HYDROLOGY F20/D18 4 PLANS

F 20/D18

4 PLANS

ENGINEERS PLANNERS PHOTOGRAMMETRISTS

BOHANNAN-HUSTON INC.

4125 CARLISLE BLVD., N.E. ALBUQUERQUE, NEW MEXICO 87107 505 881-2000

April 20, 1978

Mr. Bruno Conegliano
Assistant City Engineer,
Hydrology
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Re: Drainage Report for Bear Canyon Estates,
Units 2 and 3

Dear Mr. Conegliano:

Enclosed are two (2) copies of the Drainage Report for Bear Canyon Estates, Units 2 and 3. This report addresses all drainage information pertinent to the proposed development of this tract.

Your prompt attention to this matter would be greatly appreciated and if there are any questions, please do not hesitate to contact me or Mr. Isaac Pino at this office.

Sincerely yours,

Michial M. Emery, P.E.
Vice President

cc: The Wylie Corporation
Enclosures

IP/js
Job No. 78-050

Cremans Inc.

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

MAYOR
DAVID RUSK

CITY ATTORNEY
GEORGE R. "PAT" BRYAN, III
William L. Kraemer, Deputy City Attorney

ASSISTANT CITY ATTORNEYS

Barbara Albin
Jeffrey L. Baker
William R. Conner
Malcolm deVesty
C.J. Finnen
Robert C. Gutierrez
Phillip P. Medrano
Patrick L. McDonald
Beth McLellan
Robert K. Patten
Steven H. Schiff
Deborah C. Slade
Barbara G. Stephenson
Albert N. Thiel

F-20

January 22, 1981

RECEIVED
JAN 2 3 1981
CITY ENGINEER

Mr. Charles J. Noya
Attorney at Law
P. O. Box 30107
Albuquerque, N.M. 87190

Dear Mr. Noya:

File

I am in receipt of your letter of January 8, 1981, regarding the Turnkey Agreement for Bear Canyon Estates, Units 2 and 3; however, I did not receive your letter until January 22, 1981.

As you indicated in your letter, and as we discussed on the telephone, I have been informed by both the City Engineer, Richard Heller, and the City Hydraulic Engineer, Bruno Conegliano, that there is some documentation showing that the parties agreed that the design for the construction of certain structures on the Bear Canyon Arroyo was an experimental design and if the design did not prove out, the structures would have to be constructed according to conventional designs. However, I have not received copies of such documentation from either Mr. Heller or Mr. Conegliano.

Bruno
do we have copies?

I would be happy to meet with you to discuss this matter; however, I have somewhat of a problem in doing so in the near future. I am involved in a rate hearing in Santa Fe which is scheduled for all of this month, and it appears it will continue for another several weeks. Therefore, I am not able at this

time to set a definite date as to when I can meet with you. I will be happy to contact you as soon as my schedule is firmed up so that I can schedule with you a time to meet.

Very truly yours,

Patrick L. McDonald
Assistant City Attorney

PLMcD:ms
cc: Richard Heller, City Engineer
Bruno Conegliano, Hydraulic Engineer

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

July 25, 1980

F20-D3

Mr. M. M. Owens, Realtor
The O'Connor Company
3240 Juan Tabo Blvd., NE
Albuquerque, NM 87111

Re: Your Letter Dated July 15, 1980

Dear Mr. Owens:

I have reviewed the location of the Lot 15 Block 1 Bear Canyon Estates Unit 3 and, in my opinion, the property is not located in the flood hazard area.

Very truly yours,

Bruno Conegliano
Asst. City Engineer-Hydrology

BC:lf

MUNICIPAL DEVELOPMENT DEPARTMENT
Richard S. Heller, P.E., City Engineer ENGINEERING DIVISION Telephone (505) 766-7467

October 17, 1979

Mr. Richard S. Heller
City Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Bear Canyon Estates, Tract A-2

Dear Mr. Heller:

The undersigned is the owner of the above described property located in the City of Albuquerque. The owner agrees to participate in the protection of the north bank of the channel adjacent to the above premises on the south, to a maximum of concreting the north side slope.

Very truly yours,

McClintic Development Corporation
By: James R. McClintic, President

James R. McClintic Pres.

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

July 25, 1979

F20-D3

Meurer, Serafini & Meurer
2601 Wyoming Blvd. N.E., Suite F
Albuquerque, N.M. 87110

Re: Bear Canyon Estates
Albuquerque, N.M.

Gentlemen:

The drainage concept submitted for the above referenced site is approved subject to the following:

1. The developer will be responsible for providing the water block/wall mentioned at the N.E. corner of the site.

2. Where the rundown from the site enters the Bear Channel, provide erosion protection of the channel bank.

3. Provide adequate grading details of the proposed ponding areas to enable construction and inspection to be completed.

4. The developer should provide the city with a 5 year bond for the lining of the Bear Channel adjacent to the site. This will allow the city time to observe the amount of channel bank erosion that occurs, if any, and take appropriate action.

Sincerely,

Richard S. Heller

Richard S. Heller
City Engineer

RSH/ds

cc-Richard Leonard-AMAFCA
Drainage File
Bruno Conegliano

SULLIVAN, VILLELLA, SKARSGARD & NOYA
A PROFESSIONAL ASSOCIATION
ATTORNEYS AT LAW

WILLIAM J. SULLIVAN
PATRICK VILLELLA
GORDON L. SKARSGARD
CHARLES J. NOYA
Stephen J. Vogel

SUMMIT OFFICE BUILDING, SUITE 200
4001 INDIAN SCHOOL ROAD, N. E.
POST OFFICE BOX 30107
ALBUQUERQUE, NEW MEXICO 87190
AREA CODE 505/262-2323

February 24, 1981

F-20

Mr. Patrick L. McDonald
Assistant City Attorney
Post Office Box 1293
Albuquerque, New Mexico 87103

Re: Turnkey Agreement - Bear Canyon Estates
Units 2 and 3

Dear Mr. McDonald:

Thank you for your letter dated January 22, 1981.

If you have concluded your rate hearings, I would appreciate a meeting sometime within the next two (2) weeks so that I may discuss this matter with you. I have repeatedly heard of the speculative nature of the project and that my client is aware of it as a result of certain documents. I have yet to receive any such documents. This matter has now gone on for some period of time, and I would very much like to get the matter resolved or litigated, or whatever else needs to be done in order that it may be concluded.

May I please hear from you?

Very truly yours,

CHARLES J. NOYA

CJN:gp

cc: Wylie Corporation

2-26-81

Dick
Comments?

RECEIVED
FEB 26 1981
CITY ENGINEER

DRAINAGE REPORT

FOR THE

BEAR CANYON ESTATES UNITS 2 AND 3

ZONE ATLAS SHEET F-20

FOR

THE WYLIE CORPORATION

APRIL 1978

DRAINAGE REPORT

FOR THE

BEAR CANYON ESTATES UNITS 2 AND 3

ZONE ATLAS SHEET F-20

FOR

THE WYLIE CORPORATION

APRIL 1978

DRAINAGE REPORT
FOR
BEAR CANYON ESTATES UNITS 2 AND 3
ZONE ATLAS SHEET F-20

APRIL 1978

PREPARED FOR

THE WYLIE CORPORATION
2111 MENAUL, N.E.
ALBUQUERQUE, NEW MEXICO 87107

PREPARED BY

BOHANNAN-HUSTON, INC.
4125 CARLISLE BOULEVARD, N.E.
ALBUQUERQUE, NEW MEXICO 87107

STATE OF NEW MEXICO
MICHIAL M.
EMERY
No. 5194
REGISTERED PROFESSIONAL ENGINEER

Michial M. Emery

MICHIAL M. EMERY, P.E.
N.M.P.E. NO. 5194

TABLE OF CONTENTS

	Page
PURPOSE	1
PROJECT LOCATION AND DESCRIPTION	1
HYDROLOGY	2
UNITS 2 AND 3 PRE-DEVELOPMENT	2
UPLAND DRAINAGE	2
UNIT 2 AFTER DEVELOPMENT	3
UNIT 2 RECOMMENDATIONS	3
UNIT 3 AFTER DEVELOPMENT	4
UNIT 3 RECOMMENDATIONS	4
BEAR CANYON TRIBUTARY RECOMMENDATIONS	5
BEAR CANYON ARROYO RECOMMENDATIONS	6

APPENDIX

CALCULATIONS

PLATE

PLATE I	UPLAND DRAINAGE
PLATE II	UNIT 2 - UNDEVELOPED DRAINAGE PATTERNS AND FLOW RATES
PLATE III	UNIT 3 - UNDEVELOPED DRAINAGE PATTERNS AND FLOW RATES
PLATE IV	UNIT 2 - DEVELOPED DRAINAGE PATTERNS AND FLOW RATES
PLATE V	UNIT 3 - DEVELOPED DRAINAGE PATTERNS AND FLOW RATES

DRAINAGE REPORT
FOR
BEAR CANYON ESTATES UNITS 2 AND 3

PURPOSE

The purpose of this report is to determine the runoff resulting from a 100-year frequency storm falling on two study parcels and their contributing areas under existing and developed conditions. Guidelines for development are established so that drainage patterns and flow rates can be defined.

PROJECT LOCATION AND DESCRIPTION

The two study parcels are located west of Eubank Boulevard at the south edge of Spain Road, and comprise Units 2 and 3 of Bear Canyon Estates Subdivision. Both parcels are bounded on the south by the Bear Canyon Arroyo. The Bear Arroyo Tributary separates the two units, with Unit 2 on the east and Unit 3 on the west. This is shown on Plate I at the back of this report. Unit 2 contains 14.7 acres and Unit 3 contains approximately 9.2 acres.

Existing topography in the study areas slopes from east to west on an average grade of 4 percent. The soils are granular decomposed granite. Vegetation was removed by grading in the recent past.

Both tracts are zoned R-1, and it is anticipated that development will proceed in accordance with the typical R-1 zoning. Density is expected to be approximately 3 to 4 units per acre.

HYDROLOGY

Peak flow rates for the study areas and any contributing areas were determined from the rational formula for a 100-year storm. Rainfall intensities were selected from curves presented in the Master Plan of Drainage, 1963, for the Albuquerque area.

UNITS 2 AND 3 PRE-DEVELOPMENT

The most recent topographic data available was used to determine drainage basins affecting the two units.

Unit 2 does not currently receive runoff from any upland basins. Runoff is intercepted on the east by Eubank Boulevard and on the north by Spain Road. Unit 3 is similar, with the exception that a portion of runoff from Spain Road breaks south on Moon Street and empties into the Bear Canyon Arroyo.

The Bear Canyon Arroyo and the Bear Arroyo Tributary currently meander through both units. Proposed improvements to these channels are described later in this report. All flow leaving this property empties into the Bear Canyon Arroyo and continues west. Undeveloped area runoff originating within the study parcels can be found in the attached computations.

UPLAND DRAINAGE

The upland storm drainage will continue to be intercepted on the north by Spain Road, and diverted, for the most part, into the Bear Arroyo Tributary. Runoff from the upland basin, consisting of

approximately 124 acres, will collect at the double 6' X 4' concrete box culvert being constructed across Spain Road, approximately 1700 feet east of Eubank Boulevard. This runoff will be carried by the tributary to the Bear Canyon Arroyo as described later in this report. Runoff generated west of the CBC and north of Spain Road, will be carried west on Spain Road. Upland drainage from the east will continue to be intercepted by Eubank Boulevard, and diverted into the Bear Canyon Arroyo. Property east of Unit 2, known as Tract A, will be diverted by the higher finished grade of Unit 2 south to the Bear Canyon Arroyo. Units 2 and 3 and Tract A are singularly owned.

UNIT 2 AFTER DEVELOPMENT

In accordance with AMAFCA Drainage Resolution 1972-2, it is recommended that development not increase runoff. This is accomplished by providing back yard ponding on all lots.

The front portion of the lots fronting on Spain Road will drain onto Spain, with runoff running west to the CBC and into the Bear Tributary. Water blocks will be constructed on both intersections of Concreto Drive and Spain Road. Runoff on Concreto will flow south then west to the southwest through the drainage easement and into the Bear Tributary. The total Q to be carried is 16 cfs, and it will drain into 2 double-C inlets and be carried through a 21" RCP pipe set at 2% grade and daylighting at the tributary channel flowline.

UNIT 2 RECOMMENDATIONS

The following recommendations are made for Unit 2:

1. Back yard ponding on all units.

2. Construction of water blocks on Concreto Drive, in both locations, where it intersects Spain Road.

3. Place 8 drop structures in Bear Tributary on a 4% grade. Channel bottom 20' wide with 3:1 side slopes.

4. Build 2 double-C inlet structures at southwest corner of Concreto Drive, place 137 feet of 21" RCP at 2% slope from inlet to channel flowline.

UNIT 3 AFTER DEVELOPMENT

As with Unit 2, all back yards will have ponding. Cascajo Drive will be constructed with a water block on Spain. Lots fronting on Spain will drain west on Spain to Moon, and be diverted south on Moon Street to the Bear Canyon Arroyo. Moon Street, currently built as an alley section, will be reconstructed to a 40 foot face to face width, with standard curb and gutter on both sides of the street. In addition to the Spain Road runoff, coming from west of the CBC and on the south side of Spain, Moon Street will carry runoff from Cascajo Drive south to the Arroyo. No runoff from this unit will drain into the Bear Tributory.

UNIT 3 RECOMMENDATIONS

The following is recommended for Unit 3:

1. Back yard ponding.

2. Construct water block on Cascajo where it intersects Spain Road.

3. Rebuild Moon Street with sufficient capacities to carry Cascajo Drive flows and Spain Road flows (11.58cfs).

4. Build a temporary pavement section on Moon Street from the intersection of Cascajo Drive to the Bear Canyon Arroyo (150-feet) to remain in place until such time that the construction of Moon Street, across the arroyo, is complete. It is possible that the construction of Moon Street across the Bear Canyon Arroyo may necessitate the vertical realignment of Moon, therefore, it is recommended that a temporary pavement be installed at this time. Depending on the vertical realignment of the Moon Street crossing, drop inlets and 18-inch RCP may eventually be needed to drain Moon Street.

Recommended guidelines and results are:

Moon Street

Street Width	-	40 Feet	Anticipated Flow	-	14.7 cfs
Minimum Slope	-	.005 Ft/Ft	Flow Depth	-	5 Ft
Crown Height	-	6 Inches	Velocity	-	3.9 fps

BEAR CANYON TRIBUTARY RECOMMENDATIONS

The tributary currently meanders uncontrolled through both Units 2 and 3. A double 6' x 4' CBC is being constructed to handle a flow of 350 cfs as designated in the Villa Del Rey Drainage Report by T. T. Burnett Engineering, submitted in November 1977. It is recommended to confine the tributary within the 75 Ft. R/W. In addition, the channel bottom should be built to a 4% slope, to tie into the arroyo, with drop structures placed at 57 Ft. spacing to reduce velocity of the combined upland and Unit 2

flows. At the outlet of the 21" RCP pipe from Concreto Drive, wire-tied rip-rap will be constructed to prevent channel erosion. Additionally, at the intersection of the tributary and the Bear Canyon Arroyo, utilization of wire tied rip-rap will reduce erosion and tie the flow lines of the two channels together.

BEAR CANYON ARROYO RECOMMENDATIONS

As recommended in the Amended Drainage Report for the Bear Canyon Arroyo from Moon Street to Juan Tabo, circular drop structures will be utilized. The structures will be installed from Moon Street to Eubank Boulevard, and terminate at the apron of the six 6' x 6' CBCs at Eubank. The structures will be centered within the 150 Ft. R/W, with side-slopes from the arroyo bottom being set at 3:1. The arroyo will be graded to such a depth so as to allow for the construction of any drainage structures that the City of Albuquerque may deem necessary in the future.

RUNOFF COMPUTATIONS FOR UNDEVELOPED BEAR CANYON ESTATES UNIT 2

AREA 1	24.4 (.0573) =	1.4 ACRES
AREA 2	72.5 (.0573) =	4.2 ACRES
AREA 3	86.7 (.0573) =	5.0 ACRES
AREA 4	71.8 (.0573) =	4.1 ACRES
		14.7 ACRES

COMPUTATIONS OF FLOWS ON PARCEL

AVERAGE SLOPE OVER AREA = 4% = S

GROUND FACTOR (POOR VEGETATION COVER) = 1.8 = B

RUNOFF COEFFICIENTS (0.4) = C

$T_c = \text{Log}^{-1}[.3641 (B) + .3854 \text{ Log}(L) - .197 \text{ Log}(S) - .3618]$

T_c = TIME OF CONCENTRATION, MIN
L = LENGTH OF WATERCOURSE, FT
I = INTENSITY IN INCHES/HOUR
A = AREA IN ACRES
Q = FLOW IN CFS

$I = \frac{189}{T_c + 25}$

$Q = CIA$

$T_c = \text{Log}^{-1}[.3854 \text{ Log}(L) + .1755]$

AREA	L	Tc	I (in/hr)	A (ACRES)	Q CFS
1	510'	16.6	4.54	1.4	2.54
2	1400'	24.4	3.82	4.2	6.42
3	1420'	24.6	3.81	5.0	7.62
4	1300'	23.8	3.87	4.1	6.34
					22.92 ≈ 22.92 CFS

PROJECT NAME BEAR CANYON ESTATES SHEET 1 OF
PROJECT NO. 72-000 BY H.C. DATE 4-11-78
SUBJECT UNDEVELOPED RUNOFF UNIT 2 CH'D DATE

RUNOFF COMPUTATIONS FOR UNDEVELOPED BEAR CANYON ESTATES UNIT 2

AREA 1	24.4 (.0573) =	1.4 ACRES
AREA 2	72.5 (.0573) =	4.2 ACRES
AREA 3	86.7 (.0573) =	5.0 ACRES
AREA 4	71.8 (.0573) =	4.1 ACRES
		14.7 ACRES

COMPUTATIONS OF FLOWS ON PARCEL

AVERAGE SLOPE OVER AREA = 4% = S

GROUND FACTOR (POOR VEGETATION COVER) = 1.8 = B

RUNOFF COEFFICIENTS (0.4) = C

$T_c = \text{Log}^{-1}[.3641\,(B) + .3854\,\text{Log}(L) - .197\,\text{log}(S) - .3613]$

T_c = TIME OF CONCENTRATION, MIN
L = LENGTH OF WATERCOURSE, FT
I = INTENSITY IN INCHES/HOUR
A = AREA IN ACRES
Q = FLOW IN CFS

$I = \frac{189}{T_c + 25}$

$Q = CIA$

$T_c = \text{Log}^{-1}[.3854\,\text{Log}(L) + .1755]$

AREA	L	T_c	I (in/hr)	A (acres)	Q CFS
1	510'	16.6	4.04	1.4	2.54
2	1400'	24.4	3.32	4.2	6.42
3	1420'	24.6	3.81	5.0	7.62
4	1300'	23.8	3.87	4.1	6.34
					22.92 = 22.92 CFS

PROJECT NAME BEAR CANYON ESTATES SHEET 1 OF
PROJECT NO. 72-050 BY DATE 4-11-78
SUBJECT UNDEVELOPED RUNOFF UNIT 2 CH'D DATE

RUNOFF COMPUTATIONS FOR UNDEVELOPED REAR CANYON ESTATES. UNIT 3 (INCLUDING REAR TRACT 1124)

REASONABLE READINGS

AREA 1 29.6(.0572) = 1.7 ACRES

AREA 2 51.6(.0572) = 2.9 ACRES

AREA 3 80.5(.0572) = 4.6 ACRES

9.2

FLOW COMPUTATIONS

AVG. SLOPE = 3.3% = S

GROUND FACTOR (POOR VEGETATION COVER) = 1.8 = B

RUNOFF COEFFICIENT = (0.4) = C

$T_c = \text{Log}^{-1}[.3641(B) + .3854 \log(L) - .197 \log(S) - .3613]$

$T_c = \text{Log}^{-1}[.3854 \log(L) + .192]$

$I = \frac{189}{T_c + 25}$ $Q = CIA$

AREA	L	Tc	I in/hr	A (acres)	Q CFS
1	550'	17.7	4.42	1.7	3.00
2	880'	21.2	4.09	2.9	4.74
3	1120'	23.3	3.91	4.6	7.19
					14.93

TOTAL UNDEVELOPED Q FOR BOTH PARCELS

14.93 + 22.92 = 37.85 CFS

PROJECT NAME REAR CANYON ESTATES SHEET 2 OF

PROJECT NO. 78-020 BY DATE 4-11-78

SUBJECT UNDEVELOPED RUNOFF UNIT 3 CH'D DATE

DEVELOPED AREA RUNOFF FACTOR COMPUTATIONS

1) BACK YARD PONDING ON ALL UNITS (BONE CANYON ESTATES - UNIT 2)

TYPICAL LOT SIZE = 8847 SQ FT (67X132)

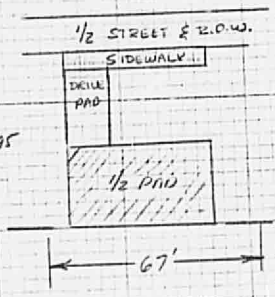
SIDEWALK = 4' WIDE DRIVE PAD = 20'X18' = 360 ft²

PAD AREA = 2500 ft sq.

TOTAL OF HARDENED SURFACES

SIDEWALK = 4'X67' = 268 SQ. FT.
DRIVE PADS = 360 SQ. FT.
½ PAD = 1250 SQ. FT
½ STREET = 16.28X67 = 1110 SQ FT

} TOTAL = 2988 SQ FT



RUNOFF COEFFICIENT "C" = 0.95 FOR HARDENED SURFACE

GROUND FACTOR "B" = 0.77

SLOPE = 3.7%

WATERCOURSE = 1820 FT.

TIME OF CONCENTRATION "Tc"

= LOG⁻¹ [.2641 (B) + .3854 LOG (L) - .197 LOG (S) - .3613]

= LOG⁻¹ [.2641 (.77) + .3854 LOG (1820) - .197 LOG (3.7) - .3613]

= LOG⁻¹ (1.0587) = 11.44 MIN

INTENSITY "I"

$\frac{189}{11.44 + 25}$ = 5.18 in/hr

AREA "A"

$\frac{59 \text{ UNITS} \times 2988 \text{ SQ FT}}{43560}$ HARDENED AREA = 4.04 ACRES

DEVELOPED "Q"

Q = C I A

= 0.95 (5.18) (4.04)

= 19.88 CFS

PROJECT NAME BONE CANYON ESTATES SHEET 3 OF
PROJECT NO. 18-050 BY JLC DATE 4-11-78
SUBJECT DEVELOPED RUNOFF - UNIT 2 CH'D DATE

DEVELOPED RUNOFF FOR UNIT 3

HARDENED SURFACE AREAS, LOT DIMENSIONS, 'C' & 'B' ARE SAME
BACK YARD PONDING ON ALL LOTS

SLOPE = 2.3% WATERCOURSE = "MED"

$T_c = 206^{-1}[.3641(.77) + .3854 \log(1430) - .197 \log(3.3) - .3613]$
$= 206^{-1}(1.0267) = 10.63$ min

$I = \frac{1.91}{10.63^{.125}} = 5.30$ in/hr

$A = \frac{34 \text{ LOTS} \times 2763 \text{ SQ.FT HARDENED AREA}}{43,560} = 2.3$

DEVELOPED "Q"

$Q = CIA$
$= .95(5.30)(2.3)$
$= 11.58$ CFS

TOTAL DEVELOPED Q = Q UNIT 2 + Q UNIT 3
= 19.88 + 11.58
= 31.46 CFS

TOTAL UNDEVELOPED Q = 37.85 CFS

RUNOFF ONTO SPAIN RD. FROM LOTS FACING SPAIN = UNIT 2

$\frac{11 \text{ LOTS} \times 2988 \text{ SQ.FT}}{43,560} = .75$ ACRES

C = 0.95
I = 5.4

FOR UNIT 3

$\frac{8 \text{ LOTS} \times 2988 \text{ SQ.FT}}{43,560} = .55$ ACRES

UNIT 2 = Q = 0.95(5.4)(.75) = 3.84 CFS = TO TRIBUTARY
UNIT 3 = Q = 0.95(5.4)(.55) = 2.82 CFS = TO MOON STREET

PROJECT NAME BEAR CANYON MESA SHEET 4 OF
PROJECT NO. 78-050 BY [illegible] DATE 2/11/78
SUBJECT DEVELOPED RUNOFF COMP CH'D DATE

RUNOFF CARRIED BY TRIBUTARY

FROM VILLA DEL REY DRAINAGE REPORT, NOVEMBER 1977

1) Q INTO 2-6'x4' CBC FROM UPLAND BASIN
= 310 CFS

2) Q INTO CBC FROM PROPERTY BETWEEN UPLAND TRIBUTARY AND SPAIN RD, PLUS SPAIN RD
= 40 CFS

3) Q INTO TRIBUTARY FROM BEAR CANYON ESTATES
= 19.88 CFS

4) TOTAL Q = 369.88 CFS

Q = 350 CFS USED FOR DESIGN OF TRIBUTARY CHANNEL

FOR RUNOFF OF 16.04 Q GENERATED WITHIN UNIT TWO
USE 2 DOUBLE C INLETS (WILL DRAIN 20 CFS)

FL IN CHANNEL = 9.70
TOP OF CURB EL 10.77 INVERT AT INLET = 7.44
PIPE LENGTH = 137 FT.

SET PIPE AT 2 % GRADE - USE 21" RCP (WILL CARRY 22 CFS)

PROJECT NAME BEAR CANYON ESTATES SHEET 5 OF
PROJECT NO. 22-050 BY JJP DATE 4-11-77
SUBJECT BEAR TRIBUTARY CHANNEL DESIGN CH'D DATE

BEAR ARROYO TRIBUTARY (SEAM NO. 13 BEAR CANYON ARROYO)

EXISTING 75' R.O.W.
2-6'x7' CBC BEING CONSTRUCTED FOR UPSTREAM FLOW OF 250 CFS.
ADDITIONAL FLOW = 19.88 CFS FROM UNIT 2 BEAR CANYON ESTATES.
SLOPE CONSTRAINTS SET BY ELEVATION OF ARROYO AT CBC AND FLOWLINE OF BEAR CANYON ARROYO.

(MANNING SOLUTION)

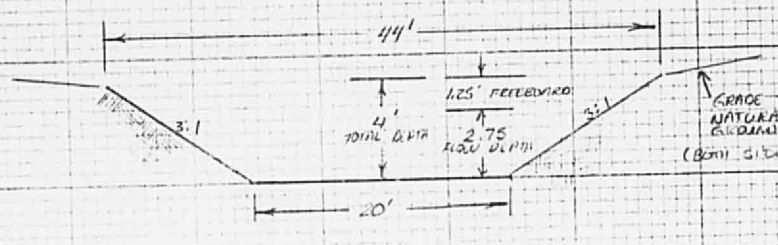
S = 4%
20' = BOTTOM WIDTH OF CHANNEL
SIDE SLOPES = 3:1
Q = 380 CFS
A = 37.91 FT²
D = 1.54 FT
Velocity = 10 fps
Fr # = 1.55
TW = 29.24

WITH DROP STRUCTURES @ 2' DROP & .5% SLOPE BETWEEN WALLS AFTER DROPS
Q = 380 SIDE SLOPES = 3:1
A = 77.69 TOP WIDTH = 36.50
D = 2.75 VELOCITY = 4.89
Fr = 0.59 TOP WIDTH = 36.50

8 DROP STRUCTURES @ 57.14' SPACING.

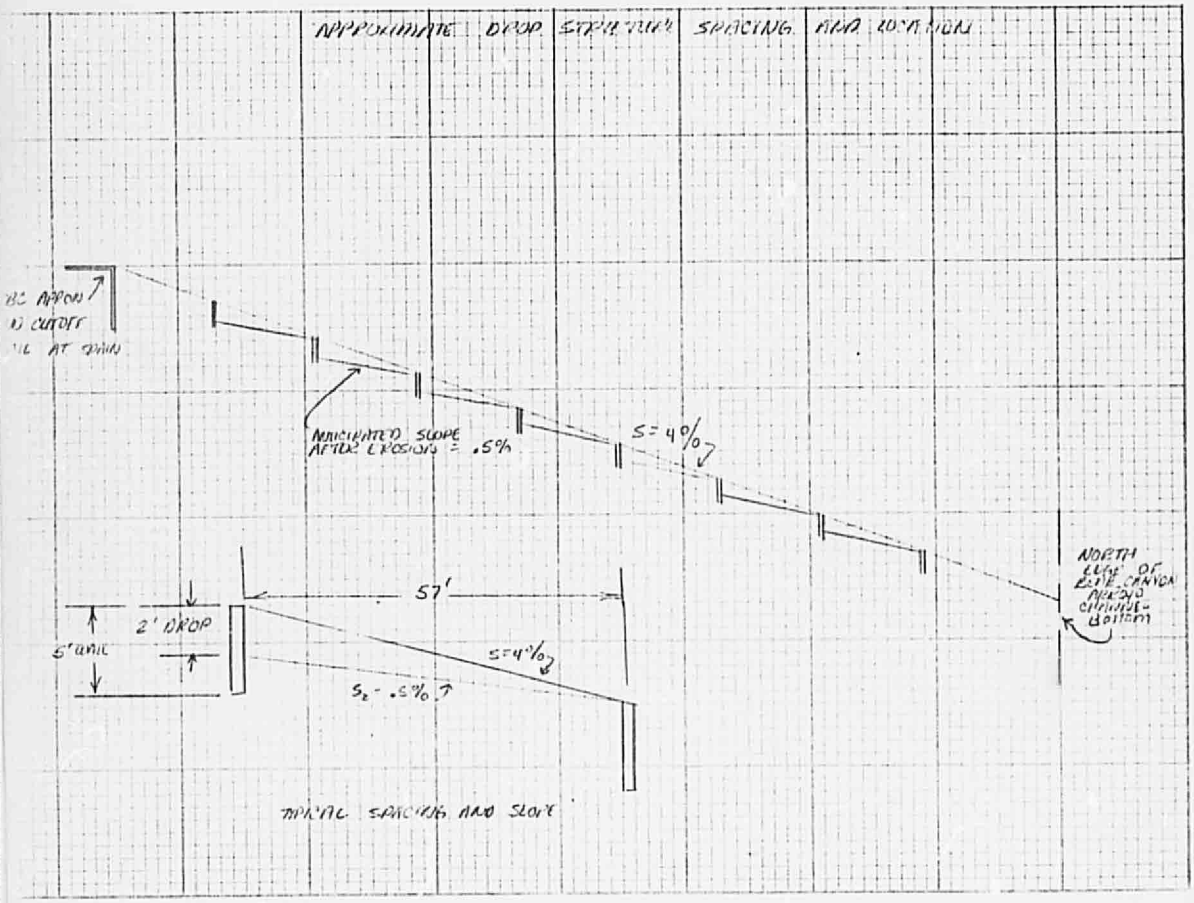
FOR CHANNEL DESIGN USE 20' BOTTOM 3:1 SIDE SLOPES D = 4'
Q = 380 TOP WIDTH = 44'

HORIZ SCALE 1" = 10'
VERTICAL SCALE 1" = 5'



PROJECT NAME BEAR CANYON ESTATES SHEET 6 OF
PROJECT NO. 73-250 BY DATE 4-11-77
SUBJECT BEAR TRIBUTARY CHANNEL DESIGN CH'D DATE

APPROXIMATE DROP STRUCTURE SPACING AND LOCATION

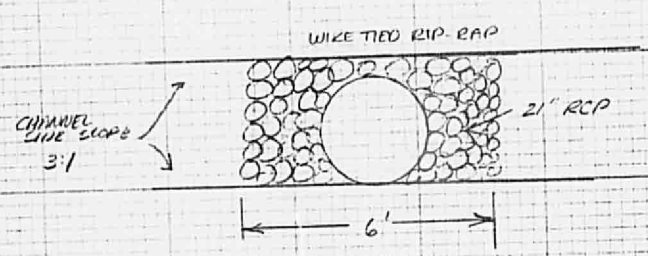


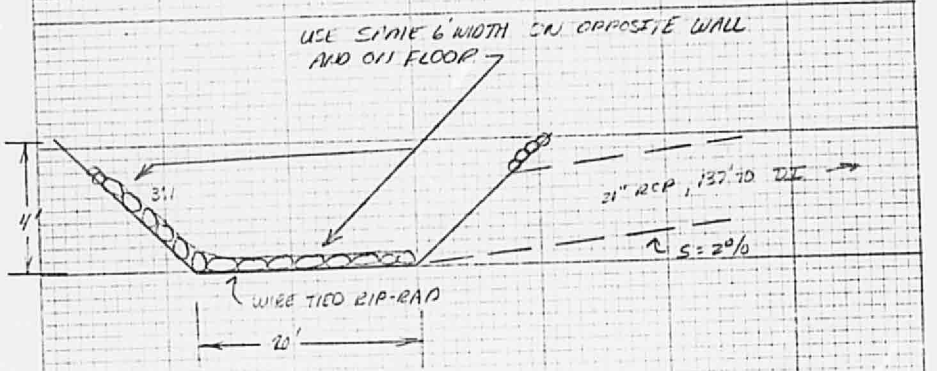
APRON SPACING AND SLOPE

PROJECT NAME BEAR CANYON ESTATES
PROJECT NO. 78-050
SUBJECT BEAR INTERMITTENT CHANNEL DESIGN
SHEET 7 OF
BY
DATE 4-11-79
CH'D
DATE

21" RCP OUTLET INTO TRIBUTARY

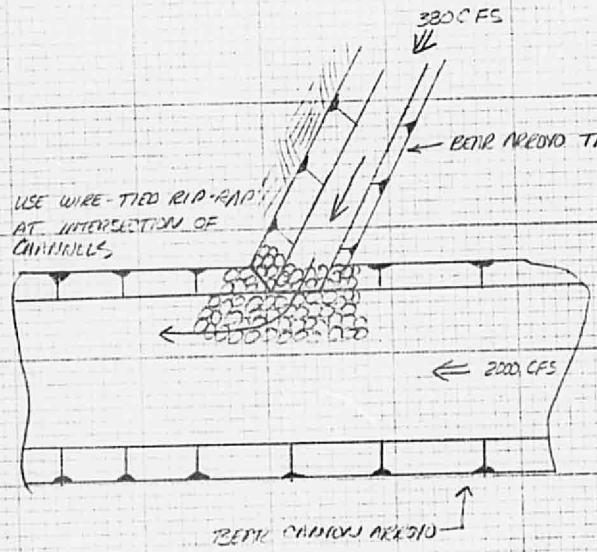
USE WIRE TIED RIP-RAP TO REDUCE EROSION FROM FLOWS EXITING 21" RCP



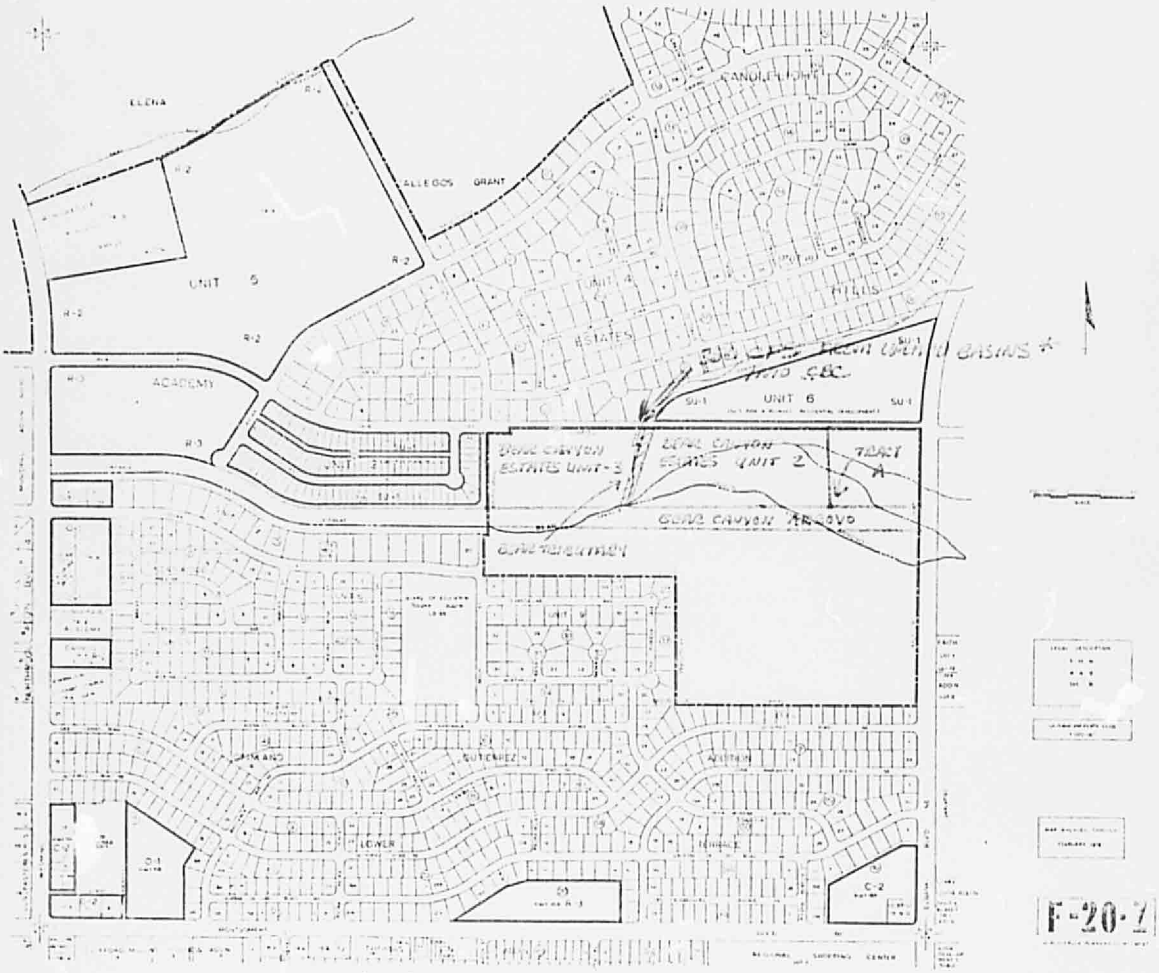


PROJECT NAME SUNE WAGON LOTTING
PROJECT NO. 75-050
SUBJECT RCP OUTLET INTO TRIBUTARY
SHEET 8 OF
BY JJS DATE 4/11/78
CH'D DATE

INTERSECTION OF BEAR CANYON ARROYO
AND BEAR TRIBUTARY



PROJECT NAME Bear Canyon Estate
PROJECT NO. 73-050
SUBJECT Channel Intersection
SHEET 9 OF
BY DATE 4-11-77
CH'D DATE



* REFERENCE : VILLA TRACT DRAINAGE REPORT TTT DRAWN FOR A.A. MARCH 16 1973.

PLATE I
UPLAND DRAINAGE

BOHANNAN WESTMAN HUSTON & ASSOCIATES, INC.