HYDROLOGY E21/D1 FIVE PLANS

E21/D1

5 Plans

CHAMBERS • CAMPBELL • ISAACSON • CHAPLIN, INC.
3600 INDIAN SCHOOL RD., N.E. / ALBUQUERQUE, NEW MEXICO 87106 / PHONE (505) 266-5521

January 20, 1976

Mr. Kleston Laws
City Engineer's Office
P.O. Box 1293
Albuquerque, New Mexico 87103

RECEIVED
JAN 2[illegible] 1976
CITY ENGINEERS

RE: Drainage Report for
Academy Hills

Dear Mr. Laws:

Pursuant to our conversation of January 19th, attached herewith please find one copy of the drainage report for the Academy Hills properties of Home Planning Development Company, Inc. Please review this material at your leisure and advise us regarding its acceptability. You will recall that we are trying to strike a compromise with the requests of both Mr. Roberts and the Parks Department by installing one 500 square foot infiltration pad for the Bear Canyon Tributary at Eubank Blvd.

Thank you for your cooperation. Please contact us if you have any questions.

Sincerely yours,

Kent Whitman

Kent Whitman, for
CHAMBERS, CAMPBELL,
ISAACSON & CHAPLIN, INC.

KW/pld

Enclosure

cc: Mr. John Mendius
Mr. Dick Boch

IMPORTANT MESSAGE

FOR Mr. Kimmitt

DATE 3/23/76 TIME 9:10 A.M. P.M.

WHILE YOU WERE AWAY

M/. Ron Chaplain

OF

PHONE NO. 266-5521

TELEPHONED		RET'D YOUR CALL	
PLEASE CALL		URGENT	
WILL CALL AGAIN		WANTS TO SEE YOU	

MESSAGE

SIGNED

2-24-76

Refused to approve

Academy Hills Units

II & III

Oct. 75 Plat (MAR. 2 mtg)

Law: write memo turning down.

paving Adm. Emerson St.

paving. Concordia 20/L.F.

postponed 60 days.

$46,000 city share.

Kles: AA

Ron Chaplin 3-23-76

Academy Hills Units 2-3

Turner

Yes - see me

Concordia near Academy

Cost sharing by city.

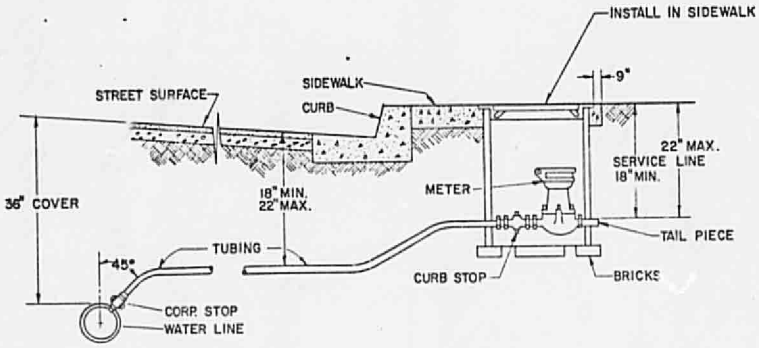
Adm. Emerson

Law wrote memo

Committees says it has been solved.

APS will pay their share.

$46,000 City Share



NOTE:
THE WATER METER SHALL BE POSITIONED IN THE METER BOX IN SUCH A MANNER THAT ACCESS IS PROVIDED TO THE CURB STOP AND TAIL PIECE FOR REMOVAL OF THE WATER METER. THE METER BOX SHALL BE SUPPORTED BY AT LEAST FOUR BRICKS.

CITY OF ALBUQUERQUE
WATER
METER INSTALLATION
PAGE

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE May 13, 1976 REF. NO._____

TO: K. H. Laws, Asst. City Engineer-Hydrology

FROM: Edwin L. Beck, Director, Traffic & Transportation Dept. EB

SUBJECT: Academy Hills, Units II & III

The Subdivision of Academy Hills, Units II & III has been resubmitted and the cost for the paving has been reduced from $60,000 to $18,000. This funding is available from the current bond funds, therefore, I have no objections to the signing off of the plat.

RECEIVED
MAY 17 1976
CITY ENGINEERS

ELB:ed

cc: E.F. Hensch
V.M. Kimmick
B. Otto
B. Lowe

CITY OF ALBUQUERQUE, N. M.
PUBLIC WORKS DEPARTMENT
LIQUID WASTE DIVISION

RECEIVED
JUN 09 1976
CITY ENGINEERS

MEMORANDUM - June 8, 1976

TO - K. H. Laws, Assistant City Engineer - Hydrology

FROM - Robert P. Lowe, Liquid Waste Engineer RPL

SUBJECT - SEWERS FOR ACADEMY HILLS, UNITS II&3III

The Liquid Waste Division has reviewed the problems involved in providing the City's share of pro rata for sewers in the above Academy Hills units, that is due to the extensive park and drainage areas abutting streets. It is our understanding that some revision has been made on this subdivision's plats to reduce the amount of City pro rata.

As park and drainage abuttments are on only one side of the street, the sanitary sewer bond fund policy lines can take care of the situation. Therefore, we have no objections.

RPL/hk

cc: E. F. Hensch
V. M. Kimmick

CHAMBERS • CAMPBELL • ISAACSON • CHAPLIN, INC.
3500 INDIAN SCHOOL RD., N.E. / ALBUQUERQUE, NEW MEXICO 87106 / PHONE (505) 266-5521

July 14, 1976

RECEIVED
JUL 1 9 1976
CITY ENGINEERS

Mr. Kleston Laws
Hydrology Engineer
City of Albuquerque
Box 1293
Albuquerque, NM 87103

REFERENCE: Acadmey Hills Drainage Report

Dear Mr. Laws:

In response to your itemized letter of June 15, and pursuant to our conversation of July 6, I am resubmitting the subject Drainage Report for approval based on the following clarifications and revisions:

1) Mr. Mann of Scanlon and Associates, informs me that the general drainage pattern in the Juan Tabo, Eubank, Layton area does conform to his street plans. Scanlon has requested a 50' wide easement at the tip of what I show as Area 4-1 for a drainage structure. Mr. Bock of Home Planning, has verbally agreed to grant the easement, and Scanlon is preparing a legal on it.

2) The alignment of Bear Canyon Tributary at Layton centers on the Layton Avenue dip section as shown in the Academy Hills, Unit 1 Plans and centers at Eubank on the proposed easement shown in the Annexation Plat entitled "Academy Place Subdivision, Unit 5".

3) We will either show that the natural arroyos will handle offsite flows until Eubank Boulevard is constructed, or show appropriate diversion berms to divert flows into the Tributary in our construction drawings.

4) We will do some preliminary investigation into the feasibility of a dip section at Point V when we lay out the preliminary street profile along Academy Road. Our clients realize, as we do, that detailed drainage reports will be needed for Areas 1 and 2 before development can take place in these areas. We feel that the details of the structure at Point V should more appropriately be worked out at that time.

Regarding drainage from Point X, I met with Roger Cox to discuss the possibility of relocating the proposed easement across the property belonging to the Boys Academy to a more westerly location, nearer to the dam itself. Mr. Cox stated that he is opposed to such a plan, and he indicated that although he will consider approving the easement now shown in the report,

the Boys Trust is under no obligation to allow any water to be diverted into the dam. Mr. Cox claims the City's easement for use of the dam has expired. It appears that the plan shown is the best we can do under the circumstances.

5) The alignment of the Tributary Channel was changed after our Unit 1 Drainage Report was submitted and approved. The new location of the channel makes it impossible to follow the Unit 1 scheme exactly. Since Mr. Swearingen will not commit himself to any specific plan of conveyance across his property at this time, we feel again that the plan shown is the best that can be devised under these limiting factors.

6) I am using the higher rainfall figures in all subsequent reports as you requested. In this case, I have not changed all the computations since there is already a reasonable safety factor in the coefficient of natural runoff.

7) Street carrying capacities have been adjusted in Table V where applicable, and Table IV has been deleted from the Report.

8) Plate II has been corrected to show only one Point C.

9) We are in the process of assembling the construction drawings for Units 2 and 3 (Areas 5 and 7, of the Report) at this time, and will be submitting them to the City within the next few weeks.

Please review the above items as they apply to your comments and approve the subject Drainage Report as resubmitted.

Sincerely yours,

Kent M. Whitman

Kent M. Whitman, for

CHAMBERS, CAMPBELL,
ISAACSON & CHAPLIN, INC.

KMW:dd
Enclosure

CITY OF ALBUQUERQUE, NEW MEXICO
CITY ENGINEER'S OFFICE

MEMORANDUM - 8/19/76
(Date)

TO:
- [ ] Robert Fosnaugh, Traffic Engineer
- [ ] William Otto, Water Engineer
- [ ] Robert Lowe, Liquid Waste Engineer
- [ ] Dwayne Sheppard, Assistant City Engineer-Field
- [x] Kleston Laws, Assistant City Engineer-Hydrology
- [ ] Monte Urban, Chief Surveyor
- [ ] Grant Snyder, Special Projects Engineer
- [ ]
- [ ]

FROM: Q. R. Kielich, Assistant City Engineer-Design

SUBJECT: ACADEMY HILLS SUBDV. UNIT 3

Attached drawings are for WATER, SANITARY SEWER, STORM SEWER, PAVING, STREET GRADES, DRAINAGE, AND _____, for subject proposed project.

Request review and comments on attached drawings. Typed comments will be submitted to CELIA TOMLINSON, by SEPT 2, 1976

QRK/tl

Attachments

comment 8-26-76
channel

affiliated mortgage & development company amdec

a wholly owned subsidiary of Albuquerque Federal Savings and Loan Association

main office:
6400 uptown blvd. ne
p.o. box 3492, station D
albuquerque, n. m. 87110
(505) 883-3100

September 16, 1976

Kles
fi

RECEIVED
SEP 17 1976
CITY ENGINEER

Mr. Varn Kimmick, City Engineer
City of Albuquerque
P O Box 1293
Albuquerque, New Mexico 87103

Dear Mr. Kimmick:

This letter will commit Amdec to the installation of a concrete trickle channel at the northwest corner of the Academy Hills park. This trickle channel will drain the proposed townhouse area, designated as Unit #6 on the enclosure, into Emerson Avenue. The approximate location and route of this trickle channel is designated in red on the enclosure.

We do not wish to install this concrete drainage way at this time because it may be necessary for us to sewer the townhouse area in the same easement.

I trust this letter satisfies your requirements.

Sincerely,

Charles A. Haegelin

Charles A. Haegelin
Vice President

Enclosure

CAH/cs

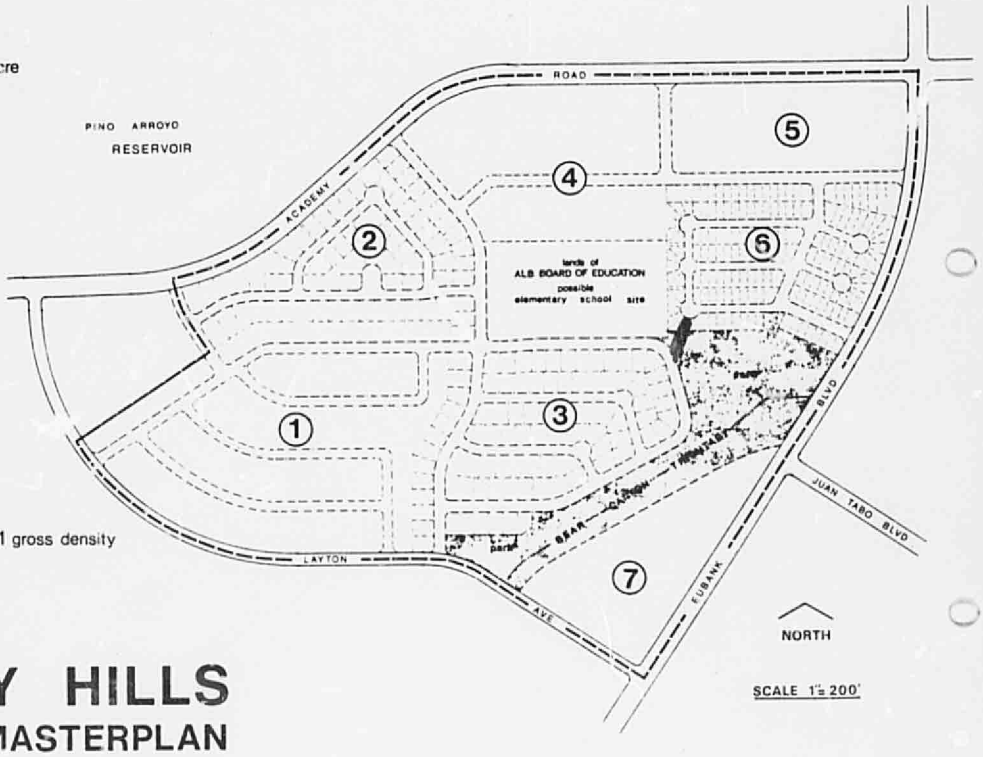
CC: Home Planning
CCIC

santa fe office:
1911 fifth street
santa fe, n. m. 87501
(505) 988-8984

building prosperity through service

branch office:
3240-C juan tabo blvd. ne
p.o. box 14393, station G
albuquerque, n. m. 87111

unit	zone	d.u.'s	gross acres	d.u.'s/acre
1	R-1	144	40	3.6
2	R-1	70	23	3.0
3	R-1	91	27	3.3
4	R-2	230	24	9.6
5	C-1	-	17	-
6	SU-1	166	22	7.5
7	R-3	300	17	17.6
	SCHOOL	-	11	-
	OPEN	-	17	-
		1,001	198	= 5.1 gross density



ACADEMY HILLS
PROPOSED MASTERPLAN

home planning development co.
affiliated mortgage & devel. co.

February 8, 1977

City of Albuquerque
City Engineers Office
P.O. Box 1293
Albuquerque, NM 87103

ATTENTION: Mr. Kimmick

REFERENCE: Academy Hills Unit #2,
Drainage Addendum #1

Dear Mr. Kimmick:

On Wednesday February 2, 1977, I met with you and Mr. Jim Smith, of AMAFCA, to discuss a change in the Master Plan of Drainage for Academy Hills Properties as pertains to Academy Hills Unit 2. The change referred to is stated in Addendum No. 1, which accompanies this letter. After discussion, you and Mr. Smith agreed to approve the change.

Upon further review of the plans, you requested a change in the method of handing the surface flow runoff from Area 2, which left the site by way of a 12' wide drainage R.O.W. You suggested a storm sewer pipe in place of the drainage channel. We have changed the plans to reflect your suggestions. The flows from Area 2 will leave the site in a storm drain system which connects directly to the proposed storm drain for Academy Road. Total flows from the storm sewer empty into an existing arroyo on the north side of Academy Road, which crosses land owned by the Boy's Academy Trust. (We have already submitted the corrected plans to Mr. Kielich's office.)

I contacted Mr. Roger Cox, a trustee for the Academy. He has agreed to the release point of the flows and will obtain Mr. Albert Simms approval in a letter of agreement for drainage purposes. We will forward a copy of this agreement to you and Mr. Smith as soon as it becomes available to us.

This will complete all the drainage requirements set forth by you and Mr. Smith. We respectfully request your approval on the plat so that it can be filed.

Chambers, Campbell, Isaacson, Chaplin, Inc.
architects engineers planners 3500 indian school road ne albuquerque new mexico 87106 505 266 5521

Thank you for your comments and participation.

Sincerely,

Christopher L. Weiss

Christopher L. Weiss, for
CHAMBERS, CAMPBELL,
ISAACSON & CHAPLIN, INC.

CLW/ple

Enclosures

cc: Mr. Jim Smith, AMAFCA
Mr. Charles Haegelin, AMDEC

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

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

Jerry D.

February 9, 1977

Mr. Christopher L. Weiss
Chambers,Campbell,Isaacson & Chaplin
3500 Indian School Rd. N.E.
Albuquerque, N.M. 87106

SUBJECT: ACADEMY HILLS SUBDIVISION, UNIT 2

Dear Mr. Weiss:

Your letter of February 8, 1977 has been reviewed. The revised drainage report is acceptable to this office, provided that a satisfactory instrument conveying a drainage easement at the discharge point north of Academy Road (near lots 11 and 12) is obtained and forwarded to this office.

Sincerely,

V. M. Kimmick
City Engineer

VMK/fs

cc: Jim Smith
Bob Kielich
Dwayne Sheppard

Public Works Department

Director — Erwin F. Hansch, P. E. 766-7467
Engineering 766-7441 — V. M. Kimmick, P. E.
Street Maint. 766-7755 — G. E. Paul, P. E.
Ass't. Director — Harold R. Orr, Jr. P. E.
Liquid Waste 766-7535 — R. P. Lowe, P. E.
Water 766-7437 — W. H. Otto, P. E.

HOOTEN/STAHL, INC.
REALTORS

L-RF

June 18, 1980

RECEIVED
JUN 19 1980
CITY ENGINEER

E21-D1

Bruno Conegniano
City Engineer
PO Box 1293
Albuquerque, New Mexico 87103

Dear Sir:

Please give a written opinion that Lot 59 Unit 3, Academy Hills (Zone Atlas page E-21) commonly known as 9817 Admiral Nimitz NE is not in flood hazard area even though it is shown to be on latest map dated December 1979. I understand that this opinion is subject to HUD'S review and that a review will be requested.

Sincerely,

Corrine Depatie

CORRINE DEPATIE
Associate Broker
HOOTEN/STAHL, INC. REALTORS

CD/jg

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

January 12, 1981

E21-D1

Ms. Corrine De Patie
Hooten & Stahl, Inc.
3733 Eubank N.E.
Albuquerque, New Mexico 87111

Re: Lot 79, Unit 1, Lot 59, Unit 3, Academy Hills Subdivision

Dear Ms. Patie:

I believe that the Flood Hazard Boundary Maps published by the F.I.A. on December 4, 1979 and indicating that the referenced properties are subject to flooding, are in error. Due to the improvements performed on the Bear Canyon Tributary, the subdivision Academy Hills, is not subject to innundation.

Very truly yours,

Bruno Conegliano
Assistant Hydrology Engineer

BC/fs

MUNICIPAL DEVELOPMENT DEPARTMENT

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

E21-D1

RECEIVED

MAY 1 1981

CITY ENGINEER

8 May 1981

Dear Mr Heller -

I am including a letter you wrote to me on 24 March 1981. At that time you told me to write to you and formally request that the city of Albuquerque take the necessary steps to remove the property from the Federal Insurance Agency flood hazard area upon my purchase of that property.

As of 8 May 1981 I own the house on Lot 56 Academy Hills, Unit 3 - 9905 Admiral Emerson NE. Thus, at this time I formally request that the city take the necessary steps to have my house removed from the Federal Insurance Agency flood hazard area.

Please send all correspondence to:

Major & Mrs. L. R. Sadoff
158 Jones Street
Coddington Cove
Middletown, RI 02840

until 13 July 1981. You can reach me at 401-846-5203

Your prompt consideration of this matter will be appreciated.

Thank you,

Larry Sadoff

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

March 24, 1981

TO WHOM IT MAY CONCERN:

Re: Lot 56, Academy Hills, Unit 3

After investigation of the information available in the City Engineer's Office it has been found that the subject property does not lie within the 100 year flood hazard area due to the improvements made by the subdivider for the Academy Hills Subdivision.

Very truly yours,

Richard S. Heller
City Engineer

RSH/fs

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

Kent M Whitman
Chambers, Campbell, Isaacson, Chaplin Inc
3500 Indian School Rd NE
Albuquerque NM 87106

Re: Academy Hill Drainage Report

Dear Mr. Whitman:

The drainage report transmitted with your letter of May 21, 1976, has been reviewed and the following items need to be resolved:

1. The drainage from Juan Tabo, Eubank and Layton does not appear to agree with SAD 184 being designed by Scanlon Engineering

2. The alignment of Bear Canyon Tributary and its crossing of Eubank is not clear. Will a "sheet crossing structure be required? Does the alignment of the easement agree with the area east of Eubank. It appears from your drawing that the northeast corner of Juan Tabo and Eubank will be unplatable.

3. If Eubank is not to be constructed how will runoff be diverted?

4. Academy is a major street with two proposed digs to remove drainage. Since this is not easily designed, I feel additional detail is necessary. Section 31 of the Subdivision Ordinance require construction plans and states they are to be prepared in conjunction with the final plat. Runoff at design point X should be conveyed to the Rio

dam. Perhaps a underground system will be required. Details of the drainage easement into the Rino Reservior should be provided to show erosion control. Perhaps topography would help clear these issues.

5. This drainage study and Academy Hills Unit 1 seem to conflict in the areas of Layton and Annapolis and Layton and Academy Hills Rd.

6. I question if 2.2 inches of rain is adequate.

7. Are street crowns and sections currently being used by the City in agreement with street carrying capacity charts?

8. Plate II shows two design points labeled C.

9. Detailed construction plans and grading plan will be required prior to beginning construction and as mentioned for some areas to show platting should be approved.

I shall be happy to discuss any questions.

VTY

KHL

cc John Robert

Dec 1

Celia Tomlinson
KH LAWS
Academy Hills Unit 2.

The 36" R.C.P storm drain should be shown in profile on sheet 4. It appears to me the sewer will have to be concrete encased at this crossing.
Sheet 7: It appears to me the 4' cut will not daylight in the right of way. I assume a easement will be provided by the developer. I believe a profile should be provided for the pipe and ditch. We have had problems with soil eroding from beneath riprap pads. What will prevent erosion at this location. Does the pipe have adequate cover?
The Rundown should be referenced to sheet 8.
Sheet 8: There should be concrete valley gutter across Cranbrook St. I think entire easement should be improved. The 1.5 feet each side will just grow weeds and be a problem.
It would be desirable to have the easement meet ~~the street~~ Academy St at angle less than 90 degrees. I also feel ~~the~~ the pedestrian should not have to walk through water, especially low flows.
Sheet 9: Does not appear to agree with drainage study.
Area 7-1 has 2.2 acres ponded, this sheet shows 0.36 acres ponded. Area 7-2 has 4.1 acres ponded, this sheet shows 2.74 acres ponded. It appears the lots adjoining Unit 1 exceed building code. Is retaining wall to be (over)

provided or does it exist?

ACADEMY HILLS UNIT #2
DRAINAGE ADDENDUM NO. 1

PURPOSE OF ADDENDUM

The original drainage plan for Academy Hills #2* indicated a total ponding area of 7.5 Acres for areas 7-1, 7-2, 7-5 and 5-1. The revised grading plan reflects a total ponding area of 6.10 acres. This is a decrease in ponding area of 1.40 acres. The undeveloped 100 year runoff rate for Academy Hills Unit 2 equals 43 cfs. After development, the runoff rate will equal 49 cfs. This is an increase of 6 cfs, or 12%, over the undeveloped rate.

The decrease in available back yard ponding can be best explained if the reader will refer to the site grading plan. The majority of the site reflects maximum grades between lots which will require the use of retaining walls. Every effort was made to incorporate back yard ponding into the final grading plan. However, the use of back yard ponds on many downhill areas of a row of lots made the elevation differences between rear yards even greater than presently shown. This would require the use of more and higher retaining walls along the rear lot lines.

There is a point reached when the requirements of ponding and the economics of development of a site slide too far out of balance with each other. This point was reached here with the attempt to pond the amount of area required by the master drainage plan. However, this situation is helped by the fact that almost half of the site's runoff empties directly into the Pino Arroyo. Further, half of the increase in unponded lots occurs within this sub-drainage area which drains directly to the Pino Arroyo. Thus a substantial part of the runoff rate increase will be intercepted by a major arroyo rather than burdening a downstream street system.

Because of these parameters - the grading, departure points for the runoff flows, and the amount of increase of flow rate, we feel that this amended drainage plan for Academy Hills Unit #2 is an acceptable alternate to the original flow characteristics presented in the Master Drainage Plan for Academy Hills Properties.

---

*Academy Hills Properties - Master Plan of Drainage, by CCIC, January 1976, Revised July 1976.

ACADEMY HILLS UNIT #2
DRAINAGE ADDENDUM NO. 1

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---

*Academy Hills Properties - Master Plan of Drainage, by CCIC, January 1976, Revised July 1976.

ACADEMY HILLS PROPERTIES

MASTER PLAN OF DRAINAGE

PREPARED FOR

HOME PLANNING DEVELOPMENT COMPANY, INC.

AND

AFFILIATED MORTGAGE AND DEVELOPMENT COMPANY

BY

CHAMBERS, CAMPBELL, ISAACSON & CHAPLIN, INC.

JANUARY 1976

REVISED JULY 1976

ACADEMY HILLS PROPERTIES

MASTER PLAN OF DRAINAGE

prepared for

HOME PLANNING DEVELOPMENT COMPANY, INC.

and

AFFILIATED MORTGAGE AND DEVELOPMENT COMPANY

by

CHAMBERS, CAMPBELL, ISAACSON & CHAPLIN, INC.

JANUARY 1976

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A) PURPOSE AND SCOPE

Home PLanning Development Company, Incorporated, in conjunction with Affiliated Mortgage and Development Company have retained this firm to devise a Master Plan of Development for Academy Hills Properties, including Subdivision Units 2 and 3, in northeast Albuquerque. As a contingency to approval of said Master Plan, a Master Drainage Study is required by the City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority. This report details the results of that study.

Since the parcel of land known as Academy Hills is presently in various stages of subdivision and development, the scope of work for this study varies for different sections of that parcel. For those areas where preliminary interior plats have been devised, detailed drainage patterns are defined. For those areas where nothing more than a specific type of land use has been chosen, drainage is treated in very general terms.

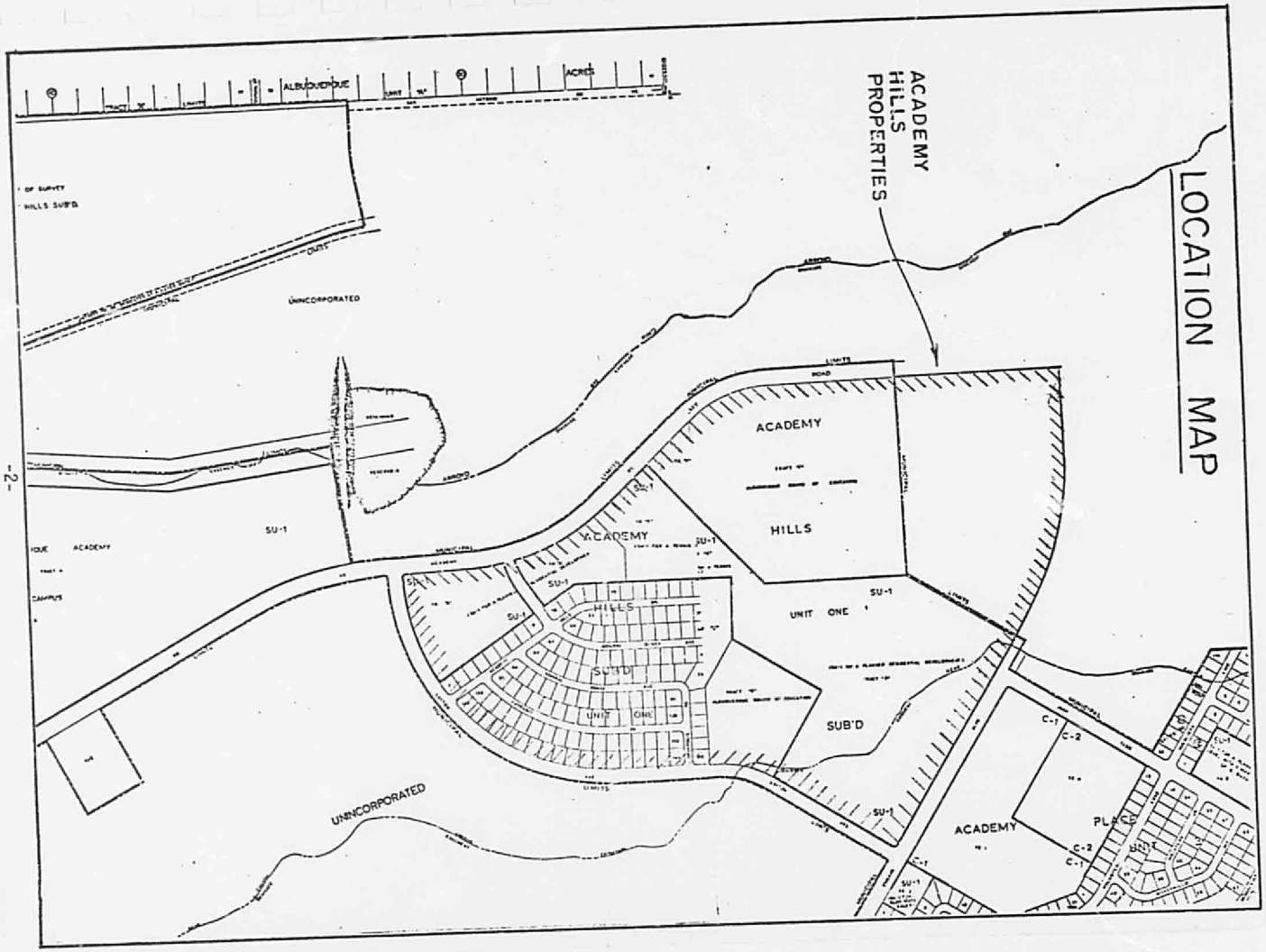
B) SITE LOCATION AND TOPOGRAPHY

Academy Hills Subdivision is located in northeast Albuquerque immediately west of the proposed intersection of the extensions of Eubank and Juan Tabo Boulevards (see Location Map). The land slopes from east to west at an average rate of 4%. Soils consist largely of alluvial sands and silts, and decomposed granite is the major soil constituent.

C) EXPLANATION OF NUMBERED AREA DESIGNATIONS

Plate I shows the areas east of Academy Hills which drain toward and onto the property naturally. Plate II shows the site itself with drainage areas

LOCATION MAP



broken down into logical sub-areas convenient for analysis. Each sub-area of drainage is designated by a number followed by a dash followed by another number. The first number indicates the land use type according to the following code chart. The code chart follows that used on the Master Plan of Development where applicable:

Code #	Land Use Type
1	Townhouse type development with up to 9.6 units per acre.
2	Commercial/Office Park type development containing non-industrial types of businesses.
3	Patio Home type development with up to 7.5 units per acre.
4	Multi-story Apartment Complex type development with up to 17.6 units per acre.
5,6,7	Single Family type development with 3.3 - 3.9 units per acre.
10	Dedicated Public Park
11	Board of Education School site
13	Off-site upland drainage areas.

The second number in the area designation code represents specific sub-areas within each land use type.

D) DESIGN CRITERIA

1) Engineering Parameters: For calculation of composite coefficients of runoff the following values of "C" were taken for the indicated land coverages:

a) Streets, roofs, walks - 0.90

b) Lawns - 0.15

c) Southwestern landscaping - 0.6

d) Natural ground - 0.35

e) Bare earth - 0.45

All runoff volume calculations have been based on a 100 year-6 hour rainfall of 2.2" per AMAFCA requirements.

Rate of runoff calculations have been based on the frequency - intensity - duration relationship for a 100 year storm as presented by Gordon Herkenhoff and Associates in their 1963 Master Plan of Drainage for the City of Albuquerque. This relationship is expressed by the following equation: $I = 189/(Tc+25)$

2) Flood Control Regulations: The drainage plan presented in this report has been designed to comply with the 1972 AMAFCA Resolution in regard to rate and volume of runoff leaving the site. That Resolution has been interpreted to say that the rate and volume of runoff allowed to leave the site after development shall be no greater than the rate and volume running off prior to development.

E. COMPUTATIONAL PROCEDURES

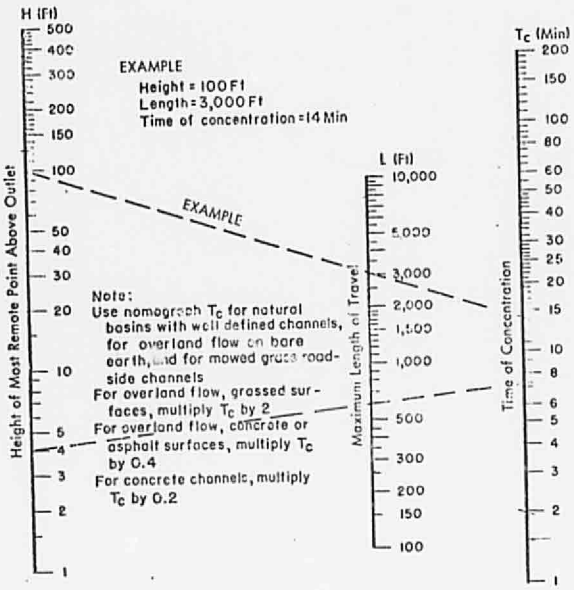
Appendix A contains samples of the various types of hydraulic calculations performed. Proposed easement channels were sized based on the Manning equation for uniform flow. Street carrying capacities were calculated by means of the same equation using City of Albuquerque Standard Street Sections.

Hydrological flow rate calculations are based on the rational runoff method. Times of concentration were calculated using Plate V for overland flow and Table IV for estimating street flow velocities. Estimates were made of percents of area covered by each coverage type described above in section D-1 for each drainage sub-area. A composite runoff coefficient was than calculated for each sub-area.

Volume calculations for sizing individual lot ponds, for determination of

PLATE V

NOMOGRAPH
TIMES OF CONCENTRATION



Based on study by P. Z. Kirpich,
Civil Engineering, Vol. 10, No. 6, June 1940, p. 362

overall ponding requirements for land use areas 1, 2, 4 and 11, and for determination of net volumes of discharge for the entire site in both natural and developed states were performed by multiplication of the applicable C factor times the 100 year - 6 hour rainfall (0.183) times the appropriate area to obtain cubic feet of water.

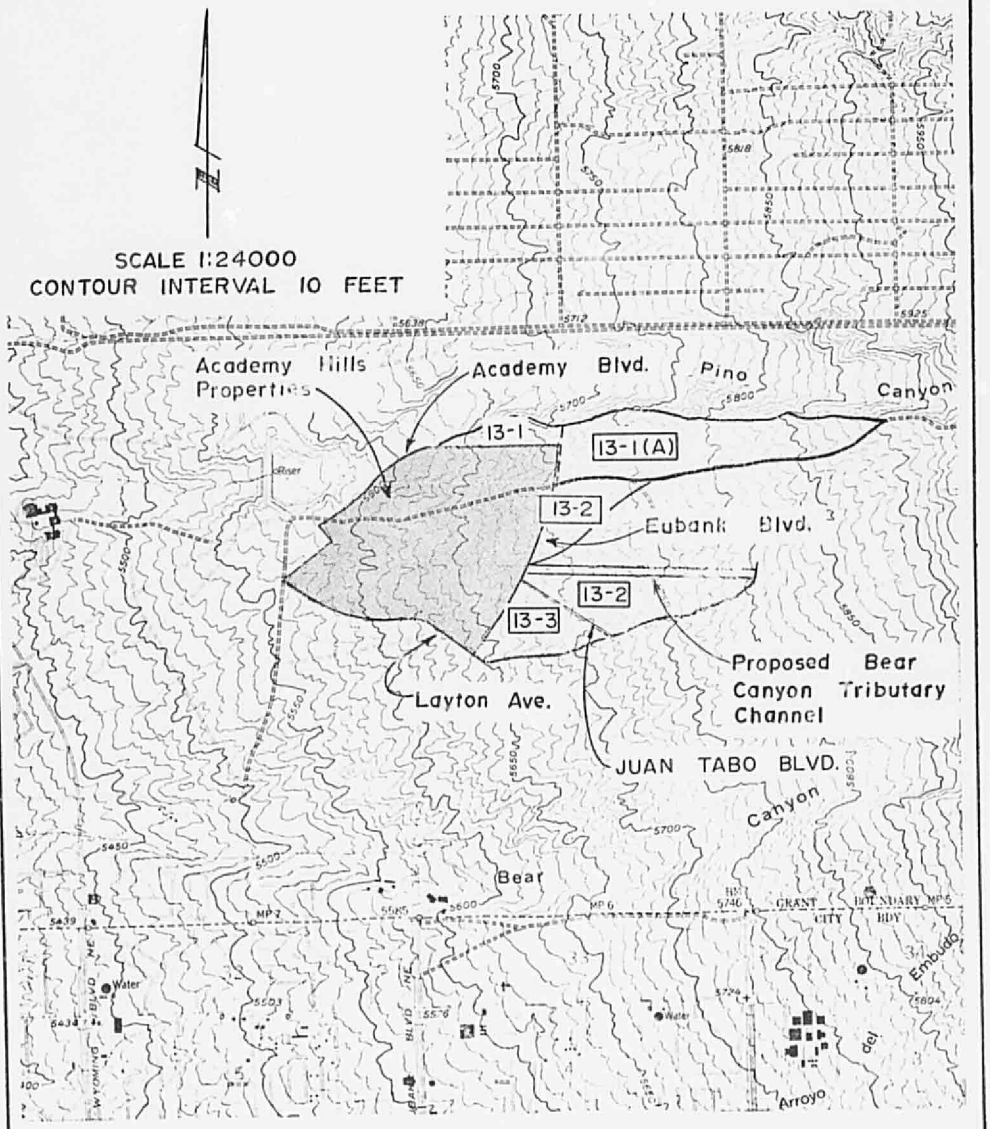
F) OFF-SITE DRAINAGE

1) Bear Canyon Tributary: A major drainage conveyance known as the "Bear Canyon Tributary" cuts through the southeastern corner of the property. The 100 year flow rate for this arroyo has been taken from a drainage study conducted by Leonard Rice and Associates for AMAFCA dated April, 1975, and it is equal to 1326 cfs in the existing state and 1400 cfs under the implemented drainage management plan for the location at the Eubank Juan Tabo intersection.

The plan presented here deviates from the Rice proposal moderately and is illustrated on Plates III and IV. We feel that these differences do not interfere with the hydrological validity of the Rice study. We propose that a broader, shallower channel with a maintained grass bottom be adopted so that the conveyance will serve a recreational function during times of low flow. The channel will have a bottom width of 176' between transitions at Eubank and Layton Boulevards, and the minimum depth of the proposed section will be 3'. A small "trickle" section will be provided along the southern easement line to carry the "nuisance" flows which will be generated by storms of lesser intensity. In accordance with Mr. John Robert's request, we have shown a 100' long section of wire enclosed rip rap at the upper end of this "nuisance" channel to serve as an infiltration section for small flows.

PLATE I

UPLAND DRAINAGE



The Rice Study recommends a bridge structure and energy dissipator for the Eubank crossing of the Bear Canyon Tributary. No funds are presently available for such improvements, however, we must assume that ultimately they will be constructed. When a bridge and dissipator structure are planned for Eubank Boulevard, the dissipator will solve any transitional problems by slowing the flows down to the point where the transition can be made at sub-critical velocities.

2) Properties East of Eubank: Outlined on Plate I are three distinct drainage areas which approach the subject property form the east. The natural divide between areas 13-1 and 13-2 intersects Eubank Boulevard approximately 600' south of the northeast property corner. Flows from area 13-1 can therefore be diverted northward on Eubank and into Academy Boulevard where they will eventually be dumped into the Pino Arroyo to the north. Flows from areas 13-2 can be diverted via Juan Tabo and Eubank Boulevards into the Bear Canyon Tributary where it crosses Eubank.

Flows from area 13-3 can be diverted southward down Eubank and then into Layton Boulevard where again, they can be dumped into the Bear Canyon Tributary where it crosses Layton Boulevard.

G) ON-SITE DRAINAGE

1) Area 6-1 - Approved Drainage Report: No calculations were performed regarding Area 6-1. A drainage report has been conducted by this office for that area, and that report has been approved by AMAFCA. The reader is referred to "A Drainage Study for Academy Hills Subdivision Unit No. 1", January, 1975,

and the subsequent addendum thereto dated the same.

2) Methods of Treatment for Other Land Use Areas: As mentioned previously, specific land use areas have been treated with varying degrees of detail based on the extent of land planning to date for each area. Areas 1, 2, 4 and 11 have been treated in the most general fashion with only overall runoff contributions and overall ponding requirements calculated for each. Since Areas 10 will be open, grassed park, it was necessary to include only their net effect upon runoff and ponding requirements for the entire site.

Even though no preliminary plat has been devised for Area 3, a maximum number of lots has been proposed in the Master Plan, and therefore, a typical plot plan for the patio homes proposed for this area has been assumed. This plot plan is shown as Plate VI and indicates that the majority of each lot shall drain into an infiltration gallery in the rear so that volume discharge requirements can be met.

Preliminary plats have been devised for areas 5 and 7, so these areas have been treated in the most detailed fashion. Plate VII shows a typical plot plan for an R1 lot located in Areas 5 or 7. Again, the majority of runoff travels to the rear of the lot where it is ponded in a back yard retention pond for percolation into the soil.

3) Volumes of Runoff: Table 1 itemizes the individual drainage sub-areas along with Composite C values and volume calculations. Volumes are given for each sub-area for both the developed and undeveloped states. In those cases where back yard ponding does not apply, total required ponding volumes are indicated (ponding volumes are not given for park areas since runoff after development will be less than what occurs naturally). A final

PLATE VI

TYPICAL PLOT PLAN
PATIO HOME

N.T.S.

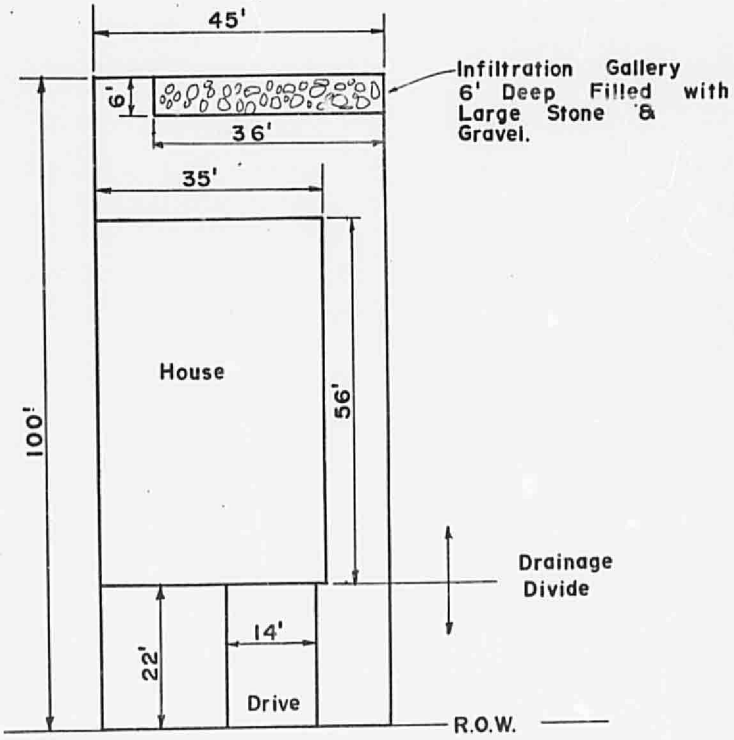


PLATE VII

TYPICAL PLOT PLAN
R-I RESIDENTIAL HOME

N.T.S.

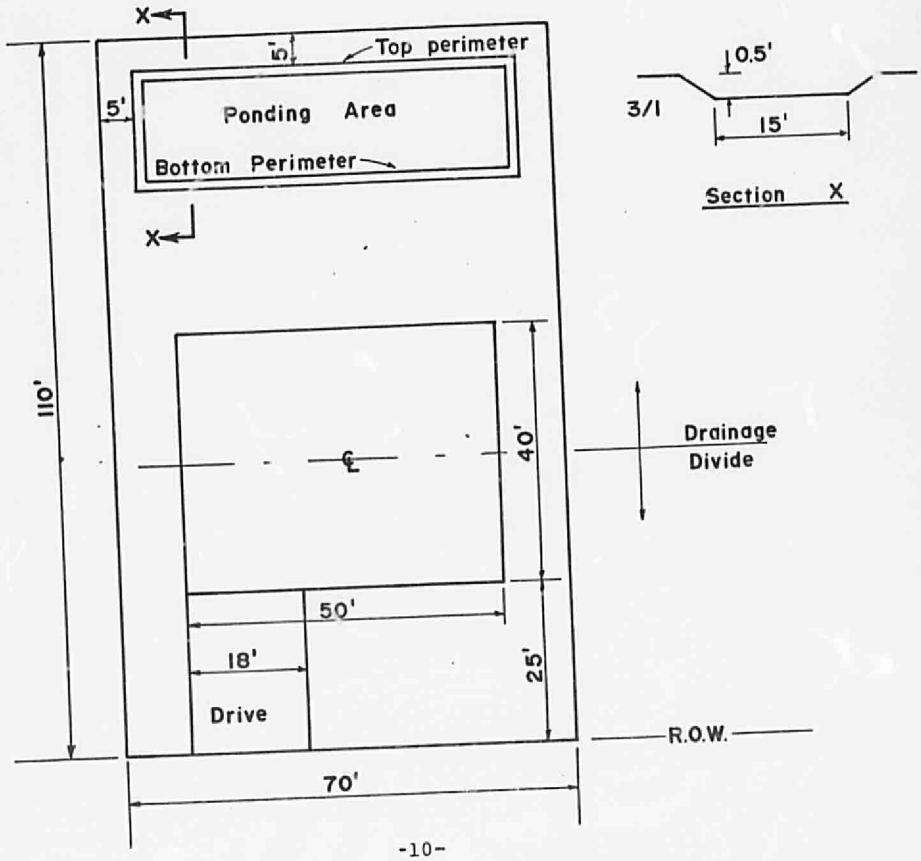


TABLE I

VOLUME CALCULATIONS

Area Designation	Area (acres)	Area Running Off If B.Y. Ponding Applies	% Area Running Off @ .9	% Area Running Off @ .15	% Area Running Off @ .6	% Area Running Off @ .35	% Area Running Off @ .45	Composite C	Natural Volume 100 Year 6 hr. Storm cu. ft.	Developed Volume 100 Year 6 hr. Storm cu. ft.	Required Retention B.Y. Ponding Does Not Apply cu. ft.
2-1	19.1	NA	50	15	25	000	10	.67	53386	102197	48811
1-2	7.8	NA	41	25	25	000	9	.6	21801	37374	15573
1-1(A)	1.9	NA	50	00	00	000	50	.68	-----	------	-----
1-1	18.0	NA	41	25	25	000	9	.6	50312	86249	35937
7-1	5.3	3.1	45	27	28	000	00	.61	14810	15100	-----
7-3	2.4	NA	50	000	00	000	50	.68	6696	13009	-----
7-5	1.7	1.0	49	25	26	000	00	.63	4750	5030	-----
7-2	11.4	7.3	49	25	26	000	00	.63	31860	36730	-----
7-4	0.7	NA	50	000	00	000	50	.68	1953	3794	-----
3-1	2.5	.9	47	26	27	000	00	.62	6988	4456	-----
3-2	19.0	9.9	47	26	27	000	00	.62	53107	49018	-----
10-1	1.7	NA	00	100	00	000	00	.15	4752	2036	-----
10-2	2.7	NA	00	100	00	000	00	.15	7547	3234	-----
5-6	4.4	3.1	53	23	24	000	00	.66	12276	16310	-----
11-1	10.9	NA	25	000	00	000	75	.56	30467	48747	18280
5-1	2.0	1.5	51	24	25	000	00	.65	5590	7790	-----
5-2	3.9	2.3	54	23	23	000	00	.66	10881	12101	-----
5-3	6.8	3.9	54	23	23	000	00	.66	19007	20556	-----
5-4	5.7	3.3	50	25	25	000	00	.64	15932	16866	-----
10-6	1.4	NA	13	87	00	000	00	.25	3913	2795	-----
5-5	6.0	3.7	48	26	26	000	00	.63	16740	18582	-----
10-3	3.0	NA	00	100	00	000	00	.15	8385	3594	-----
4-1	17.3	NA	50	15	25	000	10	.67	48355	92566	44211
4-1(A)	4.9	NA	53	000	00	000	47	.69	-----	------	-----
13-1	93.7	NA	00	000	00	100	00	.35	-----	------	-----
13-2	71.6	NA	00	000	00	100	00	.35	-----	------	-----
13-3	35.1	NA	00	000	00	100	00	.35	-----	------	-----
12-1	3.6	NA	53	000	00	000	47	.69	-----	------	-----
13-1(A)	82.2	NA	00	000	00	100	00	.35	-----	------	-----
									Summary	(with req. ret.) Summary	
									429,508	435,322	

NOTE: Areas Designated "A" are included in gross area indicated for parent designation.

TABLE II

FLOW CALCULATIONS
DEVELOPED STATE

Point Designation	Areas Contributing	Travel Length (feet)	Vel. (fps) ΔH (feet)	Tc (minutes)	I 100	Q = Σ(CIA) c.f.s.*
D	2-1	1700	70	8	5.4	36
I	1-2	1350	35	8	5.4	15
H	1-1 less 1-1(A), 1-2, 7-5	2000	66	10	5.4	49
V	2-1, 1-1(A), 13-1	1050 ** 5000	12.5 fps 190	20½	4.15	169
W	7-1	850	26	6	5.4	10
T	1-2, 1-1 less 1-1(A), 7-5, 7-3, 7-1	900 2000	12.5 fps 66	11	5.25	66
X	7-2, 7-4	950	48	4½	5.4	27
E	3-1	800	30	5	5.4	3
F	3-1, 3-2	1400	42	8	5.4	36
G	5-2	800	10 fps	1	5.4	8
O	5-6, 10-2, 10-1, 3-1, 3-2	1100 1400	6.8 fps 42	10½	5.32	50
J	11-1	1000	30	6	5.4	21
K	11-1, 5-1, 5-2	200 1000	5.6 fps 30	6½	5.4	24
L	11-1, 5-1, 5-2, 5-3	500 1000	5.6 fps 30	7½	5.4	48
M	11-1, 5-1, 5-2, 5-3, 5-4	800 1000	5.6 fps 30	8½	5.4	59
P	11-1, 5-1, 5-2, 5-3, 5-4, 5-5 10-6	1200 1000	5.6 fps 30	9½	5.4	73
C	13-1 (A)	5000	190	19	4.3	124
N	4-1(A), 13-3	800 2000	10.5 fps 70	11½	5.18	81
B	12-1, 13-2	3600	120	16	4.61	127

* C = 0.35 was used for Q calculations for areas 1-1, 1-2, 2-1, and 11-1, to account for effect of proposed ponding.

** 1050' path along streets; 5000' path overland flow; Tc is total of the two flow times.

tally of runoff volumes before and after development (including the effects of all recommended ponding) is given at the end of Table 1. Volume after development with proposed ponding (435,322 cu. ft.) is essentially equal to volume before development (429,508 cu. ft.), thereby complying with the AMAFCA Resolution.

4) Drainage Networks: Plate II indicates the positions of all drainage control points used in flow calculations. These consist of individual letters within circles, and flow rates for each control point can be read from Table II. Four basic drainage networks exist for the Academy Hills Site. The first consists of Areas 13-1, 2-1, and 1-1(A) which all drain into Academy Boulevard and converge at point V. Since these areas drain to point V naturally, it is proposed that a dip section be provided in Academy Boulevard at point V so that these flows can be discharged into the natural depression which leads northwesterly into the Pino Basin.

The second network consists of areas 1-2, 1-1 less 1-1(A), 7-1, 7-3, and 7-5 converging at point T. Here another natural depression leads northward to the Pino Basin. Since this second network represents a slight rearrangement of what occurs naturally, we recommend that an easement be acquired to accommodate these flows as shown on Plate II and as indicated in Table III.

The third network is composed of areas 5-6, 10-1, 10-2, 3-1, and 3-2. These areas drain to point O where they will be directed into the Bear Canyon Tributary.

The fourth network drains to point P at the intersection of Concordia and Layton. This network contains areas 11-1, 5-1, 5-2, 5-3, 5-4, 5-5, and 10-6. Since the Bear Canyon Tributary at Layton Avenue is actually higher

than the intersection of Concordia and Layton, it is not feasible to drain these flows eastward into the tributary. The only practical solution is to allow these flows to travel westward down Layton Avenue to join the flows from Academy Hills Drive. At the intersection of Layton Avenue and Academy Hills Drive, these flows will travel southwesterly along an existing natural arroyo and into the Bear Canyon Tributary.

The landowner to the south of Layton Avenue has committed himself in writing to providing whatever easements or watercourses AMAFCA may deem necessary when he develops his land. At that time, flows along Layton Avenue could be intercepted at a more easterly location and diverted into the Bear Canyon Tributary via said easement or watercourse.

Flows from area 7-2 and 7-4 are minimal (approximately 27 cfs) and can therefore be allowed to travel down Academy Road to a discharge point further east. Location of said discharge point will depend upon whatever development occurs east of the Academy Hills Site.

At locations F, T and W easements and corresponding easement channels are proposed. Table III describes the geometry of these easements and their respective channels.

Table V contains information regarding adequacy of proposed street sections.

H) SUMMARY OF RECOMMENDATIONS

In conclusion and as a result of the analysis presented above, we make the following recommendations with regard to drainage for the Academy Hills Subdivision:

1) That a grass surfaced conveyance channel with the dimensions shown on Plates III and IV be provided to carry flows originating in the Bear Canyon Tributary.

2) That all other off-site drainage approaching the subject property from the east be rerouted around the property via Academy, Eubank, and Layton Boulevards.

3) That the typical plot plans illustrated on Plates VI and VII for Patio and R1 Residential homes respectively be adopted in the final grading design.

4) That retention facilities of the capacities indicated in Table I be incorporated into the final grading designs for Areas 2-1, 1-1, 1-2, 4-1 and 11-1.

5) That the easements proposed in Table III be acquired and the corresponding easement channels be installed.

6) That the street sections proposed in Table V be adopted for the locations indicated.

TABLE III

DRAINAGE EASEMENTS AND CHANNELS

Point Designation	Flow Rate (c.f.s.)	Required					
		Channel Slope (ft./ft.)	Channel Bottom Width (feet)	Channel Depth (feet)	Channel Sideslopes (horz./vert.)	Channel Lining	Easement Width (feet)
F	36	0.011	10	1.0	0	Concrete	12
T	66	0.0025	10	1.5	3	Concrete	20
W	10	0.003	8	0.67	0	Concrete	10

TABLE IV

REQUIRED STREET SECTIONS

Point Designations	Street Name	Flow Rate (c.f.s.)	Recommended Street Width (feet)	Recommended Street Slope (ft./ft.)	Actual Capacity
C	Academy	124	48	.05	185
V	Academy	169	48	.05	185
N	Layton	81	48 (designed)	.018 (designed)	111
P	Concordia	72	32	.01	75
Below P	Layton	72	48 (designed)	.007 (designed)	70
O	Admiral Emerson	50	32	.025	118

APPENDIX A

SAMPLE CALCULATIONS

1) Composite Runoff Coefficient - Area 2-1:

Estimated

% area running off @ .9 = 50

% area running off @ .15 = 15

% area running off @ .6 = 0

% area running off @ .35 = 10

$\therefore$ C (composite) = (0.5 x 0.9) + (0.15 x 0.15) + (0.25 x 0.6) + (0.1 x 0.45) = 0.67

2) Volumes of Runoff = Area 2-1:

Area = 19.1 acres = 831,996 sq. ft.
Rainfall = 2.2" = 0.183 feet

a) Undeveloped:

C = 0.35

$\therefore$ Volume = 0.35 x 0.1833 x 831,996 = 53,386 cu. ft.

b) Developed:

C (composite) = 0.67

$\therefore$ Volume - 0.67 x 0.1833 x 831,996 = 102,197 cu. ft.

3) Flow Rate - Point U:

T_c (Point U) = 12 min.
$\therefore$ I (Point U) = 189/(25+12) = 5.1 in./hr.

$Q = (C \times I \times A)$

$= 0.15 \times 5.1 \times 1.5$ (Area 10-4) $+ 0.63 \times 5.1 \times 9.8$ (Area 7-2) $+ 0.61 \times 5.1 \times 6.4$ (Area 7-1) $= 33$ cfs

4) Easement Channel Capacity - Point F:

Q = 36 cfs
Available slope = 0.013
Bottom width = 0'
Sideslopes = 3/1
n = 0.03 (earth)

from Manning equation: $Q = (A)\frac{(1.49)}{n}(R)^{2/3}S^{1/2}$

Solving by trial and error

Depth = 1.6'

∴ A 2' deep channel and a 12' wide easement shall be satisfactory.

5) Required Volume for Infiltration Gallery - Patio Homes:

Area running off = 45 x 78 = 3510 sq. ft.

% area running off @ .9 = 56

% area running off @ .15 = 15

% area running off @ .35 = 0

% area running off @ .45 = 15

Composite C = 0.68

Volume = 0.1833 x 0.68 x 3510 = 438 cu. ft.

Typical value for void ratio (e) of loose sand = 0.89

$$\text{Porosity} = \frac{\text{Vol. voids}}{\text{Vol. total}} = \frac{e}{1+e} = 0.47$$

I'll use 0.33 to be conservative.

Volume of an area 6' x 36", two feet deep = 432 cu. ft. OK

∴ An area 6' x 36' x 6' deep filled with gravel will serve as an adequate infiltration gallery.

6) Required Back Yard Ponding Volume - R1 Home:

Area running off = 65 x 70 = 4550 sq. ft.

% area running off @ .9 = 26

% area running off @ .15 = 26

% area running off @ .6 = 24

% area running off @ .35 = 0

% area running off @ .45 = 24

Composite C = 0.55

Volume = 0.1833 x 0.55 x 4550 = 459 cu. ft.

A pond having 3/1 sideslopes, 0.5' deep, with bottom dimensions of 57 by 15 has a volume of approximately 16.5 x 57 x 0.5 = 470 cu. ft. OK

7) Bear Canyon Tributary - Channel Design:

a) 176' Wide Section (Normal Flow Depth)

Q = 1400 cfs
BW = 176'
Slope = .03
Sideslopes = 4/1
n = .03 (grass)

From manning equation

Depth = 0.96'
Velocity = 8.2 fps
Froude = 1.49

b) <u>100' Wide Section at Layton (Normal Flow Depth)</u>

Q = 1400 cfs
BW = 100'
Slope = .03
Sideslopes = 22.75/1
n = .03 (assume critical section is just outside of street limits in grassed ROW)

From manning equation

Depth = 1.25'
Velcoity = 8.69 fps
Froude = 1.51

Since both sections are well within the supercritical range, flow should pass through the transition and over the Layton dip section with only minor head losses due to the contraction. These losses are estimated as: $0.1X \frac{V2^2-V1^2}{2g}$ (per Corps of Engineers and are equal to

$$0.1X \frac{8.69^2-8.2^2}{64.4}$$

= .013' which is negligible

In the event that the channel below Layton is not designed to run supercritically, a hydraulic jump will occur somewhere upstream of Layton. Checking conjugate depths for the two sections described above yields the following:

c) <u>176' Wide Section (Conjugate Depth)</u>

Depth (up) = 0.96'
Velocity (up) = 8.2 fps

For very wide trapezodial sections, the hydraulic jump formula for rectangular sections can be applied with very small error.

$$\text{Depth (down)} = -\frac{0.96}{2} + \sqrt{\left(\frac{0.96}{2}\right)^2 + \frac{2(8.2)^2(0.96)}{g}}$$

Depth (down) = 1.58'

d) <u>100" Wide Section at Layton (Conjugate Depth)</u>

Depth (up) = 1.25'
Velocity (up) = 8.69 fps

$$\text{Depth (down)} = -\frac{1.25}{2} + \sqrt{\left(\frac{1.25}{2}\right)^2 + \frac{2(8.69)^2(1.25)}{g}}$$

Depth (down) = 1.88'

The above calculations show that even if a hydraulic jump occurs upstream of Layton, the conjugate depth will be less than 2'. Therefore a 3' deep channel will provide adequate freeboard.