DRAINAGE REPORT

FOR

WESTWOOD SUBDIVISION
TRACT 1-A-1, 1-B-1 OF EL RANCHO ATRISCO PHASE III

Zone Atlas Sheet J-9-Z, J-10-Z, H-9-Z, H10-Z

DECEMBER 1998

PREPARED FOR

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PURPOSE

The purpose of this report is to conceptually analyze the existing and proposed developed drainage on the site and to propose solutions to control the excess storm water runoff resulting from the 100-year storm falling on the adjacent and subject parcels. This report is part of a Site Development application.

PROJECT LOCATION AND DESCRIPTION

The site is located west of Unser Blvd. south of Ladera in the El Rancho Atrisco, Phase III subdivision including Tract 1-A-1 and 1-B-1 35.37 acres more or less. It is bounded on the east by seven single family residential lots (approximately 600 feet) and balance by a local residential street, Cherrywood St. (see the appendix, plate 1 for location map and plate 4 for floodway map). The existing site consists of 35.37 acres of undeveloped and uncompacted surface. The parcel slopes from northwest to southeast at a grade between 3 and 4 percent. All undeveloped surfaces are vegetated with weeds and native grasses.

A sector development plan has been adopted for this area. It shows Tract 1-A-1 will be developed as office park/commercial (not more than 50 percent commercial) and 1-B-1 is designated as high density residential. Using a conservative approximation of 93 percent impervious treatment for tract 1-A-1 and a proposed site plan for Tract 1-B-1, utilizing 59.97% impervious treatment, the proposed developments will create 1,322,866.9 square feet (30.37 ac.) of impermeable surface and 217,850.3 square feet (5.00 ac.) of semi-permeable surface (surface treatment B, per DPM).

An interim design which provides for the eventual development of Tract 1-A-1 and the complete development of Tract 1-B-1 is also illustrated and recommendations given. The interim design also includes the construction of only two lanes of Market Street.

EXISTING DRAINAGE CONDITIONS

The site is bounded by paved roadways, Hanover on the south, Unser on the west, Ladera on the north and Cherrywood on the east. There is no off-site drainage impacting the subject property from the adjacent property.

Remnants of an historic arroyo exist along the southern border of the property. The upstream contribution of the arroyo has been input to a storm drain system on the west side of Unser in the Parkway subdivision. This drain crosses under Unser into a drain line placed in a drainage easement along the north side of Hanover. This line was completed under an S.A.D., number 212, "Hanover Storm Sewer."

Existing topography indicates a predominant sheet flow pattern over the subject property that eventually flow into the arroyo (Plate 2). An old drainage management plan in the department of Hydrology files shows the placement of proposed dams along the historic course of flow for the arroyo. One dam would have been within Tract 1-A-1 and the other in Tract 1-B-1. These were never placed.

The approved Sector Development Plan (see appendix) for this area indicates on page 16,

> ". . .The residential and commercial area south of the Ladera Channel will be drained to a planned channel which the City proposed to construct along I-40 with a new outlet to the Rio Grande north of the Coors Interchange. Therefore, the only requirement for this section is to grade the streets to deliver the runoff to the south. In later phases of development on the south side of the Sector Plan Area some storm sewer construction will be required to gather runoff from the streets and deliver it to the proposed City channel. These systems will be constructed by the developer. . . ."

The recommendations of the sector development plan have been implemented, however the drainage systems do not appear to be adequate to accept complete developed discharge. The storm drain has been constructed, but, the storm drain nor the streets have the capacity to accept fully developed flows.

The Soil Survey of Bernalillo County, United States Department of Agriculture Soil Conservation Service, shows on sheet 30 that the soils are of two types: BCC, Bluepoint loamy fine sand; and PAC, Pajarito loamy fine sand. In both cases the SCS indicates that the runoff is slow, and the hazard of soil blowing is severe. Permeability is moderately rapid with water capacity between 8 and 9 inches for PAC and 4 to 5.5 inches for BCC. Beyond the edges of the arroyo the slope of the subject is gentle, between 1.5 and 2 percent.

The following includes the calculation of current basin conditions. Using the Development Process Manual, Volume 2, Section 22.2 - HYDROLOGY, Section A-1 gives the zone as "1". Existing soil surface conditions are:

> Treatment A - Unlined: Native grasses, weeds and shrubs with minimal disturbance. arroyos. Soil is uncompacted by human activity with 0 to 10 percent slopes.

Peak Discharge

The existing site flows for the combined tracts and Market St. discharge along Cherrywood St., concentrating at the corner of Cherrywood and Hanover. An array of four drop inlets collect existing flows and direct them into manhole 42 of the Hanover Storm Drain. The basin for the generation of these flows is indicated as Basin A. Half of the developed flows for Cherrywood St. are diverted eastward along intersecting streets The following are the calculations for the out flow using the DPM, Section 22.2, A-6:

$$Q_{p100} = Q_{pA} \times A_A + Q_{pB} \times A_B + Q_{pD} \times A_D \qquad \text{(1) Equation a-10}$$

BASIN A	AREA	PEAK DISCHARGE (table A-9)	FLOW
Treatment A	1,584,277 sf	1.29 cfs/acre	46.917 cfs

The total existing peak flow rate is 46.917 cfs at the intersection of Cherrywood and Hanover. There is an additional contribution to the flow from half of Cherrywood St.

BASIN B Cherrywood St.

Treatment D	131,731 sf	4.37 cfs/acre	13.215 cfs

Contribution = 6.108 cfs.

Total Existing flow = 53.025

Excess Precipitation

The existing excess precipitation for the combined tracts is indicated as Basin A. The following are the calculations for the volumetric flow, using the DPM, Section 22.2, A-5:

$$E_{100} = \frac{(E_A \times A_A + E_B \times A_B + E_D \times A_D)}{A_A + A_B + A_D}$$

(2) Equation a-5

BASIN A	AREA	EXCESS PRECIPITATION (table A-8)	VOLUME
Treatment A	1,584,277 sf	0.44 in	58,090.0 cf

The total existing volumetric flow is 58,090 cf. This is equivalent to 0.0367 cf/sf.

BASIN B Cherrywood St.

Treatment D	131,731 sf	1.97 in	21626.0 cf

Contribution = 10,813.0 cf

Total Existing Runoff Volume = 68,903 cf

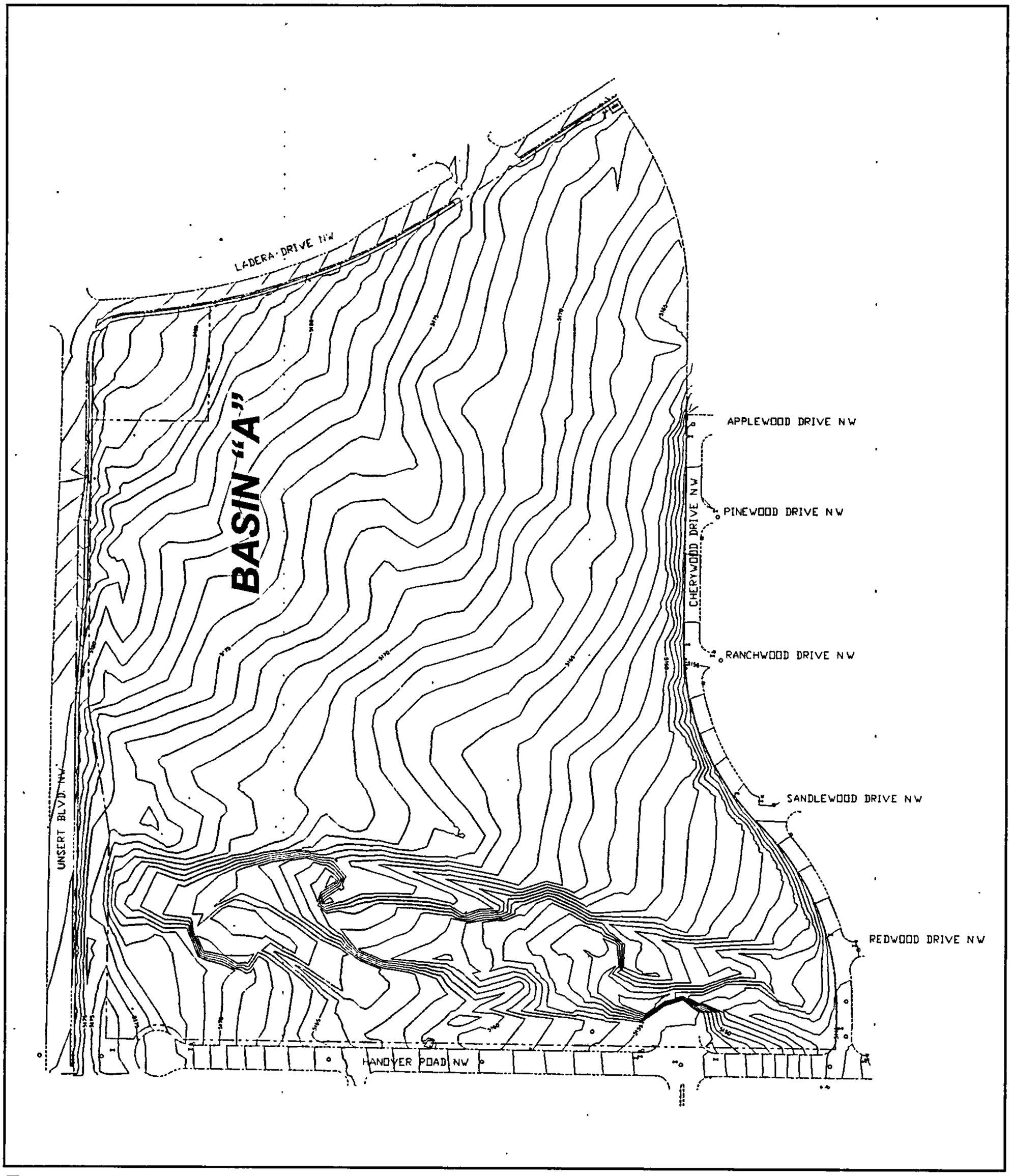


Figure 1 – PLATE 2 – EXISTING CONDITIONS PRIOR TO DEVELOPMENT

INTERIM DEVELOPED DRAINAGE CONDITIONS

Peak Discharge

The site plan (Plate 3) shows the configuration of the proposed development of the property. This section considers the proposed development of Tract 1-B-1 and a potential of four drive lanes on Market St. However, Tract 1-A-1 will not be developed and will remain as a vacant parcel. Basin D is considered as Cherrywood St. The following is an analysis of the developed flows of basins A, B, C and D:

Interim developed basin conditions are assumed to be 100% land treatment A basin area "A", comprising Tract 1-A-1 and developed conditions for Tract 1-B-1 (59.97% impervious and 40.03% landscaped treatment B).

DPM, Section 22.2, A-6:

ZONE 1:

$$Q_{p100} = Q_{pA} \times A_A + Q_{pB} \times A_B + Q_{pC} \times A_C + Q_{pD} \times A_D \quad \text{(1) Equation a-10}$$

	AREA	(table A-9)	FLOW
BASIN A Commercial Site, Tract 1-A-1			
Treatment A	869,083 sf	1.29 cfs/acre	25.737 cfs
BASIN B Market St. (one half of the total build out)			
Treatment B	81,456 sf	2.03 cfs/acre	3.775 cfs
Treatment D	50,548 sf	4.37 cfs/acre	5.071 cfs
Total	131,552 sf		8.846 cfs
BASIN C Apartment Site, Tract 1-B-1			
Treatment A	15,333 sf	1.29 cfs/acre	0.45 cfs
Treatment B	159605 sf	2.03 cfs/acre	7.44 cfs
Treatment C	49920 sf	2.87 cfs/acre	3.32 cfs
Treatment D	307143 sf	4.37 cfs/acre	30.80 cfs
Total	532,001 sf		41.99 cfs
Total Future Developed Basin			
	1,540,387 sf		77.128 cfs
BASIN D Cherrywood St.			
Treatment D	131,731 sf	4.37 cfs/acre	13.215 cfs

Half of Cherrywood St. drains directly east along intersecting streets. Therefore we include one half of Cherrywood flow, 6.108 cfs.

Total flow to intersection of Cherrywood and Hanover would be: 48.10 cfs. Flows directed to Market St. would be 34.583 cfs

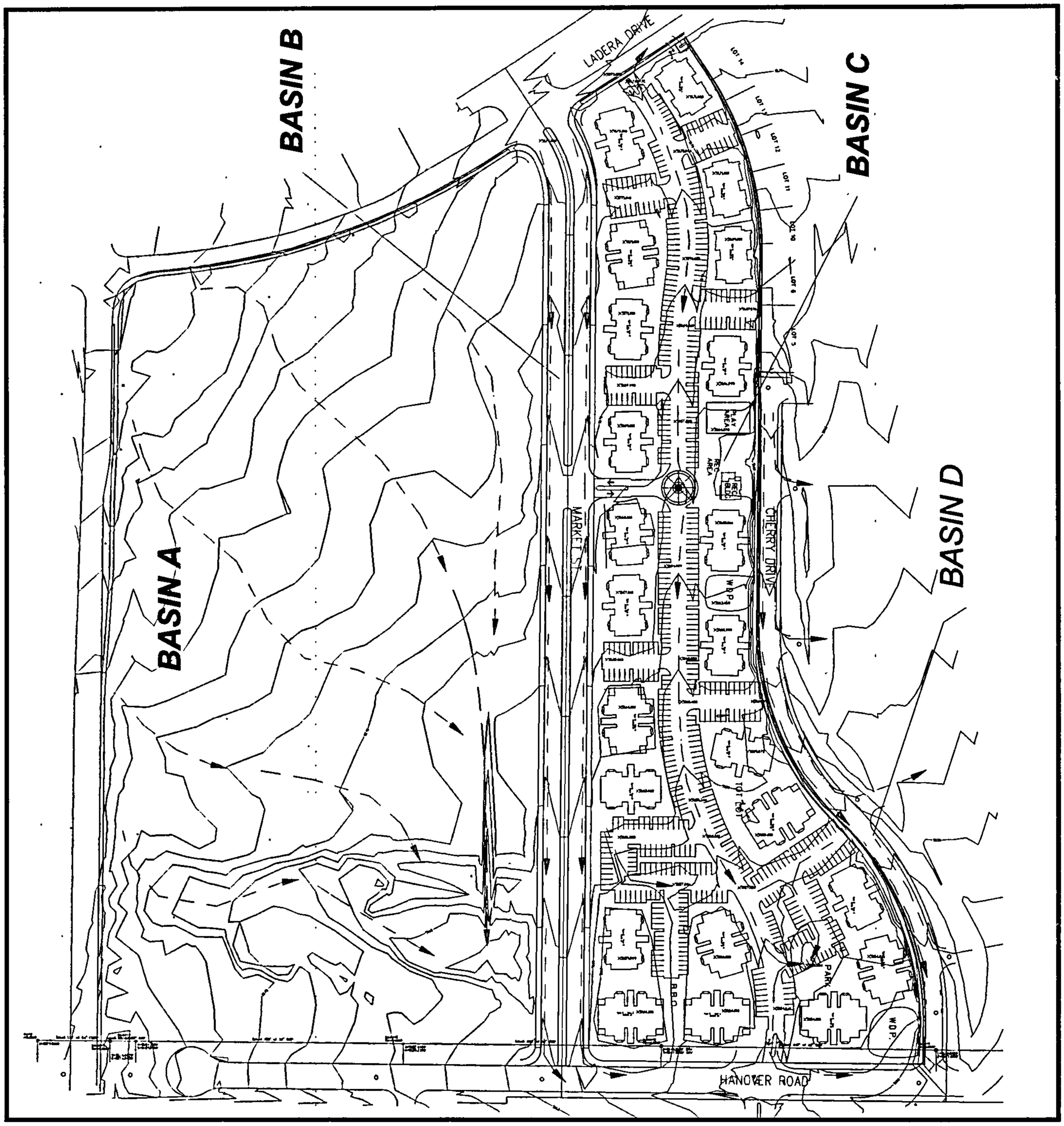


Figure 2 – PLATE 3 – INTERIM SITE DEVELOPMENT

Excess Precipitation

The existing excess precipitation for the combined tracts is indicated as Basin A, B, C and D. The following are the calculations for the volumetric flow, using the DPM, Section 22.2, A-5:

$$E_{100} = \frac{(E_A \times A_A + E_B \times A_B + E_D \times A_D)}{A_A + A_B + A_D}$$

(2) Equation a-5

		EXCESS PRECIPITATION	
BASIN A	AREA	(table A-8)	VOLUME
Treatment A	869,083 sf	0.44 in	31,866 cf
BASIN B Market St. (one half of the total build out)			
Treatment B	81,456 sf	0.67 in	4,548 cf
Treatment D	50,548 sf	1.97 in	8,298 cf
Total	131,552 sf		12,846 cf
BASIN C Apartment Site, Tract 1-B-1			
Treatment A	15333 sf	0.44 in	562 cf
Treatment B	159605sf	0.67 in	8911 cf
Treatment C	49920 sf	0.99 in	4118 cf
Treatment D	307143 sf	1.97 in	50423 cf
Total	539,752 sf		64014 cf

Total Future Developed Basin

1,540,387 sf 109,920 cf

BASIN D Cherrywood St.

Treatment D	131,731 sf	1.97 in	21,626 cf

Half of Cherrywood St. drains directly east along intersecting streets. Therefore we include one half of Cherrywood flow, 10,813 cf.

Total volumetric flow from the subdivision: 119539 cf.

Unit volume:		Volume:	Excess above historic flow:
Basin A	.0367 cf/sf	31,866 cf	0 cf
Basin B	.0976 cf/sf	12,846 cf	8,012 cf
Basin C	.1208 cf/sf	64,014 cf	45,225 cf
Basin D	.1642 cf/sf	21,626 cf	0 cf

The total excess volumetric flow over the historic level is 53,237 cf.

DEVELOPED DRAINAGE CONDITIONS

Peak Discharge

The configuration of the proposed total development of the property would include development of Tract 1-B-1, a potential of four drive lanes on Market St. and 93% developed impervious surface treatment of Tract 1-A-1, the following is an analysis of the developed flows of basins A, B, C and D:

Developed basin conditions are assumed to be 93% land treatment D and 7% land treatment B for basin area "A", comprising Tract 1-A-1. The treatments for Tract 1-B-1 are shown previously in the interim plan, Plate 3.

DPM, Section 22.2, A-6:

ZONE 1:

$$Q_{p100} = Q_{pA} \times A_A + Q_{pB} \times A_B + Q_{pC} \times A_C + Q_{pD} \times A_D$$

(1) Equation a-10

	AREA	(table A-9)	FLOW
BASIN A Commercial Site, Tract 1-A-1			
Treatment B	60,836 sf	2.03 cfs/acre	2.835 cfs
Treatment D	808,247 sf	4.37 cfs/acre	81.084 cfs
Total	869,083 sf		83.919 cfs
BASIN B Market St.			
Treatment B	30,456 sf	2.03 cfs/acre	1.419 cfs
Treatment D	101,096 sf	4.37 cfs/acre	10.142 cfs
Total	131,552 sf		11.561 cfs

BASIN C Apartment Site, Tract 1-B-1

Treatment A	15,333 sf	1.29 cfs/acre	0.45 cfs
Treatment B	159605 sf	2.03 cfs/acre	7.44 cfs
Treatment C	49920 sf	2.87 cfs/acre	3.32 cfs
Treatment D	307143 sf	4.37 cfs/acre	30.80 cfs
Total	532,001 sf		41.99 cfs

Total Future Developed Basin

1,540,387 sf 138.025 cfs

BASIN D Cherrywood St.

Treatment D 131,731 sf 4.37 cfs/acre 13.215 cfs

Half of Cherrywood St. drains directly east along intersecting streets. Therefore we include one half of Cherrywood flow, 6.108 cfs.

Total flow from all parcels: 143.488 cfs.

Excess Precipitation

The existing excess precipitation for the combined tracts is indicated as Basin A, B, C and D. The following are the calculations for the volumetric flow, using the DPM, Section 22.2, A-5:

$$E_{100} = \frac{(E_A \times A_A + E_B \times A_B + E_D \times A_D)}{A_A + A_B + A_D}$$

(2) Equation a-5

EXCESS PRECIPITATION

BASIN A	AREA	(table A-8)	VOLUME
Treatment B	60,836 sf	0.67 in	3,397 cf
Treatment D	808,247 sf	1.97 in	132.687 cf
Total	869,083 sf		136,084 cf

BASIN B Market St. (one half of the total build out)

Treatment B	81,456 sf	0.67 in	4,548 cf
Treatment D	50,548 sf	1.97 in	8,298 cf
Total	131,552 sf		12,846 cf

BASIN C Apartment Site, Tract 1-B-1

Treatment A	15333 sf	0.44 in	562 cf
Treatment B	159605sf	0.67 in	8911 cf
Treatment C	49920 sf	0.99 in	4118 cf
Treatment D	307143 sf	1.97 in	50423 cf
Total	532,000 sf		64,014 cf

Total Future Developed Basin

1,540,387 sf 214,137 cf

BASIN D Cherrywood St.

Treatment D	131,731 sf	1.97 in	21,626 cf

Half of Cherrywood St. drains directly east along intersecting streets. Therefore we include one half of Cherrywood flow, 10,813 cf.

Total volumetric flow from the subdivision: 223757 cf.

Unit volume:		Volume:	Excess above historic flow:
Basin A	.1566 cf/sf	136,084 cf	104,218 cf
Basin B	.0976 cf/sf	12,846 cf	8,012 cf
Basin C	.1208 cf/sf	65,208 cf	45,225 cf
Basin D	.1642 cf/sf	21,626 cf	0 cf

The total excess volumetric flow over the historic level is 157,455 cf.

STORM DRAIN CAPACITY

The information supplied in the as-builts for S.A.D. 212, "Hanover Storm Drain" indicates a total of 70 cfs design capacity between Unser and Cherrywood:

Manhole 44 (Tract 1-A-1)	30 cfs
Manhole 43 (Tract 1-B-1)	20 cfs
Manhole 42 (at Cherrywood/Hanover intersection)	20 cfs
Total indicated Storm Drain capacity	70 cfs
Upstream Design Flow	80 cfs
Total Design Capacity	150 cfs

Using the total build out scenario, Tract 1-A-1 would inject 30 cfs into manhole 44; Market St. would deliver 11.561 cfs into Hanover in gutter flow; Tract 1-B-1 would inject 20 cfs into manhole 43 and drain 13.892 cfs to Cherrywood and manhole 42. The balance of 53.919 cfs for Tract 1-A-1 and 8.653 cfs for Tract 1-B-1 would be detained in separate detention ponds for each tract.

An analysis is included in the appendix of the storm drain capacity. The analysis confirms that the capacity of the line is actually 115 percent of the design flows shown on the S.A.D. 212 as-built drawings.

PONDING REQUIREMENTS

Given the interim scenario of immediate development of Tract 1-B-1 and the construction of Market St., the interim ponding requirements for the subject properties depend on two aspects: the developed excess precipitation volumes, and the storm drainage systems capacity.

	Excess Precipitation	Peak Discharge	Discharge Point Capacity	
Tract 1-A-1	31,866 cf	25.737 cfs	30.000 cfs (M.H. 44)	117%
Market St.	12,846 cf	8.846 cfs	Hanover via gutter flow	0%
Tract 1-B-1	64,014 cf	42.00 cfs	20.000 cfs (M.H. 43)	
			13.892 cfs (M.H. 42)	80%
Cherrywood St.	10,813 cf	6.108 cfs	6.108 cfs (M.H. 42)	100%

A controlled flow discharge from a catch basin in Tract 1-A-1 into manhole 44 will effectively drain this tract without the necessity of a pond. The surface flow issuing from Market St. to Hanover is within the carrying capacity of both streets. By utilizing two controlled flow outlets from detention ponds within Tract 1-B-1 into manhole 42 and 43, eighty (80) percent of the peak flow and excess precipitation requirements are achieved.

A pond within the Tract 1-B-1 is required to contain the 20 percent of excess precipitation or 12,800 cf. Multiple ponds within the site will pass restricted flows to the

discharge points as described above. Two ponds with runoff capacity of 6cfs and 24 cfs are required. The volume of the pond, containing runoffs from Tract 1-A-1 and Tract 1-B-1, was determined by taking 20% of the peak runoff from the unit hydrograph. Refer to appendix POND VOLUMECALCULATIONS.

The restricted flows into Hanover Storm Drain at Cherrywood could be conveyed either directly to manhole 42 (Node 1 on the drawings) or a combination of surface flow along Cherrywood to the drop inlets and direct input at manhole 42.

RECOMMENDATIONS

The basin within Tract 1-A-1, basin A, is well allocated by discharging surface flows into an existing manhole located on the tract within the drainage easement for the Hanover storm drain. This inlet should be constructed such that clean and restricted flows are input to the storm drain at no greater than 30 cfs. Fully developed flows from this tract would aggregate into a future pond.

The proposed Market Street should drain southward to Hanover via gutter transport. The proposed 11.65 cfs is well within planning parameters and street capacity.

The basin within Tract 1-B-1, basin C, will require a pond or ponds of approximately 14,000 cf with controlled discharge to two manholes along the existing Hanover storm drain. The discharge should be restricted to 24 cfs from a single source or multiple inputs.

Cherrywood Street drains half of its developed flows directly to the east via intersecting streets. The remainder is conducted to four existing drop inlets north of the intersection of Hanover and Cherrywood. The capacity of these inlets via manhole 42 is 50 cfs. This is more than adequate for the proposed discharge of 6 cfs.

CONCLUSIONS

If the above recommendations are followed, the sites will be protected from flooding and the potential downstream flooding situation will be improved significantly during the 100-year storm event.

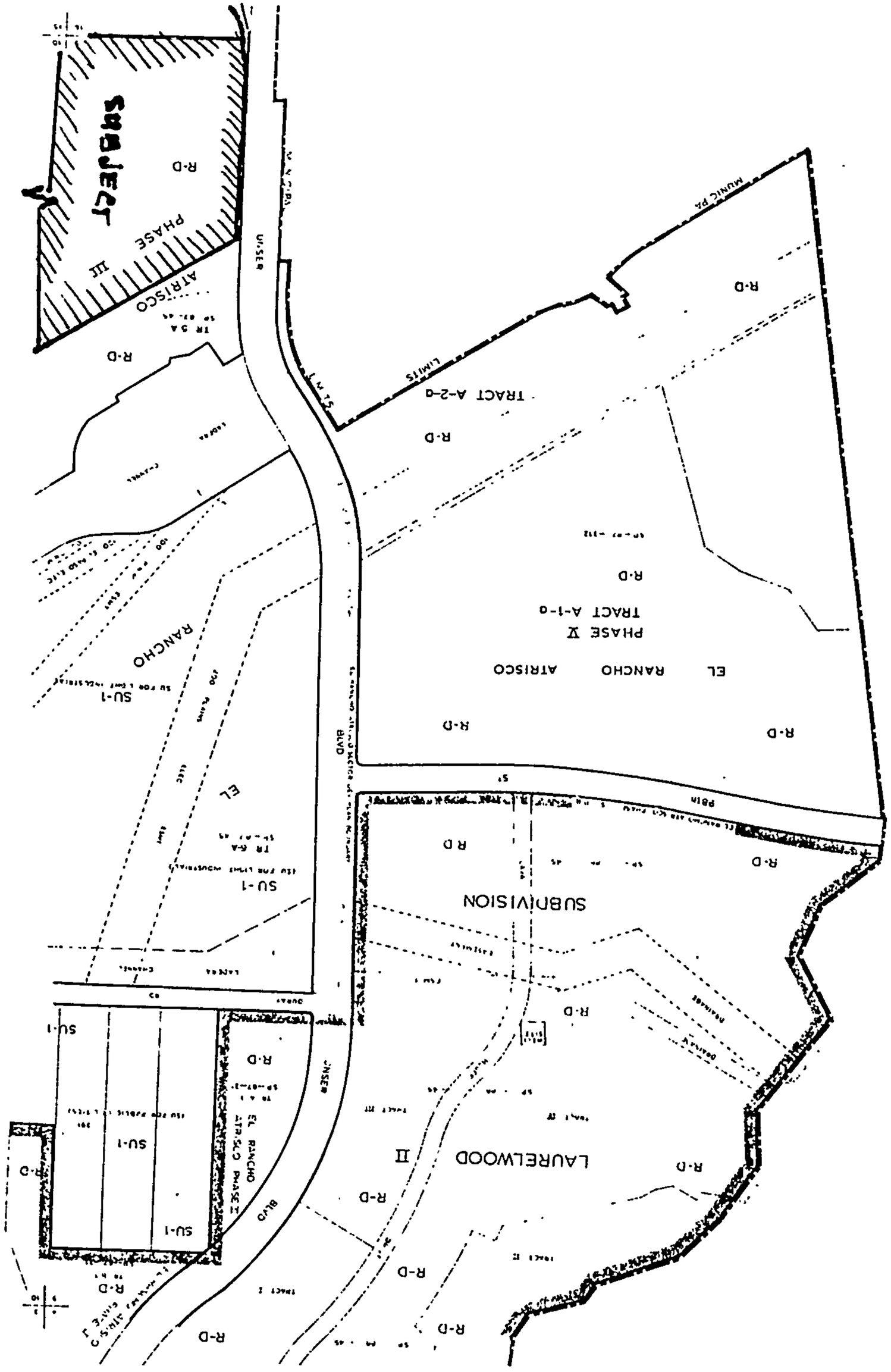
By controlling and removing sedimentation from the current flows entering the storm drain at manhole 42 in excess of 50 cfs, maintenance and capacity of the overall system will be increased. It is estimated that the current flows are 53 cfs plus sediments into the intersection at Cherrywood and Hanover. Flows will be decreased to 6 cfs at this point

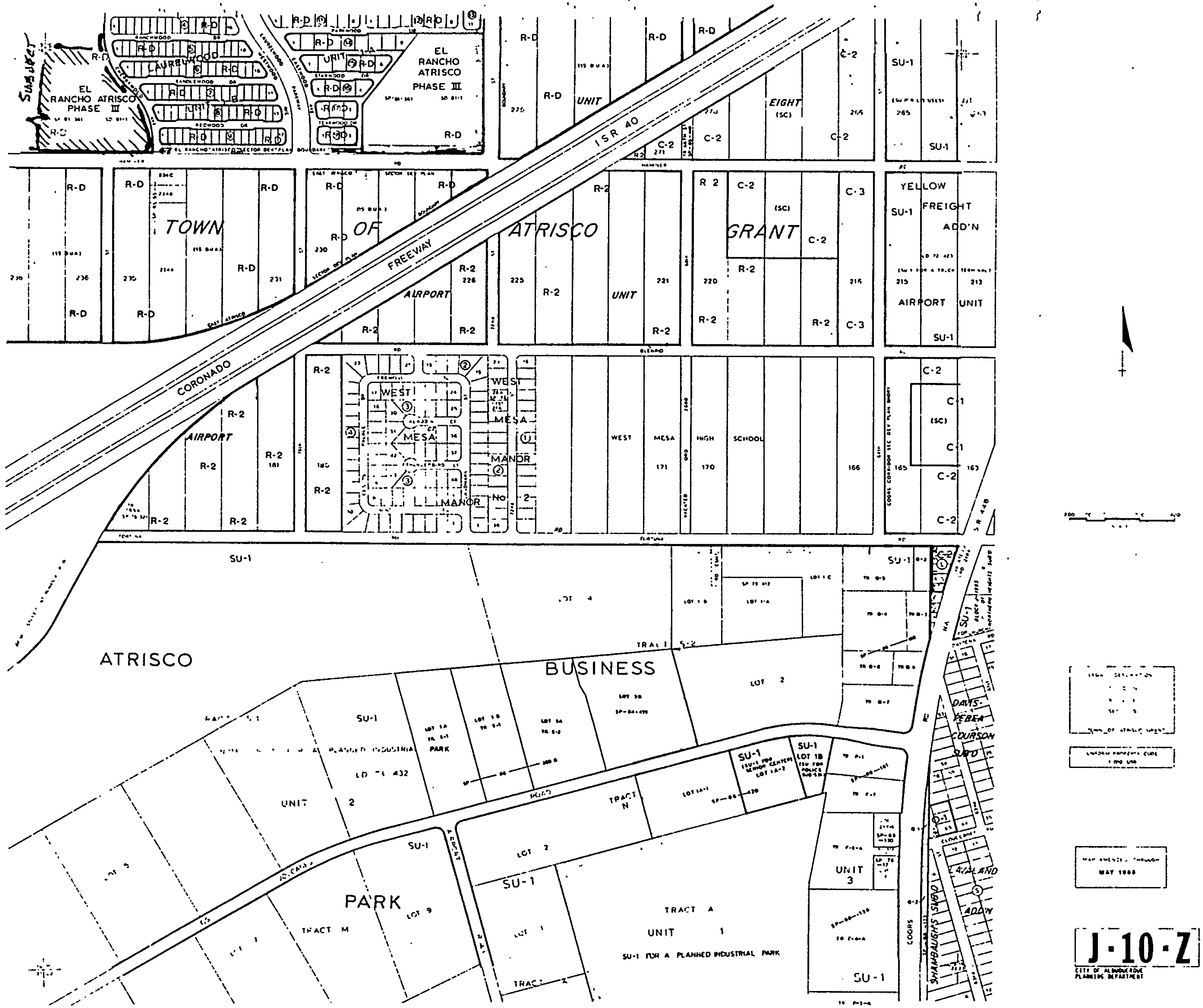
While the existing flow is significant (53 cfs), the increase in developed flows to 70 cfs will be distributed along the existing Hanover storm drain as originally designed, resulting in flows using 87 percent of existing capacity. In addition, the anticipated flows will contain greatly reduced sediment.

APPENDIX

VICINITY MAP

H-9-Z


SUBJECT
PHASE III
ATRISCO
R-D
TRACT A-2-a
LIMITS
MUNIC PR
PHASE V
TRACT A-1-a
EL RANCHO ATRISCO
SUBDIVISION
LAURELWOOD
II
EL RANCHO ATRISCO PHASE II
BLVD
SU-1
PBIN



SUBJECT
EL RANCHO ATRISCO PHASE III
EL RANCHO ATRISCO PHASE II
LAURELWOOD UNIT
TOWN OF ATRISCO GRANT
ISR 40
FREEWAY
CORONADO
AIRPORT UNIT
EIGHT (SC)
YELLOW FREIGHT ADD'N
AIRPORT UNIT
WEST MESA MANOR
WEST MESA MANOR No. 2
WEST MESA HIGH SCHOOL
ATRISCO BUSINESS PARK
UNIT 2
UNIT 3
TRACT A UNIT 1
SU-1 FOR A PLANNED INDUSTRIAL PARK
TRACT M
TRACT N
LOT 2
LOT 9
COORS
DAVIS-PEREA-COURSON SUBD
SHAMBAUGHS SUBD
J-10-Z

TOWN OF ATRISCO

EL RANCHO ATRISCO PHASE III

SUBJECT

R-D

UNIT 8

UNIT 5

GRANT

CORONADO FREEWAY

I-S R 40

UNSER BLVD

ATRISCO BLVD

PARK

TRACT S-1

TRACT T

BUSINESS

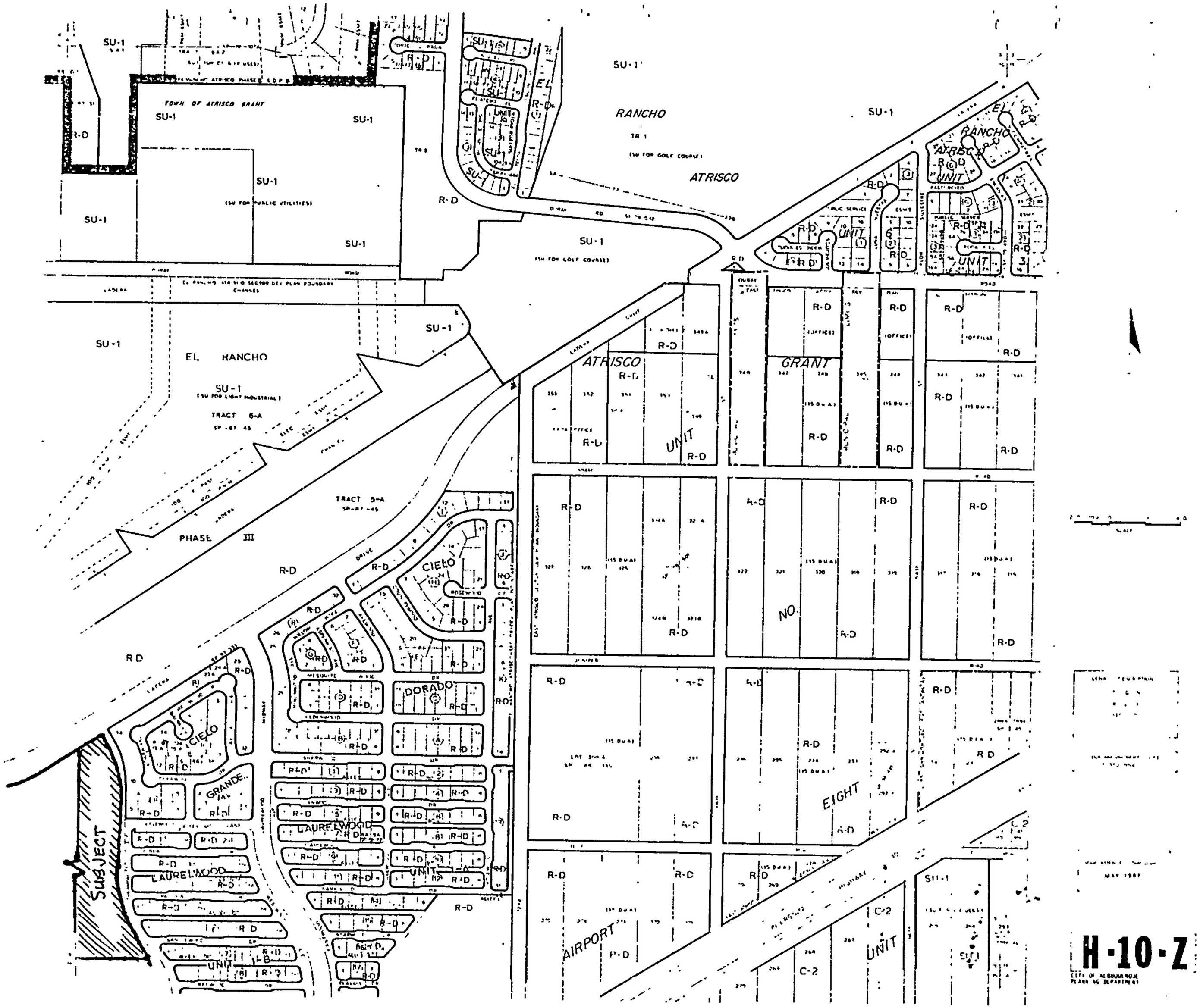
ATRISCO UNIT

SU-1

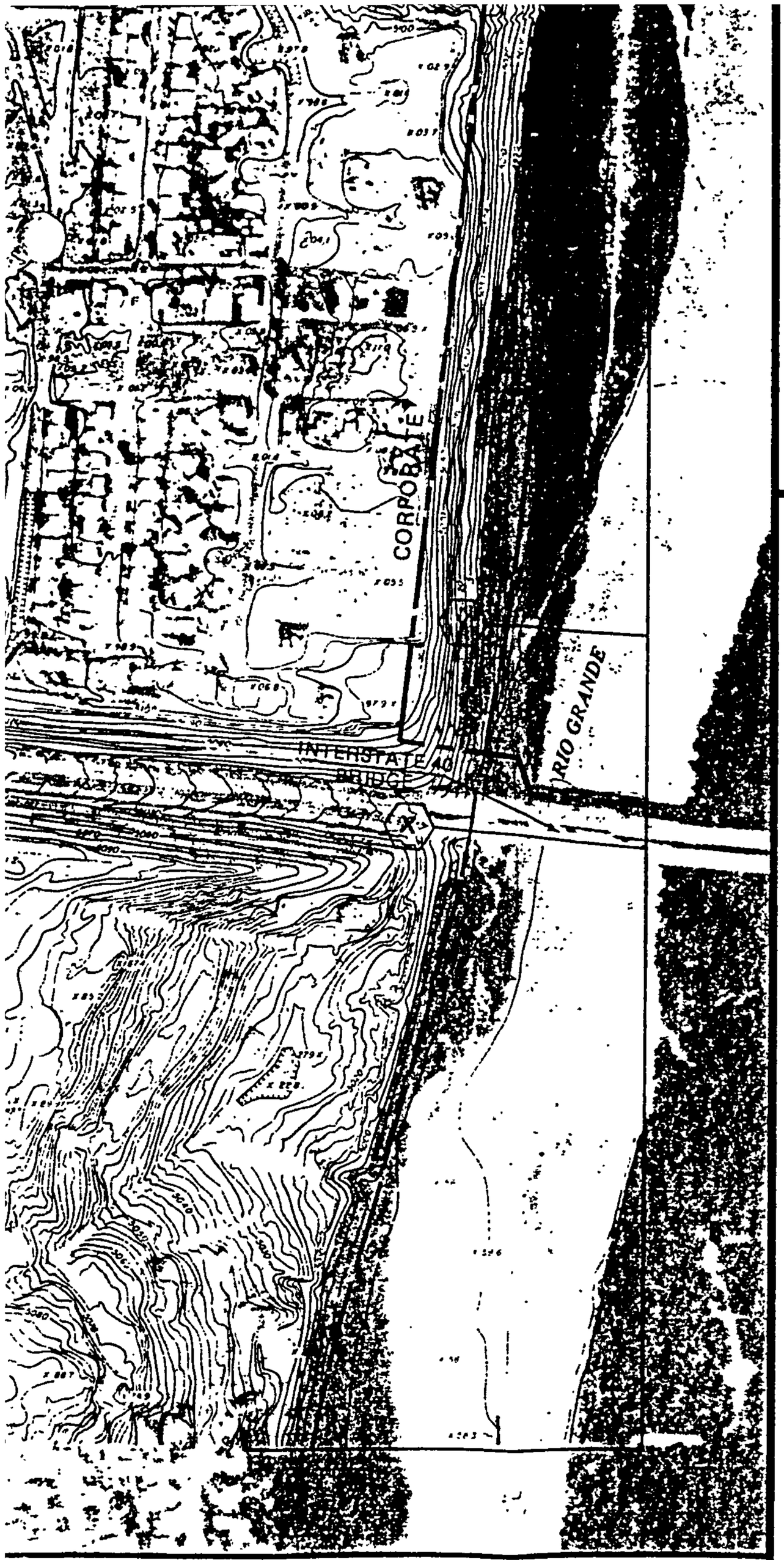
RO-1

J-9-Z

CITY OF ALBUQUERQUE
PLANNING DEPARTMENT


SU-1
TOWN OF ATRISCO GRANT
SU-1
SU-1
R-D
SU-1
(SU FOR PUBLIC UTILITIES)
SU-1
SU-1
SU-1
R-D
SU-1
RANCHO
TR 1
(SU FOR GOLF COURSE)
ATRISCO
SU-1
SU-1
(SU FOR GOLF COURSE)
R-D
SU-1
SU-1
EL RANCHO
SU-1
(SU FOR LIGHT INDUSTRIAL)
TRACT 6-A
TRACT 5-A
PHASE III
R-D
R-D
CIELO
DORADO
GRANDE
LAURELWOOD
UNIT 1-A
UNIT 1-B
SUBJECT
ATRISCO
GRANT
UNIT
R-D
(OFFICE)
(115 DU A.)
NO. EIGHT
AIRPORT
UNIT
C-2
SU-1
MAY 1981
H-10-Z
CITY OF ALBUQUERQUE
PLANNING DEPARTMENT

FLOODWAY MAP
PORTION OF FEMA MAP PANEL 35002 0021
PLATE 4



N

SCALE : 1" = 500'

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FLOODWAY

FLOOD BOUNDARY AND FLOODWAY MAP

CITY OF

ALBUQUERQUE, NEW MEXICO

BERNALILLO COUNTY

PANEL 21 OF 50

COMMUNITY-PANEL NUMBER

350002 0021

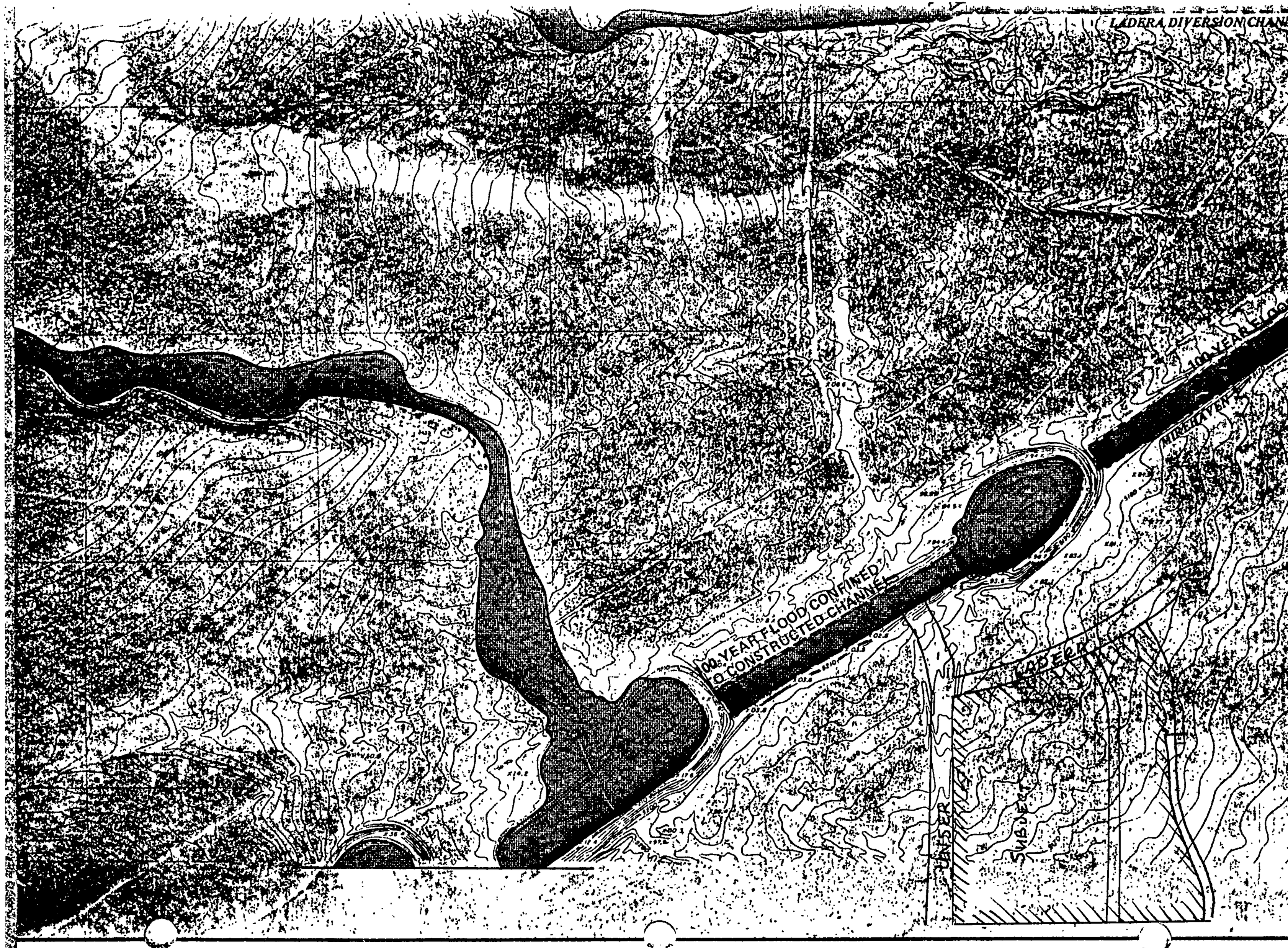
EFFECTIVE DATE:

Federal Emergency Management Agency

DESCRIPTION OF LOCATION

Top of steel rail right-of-way marker Sta. 226 + 98, stamped "ACS BM 3-G11", located about 200' north of the intersection of Coors Road and Tucson Road, NW on the east right-of-way line of Coors Road.

New Mexico State Highway Commission (NMSHC) standard brass tablet, stamped "STA I-40-18", set in top of a concrete post flush with the ground, located 20.5' north of the west wingwall at the southbound Coors Road overpass of Interstate 40, and 4.0' west of the west edge of Coors Road.


LADERA DIVERSION CHANNEL
100-YEAR FLOOD CONFINED
CONSTRUCTED CHANNEL
100-YEAR FLOOD
MILLCREEK
LADERA
SUBJECT
JANSER

EXISTING LINE ANALYSIS

User Name: Raymond
Project: d:\wstwd\drain.STM
Network: 01 Description: Hanover Storm Drain

Date: 10-22-97
Time: 20:40:27
Page: 1 of 1

S T O R M S E W E R S U M M A R Y R E P O R T

RAINFALL FILE: d:\wstwd\drain.rnd 100 YEAR DESIGN STORM I = 66.800/ (Tc + 9.590) ^ 0.800

LINE ID		FLOW RATE INFO						PIPE INFO					HYDRAULIC INFO		
LINE#	DESCRIPTION DOWNLINE#	INC AR TOT AR (ac)	RUNOFFC WEIGHTD C	INLTIME Tc (min)	INLT I TOTL I (in/h)	INC CIA TOT CIA (cfs)	INPUTQ TOTALQ (cfs)	UNIFORM FLOWCAP (cfs)	SIZE/ TYPE (in)	INVERT UP/DOWN (ft)	PLAN LEN (ft)	NVAL INVSLOP (ft/ft)	HGLSLOPE JLC (ft/ft)	HYD GRD UP/DOWN (ft)	VEL UP/DOWN (ft/s)
1	Outfall from Ch	0.0	0.00	0.00	10.95	0.00	150.00		42D	5136.88	379	0.013	0.021	5143.31	15.59
	DNLN = 0	0.0	0.00	1.36	9.85	0.00	150.00	N/A	42D	5132.00		0.013	1.00	5135.39	15.74
2	Trct 1-B-1 Manh	0.0	0.00	0.00	10.95	0.00	130.00		42D	5146.81	447	0.013	0.017	5154.49	13.51
	DNLN = 1	0.0	0.00	0.93	10.16	0.00	130.00	149.6	42D	5137.00		0.022	1.00	5147.09	13.51
3	Trct 1-A-1 Manh	0.0	0.00	0.00	10.95	0.00	110.00		42D	5157.44	420	0.013	0.012	5162.31	11.43
	DNLN = 2	0.0	0.00	0.55	10.47	0.00	110.00	158.7	42D	5147.08		0.025	1.00	5157.33	11.43
4	Tract 1-A-1 tra	0.0	0.00	0.00	10.95	0.00	80.00		36D	5169.90	435	0.013	0.019	5172.67	11.73
	DNLN = 3	0.0	0.00	0.12	10.84	0.00	80.00	109.2	36D	5158.33		0.027	1.00	5164.34	11.32
5	Restriction	0.0	0.00	0.00	10.95	0.00	80.00		36D	5174.46	42	0.013	0.058	5177.23	11.73
	DNLN = 4	0.0	0.00	0.10	10.86	0.00	80.00	230.0	36D	5169.90		0.119	1.00	5174.81	11.32
6	Inlet in Parkwa	0.0	0.00	0.00	10.95	0.00	80.00		54D	5179.50	118	0.013	0.032	5183.20	8.34
	DNLN = 5	0.0	0.00	0.00	10.95	0.00	80.00	392.8	54D	5174.94		0.040	1.00	5179.37	5.05

SECTOR PLAN (DRAINAGE SECTION)

SECTOR PLAN

EL RANCHO ATRISCO
PHASE III

Prepared for

WESTLAND DEVELOPMENT CO. INC.

For
Submission

TO THE CITY OF ALBUQUERQUE

ENVIRONMENTAL PLANNING COMMISSION

Prepared By

Fred Denney & Associates, Inc.

ENGINEERS PLANNERS

2400 COMANCHE RD. NE. ALBUQUERQUE, N.M. 87107

(505) 884-0696

FEBRUARY 27, 1981 Revised July 1, 19.

IV.

DRAINAGE ELEMENT

The proposed Industrial Area north of the Ladera Channel can be drained directly to that channel which is designed to accommodate that runoff. No ponding will be required.

The residential and commercial area south of the Ladera Channel will be drained to a planned channel which the City proposed to construct along I-40 with a new outlet to the Rio Grande north of the Coors Interchange. Therefore, the only requirement for this section is to grade the streets to deliver the runoff to the south. In later phases of development on the south side of the Sector Plan Area some storm sewer construction will be required to gather runoff from the streets and deliver it to the proposed City channel. These systems will be constructed by the developer.

A complete comprehensive drainage plan covering the Sector Plan Area has been prepared and has been submitted to the City Engineer under separate cover. That report is complete with calculations and tabulations of flows and volumes necessary for a detailed technical review. Let it suffice to say here that development of the Sector Plan Area will pose no drainage problems for the City not already anticipated and planned.

AHYMO ANALYSIS

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =10/22/1997
INPUT FILE = D:\WSTWD\WW.DAT USER NO.= RHENSLEY.194

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S										
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.200
*S	ORIGINAL BASIN - BASIN A									
COMPUTE NM HYD	100.00	-	1	.05730	45.36	1.342	.43922	1.533	1.237	PER IMP= .00
*S	COMPUTE DEVELOPED BASIN A -									
COMPUTE NM HYD	101.00	-	2	.03711	82.60	3.710	1.87442	1.567	3.477	PER IMP= 92.99
*S	COMPUTE DEVELOPED BASIN C -									
COMPUTE NM HYD	102.00	-	3	.01936	51.11	1.493	1.44589	1.467	4.125	PER IMP= 59.97
FINISH										

POND VOLUME CALCULATIONS

CAMI

Project APPLEWOOD/WESTWOOD Job # _____ Date 12/2 198

Type of Work HYDROCOGY By SHABIH RIZVI Sheet No. 1/4

To DETERMINE THE VOLUME OF THE POND

1

THE PROPERTY AREA IS 12.39 ACRES

SINCE THERE ARE 2 PONDS THE PROPETY AREA ABOVE WAS DIVEDED AS SHOWN BELOW

BASIN C1 = 4.32 ACRES FOR THE FIRST POND

BASIN C2 = 8.07 ACRES FOR THE SECOND POND

USING THE PROCEDURES IN THE DEVELOPMENT PROCESS MANUAL (DPM), SECTION 222, PAGE 22-14 TO 22-16, THE VOLUME OF RUNOFF AND DISCHARGE RATE IS DETERMINED AS FF:

BASIN C1

-LAND TREATMENT A B C AND D ZONE 1

$A_A = 0.123$ AC $A_B = 1.21$ AC $A_C = 0.4$ AC $A_D = 2.59$ AC

VOLUME = WEIGHTED $E \times (A_A + A_B + A_C + A_D)$ — (a-6)

LAND TREATMENT A ZONE 1

WEIGHTED E_A : FOR BASIN C1 = $\frac{0.44(4.32)}{4.32} = 0.44$ — (a-5)

FOR LAND TREATMENT A B C D ZONE 1

WEIGHTED $E_B = \frac{0.44(.123) + 0.67(1.21) + 0.99(.40) + 1.97(2.59)}{(.123 + 1.21 + .4 + 2.59)} = 1.47$

$\therefore$ VOLUME $= A(E_B - E_A) = \underline{16152 \text{ cf}}$

USING TABLE A-9 THE 100 YR. 6 HR SPEAK DISCHARGERS RATE WAS DETERMINED.

$$Q_P = Q_{PA} A_A + Q_{PB} A_B + Q_{PC} A_C + Q_{PD} \cdot A_D \quad \text{— (a-10)}$$

$Q_P = 1.29(0.123) + 2.03(1.21) + 2.87(0.40) + 4.37(2.59) = 15.05$ cfs

$Q_{OUTFALL} = 6.28$ cfs (REFER TO OUTLET STRUCTURE REPORT A.1 (PAGE 4)

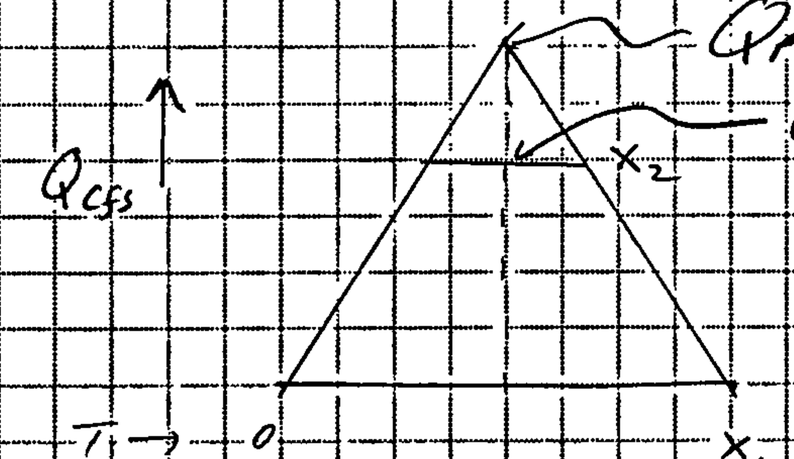
CAMI

Project APPLEWOOD / WESTWOOD Job # _____ Date 12/2/98

Type of Work HYDROLOGY By _____ Sheet No. 2/4

TO DETERMINE THE VOLUME OF THE OUTFALL. THE FOLLOWING PROCEDURE IS USED.

- THE SHAPE OF THE UNIT HYDROGRAPH WAS ASSUMED TO BE TRIANGULAR.



$\therefore A = 16152 cf = \frac{1}{2} * 15.05 X_1$

$\Rightarrow X_1 = 2146.46$

using interpolation

$\frac{X_2}{X_1} = \frac{(15.05 - 6.28)}{15.05} \Rightarrow X_2 = 1250.8$ cf

$V_{OUTFALL} = \left(\frac{X_1 + X_2}{2}\right) * 6.28$

$= \left(\frac{1250.8 + 2146.46}{2}\right) * 6.28 = 5334$ cf

$\therefore V_{POND} = A(E_B - E_A) = V_{OUTFALL} - V_{OVERFLOW}$

$= 16152$ cf 5334 cf 9190 cf $= \boxed{1628 \text{ cf}}$

THE POND WAS SIZED FOR 9222 cf.

CAMI

Project APPLEWOOD/WESTWOOD Job # _____ Date 12/2/98

Type of Work HYDROLOGY By _____ Sheet No. 3/4

BASIN C2

-LAND TREATMENT A, B, C AND D ZONE 1

$A_A = 0.229$ Ac $A_B = 2.454$ Ac $A_C = 0.746$ Ac $A_D = 4.461$ Ac

VOLUME = WEIGHTED $E \times (A_A + A_B + A_C + A_D)$ — (a-6)

-LAND TREATMENT A ZONE 1

WEIGHTED E_A FOR BASIN $C_2 = \frac{0.44(8.07)}{8.07} = 0.44$

FOR LAND TREATMENT A, B, C AND D ZONE 1

$$\text{WEIGHTED } E_B = \frac{0.44(0.229) + 0.67(2.454) + 0.99(0.746) + 1.97(4.46)}{0.229 + 2.454 + 0.746 + 4.46}$$

$E_B = 1.43$

$\therefore$ VOLUME $= A(E_B - E_A) = 29000$ cf.

-USING TABLE A-9 THE 100-YR-6HR PEAK DISCHARGE RATE WAS DETERMINED AS FF:

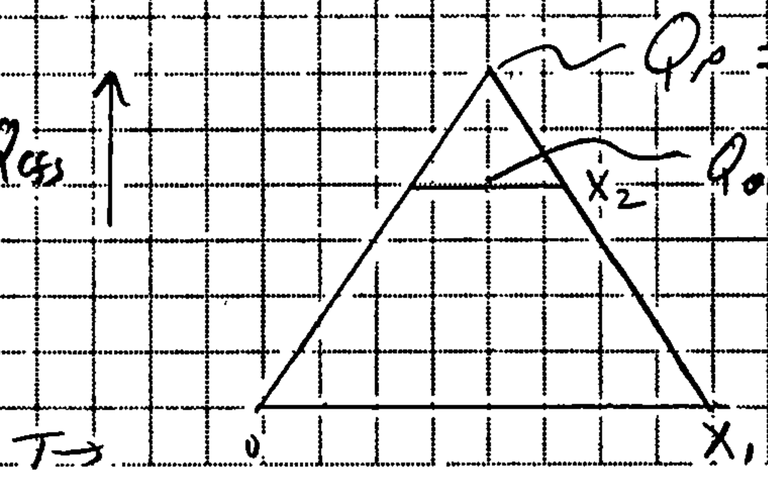
$$Q_P = Q_{PA} A_A + Q_{PB} A_B + Q_{PC} A_C + Q_{PD} A_D \quad \text{—— (a-10)}$$

$Q_P = 1.29(.229) + 2.03(2.454) + 2.87(.746) + 4.37(4.461) = 26.91$ cfs

$Q_{OUTFALL} = 23.86$ cfs (REFER TO OUTLET STRUCTURE REPORT A.2 PAGE 4)

TO DETERMINE THE VOLUME OF THE OUTFALL THE FOLLOWING PROCEDURE IS USED

- ASSUME THE SHAPE OF UNIT HYDROGRAPH TO BE TRIANGULAR



$\therefore A = 29000 = \frac{1}{2} X_1 * 26.91$

$X = 2155.33$ sec.

CAMI

Project APPLEWOOD / WEST WOOD Job # _____ Date 12/2/98

Type of Work HYDROLOGY By _____ Sheet No. 4/4

using interpolation

$$\frac{X_2}{X_1} = \frac{(26.91 - 23.86)}{26.91} \Rightarrow X_2 = 244.29 \text{ sec.}$$

$$\therefore V_{OUTFALL} = \left(\frac{X_1 + X_2}{2}\right) 23.86$$

$$= \left(\frac{2155.33 + 244.29}{2}\right) * 23.86 = 28,627 \text{ cF}$$

$$\therefore V_{POND} = A(E_A - E_A) - V_{OUTFALL} + V_{(BASIN\ A\ OVERFLOW)}$$

$$= 29000\text{cf} - 28,627\text{cf} + 9190 \text{ cf} = \boxed{9563 \text{ cf}}$$

THE POND WAS SIZED FOR 10905 CF

OUTLET STRUCTURE REPORT

RECORD NUMBER : 1
TYPE : STAND PIPE WEIR
DESCRIPTION : Pond A

[RATING CURVE LIMIT]

Minimum Elevation.....	=	0.00 (ft)
Maximum Elevation.....	=	8.00 (ft)
Elevation Increment.....	=	0.25 (ft)

[STANDPIPE INFORMATION]

CIRC. STAND PIPE WEIR DESCRIPTION :

[OUTLET STRUCTURE INFORMATION]

Radius.....	=	0.50 (ft)
Crest Length.....	=	3.14 (ft)
Crest Elevation.....	=	8.00 (ft)
Fraction Open Area.....	=	1.00000

[RECTANGULAR STAND PIPE EQUATION]

ORIFICE EQ: Q = Co*A(2gh)^0.5
WEIR EQ: Q = Cw*L*H^exp

Coefficient Co	=	0.60000
Coefficient Cw	=	3.33000
Exponential.....	=	1.50000

[DEFINITIONS]

H = Headwater depth above inlet control section invert, (ft)
A = Wetted area, (sqft)
L = Crest length, (ft)

[ORIFICE INFORMATION]

1 SUBRECORD :
RECTANGULAR DESCRIPTION :

[OUTLET STRUCTURE INFORMATION]

Width.....	=	0.34 (ft)
Height.....	=	0.34 (ft)
Invert Elevation.....	=	6.50 (ft)
Coefficient Co.....	=	0.60000
# of Openings.....	=	6

[RECTANGULAR ORIFICE EQUATION]

Q = Co*A*[2gh]/k]^0.5
A = Wetted area, (sqft)
K = 1

[ORIFICE INFORMATION]

2 SUBRECORD :
RECTANGULAR DESCRIPTION :

[OUTLET STRUCTURE INFORMATION]

Width	=	0.25	(ft)
Height	=	0.34	(ft)
Invert Elevation	=	7.00	(ft)
Coefficient Co	=	0.60000	
# of Openings	=	4	

[RECTANGULAR ORIFICE EQUATION]

Q = Co*A*[2gh]/k]^0.5
A = Wetted area, (sqft)
K = 1

[ORIFICE INFORMATION]

3 SUBRECORD :
RECTANGULAR DESCRIPTION :

[OUTLET STRUCTURE INFORMATION]

Width	=	0.25	(ft)
Height	=	0.34	(ft)
Invert Elevation	=	7.50	(ft)
Coefficient Co	=	0.60000	
# of Openings	=	4	

[RECTANGULAR ORIFICE EQUATION]

Q = Co*A*[2gh]/k]^0.5
A = Wetted area, (sqft)
K = 1

[CULVERT INFORMATION]

DESCRIPTION : RECT BOX 0 deg wingwall flares

[OUTLET STRUCTURE INFORMATION]

Height	=	0.50	(ft)
Width	=	4.00	(ft)
Culvert Invert Elevation	=	0.00000	(ft)
Pipe Length	=	5.00000	(ft)
Slope	=	0.02000	
Manning's N-value	=	0.01300	
Orifice Coefficient	=	0.60000	
Tailwater	=	0.00000	(ft)
Number barrels	=	1	

[UNSUBMERGED EQUATION]

H/Diam = Hc/Diam + K *(Q/A*Diam^0.5))^M - 0.5*S^2

Coefficient K	=	0.06100
coefficient M	=	0.75000

[SUBMERGED EQUATION]

H/Diam = c*(Q/(A*Diam^0.5))^Z + Y - 0.5*S^2

Coefficient c	=	0.04230
Coefficient Y	=	0.82000

[DEFINITIONS]

H = Headwater depth above inlet control section invert, (ft)
Diam = Inerior height of culvert barrel, (ft)
Hc = Specific head at critical depth (dc + Vc^2/2g), (ft)
Q = Discharge, (cuft/s)
A = Full cross sectional area of culvert barrel, (sqft)
S = Culvert barrel slope, (ft/ft)

[Stand Pipe Discharge Value vs. Stage]
(the elevation increment is 0.3)

STAGE	ELEVATION (ft)	ORIFICE (cfs)	WEIR (cfs)	STAND PIPE (cfs)	CULVERT (cfs)	TOTAL FLOW (cfs)
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.25	0.25	0.00	0.00	0.00	1.32	0.00
0.50	0.50	0.00	0.00	0.00	3.63	0.00
0.75	0.75	0.00	0.00	0.00	5.71	0.00
1.00	1.00	0.00	0.00	0.00	7.50	0.00
1.25	1.25	0.00	0.00	0.00	8.94	0.00
1.50	1.50	0.00	0.00	0.00	10.18	0.00
1.75	1.75	0.00	0.00	0.00	11.28	0.00
2.00	2.00	0.00	0.00	0.00	12.28	0.00
2.25	2.25	0.00	0.00	0.00	13.21	0.00
2.50	2.50	0.00	0.00	0.00	14.08	0.00
2.75	2.75	0.00	0.00	0.00	14.89	0.00
3.00	3.00	0.00	0.00	0.00	15.66	0.00
3.25	3.25	0.00	0.00	0.00	16.40	0.00
3.50	3.50	0.00	0.00	0.00	17.11	0.00
3.75	3.75	0.00	0.00	0.00	17.79	0.00
4.00	4.00	0.00	0.00	0.00	18.44	0.00
4.25	4.25	0.00	0.00	0.00	19.07	0.00
4.50	4.50	0.00	0.00	0.00	19.68	0.00
4.75	4.75	0.00	0.00	0.00	20.27	0.00
5.00	5.00	0.00	0.00	0.00	20.85	0.00
5.25	5.25	0.00	0.00	0.00	21.40	0.00
5.50	5.50	0.00	0.00	0.00	21.95	0.00

[Stand Pipe Discharge Value vs. Stage]
(the elevation increment is 0.3)

STAGE	ELEVATION (ft)	ORIFICE (cfs)	WEIR (cfs)	STAND PIPE (cfs)	CULVERT (cfs)	TOTAL FLOW (cfs)
5.75	5.75	0.00	0.00	0.00	22.48	0.00
6.00	6.00	0.00	0.00	0.00	23.00	0.00
6.25	6.25	0.00	0.00	0.00	23.51	0.00
6.50	6.50	0.00	0.00	0.00	24.01	0.00
6.75	6.75	0.87	0.00	0.00	24.49	0.87
7.00	7.00	1.92	0.00	0.00	24.97	1.92
7.25	7.25	2.97	0.00	0.00	25.44	2.97
7.50	7.50	3.98	0.00	0.00	25.90	3.98
7.75	7.75	5.14	0.00	0.00	26.35	5.14
8.00	8.00	6.28	0.00	0.00	26.80	6.28
0.00	0.00	5.74	0.00	0.00	0.00	0.00
0.00	0.00	6.39	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00

OUTLET STRUCTURE REPORT

RECORD NUMBER : 4
TYPE : STAND PIPE WEIR
DESCRIPTION : Pond B2

[RATING CURVE LIMIT]

Minimum Elevation.....	=	0.00 (ft)
Maximum Elevation.....	=	8.50 (ft)
Elevation Increment.....	=	0.25 (ft)

[STANDPIPE INFORMATION]

CIRC. STAND PIPE WEIR DESCRIPTION :

[OUTLET STRUCTURE INFORMATION]

Radius.....	=	1.00 (ft)
Crest Length.....	=	6.28 (ft)
Crest Elevation.....	=	8.00 (ft)
Fraction Open Area.....	=	1.00000

[RECTANGULAR STAND PIPE EQUATION]

ORIFICE EQ: Q = Co*A(2gh)^0.5
WEIR EQ: Q = Cw*L*H^exp

Coefficient Co	=	0.60000
Coefficient Cw	=	3.33000
Exponential.....	=	1.50000

[DEFINITIONS]

H = Headwater depth above inlet control section invert, (ft)
A = Wetted area, (sqft)
L = Crest length, (ft)

[ORIFICE INFORMATION]

1 SUBRECORD :
RECTANGULAR DESCRIPTION :

[OUTLET STRUCTURE INFORMATION]

Width.....	=	0.25 (ft)
Height.....	=	0.45 (ft)
Invert Elevation.....	=	7.00 (ft)
Coefficient Co.....	=	0.60000
# of Openings.....	=	12

[RECTANGULAR ORIFICE EQUATION]

Q = Co*A*[2gh]/k]^0.5
A = Wetted area, (sqft)
K = 1

[ORIFICE INFORMATION]

2 SUBRECORD :
RECTANGULAR DESCRIPTION :

[OUTLET STRUCTURE INFORMATION]

Width	=	0.25	(ft)
Height	=	0.45	(ft)
Invert Elevation	=	7.50	(ft)
Coefficient Co	=	0.60000	
# of Openings	=	12	

[RECTANGULAR ORIFICE EQUATION]

Q = Co*A*[2gh]/k]^0.5
A = Wetted area, (sqft)
K = 1

[ORIFICE INFORMATION]

3 SUBRECORD :
RECTANGULAR DESCRIPTION :

[OUTLET STRUCTURE INFORMATION]

Width	=	0.25	(ft)
Height	=	0.45	(ft)
Invert Elevation	=	8.00	(ft)
Coefficient Co	=	0.60000	
# of Openings	=	12	

[RECTANGULAR ORIFICE EQUATION]

Q = Co*A*[2gh]/k]^0.5
A = Wetted area, (sqft)
K = 1

[CULVERT INFORMATION]

DESCRIPTION : RECT BOX 0 deg wingwall flares

[OUTLET STRUCTURE INFORMATION]

Height	=	0.50	(ft)
Width	=	4.00	(ft)
Culvert Invert Elevation	=	0.00000	(ft)
Pipe Length	=	5.00000	(ft)
Slope	=	0.02000	
Manning's N-value	=	0.01300	
Orifice Coefficient	=	0.60000	
Tailwater	=	0.00000	(ft)
Number barrels	=	1	

[UNSUBMERGED EQUATION]

H/Diam = Hc/Diam + K *(Q/A*Diam^0.5))^M - 0.5*S^2

Coefficient K	=	0.06100
coefficient M	=	0.75000

[SUBMERGED EQUATION]

H/Diam = c*(Q/(A*Diam^0.5))^Z + Y - 0.5*S^2

Coefficient c	=	0.04230
Coefficient Y	=	0.82000

[DEFINITIONS]

H = Headwater depth above inlet control section invert, (ft)
Diam = Inerior height of culvert barrel, (ft)
Hc = Specific head at critical depth (dc + Vc^2/2g), (ft)
Q = Discharge, (cuft/s)
A = Full cross sectional area of culvert barrel, (sqft)
S = Culvert barrel slope, (ft/ft)

[Stand Pipe Discharge Value vs. Stage]
(the elevation increment is 0.3)

STAGE	ELEVATION (ft)	ORIFICE (cfs)	WEIR (cfs)	STAND PIPE (cfs)	CULVERT (cfs)	TOTAL FLOW (cfs)
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.25	0.25	0.00	0.00	0.00	1.32	0.00
0.50	0.50	0.00	0.00	0.00	3.63	0.00
0.75	0.75	0.00	0.00	0.00	5.71	0.00
1.00	1.00	0.00	0.00	0.00	7.50	0.00
1.25	1.25	0.00	0.00	0.00	8.94	0.00
1.50	1.50	0.00	0.00	0.00	10.18	0.00
1.75	1.75	0.00	0.00	0.00	11.28	0.00
2.00	2.00	0.00	0.00	0.00	12.28	0.00
2.25	2.25	0.00	0.00	0.00	13.21	0.00
2.50	2.50	0.00	0.00	0.00	14.08	0.00
2.75	2.75	0.00	0.00	0.00	14.89	0.00
3.00	3.00	0.00	0.00	0.00	15.66	0.00
3.25	3.25	0.00	0.00	0.00	16.40	0.00
3.50	3.50	0.00	0.00	0.00	17.11	0.00
3.75	3.75	0.00	0.00	0.00	17.79	0.00
4.00	4.00	0.00	0.00	0.00	18.44	0.00
4.25	4.25	0.00	0.00	0.00	19.07	0.00
4.50	4.50	0.00	0.00	0.00	19.68	0.00
4.75	4.75	0.00	0.00	0.00	20.27	0.00
5.00	5.00	0.00	0.00	0.00	20.85	0.00
5.25	5.25	0.00	0.00	0.00	21.40	0.00
5.50	5.50	0.00	0.00	0.00	21.95	0.00

[Stand Pipe Discharge Value vs. Stage]
(the elevation increment is 0.3)

STAGE	ELEVATION (ft)	ORIFICE (cfs)	WEIR (cfs)	STAND PIPE (cfs)	CULVERT (cfs)	TOTAL FLOW (cfs)
5.75	5.75	0.00	0.00	0.00	22.48	0.00
6.00	6.00	0.00	0.00	0.00	23.00	0.00
6.25	6.25	0.00	0.00	0.00	23.51	0.00
6.50	6.50	0.00	0.00	0.00	24.01	0.00
6.75	6.75	0.00	0.00	0.00	24.49	0.00
7.00	7.00	0.00	0.00	0.00	24.97	0.00
7.25	7.25	1.28	0.00	0.00	25.44	1.28
7.50	7.50	3.41	0.00	0.00	25.90	3.41
7.75	7.75	5.98	0.00	0.00	26.35	5.98
8.00	8.00	9.13	0.00	0.00	26.80	9.13
8.25	8.25	12.56	0.00	2.62	27.24	15.18
8.50	8.50	16.46	0.00	7.40	27.67	23.86
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
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0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vinyard & Associates, Inc.

4415-D Hawkins, NE
Albuquerque, New Mexico 87109
(505) 345-1937

Geotechnical Engineering • Materials Testing • Environmental Engineering

GEOTECHNICAL INVESTIGATION
APARTMENT COMPLEX ON
LADERA DRIVE

Prepared for:

de la Torre-Rainhart, PA

Project No.: 95-1-204

September 1, 1995

geotechnical engineer or his representative prior to placement of reinforcement or concrete. The purpose of the observation is to determine if the exposed soils are similar to those anticipated.

10.0 SITE GRADING AND DRAINAGE

The site soils are moderately collapsible if allowed to increase in moisture content. To reduce the risk of structure settlement the site should be graded to rapidly drain away from structures. We suggest a minimum four percent gradient within at least the first ten feet away from structures in areas not protected by sidewalks and pavement. Splash blocks should be utilized below down spouts and canales.

If ponding areas are required, they should be located as far away from structures as possible, a minimum of ten feet. If this criteria cannot be met, this office should be contacted for supplemental recommendations.

Roof gutters and downspouts should be utilized. Water should run off rapidly.

11.0 LANDSCAPING

Landscaping adjacent to structures should be designed and

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

December 3,1998

Raymond Hensley PE
CAMI
4001 Juan Tabo NE Suite A
Albuquerque, New Mexico 87111

RE: DRAINAGE PLAN FOR APPLEWOOD APARTMENTS (H10-D18) ENGINEER'S STAMP DATED 12/2/98

Dear Mr. Hensley:

Based on the information provided on your December 3, 1998 submittal, the above referenced site is approved for Building Permit

Please attach a copy of this approved plan to the construction sets prior to sign-off by Hydrology.

Also, prior to Certificate of Occupancy release, Engineer Certification per the DPM checklist will be required.

Please be advised that the Building Permit will not be issued until the covenant is executed and the work order is released.

If I can be of further assistance, please feel free to contact me at 924-3986.

C: Andrew Garcia
File

Sincerely

Bernie J. Montoya CE
Associate Engineer

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

March 21, 2001

Raymond Hensley, P.E.
CAMI
4001 Juan Tabo NE
Albuquerque, NM 87111

RE: **Grading and Drainage Certification**
Westwood Apartments- Market St. - (H-10/D018)
(AKA: Applewood Apts.)
Engineer's Stamp dated 12/2/1998
Engineers Certification dated 2/22/2001

Dear Mr. Hensley:

Based upon the information provided in your Engineers Certification submittal dated 3/21/2001, the above referenced site is approved for Permanent Certificate of Occupancy.

If I can be of further assistance, please contact me at 924-3986.

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Senior Civil Engineer
Hydrology Section, PWD

C: Vickie Chavez, COA
Teresa Martin,COA
file

City of Albuquerque

July 31, 2000

Raymond Hensley, P.E.
CAMI
4001 Juan Tabo NE
Suite A
Albuquerque, NM 87111

RE: APPLEWOOD APARTMENTS, formerly WESTWOOD SUBDIVISION, (H10-D18). ENGINEER'S CERTIFICATION - Partial- FOR CERTIFICATE OF OCCUPANCY APPROVAL. ENGINEER'S STAMP DATED JULY 28, 2000.

Dear Mr. Hensley:

Based on the information provided on your July 28, 2000 submittal, the above referenced project is approved for a PARTIAL Certificate of Occupancy. This approval is for those facilities to the North of Applewood Drive. When completed, an Engineer's Certification for the entire project will ensue.

If I can be of further assistance, please feel free to contact me at 924-3984.

Sincerely,

John P. Murray, P.E.
Hydrology

c: Whitney Reierson
File

CITY OF
Albuquerque

June 15, 1998

Raymond Hensley, P.E.
CAMI
4001 Juan Tabo NE
Suite A
Albuquerque, NM 87111

RE: APPLEWOOD APARTMENTS, formerly WESTWOOD SUBDIVISION, (H10-D18). CONCEPTUAL GRADING AND DRAINAGE PLAN FOR SITE DEVELOPMENT PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED JUNE 9, 1998.

Dear Mr. Hensley:

Based on the information provided on your June 9,1998 submittal (revised drawing) and the prior approval of your November 3,1997 submittal for Building Permit only, the above referenced project is approved for Site Development Plan for Building Permit.

If I can be of further assistance, please feel free to contact me at 924-3984.

Sincerely,

John P. Murray, P.E.
Hydrology

c: Andrew Garcia
√ File

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

December 3,1998

Raymond Hensley PE
CAMI
4001 Juan Tabo NE Suite A
Albuquerque, New Mexico 87111

RE: DRAINAGE PLAN FOR APPLEWOOD APARTMENTS (H10-D18) ENGINEER'S STAMP DATED 12/2/98

Dear Mr. Hensley:

Based on the information provided on your December 3, 1998 submittal, the above referenced site is approved for Building Permit

Please attach a copy of this approved plan to the construction sets prior to sign-off by Hydrology.

Also, prior to Certificate of Occupancy release, Engineer Certification per the DPM checklist will be required.

Please be advised that the Building Permit will not be issued until the covenant is executed and the work order is released.

If I can be of further assistance, please feel free to contact me at 924-3986.

C: Andrew Garcia
File

Sincerely

Bernie J. Montoya CE
Associate Engineer

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

February 26, 1996

Mark Goodwin
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: WESTWOOD VILLAS (H10-D18) CONCEPTUAL GRADING AND DRAINAGE PLAN FOR SITE DEVELOPMENT PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED 2-11-96.

Dear Mr. Goodwin:

Based on the information provided on your February 13, 1996 submittal, the above referenced project is approved for Site Development Plan for Building Permit.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File