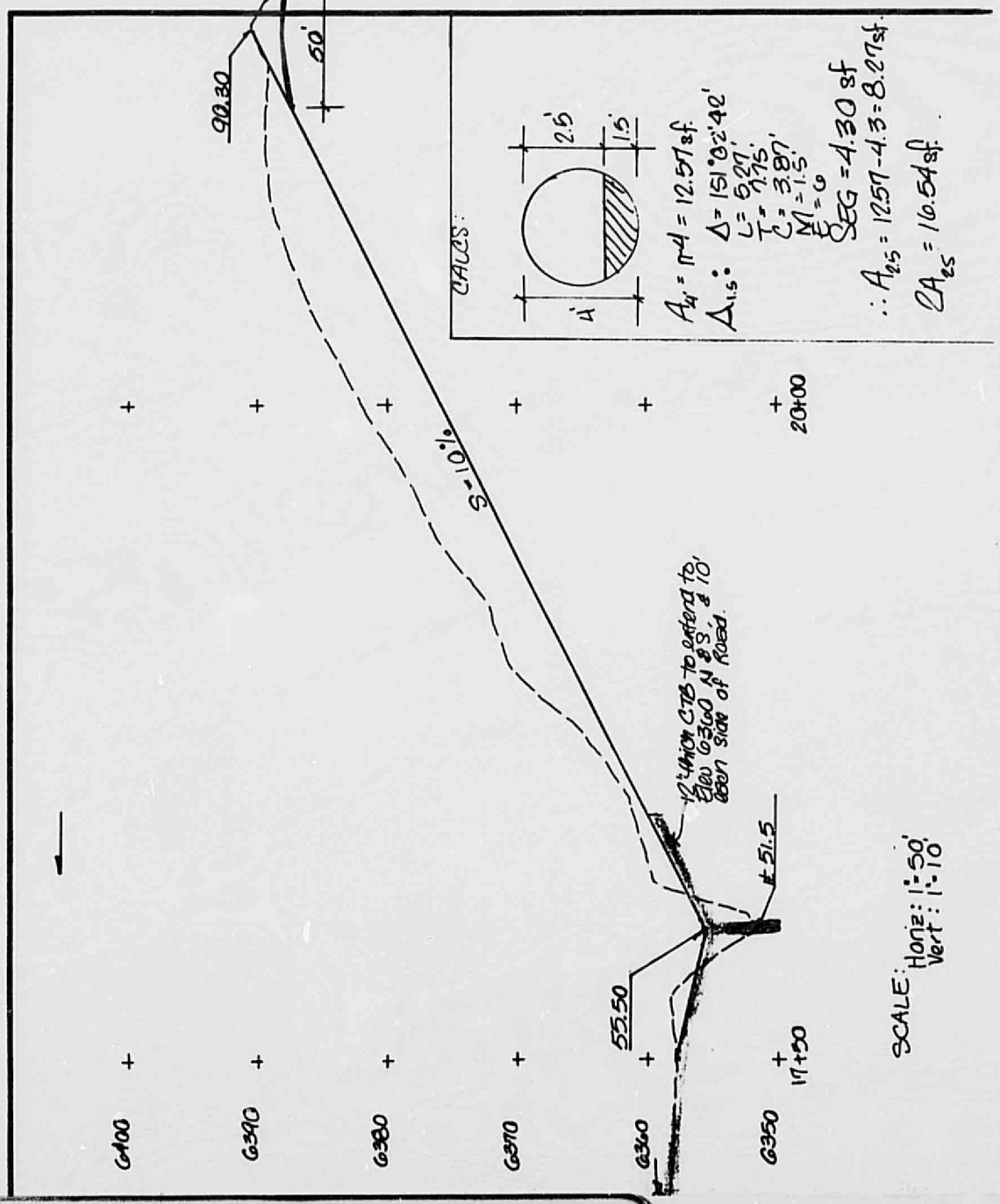
Job Elena Gallegos Channel Crossing
Subject Profile of New Road
Client AST - City P&R

Sheet No. 1 of
Job. No.
By GSM Date 2/25/88

CHAVEZ - GRIEVES CONSULTING ENGINEERS, Inc. Albuquerque, NM




25 × 10

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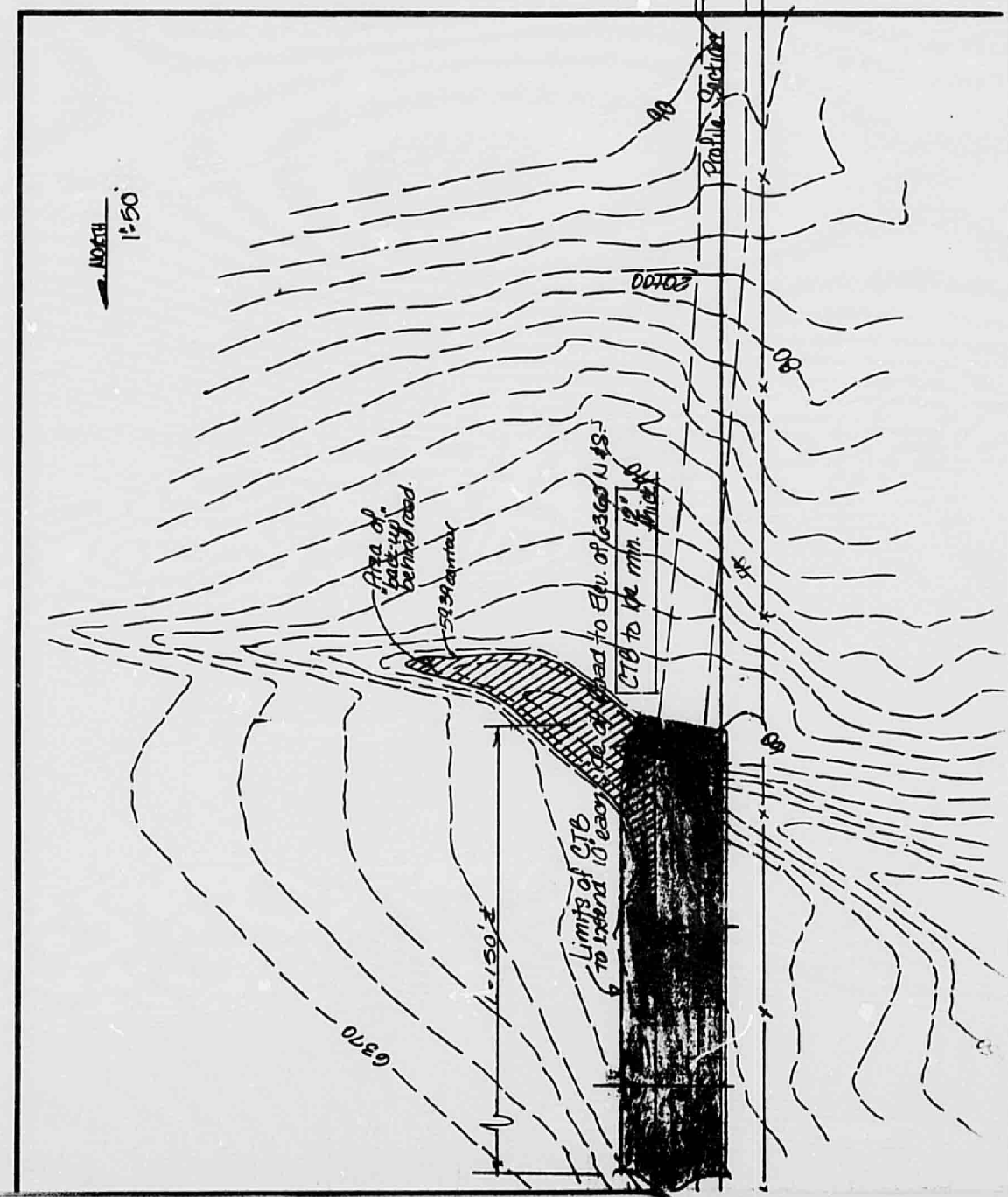
Job Elena Gallegos Channel Crossing
Subject Plan of New Road
Client ASI - City P&R

Sheet No. 2 of
Job. No.
By JSM Date 2/25/88

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

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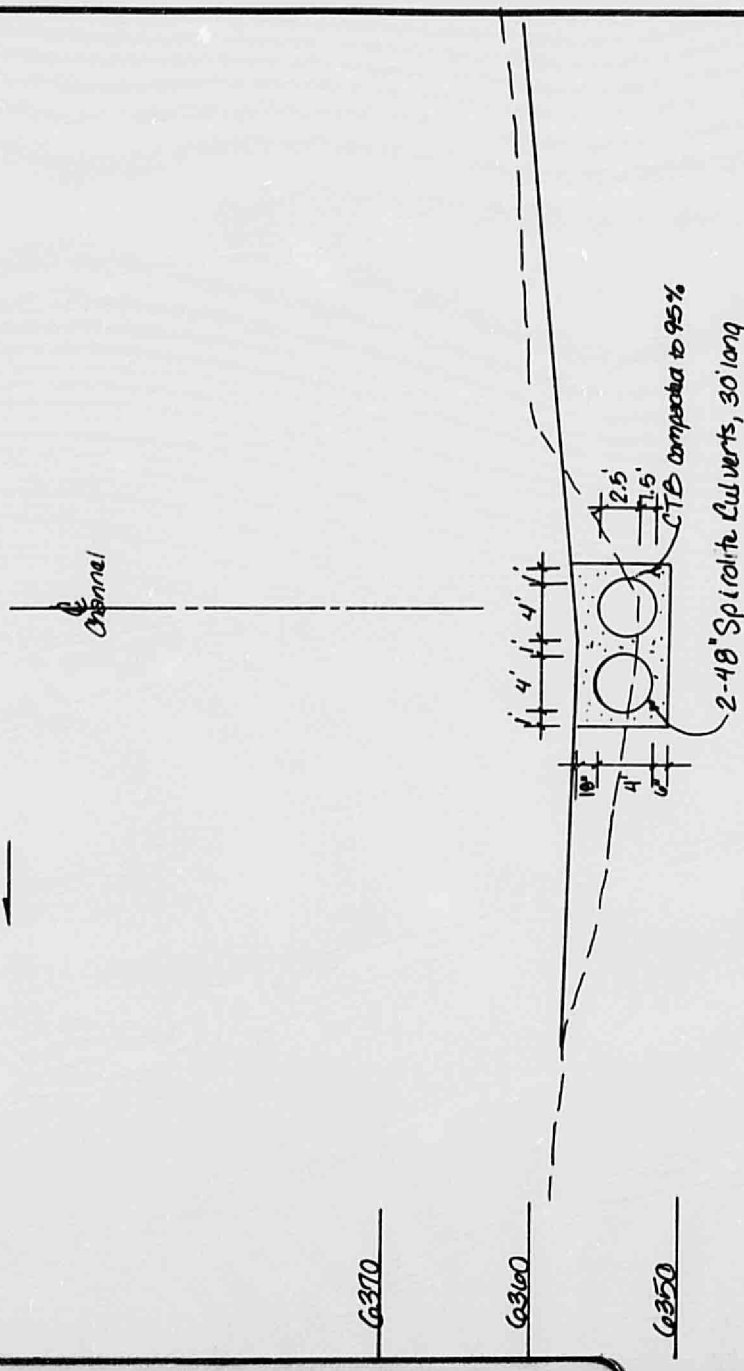
THIS MICROIMAGE IS THE BEST POSSIBLE REPRODUCTION DUE TO THE POOR QUALITY OF THE ORIGINAL DOCUMENT.

Job Elena Gallegos Channel Crossing
Subject Road Section
Client ABI - City P&R

Sheet No. 3 of
Job. No.
By JSM Date 2/25/88

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM




APPROX. SECTION @ ℄ OF NEW ROAD

1" = 10'

25×

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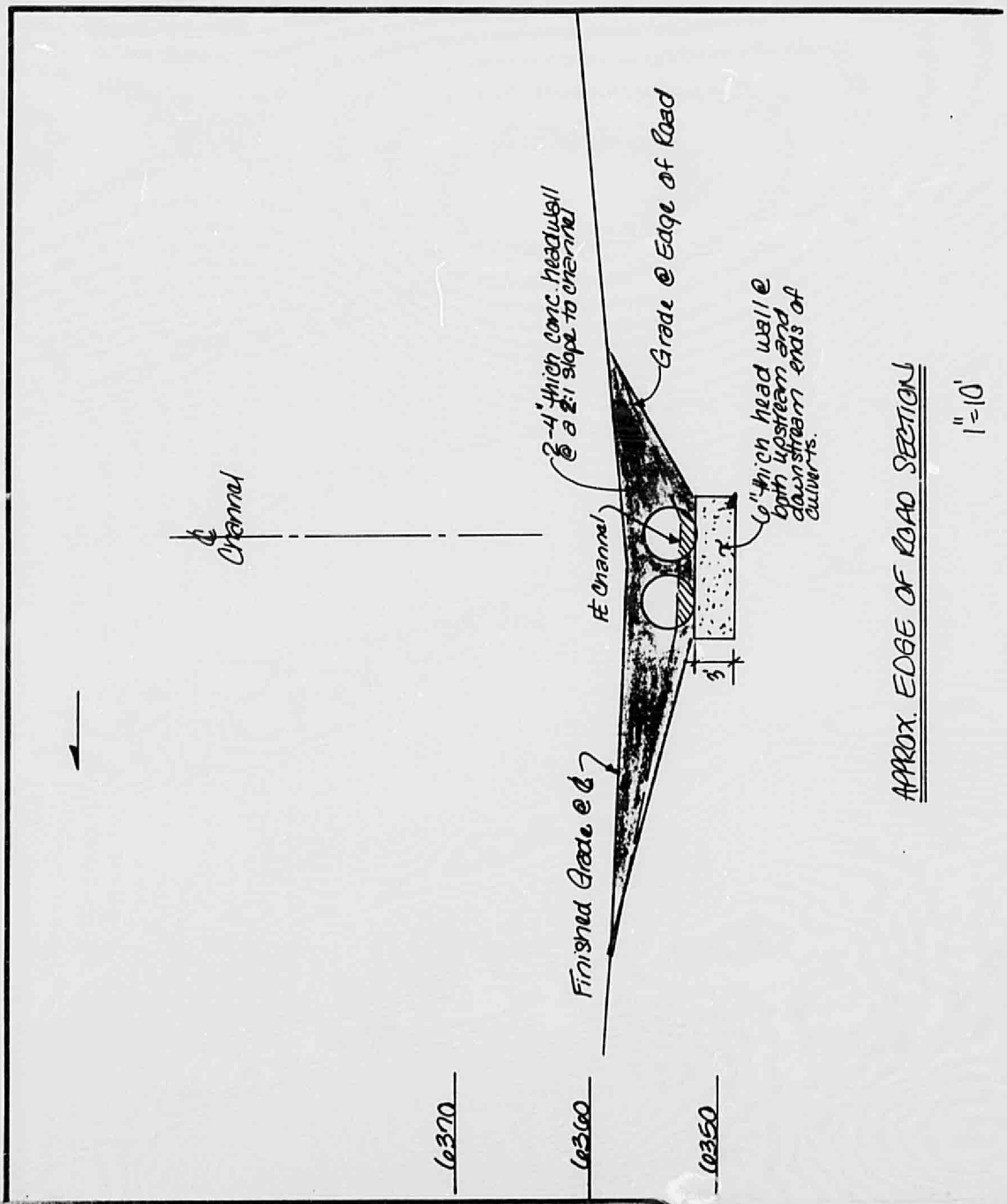
Job Elena Gallegos Channel Crossing
Subject Edge of Road Section
Client ASI - City P&R

Sheet No. 4 of
Job. No.
By JSM Date 2/25/88

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

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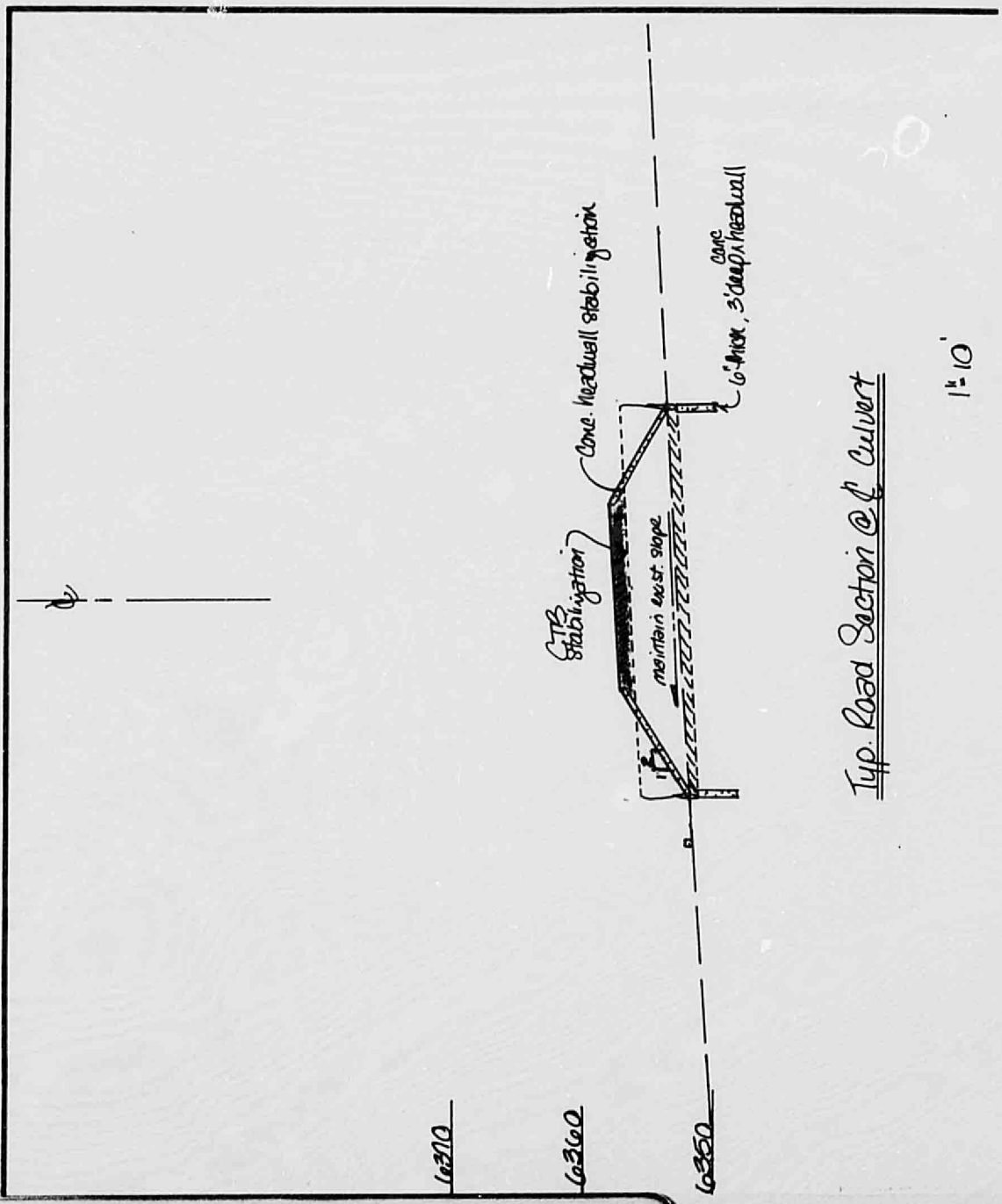
THIS MICROIMAGE IS THE BEST POSSIBLE REPRODUCTION DUE TO THE POOR QUALITY OF THE ORIGINAL DOCUMENT.

Job Elena Gallegos Channel Crossing
Subject Road Crossing Channel Section
Client ASI - City P&R

Sheet No. 5 of
Job. No.
By JAM Date 2/25/88

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

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Job Elena Gallegos Channel Crossing
Subject Capacity of 2-48" Culverts-Flowing Full
Client ASI - City P&R

Sheet No. 6 of
Job. No.
By DSM Date 4/15/88

CHAVEZ - GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Culverts are buried approx. 1.5' into the ground.

$Q = 1.486\, A^{5/3}\, S^{1/2} / n P^{2/3}$ (assuming no head)

$A = 16.54$ s.f.
$S = 0.057$
$n = 0.04$
$P = 14.59$

$Q = 159$ cfs. $\Rightarrow$ 3.6% of the 100 year storm.

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NATURAL CHANNELS

VARIABLES LIST:
Y - FLOW ELEVATION  Q - FLOWRATE  S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y

Q (CFS) ? 4425
S (FT/FT) ? .057

RESULTS
==========
Y= 58.23 FT
A= 231.17 SF
P= 116.54 FT
V= 19.14 FPS
F= 2.37 SUPER-CRITICAL FLOW

Enter up to 20 cross-section point
Enter <Return> only for distance to en

CROSS-SECTION POINTS

| DIST | ELEV | COEFF | DIST | ELEV | COEFF |
|---|---|---|---|---|---|
| 0 | 68 | .04 | 204 | 52 | .04 |
| 11 | 66 | .04 | 207 | 54 | .04 |
| 24 | 64 | .04 | 210 | 56 | .04 |
| 35 | 62 | .04 | 213 | 58 | .04 |
| 53 | 60 | .04 | 227 | 60 | .04 |
| 107 | 58 | .04 | 254 | 62 | .04 |
| 183 | 56 | .04 | 268 | 64 | .04 |
| 190 | 54 | .04 | 279 | 66 | .04 |
| 195 | 52 | .04 | 291 | 68 | .04 |
| 200 | 51.45 | .04 | | | |

<Shift> <Prt Sc> print  <Return> repeat  <Space Bar> back to men

Existing Condition

25×10

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ORIFICES 6:11:34

Enter up to 10 orifices.
Enter <Return> only for flowrate and area to end.

| FLOWRATE (CFS) | AREA (SF) | COEFF (-) | ELEVATIONS HEADWATER (FT) | CENTER (FT) | TAILWATER (FT) |
|---|---|---|---|---|---|
| 185.52 | 16.54 | 0.610 | 5.25 | 0.00 | 0.00 |

<Shift> <Prt Sc> print <Return> repeat <Space Bar> back to menu

NATURAL CHANNELS 6:13:19

VARIABLES LIST:
Y - FLOW ELEVATION Q - FLOWRATE S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y

Q (CFS) ? 4239
S (FT/FT) ? .057

Enter up to 20 cross-section points.
Enter <Return> only for distance to end.

CROSS-SECTION POINTS

| DIST | ELEV | COEFF | DIST | ELEV | COEFF |
|---|---|---|---|---|---|
| 1635 | 62 | .04 | | | |
| 1655 | 60 | .04 | | | |
| 1700 | 58 | .04 | | | |
| 1750 | 58 | .04 | | | |
| 1798 | 55.5 | .04 | | | |
| 1805 | 56 | .04 | | | |
| 1820 | 58 | .04 | | | |
| 1840 | 60 | .04 | | | |
| 1860 | 62 | .04 | | | |

RESULTS
==========
Y= 59.39 FT
A= 289.39 SF
P= 165.58 FT
V= 14.65 FPS
F= 1.95 SUPER-CRITICAL FLOW

<Shift> <Prt Sc> print <Return> repeat <Space Bar> back to menu

Proposed Condition

25×

0000 0000 1287

25×10