# CITY OF ALBUQUERQUE

March 8, 2007

David Soule, P.E.
Rio Grande Engineering
1606 Central SE, Suite 201
Albuquerque, NM 87106

**RE: University Crossings (L-16/D36)**
**Engineers Certification for Release of Financial Guaranty**
**Engineers Stamp dated 2/6/06**
**Engineers Certification dated 2/21/07**

Based upon the information provided in your Engineer's Certification Submittal dated 2/23/07, the above referenced plan is adequate to satisfy the Grading and Drainage Certification for Release of Financial Guaranty.

If you have any questions, you can contact me at 924-3695

Sincerely,

Curtis A. Cherne, E.I.
Engineering Associate Planning Dept.
Development and Building Services

C: Marilyn Maldonado
File

P.O. Box 1293

Albuquerque

New Mexico 87103

www.cabq.gov

# DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 01/28/2003rd)

PROJECT TITLE: ***University Crossings*** ZONE MAP/DRG. FILE #: L16-D36

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

LEGAL DESCRIPTION: **Tract B-1 and B-2, Cactus Park**

CITY ADDRESS: _____

| | | | |
|---|---|---|---|
| ENGINEERING FIRM: | Rio Grande Engineering | CONTACT: | David Soule, PE |
| ADDRESS: | 1606 Central SE, Suite 201 | PHONE: | (505)321-9099 |
| CITY, STATE: | ALBUQUERQUE, NM | ZIP CODE: | 87106 |
| OWNER: | ***Beazer Homes of NM*** | CONTACT: | Robert Anderson |
| ADDRESS: | 7007 Wyoming NE, Suite F-5 | PHONE: | 888-7576 |
| CITY, STATE: | ***Albuquerque, NM*** | ZIP CODE: | 87109 |
| ARCHITECT: | | CONTACT: | |
| ADDRESS: | | PHONE: | |
| CITY, STATE: | | ZIP CODE: | |
| SURVEYOR: | Terra Landsurveyss | CONTACT: | Chris Medina |
| ADDRESS: | PO Box 2532 | PHONE: | 792-0513 |
| CITY, STATE: | Corrales NM | ZIP CODE: | 87048 |
| CONTRACTOR: | | CONTACT: | |
| ADDRESS: | | PHONE: | |
| CITY, STATE: | | ZIP CODE: | |

CHECK TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ____ DRAINAGE PLAN 1st SUBMITTAL, ***REQUIRES TCL or equal***
- ____ DRAINAGE PLAN RESUBMITTAL
- ____ CONCEPTUAL GRADING & DRAINAGE PLAN
- ____ GRADING PLAN
- ____ EROSION CONTROL PLAN
- x ENGINEER'S CERTIFICATION (HYDROLOGY)
- ____ CLOMR/LOMR
- ____ TRAFFIC CIRCULATION LAYOUT (TCL)
- ____ ENGINEERS CERTIFICATION (TCL)
- ____ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
- ____ OTHER

CHECK TYPE OF APPROVAL SOUGHT:

- x SIA / FINANACIAL GUARANTEE RELEASE
- ____ 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 (PERM.)
- ____ CERTIFICATE OF OCCUPANCY (TEMP.)
- ____ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ WORK ORDER APPROVAL
- ____ OTHER (SPECIFY)

RECEIVED
FEB 23 2007
HYDROLOGY SECTION

WAS A PRE-DESIGN CONFERENCE ATTENDED:

- ____ YES
- X NO
- ____ COPY PROVIDED

DATE SUBMITTED: 2/23/2007 BY: David Soule

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a dranage submittal.
The particular nature, location and scope of the proposed development defines the degree of drainage detail.
One or more of the following levels of sumbittal may be required based on the following:

1. **Conceptual Grading and Drainage Plans**: Required for approval of Site Development Plans greater than five (5) acres and Sector Plans.
2. **Drainage Plans**: Required for building permits, grading permits, paving permits and site plans less than five (5) acres.
3. **Drainage Report**: Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more.

# DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 01/28/2003rd)

PROJECT TITLE: *University Crossings* ZONE MAP/DRG. FILE #: L16-D36

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

LEGAL DESCRIPTION: **Tract B-1 and B-2, Cactus Park**

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| ADDRESS: | PO Box 2532 | PHONE: | 792-0513 |
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- ____ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
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- ____ CERTIFICATE OF OCCUPANCY (PERM.)
- ____ CERTIFICATE OF OCCUPANCY (TEMP.)
- x GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ WORK ORDER APPROVAL
- ____ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:

- ____ YES
- X NO
- ____ COPY PROVIDED

RECEIVED
FEB 09 2006
HYDROLOGY SECTION

DATE SUBMITTED: 2/7/2006 BY: David Soule

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# Rio Grande Engineering
# Land Development and Civil Engineering Services

February 7, 2006

Mr. Bradley Bingham PE
Principal Engineer
City of Albuquerque
600 2nd Street NW
Albuquerque, NM 87102

**RE: Revised Grading Plan Approval for University Crossings, Albuquerque, New Mexico**

Dear Mr. Bingham:

The purpose of this letter is to reply to your comments dated January 18, 2006. The grading plan was revised based upon your comments. The following is a summary as to how your comments were addressed on the enclosed Grading Plan.

1. There is a possible ponding problem to the south of this site. How is this going to be addressed? Is a culvert or swale going to be placed between lots 10 & 11 or is permission being sought out to grade off site so this area may drain away from the inside corner around the outside corner?

**The plan was revised to show minor grading on the adjacent City Park/ community Center. The adjacent property is native without any improvements within the proposed disturbed area. We are in the process of obtaining Parks and Recreations approval for this.**

2. The existing inlet located at the southwest corner, which is to remain, who is going to maintain it? Does it belong to the Park or to this subdivision?

**Based upon our informal conversation regarding this inlet, we have revised the plan to show the inlet outside of this development. The only flows going to the inlet will be from the undeveloped area of the City Park / Community Center. The new inlet location will lie within the existing drainage easement.**

Should you have any questions regarding this submittal, please do not hesitate to call me.

Sincerely,

David Soule, PE

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FEB 09 2006
HYDROLOGY SECTION

Enclosures

cc: Dan Aragon

JN: 2561

gradingrevltr020706

# CITY OF ALBUQUERQUE

February 16, 2006

David Soule, PE
Rio Grande Engineering
1606 Central SE, Ste 201
Albuquerque, NM 87106

**Re: University Crossing Drainage Report**
**Engineer's Stamp dated 2-6-06 (L16-D36)**

Dear Mr. Soule,

Based upon the information provided in your submittal dated 12-29-04, the above referenced report is approved for Preliminary Plat action by the DRB. Once that board approves the grading plan, please submit a mylar copy for my signature in order to obtain a Rough Grading Permit.

This project requires a National Pollutant Discharge Elimination System (NPDES) permit. If you have any questions about this permit, please feel free to call the Municipal Development Department, Hydrology section at 768-3654 (Charles Caruso).

Prior to Release of SIA and Financial Guarantees, an Engineer's Certification of this grading plan will be required.

If you have any questions, you can contact me at 924-3986.

Sincerely,

Bradley L. Bingham, PE
Principal Engineer, Planning Dept.
Development and Building Services

C: Chuck Caruso, DMD
file

P.O. Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

# CITY OF ALBUQUERQUE

ALBUQUERQUE
Making History

January 18, 2006

David Soule, P.E.
Rio Grande Engineering
1606 Central Ave SE.
Albuquerque, NM 87107

**Re: University Crossings, Cactus Park**
**Grading and Drainage Plan**
**Engineer's Stamp dated 1-09-06 (L16-D36)**

Dear Mr. Soule,

Based upon the information provided in your submittal received 12-07-05, the above referenced plan cannot be approved for Preliminary Plat and Grading Permit until the following comments are addressed:

1. There is a possible ponding problem to the south of this site. How is this going to be addressed? Is a culvert or swale going to be placed between lots 10 & 11 or is permission being sought out to grade off site so this area may drain away from the inside corner around the outside corner?.
2. The existing inlet located at the southwest corner, which is to remain, who is going to maintain it? Does it belong to the Park or to this subdivision?

If you have any questions, you can contact me at 924-3986.

Sincerely,

Bradley L. Bingham, PE
Principal Engineer, Planning Dept.
Development and Building Services

C: file

RECEIVED
FEB 09 2006
HYDROLOGY SECTION

P.O. Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

# CITY OF ALBUQUERQUE

January 18, 2006

David Soule, P.E.
Rio Grande Engineering
1606 Central Ave SE.
Albuquerque, NM 87107

**Re: University Crossings, Cactus Park**
**Grading and Drainage Plan**
**Engineer's Stamp dated 1-09-06 (L16-D36)**

Dear Mr. Soule,

Based upon the information provided in your submittal received 12-07-05, the above referenced plan cannot be approved for Preliminary Plat and Grading Permit until the following comments are addressed:

1. There is a possible ponding problem to the south of this site. How is this going to be addressed? Is a culvert or swale going to be placed between lots 10 & 11 or is permission being sought out to grade off site so this area may drain away from the inside corner around the outside corner?.
2. The existing inlet located at the southwest corner, which is to remain, who is going to maintain it? Does it belong to the Park or to this subdivision?

If you have any questions, you can contact me at 924-3986.

Sincerely,

Bradley L. Bingham, PE
Principal Engineer, Planning Dept.
Development and Building Services

C: file

P.O. Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

# DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 01/28/2003rd)

L-16/D36

PROJECT TITLE: ***University Crossings*** ZONE MAP/DRG. FILE #: L15/16

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

LEGAL DESCRIPTION: **Tract B-1 and B-2, Cactus Park**

CITY ADDRESS: _____

| | | | |
|---|---|---|---|
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WAS A PRE-DESIGN CONFERENCE ATTENDED:

- _____ YES
- X NO
- _____ COPY PROVIDED

RECEIVED
JAN 12 2006
HYDROLOGY SECTION

DATE SUBMITTED: 1/9/2006 BY: David Soule

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a dranage submittal.
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DRAINAGE REPORT

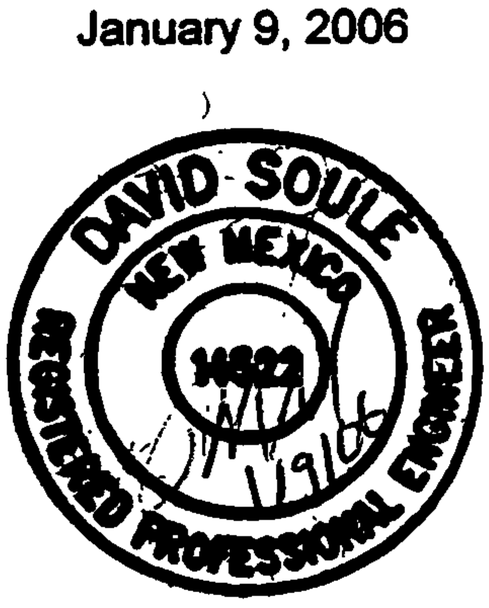
For

# UNIVERSITY CROSSINGS SUBDIVISION
# Albuquerque, New Mexico

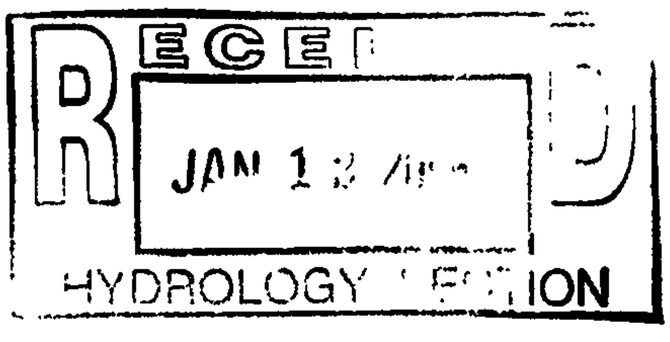
Prepared by

Rio Grande Engineering
1606 Central SE
Albuquerque, New Mexico 87106

January 9, 2006




David Soule P.E. No. 14522



## TABLE OF CONTENTS

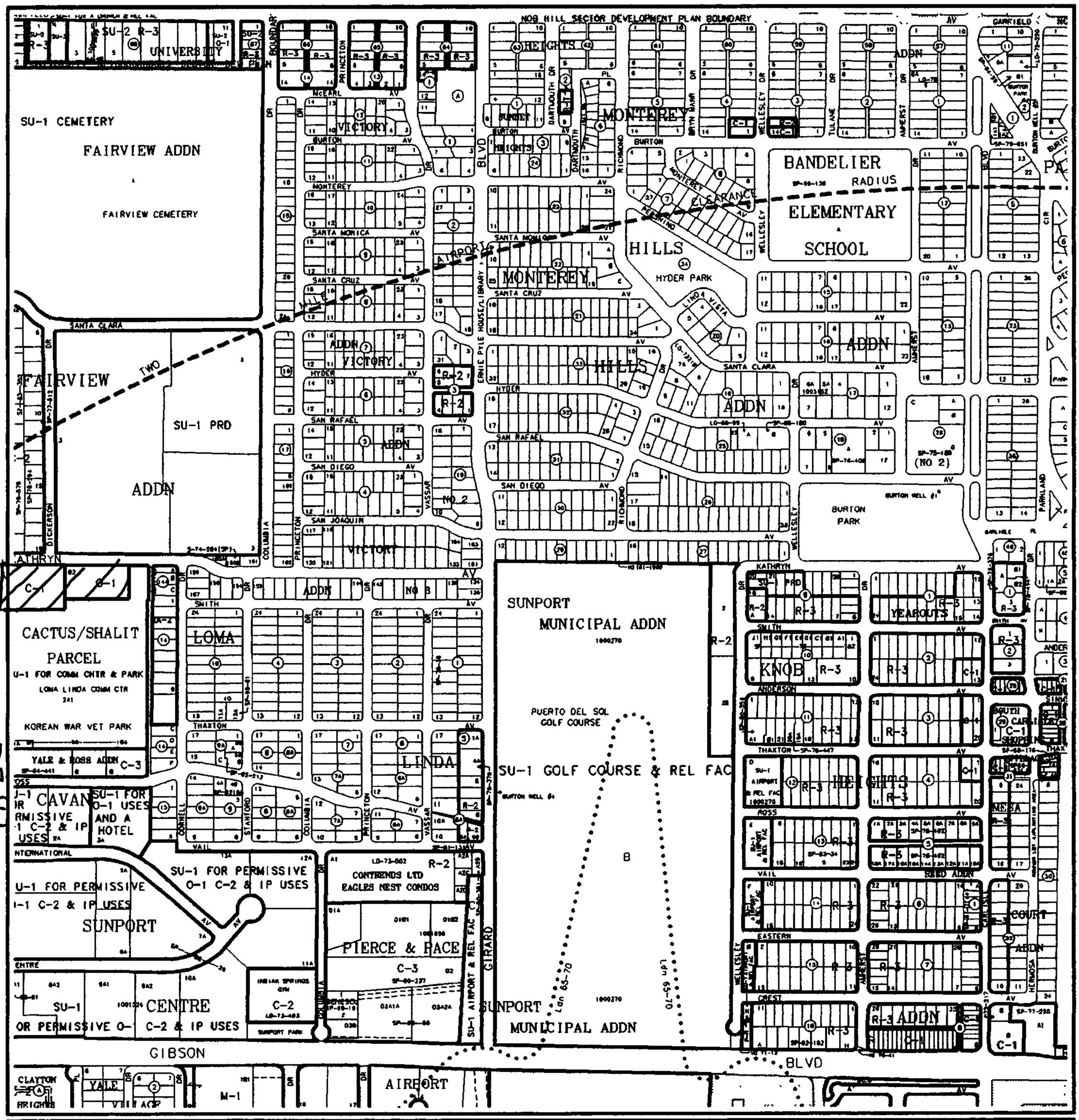
## PURPOSE

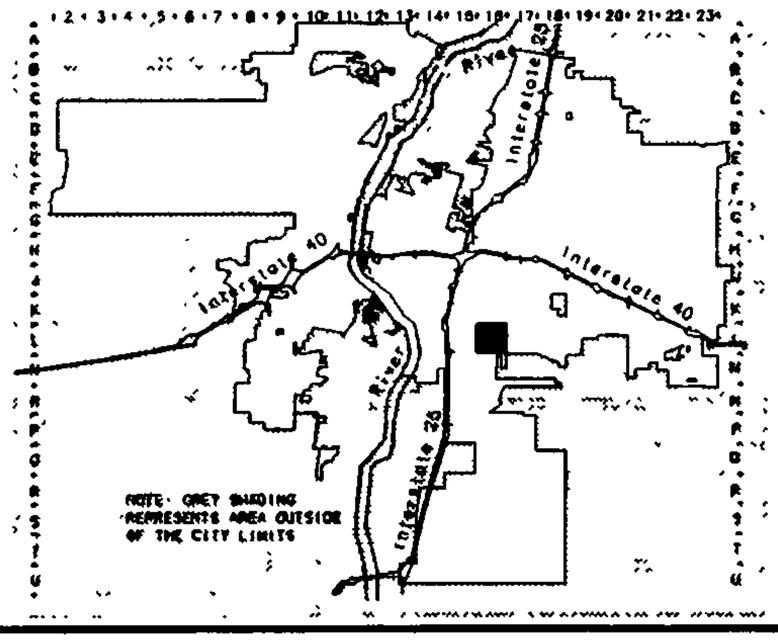
The purpose of this report is to provide the Drainage Management Plan for the development of the University Crossings Subdivision. This plan will be utilized for the development of the subject property as a 32-lot paired unit family residential subdivision. This plan was prepared in accordance with the City of Albuquerque's Development Process Manual. This report will demonstrate that the proposed improvements do not adversely affect the surrounding properties, nor the upstream or downstream facilities.

## INTRODUCTION

The subject of this report, as shown on the Exhibit A, is a 3.25-acre parcel of land located on the southeast corner of Kathryn Avenue SE and Yale Boulevard SE. The site is located in the near southeast heights area of Albuquerque. The legal description of this site is Tracts B-1 and B-2, Cactus Park Subdivision. As shown on FIRM map 35001C0353E, the site is located entirely within Flood Zone X. The site is currently undeveloped.

The site is located within an older part of Albuquerque. The site is surrounded by fully developed road to the north and west. The property to the east and south is a large community center with substantial amounts of landscaping and native vegetation along the common boundary. An existing inlet is located on the south west corner of this lot. Based upon informal discussions with the City of Albuquerque, the storm drainage system within Yale was recently upgraded; therefore the development of this site must allow for the historical patterns of flow surrounding the site and will be allowed free discharge to Yale Boulevard.




Albuquerque Geographic Information System
PLANNING DEPARTMENT


GRAPHIC SCALE IN FEET
250 0 750 1000

# Zone Atlas Page

# L-16-Z

Map Amended through February 03, 2004

EXHIBIT A

4

## EXISTING CONDITIONS

The site is currently undeveloped. Due to the location it in an established area of town, all of the surrounding improvements are in place. The site is bound on its northern and western boundary by a full width road including sidewalks and storm drain. The eastern and southern boundaries are adjacent to native seeded and landscaped 'park- area' of a city community center. The site currently drains east to west where it de-silts prior to entering the Yale Storm drain via an existing inlet located within the property at the southwest corner. As shown in Appendix A, this site discharges 5.07 cfs to the Yale Storm drain during a 100-year, 6-hour rain event.

## PROPOSED CONDITIONS

The proposed improvements consist of a 32-lot paired-unit single family residential subdivision with approximately 650 lineal feet of 26' wide public roads. The onsite lot grading shall consist of a building pad and rear and side yard swales with typical grades of 1%. Each lot will drain directly to the fronting roadway. The proposed roadway will consist of a 2% crowned roadway section with mountable curbs on the eastern lots and standard curbs on the western lots. The developed storm water discharge rates were calculated using the simplified procedure for 40 acre and smaller basins as shown in chapter 23-part A of the Development Process Manual. As shown in Appendix A, the total developed flow generated by this site is predicted to be 13.06 cfs. As shown in Appendix B, the mountable curb transitions to standard in order for the entire peak runoff to stay within the roadway.

## SUMMARY AND RECOMMENDATIONS

This site is a development of a portion of land located within the near southeast portion of Albuquerque. This site is surrounded by fully developed roadways. The storm drainage system within Yale Boulevard has been upgraded and this site is allowed free discharge. As shown within

this report, the roadways were designed to convey the 100-year 6-hour peak discharge rates..

The proposed site development does not adversely affect the upstream or downstream facilities. The site was designed in conformance to City of Albuquerque Drainage Policy. Therefore, we request approval of the site-grading plan. Since public improvements will be constructed a work order and Subdivision Improvement Agreement will be required. Since this site encompasses more than 1 acre, a NPDES permit will be required prior to any construction activity.

# APPENDIX A

# SITE HYDROLOGY

# Weighted E Method

*Existing Basins*

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 100-Year | | |
| Basin | Area (sf) | Area (acres) | Treatment A | | Treatment B | | Treatment C | | Treatment D | | Weighted E (ac-ft) | Volume (ac-ft) | Flow cfs |
| | | | % | (acres) | % | (acres) | % | (acres) | % | (acres) | | | |
| ONSITE | 141482.88 | 3.248 | 100% | 3.248 | 0% | 0.000 | 0% | 0 | 0% | 0.000 | 0.530 | 0.143 | 5.07 |
| Total | 141482.88 | 3.248 | | 3.248 | | 0.000 | | 0 | | 0.000 | | 0.143 | 5.07 |

*Proposed Developed Basins*

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 100-Year, 6-hr. | | |
| Basin | Area (sf) | Area (acres) | Treatment A | | Treatment B | | Treatment C | | Treatment D | | Weighted E (ac-ft) | Volume (ac-ft) | Flow cfs |
| | | | % | (acres) | % | (acres) | % | (acres) | % | (acres) | | | |
| ONSITE | 141526.44 | 3.249 | 0% | 0 | 15% | 0.487 | 20% | 0.6498 | 65% | 2.112 | 1.721 | 0.466 | 13.08 |
| Total | 141526.44 | 3.249 | 0% | 0 | 15% | 0.487 | 20% | 0.6498 | 65% | 2.112 | 1.721 | 0.466 | 13.08 |

**Equations:**

Weighted E = Ea*Aa + Eb*Ab + Ec*Ac + Ed*Ad / (Total Area)

Volume = Weighted D * Total Area

Flow = Qa * Aa + Qb * Ab + Qc * Ac + Qd * Ad

Where for 100-year, 6-hour storm

| | |
|---|---|
| Ea= 0.53 | Qa= 1.56 |
| Eb= 0.78 | Qb= 2.28 |
| Ec= 1.13 | Qc= 3.14 |
| Ed= 2.12 | Qd= 4.7 |

# APPENDIX B

# SITE HYDRAULICS

# Street Capacity Calculations

## STREET BOTTOM

**26' F-F Street Section with 8" curb**

**Slope= 0.006**

For water depths less than 0.125 feet

Y= Water depth
Area = 8*Y^2
P= SQRT(257*Y^2) + Y
n= 0.017

| Depth (ft) | Area (ft^2) | P (ft) | R (A/P) | Q (cfs) | 2Q (cfs) | Vel (ft/s) | D*V | Fr | D2 (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.01 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.33 | 0.0018848 |
| 0.02 | 0.00 | 0.34 | 0.01 | 0.00 | 0.00 | 0.30 | 0.01 | 0.38 | 0.0045908 |
| 0.04 | 0.01 | 0.68 | 0.02 | 0.01 | 0.01 | 0.48 | 0.02 | 0.42 | 0.0111278 |
| 0.06 | 0.03 | 1 02 | 0.03 | 0.02 | 0.04 | 0.63 | 0.04 | 0.45 | 0.0186349 |
| 0.08 | 0.05 | 1.36 | 0.04 | 0.04 | 0.08 | 0.76 | 0.06 | 0.47 | 0.0268376 |
| 0.1 | 0.08 | 1.70 | 0.05 | 0.07 | 0.14 | 0.88 | 0.09 | 0.49 | 0.0355923 |
| 0.12 | 0.12 | 2.04 | 0.06 | 0.11 | 0.23 | 1.00 | 0.12 | 0.51 | 0.0448091 |
| 0.125 | 0.13 | 2.13 | 0.06 | 0.13 | 0.26 | 1.02 | 0.13 | 0.51 | 0.0471777 |

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)+Y1

| Depth (ft) | Area (ft^2) | P (ft) | R (A/P) | Q (cfs) | 2Q (cfs) | Vel (ft/s) | D*V | Fr | D2 (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.13 | 0.14 | 2.38 | 0.06 | 0.14 | 0.27 | 1.00 | 0.13 | 0.49 | 0.0460163 |
| 0.16 | 0.23 | 3.91 | 0.06 | 0.23 | 0.46 | 1.01 | 0.16 | 0.45 | 0.0486259 |
| 0.2 | 0.42 | 5.95 | 0.07 | 0.48 | 0.95 | 1.15 | 0.23 | 0.45 | 0.0623776 |
| 0.24 | 0.69 | 8.00 | 0.09 | 0.90 | 1.81 | 1.32 | 0.32 | 0.47 | 0.0806096 |
| 0.2846 | 1.08 | 10.27 | 0.11 | 1.63 | 3.26 | 1.51 | 0.43 | 0.50 | 0.1037171 |
| 0.32 | 1.47 | 12.08 | 0.12 | 2.43 | 4.87 | 1.66 | 0.53 | 0.52 | 0.1234692 |
| 0.3551 | 1.91 | 13.87 | 0.14 | 3.45 | 6.89 | 1.81 | 0.64 | 0.53 | 0.1440036 |
| 0.365 | 2.05 | 14.37 | 0.14 | 3.77 | 7.55 | 1.85 | 0.67 | 0.54 | 0.1499436 |

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365
A3= A2 + Y2*14
P3= P2 + Y2

| Depth (ft) | Area (ft^2) | P (ft) | R (A/P) | Q (cfs) | 2Q (cfs) | Vel (ft/s) | D*V | Fr | D2 (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.37 | 2.12 | 14.38 | 0.15 | 3.99 | 7.98 | 1.89 | 0.70 | 0.55 | 0.1556607 |
| 0.4556 | 3.31 | 14.46 | 0.23 | 8.40 | 16.80 | 2.54 | 1.16 | 0.66 | 0.2556985 |
| 0.4848 | 3.72 | 14.49 | 0.26 | 10.18 | 20.37 | 2.74 | 1.33 | 0.69 | 0.2906669 |
| 0.5 | 3.94 | 14.51 | 0.27 | 11.16 | 22.33 | 2.84 | 1.42 | 0.71 | 0.3090234 |
| **0.54** | **4.50** | **14.55** | **0.31** | **13.91** | **27.82** | **3.09** | **1.67** | **0.74** | **0.357805** |
| 0.5584 | 4.75 | 14.56 | 0.33 | 15.25 | 30.50 | 3.21 | 1.79 | 0.76 | 0.3804643 |
| 0.63 | 5.76 | 14.64 | 0.39 | 20.91 | 41.83 | 3.63 | 2.29 | 0.81 | 0.4698487 |
| 0.667 | 6.27 | 14.67 | 0.43 | 24.10 | 48.21 | 3.84 | 2.56 | 0.83 | 0.5167338 |

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667
A4= A3 + 14 * Y3 + 25 * Y3^2
P4= P3 + SQRT( 2501 * Y3^2)

| Depth (ft) | Area (ft^2) | P (ft) | R (A/P) | Q (cfs) | 2Q (cfs) | Vel (ft/s) | D*V | Fr | D2 (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.7 | 6.76 | 16.32 | 0.41 | 25.44 | 50.89 | 3.76 | 2.63 | 0.79 | 0.5090958 |
| 0.72 | 7.09 | 17.32 | 0.41 | 26.43 | 52.87 | 3.73 | 2.69 | 0.77 | 0.5071856 |
| 0.74 | 7.43 | 18.32 | 0.41 | 27.55 | 55.10 | 3.71 | 2.74 | 0.76 | 0.5069788 |
| 0.76 | 7.79 | 19.32 | 0.40 | 28.79 | 57.58 | 3.70 | 2.81 | 0.75 | 0.508251 |
| 0.78 | 8.17 | 20.32 | 0.40 | 30.16 | 60.31 | 3.69 | 2.88 | 0.74 | 0.5108175 |
| 0.8 | 8.58 | 21.32 | 0.40 | 31.64 | 63.29 | 3.69 | 2.95 | 0.73 | 0.5145251 |
| 0.847 | 9.60 | 23.68 | 0.41 | 35.63 | 71.26 | 3.71 | 3.14 | 0.71 | 0.5270333 |

# Street Capacity Calculations

## STREET TOP

**26' F-F Street Section with 4" curb**

**Slope= 0.031**

Q=13.08*.42=5.49 CFS

For water depths less than 0.0625 feet

Y= Water depth
Area = 16*Y^2
P= SQRT(1025*Y^2) + Y
n= 0.017

| Depth (ft) | Area (ft^2) | P (ft) | R (A/P) | Q (cfs) | 2Q (cfs) | Vel (ft/s) | D*V | Fr | D2 (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.01 | 0.0016 | 0.33 | 0.00 | 0.00 | 0.00 | 0.44 | 0.00 | 0.78 | 0.00707 |
| 0.02 | 0.0064 | 0.66 | 0.01 | 0.00 | 0.01 | 0.70 | 0.01 | 0.87 | 0.01661 |
| 0.025 | 0.01 | 0.83 | 0.01 | 0.01 | 0.02 | 0.81 | 0.02 | 0.90 | 0.02185 |
| 0.035 | 0.0196 | 1.16 | 0.02 | 0.02 | 0.04 | 1.02 | 0.04 | 0.96 | 0.033 |
| 0.045 | 0.0324 | 1.49 | 0.02 | 0.04 | 0.08 | 1.20 | 0.05 | 1.00 | 0.04488 |
| 0.052 | 0.043264 | 1.72 | 0.03 | 0.06 | 0.11 | 1.32 | 0.07 | 1.02 | 0.05355 |
| 0.06 | 0.0576 | 1.98 | 0.03 | 0.08 | 0.17 | 1.46 | 0.09 | 1.05 | 0.06377 |
| 0.0625 | 0.0625 | 2.06 | 0.03 | 0.09 | 0.19 | 1.50 | 0.09 | 1.05 | 0.06703 |

For water depths greater than 0.0625 ft but less than 0.3025 ft

Y1= Y-0.0625
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)+Y1

| Depth (ft) | Area (ft^2) | P (ft) | R (A/P) | Q (cfs) | 2Q (cfs) | Vel (ft/s) | D*V | Fr | D2 (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.063 | 0.063506 | 2.09 | 0.03 | 0.10 | 0.19 | 1.50 | 0.09 | 1.05 | 0.06743 |
| 0.1 | 0.172656 | 3.98 | 0.04 | 0.33 | 0.66 | 1.90 | 0.19 | 1.06 | 0.10796 |
| 0.13 | 0.311406 | 5.51 | 0.06 | 0.71 | 1.41 | 2.27 | 0.29 | 1.11 | 0.14887 |
| 0.16 | 0.495156 | 7.04 | 0.07 | 1.30 | 2.60 | 2.62 | 0.42 | 1.16 | 0.19346 |
| 0.2 | 0.810156 | 9.08 | 0.09 | 2.49 | 4.98 | 3.07 | 0.61 | 1.21 | 0.25687 |
| **0.207** | **0.873506** | **9.43** | **0.09** | **2.75** | **5.50** | **3.15** | **0.65** | **1.22** | **0.26835** |
| 0.2612 | 1.446942 | 12.20 | 0.12 | 5.38 | 10.75 | 3.72 | 0.97 | 1.28 | 0.36032 |
| 0.3025 | 1.9825 | 14.31 | 0.14 | 8.17 | 16.34 | 4.12 | 1.25 | 1.32 | 0.43358 |

For water depths greater than 0.3025 ft but less than 0.333 ft

Y2= Y - 0.3025
A3= A2 + Y2*14
P3= P2 + Y2

| Depth (ft) | Area (ft^2) | P (ft) | R (A/P) | Q (cfs) | 2Q (cfs) | Vel (ft/s) | D*V | Fr | D2 (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.303 | 1.9895 | 14.31 | 0.14 | 8.22 | 16.44 | 4.13 | 1.25 | 1.32 | 0.43512 |
| 0.3039 | 2.0021 | 14.31 | 0.14 | 8.31 | 16.61 | 4.15 | 1.26 | 1.33 | 0.43789 |
| 0.3062 | 2.0343 | 14.31 | 0.14 | 8.53 | 17.06 | 4.19 | 1.28 | 1.34 | 0.44497 |
| 0.31 | 2.0875 | 14.31 | 0.15 | 8.90 | 17.80 | 4.26 | 1.32 | 1.35 | 0.45667 |
| 0.3125 | 2.1225 | 14 32 | 0.15 | 9.15 | 18.30 | 4.31 | 1.35 | 1.36 | 0.46438 |
| 0.32 | 2.2275 | 14.32 | 0.16 | 9.91 | 19.83 | 4.45 | 1.42 | 1.39 | 0.48755 |
| 0.3317 | 2.3913 | 14.34 | 0.17 | 11.15 | 22.31 | 4.66 | 1.55 | 1.43 | 0.52381 |
| 0.333 | 2.4095 | 14.34 | 0.17 | 11.29 | 22.59 | 4.69 | 1.56 | 1.43 | 0.52785 |

For water depths greater than 0.333 ft but less than 0.513 ft

Y3= Y - 0.333
A4= A3 + 14 * Y3 + 25 * Y3^2
P4= P3 + SQRT( 2501 * Y3^2)

| Depth (ft) | Area (ft^2) | P (ft) | R (A/P) | Q (cfs) | 2Q (cfs) | Vel (ft/s) | D*V | Fr | D2 (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.335 | 2.4376 | 14.44 | 0.17 | 11.46 | 22.92 | 4.70 | 1.58 | 1.43 | 0.53109 |
| 0.3601 | 2.80726 | 15.69 | 0.18 | 13.72 | 27.44 | 4.89 | 1.76 | 1.44 | 0.57259 |
| 0.38 | 3.122725 | 16.69 | 0.19 | 15.72 | 31.45 | 5.04 | 1.91 | 1.44 | 0.60657 |
| 0.4196 | 3.809389 | 18.67 | 0.20 | 20.32 | 40.64 | 5.33 | 2.24 | 1.45 | 0.67659 |
| 0.4603 | 4.596832 | 20.70 | 0.22 | 25.94 | 51.88 | 5.64 | 2.60 | 1.47 | 0.75143 |
| 0.504 | 5.534525 | 22.89 | 0.24 | 33.06 | 66.12 | 5.97 | 3.01 | 1.48 | 0.83453 |
| 0.513 | 5.7395 | 23.34 | 0.25 | 34.67 | 69.35 | 6.04 | 3.10 | 1.49 | 0.85196 |