HYDROLOGY H11/D8 3 PLANS

H11/D8

3 PLANS

HYDROFILE:
EL RANCHO ATRISCO III

G11-D7a

H-PH

BOHANNAN-HUSTON INC.

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

September 21, 1981

Mr. Greg Chappell
Federal Emergency
Management Agency
Premier Building
1725 "I" Street, N.W.
Washington, DC 20472

Dear Mr. Chappell:

This letter, requested by Dr. Gene Zelzel, FEMA, is a follow-up of the September 9, 1981, letter to you concerning the flood potential of a 160-acre parcel of land located west of Albuquerque that is now protected by the Ladera Diversion Channel.

The revised map shows areas that could be flooded by the 500-Year Flood and are designated Zone B.

If there are any questions concerning the flood potential of this parcel of land, please call.

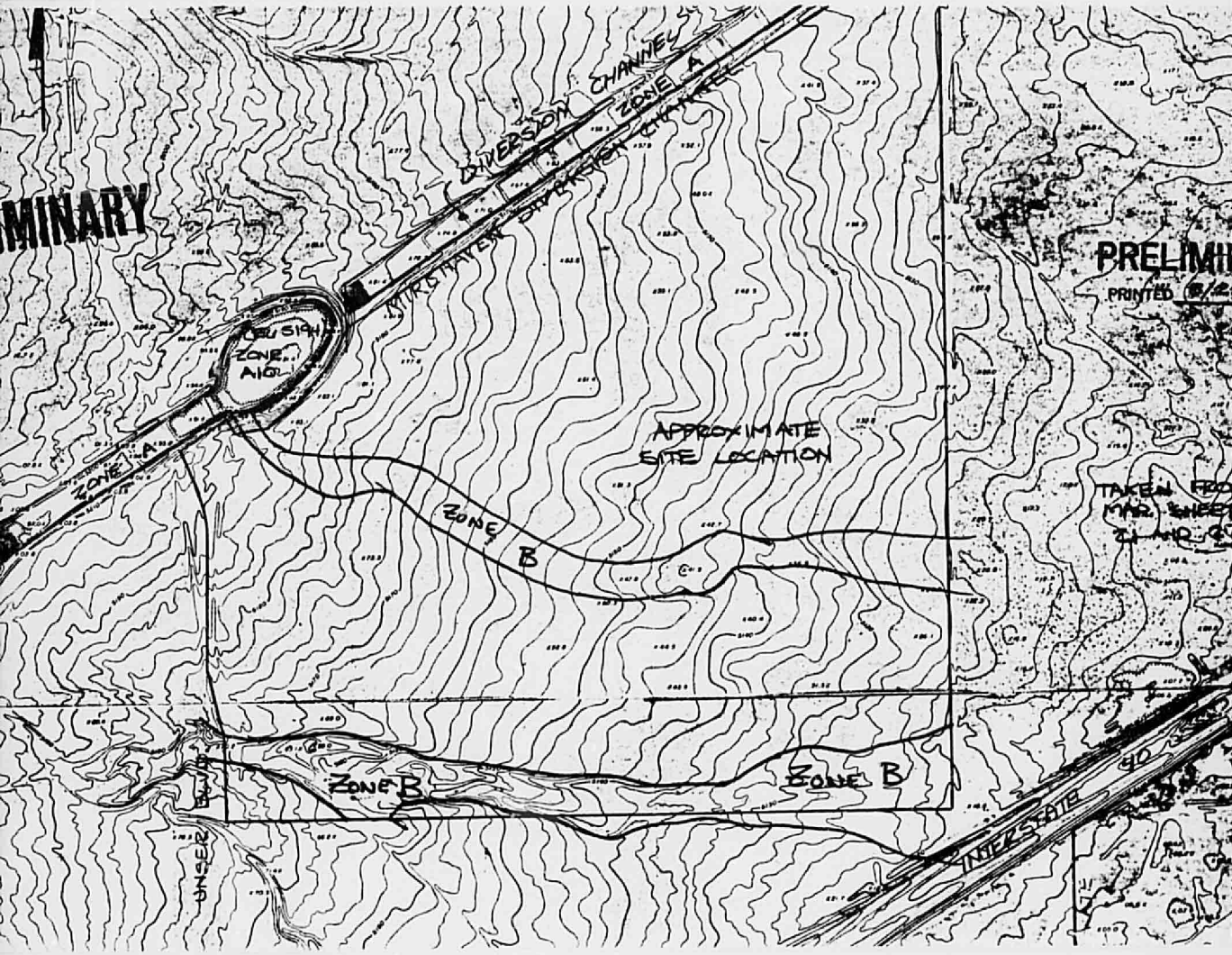
Sincerely,

Patrick L. Stiehr, P.E.
Project Manager

cc: Mr. Skip Buchanan
✓Mr. Charles Easterling
Ms. Diane Leatherwood

PLS/dlh
Job No. 1 920 5

RECEIVED
SEP 23 1981
CITY ENGINEER


MINARY
DIVERSION CHANNEL
ZONE A
DIVERSION CHANNEL
ZONE A
ZONE A
APPROXIMATE
SITE LOCATION
ZONE B
ZONE B
ZONE B
INTERSTATE
40
PRELIMI
PRINTED

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

September 8, 1980

G11-D7b

Mr. Dean Owens
Chief of Construction Evaluation
Veterans Administration
500 Gold S.W.
Albuquerque, N.M. 87102

Re: El Rancho Atrisco, Unit 4

Dear Mr. Owens:

A representative from Candlelight Homes, Inc. has requested information regarding the flood hazard designation in the referenced subdivision. The flood hazard boundary maps prepared for the City still show this subdivision to be located in the County and do not provide specific flooding information. Never-the-less I understand that the County maps do not reflect the consequences of the improvements built by AMAFCA with the construction of the Ladera Detention Area. It is my opinion that said improvements have removed any flooding potential and I have forwarded to Michael Baker, Jr. and Assoc., consultants for the FIA, the construction plans for the improvements. This information which was forwarded to the above consultants within the last six weeks should allow the official removal of the subdivision from the flood hazard designation.

Very truly yours,

Bruno Conegliano
Assistant City Engineer/Hydrology

BC/fs

cc - Candlelight Homes, Inc., 1224 Pennsylvania NE 87110

T. T. Burnett Engineering, Inc.
Consulting Engineers
120 MORNINGSIDE N. E.
ALBUQUERQUE, NEW MEXICO 87108

TELEPHONE
(505) 255-7545

February 21, 1980

G11-D7a

RECEIVED
FEB 27 1980
CITY ENGINEER

Mr. Bruno Conegliano
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87123

Re: El Rancho Atrisco Tract 3

Dear Mr. Conegliano:

This is a request for a flood Hazard Boundary review of Tract 3, El Rancho Atrisco comprised of Units 1, 3, 4, 5 and 6. Map No. 27 (revised 9/6/77) shows areas in Tract 3 in the flood Hazard Boundary. Since the Ladera Golf Course and the dike are constructed and detaining the runoff, this tract should not be in the flood Hazard Area.

Please inform me of any information maps or reports that I can supply you with to expedite this. Your attention to this matter is appreciated.

Thank you,

Andre Houle

Andre Houle for
T. T. Burnett Engineering, Inc.

cc: Rick Squires, Western Development Co.
Steve Hacker Western Development Co.

WESTERN DEVELOPMENT COMPANY

April 20, 1979

Bruno Conegliano
City Engineer
City of Albuquerque
P.O. Box 1293
Albuquerque NM 87103

RECEIVED
APR 2 0 1979
CITY ENGINEERS

RE: El Rancho Atrisco Unit 4

Dear Mr. Conegliano:

For your records, please find the enclosed copy of the approved Landscaping and Development Plan for El Rancho Atrisco, Unit 4.

If I can be of further assistance, please contact me.

Thank you.

Sincerely,

WESTERN DEVELOPMENT COMPANY

Rick Squires

Rick Squires

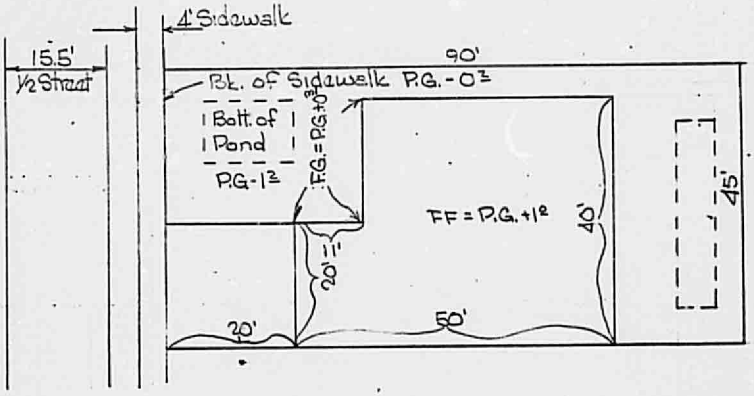
RS/cf
enclosure

619 truman, n.e. albuquerque, new mexico 87110 phone (505) 268-4395

EL RANCHO ATRISCO
TRACT 3 ~ UNITS 4&5

JJB 2/79

TYPICAL LOT



RUNOFF SOURCE

Front Yard Pond

		Area #	Runoff Coeff	Equiv. Area #
½ Street	(45)(15.5)	698	0.95	663
Sidewalk	(45)(4)	180	0.95	171
Driveway	(20)(20)	400	0.95	380
Pond	(22)(26)	572	1.00	572
Yard		203	0.20	41
				1,827

Runoff Volume Front Yard Pond

Vol. = 1827 (Rainfall/12) = 152 × Rainfall

Rear Yard Pond

Roof		1780 #	0.95	1691 #
Sideyard	(5)(59)	295	0.20	59
Pond	(20)(40)	800	1.00	800
				2,550

Runoff Volume Rear Yard Pond

Vol. = 2550 (Rainfall/12) = 213 × Rainfall

INFILTRATION RATE

t = 0 – 30 min ~ 3 in/hr, t = 30 min - 60 min ~ 2 in/hr, 1 in/hr thereafter

EL RANCHO ATRISCO

TRACT 3 ~ UNITS 4&5

POND REQUIREMENT

FRONT YARD

Storm Duration	Rainfall	Runoff Volume	Ave Pond Surface		Increm. Infiltration	Accum. Infiltration	Storage Volume
min	in	ft^3	ft^2		ft^3	ft^3	ft^3
10	0.86	131	138 354	227	9	9	122
20	1.27	193	411	382	16	25	168
30	1.50	228	431	421	17	42	186
35	1.59	242	439	435	6	48	194
45	1.75	266	452	446	12	60	206
55	1.86	283	456	454	13	73	210
60	1.90	289	456	456	6	79	210

Surface Area = $100 + 472d$, Volume = $100d + 236d^2$

REAR YARD

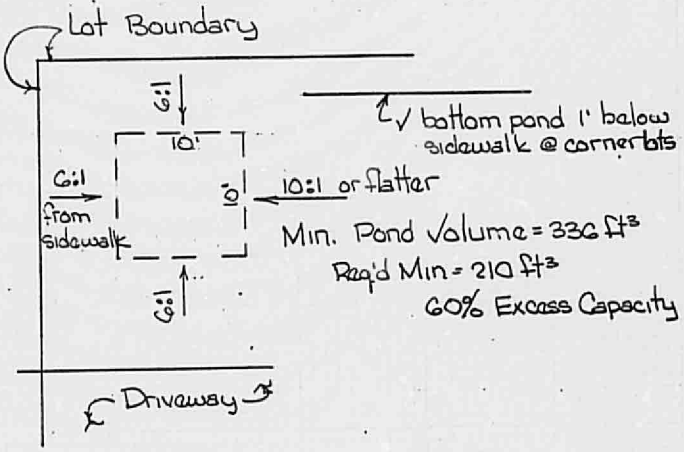
Surface Area = $175 + 600d$, Volume = $175d + 300d^2$

Storm Duration	Rainfall	Runoff Volume	Ave. Pond Surface		Increm. Infiltration	Accum. Infiltration	Storage Volume
min	in	ft^3	ft^2		ft^3	ft^3	ft^3
10	0.86	188	175 489	332	14	14	174
20	1.27	278	567	528	22	36	242
30	1.50	329	594	581	24	60	269
35	1.59	348	606	600	8	68	280
45	1.75	383	623	615	17	85	298
50	1.81	396	627	625	9	94	302
55	1.86	407	629	628	9	103	304
60	1.90	416	629	629	9	112	304

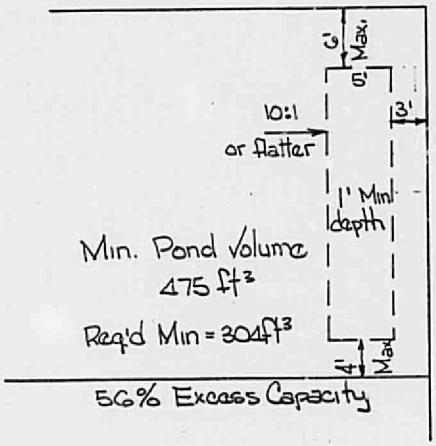
EL RANCHO ATRISCO
TRACT 3 ~ UNITS 4&5

POND DIMENSIONS

FRONT YARD



REAR YARD



DRAINAGE REPORT

FOR

EL RANCHO ATRISCO, TRACT 3

NOVEMBER, 1977

DRAINAGE REPORT

FOR

EL RANCHO ATRISCO, TRACT 3

NOVEMBER, 1977

Prepared By:

T.T. Burnett Engineering, Inc.
120 Morningside Dr. NE
Albuquerque, New Mexico 87108

Prepared For:

Western Development Co.
9821 Lona Lane NE
Albuquerque, New Mexico 87111

PROFESSIONAL ENGINEER
JEAN J. BORDENAVE

Jean J. Bordenave, N.M.P.E. & L.S. # 5510

TABLE OF CONTENTS

	PAGE
PURPOSE	1
LOCATION AND TERRAIN	1
PROPOSED DEVELOPMENT	2
UPLAND DRAINAGE	2
INTERNAL DRAINAGE RECOMMENDATIONS	2
CONCLUSIONS	3

APPENDIX A

INTENSITY DURATION CURVE DEVELOPMENT

METHODS AND EQUATIONS USED

APPENDIX B

INTERNAL DRAINAGE COMPUTATIONS

PLATES

I LOCATION MAP

II-A SOILS REPORT INFORMATION
II-B

III INFILTRATION INFORMATION,

ASCE Manual of Engineering Practice No. 28 " Hydrology Handbook"

IV EL RANCHO ATRISCO MASTER PLAN

DRAINAGE REPORT

FOR

EL RANCHO ATRISCO, TRACT 3

PURPOSE

This report is prepared for presentation to governing agencies and the developer of the described tract as a guide in preparation of drainage facilities and grading plans for the proposed development. Implementation of the recommendations of this report will provide stormwater runoff protection for the proposed development as well as downstream developments for the 100 year frequency storm.

LOCATION AND TERRAIN

The tract is located approximately 1/4 mile west of Coors Road and is bounded on the north by Redlands Road, on the south by Ouray Road and on the west by the proposed Ladera Drive and City of Albuquerque Golf Course and Stormwater Detention Pond (see Plate I for exact location).

The bulk of the tract is quite flat with grades of less than 1/2 percent. A strip along the east boundary of the tract, approximately 400 feet in width, slopes easterly at a grade of 2 percent. Vegetation is relatively dense and composed primarily of prairie grasses. Soils are silty sands and have a high infiltration rate upon breaking of the soil surface (see Plates II-A, II-B & III)

PROPOSED DEVELOPMENT

The area will be developed as an RD subdivision and a density of approximately 4.4 dwelling units per acre is anticipated. Lots will vary in width from 50 feet to 70 feet and in depth from 100 feet to 120 feet. Dwellings will vary from 1,300 to 1,700 square feet in total area.

UPLAND DRAINAGE

Drainage from upland areas is quite effectively eliminated by an existing, and permanent dike along the west boundary of the property. The dike was constructed for the stormwater detention area within the City of Albuquerque Golf Course and is approximately 2 feet higher than the surrounding area.

INTERNAL DRAINAGE RECOMMENDATIONS

Due to the ideal terrain conditions of the tract and lack of downstream drainage facilities all 100 year frequency stormwater shall be infiltrated within the proposed develop development.

Sheet 1 of the computations indicates size and location of proposed ponds within each lot. Grading plans shall be explicit as to location and size of all ponds.

An infiltration rate of 3 inches per hour is used in street side and rear lot ponds and four inches per hour is used in the front yard pond. The rate of 4 inches per hour will require planting within the pond area of a fairly dense ground cover. The higher infiltration rate is used in the front yard as it is more likley this area will be well maintained. Street side ponds are to be constructed not so much for retention value as for detention and settling of street waste prior to entering planted front yard ponds.

INTERNAL DRAINAGE RECOMMENDATIONS (cont.)

The following items shall be implemented to assure the desired results with respect to stormwater runoff will be attained.

1. Streets shall be constructed without curbs, thereby allowing water to freely enter street side ponds, and shall have a maximum grade of 0.67%.
2. Dikes shall be constructed along all front yard side lot lines as far as the street gutter to prevent flow parallel to the street.
3. Sidewalks shall be constructed with dip sections such that street side ponds will overflow to front yard ponds prior to reaching the level of the street surface.
4. Front yard ponds shall be planted and shall be provided with an overflow to the rear yard pond through a side yard swale.
5. Redlands Road, Ouray Road and Ladera Drive shall not be allowed to drain into the proposed development.

CONCLUSIONS

Ponds are sized and overflows are provided such that there will be progressive flow and ponding from the street to the rear yard. This method has been used with progressively oversized ponds to assure a zero discharge from the subdivision for the 100 year frequency storm in the event either the stormwater flows have underestimated or the infiltration rates have been overestimated.

Downstream flows, as a result of the proposed development, and resulting problems will be eliminated.

APPENDIX A

INTENSITY DURATION CURVE DEVELOPMENT

METHODS AND EQUQTIONS USED

El Rancho Atrisco

100YR. PID CURVE

from NOAA Atlas 2
Volume IV New Mexico

Duration	min, hr	5	10	15	30	1	2	3	6	12	24
Rainfall	in.	0.55	0.86	1.08	1.50	1.90	2.00	2.07	2.2	2.4	2.6
Intensity	in/hr	6.6	5.2	4.3	3.0	1.9	1.0	0.7	0.4	0.2	0.1

1 hour rainfall = $0.494 + 0.755\,(2.2)^2/2.6$

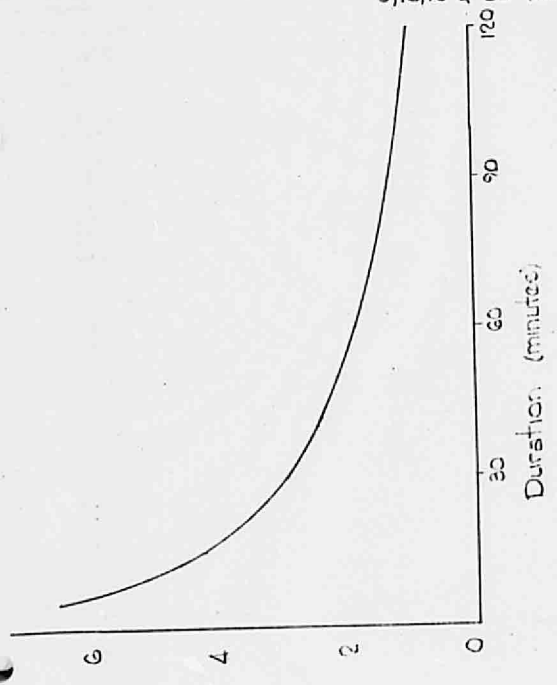
Region 2

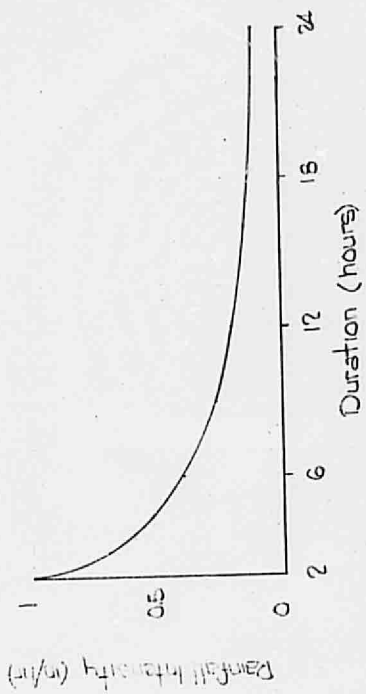
2 hr = $(.341)(2.2) + (.659)(1.9)$

3 hr = $(.569)(2.2) + (.431)(1.9)$

12 hr = from plot fig 16, p.16 NOAA Atlas 2

5, 10, 15 & 30 min. values from table 12, p.16 NOAA Atla





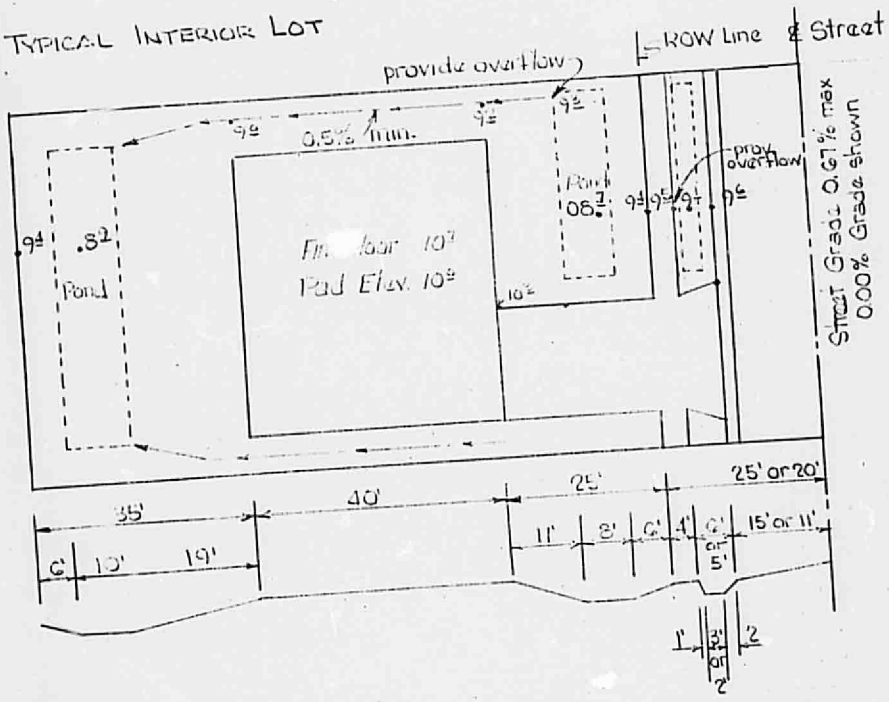
APPENDIX B

INTERNAL DRAINAGE COMPUTATIONS

Sheet 1

LL RANCH ATRISCO
TRACT 3

TYPICAL INTERIOR LOT



EL RANCHO ATHISCO
TRACT 3 - STREET SIDE POND
40' R.O.W.

STREET SIDE POND (use infiltration rate of 3 in/hr)

Runoff Source

		Area S.F.	C
Street	- 11' × 60'	660	0.95
Driveway	- 5' × 18'	90	0.95
Pond	- 5' × 42'	210	1.00
		960	

Runoff Volume - $[(660+90)(.95)+210]/12 = .77 \times$ rainfall

Storm Duration	Rainfall	Runoff Volume	Ave. Pond Surface		Increm. Infiltration	Accum. Infiltration	Storage Volume
min.	in.	ft^3	ft^2		ft^3	ft^3	ft^3
10	0.86	66	0 175	118	4.92	5	61
20	1.27	98	"	175	7.29	12	86
30	1.50	116	"	"	7.29	20	96
35	1.59	122	"	"	3.65	23	99
40	1.67	129	"	"	"	27	102
45	1.75	135	"	"	"	30	105
50	1.81	139	"	"	"	34	105
55	1.86	143	"	"	"	38	105
60	1.90	146	175	175	3.65	41	105

Pond Volume - $60(d+1.5d^2)$, ft^3; $d = [-1+\sqrt{1+0.1\,vol}]/3.$

Surface Area - $60 + 30d$, ft^2

Pond Storage Capacity - 38 ft^3
Storage Requirements in excess of 38 ft^3 shall be allowed to enter front yard ponds

EL RANCHO ARAISO

TRACT 3 - STREET SIDE POND
50' ROW.

STREET SIDE POND (use infiltration rate of 3in./hr)

Runoff Source		Area, S.F.	C
Street -	15' × 60'	900	0.95
Driveway	6' × 18'	108	0.95
Pond	6' × 42'	252	1.00
		1260	

Runoff volume = $[(900+108)(.95) + 252]/12 = 101 \times$ Rainfall

Storm Duration	Rainfall	Runoff Volume	Ave. Pond Surface	Increm Infiltration	Accum. Infiltration	Storage Volume
min.	in.	ft^3	ft^2	ft^3	ft^3	ft^3
10	0.86	87	0 / 150	0.25	6	81
20	1.27	128	210 / 210	8.75	15	113
30	1.50	152	" "	8.75	24	128
35	1.59	161	" "	4.38	28	133
40	1.67	169	" "	"	33	136
45	1.75	177	" "	"	37	140
50	1.81	183	" "	"	41	142
55	1.86	188	" "	"	46	142
60	1.90	192	210 / 210	4.38	50	142

Pond Volume = $90(d+d^2)$, ft^3 ; $d = [-1 + \sqrt{1+.0444(vol)}]/2$, ft

Surface Area = $90 + 240d$, ft^2

Pond storage capacity = 50 ft^3
Storage requirements in excess of 50 ft^3 shall be allowed to enter front yard ponds.

EL RANCHO ATRISCO

TRACT 3 - FRONT YARD POND

FRONT YARD POND (use infiltration rate of 4 in/hr)

Runoff Source

	Area, S.F.	C
Home - 1700# Roof Area, use half to Front Yard -	850	0.95
Driveway - 18' × 25' Typ	450	0.95
Front Yard - 42' × 25' less pond 30' × 20'	330	0.20
Front Yard Pond - 36' × 20' Typ	720	1.00
Sidewalk - 60' × 4'	240	0.95
	2590	

Runoff Volume

$[(850+450+240)(.95)+(330)(.20)+(720)(1.0)]/12 = 187 \times$ Rainfall + over flow from 50' ROW street side pond.

Storm Duration	Rainfall	Runoff Volume	Ave. Pond Surface	Increm. Infiltration	Accum. Infiltration	Storage Volume
min.	in.	ft^3	ft^2	ft^3	ft^3	ft^2
10	0.86	161+31	240 564 402	22.33	22	170
20	1.27	237+83	562 613	34.06	56	244
30	1.50	281+78	687 674	37.44	94	265
35	1.59	297+83	670 689	19.14	113	267
40	1.67	312+86	689 689	19.14	132	266
45	1.75	327+90	689 689	19.14	151	266
50	1.81	338+92	681 685	19.03	170	260
55	1.86	348+92	670 678	18.83	189	251

Pond Volume = $258d^2+240d$, ft^3 ; $d=[-1+\sqrt{1+0.018V}]/2.15$, ft.

Surface Area = $240+686d$, ft^2

Pond Storage Capacity - 328 cu.ft.

23% excess capacity

Based on pond bottom elev. matching street grade the max. street grade, to maintain 267 ft^3 pond storage capacity, is 0.67%

EL RANCHO ATRISCO
TRACT 3 - REAR YARD POND

REAR YARD POND (use infiltration rate of 3 in/hr)

Runoff Source		Area, S.F.	C
Home - 1700# Roof Area		1700	0.95
Side Yard	15' × 40'	600	0.30
Rear Yard	60' × 75' - 1700 - 600 - pond 22' × 60'	880	0.30
Pond	22' × 60'	1320	1.00
		4500	

Runoff Volume = [(1700)(.95) + (600+880)(.30) + 1320]/12 = 282 × Rainf

Storm Duration	Rainfall	Runoff Volume	Ave. Pond Surface		Increm. Infiltration	Accum. Infiltration	Storage Volume
min.	in.	ft^3	ft^2		ft^3	ft^3	ft^3
10	0.86	243	485 885	685	28.45	28	215
20	1.27	358	985	935	38.88	67	291
30	1.50	423	1007	994	41.42	109	314
35	1.59	448	1011	1009	21.02	130	318
40	1.67	471	1014	1012	21.10	151	320
45	1.75	494	1016	1015	21.15	172	322
50	1.81	510	1010	1013	21.10	193	317

Pond Volume = $1200 d^2 + 480 d$, ft^3; $d = [-1 + \sqrt{1 + 0.021 \text{ Vol}}]/5$, ft.

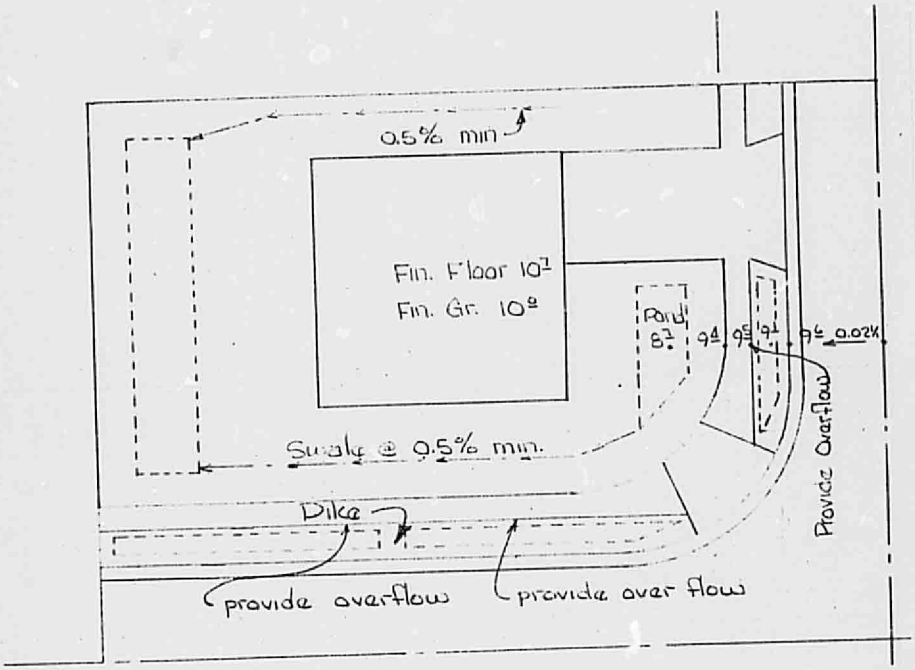
Surface Area = $480 + 1500 d$, ft^2

Pond Storage Capacity - 486 cu.ft.

51% excess capacit

EL RANCHO ATRISCO
TRACT 3

TYPICAL CORNER LOT

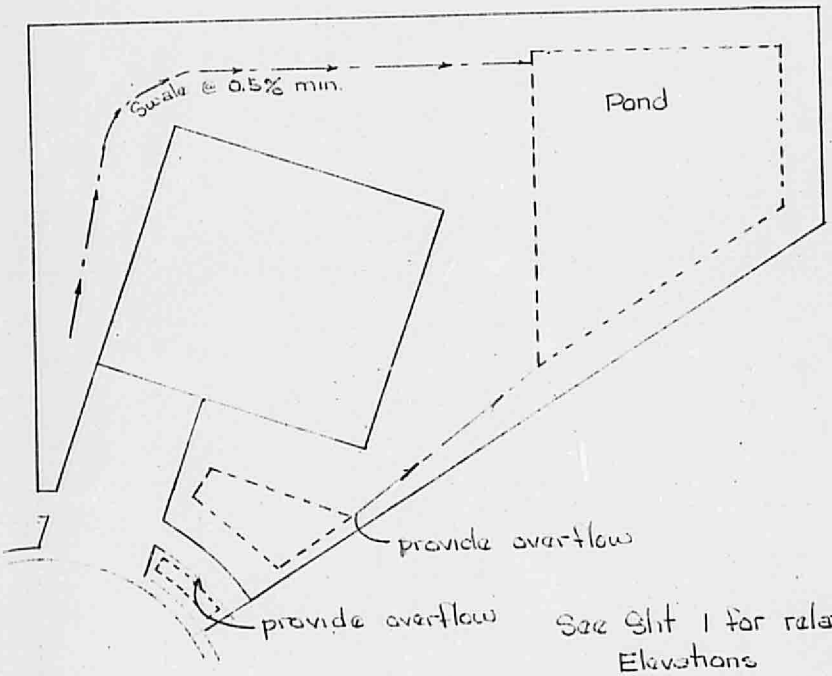


See Sht 1. for section

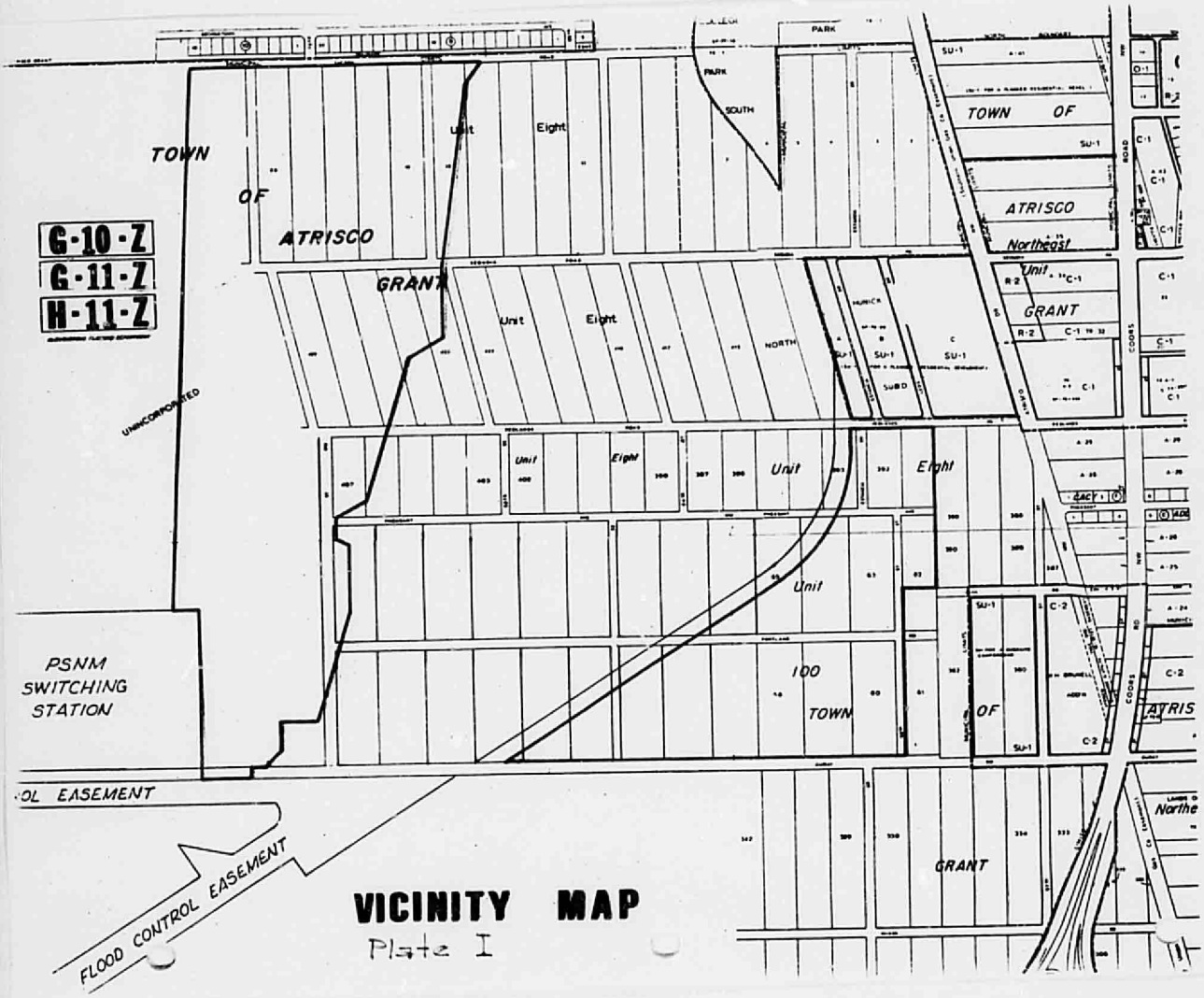
El Rancho Atrisco
Tract 3

Sheet 7

Typical Cul-de-Sac Lot

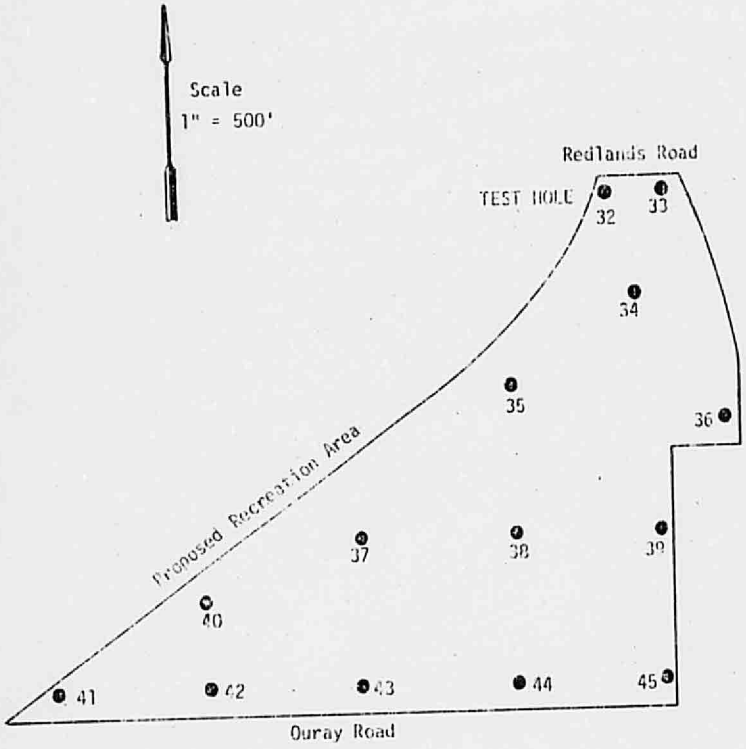


See Sht 1 for relative Elevations



VICINITY MAP

Plate I



TEST HOLE LOCATION PLAN
(61 Acre Tract)

Plate II-A

SUMMARY OF LABORATORY TEST DATA

Sample No.	Depth of Sample (ft)	Natural Dry Density (pcf)	Natural Moisture Content (%)	Atterberg Limits LL	Atterberg Limits PI	Sieve Analysis % Passing No. 4	No. 10	No. 40	No. 200	Soil Description	Remarks
5	8	110	1.9	NV	NP	98	94	72	11	slightly silty SAND	
5	8	103	4.8	23	NP	81	78	66	21	silty SAND	Figure 15
39	8	91	2.0	NV	NP	100	98	83	9	slightly silty SAND	Figure 16
0	2	109	4.0	23	NP	99	98	92	46	very silty SAND	Figure 16
1	1	96	6.1	23	NP	100	100	98	40	very silty SAND	Figure 17
2	6			NV	NP	99	93	64	16	silty SAND	

NOTES
NV indicates no value
NP indicates non-plastic

Plate II-B
(Page 1 of 1)

(*d*) Usual summertime condition (not recently cultivated and at least 1 in. of rain since last cultivation; not excessively trampled or otherwise compacted).

An easily described point on a standard curve for bare soil may be selected as a sort of "characteristic" of that soil. The infiltration capacity for a few broad classes of soil after 1 hour (f_1) of continuous rainfall is given in Table 9, in which, in the interest of simplicity, only the following three classes are mentioned in Table 9.

TABLE 9.—VALUES OF f_1 (INFILTRATION CAPACITY SHOWN BY STANDARD CURVE AT TIME OF 1 HOUR) FOR BARE SOILS

Soil group	Range in f_1 (in. per hr)
High	0.50 to 1.00
Intermediate	0.10 to 0.50
Low	0.01 to 0.10

Sandy Soil.—A soil containing a high proportion of sand particles and a low proportion of fine materials and, consequently, relatively incohesive and structureless. (For purposes of scientific classification, soil physicists define a soil as sandy if its sand content exceeds 80%; sand being defined as particles from 2 mm to 0.05 mm in diameter.)

Clay Soil.—A soil containing a sufficiently high proportion of clay to make it "heavy" and plastic and sticky at high moisture contents. (Under the scheme of classification previously mentioned, a clay soil is one that contains more than 30% clay, clay being defined as particles smaller than 0.002 mm.)

Loam.—In everyday use the term loam has a very general and indefinite meaning, being applied to any soil that contains a sufficient variety of particle sizes and enough organic matter to produce the aggregated structure which gives a soil the quality of being "friable," the characteristic most generally associated with the term loam. (To qualify for classification as a loam by soil physicists, a soil must contain less than 20% clay and a preponderance of silt particles and (or) fine sand, silt being defined as particles from 0.002 mm to 0.05 mm in diameter. However, in scientific classification loams are subdivided into numerous classes.)

The soil characteristics of the groups given in Table 9 are as follows:

High Group.—Embraces many sandy soils but also includes open-structured soils of other textures, particularly the most friable of the silt loams.

The higher values of f_1 in the range indicated are ordinarily associated with relatively loose and porous sandy soils. Some soils that appear quite coarse upon casual inspection actually contain considerable proportions of fine material. When such soils are subjected to the pelting of raindrops the fine particles tend to block the entrances to the larger pores, forming a thin layer that largely controls the rate of infiltration, making it much lower than would be the case were the drops prevented from striking the soil surface by vegetal cover, humus, or mulch.

The lower values are associated with soils characterized by a low clay content, a high organic matter content, a high degree of aggregation, and relatively small amounts of swelling and shrinking with change in moisture content. (Useful indicators: Easy tillage with absence of clod formation over a wide

range of moisture content; little or no tendency for surface crust to form on tilled land after rain; vigorous natural vegetation and good crops when properly managed; and quick disappearance of standing water after rain.)

Intermediate Group.—The higher values of f_1 in the range indicated are associated with soils approaching the "high group" in structural and other characteristics.

The lower values are associated with soils approaching the "low group" in structural and other characteristics.

The central values are associated with the loams typical of the better agricultural regions. These typical loams contain considerable clay and much silt, but are rather highly aggregated and, therefore, friable at ordinary moisture contents. (Useful indicators: Fairly easy tillage and little trouble with clod formation at ordinary moisture contents; clods and surface crusts break down readily; little checking or cracking when dry; fairly sticky when wet; and good crops under proper management.)

Low Group.—Embraces most clays and clay loams, but also includes soils of other texture that are dense in structure.

The higher values of f_1 in the range indicated are ordinarily associated with the heavy loams. Such loams are characterized by a high clay content, a low degree of aggregation (dense structure), and excessive swelling and shrinking with change in moisture content. (Useful indicators: Cracking of the surface during dry periods—soils that check and crack during dry periods almost always have low infiltration capacities when wet, but it must be kept in mind that, when these soils are extensively and deeply cracked, the initial rainfall during a storm will be infiltrated at a high rate; as soon as the soil becomes wetted, and the cracks are closed by the resultant swelling, the infiltration capacity will decrease rapidly to the low rates associated with these heavy soils; a very narrow range of moisture content in which tillage is possbile without excessive formation of long lasting clods; extreme stickiness when wet; a strong tendency for tilled land to crust after rain; usually inferior natural vegetation; and slow disappearance of standing water after rains.)

TABLE 10.—COVER FACTORS

Cover[a]		Range in value of cover factor[b]
Type	Condition	
Permanent (forest and grass)	Good	3.0 to 7.5
	Medium	2.0 to 3.0
	Poor	1.2 to 1.4
Close growing crops	Good	2.5 to 3.0
	Medium	1.6 to 2.0
	Poor	1.1 to 1.3
Row crop	Good	1.3 to 1.5
	Medium	1.1 to 1.3
	Poor	1.0 to 1.1

[a] The covers referred to are described in the text. [b] This factor is the ratio of f_1 for given soil with cover to f_1 for same soil without cover.

The lower values are usually associated with the clay soils. These soils are stickier and denser than the heavy loams previously described and are highly plastic when wet.

The profound influence of cover upon the infiltration capacity of a soil is shown by the factors in Table 10, which give the general magnitude of this