CITY OF
Albuquerque

June 4,1998

Ray Macy
PROTEC Consulting
P.O. Box 27007
Albuquerque, New Mexico 87125

RE: ENGINEER CERTIFICATION FOR FINANCIAL GUARANTEE RELEASE FOR TIGERWOOD SUBDIVISION (J10-D23) CERTIFICATION STATEMENT DATED 5/4/98

Dear Mr. Macy:

Based on the information provided on your May 28,1998 resubmittal, Engineer Certification for the above referenced site is acceptable.

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

C: Andrew Garcia
File
Terri Martin

Sincerely

Bernie J. Montoya CE
Engineering Associate

DRAINAGE INFORMATION SHEET

PROJECT TITLE: TIGERWOOD SUBDIVISION ZONE ATLAS/DRNG. FILE #: J-10 Z3

DRB #: 96-415 EPC #: _____ WORK ORDER #: 5683.81

LEGAL DESCRIPTION: Previously, TRACTS 227 & 228, AIRPORT UNIT, TOWN OF ATRISCO GRANT

CITY ADDRESS: N/A

ENGINEERING FIRM: PROTEC Consulting CONTACT: Ray Macy

ADDRESS: P.O. Box 27007 PHONE: 883-0177

OWNER: Albuquerque Ranch Estates CONTACT: Mason Mayhew

ADDRESS: 6012 Royal Oak St., NE PHONE: 296-5508

ARCHITECT: N/A CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: Aldrich Land Surveying CONTACT: Tim Aldrich

ADDRESS: P.O. Box 30701 PHONE: 884-1990

CONTRACTOR: CONDORE CONSTRUCTION - CONTACT: Rick Coe

ADDRESS: 6320 2nd St., NW PHONE: 344-3104

TYPE OF SUBMITTAL: (2nd Submittal)

____ DRAINAGE REPORT

____ DRAINAGE PLAN

____ CONCEPTUAL GRADING & DRAINAGE PLAN

____ GRADING PLAN

____ EROSION CONTROL PLAN

X ENGINEER'S CERTIFICATION

____ OTHER _____

PRE-DESIGN MEETING:

✓ YES

____ NO

____ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

____ SKETCH PLAT APPROVAL

____ PRELIMINARY PLAT APPROVAL

____ S. DEV. PLAN FOR SUB'D. APPROVAL

____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL

____ SECTOR PLAN APPROVAL

____ FINAL PLAT APPROVAL

____ FOUNDATION PERMIT APPROVAL

____ BUILDING PERMIT APPROVAL

____ CERTIFICATE OF OCCUPANCY APPROVAL

____ GRADING PERMIT APPROVAL

____ PAVING PERMIT APPROVAL

____ S.A.D. DRAINAGE REPORT

____ DRAINAGE REQUIREMENTS

X SUBDIVISION CERTIFICATION

____ OTHER _____ (SPECIFY)

DATE SUBMITTED: 5/28/98

BY: R.W. Macy

RECEIVED
MAY 28 1998
HYDROLOGY SECTION

PROTEC
Consulting

Professional Technologies and
Design Development Services

May 28, 1998

Mr. Bernie J. Montoya
Engineering Associate
City of Albuquerque
Public Works Department
Hydrology Division
P.O. Box 1293
Albuquerque, NM 87103

Re: ENGINEER'S CERTIFICATION dated 5/4/98 - Tigerwood Subdivision Grading and Drainage Plan
City Project No. 5683.81

Dear Mr. Montoya:

Per your request of May 4, 1998, the Engineer's Certification has been revised to change the word "conformance" to "compliance." Also, a description has been added to the Legend for As-built revisions, and an acceptance statement has been added with AMAFCA's approval of As-built improvements within the AMAFCA right-of-way. A copy of the above referenced Grading and Drainage Plan with the revised Engineer's Certification dated May 4, 1998, is enclosed. Please let me know at your earliest convenience if the Certification is acceptable.

If you have any questions please contact me at (505) 833-0177.

Sincerely,
PROTEC Consulting

R.W. Macy

Raymond W. Macy, P.E.
Owner

Enclosure

xc: Mr. Mason Mayhew, Albuquerque Ranch Estates

RECEIVED
MAY 28 1998
HYDROLOGY SECTION

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Tigerwood Subdivision ZONE ATLAS/DRNG. FILE #: J-10 23

DRB #: 96-415 EPC #: _____ WORK ORDER #: 5683.81

LEGAL DESCRIPTION: Previously, Tracts 227 & 228, AIRPORT UNIT, TOWN OF ATRISCO GRANT

CITY ADDRESS: N/A

ENGINEERING FIRM: PROTEC Consulting CONTACT: Ray Macy

ADDRESS: P.O. Box 27007 PHONE: 833-0177

OWNER: Albuquerque Ranch Estates CONTACT: Mason Mayhew

ADDRESS: 6012 Royal Oak St., NE PHONE: 296-5508

ARCHITECT: N/A CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: Aldrich Land Surveying CONTACT: Tim Aldrich

ADDRESS: P.O. Box 30701 PHONE: 884-1990

CONTRACTOR: CONDORE CONSTRUCTION - CONTACT: RICK COE

ADDRESS: 6320 2nd St., NW PHONE: 344-3104

TYPE OF SUBMITTAL:

___ DRAINAGE REPORT
___ DRAINAGE PLAN
___ CONCEPTUAL GRADING & DRAINAGE PLAN
___ GRADING PLAN
___ EROSION CONTROL PLAN
X ENGINEER'S CERTIFICATION
___ OTHER _____

PRE-DESIGN MEETING:

✓ YES
___ NO
___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

___ SKETCH PLAT APPROVAL
___ PRELIMINARY PLAT APPROVAL
___ S. DEV. PLAN FOR SUB'D. APPROVAL
___ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
___ SECTOR PLAN APPROVAL
___ FINAL PLAT APPROVAL
___ FOUNDATION PERMIT APPROVAL
___ BUILDING PERMIT APPROVAL
___ CERTIFICATE OF OCCUPANCY APPROVAL
___ GRADING PERMIT APPROVAL
___ PAVING PERMIT APPROVAL
___ S.A.D. DRAINAGE REPORT
___ DRAINAGE REQUIREMENTS
X SUBDIVISION CERTIFICATION
___ OTHER _____ (SPECIFY)

RECEIVED
APR 23 1998
HYDROLOGY SECTION

RECEIVED
APR 23 1998
HYDROLOGY SECTION

RECEIVED
APR 23 1998
HYDROLOGY SECTION

VERBAL on 5/4/98

DATE SUBMITTED: April 23, 1998

BY: R.W. Macy

PROTEC
Consulting

Professional Technologies and
Design Development Services

April 23, 1998

Mr. Bernie J. Montoya
Engineering Associate
City of Albuquerque
Public Works Department
Hydrology Division
P.O. Box 1293
Albuquerque, NM 87103

Re: ENGINEER'S CERTIFICATION dated 4/23/98 - Tigerewood Subdivision Grading and Drainage Plan
City Project No. 5683.81

Dear Mr. Montoya:

Enclosed is a copy of the above referenced Grading and Drainage Plan with the Engineer's Certification dated April 23, 1998. Please let me know at your earliest convenience if the Certification is acceptable.

If you have any questions please contact me at (505) 833-0177.

Sincerely,
PROTEC Consulting

R.W. Macy

Raymond W. Macy, P.E.
Owner

Enclosure

xc: Mr. Mason Mayhew, Albuquerque Ranch Estates

P.O. Box 27007 • Albuquerque, NM 87125 • (505) 833-0177

DRAINAGE INFORMATION SHEET

J-10D23

PROJECT TITLE: TIGERWOOD SUB'N ZONE ATLAS/DRNG. FILE #: _____

DRB #: 96-415 EPC #: _____ WORK ORDER #: _____

LEGAL DESCRIPTION: TRACTS 227 & 228 AIRPORT UNIT, TOWN OF ATRISCO GRANT

CITY ADDRESS: HANOVER, NW

ENGINEERING FIRM: PROTEC Consulting CONTACT: Ray Macy

ADDRESS: P.O. Box 27007 Albuquerque, NM 87125 PHONE: (505) 833-0177

OWNER: ADIL RIZVI CONTACT: ADIL RIZVI

ADDRESS: 7049 LUELLA ANNE, NE ALBUQUERQUE, NM 87109 PHONE: (505) 857-0467

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL: (RESUBMITTAL)

X DRAINAGE REPORT

X DRAINAGE PLAN

___ CONCEPTUAL GRADING & DRAINAGE PLAN

X GRADING PLAN

___ EROSION CONTROL PLAN

___ ENGINEER'S CERTIFICATION

___ OTHER _____

PRE-DESIGN MEETING:

___ YES

___ NO

___ COPY PROVIDED

RECEIVED
JAN 31 1997
HYDROLOGY SECTION

CHECK TYPE OF APPROVAL SOUGHT:

___ SKETCH PLAT APPROVAL

X PRELIMINARY PLAT APPROVAL

___ S. DEV. PLAN FOR SUB'D. APPROVAL

___ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL

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___ CERTIFICATE OF OCCUPANCY APPROVAL

___ GRADING PERMIT APPROVAL

___ PAVING PERMIT APPROVAL

___ S.A.D. DRAINAGE REPORT

___ DRAINAGE REQUIREMENTS

___ SUBDIVISION CERTIFICATION

___ OTHER _____ (SPECIFY)

DATE SUBMITTED: January 31, 1997

BY: R.W. Macy

PROTEC
Consulting

Professional Technologies and
Design Development Services

January 31, 1997

Mr. Bernie J. Montoya
Engineering Associate
City of Albuquerque
Public Works Department
Hydrology Division
P.O. Box 1293
Albuquerque, NM 87103

Re: Revision No. 1 Dated 1/31/97
Tigerwood Subdivision Drainage Report & Grading and Drainage Plan
Tracts 227 and 228 Airport Unit, Town of Atrisco Grant
Albuquerque, NM

Dear Mr. Montoya:

Please find enclosed for your review and approval, Revision No. 1 for the above referenced drainage report and grading and drainage plan. The revisions address all of your comments in your letter dated January 7, 1997. We respectfully request your expedient review and approval of theses documents. Also enclosed per your request is a copy of the current Infrastructure List.

If you have any questions regarding the information provided here, please contact me at (505) 833-0177.

Sincerely,
PROTEC Consulting

R.W. Macy

Raymond W. Macy, P.E.
Owner

Enclosures

xc: Mr. Adil Rizvi

P.O. Box 27007 • Albuquerque, NM 87125 • (505) 833-0177

DRAINAGE REPORT

FOR

TIGERWOOD SUBDIVISION

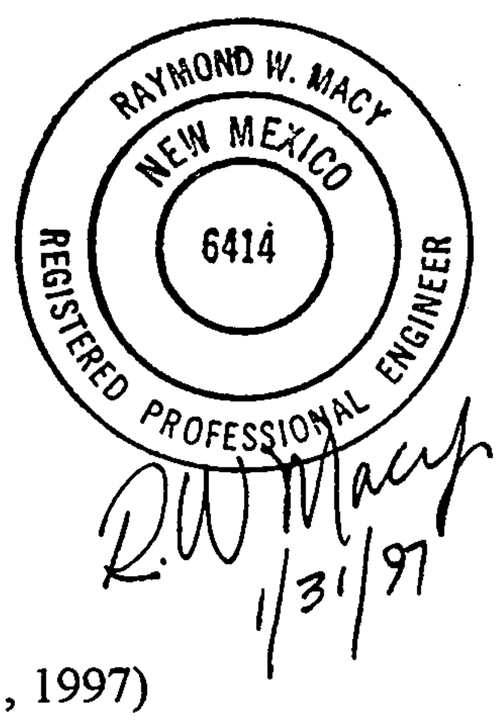
A 12 LOT SINGLE FAMILY RESIDENTIAL SUBDIVISION

PREPARED FOR:

ADIL RIZVI
7049 LUELLA ANNE DRIVE, NE
ALBUQUERQUE, NM 87112

PREPARED BY:

PROTEC CONSULTING
PO BOX 27007
ALBUQUERQUE, NM 87125
(505) 833-0177



DECEMBER 30, 1996

(REVISION NO. 1 DATED JANUARY 31, 1997)

I. GENERAL

I.1 Legal Description

A certain tract of land being and comprising a portion of Tract 227, TOWN OF ATRISCO GRANT, as the same is shown and designated on the plat thereof, filed in the Office of the County Clerk of Bernalillo County, New Mexico on December 5, 1944 in Vol. D, Folio 118, LESS AND EXCEPTING that portion of said tract taken for right of way of I-40 as the same is shown on New Mexico State Highway Commission Right of Way Map I-040-3(28) 148, together with a portion of Tract 228, TOWN OF ATRISCO GRANT, as the same is shown and designated on the plat thereof, filed in the Office of the County Clerk of Bernalillo County, New Mexico on December 5, 1944 in Vol. D, Folio 118, LESS AND EXCEPTING that portion of said Tract taken for the right-of-way of I-40 as the same is shown on the New Mexico State Highway Commission Right of Way Map I-040-3(28) 148.

I.2 Engineer

PROTEC Consulting
PO Box 27007
Albuquerque, NM 87125
(505) 833-0177

I.3 Surveyor

Southwest Surveying Co., Inc.
333 Lomas Boulevard, NE
Albuquerque, NM 87102
(505) 247-4444

I.4 Benchmark

ACS Station 8-J10 whose published elevation is 5130.013' located north of I-40 right-of-way at 76th Street, NW.

I.5 TBM

Nail in power pole at south side of Hanover Rd. near the center of Tract 228. Elev. 5127.31

I.6 Zoning

R-D (15 Du/Acre max.)

I.7 Proposed

12 Single Family Residential Lots

I.8 Area

3.0291 acres, more or less (131,947.59 square feet, more or less), are contained within Tracts 227 and 228, which includes 1.1340 acres recently acquired as 100' wide AMAFCA right-of-way. Proposed street improvements in the existing Hanover Road right-of-way and the use of a portion of AMAFCA's Tract 226 for temporary ponding, increase the site area to 3.54 acres. Of the total site, approximately 1.046 acres at the south edge of Tracts 227 and 228 will be undisturbed and reserved for future development of the West Bluff Outfall Channel. Consequently, approximately 2.5 acres are directly affected by construction of this project.

I.9 Flood Hazard

The proposed site (Tracts 227 and 228 Airport Unit, Town of Atrisco Grant) is located within Flood Hazard Zone C (areas of minimal flooding) as designated on the Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Map (FIRM), City of Albuquerque, Bernalillo County, New Mexico per Community Panel No. 350002 0027 C, effective date October 14, 1983.

I.10 Location and Description

The proposed project site is undeveloped and mostly undisturbed at the writing of this Drainage Report. Existing ground cover is comprised of sage brush and various native grasses. The proposed site is bounded on the north by Hanover Road right-of-way, on the south by I-40, on the west by Tract 229 Airport Unit, Town of Atrisco Grant (presently undeveloped), and on the east by Tract 226 Airport Unit, Town of Atrisco Grant, which is also presently undeveloped. Hanover Road ends in a cul-de-sac opposite Tract 228. The roadway is characterized by 40' wide f/f pavement with standard curb and gutter on either side, a 21-inch sanitary sewer collection line, 12-inch water line, and overhead power. Buried cable TV and telephone lines are adjacent to the street. There are presently no sidewalks on Hanover Road adjacent to the proposed site. The proposed West Bluff Outfall Channel (West Bluff Storm Interceptor, Phase II) is planned to be located within the south edge of the proposed site. AMAFCA recently acquired a 100' wide right-of-way within the southern edge of Tracts 227 and 228 for placement of the proposed channel. Plans for the outfall channel improvements are currently in the preliminary design phase, and construction is expected to begin sometime in 1997 or 1998.

II HYDROLOGIC ANALYSIS

II.1 Existing Conditions

Hanover Road, NW intercepts off site flows originating from northwest of the proposed Tigerwood Subdivision and diverts them eastward to a temporary ponding facility within the Laurelwood Park Drainage Management Area at the northwest corner of Hanover Road, NW and 72nd Street, NW.

The recently developed Chamisa Encantada Subdivision is approximately 1320' west of the proposed site. This project has been designed to carry its internal storm runoff to the south end of the subdivision for containment in a temporary earthen drainage basin. This basin will eventually be removed and replaced with residential lots when the West Bluff Outfall Channel is constructed along the north edge of the northbound Unser/I-40 off ramp. At that time, runoff from the Chamisa Encantada Subdivision will drain directly into the West Bluff Outfall Channel.

Runoff originating west of the project site to the Chamisa Encantada Subdivision and between Hanover Road and Interstate 40, is collected in a roadside ditch within the I-40 right-of-way at the north edge of the roadway, then conveyed to the southeast under I-40 through 30-inch and 24-inch diameter CMP culverts located near the southeast corner of Tract 233 and the south end of Tract 227, respectively.

Some of the overland runoff originating on Tracts 229 through 234 flows across the proposed subdivision before arriving at the I-40 roadside ditch. Plans are currently underway for development of these tracts that will result in their runoff being held onsite until the West Bluff Channel is in place. In the event Tigerwood is constructed before these other projects, the overland flow will be diverted to the I-40 roadside ditch by a block wall built along the west edge of the project.

Presently, runoff originating on the proposed Tigerwood Subdivision drains eastward primarily as sheet flow with a gradient of approximately 2%. Based on a review of field conditions and recent topography, the 3.0291 acre site drains south and east into a swale at the north edge of I-40. Some of this flow is taken to a 24-inch CMP culvert near the south end of Tract 227. The culvert carries the runoff southward to the south side of the Interstate. Runoff that is not intercepted by the 24-inch culvert continues approximately 1500' farther to the east along the north edge of the Interstate where it drains into a double 5' x 3' concrete box culvert under I-40.

II.2 Site Hydrology (Existing Conditions)

The site hydrology as determined herein is based on the methods and criteria presented in the City of Albuquerque Development Process Manual (DPM) - Volume 2, Section 22.2 Hydrology, dated January 1993. The proposed site is in Precipitation Zone 1 (west of the Rio Grande). The P360 (100-year, 6-hour storm event) has a depth of 2.20 inches as shown in Table A-2. Since the proposed site is primarily undeveloped and undisturbed land, then Land Treatment A is applicable. See Table A-2. Excess Precipitation E for this storm is 0.44 inches as shown in Table A-8. The Peak Discharge, Q_p, from the same storm is 1.29 cfs/acre. See Table A-9.

Improvements for the proposed project include an eastward extension of Hanover Road within the existing (undeveloped) street right-of-way, and construction of temporary retention ponding on a portion of Tract 226. AMAFCA is in the process of acquiring all of Tract 226 as part of the West Bluff Outfall Channel Project and has indicated that temporary ponding on the property from the proposed Tigerwood Subdivision is acceptable. The runoff volumes and peak discharge rates from the total undeveloped site are determined as follows:

3.54 Acre Undeveloped Site

Volume(360) = 0.44 in x 3.54 ac x 1 ft/12 in
Volume(360) = 0.1298 ac-ft (5,654 cf)

Peak Discharge (100-yr, 6-hr) = 1.29 cfs/acre x 3.54 ac
Peak Discharge (100-yr, 6-hr) = 4.57 cfs

II.3 Proposed Improvements (Interim)

Initially, it is proposed to construct two temporary retention basins at the south and east ends of the subdivision to receive developed on-site runoff. Each basin will be constructed on land acquired by AMAFCA for construction of the future West Bluff Outfall Channel. The first basin will be immediately south of the cul-de-sac on Tigerwood Place. The second basin will be southeast of the new cul-de-sac on Hanover Road, just inside of Tract 226.

Portions of Lots 1 and 8 will drain northward onto Hanover Road, NW. This results from the formation of a water block in Tigerwood Place at Hanover Road to prevent runoff in Hanover from entering the site. The area draining onto Hanover (DA-2) is approximately 0.29 acres which produces a peak flow of 1.06 cfs with a total volume of 0.037 ac-ft (1,606 cf). This flow will be directed to the Laurelwood Park Drainage Management Area. The effect is to raise the water surface in the Management Area by less than 0.019 feet.

The proposed eastward extension of Hanover Road will also be constructed with a water block to prevent flows moving east on Hanover Road (originating west of Tract 228) from bypassing the Laurelwood Park Drainage Management Area. The existing Hanover Road cul-de-sac will be converted into a knuckle, and the removed standard curb and gutter at the east end of the existing cul-de-sac will be replaced with concrete valley gutter. The new valley gutter will carry flows from the existing south curb line in Hanover Road around to the north end of the newly formed knuckle and discharge the flow into the Laurelwood Parkway Drainage Management Area, just as in the past.

The easterly extension of Hanover Road will be approximately 240' long and will terminate in a new cul-de-sac. Runoff on the newly formed street and cul-de-sac is from drainage area DA-3 with approximately 0.874 contributing acres. The peak flow is 2.86 cfs and the volume is 0.1064 ac-ft (4,634 cf). The resulting runoff will be discharged via the surface from the east end of the new cul-de-sac through a 20' wide concrete lined drainage easement into a temporary earthen retention basin located at the north end of Tract 226. **NOTE: See Section II.9 Revision No. 1, dated 1/31/97**. The basin will be approximately 46' x 68' at the top with a depth of just over 4' and retained volume of 5,686 cf. Interior and exterior slopes will be 3:1. It will be equipped with a 10' long emergency spillway capable of passing the peak 100 year flow rate from drainage area DA-3. Discharge from the spillway will be into the I-40 right-of-way north of the existing interstate roadside ditch. Five foot high chain link fence will surround the pond. Plain riprap will be provided where the concrete lined drainage easement discharges into the pond.

Tigerwood Place, NW will also terminate in a cul-de-sac. Runoff on Tigerwood Place is from drainage area DA-1 with approximately 1.3403 contributing acres. The peak flow is 4.2 cfs and the volume is 0.182 ac-ft (7,928 cf). The resulting runoff will be discharged via the surface from the south end of the new cul-de-sac through a 20' wide concrete lined drainage easement into a temporary earthen retention basin located at the south end of Tract 228. The basin will be approximately 62' square at the top with a depth of 5' and retained volume of 8,320 cf. Interior and exterior slopes will be 3:1. It will be equipped with a 10' long emergency spillway capable of passing the peak 100 year flow rate from drainage area DA-1. Discharge from the spillway will be into the I-40 right-of-way north of the existing interstate roadside ditch. Five foot high chain link fence will surround the pond. Plain riprap will be provided where the concrete lined drainage easement discharges into the pond.

The area designated as DA-4 has been acquired by AMAFCA and will remain undeveloped until the West Bluff Outfall Channel is constructed. DA-4 contains approximately 1.046 acres and produces a peak flow rate of 1.35 cfs. The 100 year volume is 0.0384 ac-ft (1,670 cf). Runoff from this area will drain to the north edge of I-40 without containment as it does presently. Part of this flow enters the 24-inch CMP near the south end of Tract 227 and is carried to the south side of I-40. The remaining runoff continues approximately 1500' east to the double 5' x 3' concrete box culvert under I-40.

II.4 Proposed Improvements (Final Conditions)

In the final conditions, when the West Bluff Outfall Channel is constructed, the temporary retention ponds will be removed and the 20' wide concrete lined drainage easements will be extended to the north edge of the West Bluff Outfall Channel. The concrete lined easements will also serve as pedestrian access to the future trail system planned for construction along the north edge of the future West Bluff Outfall Channel.

All other aspects of the drainage improvements will remain as described in II.3 above. **See also Section II.9 Revision No. 1, dated 1/31/97**.

II.5 General Site Hydrology for Developed Conditions

The total runoff volume and peak discharge from the developed drainage area DA-1 into the retention pond at the south end of Tigerwood Place is determined as follows:

LAND TREATMENT CLASSIFICATION	LAND AREA (Acres)	EXCESS PRECIP (Inches)	PEAK DISCHARGE (cfs)
A	0.00	0.44	1.29
B	0.4275	0.67	2.03
C	0.2702	0.99	2.87
D	0.6427	1.97	4.37

Runoff Volume into the DA-1 Retention Pond

Weighted E = ((0.4275 x 0.67) + (0.2702 x 0.99) + (0.6427 x 1.97))/1.3403
Weighted E = 1.358 inches

Volume(360) = 1.358 in x 1.3403 acres x 1 ft/12 in = 0.1820 acre-ft
Volume(360) = 0.1820 acre-ft x 43,560 sf/acre = 7,928 cf

Peak Discharge from DA-1

Total Peak Discharge exiting the cul-de-sac (Tigerwood Place) from drainage area DA-1 into the retention pond is determined as follows:

Peak Discharge (100-yr, 6-hr) = (0.4275 x 2.03) + (0.1891 x 2.87) + (0.6427 x 4.37)
Peak Discharge(100-yr, 6-hr) = 4.2 cfs

Note that the area of the retention pond (0.0882 ac) is excluded from the peak discharge calculation.

The total runoff volume and peak discharge from the developed drainage area DA-3 into the retention pond at the east end of the extended Hanover Road is determined as follows:

LAND TREATMENT CLASSIFICATION	LAND AREA (Acres)	EXCESS PRECIP (Inches)	PEAK DISCHARGE (cfs)
A	0.00	0.44	1.29
B	0.2193	0.67	2.03
C	0.1613	0.99	2.87
D	0.4937	1.97	4.37

Runoff Volume into the DA-3 Retention Pond

Weighted E = ((0.2193 x 0.67) + (0.1613 x 0.99) + (0.4937 x 1.97))/0.8743
Weighted E = 1.46 inches

Volume(360) = 1.46 in x 0.8743 acres x 1 ft/12 in = 0.1064 acre-ft
Volume(360) = 0.1064 acre-ft x 43,560 sf/acre = 4,634 cf

Peak Discharge from DA-3

Total Peak Discharge exiting the cul-de-sac (Hanover Road) from drainage area DA-3 into the retention pond is determined as follows:

Peak Discharge (100-yr, 6-hr) = (0.2193 x 2.03) + (0.0893 x 2.87) + (0.4937 x 4.37)
Peak Discharge(100-yr, 6-hr) = 2.86 cfs

Note that the area of the retention pond (0.072 ac) is excluded from the peak discharge calculation.

The total runoff volume and peak discharge from the developed drainage area DA-2 into the existing cul-de-sac (modified to a knuckle) on Hanover Road is determined as follows:

LAND TREATMENT CLASSIFICATION	LAND AREA (Acres)	EXCESS PRECIP (Inches)	PEAK DISCHARGE (cfs)
A	0.00	0.44	1.29
B	0.0377	0.67	2.03
C	0.0830	0.99	2.87
D	0.1701	1.97	4.37

Runoff Volume from DA-2

Weighted E = ((0.0377 x 0.67) + (0.0830 x 0.99) + (0.1701 x 1.97))/0.2908
Weighted E = 1.522 inches

Volume(360) = 1.522 in x 0.2908 acres x 1 ft/12 in = 0.037 acre-ft
Volume(360) = 0.037 acre-ft x 43,560 sf/acre = 1,606 cf

Peak Discharge from DA-2

Total Peak Discharge from drainage area DA-2 is determined as follows:

Peak Discharge (100-yr, 6-hr) = (0.0377 x 2.03) + (0.0830 x 2.87) + (0.1701 x 4.37)
Peak Discharge(100-yr, 6-hr) = 1.06 cfs

II.6 Site Hydrology Street Capacity

The extension of Hanover Road is proposed with 32 feet from face-of-curb to face-of-curb (f/f). Tigerwood Place will have 28 feet f/f.

The City of Albuquerque DPM Plate 22.3 D-1 provides a determination of street flow capacity for a 32 foot wide street of varying street slopes and flow depths. It is understood that the capacity within a 28 foot wide street will be less than a 32 foot wide street for depths which exceed the crown height (approximately 0.28 feet). Of particular interest here is the street capacity when the flow is just below the top of curb. It is desirable for street flow not to exceed the top of curb. This will minimize damage to the planter areas between the back of curb and sidewalk. Since the difference in flow capacity between the 28 foot wide street and 32 foot wide street is primarily due to the difference in flow areas, the results obtained from Plate 22.3 D-1 will be scaled down by a factor equal to the ratio of the area of a 28 foot wide street divided by the area of a 32 foot wide street at a flow depth of 0.5 feet. This factor is approximately equal to 10.08/10.88, or 0.926.

The street gradient on extended Hanover Road west of the new cul-de-sac is slightly more than 2.9 percent. According to DPM Plate 22.3 D-1 the half street capacity under this condition is approximately 25 cfs (depth of 0.5 feet), which greatly exceeds the anticipated peak flow of 2.86 cfs. The graph in Plate 22.3 D-1indicates that 2.86 cfs will flow with a depth of approximately 0.27 feet and a velocity of 3.2 fps.

The street gradient on Tigerwood Place north of the cul-de-sac is slightly more than 3.3 percent. According to DPM Plate 22.3 D-1 the half street capacity under this condition is approximately 26.5 cfs (depth of 0.5 feet) for a 32' f/f street. Applying the 0.926 factor for a 28' f/f street, the resulting capacity is 24.5 cfs, which greatly exceeds the anticipated peak flow from all of DA-1 of 4.2 cfs. The graph in Plate 22.3 D-1indicates that 4.2 cfs will flow with a depth of approximately 0.29 feet and a velocity of 3.6 fps. The actual curb line flows on either side of Tigerwood Place will be less than 4.2 cfs for the design storm.

II.7 Site Hydrology Concrete Lined Drainage Easements

Both concrete lined drainage easements will be 20' wide. Only a portion of each easement will be constructed with this project, as the remaining segments of the easements will have to be completed with construction of the West Bluff Diversion Channel. The gradients of both easements will be set at 0.50 percent in order to provide positive drainage without causing the easement inverts to enter the future channel unnecessarily deep. From Manning's equation for open channel flow, with n = 0.013, s = .005 ft/ft, and a 20' wide flat bottom channel, the flow depth is less than 0.18' and the velocity is less than 2.5 fps for the most severe case of 4.2 cfs (DA-1) in the concrete lined easement. Therefore, both easements will easily handle the anticipated flows. **See Section II.9 Revision No. 1, dated 1/31/97**.

II.8 Site Hydrology - Emergency Spillway

The retention pond emergency spillways will each be capable of passing the 100-year, 6-hour peak discharge flow rate arriving in the ponds from drainage areas DA-1 and DA-3, respectively. Discharge will be into the I-40 right-of-way near the existing roadside ditch. The worst case is 4.2 cfs from DA-1, which will be used to determine the spillway geometry for each retention pond.

Trapezoidal (Broad Crested) Weir

$$Q = 3.367\ LH^{3/2}$$

where: Q = weir flow rate, 4.2 cfs
L = length of the weir crest, ft
H = head on the weir, 0.3 ft (assumed)

solving L:

$$L = Q/(3.367\ H^{3/2})$$

L = 7.59 ft use 10 ft (minimum)

II.9 Revision No. 1 (1/31/97)

Discussions with engineering staff at AMAFCA following the original submittal of this drainage report have revealed that AMAFCA will be responsible for design and development of the pedestrian and bicycle trail proposed along the north edge of the future West Bluff Diversion Channel. AMAFCA has requested that the 20' wide access and drainage easements at the ends of Tigerwood Place and Hanover Road provide all-weather access to the trail system. This will require construction of inlets at each cul-de-sac with storm drains that extend to the temporary retention ponds. Eventually, the storm drains will be extended to the future West Bluff Diversion Channel. Also, AMAFCA has requested that the inlets and storm drains be designed based on flows from two times the 100 year, 6 hour storm event, and that the 20' wide drainage easements be concrete lined (as previously proposed) to serve as a drainage overflow structures from the subdivision interior, with discharge to the West Bluff Channel in the event the storm drain systems were clogged or their capacities were exceeded. Based on these requirements, the following drainage modifications are presented for inclusion in this project:

Construction of Type Double D inlets at the ends of the Tigerwood Place and Hanover Road cul-de-sacs are proposed as shown on the included Grading and Drainage Plan. From Plate 22.3 D-6 of the DPM, the grating inlet capacity of a Double D inlet is approximately 9 cfs with a depth of 0.67 feet over the inlet. This would be the depth of water if allowed to pond to the elevation of the back of sidewalk. The 2 x 100 year peak flow on Tigerwood Place is 8.4 cfs, and it is 5.72 cfs on Hanover Road. Therefore, one Double D inlet at each cul-de-sac should be adequate. An 18-inch RCP at 1 percent grade will drain from the inlet on Tigerwood Place to the adjacent temporary retention pond. The flow capacity of the pipe based on Manning's Equation is 10.5 cfs for full flow conditions with n = 0.013. Similarly, an 18-inch RCP at 0.5 percent grade will drain from the inlet on Hanover Road to the adjacent temporary retention pond. Pipe capacity is 7.43 cfs.

It is proposed to construct the concrete lined, 20' wide easements so that their inverts match the top of sidewalk elevation where they intersect the cul-de-sacs. Mountable curbs will facilitate the access of bicycle traffic between the easements and cul-de-sacs. Since the drainage easements are being used as overflow structures, this positioning of the easement inverts will not adversely affect the drainage, and will allow the sidewalk to remain dry without the need to build sidewalk culverts.

The dimensions of the pond and its spillway at the end of Tigerwood Place are unchanged from the original submittal, as these features are not required to contain volumes or pass flow rates associated with 2 x 100 year storm events. The elevation of the pond bottom for the pond at the east end of Hanover Road was lowered 0.55 feet to allow for the 18-inch RCP that will drain into it. This resulted in an increase of storage capacity of approximately 400 cf. There are no changes to the emergency spillway.

Tigerwood Place Subdivision
DRB Case No. 96-415
DRC Project No.
Date Submitted:
Prelim. Plat Approved:
Prelim Plat Expires:

FIGURE 12
EXHIBIT "A"
TO SUBDIVISION IMPROVEMENT AGREEMENT
DEVELOPMENT REVIEW BOARD
REQUIRED INFRASTRUCTURE LISTING
DRB 96-415
TRACTS 227 AND 228, TOWN OF ATRISCO GRANT, AIRPORT UNIT
BEING REPLATED AS

TIGERWOOD PLACE SUBDIVISION

Following is a summary of Public/Private Infrastructure required to be constructed or financially guaranteed to be constructed for the above development. This summary is not necessarily a complete listing. During the design process, if the City determines that appurtenant items have not been included in the summary, those items will be included in the listing and related financial guarantee, if the items normally are Subdivider responsibility. In addition, any unforeseen items which arise during construction which are necessary to complete the project and which normally are the Subdivider's responsibility are the responsibility of the Subdivider and will be included in the financial guarantee provided by the City.

SIZE	IMPROVEMENT	LOCATION	FROM	TO
32' F/F	Residential Paving	Hanover Road	Tigerwood Pl.	Cul-de-Sac
Mountable	C & G, Both Sides	"	"	"
4'	PCC Sidewalk, So. Side	Hanover Road	West Property Line	Cul-de-Sac
4"	Waterline	"	Tigerwood Pl.	"
8"	Sanitary Sewer	"	"	"
18"	RCP Storm Drain	"	Cul-de-sac	Temporary Pond
28' F/F	Residential Paving	Tigerwood Pl.	Hanover Road	Cul-de-Sac
Mountable	C & G, Both Sides	"	"	"
4'	*PCC Sidewalk, Both Sides	"	"	"
6"	Waterline	"	"	"
8"	Sanitary Sewer	"	"	"
18"	RCP Storm Drain	"	Cul-de-sac	Temporary Pond

MISCELLANEOUS

Street Lighting per DPM

Grading & Drainage: Certification per DPM (prior to release of financial guarantees). To include private perimeter and retaining walls as required on the approved Grading Plan.

20' wide concrete lined drainage easements between Lots 5 & 6 and adjacent to Lot 12 per DPM Standards

Type D storm inlets at the ends of the cul-de-sacs on Tigerwood Place and Hanover Road

Water improvements to include fire hydrants, valves and appurtenances per DPM.

Temporary storm water retention ponds with chainlink fencing and emergency spillways will be constructed within AMAFCA right-of-way adjacent to the cul-de-sacs at the east end of Hanover Road and the south end of Tigerwood Place.

Wheelchair ramps per DPM.

* Sidewalks to be deferred, except along the south side of Hanover Road.

Prepared by: R.W. Macy Date: 1/31/97

* * * * * * * * * * * * *

Development Review Board Member Approval

Transportation Development _____ Date _____

Utility Development _____ Date _____

Parks & General Services _____ Date _____

City Engineer/AMAFCA _____ Date _____

DRB Chairman _____ Date _____

J10-023

Tigerwood Place Subdivision
DRB Case No. 96-415
DRC Project No.
Date Submitted:
Prelim. Plat Approved:
Prelim Plat Expires:

ENG STAMP
1-31-97

FIGURE 12
EXHIBIT "A"
TO SUBDIVISION IMPROVEMENT AGREEMENT
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TRACTS 227 AND 228, TOWN OF ATRISCO GRANT, AIRPORT UNIT
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Following is a summary of Public/Private Infrastructure required to be constructed or financially guaranteed to be constructed for the above development. This summary is not necessarily a complete listing. During the design process, if the City determines that appurtenant items have not been included in the summary, those items will be included in the listing and related financial guarantee, if the items normally are Subdivider responsibility. In addition, any unforeseen items which arise during construction which are necessary to complete the project and which normally are the Subdivider's responsibility are the responsibility of the Subdivider and will be included in the financial guarantee provided by the City.

SIZE	IMPROVEMENT	LOCATION	FROM	TO
N/A	Modify Existing Cul-de-Sac per DRC Comments	Hanover Road (East End)		
32' F/F	Residential Paving	Hanover Road	Tigerwood Pl.	East Cul-de-Sac
Standard	C & G, North Side	"	"	"
Mountable	C & G, South Side	"	"	"
4'	PCC Sidewalk, So. Side	Hanover Road	West Property Line	East Cul-de-Sac
4"	Waterline	"	Tigerwood Pl.	"
8"	Sanitary Sewer (Piggy Back)	"	"	Manhole No. 142
18"	RCP Storm Drain	"	East Cul-de-sac	Temporary Pond
28' F/F	Residential Paving	Tigerwood Pl.	Hanover Road	South Cul-de-Sac
Mountable	C & G, Both Sides	"	"	"
4'	*PCC Sidewalk, Both Sides	"	"	"
6"	Waterline	"	"	"

SIZE	IMPROVEMENT	LOCATION	FROM	TO
8"	Sanitary Sewer	Tigerwood Pl.	Hanover Road	South Cul-de-Sac
18"	RCP Storm Drain	"	SouthCul-de-Sac	Temporary Pond

MISCELLANEOUS

Street Lighting per DPM

Grading & Drainage: Certification per DPM (prior to release of financial guarantees). To include private perimeter and retaining walls as required on the approved Grading Plan.

20' wide concrete lined drainage easements between Lots 5 & 6 and adjacent to Lot 12 per DPM Standards

Type D storm inlets at the ends of the cul-de-sacs on Tigerwood Place and Hanover Road

Water improvements to include fire hydrants, valves and appurtenances per DPM.

Temporary storm water retention ponds with chainlink fencing and emergency spillways will be constructed within AMAFCA right-of-way adjacent to the cul-de-sacs at the east end of Hanover Road and the south end of Tigerwood Place.

* Sidewalks to be deferred, except along the south side of Hanover Road.

Prepared by: _____ Date: _____

* * * * * * * * * * * * *

Development Review Board Member Approval

_____ _____
Transportation Development Date

_____ _____
Utility Development Date

_____ _____
Parks & General Services Date

_____ _____
City Engineer/AMAFCA Date

_____ _____
DRB Chairman Date

DRAINAGE REPORT

FOR

TIGERWOOD SUBDIVISION

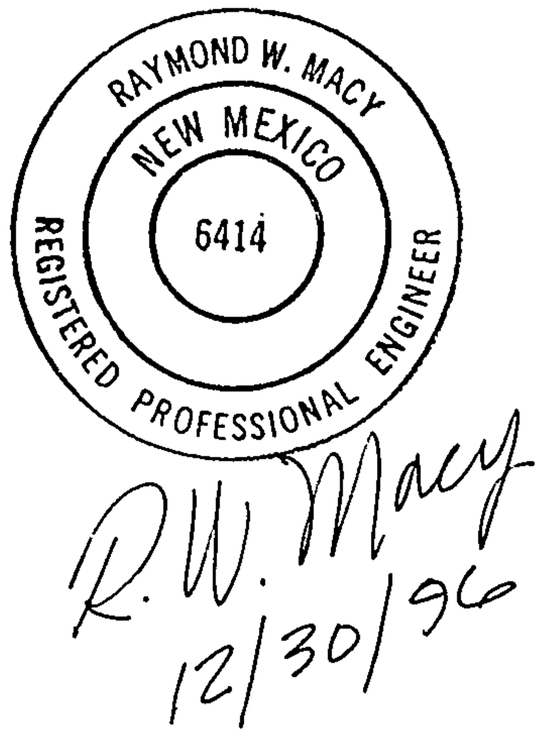
A 12 LOT SINGLE FAMILY RESIDENTIAL SUBDIVISION

PREPARED FOR:

ADIL RIZVI
7049 LUELLA ANNE DRIVE, NE
ALBUQUERQUE, NM 87112

PREPARED BY:

PROTEC CONSULTING
PO BOX 27007
ALBUQUERQUE, NM 87125
(505) 833-0177



DECEMBER 30, 1996

I. GENERAL

I.1 Legal Description

A certain tract of land being and comprising a portion of Tract 227, TOWN OF ATRISCO GRANT, as the same is shown and designated on the plat thereof, filed in the Office of the County Clerk of Bernalillo County, New Mexico on December 5, 1944 in Vol. D, Folio 118, LESS AND EXCEPTING that portion of said tract taken for right of way of I-40 as the same is shown on New Mexico State Highway Commission Right of Way Map I-040-3(28) 148, together with a portion of Tract 228, TOWN OF ATRISCO GRANT, as the same is shown and designated on the plat thereof, filed in the Office of the County Clerk of Bernalillo County, New Mexico on December 5, 1944 in Vol. D, Folio 118, LESS AND EXCEPTING that portion of said Tract taken for the right-of-way of I-40 as the same is shown on the New Mexico State Highway Commission Right of Way Map I-040-3(28) 148.

I.2 Engineer

PROTEC Consulting
PO Box 27007
Albuquerque, NM 87125
(505) 833-0177

I.3 Surveyor

Southwest Surveying Co., Inc.
333 Lomas Boulevard, NE
Albuquerque, NM 87102
(505) 247-4444

I.4 Benchmark

ACS Station 8-J10 whose published elevation is 5130.013' located north of I-40 right-of-way at 76th Street, NW.

I.5 TBM

None

I.6 Zoning

R-D (15 Du/Acre max.)

I.7 Proposed

12 Single Family Residential Lots

I.8 Area

3.0291 acres, more or less (131,947.59 square feet, more or less), are contained within Tracts 227 and 228, which includes 1.1340 acres recently acquired as 100' wide AMAFCA right-of-way. Proposed street improvements in the existing Hanover Road right-of-way and the use of a portion of AMAFCA's Tract 226 for temporary ponding, increase the site area to 3.54 acres. Of the total site, approximately 1.046 acres at the south edge of Tracts 227 and 228 will be undisturbed and reserved for future development of the West Bluff Outfall Channel. Consequently, approximately 2.5 acres are directly affected by construction of this project.

I.9 Flood Hazard

The proposed site (Tracts 227 and 228 Airport Unit, Town of Atrisco Grant) is located within Flood Hazard Zone C (areas of minimal flooding) as designated on the Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Map (FIRM), City of Albuquerque, Bernalillo County, New Mexico per Community Panel No. 350002 0027 C, effective date October 14, 1983.

I.10 Location and Description

The proposed project site is undeveloped and mostly undisturbed at the writing of this Drainage Report. Existing ground cover is comprised of sage brush and various native grasses. The proposed site is bounded on the north by Hanover Road right-of-way, on the south by I-40, on the west by Tract 229 Airport Unit, Town of Atrisco Grant (presently undeveloped), and on the east by Tract 226 Airport Unit, Town of Atrisco Grant, which is also presently undeveloped. Hanover Road ends in a cul-de-sac opposite Tract 228. The roadway is characterized by 40' wide f/f pavement with standard curb and gutter on either side, a 21-inch sanitary sewer collection line, 12-inch water line, and overhead power. Buried cable TV and telephone lines are adjacent to the street. There are presently no sidewalks on Hanover Road adjacent to the proposed site. The proposed West Bluff Outfall Channel (West Bluff Storm Interceptor, Phase II) is planned to be located within the south edge of the proposed site. AMAFCA recently acquired a 100' wide right-of-way within the southern edge of Tracts 227 and 228 for placement of the proposed channel. Plans for the outfall channel improvements are currently in the preliminary design phase, and construction is expected to begin sometime in 1997 or 1998.

II HYDROLOGIC ANALYSIS

II.1 Existing Conditions

Hanover Road, NW intercepts off site flows originating from northwest of the proposed Tigerwood Subdivision and diverts them eastward to a temporary ponding facility within the Laurelwood Park Drainage Management Area at the northwest corner of Hanover Road, NW and 72nd Street, NW.

The recently developed Chamisa Encantada Subdivision is approximately 1320' west of the proposed site. This project has been designed to carry its internal storm runoff to the south end of the subdivision for containment in a temporary earthen drainage basin. This basin will eventually be removed and replaced with residential lots when the West Bluff Outfall Channel is constructed along the north edge of the northbound Unser/I-40 off ramp. At that time, runoff from the Chamisa Encantada Subdivision will drain directly into the West Bluff Outfall Channel.

Runoff originating west of the project site to the Chamisa Encantada Subdivision and between Hanover Road and Interstate 40, is collected in a roadside ditch within the I-40 right-of-way at the north edge of the roadway, then conveyed to the southeast under I-40 through 30-inch and 24-inch diameter CMP culverts located near the southeast corner of Tract 233 and the south end of Tract 227, respectively.

Some of the overland runoff originating on Tracts 229 through 234 flows across the proposed subdivision before arriving at the I-40 roadside ditch. Plans are currently underway for development of these tracts that will result in their runoff being held onsite until the West Bluff Channel is in place. In the event Tigerwood is constructed before these other projects, the overland flow will be diverted to the I-40 roadside ditch by a block wall built along the west edge of the project.

Presently, runoff originating on the proposed Tigerwood Subdivision drains eastward primarily as sheet flow with a gradient of approximately 2%. Based on a review of field conditions and recent topography, the 3.0291 acre site drains south and east into a swale at the north edge of I-40. Some of this flow is taken to a 24-inch CMP culvert near the south end of Tract 227. The culvert carries the runoff southward to the south side of the Interstate. Runoff that is not intercepted by the 24-inch culvert continues approximately 1500' farther to the east along the north edge of the Interstate where it drains into a double 5' x 3' concrete box culvert under I-40.

II.2 Site Hydrology (Existing Conditions)

The site hydrology as determined herein is based on the methods and criteria presented in the City of Albuquerque Development Process Manual (DPM) - Volume 2, Section 22.2 Hydrology, dated January 1993. The proposed site is in Precipitation Zone 1 (west of the Rio Grande). The P360 (100-year, 6-hour storm event) has a depth of 2.20 inches as shown in Table A-2. Since the proposed site is primarily undeveloped and undisturbed land, then Land Treatment A is applicable. See Table A-2. Excess Precipitation E for this storm is 0.44 inches as shown in Table A-8. The Peak Discharge, Q_p, from the same storm is 1.29 cfs/acre. See Table A-9.

Improvements for the proposed project include an eastward extension of Hanover Road within the existing (undeveloped) street right-of-way, and construction of temporary retention ponding on a portion of Tract 226. AMAFCA is in the process of acquiring all of Tract 226 as part of the West Bluff Outfall Channel Project and has indicated that temporary ponding on the property from the proposed Tigerwood Subdivision is acceptable. The runoff volumes and peak discharge rates from the total undeveloped site are determined as follows:

3.54 Acre Undeveloped Site

Volume(360) = 0.44 in x 3.54 ac x 1 ft/12 in
Volume(360) = 0.1298 ac-ft (5,654 cf)

Peak Discharge (100-yr, 6-hr) = 1.29 cfs/acre x 3.54 ac
Peak Discharge (100-yr, 6-hr) = 4.57 cfs

II.3 Proposed Improvements (Interim)

Initially, it is proposed to construct two temporary retention basins at the south and east ends of the subdivision to receive developed on-site runoff. Each basin will be constructed on land acquired by AMAFCA for construction of the future West Bluff Outfall Channel. The first basin will be immediately south of the cul-de-sac on Tigerwood Place. The second basin will be southeast of the new cul-de-sac on Hanover Road, just inside of Tract 226.

Portions of Lots 1 and 8 will drain northward onto Hanover Road, NW. This results from the formation of a water block in Tigerwood Place at Hanover Road to prevent runoff in Hanover from entering the site. The area draining onto Hanover (DA-2) is approximately 0.29 acres which produces a peak flow of 1.06 cfs with a total volume of 0.037 ac-ft (1,606 cf). This flow will be directed to the Laurelwood Park Drainage Management Area. The effect is to raise the water surface in the Management Area by less than 0.019 feet.

The proposed eastward extension of Hanover Road will also be constructed with a water block to prevent flows moving east on Hanover Road (originating west of Tract 228) from bypassing the Laurelwood Park Drainage Management Area. The existing Hanover Road cul-de-sac will be converted into a knuckle, and the removed standard curb and gutter at the east end of the existing cul-de-sac will be replaced with concrete valley gutter. The new valley gutter will carry flows from the existing south curb line in Hanover Road around to the north end of the newly formed knuckle and discharge the flow into the Laurelwood Parkway Drainage Management Area, just as in the past.

The easterly extension of Hanover Road will be approximately 240' long and will terminate in a new cul-de-sac. Runoff on the newly formed street and cul-de-sac is from drainage area DA-3 with approximately 0.874 contributing acres. The peak flow is 2.86 cfs and the volume is 0.1064 ac-ft (4,634 cf). The resulting runoff will be discharged via the surface from the east end of the new cul-de-sac through a 20' wide concrete lined drainage easement into a temporary earthen retention basin located at the north end of Tract 226. The basin will be approximately 46' x 68' at the top with a depth of 4' and retained volume of 5,286 cf. Interior and exterior slopes will be 3:1. It will be equipped with a 10' long emergency spillway capable of passing the peak 100 year flow rate from drainage area DA-3. Discharge from the spillway will be into the I-40 right-of-way north of the existing interstate roadside ditch. Five foot high chain link fence will surround the pond. Plain riprap will be provided where the concrete lined drainage easement discharges into the pond.

Tigerwood Place, NW will also terminate in a cul-de-sac. Runoff on Tigerwood Place is from drainage area DA-1 with approximately 1.3403 contributing acres. The peak flow is 4.2 cfs and the volume is 0.182 ac-ft (7,928 cf). The resulting runoff will be discharged via the surface from the south end of the new cul-de-sac through a 20' wide concrete lined drainage easement into a temporary earthen retention basin located at the south end of Tract 228. The basin will be approximately 62' square at the top with a depth of 5' and retained volume of 8,320 cf. Interior and exterior slopes will be 3:1. It will be equipped with a 10' long emergency spillway capable of passing the peak 100 year flow rate from drainage area DA-1. Discharge from the spillway will be into the I-40 right-of-way north of the existing interstate roadside ditch. Five foot high chain link fence will surround the pond. Plain riprap will be provided where the concrete lined drainage easement discharges into the pond.

The area designated as DA-4 has been acquired by AMAFCA and will remain undeveloped until the West Bluff Outfall Channel is constructed. DA-4 contains approximately 1.046 acres and produces a peak flow rate of 1.35 cfs. The 100 year volume is 0.0384 ac-ft (1,670 cf). Runoff from this area will drain to the north edge of I-40 without containment as it does presently. Part of this flow enters the 24-inch CMP near the south end of Tract 227 and is carried to the south side of I-40. The remaining runoff continues approximately 1500' east to the double 5' x 3' concrete box culvert under I-40.

II.4 Proposed Improvements (Final Conditions)

In the final conditions, when the West Bluff Outfall Channel is constructed, the temporary retention ponds will be removed and the 20' wide concrete lined drainage easements will be extended to the north edge of the West Bluff Outfall Channel. The concrete lined easements will also serve as pedestrian access to the future trail system planned for construction along the north edge of the future West Bluff Outfall Channel.

All other aspects of the drainage improvements will remain as described in II.3 above.

II.5 General Site Hydrology for Developed Conditions

The total runoff volume and peak discharge from the developed drainage area DA-1 into the retention pond at the south end of Tigerwood Place is determined as follows:

LAND TREATMENT CLASSIFICATION	LAND AREA (Acres)	EXCESS PRECIP (Inches)	PEAK DISCHARGE (cfs)
A	0.00	0.44	1.29
B	0.4275	0.67	2.03
C	0.2702	0.99	2.87
D	0.6427	1.97	4.37

Runoff Volume into the DA-1 Retention Pond

Weighted E = ((0.4275 x 0.67) + (0.2702 x 0.99) + (0.6427 x 1.97))/1.3403
Weighted E = 1.358 inches

Volume(360) = 1.358 in x 1.3403 acres x 1 ft/12 in = 0.1820 acre-ft
Volume(360) = 0.1820 acre-ft x 43,560 sf/acre = 7,928 cf

Peak Discharge from DA-1

Total Peak Discharge exiting the cul-de-sac (Tigerwood Place) from drainage area DA-1 into the retention pond is determined as follows:

Peak Discharge (100-yr, 6-hr) = (0.4275 x 2.03) + (0.1891 x 2.87) + (0.6427 x 4.37)
Peak Discharge(100-yr, 6-hr) = 4.2 cfs

Note that the area of the retention pond (0.0882 ac) is excluded from the peak discharge calculation.

The total runoff volume and peak discharge from the developed drainage area DA-3 into the retention pond at the east end of the extended Hanover Road is determined as follows:

LAND TREATMENT CLASSIFICATION	LAND AREA (Acres)	EXCESS PRECIP (Inches)	PEAK DISCHARGE (cfs)
A	0.00	0.44	1.29
B	0.2193	0.67	2.03
C	0.1613	0.99	2.87
D	0.4937	1.97	4.37

Runoff Volume into the DA-3 Retention Pond

Weighted E = ((0.2193 x 0.67) + (0.1613 x 0.99) + (0.4937 x 1.97))/0.8743
Weighted E = 1.46 inches

Volume(360) = 1.46 in x 0.8743 acres x 1 ft/12 in = 0.1064 acre-ft
Volume(360) = 0.1064 acre-ft x 43,560 sf/acre = 4,634 cf

Peak Discharge from DA-3

Total Peak Discharge exiting the cul-de-sac (Hanover Road) from drainage area DA-3 into the retention pond is determined as follows:

Peak Discharge (100-yr, 6-hr) = (0.2193 x 2.03) + (0.0893 x 2.87) + (0.4937 x 4.37)
Peak Discharge(100-yr, 6-hr) = 2.86 cfs

Note that the area of the retention pond (0.072 ac) is excluded from the peak discharge calculation.

The total runoff volume and peak discharge from the developed drainage area DA-2 into the existing cul-de-sac (modified to a knuckle) on Hanover Road is determined as follows:

LAND TREATMENT CLASSIFICATION	LAND AREA (Acres)	EXCESS PRECIP (Inches)	PEAK DISCHARGE (cfs)
A	0.00	0.44	1.29
B	0.0377	0.67	2.03
C	0.0830	0.99	2.87
D	0.1701	1.97	4.37

Runoff Volume from DA-2

Weighted E = ((0.0377 x 0.67) + (0.0830 x 0.99) + (0.1701 x 1.97))/0.2908
Weighted E = 1.522 inches

Volume(360) = 1.522 in x 0.2908 acres x 1 ft/12 in = 0.037 acre-ft
Volume(360) = 0.037 acre-ft x 43,560 sf/acre = 1,606 cf

Peak Discharge from DA-2

Total Peak Discharge from drainage area DA-2 is determined as follows:

Peak Discharge (100-yr, 6-hr) = (0.0377 x 2.03) + (0.0830 x 2.87) + (0.1701 x 4.37)
Peak Discharge(100-yr, 6-hr) = 1.06 cfs

II.6 Site Hydrology Street Capacity

The extension of Hanover Road is proposed with 32 feet from face-of-curb to face-of-curb (f/f). Tigerwood Place will have 28 feet f/f.

The City of Albuquerque DPM Plate 22.3 D-1 provides a determination of street flow capacity for a 32 foot wide street of varying street slopes and flow depths. It is understood that the capacity within a 28 foot wide street will be less than a 32 foot wide street for depths which exceed the crown height (approximately 0.28 feet). Of particular interest here is the street capacity when the flow is just below the top of curb. It is desirable for street flow not to exceed the top of curb. This will minimize damage to the planter areas between the back of curb and sidewalk. Since the difference in flow capacity between the 28 foot wide street and 32 foot wide street is primarily due to the difference in flow areas, the results obtained from Plate 22.3 D-1 will be scaled down by a factor equal to the ratio of the area of a 28 foot wide street divided by the area of a 32 foot wide street at a flow depth of 0.5 feet. This factor is approximately equal to 10.08/10.88, or 0.926.

The street gradient on extended Hanover Road west of the new cul-de-sac is slightly more than 2.9 percent. According to DPM Plate 22.3 D-1 the half street capacity under this condition is approximately 25 cfs (depth of 0.5 feet), which greatly exceeds the anticipated peak flow of 2.86 cfs. The graph in Plate 22.3 D-1indicates that 2.86 cfs will flow with a depth of approximately 0.27 feet and a velocity of 3.2 fps.

The street gradient on Tigerwood Place north of the cul-de-sac is slightly more than 3.3 percent. According to DPM Plate 22.3 D-1 the half street capacity under this condition is approximately 26.5 cfs (depth of 0.5 feet) for a 32' f/f street. Applying the 0.926 factor for a 28' f/f street, the resulting capacity is 24.5 cfs, which greatly exceeds the anticipated peak flow from all of DA-1 of 4.2 cfs. The graph in Plate 22.3 D-1indicates that 4.2 cfs will flow with a depth of approximately 0.29 feet and a velocity of 3.6 fps. The actual curb line flows on either side of Tigerwood Place will be less than 4.2 cfs for the design storm.

II.7 Site Hydrology Concrete Lined Drainage Easements

Both concrete lined drainage easements will be 20' wide. Only a portion of each easement will be constructed with this project, as the remaining segments of the easements will have to be completed with construction of the West Bluff Diversion Channel. The gradients of both easements will be set at 0.50 percent in order to provide positive drainage without causing the easement inverts to enter the future channel unnecessarily deep. From Manning's equation for open channel flow, with n = 0.013, s = .005 ft/ft, and a 20' wide flat bottom channel, the flow depth is less than 0.18' and the velocity is less than 2.5 fps for the most severe case of 4.2 cfs (DA-1) in the concrete lined easement. Therefore, both easements will easily handle the anticipated flows.

II.8 Site Hydrology - Emergency Spillway

The retention pond emergency spillways will each be capable of passing the 100-year, 6-hour peak discharge flow rate arriving in the ponds from drainage areas DA-1 and DA-3, respectively. Discharge will be into the I-40 right-of-way near the existing roadside ditch. The worst case is 4.2 cfs from DA-1, which will be used to determine the spillway geometry for each retention pond.

Trapezoidal (Broad Crested) Weir

$$Q = 3.367\ LH^{3/2}$$

where: Q = weir flow rate, 4.2 cfs
L = length of the weir crest, ft
H = head on the weir, 0.3 ft (assumed)

solving L: $L = Q/(3.367\ H^{3/2})$
L = 7.59 ft use 10 ft (minimum)

PROTEC
Consulting

Professional Technologies and
Design Development Services

December 31, 1996

Mr. Bernie J. Montoya
Engineering Associate
City of Albuquerque
Public Works Department
Hydrology Division
P.O. Box 1293
Albuquerque, NM 87103

Re: Tigerwood Subdivision Drainage Report & Grading and Drainage Plan
Tracts 227 and 228 Airport Unit, Town of Atrisco Grant
Albuquerque, NM

Dear Mr. Montoya:

Please find enclosed for your review and comment, the above referenced drainage report and grading and drainage plan. We respectfully request your expedient review and approval of theses documents.

If you have any questions regarding the information provided here, please contact me at (505) 833-0177.

Sincerely,
PROTEC Consulting

R.W. Macy

Raymond W. Macy, P.E.
Owner

Enclosure

xc: Mr. Adil Rizvi

DRAINAGE INFORMATION SHEET

PROJECT TITLE: TIGERWOOD SUB'N ZONE ATLAS/DRNG. FILE #: J-10 / D23

DRB #: _____ EPC #: _____ WORK ORDER #: _____

LEGAL DESCRIPTION: TRACTS 227 & 228 AIRPORT UNIT, TOWN OF ATRISCO GRANT

CITY ADDRESS: _____

ENGINEERING FIRM: PROTEC CONSULTING CONTACT: RAY MACY

ADDRESS: P.O. BOX 27007, Albuq., 87125 PHONE: 505-833-0414

OWNER: ADIL RIZVI CONTACT: ADIL RIZVI

ADDRESS: 7049 Cuella Anne, NE Albuquerque, NM 87109 PHONE: 505-857-0467

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

X DRAINAGE REPORT

X DRAINAGE PLAN

___ CONCEPTUAL GRADING & DRAINAGE PLAN

X GRADING PLAN

___ EROSION CONTROL PLAN

___ ENGINEER'S CERTIFICATION

___ OTHER _____

PRE-DESIGN MEETING:

X YES

___ NO

___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

___ SKETCH PLAT APPROVAL

X PRELIMINARY PLAT APPROVAL

___ S. DEV. PLAN FOR SUB'D. APPROVAL

___ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL

___ SECTOR PLAN APPROVAL

___ FINAL PLAT APPROVAL

___ FOUNDATION PERMIT APPROVAL

___ BUILDING PERMIT APPROVAL

___ CERTIFICATE OF OCCUPANCY APPROVAL

___ GRADING PERMIT APPROVAL

___ PAVING PERMIT APPROVAL

___ S.A.D. DRAINAGE REPORT

___ DRAINAGE REQUIREMENTS

___ SUBDIVISION CERTIFICATION

___ OTHER _____ (SPECIFY)

DATE SUBMITTED: January 2, 1997

BY: R.W. Macy

RECEIVED
JAN - 3 1996
HYDROLOGY DIVISION

Project: Project No.:

06-Jan-97

Calculations: Total Basin

Calculations are based on "Section 22.2 Hydrology of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, New Mexico, January 1993 - basins < 40 acres".

Precipitation Zone = 1

Depth at 100-year, 6-hour storm: (Table A-2) P = 2.20

Land Treatments:

From Table 5 - Percent Treatment D
Single Family Residential =
7*SQR((N*N) +(5*N))
where N = units/acre
N = ---------- = ------, ok < 6 N = 0.00
Therefore Percent Treatment D 0.00%
(includes local streets)

Areas: (acres)	Existing	Proposed
Treatment A	3.54	0.00
Treatment B	0.00	0.00
Treatment C	0.00	0.00
Treatment D	0.00	0.00
Total (acres) =	3.54	0.00

Volume	100 year Existing	100 year Proposed	10 year Existing	10 year Proposed
Volume (acre-feet) =	0.13	0.00	0.02	0.00
Volume (cubic feet) =	5,654	0	1,028	0

Total Q(p), cfs:	100 year Existing Q(p)*A	100 year Proposed Q(p)*A	10 year Existing Q(p)*A	10 year Proposed Q(p)*A
Treatment A	4.57	0.00	0.85	0.00
Treatment B	0.00	0.00	0.00	0.00
Treatment C	0.00	0.00	0.00	0.00
Treatment D	0.00	0.00	0.00	0.00
Total Q (cfs) =	4.57	0.00	0.85	0.00

CITY OF
Albuquerque

Public Works Department

Martin J. Chávez, Mayor

Robert E. Gurulé, Director

February 6, 1997

R.W. Macy
Pro-Tec Consulting
P.O. Box 27007
Albuquerque , New Mexico 87125

RE: REVISED DRAINAGE PLAN FOR TIGERWOOD SUBDIVISION (J10-D23)
REVISION DATED 1/31/97

Dear Mr. Macy:

Based on the information provided on your January 31, 1997 resubmittal, the above referenced site is approved for Preliminary Plat.

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

C: Andrew Garcia

Sincerely

Bernie J. Montoya CE
Engineering Associate

CITY OF
Albuquerque

January 7, 1997

Martin J. Chávez, Mayor

R.W. Macy
Pro-Tec Consulting
P.O. Box 27007
Albuquerque, NM 87125

RE: DRAINAGE PLAN FOR TIGERWOOD SUBDIVISION (J10-D23)
ENGINEER'S STAMP DATED 12/30/96.

Dear Mr. Macy:

Based on the information provided on your January 3, 1997 submittal, listed are some concerns that will need to be addressed prior to final approval:

1. Sign-off block for AMAFCA's approval within plan drawing and verification that they are allowing the ponds within their Right-of-Way.
2. T.B.M. must be located within the site and permanently marked.
3. Top of curb and flow line elevations on Tigerwood and the Hanover extension.
4. Your legend includes inlet and manhole designations. I find no inlets or manholes on the plan drawing.
5. Copy of the infrastructure list with the resubmittal.

If I can be of further assistance, please feel free to contact me at 768-2667.

Sincerely,

Bernie J Montoya

Bernie J. Montoya, CE
Engineering Associate

BJM/dl

c: Andrew Garcia
Adil Rizvi
File