F20/D13

11 Plans

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

READING FILE

December 19, 1983

Mr. Fred Haas
MSM/SP Group
2601 Wyoming Boulevard NE
Albuquerque, NM 87112

REF: VALLE GRANDE APARTMENTS-PHASE III DATED NOVEMBER 23, 1983 (F20-D13)

Dear Mr. Haas:

The referenced drainage plan is in substantial agreement with the overall drainage report; therefore, this plan is approved.

I would like to extend my appreciation for the background information provided with this submittal, it was very helpful in the review of your plan.

If you have any further questions, please feel free to contact me at 766-7644.

Yours truly,

Fred J. Aguirre
Design Hydrologist

FJA:mrk

INFORMATION SHEET

PROJECT TITLE VALLE GRANDE - PHASE III TYPE OF SUBMITTAL PLAN IN CONCURRENCE W/ APPROVED DEVELT

ZONE ATLAS PAGE NO. F-20 & 21 CITY ADDRESS N.A.

LEGAL DESCRIPTION A PORTION OF ACADEMY ESTATES - UNIT 5

ENGINEERING FIRM MSM/SP GROUP CONTACT FRED HAAS

ADDRESS 2601 WYOMING NE, SUITE F PHONE 292-1936

OWNER ACADEMY DEVELOPMENT CONTACT GARY SWEARINGEN

ADDRESS 8401 SPAIN N.E. BLDG. 3D PHONE 821-6767

ARCHITECT BILL SHELTON CONTACT BILL SHELTON

ADDRESS 1113 RHODE ISLAND NE PHONE 262-2363

SURVEYOR MSM/SP GROUP CONTACT SEE ABOVE

ADDRESS _____ PHONE _____

CONTRACTOR N.A. CONTACT _____

ADDRESS _____ PHONE _____

DATE SUBMITTED 11/23/83

BY Fred Haas

Use this Information Sheet when submitting the following:

Drainage report or plan, conceptual grading and drainage plan, engineer's certification plan, erosion plan and grading plan. Provide the information applicable to your submittal.

RECEIVED

NOV 23 1983

ENGINEERING

MSM/SP Group
2601 Wyoming Boulevard, NE
Albuquerque, NM 87112
(505) 292-1936

A Member of the
SP Group of Professional
Services Companies
• Engineering
• Surveying
• Energy Services

November 21, 1983

City Engineering
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Attention: Fred Aguirre

Re: Valle Grande Apartments - Phase III Map No. F-20-913

Dear Fred,

Per our phone conversation of October 17, 1983, please find enclosed two (2) copies of the Drainage Plan for the referenced project which is in general compliance with the approved drainage report. The "Drainage Report for Valle Grande Apartments Bear Canyon Drainage Basin (Phases II, III, & portions of Phases IV & V)" April 1979, by Meurer, Serafini and Meurer, and supplemented by Addendum No. 1, April 26, 1979, was approved by the City of Albuquerque April 27, 1979. The basic premise of the approved report is to direct the runoff to a detention pond in the southeast corner of the study area. This detention pond and the outlet and storm sewer extension proposed in the Drainage Report are all now existing facilities.

Also enclosed, please find Figure III - Developed Drainage Characteristics, from the approved report. This is included to facilitate your review of the Phase III Drainage Plan. Figure III has been updated to show the flows generated by Phase III along with the offsite area which will be developed in the future and currently contributes runoff that will be conveyed through Phase III. 100 year developed runoff rates have been calculated using current City of Albuquerque criteria to verify compliance with the approved report. An information sheet, vicinity map, watershed soils map, and flood hazard boundary map are also included with this submittal.

If you have any questions, please advise.

Sincerely,

MSM/SP Group

Fred Haas
Design Engineer

FH:jb
Enclosures

RECEIVED
NOV 23 1983
ENGINE

ACADEMY DEVELOPMENT COMPANY

8401 SPAIN RD., N.E. BLDG. 3-D
ALBUQUERQUE, NEW MEXICO 87111
TELEPHONE 505 / 821-3767

GARY SWEARINGEN
PRESIDENT

August 31, 1983

Bernie Montoya
City of Albuquerque
Hydrology Department
Albuquerque, New Mexico

Re: Valle Grande Apartments
Drainage Inspection - Building 37
8401 Spain Rd., NE

Dear Bernie:

This letter will confirm that the vacant land adjacent to, and north of, building 37 is owned by this firm. Our master plan calls for development of this property as a part of the Valle Grande Apartment project.

Academy Development Company agrees to provide any maintenance required concerning damage to, or caused by, the vacant land in the event of possible soil erosion.

Sincerely,

Gary Swearingen

Gary Swearingen
President

GS/vl

Part copy in letters recd

MEURER, SERAFINI AND MEURER, INC. CONSULTING ENGINEERS • SURVEYORS • PLANNERS

2601 WYOMING BLVD., N.E., SUITE F • ALBUQUERQUE, NEW MEXICO 87112 • (505) 292-1936

February 25, 1980

F20-D13

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

RE: Valle Grande Apartments, Phase II

Dear Mr. Heller:

The Drainage Plan for the referenced development has been approved by the City of Albuquerque. The approved Drainage Plan consists of four ponding areas, two temporary retention ponds north of the property to retain 100 percent of 100-year, 6-hour runoff from offsite drainage areas. These temporary ponds are constructed and will be removed when this area is developed and permanent drainage facilities are built. The onsite drainage is to the two southern ponds, the southwestern pond is designed to retain the 100-year, 6-hour runoff and the southeastern pond is designed to detain the 100-year, 6-hour runoff from onsite and future development to the north of this site. This future development cannot proceed until the proposed stormwater drain is constructed along Spain Road and the 27-inch controlled outlet from the detention pond is connected to the proposed stormwater drain. The retention pond as designed will hold the 100-year, 6-hour onsite runoff with all offsite runoff being retained by the temporary ponds, as previously mentioned.

The construction date of the proposed stormwater drain along Spain Road is now known to be this year. The early construction of this drain causes the placement of the 6-inch P.V.C. temporary drain line to Spain Road to be an unnecessary expense. With your concurrence the owner would like to scarify both southern ponds and flood them to facilitate percolation to the groundwater, and not to construct the 6-inch temporary drain line to Spain Road. This would be beneficial to both the City of Albuquerque and the owner.

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

MEURER, SERAFINI, AND MEURER, INC.

A signature block is provided below for your concurrence. Thank you for your interest in this proposed change in the original Drainage Plan.

Sincerely,

MEURER, SERAFINI AND MEURER, INC.

Joseph W Abbott

Joseph W. Abbott
Project Engineer

Approved for the City of Albuquerque this 27th day of Feb '80 by: R S Heller.

Mr. Richard Heller
City Engineer

JWA:vlt

C.O. will be granted after presentation of as built survey of pond in SE corner & SW corner of property. Volume must comply w/ approved drainage report.

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE January 24, 1980 REF. NO._____

F20-013

TO: Richard Heller, City Engineer

FROM: Bruno Conegliano, Assistant City Engineer/Hydrology BC

SUBJECT: Camino Del Sol NE

I am enclosing copies of the addendum to Valle Grande Phase II, and of the computations performed by Billy Colsby, for the flows at the intersection. The total flows amount will be 140 c.f.s., 106 c.f.s. from Academy Acres 2 & 4, and 34 c.f.s. from Gary Swearenger's Development.

BC/lc
encl.

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
David Rusk

April 27, 1979

Mr. Wiley R. Smith, P.E.
Meurer, Serafin, and Meurer, Inc.
2801 Wyoming Blvd. N.E., Suite F
Albuquerque, New MEXICO 87110

F20-D13

Re: Valle Grande Apartments - Phase 2

Dear Mr. Smith:

I have reviewed the Addendum No. 1 for the captioned drainage study and I am in agreement. The drainage plan is therefore hereby approved.

Very truly yours,

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/ms

cc - Dick Heller
Rich Leonard
Drainage File

AN EQUAL OPPORTUNITY EMPLOYER

MEURER, SERAFINI AND MEURER, INC.
CONSULTING ENGINEERS • SURVEYORS • PLANNERS
2601 WYOMING BLVD., N.E., SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • (505) 292-1936

April 26, 1979

Mr. Bruno Conegliano
ACE-Hydrology
City of Albuquerque
City Hall, 4th Flood
Albuquerque, New Mexico 87102

RE: ADDENDUM NO. 1 TO DRAINAGE STUDY (SUBMITTED APRIL 4, 1979)
VALLE GRANDE APARTMENTS

Dear Bruno:

As a result of our conversation of April 25, 1979 in your office concerning the above-captioned project, I am submitting the information you requested as follows:

1. The new drainage study dated April, 1979 was submitted as a result of a meeting with Mr. R. Heller, City Engineer, in February 1979 after review of a previous drainage report for the development dated June, 1978. At this meeting, with Mr. Heller, our client agreed to provide one detention pond in place of the individual site ponds provided that the City of Albuquerque would extend a storm sewer up Spain Road, N.E. at no cost to our client. A connection to this storm sewer would then be made by our client to make this pond function as a detention pond for the ultimate development.

2. As stated, our client desires to develop only Phase II at this time. Since the storm sewer is not yet extended, this detention pond can act as a retention pond for Phase II. A review of Phase II indicates that 7.64 acres drains into this pond. Since the pond capacity without overflow is 50,788 cubic feet and total in-flow is 48,300 cubic feet, the existing detention pond can be used as a retention pond for Phase II (see Attachment & Figure IIIa).
All offsite flows will be retained in temporary ponds shown on Figure II, as stated in the report. The flows from sub-areas F-1 and F-2 are contained in retention pond F-2 (see Figure IIIa).

3. Please note that the previously approved Drainage Report for Valle Grande Apartments (Genge/Murray-McCormick) allows for 17.5 c.f.s. flow from the off-site area retention pond at the east boundary of the existing Valle Grande apartments. This Drainage Report reduces this existing 17.5 c.f.s. flow onto Spain Road N.E. to 10.5 c.f.s. (3.8 c.f.s. from Sub-area G-3 and 6.7 c.f.s. from Sub-area G-1 and G-2) as shown on Figure IIIa. This should improve the problem flooding that can occur on Spain Road N.E. until such time as the City can extend a storm sewer up Spain Road N.E.

If I can be of assistance in answering any further questions, please call.

Sincerely yours,

Wiley R. Smith, P.E.
Project Engineer

WRS/th

Enclosure

RICHARD E. LEONARD
EXECUTIVE ENGINEER

B. H. SWINBURNE, CHAIRMAN
WILLIAM V. HEREFORD, VICE-CHAIRMAN
FRANCES McCOY, SECRETARY-TREASURER
VERNON DOAK, DIRECTOR
RICHARD H. CLOUGH, DIRECTOR

Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

2600 PROSPECT AVE. N.E.
P. O. BOX 25851 - ALBUQUERQUE, N. M. 87125
TELEPHONE 344-3516

RECEIVED
DEC 08 1978
CITY ENGINEERS

December 8, 1978

Mr. Bruno Conegliano
Assistant City Engineer-Hydrology
P.O. Box 1293
Albuquerque, N.M. 87103

Dear Bruno:

Attached for your review and comment is a preliminary draft of a proposed agreement. Exhibit A is not yet available, but I believe you will recognize the property from our earlier discussions with Mr. Swearingen.

I have reviewed the situation with Stan Zuris. His opinion is that the agreement only requires the owner to do what our regulations already require. Therefore, I'm inclined to forget the agreement. If the owner wants to develop incrementally, we should require the usual drainage report. Only if he proposes to encroach on the 100-year flood plain should we demand channel improvements.

Please give me your thoughts.

Sincerely,

Richard E Leonard

Richard E. Leonard
Executive Engineer

Valle Grande

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

December 12, 1978

Mr. Carl Tebbens
Meurer, Serafini & Meurer
2601 Wyoming Blvd. N.E.
Albuquerque, New Mexico 87112

RE: VALLE GRANDE APARTMENTS

Dear Mr. Tebbens:

The drainage report for the captioned Subdivision needs to address two concerns:

1. Treatment of the offsite flows.
2. Internal drainage provisions.

Both concerns have to be solved in a manner consistent with City Polic[illegible] and with the AMAFCA RES. 72-2.

On the first question, the problem of the treatment of the Bear Arroyo Tributary must be addressed. As indicated to you in our conversation with Mr. Leonard and with Mr. Swearingen this past summer, it is incumbent on the developer to provide his proportionate share of the improvements necessary to implement the Northeast Albuquerque Acres Drainage management plan or Rice Report. That plan envisions the rerouting of the channel in a more Northerly position, together with the construction of drop structure and similar erosion protection facilities. Mr. Leonard has forwarded for my attention a draft of an agreement submitted to him by the developer's Attorney. It is my opinion that the agreement submitted is insufficient security for the City but I will defer to the opinion of our Legal Council and to the requirements that Mr. Heller will consider appropriate in this case. It is my opinion that an agreement of the type submitted needs to be supported by an appropriate bond from the developer. In the interim, before the planned rechannelization is executed, bank erosion protection will have to be provided to prevent undermining of any part of the development.

Secondly, an evaluation must be made of the 100 yrs. water surface elevation in the streets along the perifery of this parcel. An assessment must be made of the flooding potential, for instance, an elevation of 5102 ft. is indicated for Moon St. next to a proposed building for which the finished floor elevation is also given as 5102 ft.

Thirdly, the indication is given that 25 cfs are to be conveyed to the West into the adjacent development. What condition will result from this inflow and what provisions are available in that development for offsite flows?

Regarding the on-site provisions for ponding, the plan submitted is at such a small scale and with so few details to make it impossible to verify the adequacy of the proposal. Again, I need to reiterate that I have to be able to verify the balance between the drainage areas and the ponding volumes provided.

Your assistance and cooperation in providing answers to the questions above will be appreciated.

Sincerely,

Bruno Conegliano
Asst. City Engineer-Hydrology

BC/tl

cc: Rick Leonard, AMAFCA
Richard Heller, City Engineer
Dr. File

CITY OF ALBUQUERQUE, NEW MEXICO
CITY ENGINEER'S OFFICE

MEMORANDUM - December 11, 1978

TO: Richard S. Heller, City Engineer
FROM: Bruno Conegliano, Assistant City Engineer-Hydrology
SUBJECT: TRACT A, ACADEMY ESTATES #5

This letter pertains to Tract A, Academy Estates Unit 5, Page F-20 on Zone Atlas. It is the same developer of Academy Estates Unit 8. Carl Tebbens can give you a rundown of the situation. This is the result of the policy vacuum I mention in my memo to Rip. The agreement is not worth the paper it is written on since the development was not draining into the Bear Canyon Tributary (Exhibit 15 of Rice Report Plan). The opinion of Mr. Kimmick was that he did not have to do anything to the arroyo, Mr. Jim Smith concurred, so the City will be stuck with the construction of the half of the improvements provided that we can get the owner of the Northern parcel to build his half which, in the present circumstances, is doubtful. In regard to this parcel, the owner wants to build high density residences on his tract. Will benefit for the existence of an outfall (The Bear Canyon) but will not contribute his fair share to the overall cost of the drainage (channel) improvements. The problem is complicated by the fact that his property is not bound on the North by the Bear Canyon Tributary except for a very small segment (approximately where the Tract R2 is shown North of his property and West of Moon St.). Thence, the arroyo veers slightly to the North and a small triangular piece of land is left South of the arroyo belonging to a Doctor Edwards, owner of the Tracts labeled C2 and R2, who has shown on inclination to work in cooperation with anybody and would have to perform all the improvements just to be able to utilize the little triangle of land South of the arroyo mentioned above.

During the special session of the legislature last January, in accordance with Mr. Frank Horan, Jr., we tried to modify some existing legislation in order to be authorized to establish drainage improvement districts so that the needed channel improvements could be constructed in one single operation and the land owners would be charged for the improvements on a per acre basis of land falling within a given watershed. In that fashion, everybody would be treated equally and equitably and the appropriate improvements would be built. I went to lobby for the proposal in Santa Fe but it was shelved. Please note that this effort was undertaken precisely because of the conditions with this parcel of land.

According to my previous discussions with Carl, Mr. Swearinger and Rick Leonard, the developer would be required to construct a couple of drop structures in the channel at the boundary between his property and Dr. Edward's land which would amount to some $30,000 in cost and this is what the agreement refers to. Yet this contribution, which is very minor, does not reflect the benefit that

Mr. Swearinger has, being able to develop this land. Maybe this case should be discussed with Mr. Jaramillo because approval of the plat sets a precedent (so to speak) and verifies the fact that the City cannot enforce its regulations and get some guidance on basic policy decisions. At the very least, we need to have some money in escrow in some tangible form and here we need the help of Mac deVesty to draft an agreement that we can use as Standard, set aside an account for this type of agreement, keep with your office a running file of these agreements in the manner I mentioned to you a couple of days ago.

BC/tl

MEURER, SERAFINI AND MEURER, INC.

CONSULTING ENGINEERS • SURVEYORS • PLANNERS

2601 WYOMING BLVD., N.E., SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • (505) 292-1936

November 15, 1978

RECEIVED
NOV 20 1978
CITY ENGINEERS

City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Attn: Mr. Bruno Conegliano, Hydrology Engineer

Re: Addendum to Valle Grande Apartments Drainage Report

Dear Mr. Conegliano:

In order to comply with your request, the following revisions have been made to Valle Grande drainage report and grading plan.

The City's Drainage criteria states that developed flows for each drainage basin must equal undeveloped flow within each major drainage basin. The street and parking lot grades in the complex have been revised to direct sufficient runoff from the north end of the development into the Bear Arroyo tributary to meet these city requirements.

Siltation ponds will be constructed during the initial grading and building phases to reduce mud and sand flow into streets adjacent to the construction site.

These additions to the drainage plan for Valle Grande Apartments will bring this project into compliance with all city drainage requirements.

If you have any questions, please do not hesitate to call.

Sincerely yours,

MERURER, SERAFINI AND MEURER, INC

Frank Krim

Frank Krim
Project Engineer

Fk:vb

MEURER, SERAFINI AND MEURER, INC.

CONSULTING ENGINEERS • SURVEYORS • PLANNERS

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RECEIVED
FEB 15 1978
CITY ENGINEERS

F20.013

Bruno - This is what was agreed. Please prepare ltr. K.

February 13, 1978

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

Re: Academy Estates, Unit 5 (Valle Grande Apartments)

Dear Mr. Kimmick:

Pursuant to our meeting on February 2, 1978, which included Gary Swearingen, Bruno, yourself, and me; I would like to summarize what I feel were the results of our drainage related meeting.

As we discussed we would like to prepare a preliminary drainage and grading plan for the balance of the apartment units to the east of the Phase I apartment complex which is constructed as of this time. The drainage study which would be in conformance with the City of Albuquerque and A.M.A.F.C.A. requirements would be submitted to you for approval.

Gary intends to build the balance of his apartment complex in small phases as the market permits; therefore, it was agreed that individual drainage studies for those small phases would not be required as long as each phase conformed to the master drainage plan approved by the City. If your understanding of our meeting is any different that I have mentioned above, please inform me in writing. Thank you.

Very truly yours,

MEURER, SERAFINI AND MEURER, INC.

Carl A. Tebbens

Carl A. Tebbens, P.E.
Vice President

CAT:dw

cc: Mr. Gary Swearingen

drainage file

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

May 31, 1977

Mr. Word H. Payne
829 Pennsylvania N.E.
Albuquerque, New Mexico 87110

Re: Flooding in Academy Estates, Unit 3, Blocks 9A & 10A

Dear Mr. Payne:

In reply to your recent inquiry regarding the flood prone area in Academy Estates, Unit 3, I am enclosing a copy of the plat with an outline of the flood prone area. This outline was obtained from the Flood Hazard Map prepared by the Federal Insurance Administration. Please bear in mind that any lot that is marginally affected by the flood boundary line is considered inside Zone A (i.e. lots 22, 23, and 24).

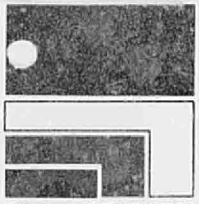
I hope that the enclosed information will satisfy your requirements.

Very truly yours,

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/kr

NEW ADDRESS:
829 PENNSYLVANIA N. E.
ALBUQUERQUE, N. M. 87110



WORD H. PAYNE CO.

DEVELOPER AND BUILDER

360 Menaul Blvd., N.E., Albuquerque, N.M. 87107

Telephone (505) 345-3601

May 16, 1977

RECEIVED
MAY 16 1977
CITY ENGINEERS

Mr. V.M. Kimmick, City Engineer
City of Albuquerque
400 Marquette Ave. N.W.
Albuquerque, New Mexico

Dear Mr. Kimmick:

The purpose of this letter is to ask that your office determine which of the following lots are deleted from the flood hazard boundary map which I understand will be due about June 24, 1977:

Unit #3, Academy Estates, Being a repeat of Blocks 9 & 10, Unit #2. Academy Estates:

. .

Block 9-A: Lots 1,2,18,32,33,36,37,38,39,40,41,56 & 57.

Block 10-A: Lots 5,6,7,8,9,10,13,14,15,16,17,18,19,20, 21,22,23,24,25,26,29,30,33, & 34.

If you require any addition data or assistance from me please let me know.

Yours very truly,
WORD H. PAYNE CO.
Word H. Payne
Word H. Payne

Bruno —
Can you determine?
L

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

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

March 29, 1977

Mr. Ricardo J. Goncalves
Genge/Murray-McCormick
2601 Wyoming Blvd. N.E.,Suite F
Albuquerque, New Mexico 87110

SUBJECT: VALLE GRANDE APARTMENTS
(Academy Estates No. 5)

Dear Mr. Goncalves:

Your letter of March 21, 1977 and the attached drainage report revision has been reviewed and is approved. Please forward one additional copy of the revised report.

Sincerely,

V. M. Kimmick
City Engineer

VMK/fs

cc: Bob Kielich
Dwayne Sheppard
Bruno Congeliano

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

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kitzinhenz

March 1, 1977

Mr. Carl A. Tebbens, P.E.
Genge/Murray-McCormick
2601 Wyoming Blvd. N.E., Suite F
Albuquerque, New Mexico 87110

SUBJECT: VALLE GRANDE APARTMENTS (ACADEMY ESTATES #5)

Dear Mr. Tebbens:

The drainage report forwarded by your letter of February 17, 1977 has been reviewed and comments are indicated below.

1. There are portions of the site which lie within Zone A of the Flood Hazard Boundary Map. While measures proposed in this study may indicate the removal of the area from Zone A, this office cannot make such a judgment. It will be necessary to submit data to the Federal Flood Insurance Agency as outlined in Part 1920, Federal Register, Vol. 41, No. 207, Tuesday, October 26, 1976 via this office, to attempt such an action.

2. The diversion of 89cfs from OSA-1 to Spain Road cannot be approved. The grades of Spain are too gentle to handle such flows. In addition, such flows would then be conveyed directly

Public Works Department

Director — Erwin F. Hensch, 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.

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to Wyoming Blvd. Some alternate way of handling these flows to the Bear Arroyo is suggested.

3. Where other flows are to discharge into Spain Road or Wyoming Blvd., they should be directed to flow within the gutter. Flows are not to cross Spain Road or Wyoming Blvd.

Sincerely,

V. M. Kimmick
City Engineer

VMK/fs

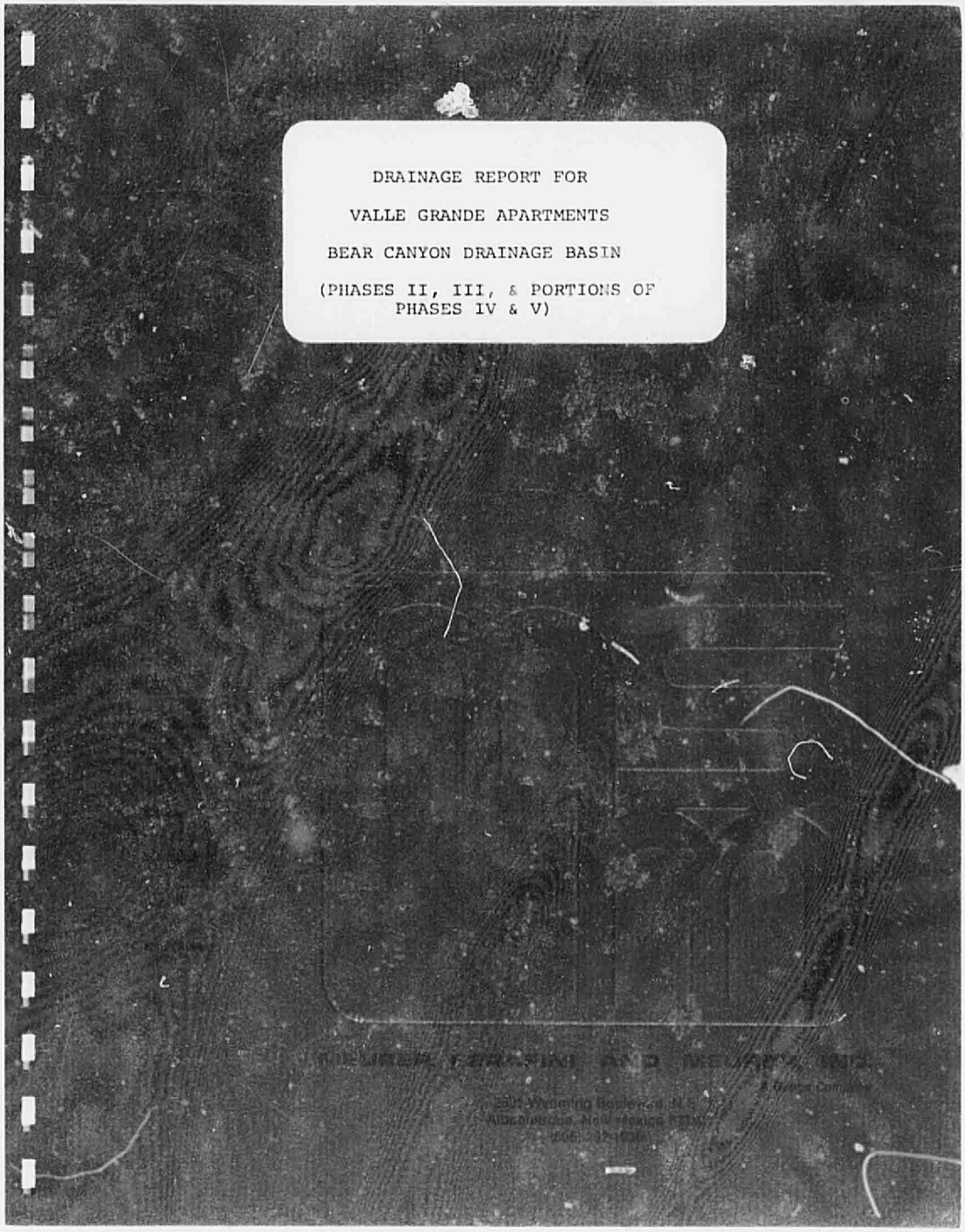
cc: Jim Smith
Dwayne Sheppard
Bob Kielich
Drainage File

DRAINAGE REPORT FOR

VALLE GRANDE APARTMENTS

BEAR CANYON DRAINAGE BASIN

(PHASES II, III, & PORTIONS OF PHASES IV & V)



DRAINAGE REPORT FOR

VALLE GRANDE APARTMENTS

BEAR CANYON DRAINAGE BASIN

(PHASES II, III, & PORTIONS OF PHASES IV & V)

RECEIVED
APR 05 1979
CITY ENGINEERS

Prepared For

Academy Development Company
8401 Spain Road N.E.
Albuquerque, New Mexico 87111

April 1979

Prepared By

Meurer, Serafini and Meurer, Inc.
2601 Wyoming Boulevard N.E.
Albuquerque, New Mexico 87112

(505) 292-1936

MEURER, SERAFINI AND MEURER, INC.
CONSULTING ENGINEERS • SURVEYORS • PLANNERS
2601 WYOMING BLVD., N.E., SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • (505) 292-1936

April 4, 1979

Mr. Brunc Conegliano
Assistant City Engineer-Hydrology
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Drainage Report for Valle Grande Apartments

Dear Bruno:

Enclosed please find the Drainage Report for the above captioned development located immediately north of the intersection of Spain and Camino del Sol, N.E., on behalf of Academy Development Company.

I request that you review and comment for approval of the attached report. Should you have any questions, please contact me at 292-1936.

Sincerely,

MEURER, SERAFINI AND MEURER, INC.

Wiley R. Smith, P.E.
Project Engineer

Enclosure

DRAINAGE REPORT

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Figure I	Vicinity Map & Undeveloped Drainage Characteristics
Figure II	Grading Plan - Phase II
Figure III	Developed Drainage Characteristics
Figure IV	Composite Area Hydrograph
Figure V	Storage-Discharge Curve

Bibliography

DRAINAGE REPORT FOR

VALLE GRANDE APARTMENTS

INTRODUCTION

This drainage report analyzes the drainage characteristics for a fully developed apartment complex and outlines the ponding requirements for Phases II, III, portions of IV and V that drain to the Bear Arroyo. Recommendations for control of the developed site runoff and temporary retention of runoff for development of Phase II are presented in the following text.

The overall property is described in the previous Valle Grande Drainage Report (March 1977) as Phase "B". It should be noted that only that portion of Phase B that drains to the Bear Canyon Arroyo is considered in this drainage report (Drainage Areas UD-2 and UD-1, Figure I inclusive). That portion of this tract which drains to the Bear Arroyo Tributary is excluded from this report and will not be discussed (Drainage Area UD-A, Figure I). The subject property is located in the Northeast Heights and is bounded on the south by Spain Road N.E., on the west by the existing Valle Vista Apartments, on the east by Camino del Sol, N.E., and on the north by the Bear Arroyo Tributary. More particularly, the area comprises the R-2 portion of Unit 5, Zone Atlas page F-20 (Vicinity Map, Figure I) within Section 32, T. 11 N., R. 4 E., New Mexico Principal Meridian.

The development is part of a larger drainage basin draining to the Bear Arroyo south of Spain Road N.E., along Camino del Sol N.E., and Wyoming Boulevard N.E. Offsite flows to the east are diverted north to the Bear Tributary and south to Camino del Sol by paving

improvements along Moon Street, thus, only the onsite flows need to be considered. The land slopes at an average 3.5 percent to the southwesterly direction to meet Spain Road and the east property line of the existing Valle Vista Apartments. The offsite flow is presently contained in a temporary pond approved in Phase A which flows overland south to Spain Road N.E., and the southwest corner of the development. The area is sparsely covered with native vegetation of mesa dropseed, black grama, blue grama and some cholla cactus. Soils are of the Embudo and Embudo-Tijeras complex Type B classification. Soils are primarily silty sands with lesser amounts of clean sand and slightly clayey sands.

Runoff is medium with a moderate water erosion hazard. Permability is moderate in the upper 20 inches and very rapid below 20 inches.

At present, precipitation falling on this site forms a sheet flow before accumulating in two well defined drainage swales. As previously mentioned, flows then travel southwest to a pond and leave the site at the southwest corner of the development at a controlled discharge rate of 17.5 cfs onto the north half of Spain Road N.E. Since this temporary detention pond is to be removed to construct Phase II, two additional detention ponds will be constructed as shown on the Phase II, Grading Plan, Figure II.

This report will analyze the existing and proposed flows and will show that the increase in runoff will be accommodated with a combination of detention and retention ponding with controlled discharge so as not to exceed the 31.5 cfs flow capacity discussed in the Phase A Drainage Report.

DESIGN CRITERIA

To analyze the change in runoff resulting from development of this tract of land, the effects of converging flows with regard to establishing peak flows and time to peak, storage pond sizing and routing of on-site flows reveal, an extreme limitation in utilization of the traditional (Q = CIA) Rational Method approach. To determine the effects of these parameters in a logical, yet readily assimilated procedure, the SCS Method as modified for effects of urbanization has been chosen for this report. The methods are fully explained in the SCS National Engineering Handbook, Section 4, Hydrology and "SCS Urban Hydrology For Small Watersheds," Technical Release No. 55 (see Bibliography). This method is in general usage by many major cities in the United States and offers the advantages of considering soil types, lag time, slope and shape factors for varying basin configuration and the unit hydrograph for determination of the maximum time of peak and peak flow to be expected. The 100-year, 6-hour storm runoff for both the undeveloped and proposed developed conditions are calculated. Peak flows are compared to the Rational Method and similar values resulted. These comparative results will be presented later in this report.

A summary of equations and explanation of terminology are contained in the Appendix (page A-7).

UNDEVELOPED FLOW CONDITIONS

The site was analyzed for runoff in the undeveloped state by the Rational Method and SCS Method (see Appendix, pages A-2 through A-4B).

It should be noted that the Rational Method produced a maximum runoff of 52.8 cfs while the SCS Method yielded a maximum runoff of 51.9 cfs or less than 1 cfs difference. Given the lesser reliance on "Engineers Judgement" in determining "C" values and the added ability to determine intermediate flows at various times as well as time to peak, the results of the SCS Method are of much greater application. Existing flows of 30.9 cfs and 28.1 cfs would leave the site in a southwesterly direction as shown on Figure I. A temporary pond along the east property line of Valle Grande Apartments direct this outflow on to Spain as outlined in the Phase I Drainage Report.

DEVELOPED FLOW CONDITIONS

When the site is fully developed, runoff flows from contributing areas of internal flows are as shown on Figure 3. A summary of the sub-areas and peak flows is found in the Appendix (pages A-5 and A-6). The peak flows were determined by the SCS Method based on a curve number of 74 as derived from page A-4A. It should be noted that travel time on page A-5 is not a sum of individual sub-area travel times, but rather the time to peak (Tp) as calculated and shown on page A-6. A comparison of overland flow times versus the computed time to peak shows similar results. By grading this site, the original drainage swales that travel in a southwesterly direction will be eliminated. This grading will allow flows to be directed along streets and grassed drainageways into detention and retention ponds shown in sub-areas F-2 and C-4 respectively. The contained flows from sub-areas F-1 and F-2 will be contained in a one-foot deep pond as shown on Figure III.

The remaining on-site flows will be either directed toward the large detention pond within sub-area C-4 or allowed to discharge along internal streets at G-2 and G-3 and at the Spain Road entrance at G-4. Water blocks will be constructed to prevent flows from crossing sub-area boundaries. The large detention pond in sub-area C-4 will have a 27-inch diameter RC pipe stubbed out for connection to the future storm sewer in Spain Road. This pipe will be plugged at present. However, by analyzing the composite inflow hydrograph (Figure IV) and storage discharge curve (Figure V) it can be seen that the peak flow can be reduced to a maximum discharge of 34 cfs when the pond depth reaches 2.3 feet. The top of berm will have a one-foot freeboard at maximum depth. The storage-discharge curve, Figure V, was derived utilizing the SCS Storage-Indication Method outlined in Chapter 17, Section 4, Hydrology, previously cited (see Bibliography).

Since there is no existing storm drain in Spain Road at present, a temporary overflow from the detention pond will discharge at a controlled rate of 17.5 cfs or less onto Spain Road. When the City installs a storm drain on Spain Road, they can connect to this drain and the developer will remove the overland weir outflow, and the surface runoff from this site will be very minimal.

Since only Phase II is to be constructed at this time, the developer will install two temporary retention ponds as shown on Figure II. These two ponds will intercept the flows from the undeveloped areas and retain this runoff. The two permanent ponds in sub-areas C-4 and F-2 will be constructed with 3 to 1 side slopes at the locations and depths indicated.

The two temporary ponds will be constructed with 2 to 1 side slopes and depth of 3.5 feet. This will allow for a maximum capacity of 56,600 ft.^{3} and 40,250 ft.^{3}, and one foot of freeboard above high water. C = 0.63 (Phase A Report), I = 5.4".

RECOMMENDATIONS

The following recommendations are made to enable the developer to progress with Phase II of the apartment complex as shown.

OFFSITE FLOWS

1. It is recommended that one temporary retention pond be constructed on the northeast boundary and one temporary retention pond be constructed on the north boundary of Phase II to intercept undeveloped runoff flows. Detention ponds would retain 41,100 ft.^{3} and 25,150 ft.^{3} respectively at an average depth of 2.5 feet. Bottom could be rectangular in shape so as to have minimum land surface areas of 15,400 ft.^{2} and 9,200 ft.^{2} respectively.
2. Streets within the Phase II complex will be private and not required to meet City standards. However, it is recommended that all streets have an inverted crown of 1% slope to the centerline of pavement and 6" curbs.
3. Areas designated as detention areas should have a constant cross-section with no crown. The detention basin in sub-area C-4 should have a positive slope toward the outlet of 0.5% maximum.
4. Water blocks are recommended in streets as shown on Figure III to facilitate movement of runoff as shown. Water blocks should have a one foot differential from flowline to crown of street.

5. Based on the soil investigation for Academy Estates, Unit 8, it is recommended that ponding should be at least 15 feet away from structures and footings. Drainage swales shall be at least 1% minimum grade.

CONCLUSION

The proposed construction, by means of temporary and permanent retention and detention ponds will contribute less external runoff to the surrounding areas than previously existed before development.

Prepared by:

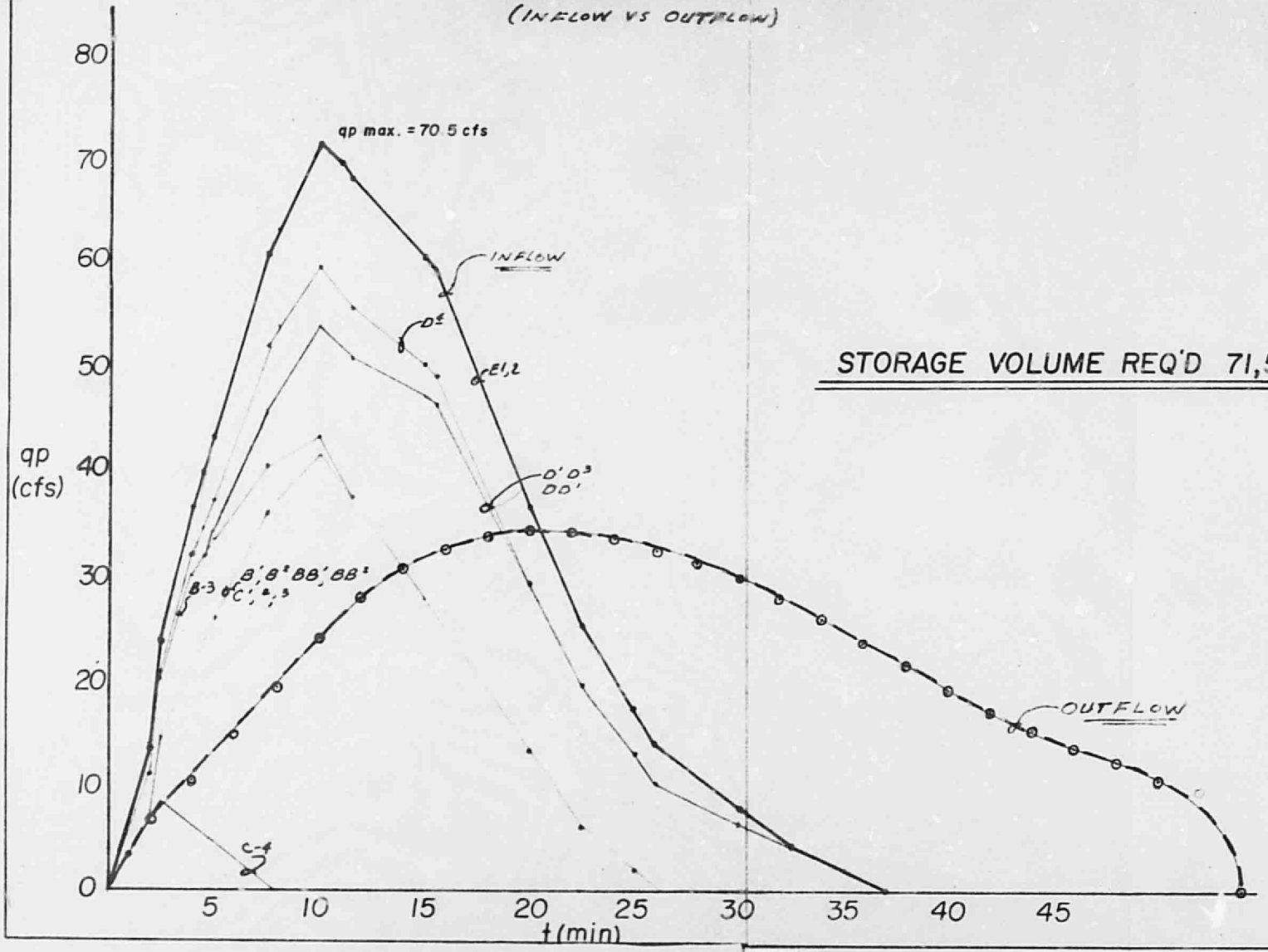
Wiley R. Smith
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3. "Drainage Report, Valle Grande Apartments," Genge/Murray-McCormick, Inc., March 1977.
4. "AMAFCA Drainage Resolution 72-2" with 100 year, 6-hour Precipitation Chart by U.S. Weather Bureau.
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6. SCS National Engineering Handbook, Section 4, Hydrology, Victor Mockus, August 1972.

COMPOSITE HYDROGRAPH

(INFLOW VS OUTFLOW)

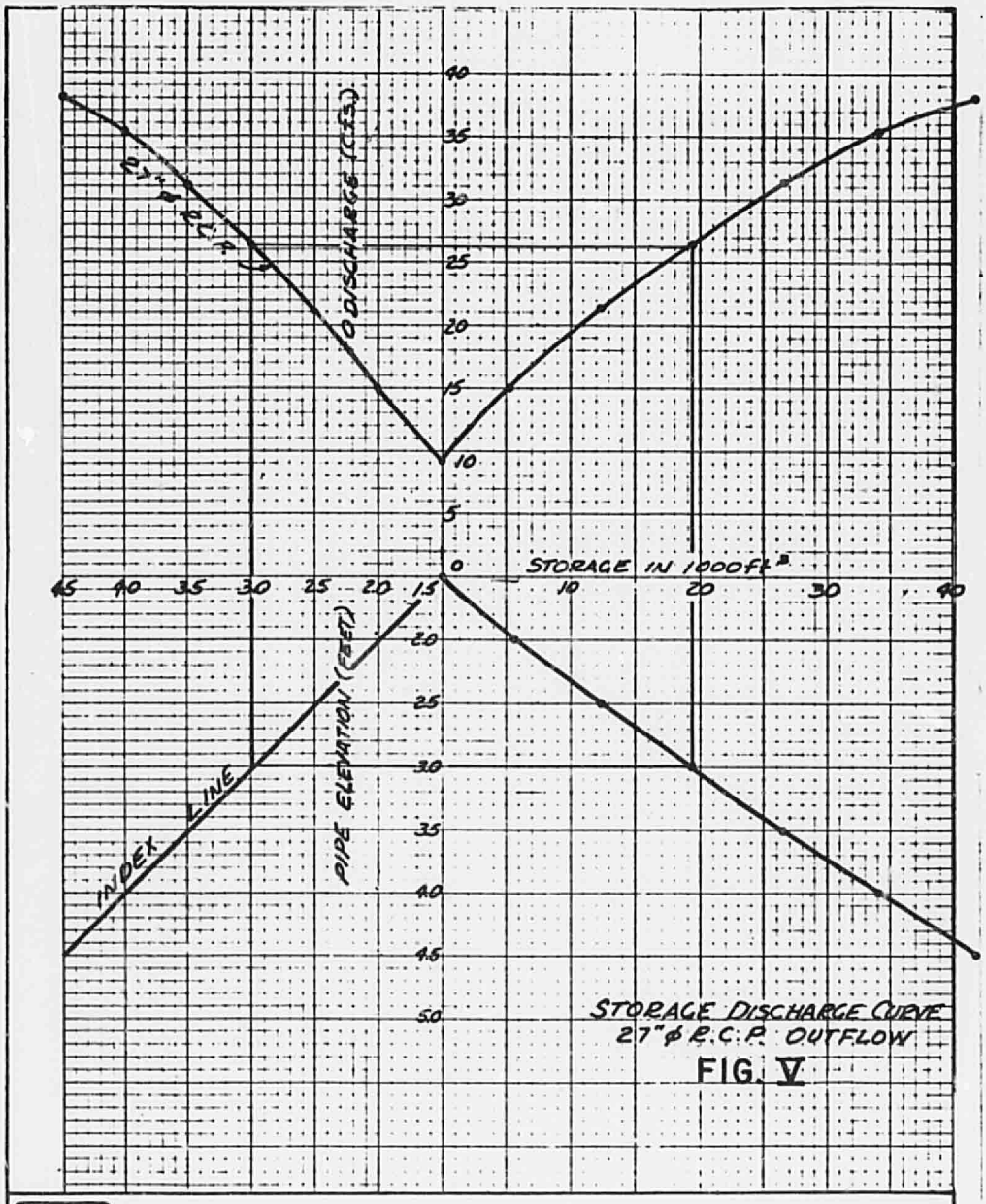


STORAGE VOLUME REQ'D 71,505 ft.³

FIG. IV

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STORAGE DISCHARGE CURVE
27"ϕ R.C.P. OUTFLOW

FIG. V

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APPENDIX

(URBAN) SCS HYDROLOGY EQUATIONS

P = Total Storm Rainfall (inches) = 2.5" - 100yr/6Hr Storm)

S = Potential Abstraction (inches)

$S = \frac{1000}{CN} - 10$ (CN - Runoff Curve Number for Urban Land Use)

CN = 74 Type "B" Soil (Embudo Soil - Soil Survey of Bernalillo County)

1. $S = \frac{1000}{74} - 10 = 3.51"$

Q = Actual Direct Runoff (inches)

2. $Q = \frac{(P - 0.2S)^2}{P + 0.8S} = \frac{[2.5 - 0.2(3.51)]^2}{2.5 + 0.8(3.51)} = 0.610"$

L = Lag to Maximum Runoff (Hours)

$L = \frac{\ell^{0.8}(S+1)^{0.7}}{1900\, y^{0.5}}$ ℓ = Length of Watershed (Ft), y = Avg Slope (%)

L' = 60 L (Lag in Minutes)

3. $L' = \frac{60\,\ell^{0.8}(3.51+1)^{0.7}}{1900\, y^{0.5}} = 9.064(10^{-2})\frac{\ell^{0.8}}{y^{0.5}}$

T_c = Time to Flow From Most Remote Point to Point of Reference

4. $T_c = 1.67\,L'$ (MIN)

T_p = Time-to-Peak Discharge (minutes)

5. $T_p' = \frac{.133\,T_c}{2} + L'$

T_B = Time Base of Unit Hydrograph (minutes)

6. $T_B = 3\,T_p$

q_p = Peak Hydrograph Discharge (CFS)

A = Drainage Area (mi^2), A' = DA(acres)(1/640)

7. $q_p = \frac{484\,AQ}{T_p} = \frac{484(A'/640)(60\,min/hr)(0.61)}{T_p'} = \frac{27.65\,A'}{T_p'}$

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SCALE —

UNDEVELOPED CONDITION

SCS METHOD

Soil Type "B" - EMBUDO-TIJERAS Type

$L'_{(Lag)(min)} = \frac{\ell^{0.8}(S+1)^{0.7}}{1900\ y^{0.5}}(60)$, $S = \frac{1000}{CN} - 10$

$T_c = 1.67\,L'$ (Time of Conc. in Min)

$T_p' = \frac{.133}{2} T_c + L'$ (Time to Peak in Min.)

$T_B = 3\,T_p'$ (Time Base-Min)

$q_p = \frac{484\,A\,Q}{T_p}$ { q_p = Flow Runoff at Peak; A = Area (M.²); T_p = Time (Hrs)

CN = 79 (Range Land - Poor Condition - See A-4A)

$\therefore S = \frac{1000}{79} - 10 = 2.66$

$Q = \frac{(P-0.2S)^2}{P+0.8S} = 0.837"$

US Weather Bureau (P = 2.5") 100 YR - 6HR Storm

Area	Acreage	L'(min)	T_c	T_p'(min)	T_B(min)	ℓ(ft)	$Y_{\%}$	q_p (cfs)
UD1	13.56	15.3	25.6	17.0	51.0	1600	3.5	22.1
UD2	18.10	14.5	24.2	16.1	48.3	1500	3.5	30.9
(See A-3 Hydrograph) Σ UD1&2	31.66			17.0	51.0			51.9

RATIONAL METHOD

$Q = CiA$ $\quad i = \frac{189}{T_c + 25}$ Near Bare Soil (See A-4B)

$Q_{UD1} = 0.35(4.7)(13.6) = 22.4$ cfs

$Q_{UD2} = 0.35(4.8)(18.1) = 30.4$ cfs

$\Sigma Q = 52.8$ cfs

AREA UD1: $V_{AVG} = 1.8$ fps

$T_c = \frac{1600}{1.8(60)} = 14.8$ min

AREA UD2: $V_{AVG} = 1.8$ fps

$T_c = \frac{1500}{1.8(60)} = 13.9$ min

UD1 - $(i = \frac{189}{40} = 4.7")$

UD2 - $(i = \frac{189}{39} = 4.8")$

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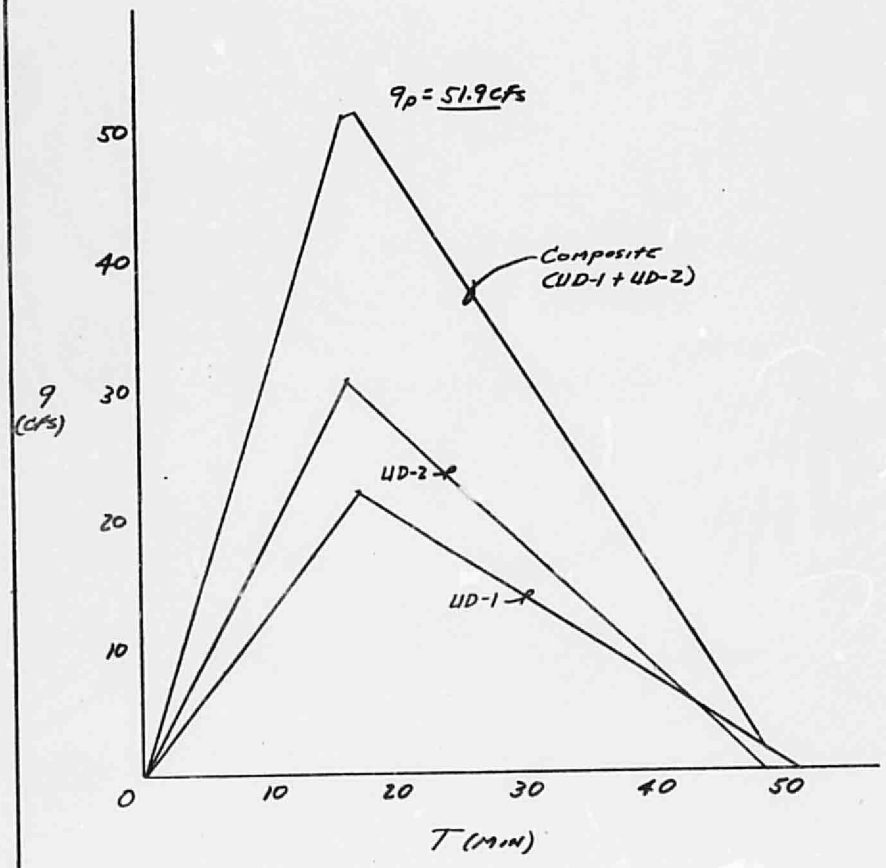
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UNDEVELOPED CONDITION

"UNIT & COMPOSITE HYDROGRAPHS"



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Table 2-2.--Runoff curve numbers for selected agricultural, suburban, and urban land use. (Antecedent moisture condition II, and $I_a = 0.2S$)

LAND USE DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Cultivated land[1]: without conservation treatment	72	81	88	91
: with conservation treatment	62	71	78	81
Pasture or range land: poor condition (UNDEVELOPED)	68	79	86	89
good condition	39	61	74	80
Meadow: good condition	30	58	71	78
Wood or Forest land: thin stand, poor cover, no mulch	45	66	77	83
good cover[2]	25	55	70	77
Open Spaces, lawns, parks, golf courses, cemeteries, etc.				
good condition: grass cover on 75% or more of the area	39	61	74	80
fair condition: grass cover on 50% to 75% of the area	49	69	79	84
Commercial and business areas (85% impervious)	89	92	94	95
Industrial districts (72% impervious).	81	88	91	93
Residential:[3]				
Average lot size / Average % Impervious[4]				
1/8 acre or less / 65	77	85	90	92
1/4 acre / 38 (DEVELOPED)	61	75	83	87
1/3 acre / 30	57	72	81	86
1/2 acre / 25	54	70	80	85
1 acre / 20	51	68	79	84
Paved parking lots, roofs, driveways, etc.[5]	98	98	98	98
Streets and roads:				
paved with curbs and storm sewers[6]	98	98	98	98
gravel	76	85	89	91
dirt	72	82	87	89

[1] For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, Aug. 1972.

[2] Good cover is protected from grazing and litter and brush cover soil.

[3] Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

[4] The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

[5] In some warmer climates of the country a curve number of 95 may be used.

Developed Conditions

VALLE GRANDE APARTMENTS

"SUB-AREA TRAVEL TIMES"

Curve	Area	Velocity	Length

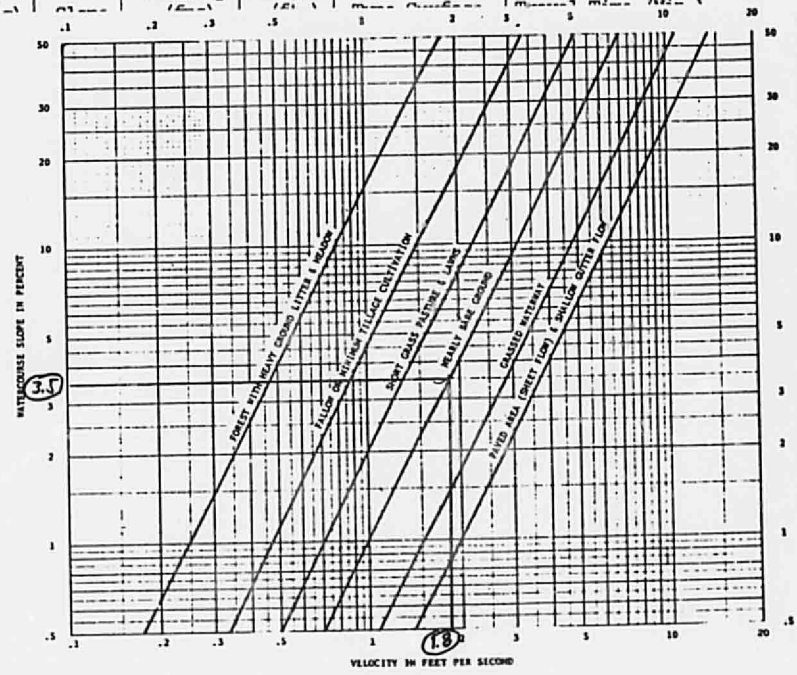


Figure 3-1.--Average velocities for estimating travel time for overland flow.

A-48

74	E-1
74	E-2
Σ E-1,2	
74	F-1
74	F-2
Σ G-1 & G-	
74	G-3
74	G-4

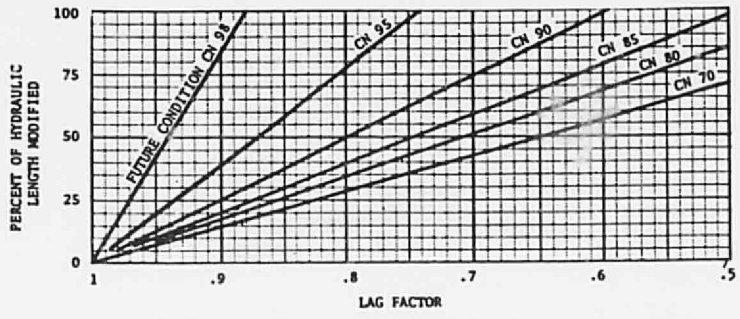


Figure 3-4.--Factors for adjusting lag from equation 3-2 or figure 3-3 when the main channel has been hydraulically improved.

DEVELOPED CONDITIONS

VALLE GRANDE APARTMENTS

SUB-AREA "PEAK DISCHARGES"

% Improved	Area No.	Acreage	L'	T_c	T_p'	T_b	q_p
80%	B-1,2,BB-1,2	8.14	(14.4x.5=7.2)	12.0	8.0	24.0	28.1 cfs
75%	B-3	1.22	(6.9x.5=3.4)	5.7	3.8	11.4	8.9 "
50%	C-1 thru C-3	4.42	(10.0x.67=6.7)	11.2	7.4	22.4	16.5 "
50%	C-4	0.78	(4.6x.5=2.3)	3.8	2.6	7.8	8.3 "
80%	D-1 thru D-3 & DD-1	7.85	(19.4x.5=9.7)	16.2	10.8	32.4	20.1 "
50%	D-4	1.42	(8.3x.67=5.5)	9.2	6.1	18.3	6.4 "
85%	E-1 & E-2	4.93	(18.4x.5=9.7)	16.2	10.8	32.4	12.6 "
50%	F-1	0.73	(6.1x.67=4.1)	6.8	4.6	13.8	4.4 "
50%	F-2	0.87	(3.8x.67=2.5)	4.2	2.8	8.3	8.6 "
50%	G-1 & G-2	1.17	$(\frac{5.6}{6.4}x.67=4.3)$	7.2	4.8	14.4	6.7 "
100%	G-3	0.25	(3.1x.5=1.6)	2.7	1.8	5.4	3.8 "
100%	G-4	0.19	(2.7x.5=1.4)	2.3	1.6	4.8	3.3 "

"CALCULATIONS"

DEVELOPED CONDITIONS

SAMPLE CALCULATIONS - SCS METHOD

SUB-AREAS B-1, B-2, BB-1, BB-2

SLOPE (Y) = 1.4%

AREA (A') = 8.14 Ac.

LENGTH (ℓ) = 700 Ft

$L'(LAG) = 9.064(10^{-2}) \frac{\ell^{0.8}}{Y^{0.5}}$ (EQUATION 3, PAGE A-1)

$= 9.064(10^{-2})\left(\frac{700^{0.8}}{1.4^{0.5}}\right) = 14.4$ minutes

80% CHANNEL IMPROVED (LAG FACTOR = 0.5 FOR CN = 74)

$\therefore L' = 14.4(.5) = 7.2$ MIN.

T_c (TIME OF CONCENTRATION) $= 1.67 L'$ (EQUA. 4, PG A-1)

$T_c = 7.2(1.67) = \underline{12.0}$ min

$T_p' = \frac{0.133}{2} T_c + L'$ = Time to Peak Flow (EQUA 5, PG A-1)

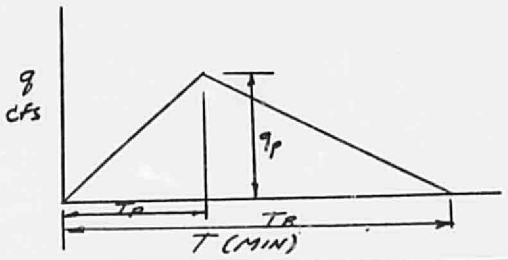
$T_p' = \frac{0.133}{2}(12.0) + 7.2 =$ **8.0 MIN**

T_B (TIME BASE) $= 3.0\, T_p'$ (EQUA. 6, PG A-1) $= 3(8.0) = 24.0$

$q_p = \frac{27.65\, A'}{T_p'}$ = PEAK DISCHARGE (EQUA. 7, PG A-1)

$q_p = \frac{27.65(8.14)}{8.0} = \underline{\underline{28.1}}$ CFS

SAMPLE UNIT HYDROGRAPH



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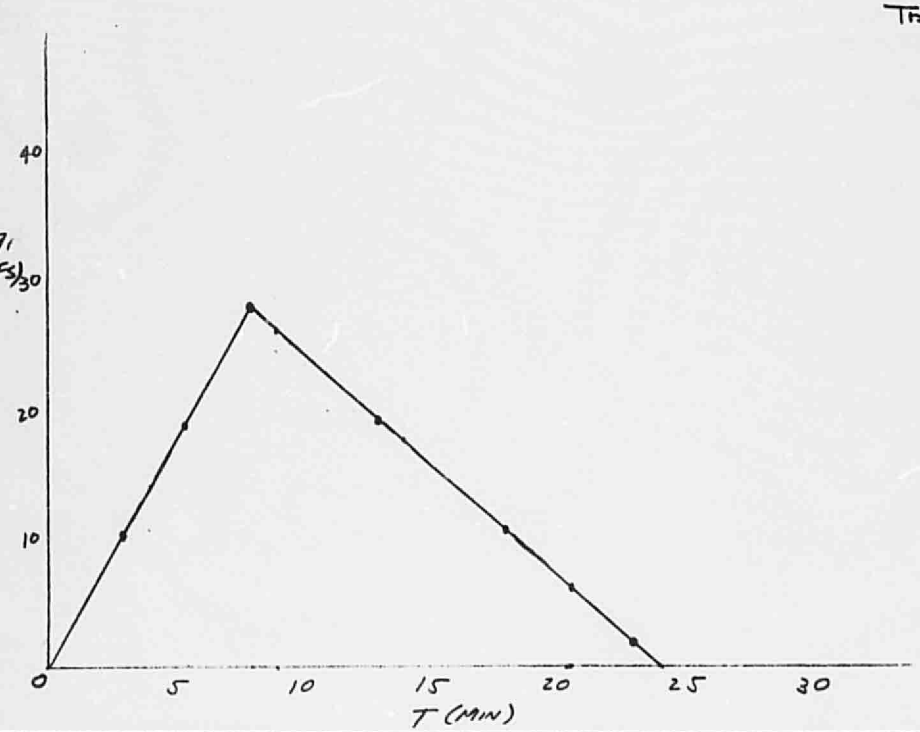
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POND #1 SCALE —

INFLOW HYDROGRAPH
(AREAS B1, B2, B81 & B82)

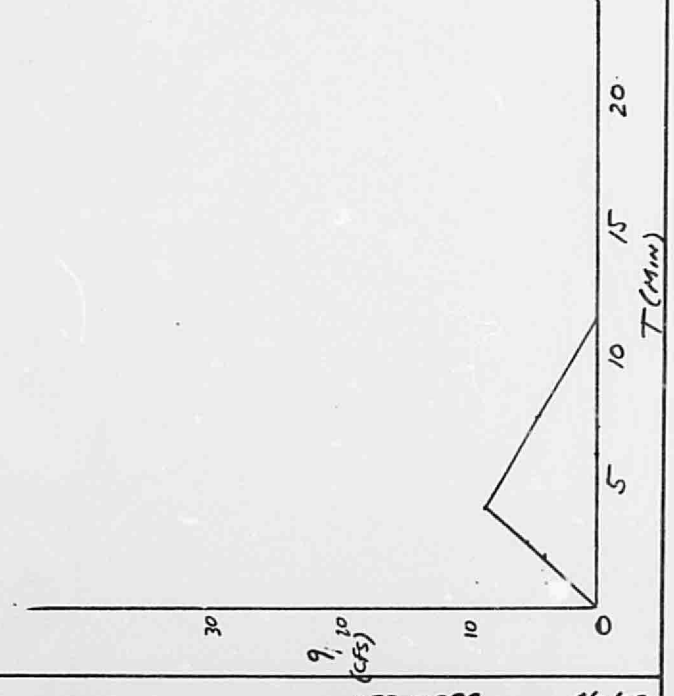
Travel Time to Pond
(t_t = 2.0)



INFLOW HYDROGRAPH

(AREA B-3)

$T_r = 0$



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PROJECT Valle Grande Apts

SCALE ____

A-3

INFLOW HYDROGRAPH
(AREAS C1-C3)
$T_T = 0$

A-10

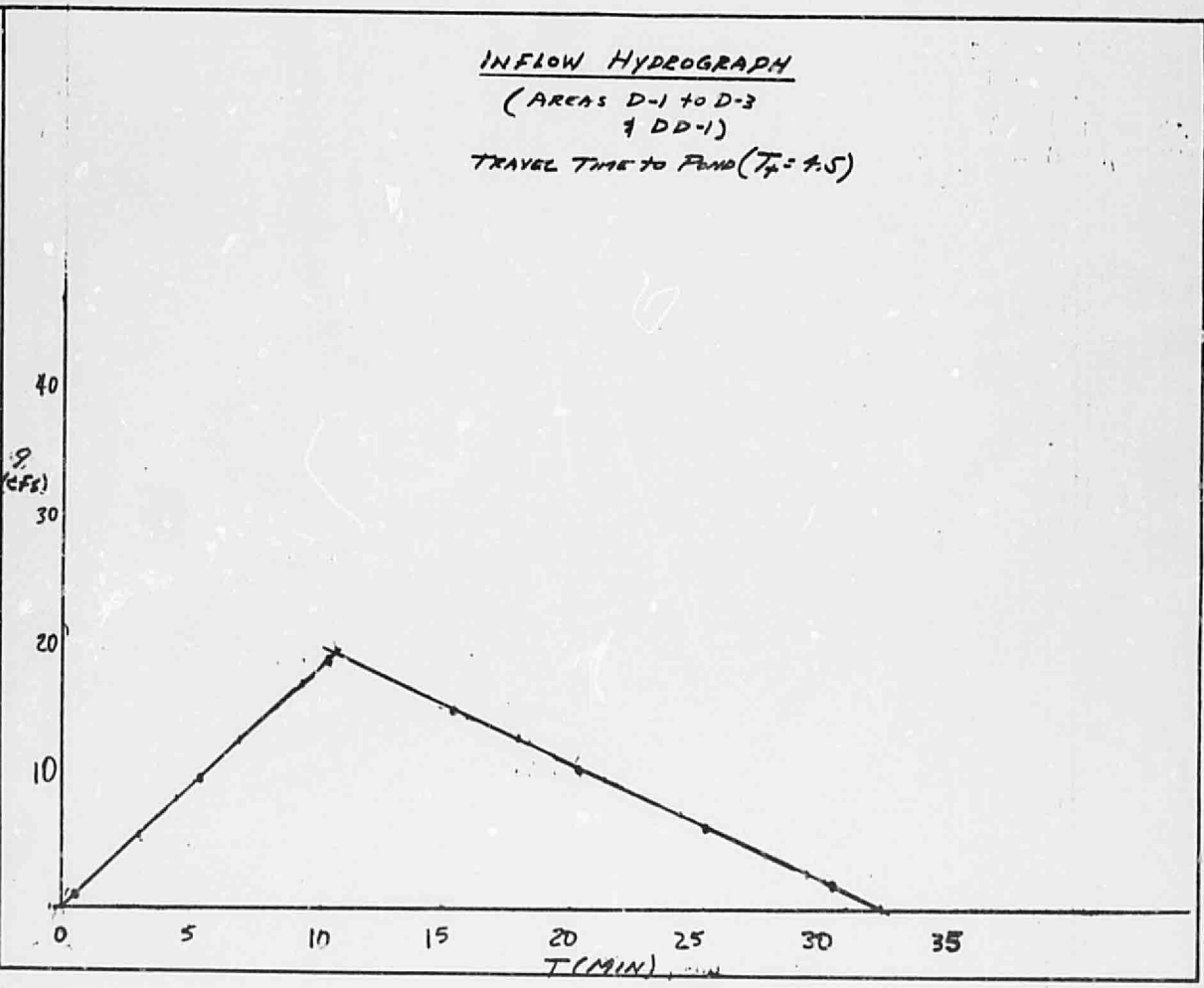
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JOB NO. 252-0089 DATE 4/12/89
PROJECT VALLE GRANDE APTS.
SCALE —

INFLOW HYDROGRAPH

(AREAS D-1 TO D-3 & DD-1)

TRAVEL TIME TO POND (T_t = 4.5)

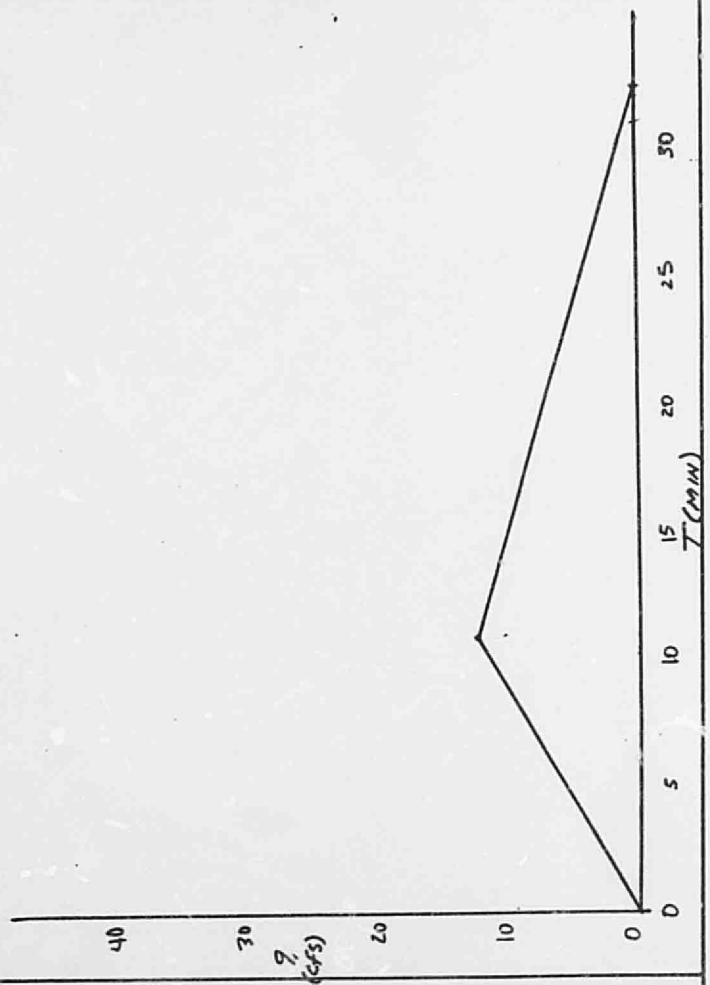


A-11

A-4

INFLOW HYDROGRAPH
(ARMS E1 & E2)

$T_F = 0$



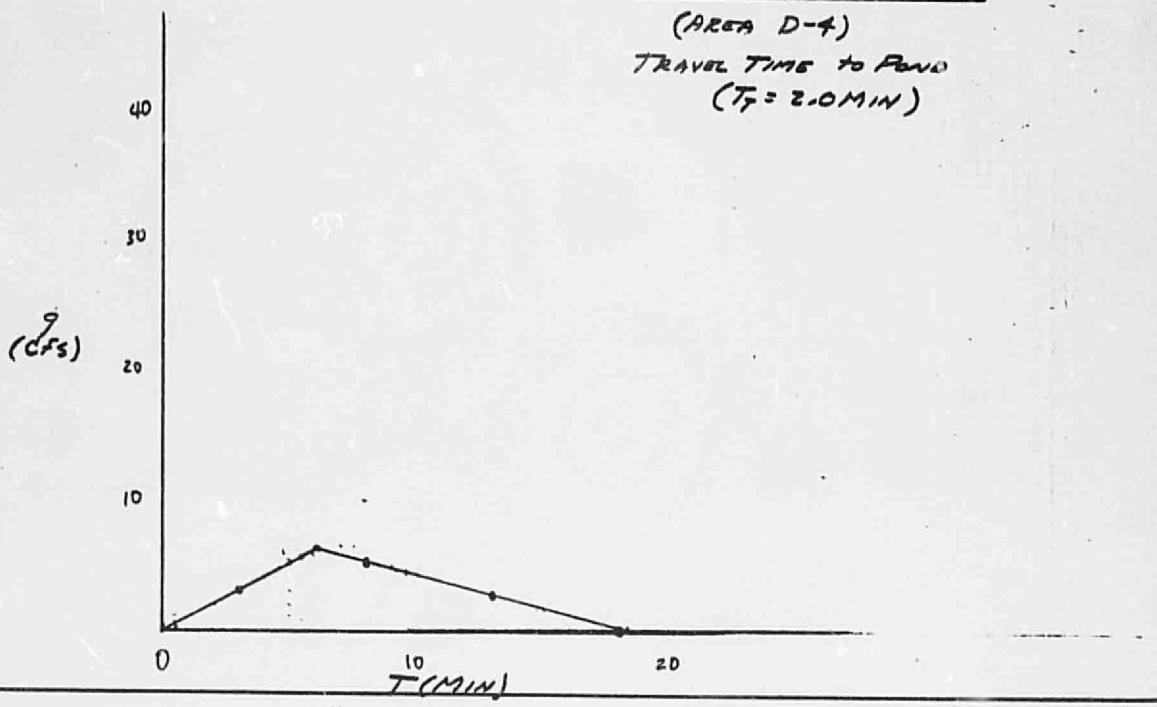
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JOB NO. 252-0089 DATE 4/2/87
PROJECT VALLE GRANDE Apts
SCALE ——

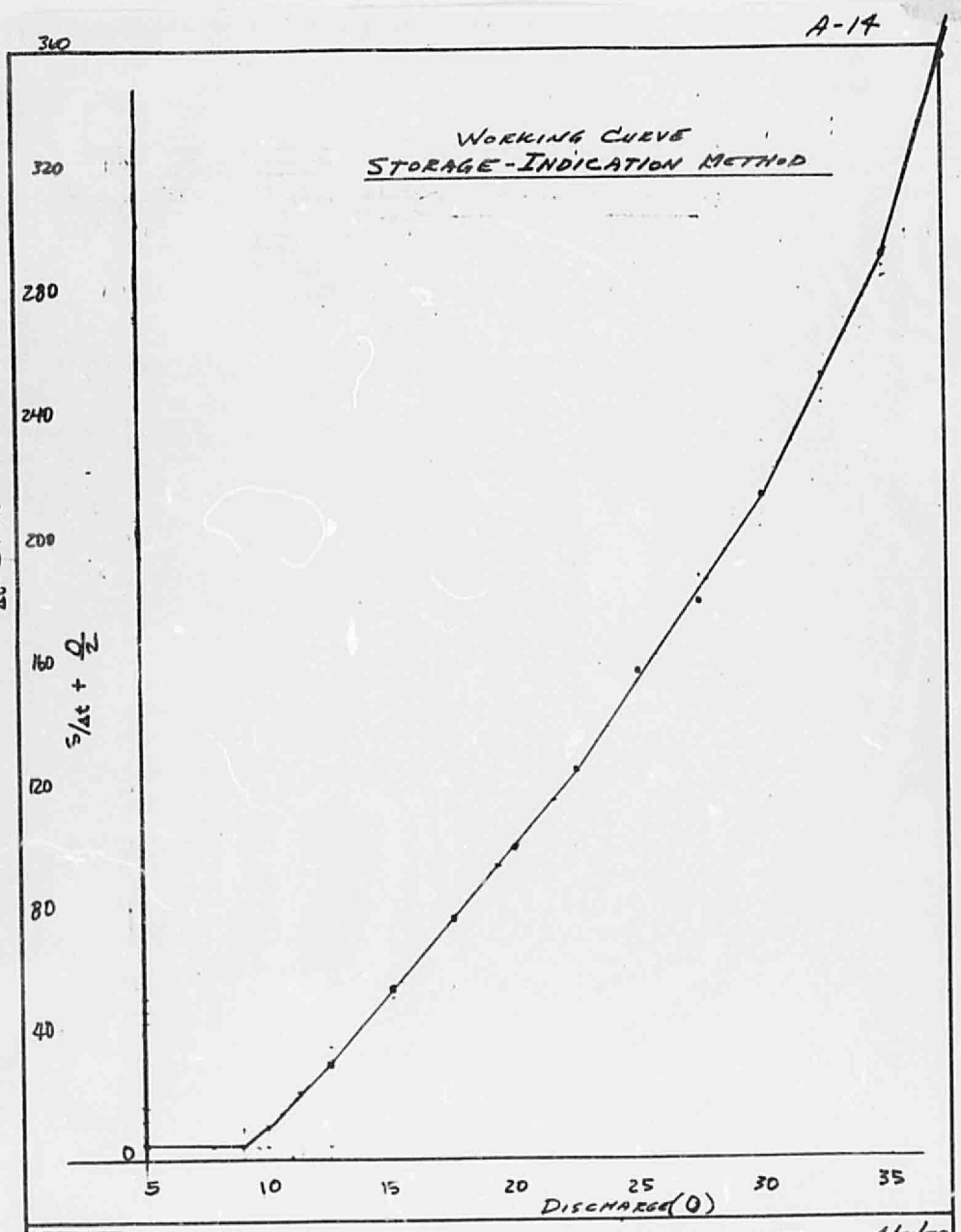
MEURER, SERAFINI AND MEURER, INC.
CONSULTING ENGINEERS • SURVEYORS • PLANNERS
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JOB NO. 252-0089 DATE 4/2/92
PROJECT VALLE GRANDE APTS
SCALE

INFLOW HYDROGRAPH
(AREA D-4)
TRAVEL TIME to POND
(T_T = 2.0 MIN)



D-13



MEURER, SERAFINI AND MEURER, INC.
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JOB NO. 252-0089 DATE 4/2/79
PROJECT Valle Grande Apt's
SCALE —

A 15(1)

OPERATION TABLE
STORAGE-INDICATION METHOD

TIME Acc. (MIN)	Δt (MIN)	I INFLOW (cfs)	$\bar{I}$ AVG. INFLOW (cfs)	$\frac{S_2}{\Delta t} + \frac{O_2}{2}$ (cfs)	O (cfs)	Remarks
0		0			0	
	2		6.8	3.4		
2		13.5			6.8	
	2		25.0	21.6		
4		36.5			11.4	
	2		43.3	53.5		
6		50.0			15.0	
	2		56.5	95.0		
8		63.0			19.3	
	2		66.8	142.5		
10		70.5			24.0	
	2		68.8	187.3		
12		67.0			27.8	
	2		65.5	225.0		
14		64.5			30.7	
	2		59.5	253.8		
16		54.5			32.6	
	2		52.0	273.2		
18		47.5			33.8	
	2		42.0	281.4		
20		36.5			(34.3)	← "PEAK OUTFLOW"
	2		31.9	279.0		
22		27.3			34.2	
	2		23.8	268.6		
24		20.2			33.5	
	2		17.1	252.2		
26		14.0			32.5	
	2		12.4	232.1		
28		10.9			31.2	
	2		9.5	210.4		
30		8.0			29.8	
	2		6.5	187.1		
32		5.0			27.8	
	2		4.0	163.3		
34		2.9			25.8	
	2		2.0	139.5		
36		1.0			23.7	
	2		0.5	116.3		
38		0			21.6	
			0	94.7		

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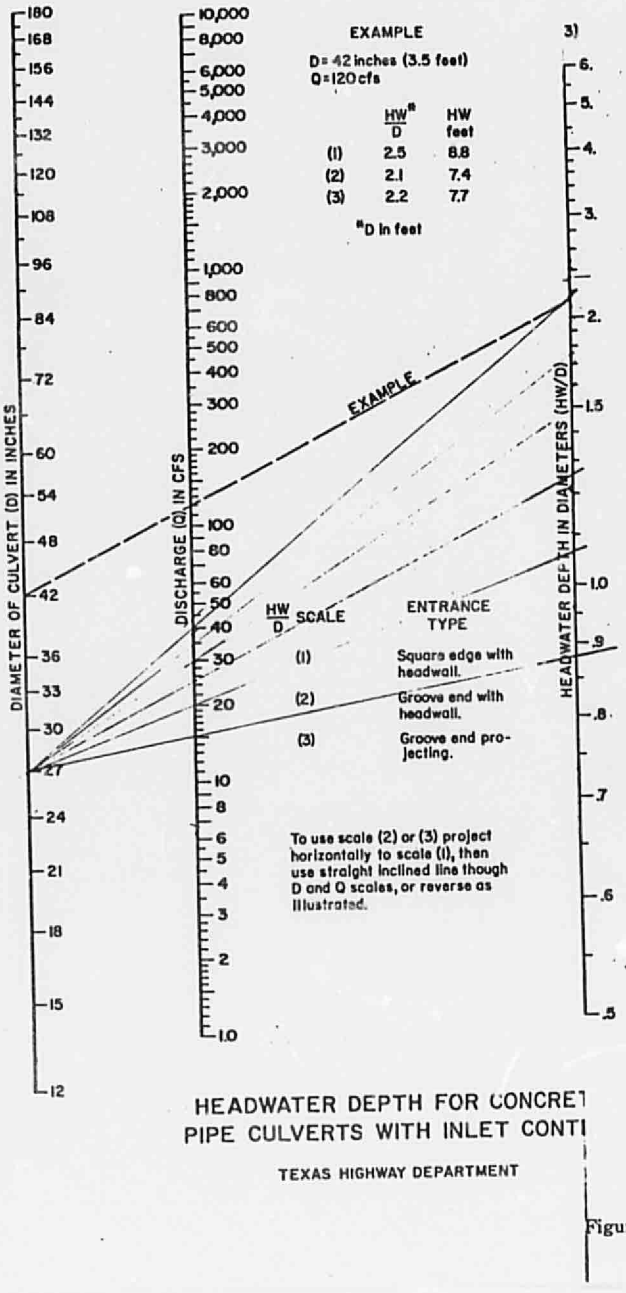
JOB NO. 252-0087 DATE 4/3/87
PROJECT VALLE GRANDE Apts
P1 of 2 SCALE —

A-15(2)

TIME Acc. (MIN)	TIME Δt (MIN)	I INFLOW (cfs)	$\bar{I}$ AVG. INFLOW (cfs)	$\frac{S_2}{\Delta t} + \frac{O_2}{2}$ (cfs)	O (cfs)	Remarks
			0	94.7		
40		0			19.2	
	2		0	75.5		
42		0			12.2	
	2		0	58.3		
44		0			15.4	
	2		0	42.9		
46		0			13.8	
	2		0	29.1		
48		0			12.3	
	2		0	16.8		
50		0			10.7	
	2		0	6.1		
52		0			9.3	
	2			0		
4						
	2					
6						
	2					
8						
	2					
0						
	2					
2						
	2					
4						
	2					
6						
	2					
8						
	2					
0						
	2					
2						
	2					
4						
	2					
6						
	2					
8						

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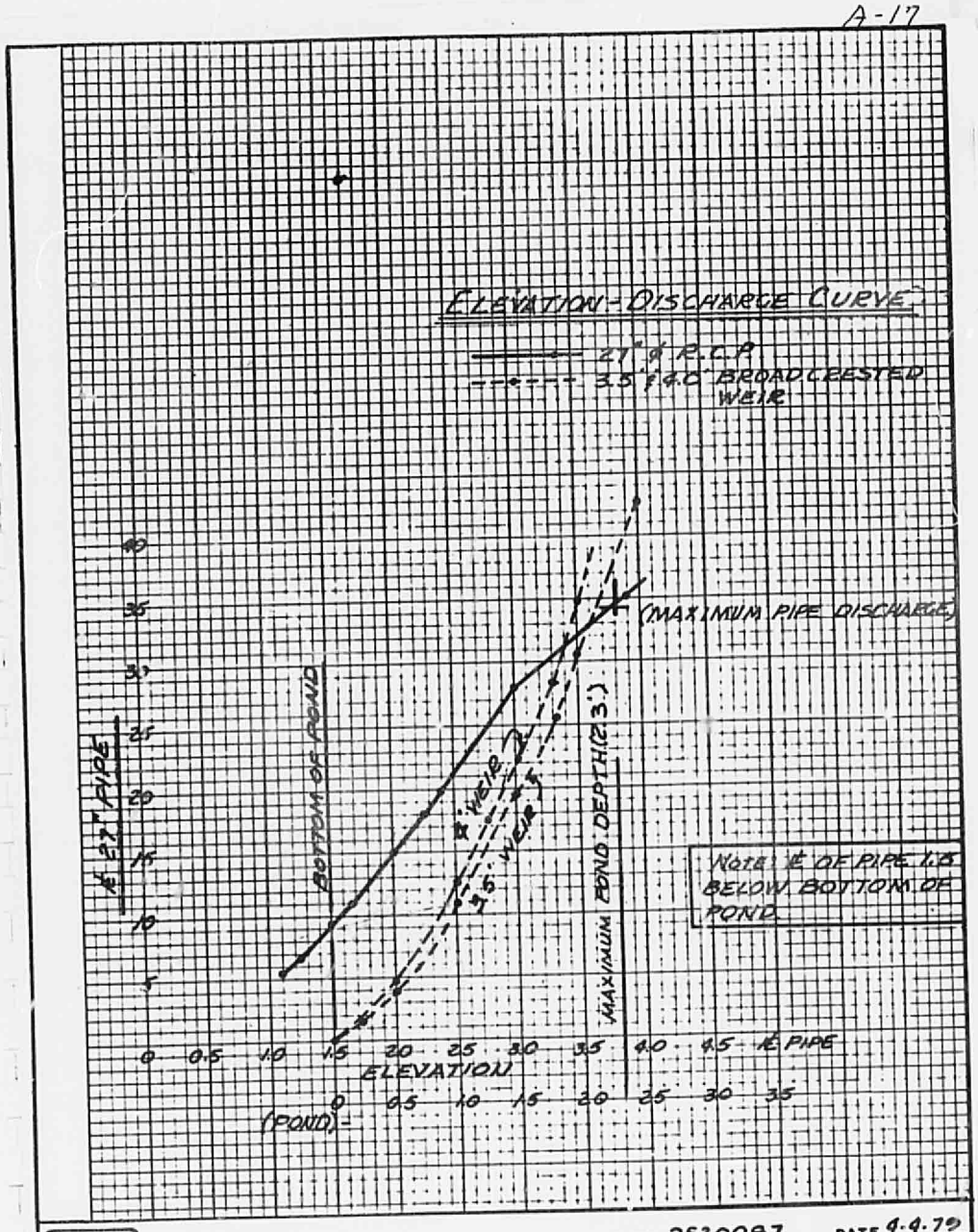
JOB NO. 252-0087 DATE 4/3/87
PROJECT VALLE GRANDE APTS
Pg 2 of 2 SCALE —



HEADWATER DEPTH FOR CONCRET
PIPE CULVERTS WITH INLET CONTI

TEXAS HIGHWAY DEPARTMENT

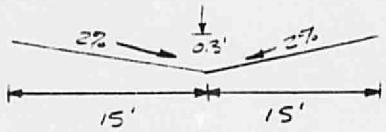
Figure 8-14



MEURER, SERAFINI AND MEURER, INC.
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JOB NO. 2520087 DATE 4-4-79
PROJECT VALLE GRANDE APTS.
SCALE

CAPACITY OF STREET



$Q = \frac{1.49}{n} A R_H^{2/3} S^{1/2}$

WITH NO ENCROACHMENT ON PARKING SPACES

$A = \frac{0.3(30)}{2} = 4.5 \text{ FT}^2$

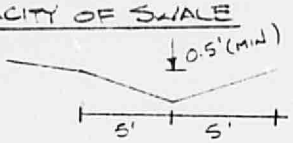
$R_H = \frac{4.5}{30} = 0.15 \text{ FT}$

$n = 0.017$

$Q = \frac{1.49}{0.017}(4.5)(0.15)^{2/3} S^{1/2} = 111.35 S^{1/2}$

WHERE Q IS MAX $S = 0.035'/' \Rightarrow Q = 21 \text{ cfs}$
> 20.8

CAPACITY OF SWALE



$A = \frac{0.5(10)}{2} = 2.5 \text{ FT}^2$

$R_H = \frac{2.5}{10} = 0.25 \text{ FT}$

$n = 0.025$

$Q = \frac{1.49}{0.025}(2.5)(0.25)^{2/3} S^{1/2} = 59.13 S^{1/2}$

$S = 3.1\% \Rightarrow Q = 10.4 \text{ cfs} \neq 10.5$

MSM/SP GROUP — ALBUQUERQUE N.M.

By F.H.H. Date 11/21/83 PROJECT VALLE GRANDE PHASE III sheet No. 1 of 3

Checked By ____ Date ____ DRAINAGE CALCULATIONS Job No. ____

GENERAL INFORMATION (FOR DRAINAGE AREAS - SEE PLAN)

SOIL TYPE - EtC EmB - HYDROLOGIC SOIL GROUP B

RAINFALL AMOUNT - 2.4" (PLATE 22.2 D-1)

% IMPERVIOUS - 62%

C - UNDEVELOPED = 0.34
C - DEVELOPED = 0.65
} PLATE 22.2 C-1

T_c = 10 MIN $\Rightarrow$ $i_{100} = 2.4(6.84)10^{-.51} = 5.07$ IN/HR

RUNOFF

ON-SITE BASIN A (DEVELOPED)

AREA = 1.5 ACRES

$Q_{100} = .65(5.07)1.5 = 5$ cfs

ON-SITE BASIN B (DEVELOPED)

AREA = 5.7 ACRES

$Q_{100} = 0.65(5.07)5.7 = 19$ cfs

ON-SITE BASIN C (DEVELOPED)

AREA = 3.2 ACRES

$Q_{100} = 0.65(5.07)3.2 = 10.5$ cfs

OFF-SITE BASIN A (UNDEVELOPED)

AREA = 4.4 ACRES

$Q_{100} = 0.34(5.07)4.4 = 7.6$ cfs

OFFSITE BASIN B-1 (UNDEVELOPED)

AREA = 0.4 ACRES

$Q_{100} = 0.34(5.07)0.4 = 0.7$ cfs

OFF-SITE BASIN B-2 (UNDEVELOPED)

AREA = 0.3 ACRES

$Q_{100} = 0.34(5.07)0.3 = 0.5$ cfs

MSM/SP GROUP — ALBUQUERQUE N.M.

By FHH Date 11/21/85 PROJECT VALLE GRANDE PHASE III sheet No. 2 of 3

Checked By ____ Date ____ DRAINAGE CALCULATIONS Job No. ____

ON-SITE BASIN A AND OFF-SITE BASIN A COMBINED

$A_{TOTAL} = 1.5 + 4.4 = 5.9$ ACRES

$C = 0.34\left(\frac{4.4}{5.9}\right) + 0.65\left(\frac{1.5}{5.9}\right) = 0.42$

$T_c = 10$ MIN $\Rightarrow i = 5.07$

$Q_{100} = 0.42(5.07)\,5.9 = 12.6$ CFS

ON-SITE BASIN B AND OFF-SITE BASINS B-1 & B-2 COMBINED

$A_{TOTAL} = 5.7 + 0.4 + 0.3 = 6.4$ ACRES

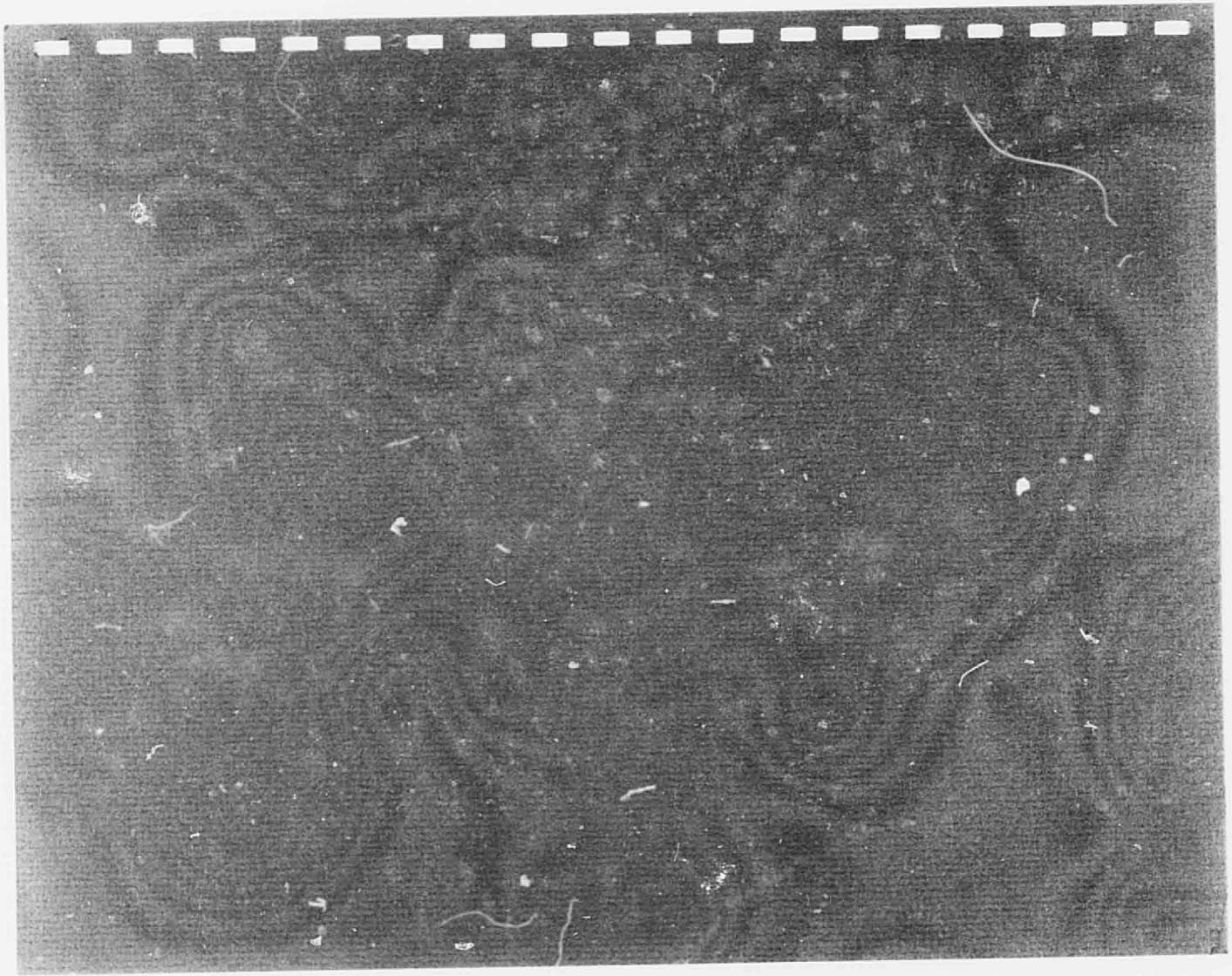
$C = \frac{0.7}{6.4}(.34) + \frac{5.7}{6.4}(.65) = 0.62$

$T_c = 10$ MIN $\Rightarrow i = 5.07$

$Q_{100} = 0.62(5.07)(6.4) = 20.1$ cfs

SUMMARY TABLE

BASIN	T_c (MIN.)	i_{100} (IN/HR)	C	A (ACRES)	Q_{100} (CFS)
ON-SITE A	10	5.07	.65	1.5	5
" B	"	"	.65	5.7	19
" C	"	"	.65	3.2	10.5
OFF-SITE A	"	"	.34	4.4	7.6
" B-1	"	"	.34	0.4	0.7
" B-2	"	"	.34	0.3	0.5
ON-SITE A & OFF-SITE A	"	"	.42	5.9	12.6
ON-SITE B & OFF-SITE B-1, B-2	"	"	.62	6.4	20.1



F20/D13

11 Plans

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

READING FILE

December 19, 1983

Mr. Fred Haas
MSM/SP Group
2601 Wyoming Boulevard NE
Albuquerque, NM 87112

REF: VALLE GRANDE APARTMENTS-PHASE III DATED NOVEMBER 23, 1983 (F20-D13)

Dear Mr. Haas:

The referenced drainage plan is in substantial agreement with the overall drainage report; therefore, this plan is approved.

I would like to extend my appreciation for the background information provided with this submittal, it was very helpful in the review of your plan.

If you have any further questions, please feel free to contact me at 766-7644.

Yours truly,

Fred J. Aguirre
Design Hydrologist

FJA:mrk

INFORMATION SHEET

PROJECT TITLE VALLE GRANDE - PHASE III TYPE OF SUBMITTAL PLAN IN CONCURRENCE w/ APPROVED CEPOLT

ZONE ATLAS PAGE NO. F-20 & 13 CITY ADDRESS N.A.

LEGAL DESCRIPTION A PORTION OF ACADEMY ESTATES - UNIT 5

ENGINEERING FIRM MSM/SP GROUP CONTACT FRED HAAS

ADDRESS 2601 WYOMING NE, SUITE F PHONE 292-1936

OWNER ACADEMY DEVELOPMENT CONTACT GARY SWEARINGEN

ADDRESS 8401 SPAIN N.E. BLDG. 3D PHONE 821-6767

ARCHITECT BILL SHELTON CONTACT BILL SHELTON

ADDRESS 1113 RHODE ISLAND NE PHONE 262-2363

SURVEYOR MSM/SP GROUP CONTACT SEE ABOVE

ADDRESS _____ PHONE _____

CONTRACTOR N.A. CONTACT _____

ADDRESS _____ PHONE _____

DATE SUBMITTED 11/23/83

BY Fred Haas

Use this Information Sheet when submitting the following:

Drainage report or plan, conceptual grading and drainage plan, engineer's certification plan, erosion plan and grading plan. Provide the information applicable to your submittal.

RECEIVED

NOV 23 1983

ENGINEERING

MSM/SP Group

2601 Wyoming Boulevard, NE
Albuquerque, NM 87112
(505) 292-1936

A Member of the
SP Group of Professional
Services Companies

- Engineering
- Surveying
- Energy Services

November 21, 1983

City Engineering
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Attention: Fred Aguirre

Re: Valle Grande Apartments - Phase III Map No. F-20-913

Dear Fred,

Per our phone conversation of October 17, 1983, please find enclosed two (2) copies of the Drainage Plan for the referenced project which is in general compliance with the approved drainage report. The "Drainage Report for Valle Grande Apartments Bear Canyon Drainage Basin (Phases II, III, & portions of Phases IV & V)" April 1979, by Meurer, Serafini and Meurer, and supplemented by Addendum No. 1, April 26, 1979, was approved by the City of Albuquerque April 27, 1979. The basic premise of the approved report is to direct the runoff to a detention pond in the southeast corner of the study area. This detention pond and the outlet and storm sewer extension proposed in the Drainage Report are all now existing facilities.

Also enclosed, please find Figure III - Developed Drainage Characteristics, from the approved report. This is included to facilitate your review of the Phase III Drainage Plan. Figure III has been updated to show the flows generated by Phase III along with the offsite area which will be developed in the future and currently contributes runoff that will be conveyed through Phase III. 100 year developed runoff rates have been calculated using current City of Albuquerque criteria to verify compliance with the approved report. An information sheet, vicinity map, watershed soils map, and flood hazard boundary map are also included with this submittal.

If you have any questions, please advise.

Sincerely,

MSM/SP Group

Fred Haas
Design Engineer

FH:jb
Enclosures

RECEIVED
NOV 23 1983
ENGINE

ACADEMY DEVELOPMENT COMPANY

8401 SPAIN RD., N.E. BLDG. 3-D
ALBUQUERQUE, NEW MEXICO 87111
TELEPHONE 505 / 821-3767

GARY SWEARINGEN
PRESIDENT

August 31, 1983

Bernie Montoya
City of Albuquerque
Hydrology Department
Albuquerque, New Mexico

Re: Valle Grande Apartments
Drainage Inspection - Building 37
8401 Spain Rd., NE

Dear Bernie:

This letter will confirm that the vacant land adjacent to, and north of, building 37 is owned by this firm. Our master plan calls for development of this property as a part of the Valle Grande Apartment project.

Academy Development Company agrees to provide any maintenance required concerning damage to, or caused by, the vacant land in the event of possible soil erosion.

Sincerely,

Gary Swearingen

Gary Swearingen
President

GS/vl

Part copy in letters recd

MEURER, SERAFINI AND MEURER, INC.

CONSULTING ENGINEERS • SURVEYORS • PLANNERS

2601 WYOMING BLVD., N.E., SUITE F • ALBUQUERQUE, NEW MEXICO 87112 • (505) 292-1936

February 25, 1980

F20-D13

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

RE: Valle Grande Apartments, Phase II

Dear Mr. Heller:

The Drainage Plan for the referenced development has been approved by the City of Albuquerque. The approved Drainage Plan consists of four ponding areas, two temporary retention ponds north of the property to retain 100 percent of 100-year, 6-hour runoff from offsite drainage areas. These temporary ponds are constructed and will be removed when this area is developed and permanent drainage facilities are built. The onsite drainage is to the two southern ponds, the southwestern pond is designed to retain the 100-year, 6-hour runoff and the southeastern pond is designed to detain the 100-year, 6-hour runoff from onsite and future development to the north of this site. This future development cannot proceed until the proposed stormwater drain is constructed along Spain Road and the 27-inch controlled outlet from the detention pond is connected to the proposed stormwater drain. The retention pond as designed will hold the 100-year, 6-hour onsite runoff with all offsite runoff being retained by the temporary ponds, as previously mentioned.

The construction date of the proposed stormwater drain along Spain Road is now known to be this year. The early construction of this drain causes the placement of the 6-inch P.V.C. temporary drain line to Spain Road to be an unnecessary expense. With your concurrence the owner would like to scarify both southern ponds and flood them to facilitate percolation to the groundwater, and not to construct the 6-inch temporary drain line to Spain Road. This would be beneficial to both the City of Albuquerque and the owner.

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

MEURER, SERAFINI, AND MEURER, INC.

A signature block is provided below for your concurrence. Thank you for your interest in this proposed change in the original Drainage Plan.

Sincerely,

MEURER, SERAFINI AND MEURER, INC.

Joseph W Abbott

Joseph W. Abbott
Project Engineer

Approved for the City of Albuquerque this 27th day of Feb '80 by: R Heller.

Mr. Richard Heller
City Engineer

JWA:vlt

C.O. will be granted after presentation of as built survey of pond in SE corner & SW corner of property. Volume must comply w/ approved drainage report.

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE January 24, 1980 REF. NO._____

F20-013

TO: Richard Heller, City Engineer

FROM: Bruno Conegliano, Assistant City Engineer/Hydrology BC

SUBJECT: Camino Del Sol NE

I am enclosing copies of the addendum to Valle Grande Phase II, and of the computations performed by Billy Colsby, for the flows at the intersection. The total flows amount will be 140 c.f.s., 106 c.f.s. from Academy Acres 2 & 4, and 34 c.f.s. from Gary Swearenger's Development.

BC/lc
encl.

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
David Rusk

April 27, 1979

Mr. Wiley R. Smith, P.E.
Meurer, Serafin, and Meurer, Inc.
2801 Wyoming Blvd. N.E., Suite F
Albuquerque, New MEXICO 87110

F20-D13

Re: Valle Grande Apartments - Phase 2

Dear Mr. Smith:

I have reviewed the Addendum No. 1 for the captioned drainage study and I am in agreement. The drainage plan is therefore hereby approved.

Very truly yours,

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/ms

cc - Dick Heller
Rich Leonard
Drainage File

MEURER, SERAFINI AND MEURER, INC.
CONSULTING ENGINEERS • SURVEYORS • PLANNERS
2601 WYOMING BLVD., N.E., SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • (505) 292-1936

April 26, 1979

Mr. Bruno Conegliano
ACE-Hydrology
City of Albuquerque
City Hall, 4th Flood
Albuquerque, New Mexico 87102

RE: ADDENDUM NO. 1 TO DRAINAGE STUDY (SUBMITTED APRIL 4, 1979)
VALLE GRANDE APARTMENTS

Dear Bruno:

As a result of our conversation of April 25, 1979 in your office concerning the above-captioned project, I am submitting the information you requested as follows:

1. The new drainage study dated April, 1979 was submitted as a result of a meeting with Mr. R. Heller, City Engineer, in February 1979 after review of a previous drainage report for the development dated June, 1978. At this meeting, with Mr. Heller, our client agreed to provide one detention pond in place of the individual site ponds provided that the City of Albuquerque would extend a storm sewer up Spain Road, N.E. at no cost to our client. A connection to this storm sewer would then be made by our client to make this pond function as a detention pond for the ultimate development.

2. As stated, our client desires to develop only Phase II at this time. Since the storm sewer is not yet extended, this detention pond can act as a retention pond for Phase II. A review of Phase II indicates that 7.64 acres drains into this pond. Since the pond capacity without overflow is 50,788 cubic feet and total in-flow is 48,300 cubic feet, the existing detention pond can be used as a retention pond for Phase II (see Attachment & Figure IIIa).
All offsite flows will be retained in temporary ponds shown on Figure II, as stated in the report. The flows from sub-areas F-1 and F-2 are contained in retention pond F-2 (see Figure IIIa).

3. Please note that the previously approved Drainage Report for Valle Grande Apartments (Genge/Murray-McCormick) allows for 17.5 c.f.s. flow from the off-site area retention pond at the east boundary of the existing Valle Grande apartments. This Drainage Report reduces this existing 17.5 c.f.s. flow onto Spain Road N.E. to 10.5 c.f.s. (3.8 c.f.s. from Sub-area G-3 and 6.7 c.f.s. from Sub-area G-1 and G-2) as shown on Figure IIIa. This should improve the problem flooding that can occur on Spain Road N.E. until such time as the City can extend a storm sewer up Spain Road N.E.

If I can be of assistance in answering any further questions, please call.

Sincerely yours,

Wiley B. Smith, P.E.
Project Engineer

WBS/th

Enclosure

RICHARD E. LEONARD
EXECUTIVE ENGINEER

B. H. SWINBURNE, CHAIRMAN
WILLIAM V. HEREFORD, VICE-CHAIRMAN
FRANCES McCOY, SECRETARY-TREASURER
VERNON DOAK, DIRECTOR
RICHARD H. CLOUGH, DIRECTOR

Albuquerque Metropolitan Arroyo Flood Control Authority

2600 PROSPECT AVE. N.E.
P. O. BOX 25851 - ALBUQUERQUE, N. M. 87125
TELEPHONE 344-3516

RECEIVED
DEC 08 1978
CITY ENGINEERS

December 8, 1978

Mr. Bruno Conegliano
Assistant City Engineer-Hydrology
P.O. Box 1293
Albuquerque, N.M. 87103

Dear Bruno:

Attached for your review and comment is a preliminary draft of a proposed agreement. Exhibit A is not yet available, but I believe you will recognize the property from our earlier discussions with Mr. Swearingen.

I have reviewed the situation with Stan Zuris. His opinion is that the agreement only requires the owner to do what our regulations already require. Therefore, I'm inclined to forget the agreement. If the owner wants to develop incrementally, we should require the usual drainage report. Only if he proposes to encroach on the 100-year flood plain should we demand channel improvements.

Please give me your thoughts.

Sincerely,

Richard E Leonard

Richard E. Leonard
Executive Engineer

Valle Grande

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

December 12, 1978

Mr. Carl Tebbens
Meurer, Serafini & Meurer
2601 Wyoming Blvd. N.E.
Albuquerque, New Mexico 87112

RE: VALLE GRANDE APARTMENTS

Dear Mr. Tebbens:

The drainage report for the captioned Subdivision needs to address two concerns:

1. Treatment of the offsite flows.
2. Internal drainage provisions.

Both concerns have to be solved in a manner consistent with City Polic[illegible] and with the AMAFCA RES. 72-2.

On the first question, the problem of the treatment of the Bear Arroyo Tributary must be addressed. As indicated to you in our conversation with Mr. Leonard and with Mr. Swearingen this past summer, it is incumbent on the developer to provide his proportionate share of the improvements necessary to implement the Northeast Albuquerque Acres Drainage management plan or Rice Report. That plan envisions the re-routing of the channel in a more Northerly position, together with the construction of drop structure and similar erosion protection facilities. Mr. Leonard has forwarded for my attention a draft of an agreement submitted to him by the developer's Attorney. It is my opinion that the agreement submitted is insufficient security for the City but I will defer to the opinion of our Legal Council and to the requirements that Mr. Heller will consider appropriate in this case. It is my opinion that an agreement of the type submitted needs to be supported by an appropriate bond from the developer. In the interim, before the planned rechannelization is executed, bank erosion protection will have to be provided to prevent undermining of any part of the development.

Secondly, an evaluation must be made of the 100 yrs. water surface elevation in the streets along the perifery of this parcel. An assessment must be made of the flooding potential, for instance, an elevation of 5102 ft. is indicated for Moon St. next to a proposed building for which the finished floor elevation is also given as 5102 ft.

Thirdly, the indication is given that 25 cfs are to be conveyed to the West into the adjacent development. What condition will result from this inflow and what provisions are available in that development for offsite flows?

Regarding the on-site provisions for ponding, the plan submitted is at such a small scale and with so few details to make it impossible to verify the adequacy of the proposal. Again, I need to reiterate that I have to be able to verify the balance between the drainage areas and the ponding volumes provided.

Your assistance and cooperation in providing answers to the questions above will be appreciated.

Sincerely,

Bruno Conegliano
Asst. City Engineer-Hydrology

BC/tl

cc: Rick Leonard, AMAFCA
Richard Heller, City Engineer
Dr. File

CITY OF ALBUQUERQUE, NEW MEXICO
CITY ENGINEER'S OFFICE

MEMORANDUM - December 11, 1978

TO: Richard S. Heller, City Engineer
FROM: Bruno Conegliano, Assistant City Engineer-Hydrology
SUBJECT: TRACT A, ACADEMY ESTATES #5

This letter pertains to Tract A, Academy Estates Unit 5, Page F-20 on Zone Atlas. It is the same developer of Academy Estates Unit 8. Carl Tebbens can give you a rundown of the situation. This is the result of the policy vacuum I mention in my memo to Rip. The agreement is not worth the paper it is written on since the development was not draining into the Bear Canyon Tributary (Exhibit 15 of Rice Report Plan). The opinion of Mr. Kimmick was that he did not have to do anything to the arroyo, Mr. Jim Smith concurred, so the City will be stuck with the construction of the half of the improvements provided that we can get the owner of the Northern parcel to build his half which, in the present circumstances, is doubtful. In regard to this parcel, the owner wants to build high density residences on his tract. Will benefit for the existence of an outfall (The Bear Canyon) but will not contribute his fair share to the overall cost of the drainage (channel) improvements. The problem is complicated by the fact that his property is not bound on the North by the Bear Canyon Tributary except for a very small segment (approximately where the Tract R2 is shown North of his property and West of Moon St.). Thence, the arroyo veers slightly to the North and a small triangular piece of land is left South of the arroyo belonging to a Doctor Edwards, owner of the Tracts labeled C2 and R2, who has shown on inclination to work in cooperation with anybody and would have to perform all the improvements just to be able to utilize the little triangle of land South of the arroyo mentioned above.

During the special session of the legislature last January, in accordance with Mr. Frank Horan, Jr., we tried to modify some existing legislation in order to be authorized to establish drainage improvement districts so that the needed channel improvements could be constructed in one single operation and the land owners would be charged for the improvements on a per acre basis of land falling within a given watershed. In that fashion, everybody would be treated equally and equitably and the appropriate improvements would be built. I went to lobby for the proposal in Santa Fe but it was shelved. Please note that this effort was undertaken precisely because of the conditions with this parcel of land.

According to my previous discussions with Carl, Mr. Swearinger and Rick Leonard, the developer would be required to construct a couple of drop structures in the channel at the boundary between his property and Dr. Edward's land which would amount to some $30,000 in cost and this is what the agreement refers to. Yet this contribution, which is very minor, does not reflect the benefit that

Mr. Swearinger has, being able to develop this land. Maybe this case should be discussed with Mr. Jaramillo because approval of the plat sets a precedent (so to speak) and verifies the fact that the City cannot enforce its regulations and get some guidance on basic policy decisions. At the very least, we need to have some money in escrow in some tangible form and here we need the help of Mac deVesty to draft an agreement that we can use as Standard, set aside an account for this type of agreement, keep with your office a running file of these agreements in the manner I mentioned to you a couple of days ago.

BC/tl

MEURER, SERAFINI AND MEURER, INC.
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2601 WYOMING BLVD., N.E., SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • (505) 292-1936

November 15, 1978

RECEIVED
NOV 20 1978
CITY ENGINEERS

City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Attn: Mr. Bruno Conegliano, Hydrology Engineer

Re: Addendum to Valle Grande Apartments Drainage Report

Dear Mr. Conegliano:

In order to comply with your request, the following revisions have been made to Valle Grande drainage report and grading plan.

The City's Drainage criteria states that developed flows for each drainage basin must equal undeveloped flow within each major drainage basin. The street and parking lot grades in the complex have been revised to direct sufficient runoff from the north end of the development into the Bear Arroyo tributary to meet these city requirements.

Siltation ponds will be constructed during the initial grading and building phases to reduce mud and sand flow into streets adjacent to the construction site.

These additions to the drainage plan for Valle Grande Apartments will bring this project into compliance with all city drainage requirements.

If you have any questions, please do not hesitate to call.

Sincerely yours,

MERURER, SERAFINI AND MEURER, INC

Frank Krim
Frank Krim
Project Engineer

Fk:vb

MEURER, SERAFINI AND MEURER, INC.

CONSULTING ENGINEERS • SURVEYORS • PLANNERS

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RECEIVED
FEB 15 1978
CITY ENGINEERS

Bruno - This is what was agreed. Please prepare ltr. C.

F20.013

February 13, 1978

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

Re: Academy Estates, Unit 5 (Valle Grande Apartments)

Dear Mr. Kimmick:

Pursuant to our meeting on February 2, 1978, which included Gary Swearingen, Bruno, yourself, and me; I would like to summarize what I feel were the results of our drainage related meeting.

As we discussed we would like to prepare a preliminary drainage and grading plan for the balance of the apartment units to the east of the Phase I apartment complex which is constructed as of this time. The drainage study which would be in conformance with the City of Albuquerque and A.M.A.F.C.A. requirements would be submitted to you for approval.

Gary intends to build the balance of his apartment complex in small phases as the market permits; therefore, it was agreed that individual drainage studies for those small phases would not be required as long as each phase conformed to the master drainage plan approved by the City. If your understanding of our meeting is any different that I have mentioned above, please inform me in writing. Thank you.

Very truly yours,

MEURER, SERAFINI AND MEURER, INC.

Carl A. Tebbens

Carl A. Tebbens, P.E.
Vice President

CAT:dw

cc: Mr. Gary Swearingen

drainage file

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

May 31, 1977

Mr. Word H. Payne
829 Pennsylvania N.E.
Albuquerque, New Mexico 87110

Re: Flooding in Academy Estates, Unit 3, Blocks 9A & 10A

Dear Mr. Payne:

In reply to your recent inquiry regarding the flood prone area in Academy Estates, Unit 3, I am enclosing a copy of the plat with an outline of the flood prone area. This outline was obtained from the Flood Hazard Map prepared by the Federal Insurance Administration. Please bear in mind that any lot that is marginally affected by the flood boundary line is considered inside Zone A (i.e. lots 22, 23, and 24).

I hope that the enclosed information will satisfy your requirements.

Very truly yours,

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/kr

NEW ADDRESS:
829 PENNSYLVANIA N. E.
ALBUQUERQUE, N. M. 87110

WORD H. PAYNE CO.

DEVELOPER AND BUILDER

360 Menaul Blvd., N.E., Albuquerque, N.M. 87107

Telephone (505) 345-3601

May 16, 1977

RECEIVED
MAY 16 1977
CITY ENGINEERS

Mr. V.M. Kimmick, City Engineer
City of Albuquerque
400 Marquette Ave. N.W.
Albuquerque, New Mexico

Dear Mr. Kimmick:

The purpose of this letter is to ask that your office determine which of the following lots are deleted from the flood hazard boundary map which I understand will be due about June 24, 1977:

Unit #3, Academy Estates, Being a repeat of Blocks 9 & 10, Unit #2. Academy Estates:

. .

Block 9-A: Lots 1,2,18,32,33,36,37,38,39,40,41,56 & 57.

Block 10-A: Lots 5,6,7,8,9,10,13,14,15,16,17,18,19,20, 21,22,23,24,25,26,29,30,33, & 34.

If you require any addition data or assistance from me please let me know.

Yours very truly,
WORD H. PAYNE CO.
Word H. Payne
Word H. Payne

Bruno —
Can you determine?
L

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

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

March 29, 1977

Mr. Ricardo J. Goncalves
Genge/Murray-McCormick
2601 Wyoming Blvd. N.E.,Suite F
Albuquerque, New Mexico 87110

SUBJECT: VALLE GRANDE APARTMENTS
(Academy Estates No. 5)

Dear Mr. Goncalves:

Your letter of March 21, 1977 and the attached drainage report revision has been reviewed and is approved. Please forward one additional copy of the revised report.

Sincerely,

V. M. Kimmick
City Engineer

VMK/fs

cc: Bob Kielich
Dwayne Sheppard
Bruno Congeliano

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

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

March 1, 1977

Mr. Carl A. Tebbens, P.E.
Genge/Murray-McCormick
2601 Wyoming Blvd. N.E., Suite F
Albuquerque, New Mexico 87110

SUBJECT: VALLE GRANDE APARTMENTS (ACADEMY ESTATES #5)

Dear Mr. Tebbens:

The drainage report forwarded by your letter of February 17, 1977 has been reviewed and comments are indicated below.

1. There are portions of the site which lie within Zone A of the Flood Hazard Boundary Map. While measures proposed in this study may indicate the removal of the area from Zone A, this office cannot make such a judgment. It will be necessary to submit data to the Federal Flood Insurance Agency as outlined in Part 1920, Federal Register, Vol. 41, No. 207, Tuesday, October 26, 1976 via this office, to attempt such an action.

2. The diversion of 89cfs from OSA-1 to Spain Road cannot be approved. The grades of Spain are too gentle to handle such flows. In addition, such flows would then be conveyed directly

Public Works Department

Director — Erwin F. Hensch, 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.

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to Wyoming Blvd. Some alternate way of handling these flows to the Bear Arroyo is suggested.

3. Where other flows are to discharge into Spain Road or Wyoming Blvd., they should be directed to flow within the gutter. Flows are not to cross Spain Road or Wyoming Blvd.

Sincerely,

V. M. Kimmick
City Engineer

VMK/fs

cc: Jim Smith
Dwayne Sheppard
Bob Kielich
Drainage File

DRAINAGE REPORT FOR

VALLE GRANDE APARTMENTS

BEAR CANYON DRAINAGE BASIN

(PHASES II, III, & PORTIONS OF PHASES IV & V)



[redacted]

DRAINAGE REPORT FOR

VALLE GRANDE APARTMENTS

BEAR CANYON DRAINAGE BASIN

(PHASES II, III, & PORTIONS OF
PHASES IV & V)

RECEIVED
APR 05 1979
CITY ENGINEERS

Prepared For

Academy Development Company
8401 Spain Road N.E.
Albuquerque, New Mexico 87111

April 1979

Prepared By

Meurer, Serafini and Meurer, Inc.
2601 Wyoming Boulevard N.E.
Albuquerque, New Mexico 87112

(505) 292-1936

MEURER, SERAFINI AND MEURER, INC.
CONSULTING ENGINEERS • SURVEYORS • PLANNERS
2601 WYOMING BLVD., N.E., SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • (505) 292-1936

April 4, 1979

Mr. Brunc Conegliano
Assistant City Engineer-Hydrology
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Drainage Report for Valle Grande Apartments

Dear Bruno:

Enclosed please find the Drainage Report for the above captioned development located immediately north of the intersection of Spain and Camino del Sol, N.E., on behalf of Academy Development Company.

I request that you review and comment for approval of the attached report. Should you have any questions, please contact me at 292-1936.

Sincerely,

MEURER, SERAFINI AND MEURER, INC.

Wiley R. Smith, P.E.
Project Engineer

Enclosure

DRAINAGE REPORT

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DRAINAGE REPORT FOR

VALLE GRANDE APARTMENTS

INTRODUCTION

This drainage report analyzes the drainage characteristics for a fully developed apartment complex and outlines the ponding requirements for Phases II, III, portions of IV and V that drain to the Bear Arroyo. Recommendations for control of the developed site runoff and temporary retention of runoff for development of Phase II are presented in the following text.

The overall property is described in the previous Valle Grande Drainage Report (March 1977) as Phase "B". It should be noted that only that portion of Phase B that drains to the Bear Canyon Arroyo is considered in this drainage report (Drainage Areas UD-2 and UD-1, Figure I inclusive). That portion of this tract which drains to the Bear Arroyo Tributary is excluded from this report and will not be discussed (Drainage Area UD-A, Figure I). The subject property is located in the Northeast Heights and is bounded on the south by Spain Road N.E., on the west by the existing Valle Vista Apartments, on the east by Camino del Sol, N.E., and on the north by the Bear Arroyo Tributary. More particularly, the area comprises the R-2 portion of Unit 5, Zone Atlas page F-20 (Vicinity Map, Figure I) within Section 32, T. 11 N., R. 4 E., New Mexico Principal Meridian.

The development is part of a larger drainage basin draining to the Bear Arroyo south of Spain Road N.E., along Camino del Sol N.E., and Wyoming Boulevard N.E. Offsite flows to the east are diverted north to the Bear Tributary and south to Camino del Sol by paving

improvements along Moon Street, thus, only the onsite flows need to be considered. The land slopes at an average 3.5 percent to the southwesterly direction to meet Spain Road and the east property line of the existing Valle Vista Apartments. The offsite flow is presently contained in a temporary pond approved in Phase A which flows overland south to Spain Road N.E., and the southwest corner of the development. The area is sparsely covered with native vegetation of mesa dropseed, black grama, blue grama and some cholla cactus. Soils are of the Embudo and Embudo-Tijeras complex Type B classification. Soils are primarily silty sands with lesser amounts of clean sand and slightly clayey sands.

Runoff is medium with a moderate water erosion hazard. Permability is moderate in the upper 20 inches and very rapid below 20 inches.

At present, precipitation falling on this site forms a sheet flow before accumulating in two well defined drainage swales. As previously mentioned, flows then travel southwest to a pond and leave the site at the southwest corner of the development at a controlled discharge rate of 17.5 cfs onto the north half of Spain Road N.E. Since this temporary detention pond is to be removed to construct Phase II, two additional detention ponds will be constructed as shown on the Phase II, Grading Plan, Figure II.

This report will analyze the existing and proposed flows and will show that the increase in runoff will be accommodated with a combination of detention and retention ponding with controlled discharge so as not to exceed the 31.5 cfs flow capacity discussed in the Phase A Drainage Report.

DESIGN CRITERIA

To analyze the change in runoff resulting from development of this tract of land, the effects of converging flows with regard to establishing peak flows and time to peak, storage pond sizing and routing of on-site flows reveal, an extreme limitation in utilization of the traditional (Q = CIA) Rational Method approach. To determine the effects of these parameters in a logical, yet readily assimilated procedure, the SCS Method as modified for effects of urbanization has been chosen for this report. The methods are fully explained in the SCS National Engineering Handbook, Section 4, Hydrology and "SCS Urban Hydrology For Small Watersheds," Technical Release No. 55 (see Bibliography). This method is in general usage by many major cities in the United States and offers the advantages of considering soil types, lag time, slope and shape factors for varying basin configuration and the unit hydrograph for determination of the maximum time of peak and peak flow to be expected. The 100-year, 6-hour storm runoff for both the undeveloped and proposed developed conditions are calculated. Peak flows are compared to the Rational Method and similar values resulted. These comparative results will be presented later in this report.

A summary of equations and explanation of terminology are contained in the Appendix (page A-7).

UNDEVELOPED FLOW CONDITIONS

The site was analyzed for runoff in the undeveloped state by the Rational Method and SCS Method (see Appendix, pages A-2 through A-4B).

It should be noted that the Rational Method produced a maximum runoff of 52.8 cfs while the SCS Method yielded a maximum runoff of 51.9 cfs or less than 1 cfs difference. Given the lesser reliance on "Engineers Judgement" in determining "C" values and the added ability to determine intermediate flows at various times as well as time to peak, the results of the SCS Method are of much greater application. Existing flows of 30.9 cfs and 28.1 cfs would leave the site in a southwesterly direction as shown on Figure I. A temporary pond along the east property line of Valle Grande Apartments direct this outflow on to Spain as outlined in the Phase I Drainage Report.

DEVELOPED FLOW CONDITIONS

When the site is fully developed, runoff flows from contributing areas of internal flows are as shown on Figure 3. A summary of the sub-areas and peak flows is found in the Appendix (pages A-5 and A-6). The peak flows were determined by the SCS Method based on a curve number of 74 as derived from page A-4A. It should be noted that travel time on page A-5 is not a sum of individual sub-area travel times, but rather the time to peak (Tp) as calculated and shown on page A-6. A comparison of overland flow times versus the computed time to peak shows similar results. By grading this site, the original drainage swales that travel in a southwesterly direction will be eliminated. This grading will allow flows to be directed along streets and grassed drainageways into detention and retention ponds shown in sub-areas F-2 and C-4 respectively. The contained flows from sub-areas F-1 and F-2 will be contained in a one-foot deep pond as shown on Figure III.

The remaining on-site flows will be either directed toward the large detention pond within sub-area C-4 or allowed to discharge along internal streets at G-2 and G-3 and at the Spain Road entrance at G-4. Water blocks will be constructed to prevent flows from crossing sub-area boundaries. The large detention pond in sub-area C-4 will have a 27-inch diameter RC pipe stubbed out for connection to the future storm sewer in Spain Road. This pipe will be plugged at present. However, by analyzing the composite inflow hydrograph (Figure IV) and storage discharge curve (Figure V) it can be seen that the peak flow can be reduced to a maximum discharge of 34 cfs when the pond depth reaches 2.3 feet. The top of berm will have a one-foot freeboard at maximum depth. The storage-discharge curve, Figure V, was derived utilizing the SCS Storage-Indication Method outlined in Chapter 17, Section 4, Hydrology, previously cited (see Bibliography).

Since there is no existing storm drain in Spain Road at present, a temporary overflow from the detention pond will discharge at a controlled rate of 17.5 cfs or less onto Spain Road. When the City installs a storm drain on Spain Road, they can connect to this drain and the developer will remove the overland weir outflow, and the surface runoff from this site will be very minimal.

Since only Phase II is to be constructed at this time, the developer will install two temporary retention ponds as shown on Figure II. These two ponds will intercept the flows from the undeveloped areas and retain this runoff. The two permanent ponds in sub-areas C-4 and F-2 will be constructed with 3 to 1 side slopes at the locations and depths indicated.

The two temporary ponds will be constructed with 2 to 1 side slopes and depth of 3.5 feet. This will allow for a maximum capacity of 56,600 ft.^{3} and 40,250 ft.^{3}, and one foot of freeboard above high water. C = 0.63 (Phase A Report), I = 5.4".

RECOMMENDATIONS

The following recommendations are made to enable the developer to progress with Phase II of the apartment complex as shown.

OFFSITE FLOWS

1. It is recommended that one temporary retention pond be constructed on the northeast boundary and one temporary retention pond be constructed on the north boundary of Phase II to intercept undeveloped runoff flows. Detention ponds would retain 41,100 ft.^{3} and 25,150 ft.^{3} respectively at an average depth of 2.5 feet. Bottom could be rectangular in shape so as to have minimum land surface areas of 15,400 ft.^{2} and 9,200 ft.^{2} respectively.
2. Streets within the Phase II complex will be private and not required to meet City standards. However, it is recommended that all streets have an inverted crown of 1% slope to the centerline of pavement and 6" curbs.
3. Areas designated as detention areas should have a constant cross-section with no crown. The detention basin in sub-area C-4 should have a positive slope toward the outlet of 0.5% maximum.
4. Water blocks are recommended in streets as shown on Figure III to facilitate movement of runoff as shown. Water blocks should have a one foot differential from flowline to crown of street.

5. Based on the soil investigation for Academy Estates, Unit 8, it is recommended that ponding should be at least 15 feet away from structures and footings. Drainage swales shall be at least 1% minimum grade.

CONCLUSION

The proposed construction, by means of temporary and permanent retention and detention ponds will contribute less external runoff to the surrounding areas than previously existed before development.

Prepared by:

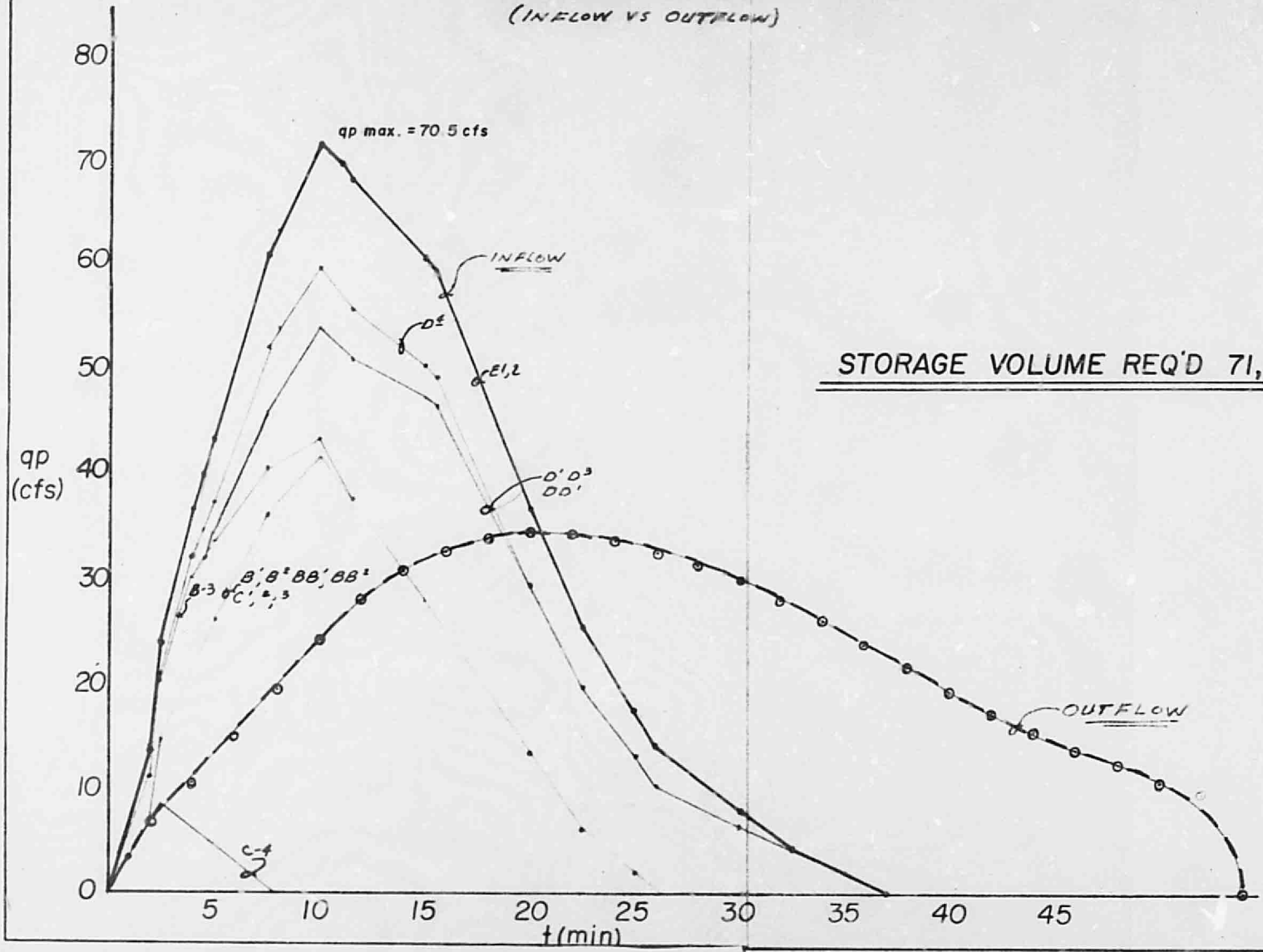
Wiley R. Smith
N.M.P.E. No. 6618

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2. "Soil & Foundation Investigation Report," Academy Estates, Unit 8, Sergent, Hauskins & Beckwith, October 1977.
3. "Drainage Report, Valle Grande Apartments," Genge/Murray-McCormick, Inc., March 1977.
4. "AMAFCA Drainage Resolution 72-2" with 100 year, 6-hour Precipitation Chart by U.S. Weather Bureau.
5. "Urban Hydrology for Small Watersheds," Technical Release No. 55, U.S. Soil Conservation Service, January 1975.
6. SCS National Engineering Handbook, Section 4, Hydrology, Victor Mockus, August 1972.

COMPOSITE HYDROGRAPH

(INFLOW VS OUTFLOW)



STORAGE VOLUME REQ'D 71,505 ft.³

FIG. IV

MEURER, SERAFINI AND MEURER, INC.

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JOB NO. 2520087 DATE 4-4-79

PROJECT VALLE GRANDE APTS.

SCALE

DRAINAGE REPORT

FOR

VALLE GRANDE APARTMENTS

MEURER, SERAFINI AND MEURER, INC. *CONSULTING ENGINEERS*

2601 WYOMING BOULEVARD N.E. • SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • 505/292-1936

DRAINAGE REPORT

FOR

VALLE GRANDE APARTMENTS

Perpared For

Academy Development Company
8401 Spain Road, Bldg. 3-D
Albuquerque, New Mexico 87111

Prepared by

Meurer, Serafini and Meurer, Inc.
2601 Wyoming N.E.
Albuquerque, New Mexico 87111
(505) 292-1936

June 1978

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APPENDIX-1	Street Runoff Calculations
APPENDIX-2	Drainage Calculations Summary
APPENDIX-3	Pond Volume Calculations

DRAINAGE REPORT

PURPOSE AND SCOPE

Academy Development Company is proposing to develop a parcel of land called Valle Grande, located in the northeast quadrant of the Albuquerque area. This parcel will be developed into a medium density apartment complex to be developed in four phases, each of approximately 144 apartments and covering 9.5 acres per phase.

The purpose of this report is to present a master plan for controlling surface runoff from the entire planning area in a manner acceptable to the Albuquerque Metropolitan Arroyo Flood Control Authority and the Albuquerque City Engineer's office.

SITE LOCATION AND TOPOGRAPHY

The said parcel of land is bounded on the south by Spain Road N.E., and by Camino Del Sol N.E. The eastern boundary is adjacent to Moon Street.

The northern property line borders the Bear Canyon Tributary Arroyo and the flood plain extends into the property in Phases 4 and 5 as shown on the drainage plan. The area to the east of Moon Street is developing into single family residences (Academy Estates Unit 8). The western property line is adjacent to the completed Phase I of Valle Grande Apartments, and a section of Albuquerque Academy Lands, undeveloped at this time

The soil on the site is generally comprised of SM sand and silt. The natural ground slopes from northeast to southwest at an average of 3%.

DESIGN CRITERIA

In analyzing the storm runoff, the Rational Formula, $Q = CIA C_f$ is used.[1].

Where:

Q = Runoff quantity in cubic feet/second.

A = Contributing area in acres.

C_f = Frequency factor for Rational Formula

I = Intensity in inches/hour for a duration equal to the time of accumulation (duration) measured in minutes and obtained from Figure IV, Intensity Duration Frequency Curves, Albuquerque Area 1961. (Note: Where a Time of Concentration [Tc] is less than ten minutes from Figure III, the intensity value derived from a Tc of ten minutes is employed.)

C = Runoff Coefficient (No Units). This coefficient represents the integrated effects of infiltration, detention storage, evaporation, retention, flow routing, and interception which all affect the time distribution and peak rate of runoff.

ESTIMATED RUNOFF UNDEVELOPED STATE

Drainage within the boundary of the site is carried in several small arroyos, travelling from the northeast corner of the property to the southwest boundary.

The total runoff in the undeveloped state forms the basis for comparison with the flow in the developed state. See Table I for a listing of undeveloped runoff.

TABLE I

Runoff In Undeveloped State

Development Phase	Elev. Diff.	Length Of Flow	T.C. (Min.)	I100 yr. In./Hr.	C^2	Area Ac.	Q (CFS)
II	12'	700'	10 6.5	5.4	.38	9.4	19.29
III	20'	800'	10 5.7	5.4	.38	9.8	20.11
IV	18'	550'	10 3.8	5.4	.38	9.4	19.29
V	16'	700'	10 5.4	5.4	.38	9.8	20.11
TOTAL							78.80

Runoff in Developed State

Development Phase	Elev. Diff.	Length Of Flow	T.C. (Min.)	I 100 yr. In./Hr.	C^2	Area Ac.	Q (CFS)
II	13'	550'	6.5	5.4	1.00	2.66	14.36
III	32'	1050'	7.5	5.4	1.00	2.81	15.17
IV	18'	700'	7.0 5.0	5.4	1.00	2.92	15.78
V	19'	900'	7.5	5.4	1.00	2.83	15.31
TOTAL							60.62

ESTIMATED RUNOFF DEVELOPED STATE

As development occurs, the area of impervious surfaces increases and thereby the amount of runoff and volume usually increase. In order to offset this increase, onsite restrictions of flows must be incorporated into the development. While this can take different forms, the usual solution for this type of development is to utilize retention ponding.

The runoff coefficient for various surfaces prior to adjusting C_f is as follows:

Streets, Walks and Drives	C = 0.80
Roofs	C = 0.80
Lawns, Sandy Soil (Average 2 to 7% slope)	C = 0.30

See Appendix-1 for computations on composite runoff coefficients.

EXPLANATION OF RESULTS

OFFSITE FLOW

As shown on the drainage plan, a northern portion of the development encroaches into the 100-year frequency flood plain as determined by A.M.A.F.C.A. The layout of improvements for this project avoids the existing flood plain, thereby not altering the flood plain.

A study, currently being prepared by Bovay Engineering, is analyzing the feasibility of diverting the flow carried in the Bear Tributary Arroyo generated east of Tramway. The diverted flows would be conveyed by two diversion channels northward to the Pino Arroyo. The proposed diversion is shown on sheet 2 of 2 of the attached drainage plan.

A significant reduction in the size of the flood plain may be caused by the upstream diversion of the Bear Tributary Arroyo. The question of leaving the channel natural or improvement of it should be left until such upstream study is finalized and approved.

Since the Bear Tributary is within a drainage basin north of the majority of the Valle Grande project, Phases II, III, V and a portion of Phase IV can be constructed prior to final disposition of the arroyo. If the flood plain is substantially reduced or if the arroyo is required to be improved at a future date, then the lands within the current flood plain can be utilized for development.

There is no other offsite runoff onto this development. Upstream drainage is intercepted by Moon Street to the east and Camino Del Sol to the south.

HISTORIC RUNOFF

Runoff from the project in the undeveloped state is generally carried in minor arroyos and can be divided loosely into two drainage areas; one in the north and the majority of the project in the southerly basin. Due to the steepness of the terrain, and the undiverted path of the runoff, the times of concentration are low, 10.0 minutes, resulting in a total historic drainage for the area of 78.8 cfs.

DEVELOPED RUNOFF

The ponding of runoff from the apartments and lawn area is sufficient to maintain the developed (60.6 cfs) runoff below the historic runoff (78.8 cfs). This will make it unnecessary to pond any street or parking lot areas.

As each phase is constructed there will be a corresponding increase in required ponding volume since some ponds will be jointly used by the various phases. These ponds will be excavated as necessary even though the phase that they are located in is not yet under construction. Following this ponding practice, sufficient ponding capacity will be available at all times to meet City and A.M.A.F.C.A. requirements.

Some groups of apartments will not have sufficient lawn area to put in ponds of adequate volume to handle runoff from that group. In order to pond this excess runoff the flow will be carried under the street in 8" diameter pipes to large collector ponds covering several thousand square feet. As a result, the total 100-year flood runoff from the developed site is 60.6 cfs, less than the 78.8 cfs undeveloped runoff.

This drainage plan meets both the City Engineer and A.M.A.F.C.A. requirements for the storage and discharge of storm runoff.

RECOMMENDATIONS

1. No permanent structures should be built in the flood plain.
2. Ponds should be built to the required size and depth as shown on the drainage plan.
3. Preliminary grading plan indicates the grading concept. The final grading plan must show much more detail and ponding sizes and depth. Street grades and pad elevations should not change to a large extent.
4. Landscape ponds to the extent necessary to prevent erosion of side slopes.
5. 8" storm drain pipes should be of sufficient strength to adequately handle impact loads from traffic.

CONCLUSION

The use of ponding throughout the site will be sufficient to maintain developed runoff below that occurring in the undeveloped state. Pipes running beneath paved areas will transfer excess runoff from drainage basins which have limited ponding volume available.

Runoff from parking lots and streets will be carried on the surface of the street to be discharged onto Camino Del Sol N.E., or into Valle Grande Apartments, Phase I, streets and eventually discharge into Spain Road N.E. This runoff routing generally follows the undeveloped storm drainage pattern. The runoff discharged downstream will have no adverse affect to downstream improvements.

APPENDIX-1

UBDIVISION VALLE GRANDE APTS
OCATION N.E. HTS Wyoming + SPAIN
OB NO.
ESIGN STORM 100 YR. RECURRENCE INTERVAL
AJOR STORM 100 YR.
OMPUTATIONS BY D. Ward DATE JUNE-9-78

STREET RUNOFF
Route I

RUNOFF COMPUTATIONS
(Rational Method)

INVERTED CROWN
Asphalt n=.017

PAGE 1 O

Area Designation	A (Acres)	c	c_f	$\bar{c}$ = ($c \times c_f$)	A·$\bar{c}$	ΣA·$\bar{c}$	tc (min)	I (in/hr)	Q = (ΣA·$\bar{c}$)×I cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)
A - III	1.24	.80	1.25	1.0	1.24		10	5.4	6.7							
A - IV	1.5	.80	1.25	1.0	1.5		10	5.4	8.2							
ΣA1B - V	2.74	.80	1.25	1.0		2.74	10.6	5.3	14.6							
B - IV	1.3	.80	1.25	1.0	1.3		10.	5.4	7.0							
A - II	.76	.80	1.25	1.0	.76		11	5.2	4.0							
Σ B-V + A-II	2.06	.80	1.25	1.0		2.06	11	5.2	10.71							
ROUTE I						4.8	11	5.2	25.0							
B - II	0.5	.80	1.25	1.0	.5		11	5.2	2.6							
C - II	1.24	.80	1.25	1.0	1.24		11	5.2	6.5							
D - II	0.2	.80	1.25	1.0	0.2		11	5.2	1.04							
						1.94	11	5.2	10.1							

BDIVISION Valle Grande Apts
CATION N.E. Apts Wyoming + Spain
B NO.
ESIGN STORM 100 YR. RECURRENCE INTERVAL
AJOR STORM 100 YR.
OMPUTATIONS BY D. Wood DATE June-9-78

STREET RUNOFF
ROUTE II

RUNOFF COMPUTATIONS
(Rational Method)

INVERTED CROWN
n = .017

Area Designation	A (Acres)	c	c_f	$\bar{c}$ = (c x c_f)	A·$\bar{c}$	ΣA·$\bar{c}$	tc (min)	I (in/hr)	Q = (ΣA·$\bar{c}$) x I cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	ΔT (min)	
B - IV	1.24	.80	1.25	1.0	1.24		10	5.4	6.7								
B - III	2.0	.80	1.25	1.0	2.0		10	5.4	10.8								
Σ II-B-III	3.24	.80	1.25	1.0		3.24	10	5.4	17.5								
A - III	.81	.80	1.25	1.0	.81	-	10	5.4	4.37								
D - IV	.20	.80	1.25	1.0	.20		10	5.4	1.1								
Σ A-III + D IV	1.01	.80	1.25	1.0		1.01	10	5.4	5.5								
Σ to II	4.25	.80	1.25	1.0		4.25	10	5.4	22.95								
						4.80 1.94 4.25											
TOTAL RUNOFF						11.0	11	5.25	57.8								

APPENDIX-2

ALBUQUERQUE, N.M.

MEURER - SERAFINI - MEURER, INC.

By D. Wood Date 5-15-78 PROJECT VALLE GRANDE APTS sheet No. ___ of ___

Checked By ___ Date ___ HISTORIC Vs DEVELOPED Job No. ___

PHASE	AREA (AC) FT^2	ORIGINAL RUNOFF VOL (CFS)	DEVELOPED RUNOFF VOL (CFS)	ORIGINAL FLOW (CFS)	DEVELOPED FLOW (CFS)	
II	9.4 Ac. 409,464 FT^2	31,119	23,153	19.29	14.36	26.89
III	9.8 Ac. 426,888	32,443	24,518	20.11	15.17	26.88
IV	9.4 Ac. 409,464	31119.3	25,452.8	19.29	15.78	
V	9.8 426,888	32,443	24,698	2010	15.31	
TOTAL		127124.3	97821.8	78.49	60.62	

ALBUQUERQUE, N.M.

MEURER - SERAFINI - MEURER, INC.

By_____ Date_____ PROJECT Valle Grande Apts sheet No.____of____

Checked By_____ Date_____ Drainage Calcs. Phase II Job No._____

AREA #	AREA Ft²	BLDG AREA Ft²	Cf	RUNOFF Vol. Ft³	POND AREA Ft²	POND desig.	TOTAL VOL	CFS
1	18000	4000	.222 x 1.0 = .222 .778 x .38 = .295 Cf = .517	1863	0		0	1.15
2	13,000	4000	.308 x 1.0 = .308 .692 x .38 = .263 Cf = .571	1485	0		0	.92
3	13,000	4000	same Cf .571	1485	0		0	.92
4	34,000	7,500	.221 x 1.0 = .221 .779 x .38 = .296 Cf = .517	3516	2000	X	2320	
5	65,000	17,400	.268 x 1.0 = .268 .732 x .38 = .278 Cf = .546	7098	2000	S, T, U	6350	
6	45,700	12,900	.282 x 1.0 = .282 .717 x .38 = .273 Cf = .555	5073	3.000	R, Y	3301	
7	105,000	23,000	.219 x 1.0 = .219 .781 x .38 = .297 Cf .516	10840	18,500	V-W	23990	
1-7	293,700	72,800		31,360	25500		35961	
Parking Cf .44-.87	115,754		Cf 1.00	23,153				
TOTAL RUNOFF VOLUME	409,454		.38	31,119				
ORIGINAL FLOW	9.4 Ac.		.38	19.29 cfs				
DEVELOPED FLOW	2.66 Ac.		1.0	14.36 cfs				

MEURER - SERAFINI - MEURER, INC. ALBUQUERQUE, N.M.

By D. Wood Date May 1 PROJECT Valle Grande Apts sheet No. of

Checked By Date Drainage Calcs Phase 3 Job No.

Total AREA 9.8 Ac.

AREA #	TOTAL AREA, Ft²	BLDG. AREA Ft² ±	Cf	RUNOFF VOL Ft³	POND AREA Ft²	POND DESIG.	TOTAL POND VOL	
1	40,500	11,500	.284 x 1.0 = .284 .716 x .38 = .272 Cf .556	4503.6	0	—		2.79
2	70,500	18,400	.261 x 1.0 = .261 .739 x .38 = .281 Cf .542	7642	11600	N, M	17,608	
3	34,000	11,000	.323 x 1.0 = .324 .677 x .38 = .257 Cf = .581	3951	4700	L	11151	1.74
4	151,500	36,900	.243 x 1.0 = .243 .756 x .38 = .287 Cf = .530	16059	15600	O, P, Q	17,190	
1-4	296,500	77,800	—	32,156			35,949	
STREET ISLAND 5	7800	0	1.00 x .38 Cf = .38	0				
STREET AREA RUNOFF	122,588		Cf = 1.00	24518		By Ponding ALL APTS AND LOANS ARE ALLOWING STREET TO RUNOFF FLOWS KEPT BELOW HISTORIC		
ORIGINAL RUNOFF VOL	9.8 x 43560 426,888	0	Cf = .38	32,443				
ORIGINAL FLOW	9.8 Ac.		Cf = .38 x 5.4 =	20.11 cfs				
DEVELOPED FLOW	2.81 Ac.		Cf = 1.00 x 5.4 =	15.17 cfs				

ALBUQUERQUE, N.M.

MEURER - SERAFINI - MEURER, INC.

By_____ Date_____ PROJECT Valle Grande APTS Phase III Sheet No.____ of____

Checked By____ Date_____ Job No.____

TOTAL AREA 9.4 Ac.

AREA #	TOTAL AREA Ft²	BLDG AREA Ft²	Cf	RUNOFF Vol Ft³	POND AREA Ft²	POND DESIG	POND Vol. Ft³	Cfs
1	70400	16900	.240 x 1 = .240 .760 x .78 = .593 Cf = .5219	7448	8900	H, K, G	9950	
2	30000	9400	.313 x 1.0 = .313 .687 x .38 = .261 Cf = .574	3444	0	I	1022	2.13
3	16000	4000	.25 x 1.0 = .25 .75 x .38 = .285 Cf = .535	1712	0	—	—	1.06
4	84200	24400	.290 x 1.0 = .290 .710 x .38 = .270 Cf = .560	9430	2400	J	1889	4.67
5	42,100	7500	.178 x 1.0 = .178 .822 x .38 = .312 Cf = .490	4126	12000	½ K	13,020	
6	27000	8000	.296 x 1.0 = .296 .703 x .38 = .267 Cf = .563	3040	0	—	—	1.85
7	12,500	3500	.28 x 1.0 = .28 .72 x .38 = .274 Cf = .554	1382	0	—	—	.86
DEVELOPED 1-7	282,200	73,700		30582			25881	
START AREA	127,264		Cf = 1.00	25452.8				15.78
ORIGINAL RUNOFF VOLUME	409,464		Cf = .38	31119.3				
ORIGINAL RUNOFF FLOW	9.4 Ac.		Cf = .38 x 5.4	19.29 cfs				19.29
DEVELOPED RUNOFF FLOW	2.92 Ac		Cf = 1.00 x 5.4 =	15.78 cfs				15.78

MEURER - SERAFINI - MEURER, INC. ALBUQUERQUE, N.M

By D. Wood Date May-4-78 PROJECT VALLE GRANDE PHASE V sheet No. ___ of ___

Checked By ___ Date ___ Job No. ___

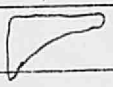
AREA #	TOTAL AREA FT²	BLDG. AREA FT²	Cf	RUNOFF Vol FT³	Pond AREA FT²	Pond Desig.	9.8 Ac. Pond Vol	
1	145,800	35700	1.0 x .296 = .296 .738 x .274 = .202 Cf = .534	15370	18000	A, B, E, F, G	36102	
2	72,400	19,500	.268 x 1.0 = .268 .732 x .78 = .238 Cf = .506	7819	2800	D, E, F	2521	
3	31,000	8,375	.263 x 1.0 = .263 .737 x .78 = .280 Cf = .543	3348	0	—	—	2.09
4	23,000	7,500	.323 x 1.0 = .323 .676 x .78 = .257 Cf = .580	2668	0	—	—	1.65
5	32,000	7,500	.239 x 1.0 = .239 .722 x .78 = .290 Cf = .529	3360	6000	½ K	13020	
2-5	303,400			32565			51,643	
STREETS AREA	123,488		Cf = 1.0	24698				
REGIONAL RUNOFF VOLUME	426,888		Cf = .38	32443				
REGIONAL FLOW CFS	9.8 Ac.		Cf = .38 x 5.4	20.10 CFS				
DEVELOPED FLOW	2.83 Ac		Cf = 1.0 x 5.4	15.31 CFS				

APPENDIX-3

MEURER - SERAFINI - MEURER, INC. ALBUQUERQUE, N.M.

By Dwood Date 5-16-78 PROJECT VALLE GRANDE APTS sheet No. ___ of ___

Checked By ___ Date ___ Pond Volumes Job No. ___

Pond	Shape	Depth	Surface Area Ft²	Surface Area of Full Depth Area	Volume at Full Depth Area Ft³	Length D	Side Slope n:1	Area Vol
A		2.0'	10000	8000	16000	3590	6	2100 / T. 18100
B		1.5	3000	1600	2250	1300	3.4	442 / 2692
C		2.0'	9000	6000	12000	340	6.0	2040 / 14040
D		1.5'	1400	500	750	70	3.4	238 / 988
E		1.5'	900	450	675	65	3.4	221 / 896
F		1.5'	600	300	450	55	3.4	187 / 637
G		2.0'	2000	1000	2000	90	6.0	540 / 2540
H		2.0'	7000	3500	7000	280	6	1680 / 8680
I		1.5'	1000	500	750	80	3.4	272 / 1022
J		2.0'	1500	800	1600	85	3.4	289 / 1889
K		2.0'	18000	12000	24000	340	6.0	2040 / 26040
L		1.7'	1200	500	850	70	4.3	301 / 1151
M		1.5'	1000	500	750	50	3.4	170 / 920

MEURER - SERAFINI - MEURER, INC.

ALBUQUERQUE, N.M.

By____ Date____ PROJECT Valle Grande APTS sheet No.____ of____

Checked By____ Date____ Pond Volumes Job No.____

Pond	Shape	Depth	Surface Area Ft²	Surface Area of Full Depth	Volume of Full Depth		Volume of Side Area Lg	Area	W	Sub Total
N		2.0'	10600	7500	15,000		280	6	1680	16680
O		2.0'	8600	5200	10,400		200	6	1200	11600
P		2.0'	2500	1000	2,000		125	6	750	2750
Q		2.0	2700	1000	2,000		140	6	840	2840
R		2.0	2000	800	1600		120	6	720	2320
S		1.5	1000	500	750		50	3.4	170	920
T		2.0	1500	800	1600		85	6	510	2110
U		2.0	4300	1300	2600		120	6	720	3320
V		2.0	8000	4500	9000		280	6	1680	10680
W		2.0	10000	5500	11000		385	6	2310	13310
X		2.0	2000	950	1900		70	6	420	2320
Y		1.5'	1200	450	675		90	3.4	306	981

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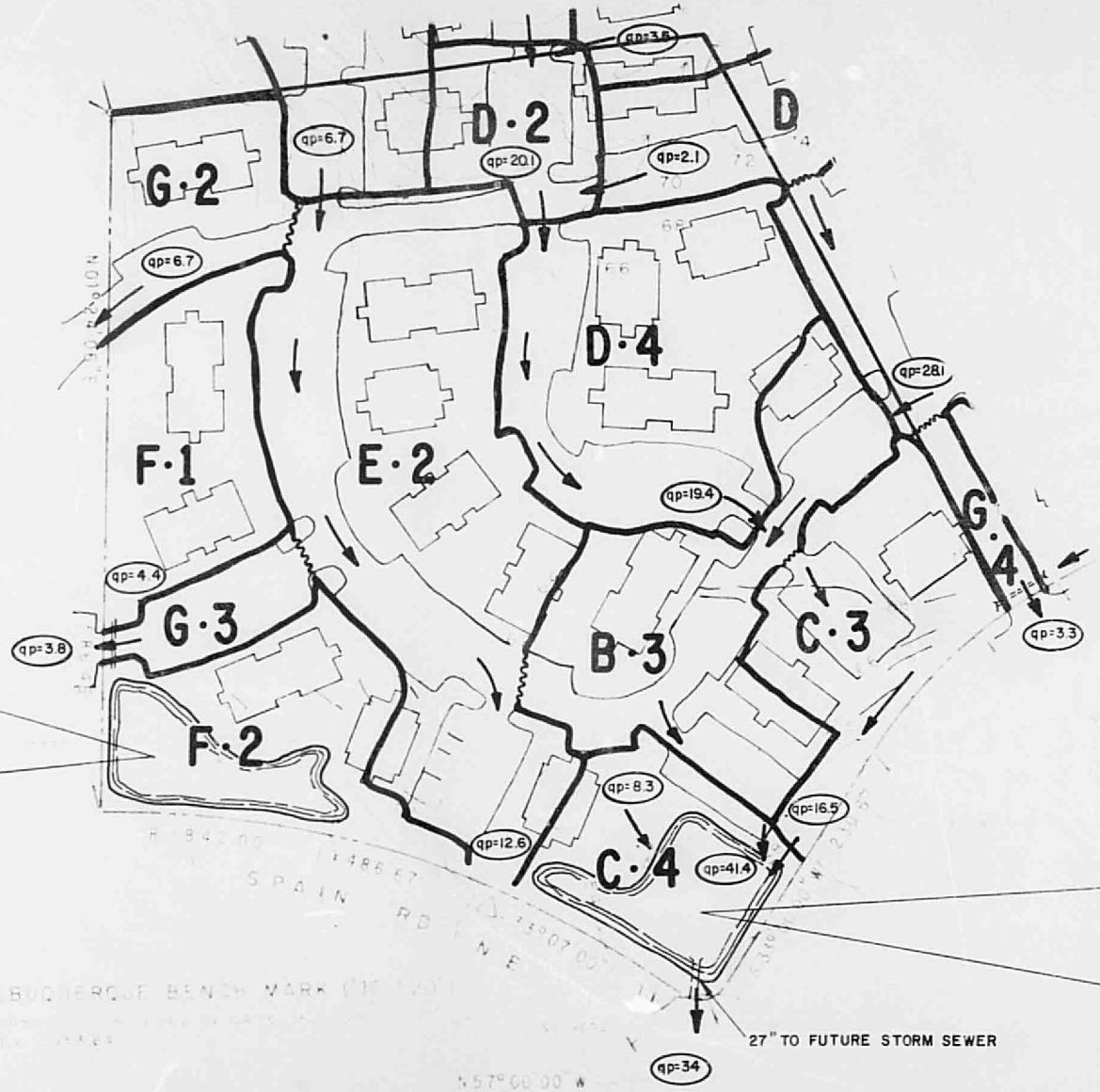
ALBUQUERQUE, N.M.

By_____ Date_____ PROJECT Valle Grande Apts sheet No.____ of____

Checked By____ Date_____ Pond Volumes Job No._____

Pond	Shape	Depth	Surface Area Ft²	Surface Area @ Full Depth	Volume @ Full Depth		Volume of Side Area Log	Area	W	Sub Total
N		2.0'	10600	7500	15,000		280	6	1680	16680
O		2.0'	8600	5200	10,400		200	6	1200	11600
P		2.0'	2500	1000	2,000		125	6	750	2750
Q		2.0	2700	1000	2,000		140	6	840	2840
R		2.0	2000	800	1600		120	6	720	2320
S		1.5	1000	500	750		50	3.4	170	920
T		2.0	1500	800	1600		85	6	510	2110
U		2.0	4300	1300	2600		120	6	720	3320
V		2.0	8000	4500	9000		280	6	1680	10680
W		2.0	10000	5500	11000		385	6	2310	13310
X		2.0	2000	950	1900		70	6	420	2320
Y		1.5'	1200	450	675		90	3.4	306	981

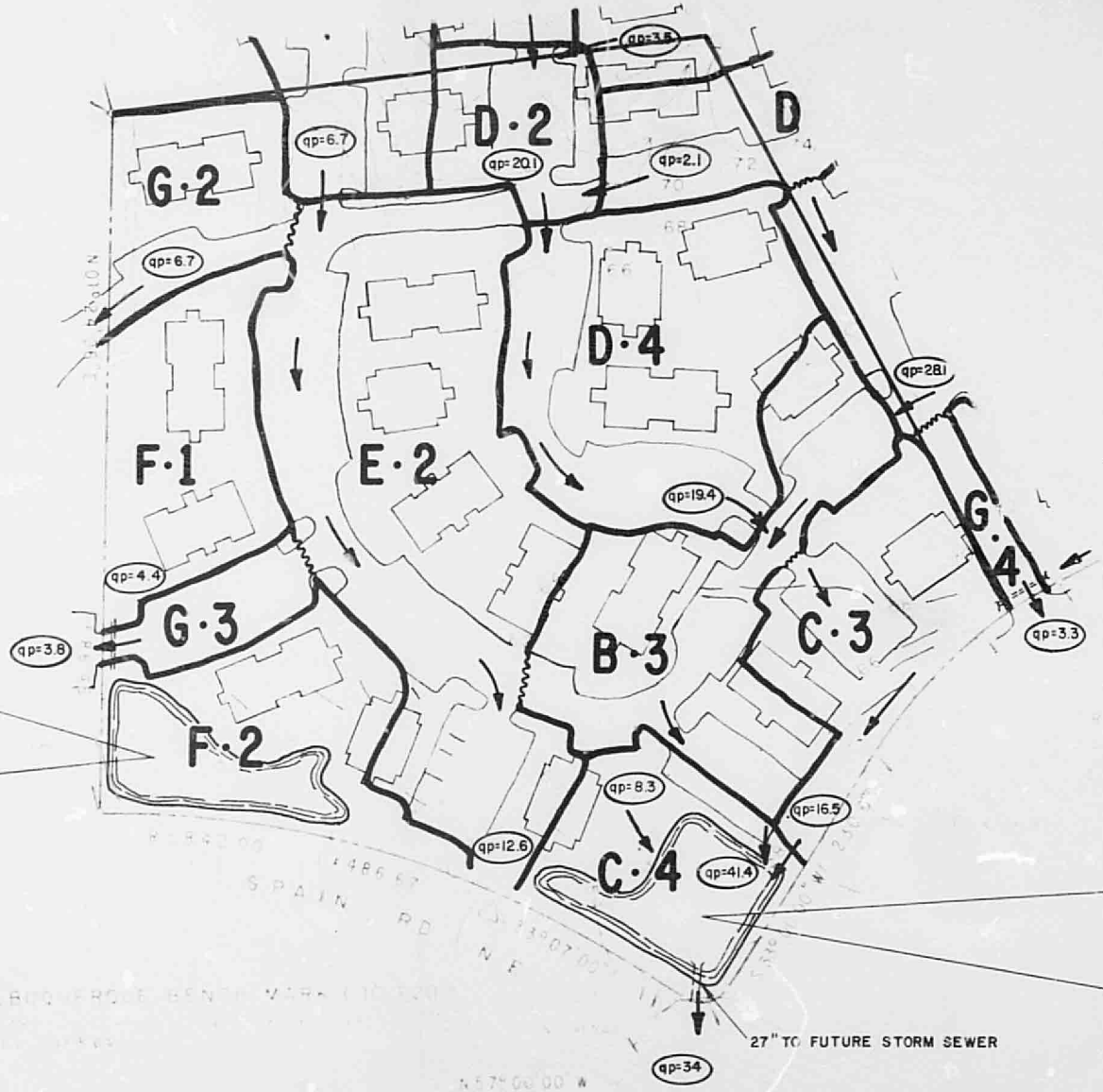
PHASE A



POND F-2

POND ELEVATION	SURFACE AREA	STORAGE (FT³)
MAX. 48.0	7888	7168
47.5	7168	3404
Æ 47.0	6448	

PLAN SHOT IN TWO SECTIONS



UNIT 2

F-2

Area	Storage (FT³)
3	7168
8	3404
3	

POND C-4

Pond Elevation		Surface Area	Storage (FT³)
MAX.	54.5	17,192	50,788
	54.0	16,752	42,192
	53.5	15,872	34,060
	53.0	14,992	26,368
	52.5	14,080	19,092
	52.0	13,168	12,272
	51.5	12,272	5,912
℄	51.0	11,376	

Fig. III(a)

DRAINAGE to POND C-4

%IMP	AREA	ACRES	T_c (MIN)	AVG "C"	i	Q	Vol. ($Q \times \frac{43,560}{12}$)
70%	E-1(PART)	0.28	7.1	0.76	2.5"	0.53	1920 FT³
65%	D-2	0.70	7.3	0.72		0.72	2610 FT³
45%	DD-1(PART)	0.10	6.7	0.63		0.16	580 FT³
70%	D-3(PART)	0.32	6.4	0.76		0.61	2210 FT³
55%	D-4	1.42	9.2	0.68		2.41	8756 FT³
65%	E-2	2.30	6.5	0.72		4.14	15,030 FT³
75%	B-3	1.22	3.6	0.78		2.38	8,640 FT³
65%	C-3	0.82	4.1	0.72		1.48	5,370 FT³
10%	C-4	0.78	1.5	0.45		0.88	3,190 FT³
		7.64Ac					Σ = 48,300 FT³

"ATTACHMENT"

MEURER, SERAFINI AND MEURER, INC.
CONSULTING ENGINEERS • SURVEYORS • PLANNERS
2601 WYOMING BOULEVARD • SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • (505) 292-1936

JOB NO. 252-0087 DATE 4/26/79
PROJECT Valle Vista
SCALE N/A



DRAINAGE REPORT

VALLE GRANDE APARTMENTS

MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ECOSYSTEMS ANALYSIS • PLANNING • LAND SURVEYS • ENGINEERING

2601 WYOMING BLVD., NE. SUITE F / ALBUQUERQUE, N.M. 87110 / 505-292-1936

DRAINAGE REPORT

VALLE GRANDE APARTMENTS

Prepared For

Academy Development Company
910 Juan Tabo, N.E.
Albuquerque, New Mexico 87112

Prepared By

Genge/Murray-McCormick, Inc.
2601-F Wyoming Blvdevard, NE
Albuquerque, New Mexico 87110

(505) 292-1936

DRAINAGE REPORT

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STEP II	5
SUMMARY OF RESULTS	8
RECOMMENDATIONS	9

APPENDIX

Calculations for Rational Formula	A-1
Calculations for An Orifice Outlet	A-2
Calculations for Detention Pond Capacity	A-4

Figure I - Location Map, Plat F-20

Figure II - Apt. Complex Site Plan, Phase I and II

Figure III - Topographic Map & Drainage in Undeveloped State

Figure IV - Topographic Map & Drainage in Developed State, Phase I

Figure V - Time of Concentration of Small Basins

Figure VI - Intensity-Duration-Frequency Curves

Bibliography of References

INTRODUCTION

The purpose of this report is to analyze the drainage characteristics of an apartment complex in its proposed developed state. Recommendations for controlling this runoff will be presented in the following text.

The overall subject property, Phase "A" and Phase "B" (Fig. II) of the proposed apartment developemnt, is located in the Northeast Heights of Albuquerque, at the northeast corner of the intersection of Wyoming Boulevard, N.E., and Spain Road, N.E. More particularly, it comprises the R-2 portion of Unit 5, (Figure III) within Section 32, T. 11 N., R. 4 E., N.M.P.M. (Zone Atlas F-20, Fig. I).

The property is bordered by Spain Road on the south side, Wyoming Boulevard on the west side, and undeveloped land on the north and east sides. The area which this report will deal with, is the first phase of construction, herein referred to as Phase "A". The area to the east of Phase "A" will be developed at some future date, and this area will be referred to as Phase "B". A drainage study for Phase "B" will be submitted at such time of future development.

Phase "A" is located on land which forms the downstream outlet of a larger drainage basin to the east. The flows from this basin collect in an arroyo which bisects the Phase "A" area

before emptying onto Wyoming Boulevard. These flows are picked up by a newly constructed storm drain system in Wyoming Boulevard before being released into the Bear Arroyo.

The original area which contributed runoff to Phase "A" was much larger before recent construction activity caused a re-routing of potential runoff. In particular, the road bordering the south side of Phase "B", Canino Del Sol, has been rough-graded to a point where flows now follow its pathway directly into the Bear Arroyo (Fig. III). This has resulted in a large reduction of potential runoff which previously passed through Phase "B", then "A", and out onto Wyoming Boulevard.

Almost all precipitation falling directly on the Phase "A" site forms into sheet flow before accumulating in the defined drainage arroyo which traverses the center of the site. This flow leaves the site at the intersection of Wyoming Boulevard and Spain Road. The remaining precipitation leaves the Phase "A" area at the northwest corner of the site in the form of sheet flow. This runoff also flows onto Wyoming Boulevard.

As it will be shown in the following test, these internal flows will be accommodated by a combination of detention ponding with controlled outlets, and ponding in the open landscaped areas.

DESIGN CRITERIA

In analyzing the storm runoff to determine the runoff basis of the undeveloped site, the Rational Formula, Q=CIA was used.

Where:

Q = Runoff quantity in cubic feet/second.

A = Contributing area in acres.

I = Intensity in inches/hour for a duration equal to the time of accumulation (duration) measured in minutes and obtained from Figure VI - Intensity Duration Frequency Curves (Albuquerque Area - 1961). (Note: Where a Time of Concentration [Tc] is less than 10 minutes from Figure V, the intensity value equal to 10 minutes was used as shown on the curve for a 100 year storm in Fig. VI).

C = Runoff coefficient (no unit). This coefficient represents the integrated effects of infiltration, detention storage, evaporation, retention, flow routing, and interception which all affect the time distribution and peak rate of runoff.

For the proposed developed areas, it was desirable to develop a composite runoff coefficient based on the percentage of different types of surface in each sub-drainage area. Different coefficients with respect to surface type are given below.[1]

Streets, walls and drives	C = 0.90
Roofs	C = 0.90
Lawns, sandy soils, Ave. 2 to 7% slope	C = 0.20

1. Table 3-2, Urban Storm Drainage Criteria Manual Vol. I, Denver Regional Council of Governments.

The following table is a summary of these values - refer to the appendix for an example of the calculations.

Sub-Drainage Section	Area	By Area C = 0.20	By Area C = 0.90	Composite "C" Factor
1	1.50	0.44	1.06	0.69
2	0.78	0.41	0.37	0.53
3	2.27	0.89	1.38	0.63
4	1.79	0.74	1.05	0.61
5	2.46	1.13	1.33	0.58
6	0.39	0.27	0.12	0.42
7	0.32	0.22	0.10	0.42
	9.51			

Quantities of runoff were computed on a 100 year storm frequency for both the undeveloped condition and the proposed final developed state.

STEP I

Step I consists of analyzing the site in the undeveloped form. Runoff was based on general accumulation of flows into the natural arroyo traversing the center of the site, Phase "A".

The runoff coefficient used for undeveloped areas = 0.35.[2]

2. Table XII, Master Plan of Drainage, City of Albuquerque, N.M. and Environs, 1963, G. Herkenhoff & Assoc.

Tabulation of Results - Step I
Estimated Flows - Undeveloped Site

Area	Elev. Diff. (feet)	Length of Flow (feet)	Tc (min.)	I "/hr.	C	Area (Ac.)	Q (cfs)
A-1	8'	150'	10	5.4	0.35	1.15	2
A-2	18'	685'	10	5.4	0.35	8.36	16
		Total Undeveloped Flow Rate =					18 cfs
O.S.A-1	98'	2530'	12	5.11	0.35	49.59	89
O.S.A-2	16'	340'	10	5.4	0.35	1.38	3

Therefore, maximum developed flow rate cannot exceed 18 cfs. O.S.A-1 will be detained at the east boundary of the site, flow from this detention pond will be allowed to flow onto Spain Road at a reduced rate. O.S.A-2 will pass through the site's internal street system before entering Wyoming Boulevard.

STEP II

Step II consists of analyzing the Phase "A" site in its developed state. Only internal flows were considered in this step. The resulting runoff flows and area contributing to this runoff are shown for each area on Fig. IV.

The following approach was taken for developing the runoff characteristics of the proposed site: The runoff flow will be detained on site where possible and released at controlled rates at designated receiving areas. Generally, low flows from small intensity storms will not be detained. However, for larger inflows, properly designed detention storage will reduce the outflow from the retention areas to a rate much less than the inflow. The final results will help reduce the impact of the outflowing drainage on the downstream facilities.

The detention areas will use a combination of open spaces and the parking-street areas. It might seem objectionable to some to detain water on a common use parking area-street. However, if done properly, it can be accomplished without interfering with the layout and functioning of the street. Furthermore, controlled rates of release are generally large enough so that water is ponded only during the larger storms. Therefore, theoretically once in a 100 years, the ponding volume of the parking area or street would be used to its maximum capacity. For a design storm having a recurrence period of five years, the depth of ponding would be 26% of that of a 100 year storm. It should be evident that the inconvenience to the street users would not be significant.

The flows generated in the undeveloped state will be 18 cfs. Since the developed discharge would equal approximately 31 cfs, controlled flow orifices will be constructed to release no more than 18 cfs discharge rate. The following table is a breakdown of the sub-drainage areas to determine total developed uncontrolled runoff rate. I = 5.4"/hr. for all areas.

Area	Composite "C"	Area	Q
1	0.69	1.50	6 cfs
2	0.53	0.78	2 cfs
3	0.63	2.27	8 cfs
4	0.61	1.79	6 cfs
5	0.58	2.46	8 cfs
6	Retention Ponding		
7	0.42	0.32	1 cfs
			31 cfs

Refer to the appendix for a sample calculation for determining the peak discharge and allowable runoff from each sub-area. The following table is a summarization of these values.

Table of Controlled Outflows

Areas 2 through 5

Sub-Drainage Areas	Area 2	Area 3	Area 4	Area 5	
Area (Ac.)	0.78	2.27	1.79	3.84	(Area 5 + O.S.A-2)
Allowable Outflow (cfs)	1.0	3.0	2.0	8.0	(5 cfs - Area 5) (3 cfs - O.S.A-2)
Runoff Coefficient	0.53	0.63	0.61	0.50	
Qo (cfs/Ac.Imp.)	2.42	2.10	1.83	4.17	
T (minutes)	29.13	33.13	37.20	16.24	
Vs (ft^3/Ac.Imp.)	3282.75	3679.73	4058.57	1756.77	
Vt (ft^3)	1357.09	5262.38	4431.56	3373.01	
Head (ft)	0.58	0.58	0.67	0.58	
a (ft^2)	0.20	0.61	0.76	1.64	
Size Pipe (in.)	1-6" pipe 10" curb	3-6" pipes 10" curb	2-8" pipes 12" curb	3-10" pipes 12" curb	

Sub-drainage Area 6 lends itself to total ponding. The following table is a summary of total flows generated within this area and total ponding capacity. A rainfall value of 2.5" for a 100 year-6 hour storm was used.

Sub-Drainage	Composite "C" Factor	Area (ft^2)	Volume Runoff (ft^3)	Pond Area (ft^2)
Area 6	0.42	16,998	1,486	1,980 ft^2

The pond storage available is based upon 0.75' depth.

SUMMARY OF RESULTS

The following is a breakdown of the individual areas and their relationship to the overall drainage pattern.

Area 1

Area 1 is an uncontrolled area in that flows leave this area with no retention. This area incorporates the downstream limits of the collector street for Phase "B", and as such, needs to empty directly onto Spain Road. Flow rate = 6.0 cfs.

Area 2

Area 2 has a detention pond and a controlled outlet (1 - 6" pipe) which empties flows onto Spain Road. Total time to discharge the peak volume of runoff would be 52 minutes.

Area 3

Area 3 has a detention pond and controlled outlets (3 - 6" pipes) that empty flows onto Spain Road. Total time to discharge the peak volume of runoff would be 62 minutes.

Area 4

Area 4 has a detention pond and controlled outlets (2 - 8" pipes) that empty flows onto Wyoming Boulevard. Total time to discharge the peak volume of runoff would be 73 minutes.

Area 5

Area 5 has a detention pond and controlled outlets (3 - 10" pipes) that empty flows into a swale (see typ. Fig. IV) that flows onto Wyoming Boulevard. Total time to discharge the peak volume of runoff would be 23 minutes.

Area 6

Area 6 has total retention of runoff in a pond at the southwest corner of the site.

Area 7

Area 7 has uncontrolled runoff onto Wyoming Boulevard at a flow rate of 1.0 cfs.

Total controlled flow rate from Areas 2, 3, 4, and 5, plus uncontrolled flow rate from Areas 1 and 7 equals 18 cfs. Additionally, 3 cfs from O.S.A.-2 is released through Area 5 for a total flow of 21 cfs.

RECOMMENDATIONS

The following recommendations are made to enable the developer of the Phase "A" apartment complex to complete this project within the design framework stated above:

Offsite Flows

1. It is recommended that a detention pond be constructed at the east boundary of Phase "A", at the point where the natural arroyo intersects the property. A channel constructed along the east boundary of Phase "A" would drain a controlled flow from the detention pond to Spain Road. The outlet flow from the detention pond

must be such that it will flow in only the north half of Spain Road, since half of Spain has a capacity of 31.5 cfs, Phase "A" is discharging a developed flow of 10 cfs, and a two acre section of Phase "B" is discharging 4.05 cfs. The allowable flow onto Spain from the channel would be 17.50 cfs. The available slope for this channel would be 1.75%. A typical cross-section of a 1.6' wide base, 2:1 S.S., depth of flow of 1.1 ft., would have a maximum capacity of 21.4 cfs, 3.9 cfs more than required. The detention pond is designed to retain 53,000 cubic feet, at an average water depth of 4'. A minimum five foot high berm should be provided at least 20' east of the Phase "A-B" property line. A one foot deep spillway will be provided at the top of the berm to direct overflows from storms larger than 100-year towards the channel. Flows from 100-year storms or less will flow from the detention pond to the channel through an 18" orifice pipe. It is further recommended that the outlet of the channel onto Spain Road be lined with rip-rap or concrete at least 10' back from the street to minimize erosion damage. Both the detention pond and channel will be abandoned when Phase "B" is completed. (See calculations in Appendix.)

2. Because all streets within the Phase "A" complex will be private streets, City standards will not be required. However, it is recommended that all streets have the following section: inverted crowns with 1% cross slope to the centerline of pavement and 6" high stand-up rectangular curbs. The minimum roadway section would be 6" of compacted subgrade, 4" of compacted base

course, and a 2" asphaltic concrete surface course. It is recommended that the center eight feet width of pavement be thickened to 3" asphaltic concrete. The almost constant flow of nuisance runoff from grass watering, etc., plus sustained wheel loads in the center area of the pavement, will create high demands on the integrity of the pavement. A typical roadway section of 30" B-B with a 1% inverted crown at centerline, will carry 79 cfs flowing full at 0.5% slope.

In referring to the overall site plan of both Phase "A" and Phase "B", there exists the needed possibility of a collector street, with a median in some areas, traversing the entire site, from Spain Road to Moon Street. This street will not only serve as a collector of traffic, but of runoff from the majority of Phase "A" and Phase "B". The median section of the collector street through Phase "A" should be constructed at a minimum slope of 0.5% to carry the anticipated flows from Phase "B" in the future. A typical roadway section of 2 - 20.5' wide lanes with a 1% inverted crown at each centerline will carry 98 cfs flowing full at 0.5% slope. The remainuer of the collector street will have the 30' B-B roadway section. (Note: The projected flow rate from Phase "B" was based upon two assumptions: (1) that Moon Street will intercept all flows to the east of Phase "B" and direct these flows either north or south to the Bear Tributary or the Bear Arroyo; (2) that the developed flow rate will not exceed the undeveloped flow rate for Phase "B", i.e., 75 cfs.)

The inverted street section was chosen because of the use of this type of curb. There is no gutter, so rather than have the flows deteriorate the asphalt at the face of the curb, the flows will be concentrated at the center of the street, away from any construction joint. The added benefit of an inverted section is the large carrying capacities of the streets, even if these flows are never realized.

3. The areas designated as detention areas, except for the offsite detention pond, should have a constant cross-section, with no crown. The detention areas should slope toward the orifice with a positive slope of 0.5% maximum.

4. Because each onsite detention area will have a positive slope to the controlled orifice, the detention cross-section would assume a trapazodial section when referenced to a level plane at the maximum depth. However, the required volume is computed on a rectangular section. In order to compensate for the sloping pavement, the top of the curb around the detention area should be kept at a constant elevation. Thus the depth between the top of curb and pavement will increase as the pavement slopes to the orifice. The elevation of the curb would be established at the upstream limit of the detention area, the minimum depth of each detention area being shown on Figure IV. Each detention area, therefore, will have slightly more capacity than the minimum required because of this section.

A variable depth of curb can be realized with the construction of a rectangular curb. A typical section would be 6" wide x 18"

deep, with 6" minimum above the pavement. This type of curb can be very competitive in cost to the standard curb and gutter as required by the City.

5. Water blocks are recommended in the streets as shown in Figure IV to facilitate the movement of runoff as shown.

6. Because of the nature of the soil in that entire area, it is recommended that a thorough soils investigation be made of the site to establish parameters for ponding and drainage. For the purpose of this report, ponding limits were held to a 1% minimum grade.

CONCLUSION

The subject property, by utilizing detention and retention ponding for the Phase "A" site, will contribute no more internal runoff to the surrounding areas than that which existed before development.

Respectfully sumitted,

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N.M.P.E. No. 6309
March 21, 1977

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APPENDIX

Sample Calculations

1. Composite "C" Factor

Area 3~Total Area = 2.27 Acres

= 0.89 Acres Grassed Area

= 1.38 Acres Pavement and Roofs

Where C = 0.90 for Pavement

= 0.20 for Grassed Area

$$\text{Composite C} = (0.20)\frac{0.89}{2.27} + (0.90)\frac{1.38}{2.27} = \underline{0.63}$$

2. Rational Formula Q = CIA

H = Height above most remote point above outlet

= 18 ft.

L = Distance most remote point of basin to outlet

= 685 ft.

Tc = 4.5 min. (use 10 min.) ~Figure V

$$I = \frac{189}{T+25} \text{ for 100 year storm} = \frac{189}{35} = 5.4\text{"/hr. (Fig. VI)}$$

C = 0.35

A = 8.36

Q = CIA

(0.35)(5.4)(8.36) = 16 cfs

3. Retention Pond Volume Requirements

Area = 0.39 Ac. or 16,988 $ft.^2$

Design storm criteria = 2.5"-6 hr./100 year storm.
Therefore, volume required for ponding =
Area x volume of runoff x composite "C" factor.

= $(16{,}988)ft^2 \times (2.5/_{12})$ ft. x (0.42) = 1486 $ft.^3$
min. storage required.

Pond depth shown on Figure IV.

4. Peak Discharge and Allowable Runoff

Area = 2.27 Ac.; set allowable outflow discharge at 3.0 cfs.

1. From the design criteria, calculate Qo

$$Qo = \frac{\text{Allowable Outflow}}{\text{Acreage x Runoff Coefficient}}$$

$$= \frac{3.0 \text{ cfs}}{2.27 \text{ Ac.} \times 0.63} = 2.10 \text{ cfs/Ac.Imp.}$$

2. Calculate time in minutes that the maximum volume of storage will occur from the orifice outlet storage time equation.

$$T = -25 + \sqrt{\frac{7087.5}{Qo}}$$

$$= -25 + \sqrt{\frac{7087.5}{2.10}} = 33.13 \text{ minutes}$$

3. Calculate the maximum volume of storage per acre imperviousness from the orifice outlet storage equation.

$$Vs = \frac{11,340T}{T + 25} - 40 \, Qo \, T$$

$$= \frac{11,340(33.13)}{(33.13) + 25} - 40 \, (2.10)(33.13)$$

$$= 3679.73 \text{ ft.}^3\text{/Ac.Imp.}$$

4. Calculate the total volume of storage required for the contributing area

$$Vt = Vs \times \# \text{ Acres} \times \text{Runoff Coefficient}$$

$$Vt = (3679.73)(2.27)(0.63) = 5262 \text{ ft.}^3$$

5. Select an outflow pipe from the orifice formula that will yield the allowable outflow of 3.0 cfs under a head of 0.58 ft.

$Q = Ca\sqrt{2gh}$ - note C = 0.80 from trial and error solutions from Table 4-10, Handbook of Hydraulics, King & Brater, 1963.

Solving for "a"

$$a = \frac{Q}{C\sqrt{2gh}} = \frac{3.0}{0.8\sqrt{(64.4)(0.58)}}$$

$a = 0.61$ ft.^{2}

Therefore, select 3 - 6" pipes.

Street Capacity Calculations

1. Typ. 30' B-B with 1% inverted crown with 6" high curbs.

   Curb 6" wide, flow at top of curb.

   $A = 16.68$ ft.^{2} $P = 30'$ $n = 0.015$

   $S = 0.5\%$

   $$Q = \frac{1.486}{n}\left(\frac{a}{P}\right)^{5/3} S^{1/2} = \frac{1.486}{0.015}\left(\frac{16.68^{5/3}}{30^{2/3}}\right)(0.005)^{1/2}$$

   $= \underline{\underline{79}}$ cfs = max. capacity of street at min. slope.

   Anticipated flows per street might equal 20% of the maximum.

2. Collector street capacity - 2 - 20.5 B-B lanes with 1% inverted crown. Curb 6" high, 6" wide, flow at top of curb.

   Area of one-half of total street

   $A = 10.73$ ft.^{2} $P = 20.5$, $n = 0.015$

   $S = 0.5\%$

   $$Q = \frac{1.486}{n}\left(\frac{a}{P}\right)^{5/3} S^{1/2} = \frac{1.486}{0.015}\left(\frac{10.73^{5/3}}{20.5^{2/3}}\right)(0.005)^{1/2}$$

   $Q = 48.8$ cfs x 2 = $\underline{\underline{97.6}}$ cfs = max. capacity of collector street at minimum grade vs. 60 cfs anticipated flow rate when Phase "B" is completed.

Detention Pond Capacity (at east property line) For O.S.A.-1 Flows.

1. Capacity of one-half of Spain Road:

   Grade = 1.843%

   Area = 6 ft.^{2}

   P = 24.5

   n = .015

   $Q = \frac{1.49}{.015} \frac{(6)^{5/8}}{(24.5)^{2/3}} (.0184)^{1/2}$

   = 31.55 cfs

2. Contribution of flow to Spain from triangular section northwest of intersection of Spain and Camino

   Area = 2.00 acres

   Length of run = 350'

   High point = 26'

   Tc = 10 min.

   100 year storm intensity = $\frac{189}{25+10}$ = 5.4 in/hr.

   $Q = C1 4 C_f = .30\ (5.4)(2.00)(1.25)$

   = 4.05 cfs

3. Flow onto Spain from developed Phase "A" = 10 cfs.

4. Allowable flow onto Spain from O.S.A.-1, then =

   31.55 - 4.05 - 10 = 17.5

5. Storage Volume of Detention Pond:

   Use triangular shaped storm hydrograph, with Tc = 12 min., maximum flow = 89.0 cfs (see page 5).

   Maximum outflow - 17.5 cfs at Tc - 12 min.

Storage volume = 52,560 ft.^{3}

(see hydrograph)

With depth of 4', area of 13,125 ft.^{2} is necessary.

6. Outlet pipe size:

Q = 17.5 cfs

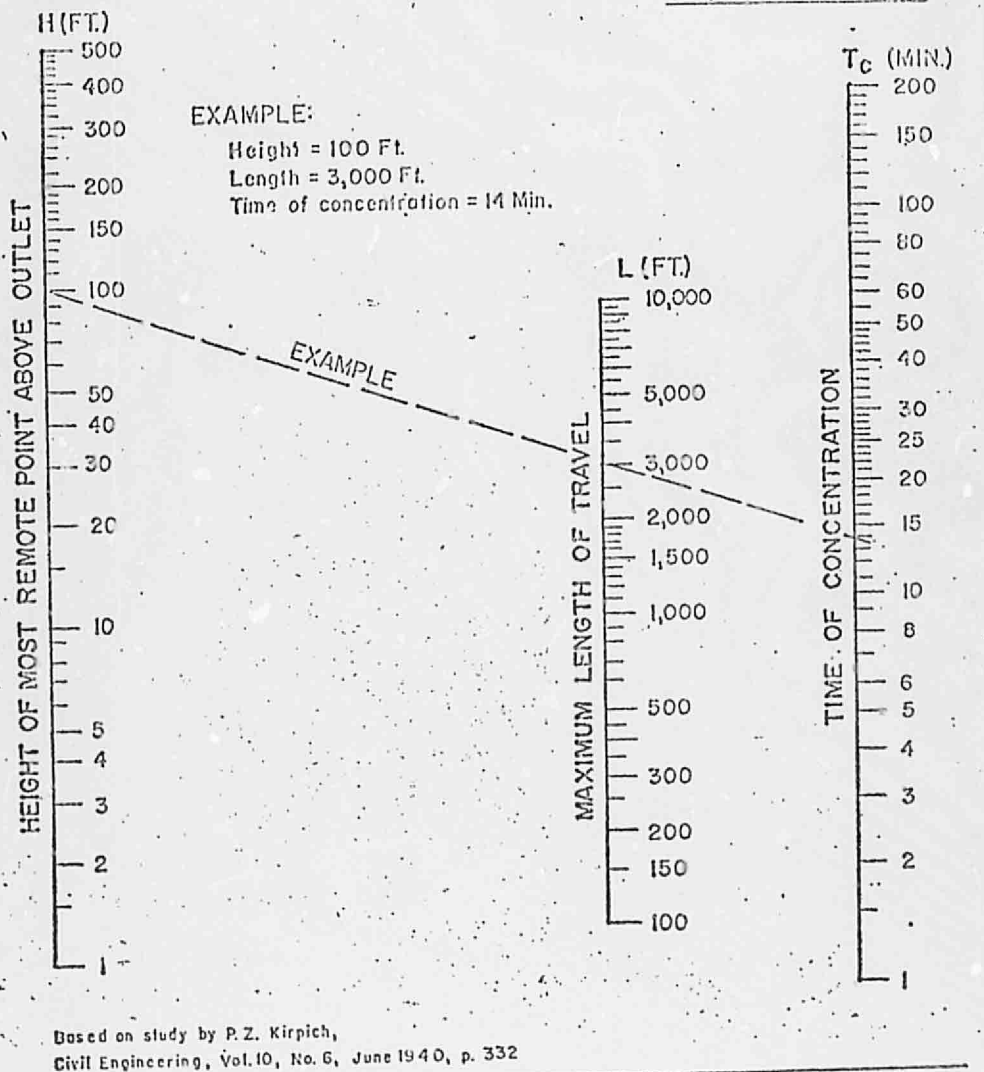
HW + 5.6 = 4'

Use 18" Ø RCP (see Figure 38 from concrete design manual.)



Figure I

F-20-2



Based on study by P. Z. Kirpich,
Civil Engineering, Vol. 10, No. 6, June 1940, p. 332

TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

Figure V

Reprinted from "Design of Roadside
Drainage Channels - Hydraulic Engineering
Circular No. 6", April 1962, U. S. Dept.

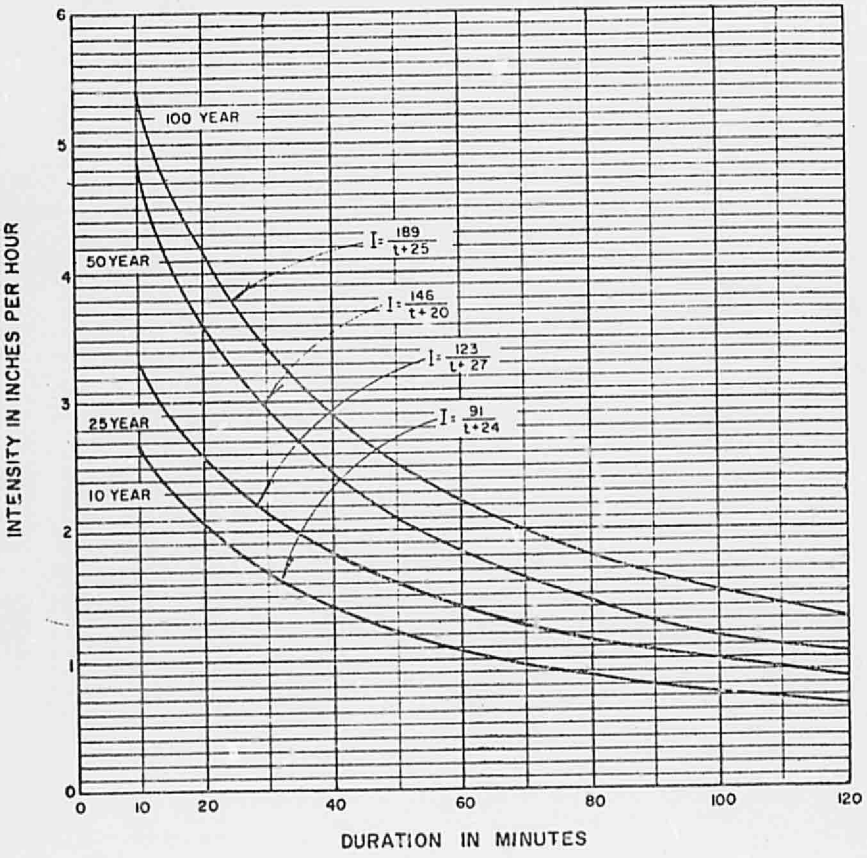


Figure VI

MASTER PLAN OF DRAINAGE
CITY OF ALBUQUERQUE - NEW MEXICO
AND ENVIRONS

INTENSITY DURATION
FREQUENCY CURVES

(ALBUQUERQUE AREA - 1961)

GORDON HERKENHOFF & ASSOC
CONSULTING ENGINEERS
ALBUQUERQUE, NEW MEXICO

CHART 1

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