CITY OF ALBUQUERQUE

March 27, 2008

Gregory J. Krenik, P.E.
Mark Goodwin & Associates, P.A.
P.O. Box 90606
Albuquerque, NM 87199

Re: Juan Tabo Hills Unit 1, 1A, 1B, (M-21/D015), W.O. #: 756185
Engineers Certification for Release of Financial Guaranty
Engineers Stamp dated 02/09/2006
Engineers Certification dated 01/09/2007

Mr. Krenik,

Based upon the information provided in your submittal received 03/26/2008, the above referenced certification is approved for release of SIA and Financial Guarantee.

However, prior to release of financial guaranty, the LOMR must be accepted by FEMA.

If you have any questions, you can contact me at 924-3982.

Sincerely,

Timothy E. Sims
Plan Checker, Planning Dept. - Hydrology
Development and Building Services

C: Marilyn Maldonado, COA# 756185
File

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 1/28/2003rd)

M-21/D015

PROJECT TITLE: Juan Tabo Hills
DRB #: 1004715 EPC#:_____

ZONE MAP/DRG. FILE #: ~~M-21/M-22~~
WORK ORDER#: 756185

LEGAL DESCRIPTION: Tracts 6 & 7, Juan Tabo Hills, Unit 1
CITY ADDRESS:_____

ENGINEERING FIRM: Mark Goodwin & Associates, PA
ADDRESS: PO Box 90606
CITY, STATE: Albuquerque, NM

CONTACT: Gregory J. Krenik, PE
PHONE: 828-2200
ZIP CODE: 87199

OWNER: JTH, LLC
ADDRESS: PO Box 1443
CITY, STATE: Corrales, NM

CONTACT: Scott Grady
PHONE: 892-5533
ZIP CODE: 87048

ARCHITECT: _____
ADDRESS: _____
CITY, STATE: _____

CONTACT: _____
PHONE:
ZIP CODE: _____

SURVEYOR: Surv-Tek
ADDRESS: 9384 Valley View Drive
CITY, STATE: Albuquerque, NM

CONTACT: Russ Hugg
PHONE: 897-3366
ZIP CODE: 87114

CONTRACTOR: _____
ADDRESS: _____
CITY, STATE: _____

CONTACT: _____
PHONE: _____
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
- ☒ 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:

- ☒ SIA / FINANCIAL 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
MAR 24 2008
HYDROLOGY SECTION

WAS A PRE-DESIGN CONFERENCE ATTENDED:

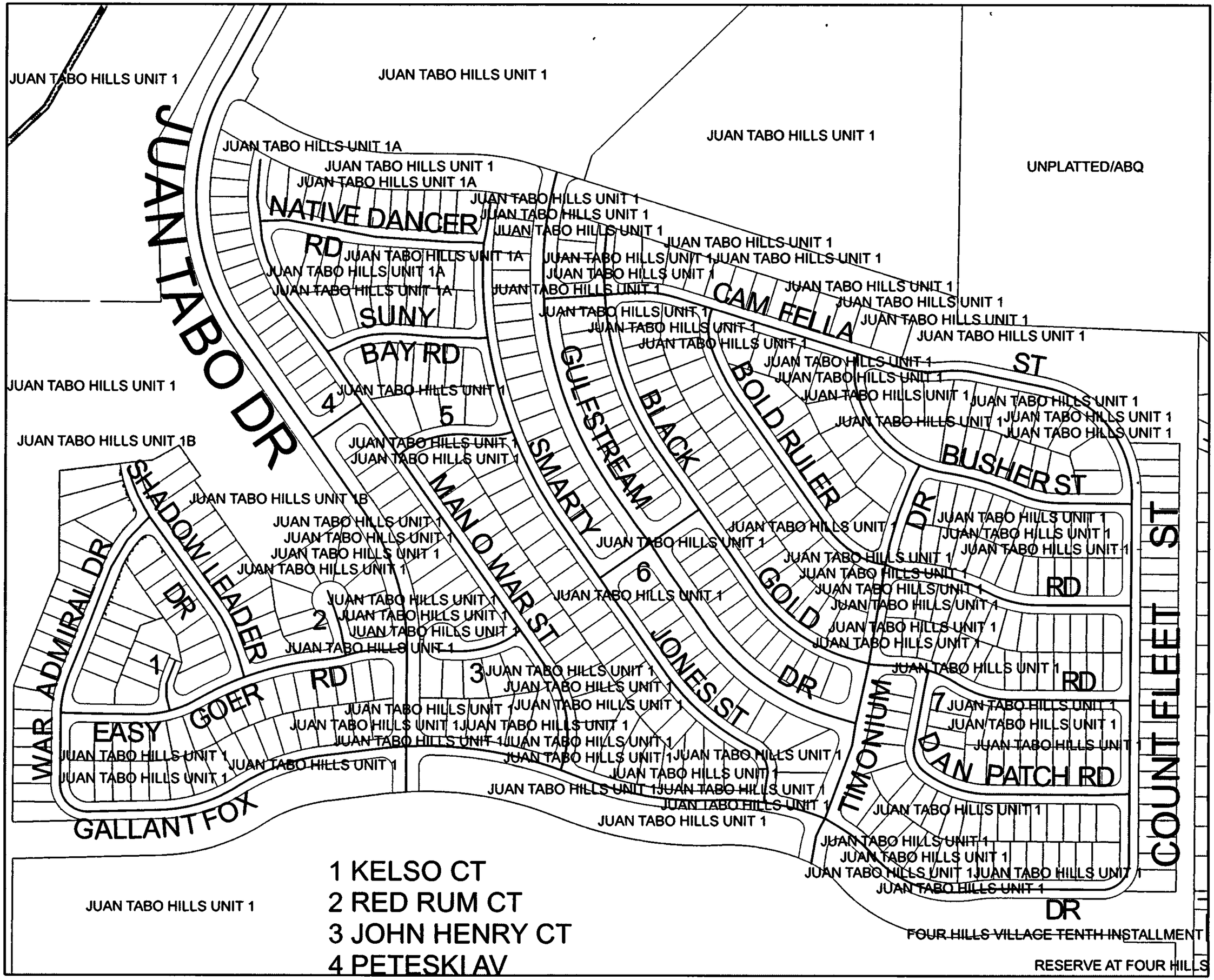
- ☐ YES
- ☒ NO
- ☐ COPY PROVIDED

DATE SUBMITTED: 3-24-08

BY: Gregory J. Krenik, PE

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

1. **Conceptual Grading and Drainage Plan**: 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.


JUAN TABO HILLS UNIT 1
JUAN TABO DR
NATIVE DANCER RD
SUNY BAY RD
GULFSTREAM
BLACK
BOLD RULER
CAM FELIA
ST
BUSHER ST
UNPLATTED/ABQ
SHADOW LEADER DR
MAN O WAR ST
SMARTY
JONES ST
GOLD
DR
TIMONIUM
DAN PATCH RD
RD
WAR ADMIRAL DR
EASY GOER RD
GALLANT FOX
COUNT FLEET ST
DR
1
2
3
4
5
6
7
JUAN TABO HILLS UNIT 1A
JUAN TABO HILLS UNIT 1B
1 KELSO CT
2 RED RUM CT
3 JOHN HENRY CT
4 PETESKLAV
FOUR HILLS VILLAGE TENTH INSTALLMENT
RESERVE AT FOUR HILLS

Sent: Thursday, March 20, 2008 11:05 AM
To: Sims, Timothy E.
Cc: Bingham, Brad L.
Subject: JTH 2 cert

Tim,
Just some comments to your letter of March 19.
1) Just to clarify this....do we take the work order information and put it on the grading plan (won't be very legible) or can I just submit the paving sheets of the work order with this instead or rewriting everything? These shots are pad elevations done before the site is trashed during construction.
2) This submittal is for Unit 1, it includes Units 1A & 1B, there were no separate infrastructure lists for those and hence no separate FG's. They were delayed because they are in the landfill buffer zone and a report needed to be finalized before we could plat them. They are included in the Unit 1 report.
3) Do you mean the DRC number?
4) Yes, we understand this.
5) We will change the surveyor on the info sheet.

Please note that we can not submit our work order closeout package for this project until the PID is approved so the FG can not be released until then.

Thanks, Greg

Gregory J. Krenik, PE
Vice President
MARK GOODWIN & ASSOCIATES, PA
(505) 828-2200
(505) 235-9338 cell
(505) 797-9539 fax
greg@goodwinengineers.com
website: www.goodwinengineers.com

CITY OF ALBUQUERQUE

September 27, 2006

Greg Krenik, PE
Mark Goodwin & Associates
P.O. 90606
Albuquerque, NM 87199

Re: Juan Tabo Hills Subdivision Drainage Report
Engineer's Stamp dated 9-8-06 (M21/D15)

Dear Mr. Krenik,

Based upon the information provided in your submittal dated 9-11-06, the above referenced report is approved for Preliminary Plat action by the DRB. Once that board approves the plan, please bring a mylar copy of the grading plan for my signature in order to obtain a Rough Grading permit.

This project requires a National Pollutant Discharge Elimination System (NPDES) permit. Refer to the attachment that is provided with this letter for details. If you have any questions please feel free to call the Municipal Development Department, Hydrology section at 768-3654 (Charles Caruso).

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

Sincerely,

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

C: Chuck Caruso, DMD
file

P.O. Box 1293

Albuquerque

New Mexico 87103

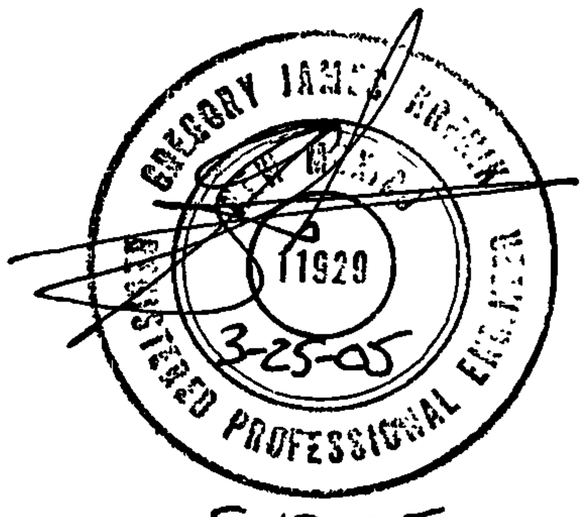
www.cabq.gov

DRAINAGE REPORT

for

JUAN TABO HILLS

RECEIVED
SEP 11 2006
HYDROLOGY SECTION



5-12-05
2-9-06
9-8-06

March 2005

L-22-Z

L-21-Z

L-23-Z

M-21-Z

M-23-Z

N-21-Z

N-23-Z

N-22-Z

PARK

A-1

R-D

SU-1 PRD

HIDDEN VALLEY

VALLEY

CASITAS

CORONADO

FOUR HILLS VILLAGE 20TH INSTALLMENT

VISTA SUZANNE LA

FOUR HILLS 4TH INSTALLMENT VILLAGE

FOUR HILLS MANOR

FOUR HILLS COUNTRY CLUB

SU-1 GOLF COURSE

9TH INSTALLMENT

10TH INSTALLMENT

5TH INSTALLMENT

FOUR HILLS VILLAGE

SITE

TIJERAS ARROYO

SAGEBRUSH TRL

WAGON TRAIN

SANTA ANA

BRAZOS

RATON AV

SECRETARIAT AV

SEATTLE SLEW AV

RESERVE AT FOUR HILLS

CATRON

TORO

CUATRO CERROS

MATADOR

VIA POSADA

KEELY RD

STAGECOACH

HIDDEN VALLEY

LAMP POST

NAVARRA

KIVA

CANADA ST

SEA BISCUIT DR

BERNALILLO

Zone Atlas Page: **M-22-Z**

Map amended through: **Aug 06, 2004**

Selected Symbols

- Unincorporated Areas
- Sector Plan Boundaries
- Parcel Boundaries
- Easement Lines
- Freeway Lanes
- Junsdictional Boundaries
- Westgate Wall
- Escarpment
- Grant Boundaries
- Petroglyph
- H-1 Buffer Zone
- Arroyos
- LDN Noise Level
- Airport Clearance Zone
- Design Overlay Zones

0 750 1,500 Feet

NOTE: GREY SHADING REPRESENTS AREA OUTSIDE OF THE CITY LIMITS

RIO GRANDE

CITY OF ALBUQUERQUE 1706 THREE HUNDRED YEARS 1706 • 2006

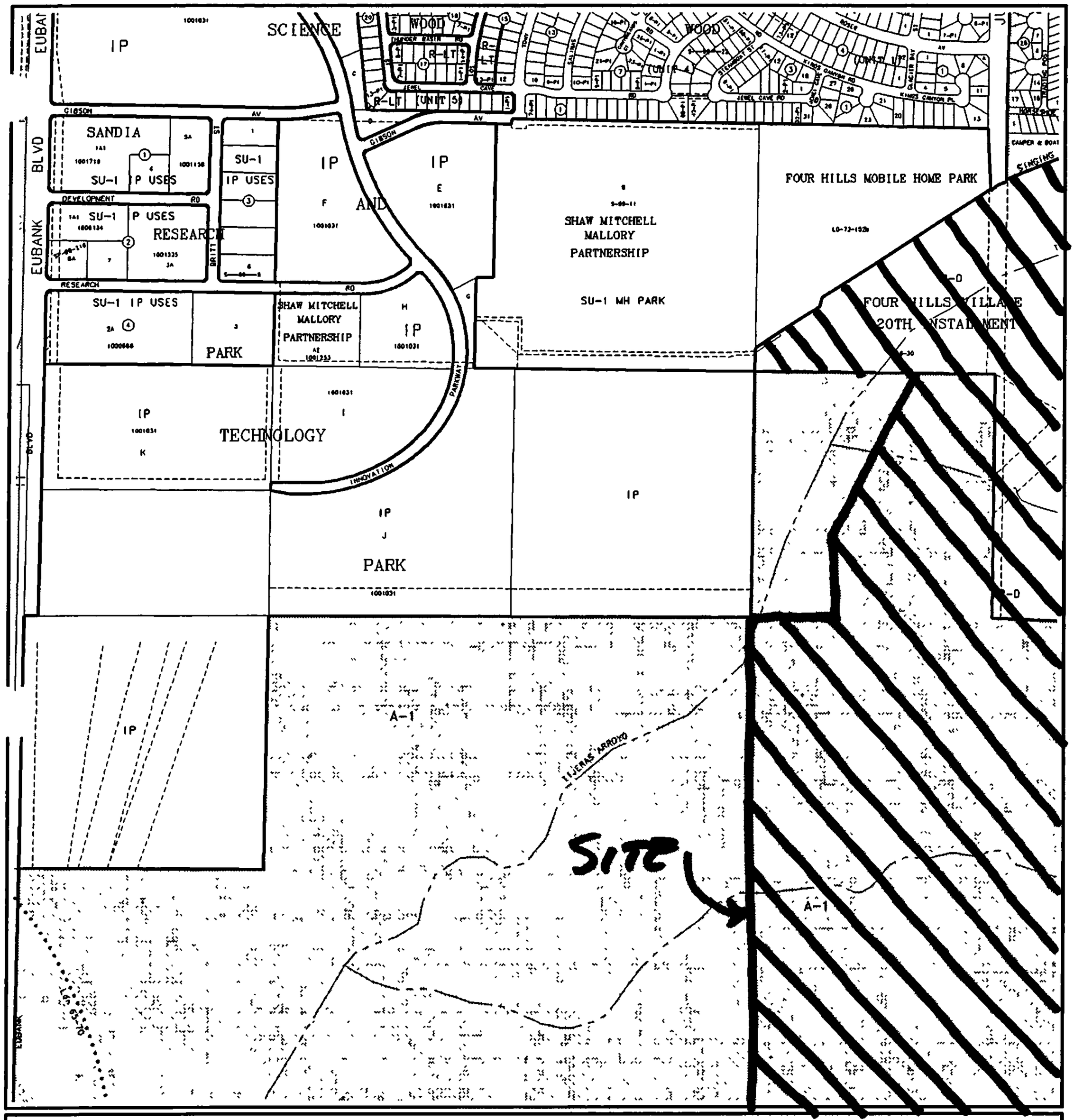
ALBUQUERQUE

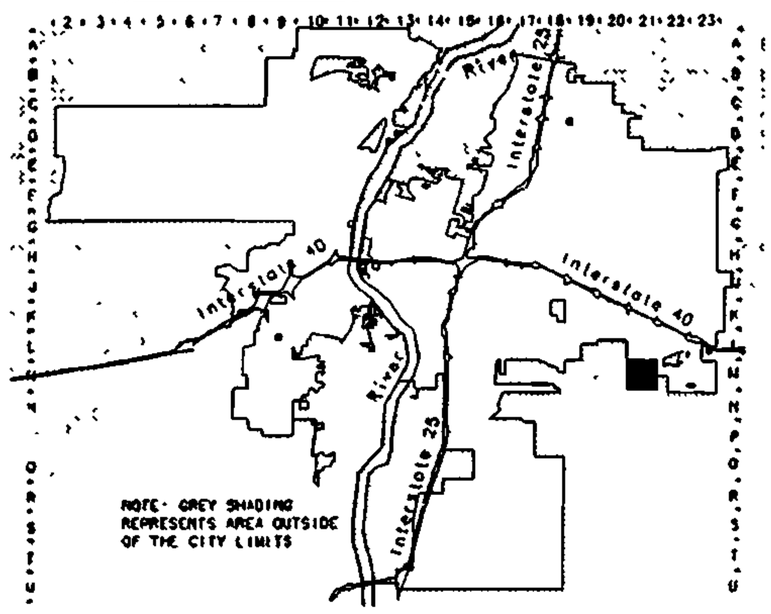
Haciendo Historia

Albuquerque Geographic Information System

PLANNING DEPARTMENT

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CITY OF ALBUQUERQUE · NEW MEXICO · 1706

A lbuquerque G eographic I nformation S ystem
PLANNING DEPARTMENT

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GRAPHIC SCALE IN FEET

250 0 750 1000

Zone Atlas Page

M-21-Z

Map Amended through November 01, 2003

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Consulting Engineers
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(505) 828-2200 FAX 797-9539
e-mail: dmg@swcp.com

PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED _____ DATE _____
SHEET 1 OF ____
REVISED 1-26-06 & 5-31-06

- PROJECT CONSISTS OF 327.5954 AC AT THE SOUTH END OF JUAN TABO BLVD.
- PART OF THE PROJECT DOES LIE IN A 100 YEAR FLOOD ZONE (SEE ATTACHED MAP # 35001C0367F)
- A LOMR WILL BE COMPLETED TO REVISE THE FLOODPLAIN.
- A BRIDGE WILL BE CONSTRUCTED ACROSS THE TEJERAS ARROYO. THIS IS ONE AREA THAT THE FLOODPLAIN WILL BE REVISED.
- THE FOUR HILLS CONCRETE CHANNEL WILL TERMINATE INTO A PIPE, THIS IS THE OTHER AREA THAT THE FLOODPLAIN WILL BE REVISED.
- OFFSITE RUNOFF FROM THE EAST WILL BE DIVERTED THROUGH THIS SITE AND INTO THE ON SITE STORM SYSTEM.
- THE SITE CURRENTLY SLOPES EAST TO WEST AT 5%.
- THE NATURAL ARROYOS WILL BE ELIMINATED AND UNDERGROUND PIPES WILL BE INSTALLED.
- FLOWS WILL BE ROUTED TO A POND BEFORE ENTERING THE TEJERAS ARROYO TO REMOVE FLOATABLES.
- THERE IS AN OPEN SPACE TRACT CALLED "TRACT I" THAT WAS RECORDED WITH THE BULK PLAT THAT CONSISTS OF 90.9203 AC.
- THERE WILL BE 1132 LOTS AND 27.7621 ACRES OF COMMERCIAL. THIS LEAVES 208.9130 ACRES FOR THE LOTS.

- DETERMINE RUNOFF PER LOT

~~#~~ LOTS = 1132
PADS = 35x65 = 2275 ☒
DRIVE PAD = 20x20 = 400 ☒
TOTAL TYPE "D" = 69.5156 AC

ROW AREA WITHIN RESIDENTIAL LOTS = 50.8351 AC

80% "D" = 40.6681
20% "B" = 10.1670

TOTAL "D" = 69.5156 + 40.6681 = 110.1837 AC = 52.74%
TOTAL "B" = 47.26%

P_1 = 2.05 in
P_6 = 2.60 in
P_{24} = 3.20 in

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 2 OF ____

OPEN SPACE AREA
= 90.9203 AC

50% B
50% C

FROM AHYMO OUTPUT SHEETS 50-59
Q = 271.35 CFS

Q PER ACRE = 2.98 CFS

COMMERCIAL AREA
= 27.7621 AC

80% "D"
20% "B"

FROM AHYMO OUTPUT SHEETS 50-59
Q = 82.97 CFS

MAJOR LOCAL ROADS - (NO LOTS FRONTING)

A = 11.5393 AC

83% "D"
17% "B"

FROM AHYMO OUTPUT SHEETS 50-59
Q = 51.05 CFS = 4.4240 CFS/AC

JUAN TABO BRIDGE

A = 1.5832 AC
100% "D"

FROM AHYMO OUTPUT SHEETS 50-59
Q = 7.62 CFS

RESIDENTIAL LOTS

FROM AHYMO OUTPUT SHEETS 50-59
Q = 795.29 CFS

Q PER LOT = 0.702553 CFS

• FIND CURB TRANSITION FROM MOUNTABLE TO STD C+G

S = 4% n = 0.017 32' F-F MTBL C+G CAPACITY

d = 0.25
WP = 11.625
A = 1.3164
$V_{1/2}$ = 4.092 F/S
$Q_{1/2}$ = 5.3867 CFS

$d + V^2/2g = 0.51$ OK

OF LOTS = 5.3867/0.702553
= 7.667 USE 7 LOTS BEFORE TRANSITIONING TO STD C+G.

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 3 OF ____

FIND CAPACITY OF STREETS AT THE FOLLOWING SLOPES
STD C+G n=0.017 32' F-F

s = 4%
d = 0.41
wP = 32.82
A = 5.45
V = 5.28 F/s
Q = 28.79 cfs
$d + v^2/2g$ = 0.84 ≈ 0.85 OK
NO. OF LOTS = 40.98 SAY 41

s = 2%
d = 0.49
wP = 32.98
A = 8.01
V = 4.81 F/s
Q = 38.55 CFS
$d + v^2/2g$ = 0.85 OK
NO. OF LOTS = 54.87 SAY 54

s = 1%
d = 0.58
wP = 33.16
A = 10.89
V = 4.16 F/s
Q = 45.31 CFS
$d + v^2/2g$ = 0.85 OK
NO. OF LOTS = 64.49 SAY 64

5%
d = 0.38
wP = 15.13
A = 2.26
$V_{1/2}$ = 5.50 F/s
$Q_{1/2}$ = 12.44 CFS
$d + v^2/2g$ = 0.85 OK
NO. OF LOTS PER SIDE = 17.71 SAY 17

3%
d = 0.44
wP = 32.88
A = 6.41
V = 5.09 F/s
Q = 32.63 CFS
$d + v^2/2g$ = 0.84 OK
NO. OF LOTS = 46.44 SAY 46

8%
d = 0.31
wP = 11.56
A = 1.3506
$V_{1/2}$ = 5.9088 F/s
$Q_{1/2}$ = 7.98 CFS
$d + v^2/2g$ = 0.85 OK
NO. OF LOT PER SIDE = 11.36 SAY 11

6%
d = 0.35
wP = 13.60
A = 1.8406
$V_{1/2}$ = 5.6441
$Q_{1/2}$ = 10.3886 CFS
$d + v^2/2g$ = 0.84 OK
NO. OF LOTS = 14.79 say 14 EACH SIDE

D. Mark Goodwin & Associates, P.A.
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e-mail: dmg@swcp.com

PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED _____ DATE _____
SHEET 4 OF ____
REVISED - 5-31-06,

• FIND FLOW IN POMPANO PL JUST EAST OF JUAN TABO BLVD

$Q = 33 \times 0.702553 = 23.1842$ CFS
$S = 2.13\%$ $n = 0.017$ STD C+G 32' F-F

$d = 0.42$
$WP = 32.84$
$A = 5.77$
$V = 4.00$ F/S
$Q = 23.09$ CFS $\approx$ 23.18 OK
$d + V^2/2g = 0.67$ OK

THE FLOW ON THE NORTH SIDE WILL TURN ON TO JUAN TABO DRIVE.

• FIND Q AT WEST TERMINUS OF POMPANO PL.

$Q = 11.5921 + 14(0.702553)$
$= 14.4023$ CFS

FIND Q 300' EAST OF TERMINUS WHERE 8% SLOPE BEGINS

11.5921 CFS ON SOUTH SIDE > 7.98 CFS NO INLETS NEEDED
$10 \times (0.702553) = 7.0255$ CFS IS FLOW IN RETAMA CT

INSTALL TWO SINGLE A INLETS JUST EAST OF JUAN TABO BLVD
FROM NOMO SHEET 40
Q GRATE = 7.4 CFS
Q PAST INLETS = $23.1842 - 2(7.4)$
$= 8.3842$ CFS

• 4.1921 CFS WILL CONTINUE WEST ON THE SOUTHSIDE WHILE 4.1921 CFS WILL TURN ON JUAN TABO BLVD

FIND NEW Q AT TERMINUS
Q NORTHSIDE = $4(0.702553)$
$= 2.81$ CFS
Q SOUTHSIDE = 4.1921 CFS

TOTAL = 7.00 CFS

INSTALL DBL "A" DBL THROAT SUMP INLET IN BOTH WEST POMPANO TERMINUS AND RETAMA CT.

$Q_R = 3.0 H^{1.5}$ P = 17
$H = 0.27' < 0.67'$ OK
ASSUME 50% CLOGGED
$H = 0.42' = 0.67'$ OK

D. Mark Goodwin & Associates, P.A.
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e-mail: dmg@swcp.com

PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GSK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 5 OF ____

(REVISED 5-31-06)

• FIND FLOW ON RED MILE RD AT JUAN TABO BLVD

$Q = 31 \times 0.702553$
$= 21.7791$ CFS OK

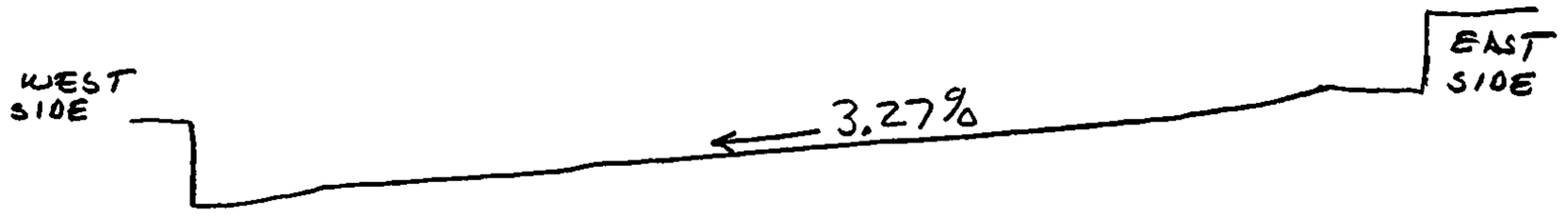
$S = 2.54\%$
$Q_{3\%} = 32.63$ CFS $Q_{2\%} = 38.55$ CFS

• FIND FLOW IN JUAN TABO DRIVE ON SOUTH SIDE OF POCONO RD

$Q = 4.1921 + 21.7791 + 0.8264(4.4240)$
$= 29.6272$ CFS

AREA OF JUAN TABO
$72' \times 500' = 0.8264$ AC

JUAN TABO DRIVE IS SUPERELEVATED IN THIS SECTION



• FIND CAPACITY $S = 1.0\%$ $n = 0.017$ 48' F-F STD C+G

$d = 0.67$
$wp = 19.34$
$A = 5.7575$
$V = 3.897$ F/S
$Q = 22.44$ CFS < 29.6272 CFS UG INLETS REQUIRED
$d + V^2/2g = 0.91$ OK

ADD TWO SGL "A" INLETS ON RED MILE BEFORE JUAN TABO

$Q = 21.7791$ CFS $S = 2.54\%$ $n = 0.017$ STD C+G 32' F-F

$d = 0.405$
$wp = 32.81$
$A = 5.29$
$V = 4.13$ F/S
$Q = 21.83$ CFS ≈ 21.78 OK
$d + V^2/2g = 0.67'$ OK

FROM NOMO SHEET 40
$Q_{GRATE} = 5.9$ CFS

$Q_{PAST\ INLETS\ INTO\ JUAN\ TABO\ DRIVE}$
$= 21.7791 - 2(5.9)$
$= 9.9791$ CFS

• FIND REVISED FLOW IN JUAN TABO ON SOUTH SIDE OF POCONO
$Q = 4.1921 + 9.9791 + 0.8264(4.4240)$
$= 17.8272$ CFS < 22.44 CFS OK

ADD ONE DBL "A" INLET ON WEST SIDE OF JUAN TABO

$S = 1.0\%$ $n = 0.017$ 48' F-F STD C+G

D. Mark Goodwin & Associates, P.A.
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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED DATE
SHEET 6 OF
(REVISED 5-31-06)

d= 0.62
wP = 17.76
A = 4.86
V = 3.685 F/S
Q = 17.91 CFS ≈ 17.83 OK
$d + V^2/2g = 0.85 < 0.91$ OK

FROM NOMO SHEET 41
Q GATE = 10 CFS
Q PAST INLET INTO POCONO
= 17.8272 - 10.00
= 7.8272 CFS

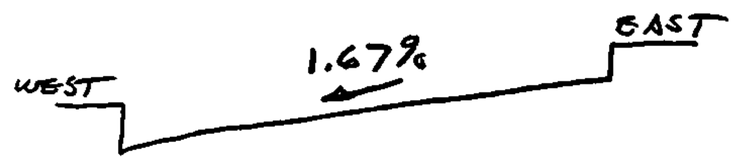
- FIND Q IN POCONO JUST EAST OF TIMONIUM DRIVE
Q = 25 x 0.702553
= 17.5638 CFS

- FIND Q IN NASHUA JUST EAST OF TIMONIUM DRIVE
Q = 24 x 0.702553
= 16.8613 CFS

- FIND Q IN TIMONIUM DRIVE JUST NORTH OF POCONO RD.
Q = 16.8613 + 0.4628 x (4.4240)
= 18.9087 CFS

TIMONIUM DRIVE IS SUPERELEVATED AT THIS POINT - 1.67%

- FIND CAPACITY
S = 1.59%
n = 0.017
STD C+G
48' F-F



d = 0.61
wP = 31.65
A = 8.137
V = 4.456 F/S
Q = 36.26 CFS
$d + V^2/2g = 0.92 \approx 0.91$ OK

D. Mark Goodwin & Associates, P.A.
Consulting Engineers
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e-mail: dmg@swcp.com

PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GSK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 7 OF ____
[REVISED 5-31-06]

• FIND Q IN POCONO RD JUST WEST OF TIMONIUM DRIVE
Q = 7.8272 + 17.5638 + 18.9087
= 44.2997 CFS > 32.63 CFS NG - NEED INLETS

• INSTALL TWO SGL "A" INLETS ON NASHUA JUST EAST OF TIMONIUM DRIVE

S = 2.71 % n = 0.017 32' F-F STD C+G
Q = 16.8613 CFS
d = 0.37
wP = 14.62
A = 2.1156
V = 3.966 F/S
Q ½ = 8.39 CFS x 2 = 16.78 CFS ≈ 16.86
d + V²/2g = 0.61

FROM NOMO SHEET 40
Q GRATE = 4.9 CFS

Q PAST INLETS INTO TIMONIUM
= 16.8613 - 2(4.9)
= 7.0613 CFS

• INSTALL ONE DBL "A" INLET ON TIMONIUM JUST NORTH OF POCONO RD.
Q = 7.0613 + 0.4628(4.4240)
= 9.1087 CFS
d = 0.40
wP = 18.87
A = 2.9396
V = 3.19 F/S
Q = 9.38 CFS ≈ 9.1087 CFS OK
d + V²/2g = 0.56 OK

FROM NOMO SHEET 41
Q GRATE = 5.1 CFS

Q PAST INLET INTO POCONO RD
= 9.1087 - 5.1
= 4.0087 CFS

• REVISED Q IN POCONO JUST WEST OF TIMONIUM DRIVE
Q = 7.8272 + 17.5638 + 4.0087
= 29.3997 CFS < 32.63 CFS OK

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY BJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 8 OF ____
(REVISED 5-31-06)

• ADD 2 DBL "A" INLETS AT THE WEST RETURNS ON POCONO RD
S = 3% n = 0.017 32' F-F STD C+G
Q = 29.3997 CFS

d = 0.43
WP = 32.86
A = 6.09
V = 4.92 F/S
Q = 29.975 CFS ≈ 29.3997 OK

FROM NOMO SHEET 41
Q GRATE = 8.0 CFS
Q PAST INLETS IN POCONO RD
= 29.3997 - 2(8)
= 13.3997 CFS

• FIND Q ON POCONO JUST EAST OF JUAN TABO BLVD
Q = 13.3997 + 21(0.702553)
= 28.1533 CFS ≈ 28.79 CFS OK BUT ADD 2 "B" INLETS

S = 4% 32' F-F STD C+G n = 0.017
d = 0.41 SEE SHEET 3

FROM NOMO SHEET 42
Q GRATE = 10.25 CFS
Q PAST INLETS INTO INTERSECTION
= 28.1533 - 2(10.25)
= 7.6533 CFS

• FIND Q ON POCONO JUST EAST OF MAYWOOD S = 1.0%
Q = 7.6533 + 20(0.702553) + 0.5124(4.424)
= 23.9712 CFS < 45.31 OK BUT ADD TWO DBL "A" INLETS
d = 0.47 Q = 23.74 ≈ 23.9712
FROM NOMO SHEET 41
Q GRATE = 5.9 CFS
Q PAST INLET = 23.9712 - 2(5.9) = 12.1712 CFS HALF WILL TURN ON MAYWOOD
6.09 CFS WILL CONTINUE WEST

• FIND Q ON MAYWOOD 6 LOTS NORTH OF TRISTLE DOWN S = 1.0%
Q = 12.1712/2 + 32(0.702553) = 28.5673 CFS < 45.31 OK
ADD TWO DBL "A" INLETS

d = 0.50
WP = 33.0
A = 8.33
V = 3.49 F/S
Q = 29.083 CFS ≈ 28.5673 CFS OK

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED DATE
SHEET 9 OF
[REVISED 5-31-06]

FROM NOMO SHEET 41
$Q_{GRATE} = 6.6$ CFS

$Q_{PAST\ INLETS} = 28.5673 - 2(6.6)$
$= 15.3673$ CFS GO TO SHEET 12

- FIND Q ON HARRINGTON JUST SOUTH OF BLUE RIBBON
$Q = 43 \times 0.702553$
$= 30,2098$ CFS

- FIND Q ON BLUE RIBBON JUST EAST OF FONNER DR $S = 4.48\%$
$Q = 27 \times 0.702553$
$= 18.9689$ CFS

- FIND Q ON FONNER JUST SOUTH OF BLUE RIBBON
$Q = 13 \times 0.702553$
$= 9.1332$ CFS

- ADD 2 SGL "A" INLETS ON BLUE RIBBON JUST EAST OF FONNER DR.

$S = 4.48\%$ 32' F-F STD C+G $n = 0.017$

$d = 0.36$
$wp = 14.11$
$A = 1.9756$
$V_{1/2} = 4.9688$ F/S
$Q_{1/2} = 9.8559$ CFS $\times 2 = 19.7118$ CFS ≈ 18.9689 CFS OK
$d + V^2/2g = 0.75'$ OK

FROM NOMO SHEET 40
$Q_{GRATE} = 6.1$ CFS

Q PAST INLETS
$= 18.9689 - 2(6.1)$
$= 6.7689$ CFS

- FIND Q ON BLUE RIBBON JUST EAST OF NORTHLANDS
$Q = 6.7689 + 9.1332 + 6(0.702553)$
$= 20.1174$ CFS

- ADD 2 SGL "A" INLETS 4 LOTS SOUTH OF BLUE RIBBON ON NORTHLANDS
$Q = 30.2098 - 4(0.702553)$
$= 27.3996$ CFS

$S = 4\%$ 32' F-F $n = 0.017$ STD C+G

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PROJECT JUAN TABO HILLS
SUBJECT ORDINANCE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 10 OF ____
REVISED 1-26-06, (5-31-06)

d = 0.405
wp = 32.81
A = 5.29
V = 5.18 F/S
Q = 27.40 CFS ≈ 27.3996 CFS OK < 28.79 CFS OK see sheet 3

FROM NOAA SHEET 40
Q GATE = 7.0 CFS
Q PAST INLETS INTO BLUE RIBBON
= 27.3996 - 2(7.0) + 4(0.202553)
= 16.2098 CFS

• FIND Q ON BLUE RIBBON JUST EAST OF JUAN TABO BLVD
Q = 16.2098 + 20.1174 + 2(0.202553)
= 37.7323 CFS

INSTALL 2 "B" INLETS AT WEST RETURNS OF BLUE RIBBON AND NORTHBOUND
48' F-F STD C+G n = 0.017 S = 2.79%

d = 0.47
wp = 19.72
A = 3.79
$V_{1/2}$ = 4.86 F/S
$Q_{1/2}$ = 18.43 CFS x 2 = 36.86 CFS ≈ 37.7323 OK
$d + V^2/2g$ = 0.84' OK

FROM NOAA SHEET 42
Q GATE = 12.50 CFS
Q PAST INLETS INTO JUAN TABO BLVD
= 37.7323 - 2(12.5)
= 12.7323 CFS

• FIND FLOW AT LOW POINT OF JUAN TABO BLVD JUST SOUTH OF GALLANT FOX ROAD
Q = 12.7323 + 1.1290(4.424) + 0.7107(4.424) + 0.5839 - FROM 136
= 20.8490 CFS

• INSTALL TWO DBL "A" DBL THROAT INLETS IN SUMP
$Q/P = 3.0 H^{1.5}$ P = 17
H = 0.35' < 0.67' OK

ASSUME 50% CLOGGED
H = 0.55' < 0.91' OK

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED DATE
SHEET 11 OF
[REVISED 5-31-06]

• FIND FLOW ON BLUE RIBBON JUST EAST OF PLEASANTON AR.

$Q = 50. \times 0.702553$

$= 35.1276$ CFS INSTALL 2-DBL "A" INLETS AT THIS LOCATION

$S = 2.5\%$ 32'F-F $n = 0.017$ STD C+G

$d = 0.46$
$wP = 32.92$
$A = 7.05$
$V = 4.947$ F/S
$Q = 34.88 \not\geq 35.1276$ CFS OK
$d + v^2/2g = 0.84$ OK

FROM NOMO SHEET 41
$Q_{GRATE} = 8.6$ CFS

Q PAST INLETS
$= 35.1276 - 2(8.6)$
$= 17.9276$ CFS

• FIND Q JUST WEST OF PLEASANTON ON BLUE RIBBON
$Q = 17.9276 + 26(0.702553)$
$= 36.1940$ CFS

ADD TWO DBL "A" INLETS AT THIS POINT

$Q_{GRATE} = 8.6$ CFS FROM NOMO SHEET 41

Q PAST INLETS
$= 36.194 - 2(8.6)$
$= 18.9940$ CFS

• ADD TWO "B" INLETS TWO LOTS WEST $S = 2.5\%$

$Q = 18.9940 + 2(0.702553)$
$= 20.3991$ CFS

$d = 0.40$
$wP = 16.15$
$A = 2.5656$
$V_{1/2} = 4.054$ F/S
$Q_{1/2} = 10.401$ CFS $\times 2 = 20.802$ CFS $\not\geq 20.3991$ CFS OK

FROM NOMO SHEET 42
$Q_{GRATE} = 8.4$ CFS
Q PAST INLETS
$= 20.3991 - 2(8.4)$
$= 3.5991$ CFS

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-31-06
CHECKED ____ DATE ____
SHEET 12 OF ____

• FIND Q ON MAYWOOD 2 LOTS SOUTH OF BLUE RIBBON

$Q = 15.3673 + 20(0.702553)$
$= 29.4184$ CFS

ADD TWO "B" INLETS
$d = 0.50$
FROM NOMO SHEET 42
$Q_{GRATE} = 7.8$ CFS
Q PAST INLETS
$= 29.4184 - (2 \times 7.8)$
$= 13.8184$ CFS

• FIND Q AT WEST END OF BLUE RIBBON

$Q = 13.8184 + 3.5991 + 5(0.702553)$
$= 20.9302$ CFS CONTINUES WEST

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 1-26-06
CHECKED _____ DATE _____
SHEET 13 OF ____

• FIND FLOW ON GALLNT FOX ROAD JUST EAST OF TIMONIUM DRIVE

$Q = 24 \times 0.702553$

$= 16.8613$ CFS

• FIND FLOW ON GALLNT FOX ROAD JUST WEST OF SMARTY JONES STREET

$Q = 16.8613 + 3(0.702553) + [(0.9917 + 0.595)(4.424)]$

$= 25.9885$ CFS

• INSTALL TWO DBL "A" INLETS AT WEST RETURN

$S = 4.35\%$ 32' F-F $n = 0.017$ STD C+G

$d = 0.39$

$WP = 15.64$

$A = 2.41$

$V_{1/2} = 5.24$ F/S

$Q_{1/2} = 12.63$ CFS $\times 2 = 25.26$ CFS ≈ 25.9885 OK

$d + V^2/2g = 0.82$ OK

FROM NOMO SHEET 41

$Q_{GRATE} = 7.6$ CFS

Q PAST INLETS

$= 25.9885 - 2(7.6)$

$= 10.7885$ CFS

• FIND FLOW ON GALLNT FOX ROAD JUST EAST OF JUAN TABO DRIVE

$Q = 10.7885 + 20(0.702553)$

$= 24.8396$ CFS

• INSTALL 2 SGL "A" INLETS 2 LOTS EAST $S = 4.35\%$ STD C+G

$Q = 24.8396 - 2(0.702553)$

$= 23.4345$ CFS

$d = .38$

$WP = 15.13$

$A = 2.26$

$V_{1/2} = 5.13$ F/S

$Q_{1/2} = 11.60$ CFS $\times 2 = 23.20$ CFS ≈ 23.4345 OK

FROM NOMO SHEET 40

$Q_{GRATE} = 6.5$ CFS

Q PAST INLETS

$= 23.4345 - 2(6.5)$

$= 10.4345$ CFS

• INSTALL 2 TYPE "B" INLETS AT EAST RETURNS OF GALLNT FOX & J.T.

$Q = 10.4345 + 2(0.702553)$

$= 11.8396$ CFS

$S = 2.6\%$ STD C+G

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PROJECT Juno Tabo Hills
SUBJECT Drainage Calcs
BY GSK DATE 1-26-06
CHECKED ____ DATE ____
SHEET 136 OF ____

[REVISED 5-31-06]

$d = 0.35$
$wp = 13.60$
$A = 1.8406$
$V_{1/2} = 3.72$ F/s

$Q_{1/2} = 6.839$ cfs $\times 2 = 13.68$ cfs ≈ 12.7839

FROM NOMO SHEET 42
Q GRATE = 6.1 cfs
Q PAST INLETS
$= 12.7839 - 2(6.1)$
$= 0.5839$ cfs

• FIND Q ON AQUEDUCT BETWEEN LOTS 5+6 BLOCK 12
$Q = 41\,(0.702553)$ $S = 4.0\%$ STD C+G 32'F-F
$= 28.8047$ cfs
FROM SHEET 3 $d = 0.41$
INSTALL 2 DBL "A" INLETS
FROM NOMO SHEET 41
Q GRATE = 7.8 cfs
Q PAST INLETS
$= 28.8047 - 2(7.8)$
$= 13.2047$ cfs

• FIND FLOW ON AQUEDUCT JUST EAST OF TIMONIUM - Between lots 2+3 Blk 12
$Q = 13.2047 + 8\,(0.702553)$
$= 18.8251$ cfs
INSTALL 2 "B" INLETS $S = 2.5\%$
$d = 0.39$
$wp = 15.64$
$A = 2.41$
$V_{1/2} = 3.97$ F/s
$Q_{1/2} = 9.57$ cfs $\times 2 = 19.14$ cfs ≈ 18.8251 OK
FROM NOMO SHEET 42
Q GRATE = 8.0 cfs
Q PAST INLETS INTO TIMONIUM
$= 18.8251 - 2(8)$
$= 2.8251$ cfs

• FIND FLOW AT DBL "A" DBL THROAT SUMP INLET ON TIMONIUM JUST SOUTH OF GALLANT FOX
$Q = 2.8251 + 0.9421(4.424)$
$= 6.9930$ cfs
$H = 0.27'$ OK
IF 50% CLOGGED
$H = 0.42'$ OK

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED _____ DATE _____
SHEET 14 OF ____

REVISED 1-26-06

- FIND FLOW AT WEST END OF: GALLANT FOX AT SUMP

$Q = .17(0.702553)$
$= 11.9434$ CFS

- FIND FLOW ON DAN PATCH ROAD JUST SOUTH OF BUCK GOLD STREET

$Q = 32 \times 0.702553$
$= 22.4817$ CFS OK

- FIND FLOW ON BUCK GOLD STREET JUST EAST OF DAN PATCH ROAD

$Q = 19 \times 0.702553$
$= 13.3485$ CFS OK

- FIND FLOW ON BUCK GOLD STREET JUST EAST OF TIMONIUM DRIVE

$Q = 22.4817 + 13.3485 + 4(0.702553)$
$= 38.6404$ CFS

INSTALL TWO DBL "A" INLETS AT THIS POINT
$S = 1.0\%$ $n = 0.017$ 32' F-F STD C+G

$d = 0.55$
$WP = 33.10$
$A = 9.93$
$V = 3.92$ F/S
$Q = 38.8986$ CFS $\approx$ 38.6404 OK
$d + V^2/2g = 0.79$ OK

FROM NOMO SHEET 41
$Q_{ENTE} = 8.2$ CFS
Q PAST INLETS INTO TIMONIUM DRIVE
$= 38.6404 - 2(8.2)$
$= 22.2404$ CFS

- FIND FLOW ON BOLD RULER STREET JUST EAST OF TIMONIUM DRIVE

$Q = 26 \times 0.702553$
$= 18.2664$ CFS

- ADD 2 "B" INLETS ON TIMONIUM DRIVE JUST SOUTH OF BOLD RULER STREET.

$Q = 22.2404$ CFS $S = 1.0\%$ 32' F-F STD C+G $n = 0.017$
$d = 0.46$
$WP = 32.92$
$A = 7.05$
$V = 3.13$ F/S
$Q = 22.06$ CFS $\approx$ 22.24 OK

FROM NOMO SHEET 42
$Q_{ENTE} = 6.4$ CFS

Q PAST INLETS
$= 22.2404 - 2(6.4) = 9.4404$ CFS

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 15 OF ____

• FIND FLOW IN TIMONIUM JUST SOUTH OF BUSHER STREET

$Q = 9.4404 + 18.2664$

$= 27.7068$ CFS < 28.79 CFS OK $\quad S = 4.0\%$ see sheet 3

• INSTALL TWO DBL "A" INLETS AT THIS POINT

$d = 0.405$

$WP = 32.81$

$A = 5.29$

$V = 5.18$ F/S

$Q = 27.40$ CFS ≈ 27.71 CFS OK

FROM NOAA SHEET 41

$Q_{GATE} = 7.8$ CFS

Q PAST INLETS INTO BUSHER STREET

$= 27.7068 - 2(7.8)$

$= 12.1068$ CFS

• FIND Q IN BUSHER STREET JUST EAST OF TIMONIUM DRIVE

$Q = 20 \times 0.702553$

$= 14.0511$ CFS OK

• FIND Q IN BUSHER STREET JUST SOUTH OF CAM FELLA STREET

$Q = 14.0511 + 12.1068 + 10(0.702553)$

$= 33.1834$ CFS < 38.55 CFS OK $\quad S = 2\%$ see sheet 3

• INSTALL TWO DBL "A" INLETS AT THIS POINT

$S = 2.0\%$ 32' F-F $n = 0.017$ STD C+G

$d = 0.47$

$WP = 32.94$

$A = 7.37$

$V = 4.556$ F/S

$Q = 33.5775$ CFS ≈ 33.1834 OK

FROM NOAA SHEET 41

$Q_{GATE} = 8.6$ CFS

Q PAST INLETS INTO CAM FELLA STREET

$= 33.1834 - 2(8.6)$

$= 15.9834$ CFS

• FIND Q IN CAM FELLA STREET JUST EAST OF BUSHER STREET

$Q = 29 \times 0.702553$

$= 20.3740$ CFS

INSTALL TWO DBL "A" INLETS AT THIS POINT

$S = 4\%$ 32' F-F STD C+G $n = 0.017$

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 16 OF ____

$d = 0.37$
$wP = 14.62$
$A = 2.1156$
$V_{1/2} = 4.8186$ F/S
$Q_{1/2} = 10.1943$ CFS $\times 2 = 20.3886$ CFS ≈ 20.3740 CFS OK

FROM NOMO SHEET 41
$Q_{GATE} = 6.5$ CFS
Q PAST INLETS
$= 20.3740 - 2(6.5)$
$= 7.3740$ CFS

- FIND Q IN CAM FELLA STREET JUST EAST OF BOLD RULER STREET
$Q = 7.3740 + 18(0.702553)$
$= 20.02$ CFS

- FIND Q IN BOLD RULER JUST SOUTH OF CAM FELLA STREET
$Q = 31 \times 0.702553$
$= 21.7791$ CFS

- INSTALL TWO DBL "A" INLETS ON CAM FELLA AT THIS LOCATION
$S = 2.68\%$ $n = 0.017$ 32' F-F STD C+G
$d = .39$
$WP = 15.64$
$A = 2.41$
$V_{1/2} = 4.113$ F/S
$Q_{1/2} = 9.91$ CFS $\times 2 = 19.82$ CFS ≈ 20.02 CFS OK

FROM NOMO SHEET 41
$Q_{GATE} = 6.2$ CFS
Q PAST INLETS
$= 20.02 - 6.2(2)$
$= 7.62$ CFS

- FIND Q ON CAM FELLA JUST EAST OF BUCK GOLD STREET
$Q = 7.62 + 21.7791 + 7(0.702553)$
$= 34.317$ CFS < 38.55 CFS 2.0% see sheet 3

- INSTALL TWO DBL "A" INLETS AT THIS POINT
$d = 0.47$ 2% 32' F-F $n = 0.017$ STD C+G
$WP = 32.94$
$A = 7.37$
$V = 4.556$ F/S
$Q = 33.58$ CFS ≈ 34.317 CFS OK

FROM NOMO SHEET 41
$Q_{GATE} = 8.6$ CFS

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PROJECT SUN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GSK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 17 OF ____

Q past INLETS
= 34.317 − 2(8.6)
= 17.117 cfs

• FIND Q ON BUCK GOLD STREET JUST SOUTH OF ALYDAR AVE.
Q = 23 × 0.702553
= 16.1587 cfs

• ½ THE FLOW WILL TURN ON ALYDAR AVE, ½ WILL CONTINUE

• FIND Q ON BUCK GOLD STREET JUST SOUTH OF CAM FELLA STREET
$Q = \frac{16.1587}{2} + 26(0.702553)$

=26.3457 cfs

INSTALL 2 OBL "A" INLETS AT ~~THIS~~ POINT
S=1% 32' F-F n=0.017 STD C+G
d = 0.48
wP = 32.96
A = 7.69
V = 3.31 F/S
Q = 25.48 cfs ≯ 26.3457 OK

FROM NOAA SHEET 41
Q_{GRATE} = 6.2 cfs

Q past INLETS INTO CAM FELLA
= 26.3457 − 2(6.2)
= 13.9457 cfs

• FIND Q IN CAM FELLA JUST EAST OF GULFSTREAM DRIVE
Q = 13.9457 + 17.117 + 3(0.702553)
= 33.1704 cfs

• FIND Q IN GULFSTREAM DRIVE JUST SOUTH OF CAM FELLA
$Q = \frac{16.1587}{2} + 2.397(4.424)$

= 18.6837 cfs

• FIND CAPACITY OF GULFSTREAM DRIVE AT CAM FELLA
S = 1.0% 48' F-F STD C+G n = 0.017

d = 0.65
wP = 49.30
A = 15.77
V = 4.088 F/S
Q = 64.4755 cfs
$d + V^2/2g$ = 0.91 = 0.91 OK

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PROJECT SAN TAO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 18 OF ____

• INSTALL TWO SGL "A" INLETS ON GULFSTREAM DRIVE JUST SOUTH OF CAM FELLA

$Q = 18.6837$ CFS $n = 0.017$ 48' F-F STD C+G

$d = 0.45$
$wP = 18.70$
$A = 3.415$
$V_{1/2} = 2.814$ F/S
$Q_{1/2} = 9.612$ CFS $\times 2 = 19.22$ CFS ≈ 18.68 CFS OK

FROM NOMO SHEET 40
$Q_{GRATE} = 4.7$ CFS
$Q_{PAST\ INLETS} = 9.2837$ CFS

• FIND Q JUST NORTH OF CAM FELLA
$= 9.2837 + 33.1704$
$= 42.4541$ CFS

• INSTALL TWO "B" INLETS AT RETURUS

$d = 0.58$ $S = 1\%$ 48' F-F STD C+G $n = 0.017$
$wP = 49.16$
$A = 12.41$
$V = 3.49$ F/S
$Q = 43.33$ CFS ≈ 42.45 CFS OK

FROM NOMO SHEET 42
$Q_{GRATE} = 11.25$ CFS
$Q_{PAST\ INLETS} = 42.4541 - 2(11.25)$
$= 19.9541$ CFS

• INSTALL TWO "B" INLETS 150' NORTH

$Q = 19.9541 + 0.4628(4.424)$
$= 22.00$ CFS

$d = 0.47$
$wP = 19.72$
$A = 3.79$
$V_{1/2} = 2.91$ F/S
$Q_{1/2} = 11.03$ CFS $\times 2 = 22.06$ CFS ≈ 22.00 CFS OK

FROM NOMO SHEET 42
$Q_{GRATE} = 6.6$ CFS
$Q_{PAST\ INLETS} = 22.00 - 2(6.6) = 8.80$ CFS

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 19 OF ____
REVISED 1-26-06

• FIND Q IN SMARTY JONES STREET JUST SOUTH OF SIR BARTON RD.

$Q = 42 \times 0.702553$

$= 29.5072$ CFS

½ FLOW WILL TURN ON SIR BARTON

• FIND Q ON SIR BARTON JUST EAST OF MAN O'WAR

$Q = \frac{29.5072}{2} + 5(0.702553)$

$= 18.2664$ CFS

• FIND Q IN SMARTY JONES STREET JUST SOUTH OF SUNNY BAY RD.

$Q = \frac{29.5072}{2} + 6(0.702553)$

$= 18.9689$ CFS

• FIND Q THAT TURNS ON SUNNY BAY RD

HALF SECTION TO CROWN CAPACITY OF 1% SLOPE

$d = .405$
$WP = 32.81$
$A = 5.29$
$V = 2.589$ F/S
$Q = 13.6981$ CFS DIVIDE BY 2 = 6.849 CFS

½ OF FLOW WILL TURN

• FIND Q ON SUNNY BAY ROAD JUST EAST OF MAN O'WAR

$Q = \frac{18.9689}{2} + 16(0.702553)$

$= 20.7253$ CFS

• FIND Q IN SMARTY JONES STREET AT NATIVE DANCER ROAD

$Q = \frac{18.9689}{2} + 8(0.702553)$

$= 15.1049$ CFS

• FIND Q ON NATIVE DANCER JUST EAST OF MAN O'WAR

$Q = 15.1049 + 23(0.702553)$
$= 31.2636$ CFS

• FIND Q ON MAN O'WAR JUST SOUTH OF SIR BARTON

$Q = 24 \times 0.702553$
$= 16.8613$ CFS

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 20 OF ____

REVISED 1-26-06

• INSTALL 2 DBC "Δ" INLETS AT THIS POINT
S = 2.43% 32' F-F STD C+G n = 0.017

d = 0.38
wP = 15.13
A = 2.26
V = 3.84 F/S
Q = 8.67 CFS x2 = 17.34 > 16.8613 CFS OK
$d + V^2/2g$ = 0.61' OK

FROM NOMO SHEET 41
Q_{GRATE} = 5.9 CFS

Q PAST INLETS
= 16.8613 − 2(5.9)
= 5.0613 CFS

• FIND Q ON NW 9' WAY JUST SOUTH OF SUNNY BAY
Q = 5.0613 + 18.2664 + 5(0.702553)
= 26.8405 CFS

• INSTALL TWO DBC "A" INLETS AT THIS POINT
d = 0.43
wP = 32.86
A = 6.09
V = 4.43 F/S
Q = 26.97 CFS > 26.8405 OK
$d + V^2/2g$ = 0.73 OK

FROM NOMO SHEET 41
Q_{GRATE} = 7.6 CFS

Q PAST INLETS
= 26.8405 − 2(7.6)
= 11.6405 CFS

• INSTALL 2 "B" INLETS ON THE NORTH SIDE OF SUNNY BAY
Q = 11.6405 + 20.7253 + 0.702553
= 33.0684 CFS

d = 0.455
wp = 32.91
A = 6.89
V = 4.80 F/S
Q = 33.10 > 33.0684
$d + V^2/2g$ = 0.81 OK

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SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED _____ DATE _____
SHEET 21 OF ____

REVISED 1-26-06

FROM NOMO SHEET 42
$Q_{GRATE} = 11.25$ CFS

$Q_{PAST\ INLETS}$
$= 33.0684 - 2(11.25)$
$= 10.5684$ CFS

• FIND Q ON MAN O' WAR JUST SOUTH OF NATIVE DANCER
$Q = 10.5684 + 9(0.702553)$
$= 16.8914$ CFS

• INSTALL TWO ABL "A" INLETS ON NATIVE DANCER EAST OF MAN O' WAR TWO LOTS BACK
$Q = 31.2636 - 2(0.702553)$
$= 29.8585$ CFS
$S = 3.5\%$ 32' F-F STD CTG $n = 0.017$

$d = 0.42$
$WP = 32.84$
$A = 5.77$
$V = 5.13$ F/S
$Q = 29.60$ CFS ≈ 29.8585 OK
$d + V^2/2g = 0.83$ OK

FROM NOMO SHEET 41
$Q_{GRATE} = 8.0$ CFS

$Q_{PAST\ INLETS}$
$= 29.8585 - 2(8.0)$
$= 13.8585$ CFS

• FIND Q JUST NORTH OF NATIVE DANCER ON MAN O' WAR
$Q = 13.8585 + 16.8914 + 3(0.702553)$
$= 32.8576$ CFS

• INSTALL TWO "B" INLETS AT THIS POINT

$d = 0.455$ $S = 2.43\%$ $n = 0.017$ STD CTG 32' FF
$WP = 32.91$
$A = 6.89$
$V = 4.80$ F/S
$Q = 33.10$ CFS ≈ 32.8576 CFS OK
$d + V^2/2g = 0.81$ OK

FROM NOMO SHEET 42
$Q_{GRATE} = 11.25$ CFS

$Q_{PAST\ INLETS}$
$= 32.8576 - 2(11.25) = 10.3576$ CFS

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PROJECT JUMI TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 22 OF ____

REVISED 1-26-06

• FIND Q AT NORTH END OF MAN O' WAR

$Q = 10.3576 + 4(0.702553)$
$= 13.17$ CFS

• INSTALL TWO SGL "A" INLETS IN SUMP

$Q/P = 3.0H^{1.5}$ $P = 11$

$H = 0.34' < 0.67'$ OK

ASSUME 50% CLOGGED

$H = 0.54' < 0.67'$ OK

• FIND Q ON EASY GOER ROAD JUST EAST OF WAR ADMIRAL DRIVE

$Q = 38 \times 0.702553$
$= 26.697$ CFS

INSTALL 2 SGL "A" INLETS

$S = 1.0\%$ 32' F-F STD C+G $n = 0.017$

$d = 0.49$
$WP = 32.98$
$A = 8.01$
$V = 3.40$ F/S
$Q = 27.25$ CFS $\geq$ 26.697 OK
$d + V^2/2g = 0.67$ OK

FROM NOMO SHEET 40
$Q_{GRATE} = 5.7$ CFS

Q PAST INLETS AND INTO WAR ADMIRAL
$= 26.697 - 2(5.7)$
$= 15.297$ CFS

• FIND Q ON WAR ADMIRAL JUST NORTH OF EASY GOER

$Q = 34 \times 0.702533$
$= 23.8868$ CFS

INSTALL TWO SGL "A" INLETS HERE

$S = 1.0\%$
$d = 0.47$
$WP = 32.94$
$A = 7.37$
$V = 3.22$ F/S
$Q = 23.74$ CFS $\approx$ 23.8868 OK

FROM NOMO SHEET 40
Q GRATE = 5.2 CFS

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SUBJECT DRAINAGE CALCS
BY GSK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 23 OF ____

REVISED 1-26-06

Q PAST INLETS
= 23.8868 - 2(5.2)
= 13.4868 CFS

• FIND Q JUST SOUTH OF EASY GOER ON WAR ADMIRAL
Q = 15.297 + 13.4868 + 2 (0.702553)
= 30.1889 CFS

INSTALL TWO "B" INLETS HERE

S = 2.0%
d = 0.46
wp = 32.92
A = 7.05
V = 4.42 F/S
Q = 31.20 CFS > 30.19 CFS OK

FROM NOMO SHEET 42
Q GATE = 11.0 CFS

Q PAST INLETS
= 8.1889 CFS

• FIND Q AT SOUTH END OF WAR ADMIRAL AT SUMP
Q = 8.1889 + 5 (0.702553)
= 11.7017 CFS

• TOTAL SUMP Q
Q = 11.7017 + 11.9434 (see sheet 14)
= 23.6451 CFS

USE TWO DBL "A" DBL THROAT INLETS

Q/P = 3.0 H^1.5 P = 17

H = 0.38' < 0.67' OK

ASSUME 50% CLOGGED

H = 0.60' < 0.85' OK

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 24 OF ____

• FIND Q ON STREET "L" JUST EAST OF STREET "M"

$Q = 25 \times 0.702553$

$= 17.5638$ CFS

• FIND Q ON STREET "N" JUST EAST OF STREET "M"

$Q = 13 \times 0.702553$

$= 9.1332$ CFS

• FIND Q ON STREET "M" JUST NORTH OF STREET "N"

$Q = 28 \times 0.702553$

$= 19.6715$ CFS

• FIND Q ON STREET "M" JUST NORTH OF STREET "L"

$Q = 9.1332 + 19.6715 + 6(0.702553)$

$= 33.02$ CFS

• INSTALL TWO DBL "A" INLETS ON STREET "L" JUST EAST OF STREET "M"

$Q = 17.5638$ CFS

$S = 1\%$ $n = 0.017$ 32' F-F STD C+G

$d = 0.43$

$WP = 32.86$

$A = 6.09$

$V = 2.84$ F/S

$Q = 17.30$ CFS $\approx$ 17.5638 OK

FROM NOAA SHEET 41

$Q_{GRATE} = 5.0$ CFS

Q PAST INLETS

$= 17.5638 - 2(5.0)$

$= 7.5638$ CFS

• INSTALL TWO DBL "A" INLETS JUST SOUTH OF STREET "N" ON STREET "M"

$Q = 9.1332 + 19.6715 + 0.702553$

$= 29.5073$ CFS

$S = 1.0\%$ $n = 0.017$ 32' F-F STD C+G

$d = 0.50$

$WP = 33$

$A = 8.33$

$V = 3.49$ F/S

$Q = 29.08$ CFS $\approx$ 29.5073 CFS OK

FROM NOAA SHEET 41

$Q_{GRATE} = 6.7$ CFS

Q PAST INLETS

$= 29.5073 - 2(6.7)$

$= 16.1073$ CFS

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 3-17-05
CHECKED ____ DATE ____
SHEET 25 OF ____

• INSTALL 2 "B" INLETS ON STREET "M" JUST NORTH OF STREET "L"

$Q = 16.1073 + 5(0.702553)$
$= 19.6201$ CFS
$S = 1.0\%$ 32' F-F $n = 0.017$ STD C+G
$d = 0.45$
$wp = 32.90$
$A = 6.73$
$V = 3.03$ F/S
$Q = 20.42$ CFS ≈ 19.6201 CFS OK

FROM NOMO SHEET 42
$Q_{GRATE} = 6.2$ CFS
Q PAST INLETS
$= 19.6201 - 2(6.2)$
$= 7.2201$ CFS CONTINUES INTO STREET "L"

• FIND Q IN STREET "L" JUST EAST OF GULFSTREAM
$Q = 7.2201 + 7.5638$
$= 14.7839$ CFS

• FIND Q IN STREET "L" JUST WEST OF GULFSTREAM
$Q = 14.7839 + 8.80$
$= 23.5839$ CFS

• FIND Q IN STREET "L" 130' EAST OF JUAN TABO

$Q = 23.5839 + \frac{750 \times 72}{43560}(4.424)$
$= 29.0682$ CFS

INSTALL TWO OBC "A" INLETS
$S = 2.22\%$ $n = 0.017$ 48' F-F STD C+G

$d = 0.46$
$wp = 19.21$
$A = 3.60$
$V_{1/2} = 4.265$ F/S
$Q_{1/2} = 15.35$ CFS $\times 2 = 30.70$ CFS ≈ 29.0682 OK

FROM NOMO SHEET 41
$Q_{GRATE} = 8.4$ CFS
Q PAST INLETS
$= 29.0682 - 2(8.4)$
$= 12.2682$ CFS

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-11-05
CHECKED ____ DATE ____
SHEET 26 OF ____

• FIND Q ON JUAN TABO JUST NORTH OF STREET "L"

$$Q = \left[\left(\frac{1604 \times 72}{43560}\right) + \left(\frac{130 \times 72}{43560}\right)\right] 4.424 + 12.2682$$

$$= 24.9479 \text{ CFS}$$

INSTALL ONE DBL "A" INLET ON THE EAST SIDE
S = 3.0% n = 0.017 STD C+G 56'F-F AT THIS POINT

$$Q_{\text{WEST SIDE}} = \left(\frac{1604 \times 72}{43560}\right) 4.424/2$$

$$= 5.8645 \text{ CFS}$$

$$Q_{\text{EAST SIDE}} = 24.9479 - 5.8645$$
$$= 19.0834 \text{ CFS}$$

d = 0.47
WP = 19.72
A = 3.79
$V_{1/2}$ = 5.042 F/S
$Q_{1/2}$ = 19.11 CFS ≈ 19.08 OK
$d + V^2/2g$ = 0.86 OK

FROM NOAA SHEET 41
Q_{GATE} = 9.3 CFS
$Q_{PAST\ INLET\ ON\ EAST\ SIDE}$
= 19.0834 - 9.3
= 9.7834 CFS

• FIND Q ON JUAN TABO 475' TO THE NORTH

$$Q = \left(\frac{475 \times 80}{43560}\right) 4.424$$

= 3.8593 CFS

= 1.9297 CFS PER SIDE

$$Q_{WEST} = 5.8645 + 1.9297$$
$$= 7.7942 \text{ CFS}$$

$$Q_{EAST} = 9.7834 + 1.9297$$
$$= 11.7131 \text{ CFS}$$

INSTALL SGL "A" INLETS AT THIS POINT
S = 0.6% 60'F-F n = 0.017 STD C+G

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-11-05
CHECKED ____ DATE ____
SHEET 22 OF ____
[REVISED 5-31-06]

- $d_{WEST} = 0.46$
  $WP = 19.21$
  $A = 3.60$
  $V_{1/2} = 2.217$ F/S
  $Q_{1/2} = 7.9824$ CFS ≈ 7.7942 OK

  $d_{EAST} = 0.52$
  $WP = 22.27$
  $A = 4.8156$
  $V_{1/2} = 2.4393$ F/S
  $Q_{1/2} = 11.7467$ CFS ≈ 11.7131 OK

FROM NOMO SHEET

$Q_{GATE} = 4.1$ CFS

$Q_{PAST\ INLET} = 7.7942 - 4.1 = 3.6942$ CFS

$Q_{GATE} = 5.3$ CFS

$Q_{PAST\ INLET} = 11.7131 - 5.3 = 6.4131$ CFS

- FIND Q ON JUAN TABO JUST NORTH OF SUMP

$Q_{WEST} = 3.6942 + \left(\frac{390 \times 80}{43560}\right) 4.424 = 6.8629$ CFS

$Q_{EAST} = 6.4131 + \left(\frac{390 \times 80}{43560}\right) 4.424 = 9.5818$ CFS

- SIZE SUMP INLET IN TRACT 1 SE OF JUAN TABO & POCONO

$A = \frac{930 \times 100}{43560} = 2.1350$ AC

$Q = 2.1350 \times 2.98$ CFS/AC $= 6.3623$ CFS

USE DBL "D" INLET

$Q/P = 3.0H^{1.5}$ $P = 16.9$

$H = 0.25'$

50% CLOGGED

$H = 0.40'$

- SIZE SUMP INLET IN TRACT 1 AT SW CORNER OF SITE

$A = 2.7548$ AC

$Q = 2.7548 \times 2.98 = 8.2094$ CFS

USE DBL "D" INLET

$Q/P = 3.0H^{1.5}$ $P = 16.9$

$H = 0.30'$

50% CLOGGED

$H = 0.47'$

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-11-05
CHECKED ____ DATE ____
SHEET 28 OF ____
[REVISED 5-31-06]

• SIZE RETENTION POND IN SW CORNER

$A = 0.5051$ AC

$Q = 0.5051 \times 2.98$
$= 1.505$ CFS

$V = \frac{7.9360}{90.9203} \times 0.5051$

$= 0.0441$ AC-FT

VOLUME NEEDS TO BE TWICE THIS

$V_{POND} = 3,841$ CF REQUIRED

ELEV	AREA	VOLUME	
70	2029	0	
71	2065	2047	→ WATER SURFACE = 71.85
72	2095	4160	
73	2121	6268	

• SIZE SUMP INLET IN TRACT I SE OF JUAN TABO & GALLANT FOX

$A = \frac{1072 \times 100}{43560} = 2.4610$ AC

$Q = 2.4610 \times 2.98$
$= 7.3337$ CFS

USE OBL "D" INLET

$Q/P = 3.0H^{1.5}$ $P = 16.9$

$H = 0.28'$

50% CLOGGED
$H = 0.44'$

• SIZE SUMP INLET IN TRACT I SW OF GALLANT FOX & WNR ADMINAL

$A = \frac{1040 \times 100}{43560} = 2.3875$ AC

$Q = 2.3875 \times 2.98$
$= 7.1148$ CFS

USE DBL "D" INLET

$Q/P = 3.0H^{1.5}$ $P = 16.9$

$H = 0.27'$

50% CLOGGED
$H = 0.43'$

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-11-05
CHECKED ____ DATE ____
SHEET 29 OF ____

• SIZE SUMP INLET IN TRACT I SE OF JUAN TABO & STREET L

$A = \frac{900 \times 100}{43560} = 2.0661$ AC

$Q = 2.0661 \times 2.98$
$= 6.1570$ CFS

USE OPC "D"

$Q/P = 3.0 H^{1.5}$ $P = 16.9$

$H = 0.25'$

50% CLOGGED

$H = 0.39'$

• FIND Q ON VIA POSADA JUST EAST OF GULFSTREAM

RAW $A = \frac{592 \times 60}{43560} = 0.8154$ AC $Q = 0.8154 \times 4.424 = 3.6073$ CFS

OPEN SPACE $A = 3.6588$ AC $Q = 3.6588 \times 2.98 = 10.9032$ CFS

OFFSITE $Q = 4.43$ CFS

TOTAL Q AT INTERSECTION

$= 3.6073 + 10.9032 + 4.43$
$= 18.9405$ CFS

• FIND Q IN GULFSTREAM JUST SOUTH OF VIA POSADA
THIS AREA TO INCLUDE THE COMMERCIAL AREA TO THE EAST.

$A = 4.7432$ AC

$Q = 4.7432 \times \frac{82.97 \text{ CFS}}{27.7621 \text{ AC}}$

$= 14.1756$ CFS

• FIND Q IN VIA POSADA JUST WEST OF GULFSTREAM

$Q = 18.9405 + 14.1751$
$= 33.1161$ CFS

• FIND CAPACITY OF VIA POSADA

$S = 2.0\%$ 40'F-F $n = 0.017$ STD C+G

$d = 0.52$
$WP = 41.04$
$A = 9.57$
$V = 4.68$ F/S
$Q = 44.82$ CFS > 33.1161 OK
$d + V^2/2g = 0.86 \approx 0.87$ OK

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-11-05
CHECKED ____ DATE ____
SHEET 30 OF ____

REVISED 1-26-06

INSTALL 2 - DBL "A" INLETS AT THIS POINT

d = .485
wP = 40.97
A = 8.17
V = 4.29 F/S
Q = 34.47 CFS ≈ 33.1161 OK

FROM NOMO SHEET 41
Q GATE = 9.1 CFS
Q PAST INLETS
= 33.1161 - 2(9.1)
= 14.9161 CFS

• FIND Q IN VIA POSADA JUST EAST OF JUAN TABO

$Q = 14.9161 + 0.8264 \times \frac{82.97}{27.7621}$

= 17.3860 CFS

COMMERCIAL SITE TO THE SOUTH WILL NOT DISCHARGE TO STREET. INTERNAL STORMDRAIN WILL TIE IN IN JUAN TABO.

INSTALL 2 "B" INLETS

S = 1% 40' F-F STD CTG n = 0.017

d = 0.44
wP = 18.19
A = 3.24
$V_{1/2}$ = 2.76 F/S
$Q_{1/2}$ = 8.96 CFS x 2 = 17.92 CFS ≈ 17.386 OK

FROM NOMO SHEET 42
Q GATE = 5.4 CFS

Q PAST INLETS INTO SUMP IN JUAN TABO
= 17.3860 - 2(5.4)
= 6.5860 CFS

• DETERMINE JUAN TABO SUMP - WEST SIDE ONLY

Q_W = 6.8629 + 7.62/2 = 10.6729 CFS

Q_E = 9.5818 + 6.5860 + 7.62/2 = 19.9778 CFS

USE DBL "A" DBL THROAT INLETS FOR SUMP

$Q = 3OH^{1.5}$ P = 17

H_W = 0.35' OK 50% CLOGGED = 0.56' OK

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-11-05
CHECKED _____ DATE _____
SHEET 31 OF ____

REVISED 1-26-06

- INSTALL DBL "A" INLET ON THE EAST SIDE OF JUAN TABO JUST SOUTH OF VIA POSADA.

  Q = 9.5818 CFS
  d = 0.49
  wP = 20.74
  A = 4.19
  $V_{1/2}$ = 2.33 F/S
  $Q_{1/2}$ = 9.75 CFS > 9.5818 CFS OK

  FROM NOMO SHEET 41
  Q_{GRATE} = 5.6 CFS
  Q PAST INLET
  = 9.5818 - 5.6
  = 3.9818 CFS

- FIND Q IN VIA POSADA JUST EAST OF JUAN TABO

  Q_{NORTH} = 6.5860/2 + 7.62/2
  = 7.103 CFS
  Q_{SOUTH} = 3.9818 + 6.5860/2
  = 7.2748 CFS

  INSTALL A "DBL A DBL THROAT" ON EACH SIDE

  Q/P = 3.0 $H^{1.5}$ P=17

  H_N = 0.27'

  H_S = 0.27'

  ASSUME 50% CLOGGED

  H_N = 0.43' OK

  H_S = 0.43' OK

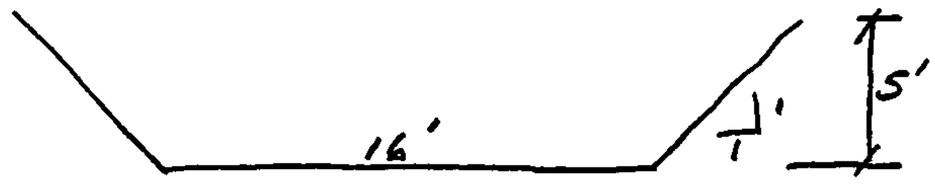
- THE AREA NORTH OF VIA POSADA WILL BE DEVELOPED DURING A LATER PHASE.
- SEE SHEET 44 FOR STORMDRAIN LAYOUT
- SEE SHEETS 60 - 135 FOR STORMDRAIN DESIGN

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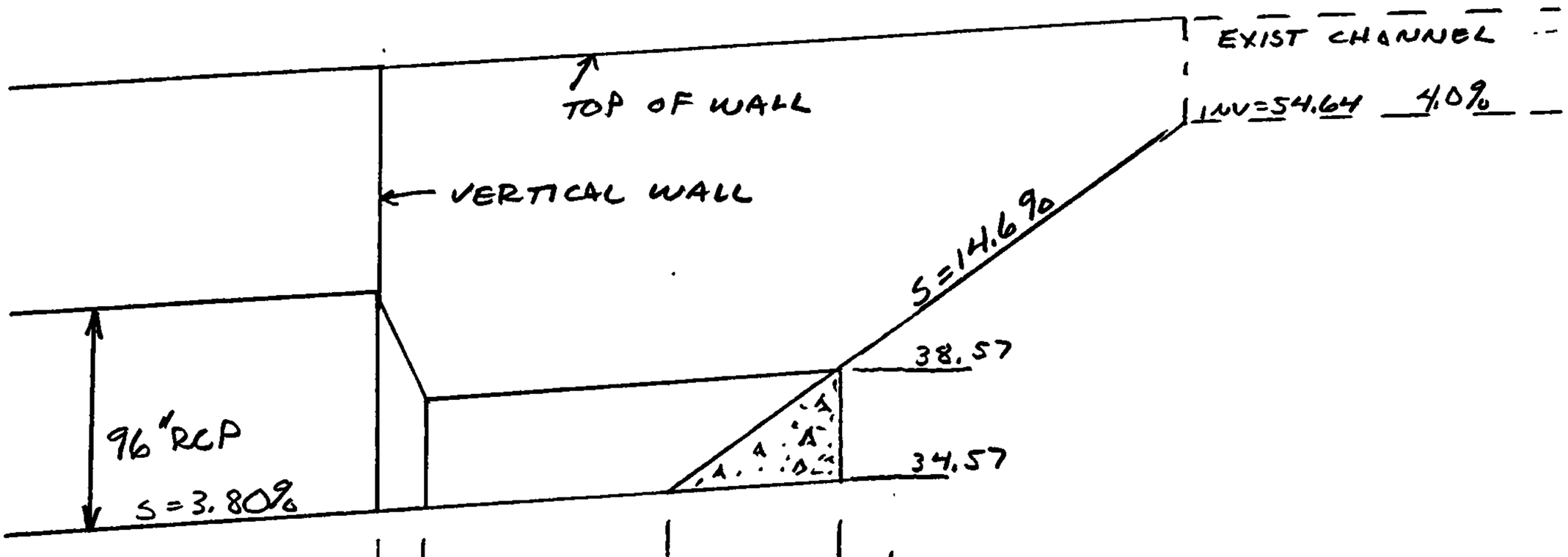
PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 1-26-06
CHECKED _____ DATE _____
SHEET 31A OF ____

- DETERMIN TRANSITION STRUCTURE FOR THE EXISTING FOUR HILLS CHANNEL TO THE 96" RCP.

Q = 1099 CFS SLOPE OF CHANNEL = 4.0%



- FIND REQUIRED HEADWATER DEPTH FROM NOMO SHEET 47
D = 19.6'



36+82.31 BEGIN 2:1 BEVEL
END BEVEL / BEGIN 96" HALF PIPE
36+90.31 INV = 31.65

BEGIN CONCRETE FILL
37+30.31 INV = 33.17

END CONCRETE FILL / 96" HALF PIPE
BEGIN TRANSITION FROM RECTANGULAR TO TRAPEZOIDAL

FROM OUTPUT OF STORMDRAIN #7 WATER SURFACE IS WELL WITHIN THE DESIGN SEE ENCLOSED SHEET 80 OF 83.

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GSK DATE 5-6-05
CHECKED _____ DATE _____
SHEET 32 OF ____

• DETERMINE OFFSITE DRAINAGE

THERE ARE TWELVE (12) LOCATIONS WHERE RUNOFF ENTERS THIS PROPERTY. STARTING AT THE SOUTH PROPERTY LINE AND GOING NORTH ARE THE FOLLOWING LOCATIONS.

1) 2.7773 AC OF KIRTLAND AIR FORCE BASE DRAINS TO THE SOUTH EAST CORNER. THIS AREA IS A 50' BUFFER BETWEEN THE RESIDENTIAL HOMES AND A RAZOR WIRE FENCE ON THE BASE PROPERTY. THIS RUNS FROM OUR SE CORNER EAST TO WHERE WAGON TRAIN DR IS ADJACENT TO THE BASE PROPERTY. THERE IS A BERM AND GRADING HAS BEEN DONE ON THE BASE TO KEEP ALL RUNOFF FROM LEAVING THE BASE PROPERTY ALONG THIS 50' BUFFER STRIP.

2) RUNOFF FROM FOUR HILLS VILLAGE 16TH INSTALLMENT AND 2 LOTS OF THE 5TH INSTALLMENT ON RIO ARRIBA AVE

3) RUNOFF FROM FOUR HILLS VILLAGE 16TH INSTALLMENT ALONG THE NORTH PROPERTY LINE. THE BACKYARD PONDS THAT WERE SUPPOSED TO BE INSTALLED ARE INSTEAD BACKYARDS THAT DRAIN TO THE NORTH. WHEN THE RESERVE AT FOUR HILLS (ADJACENT PROPERTY TO THE NORTH) WAS CONSTRUCTED A SWALE ALONG THIS PROPERTY LINE WAS CONSTRUCTED.

4) RUNOFF FROM THE RESERVE AT FOUR HILLS THROUGH A 36" RCP OUTFALL. THERE IS A STUBOUT FROM THE ONSITE STORMDRAIN SYSTEM. THE ON-SITE POND WILL BE FILLED (NOT PART OF THIS PROJECT) AND THE OUTFALL TO THAT POND PLUGGED.

5) RUNOFF FROM FOUR HILLS VILLAGE 10TH INSTALLMENT ALONG THE SOUTH PROPERTY LINE. THE BACKYARD PONDS THAT WERE SUPPOSED TO BE INSTALLED ARE INSTEAD BACKYARDS THAT DRAIN TO THE SOUTH. WHEN THE RESERVE AT FOUR HILLS (ADJACENT PROPERTY TO THE SOUTH) WAS CONSTRUCTED A SWALE ALONG THIS PROPERTY LINE WAS CONSTRUCTED.

6) RUNOFF FROM RATON AVE. THIS BASIN CONSISTS OF VILLA SERENA AND PARTS OF FOUR HILLS VILLAGE 5TH & 10TH INSTALLMENTS.

7) RUNOFF FROM FOUR HILLS CHANNEL. THIS BASIN CONSISTS OF PARTS OF FOUR HILLS VILLAGE 5TH, 9TH, 10TH, 3rd, 17TH, 18TH, 12TH, 19TH, 11TH, 13TH & 7TH INSTALLMENTS.

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-6-05
CHECKED ____ DATE ____
SHEET 33 OF ____

REVISED 1-26-06

8-11) RUNOFF FROM CITY OPEN SPACE NORTH OF THE FOUR HILLS CHANNEL OCCURS IN FOUR LOCATIONS

12) RUNOFF FROM LA POSADA THROUGH A 60" RCP STUB/OUTFALL.

ALL OFFSITE RUNOFF WILL ENTER THE ONSITE STORMDRAIN SYSTEM WHICH DISCHARGES TO THE TIJERAS ARROYO AT THE NW PORTION OF THE SITE.

1) THIS RUNOFF WILL ENTER THE SYSTEM THROUGH A NEW SUMP INLET AT THE SE CORNER OF THE PROJECT.

2) THIS RUNOFF WILL ENTER THE SYSTEM THROUGH A NEW TRENCH DRAIN AT THE END OF RIO ARRIBA AVE.

3) THIS MINOR RUNOFF WILL ENTER THE PROJECT ALONG NEW DRAINAGE SWALES IN THE NEW OPEN SPACE AND ENTER INTO THE SYSTEM THROUGH A SUMP INLET.

4) THIS RUNOFF ENTERS THE SYSTEM THROUGH A CONTINUATION OF THE 36" RCP OUTFALL TO THE NEW SYSTEM.

5) THIS MINOR RUNOFF WILL ENTER THE PROJECT ALONG NEW DRAINAGE SWALES IN THE NEW OPEN SPACE AND ENTER INTO THE SYSTEM THROUGH A SUMP INLET.

6) THIS RUNOFF WILL ENTER THE SYSTEM THROUGH A NEW TRENCH DRAIN AT THE END OF RATON AVE.

7) THIS RUNOFF ENTERS THE SYSTEM THROUGH A TRANSITION STRUCTURE FROM THE EXISTING CHANNEL TO A 96" RCP PIPE. THE FLOW WILL CONTINUE WEST.

8) & 9) THE SOUTHERLY TWO DISCHARGE POINTS ENTER THE SYSTEM BY WAY OF NEW DRAINAGE SWALES TO A SUMP INLET.

10) & 11) THE NORTHERLY TWO DISCHARGE POINTS ARE MINOR AND ENTER THE SYSTEM BY WAY OF NEW DRAINAGE SWALES THAT ENTER THE COMMERCIAL AREA NEAR VIA POSADA.

12) THIS RUNOFF ENTERS THE SYSTEM THROUGH A CONTINUATION OF THE 60" RCP OUTFALL TO THE NEW SYSTEM.

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SUBJECT DRAINAGE CALCS
BY GJK DATE 5-6-05
CHECKED ____ DATE ____
SHEET 34 OF ____

FIND RUNOFF FOR OFFSITE BASINS

1) KIRTLAND RUNOFF - AREA = 2.7773 AC
100% "A"

2)+3) FOUR HILL VILLAGE 16TH AMENDMENT & 2 LOTS OF 5TH AMENDMENT RUNOFF
AREA = 9.9768 AC
32 LOTS
PADS = 50'x50' = 2500 SF
DRIVE PADS = 20'x20' = 400 SF
2900 SF x32 = 92,800 SF = 2.1304 AC 100% "D"

THE ORIGINAL REPORT WAS DONE IN 1972 BY MAC CORNAK AND BURNS M22/06. WE WILL RE ANALYZE USING CURRENT HYDROLOGY.

ROW AREA = 1432 x50
= 71,600 SF = 1.6437 AC 1.3150 AC = 80% "D"
0.3287 AC = 20% "B"

BACKYARDS WERE SUPPOSED TO DRAIN INTO BACKYARD PONDS BUT INSTEAD DRAIN OFFSITE. 35' OF THE LOTS WILL DRAIN OFFSITE.

AREA 1) DRAINS BACKYARDS OF SOUTH LOTS TO BASIN 1
AREA 2) DRAINS ALL BUT BACKYARDS TO RIO ARRIBA
AREA 3) DRAINS BACKYARDS OF NORTH LOTS TO SWALE ALONG SOUTH SIDE OF BASIN 4

AREA	SIZE(AC)	"A"	"B"	"C"	"D"
2a	1.1051	-	100%	-	-
2	7.8299	-	56.00%	-	44.00%
3	1.0418	-	100%	-	-

4)+5) PER THE RESERVE AT FOUR HILLS DRAINAGE REPORT PREPARED BY MARK GOODWIN AND ASSOC. M22/D14

6) THERE ARE NO DRAINAGE REPORTS TO SAY WHAT THE FLOW IS FOR THIS BASIN SO WE WILL COMPLETE THIS WITH THIS REPORT. Tc =] B 2.6 CH/HR D 5.07 CFS/AC

AREA = 53.7706 AC 53.8 AC 26.9 AC / 2.6 = 70
50% - "D" 26.9 AC + 5.07 135 = 205 CFS
50% - "B" > THIS CORRESPONDS TO A C=0.6 WITH RATIONAL METHOD

7) THERE ARE NO DRAINAGE REPORTS TO SAY WHAT THE FLOW IS FOR THIS BASIN. THE ONLY RECORD OF FLOW IS FROM THE ASBUILTS FOR COA PROJECT NO 3383 - FOUR HILLS DRAINAGE CHANNEL IMPROVEMENTS, LOCATED EAST OF SAGEBRUSH TRAIL - JULY 1988

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-6-05
CHECKED ____ DATE ____
SHEET 35 OF ____

8) COA OPEN SPACE

A = 20.3758 AC

100% "A"

9) COA OPEN SPACE

A = 0.4105 AC

100% "A"

10) COA OPEN SPACE

A = 1.6285 AC

100% "A"

11) COA OPEN SPACE

A = 0.8247 AC

100% "A"

12) PER THE FOUR HILLS VILLAGE 20TH INSTALLMENT DRAINAGE REPORT PREPARED BY ISAACSON & ARFMAN M22/011A

*FROM AHYMO OUTPUT SHEETS

BASIN	Q cfs	
1	5.01	
2	29.83	
2a	2.81	
3	2.65	
4	77.5	FROM MGA REPORT
5	5.39	FROM MGA REPORT
6	197.77	20S Land Treatment
7	1099.00	FROM ASBUILTS
8	36.72	
9	0.75	
10	2.94	
11	1.49	
12	230.10	FROM I & A REPORT

• BASINS 1 + 2a WILL COMBINE AT THE SOUTHEAST CORNER OF OUR SITE IN A DBL "D" SUMP INLET

Q = 5.01 + 2.81
= 7.82 CFS

$Q/P = 3.0H^{1.5}$ P = 16.9 FOR DBL "D"

H = 0.29'

ASSUME 50% CLOGGED H = 0.46'

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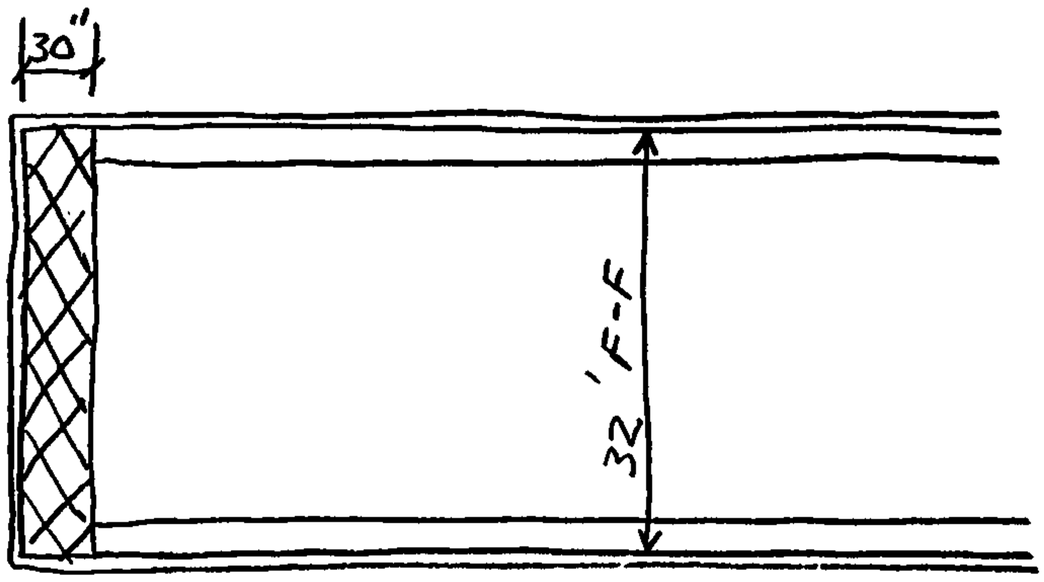
PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-6-05
CHECKED DATE
SHEET 36 OF

- BASIN 2 WILL DRAIN TO A TRENCH DRAIN AT THE END OF RIO ARRIBA AVE.

Q = 29.83 CFS S = 4.0% 32' F-F n = 0.017 STD CHG

d = 0.415
wp = 32.83
A = 5.61
V = 5.38 F/S
Q = 30.18 CFS > 29.83 OK

FROM NOMO SHEET 43 FOR INTERCEPTION EFFICIENCY
USE P-1-7/8-4 GRATES FROM FACE TO FACE
GRATE WILL BE 30" LONG



- BASIN 3 WILL DRAIN BY SWALE INTO TRACT 1 ON SITE AND THEN FLOW WITHIN TRACT 1 TO A SUMP INLET TO THE WEST.

3.4973 AC OF TRACT 1 WILL ALSO DRAIN TO THIS INLET
Q = 2.65 + 3.4973(2.98)
= 13.0719 CFS

USE DBL "D" INLET IN SUMP

Q/P = 3.0H^1.5 P = 16.9
H = 0.41'
ASSUME 50% CLOGGED
H = 0.64'

- BASIN 5 WILL DRAIN BY SWALE INTO TRACT 1 ON SITE AND THEN FLOW WITHIN TRACT 1 TO A SUMP INLET TO THE WEST

3.0820 AC OF TRACT 1 WILL ALSO DRAIN TO THIS INLET
Q = 5.39 + 3.0820(2.98)
= 14.5742 CFS

USE A DBL "D" INLET IN SUMP
H = 0.44

50% CLOGGED H = 0.69'

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GSK DATE 5-6-05
CHECKED ____ DATE ____
SHEET 37 OF ____

- BASIN 6 WILL DRAIN TO A TRENCH DRAIN AT THE END OF RATON AVE.

S = 3.48% 32' F-F n = 0.017 STD C+G
Q = 197.77 CFS

d = 0.67
WP = 33.34
A = 13.77 ~~-~~ 7
V = 9.04 F/S
Q = 124.53 CFS < 197.77 CFS NG

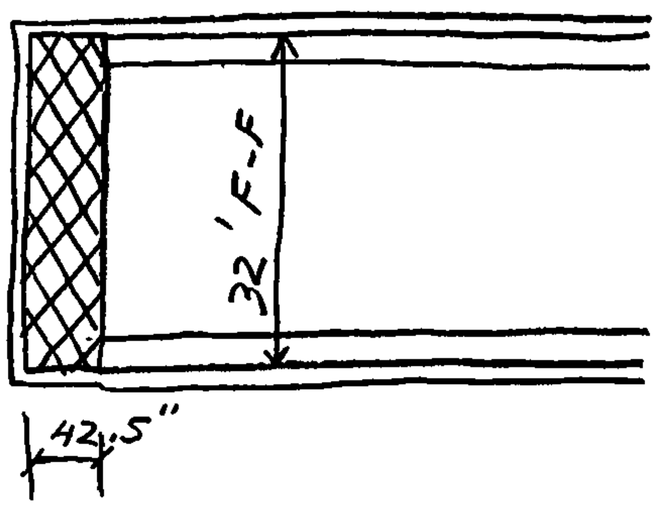
1 ddl A -
3.4% Slope
12 cfs
2 - ddl A'1

- REMOVE PAVEMENT EAST FOR 95' - RE INSTALL WITH NO CROWN 50% Clog

d = 0.525
WP = 33.13
A = 18.08 ~~-~~ 7
V = ~~10.89~~ 10.89 F/S
Q = 196.88 CFS ≈ 197.77 OK

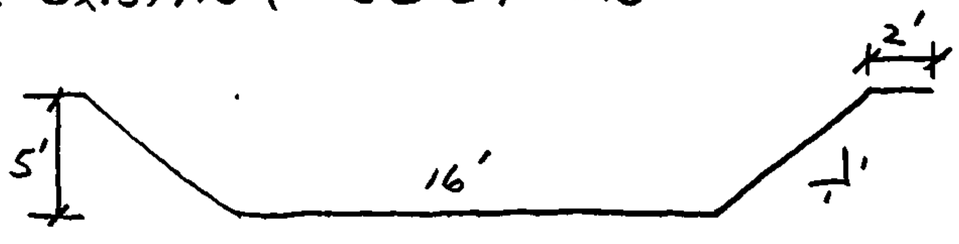
- USE P-1-7/8 GRATES FROM FACE TO FACE GRATE WILL NEED TO BE 42.5" LONG SEE NOMO SHEET 43 FOR INTERCEPTION EFFICIENCY not in report

ddl A N
North side of Road

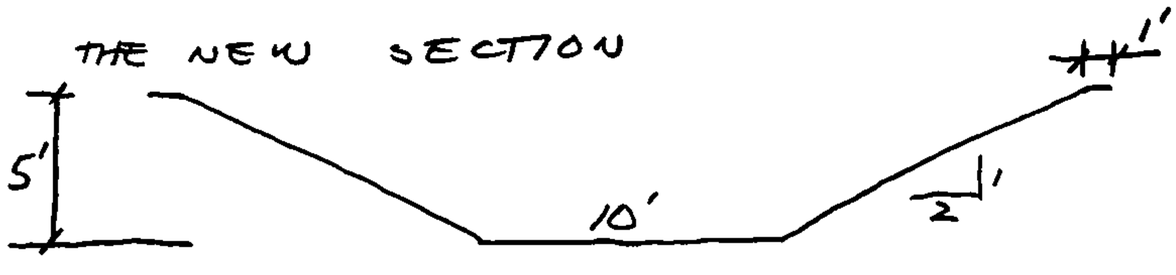


- BASIN 7 WILL DRAIN TO AN EXTENTION OF THE FOUR HILLS CHANNEL
Q = 1099 CFS

THE EXISTING SECTION



THE NEW SECTION



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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GSK DATE 5-6-05
CHECKED ____ DATE ____
SHEET 38 OF ____

- THE EXISTING SLOPE OF THE CONCRETE CHANNEL IS 4.0%

  WE WILL TIE INTO THIS AT A SLOPE OF 3.85%
  AND FARTHER TO THE WEST CHANGE TO 3.12%

3.12%	3.85%
d = 2.5	d = 2.35
WP = 21.18	WP = 20.51
A = 37.5	A = 34.55
V = 29.55 F/S	V = 31.75 F/S
Q = 1108.11 CFS ≈ 1099 CFS OK	Q = 1097.00 CFS ≈ 1099 CFS OK

- FIND SUPERELEVATION

  S = 3.85% V = 31.75 F/S D = 2.35'
  r = 150' b = 10' z = 2

$$S = 1.3\ \frac{V^2(b + 2zD)}{2gr}$$

$$= 2.02'$$

- FIND FREEBOARD

$$F = 0.7(2.0 + 0.025Vd^{1/3})$$

$$= 2.14'$$

- FIND HEIGHT OF WALLS REQUIRED ON CURVES

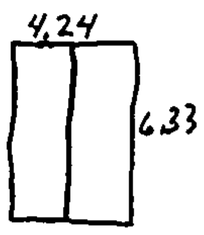
  2.35 + 2.02 + 2.14 = 6.51'

  6.51 − 5.0 = 1.51' REQUIRED ON CURVES

- BASINS 8+9 WILL DRAIN INTO A 50' WIDE DRAINAGE EASEMENT IN THE BACKYARDS OF PROPOSED LOTS THEN DRAIN BY SWALE TO A SUMP INLET IN TRACT I AND DISCHARGE INTO THE FOUR HILLS CHANNEL

  Q = 36.72 + 0.75
  = 37.47 CFS

USE 2 - DBL "D" INLETS SIDE BY SIDE



P = 21.14

$$Q/P = 3.0H^{1.5}$$

H = 0.70'

50% CLOGGED H = 1.12'

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-6-05
CHECKED ____ DATE ____
SHEET 39 OF ____
REVISED 1-26-06

- BASINS 10+11 WILL DRAIN INTO A 50' WIDE DRAINAGE EASEMENT IN THE BACKYARDS OF PROPOSE LOTS THEN DRAIN BY SWALE TO THE COMMERCIAL AREA

  $Q = 2.94 + 1.49$

  $= 4.43$ CFS

  THIS FLOW WILL BE INCORPORATED INTO THE SPECIFIC GRADING FOR THIS FUTURE DEVELOPMENT.

- FIND FLOW INTO DBL "D" INLET JUST TO THE NW OF THE TRENCH DRAIN OF RATON.

  $Q = 0.4649$ ac $\times 2.98$

  $= 1.3853$ cfs

- SEE SHEET 44 FOR STORMDRAIN LAYOUT

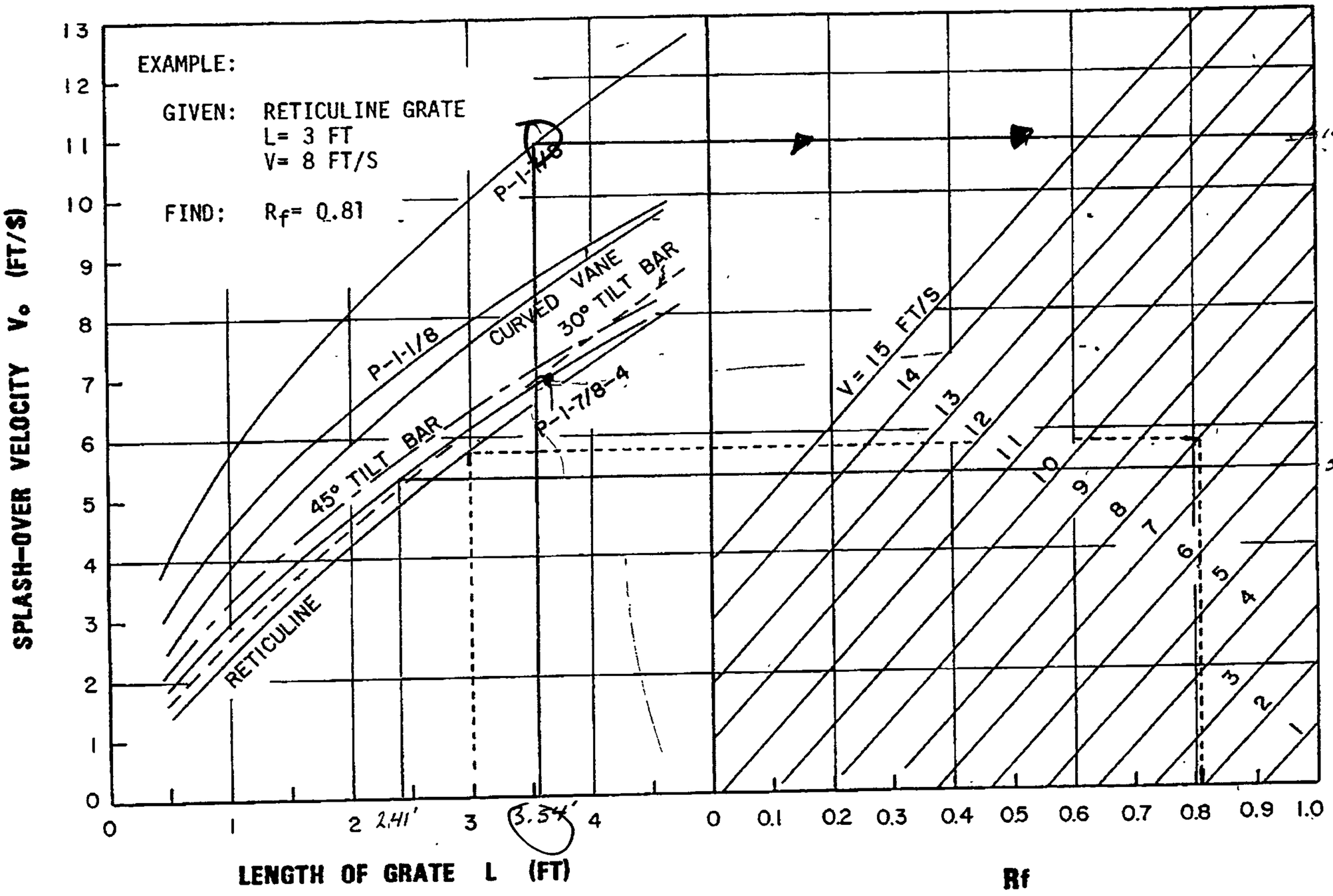


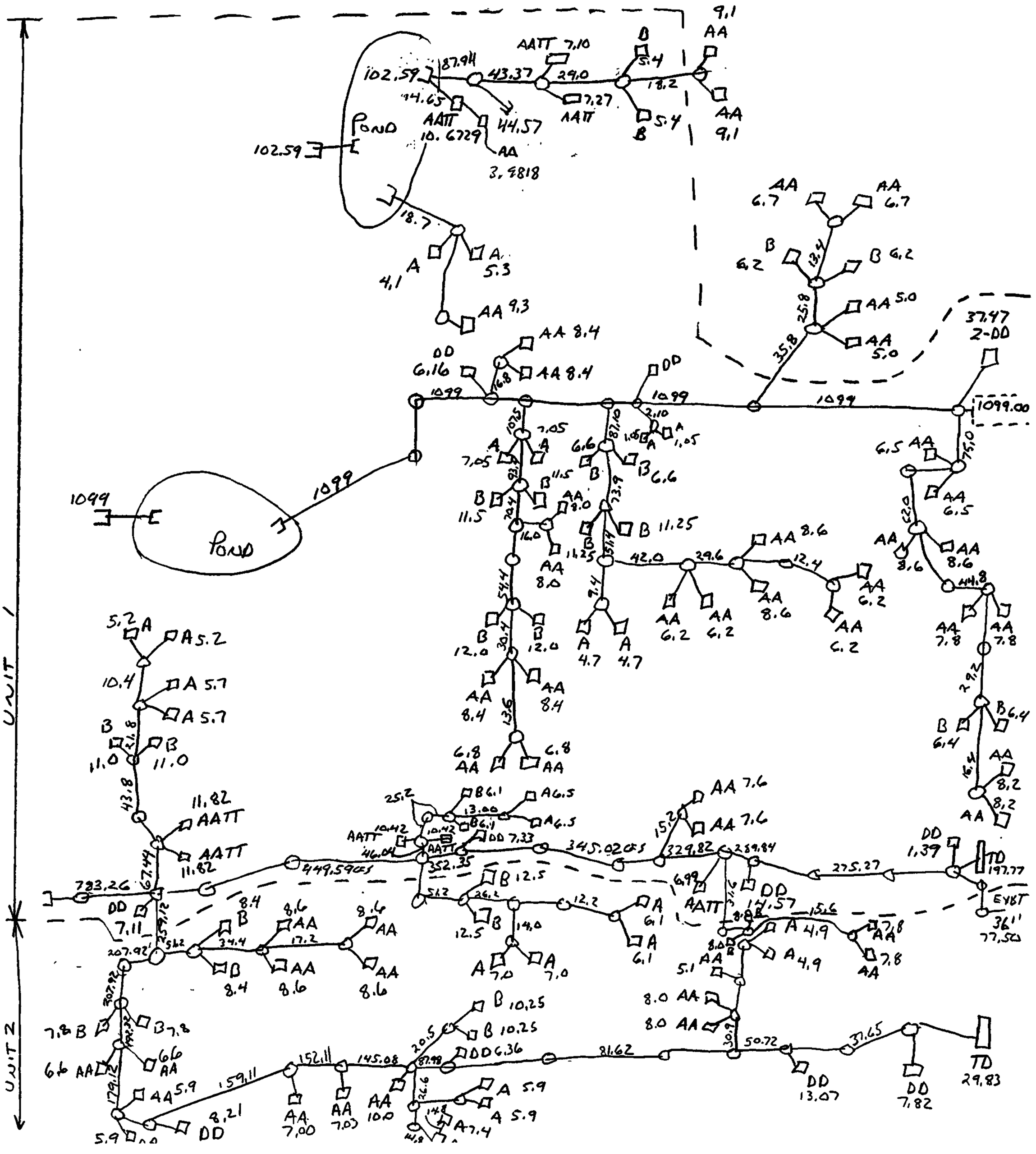
CHART 7. Grate inlet frontal flow interception efficiency.

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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GSK DATE 5-11-05
CHECKED ____ DATE ____
SHEET 44 OF ____

REVISED 1-26-06, 5-31-06

• STORM DRAIN DESIGN - SEE SHEETS 60-135 FOR UNIT 1
- SEE SHEETS 140-200 FOR UNIT 2



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PROJECT JUAN TABO HILLS
SUBJECT DRAINAGE CALCS
BY GJK DATE 5-11-05
CHECKED ____ DATE ____
SHEET 45 OF ____

FROM NOMO SHEET 46

18" RCP @ 1% CARRIES 10.5 CFS

54"	1%	190
60"	1%	260
42"	2%	140
36"	2%	95
24"	4%	45
30"	4%	80
36"	4%	130
54"	2%	270
54"	4%	375
60"	2%	400
66"	4%	625
96"	1%	900
72"	1%	400
120"	1%	1700
108"	1%	1240
30"	2%	55
30"	1%	40
48"	1%	140
48"	4%	275
36"	1%	65
42"	1%	95
84"	2%	925
96"	4%	1700
108	2%	1600
66"	1%	295

```
START                TIME=0.0
***** HYDROGRAPH FOR JUAN TABO HILLS WITHOUT OPEN SPACE & COMMERCIAL
RAINFALL             TYPE=1 RAIN QUARTER=0.0 IN
                     RAIN ONE=2.05 IN RAIN SIX=2.60 IN
                     RAIN DAY=3.20 IN DT=0.03333 HR
COMPUTE NM HYD       ID=1 HYD NO=101.1 AREA=0.326427 SQ MI
                     PER A=0 B=47.26 C=0 D=52.74
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
***** HYDORGRAPH FOR JUAN TABO HILLS OPEN SPACE (TRACT 1)
COMPUTE NM HYD       ID=2 HYD NO=102.1 AREA=0.142063 SQ MI
                     PER A=0 B=50 C=50 D=0
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=2 CODE=1
***** HYDORGRAPH FOR JUAN TABO HILLS COMMERCIAL TRACT
COMPUTE NM HYD       ID=3 HYD NO=103.1 AREA=0.043378 SQ MI
                     PER A=0 B=80 C=0 D=20
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=3 CODE=1
***** HYDORGRAPH FOR JUAN TABO HILLS BRIDGE
COMPUTE NM HYD       ID=5 HYD NO=105.1 AREA=0.002474 SQ MI
                     PER A=0 B=0 C=0 D=100
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=5 CODE=1
***** HYDORGRAPH FOR JUAN TABO HILLS MAJOR LOCALS
COMPUTE NM HYD       ID=6 HYD NO=106.1 AREA=0.018030 SQ MI
                     PER A=0 B=17 C=0 D=83
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=6 CODE=1
***** HYDORGRAPH FOR RIO ARRIBA AVE OFFSITE BASIN 2
COMPUTE NM HYD       ID=7 HYD NO=107.1 AREA=0.012234 SQ MI
                     PER A=0 B=44 C=0 D=56
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=7 CODE=1
***** HYDORGRAPH FOR KIRTLAND SWALE OFFSITE BASIN 1
COMPUTE NM HYD       ID=8 HYD NO=108.1 AREA=0.004340 SQ MI
                     PER A=100 B=0 C=0 D=0
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=8 CODE=1
***** HYDORGRAPH FOR RATON AVE OFFSITE BASIN 6
COMPUTE NM HYD       ID=9 HYD NO=109.1 AREA=0.084017 SQ MI
                     PER A=0 B=50 C=0 D=50
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=9 CODE=1
***** HYDORGRAPH FOR COA OPEN SPACE OFFSITE BASIN 8
COMPUTE NM HYD       ID=10 HYD NO=110.1 AREA=0.031837 SQ MI
                     PER A=100 B=0 C=0 D=0
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=10 CODE=1
***** HYDORGRAPH FOR COA OPEN SPACE OFFSITE BASIN 9
COMPUTE NM HYD       ID=11 HYD NO=111.1 AREA=0.000641 SQ MI
                     PER A=100 B=0 C=0 D=0
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=11 CODE=1
***** HYDORGRAPH FOR COA OPEN SPACE OFFSITE BASIN 10
COMPUTE NM HYD       ID=12 HYD NO=112.1 AREA=0.002545 SQ MI
                     PER A=100 B=0 C=0 D=0
                     TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=12 CODE=1
***** HYDORGRAPH FOR COA OPEN SPACE OFFSITE BASIN 11
COMPUTE NM HYD       ID=13 HYD NO=113.1 AREA=0.001289 SQ MI
```

```
                    PER A=100 B=0 C=0 D=0
                    TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=13 CODE=1
***** HYDORGRAPH FOR RIO ARRIBA AVE OFFSITE BASIN 2A
COMPUTE NM HYD      ID=14 HYD NO=114.1 AREA=0.001727 SQ MI
                    PER A=0 B=100 C=0 D=0
                    TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=14 CODE=1
***** HYDORGRAPH FOR RIO ARRIBA AVE OFFSITE BASIN 3
COMPUTE NM HYD      ID=15 HYD NO=115.1 AREA=0.001628 SQ MI
                    PER A=0 B=100 C=0 D=0
                    TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=15 CODE=1

FINISH
```

```
          RUNOFF VOLUME =     2.34702 INCHES     =         .3097 ACRE-FEET
          PEAK DISCHARGE RATE =       7.62 CFS  AT    1.500 HOURS   BASIN
AREA =    .0025 SQ. MI.


     ***** HYDORGRAPH FOR JUAN TABO HILLS MAJOR LOCALS
     COMPUTE NM HYD       ID=6 HYD NO=106.1 AREA=0.018030 SQ MI
                          PER A=0 B=17 C=0 D=83
                          TP=0.1333 HR MASS RAINFALL=-1

          K =    .072649HR    TP =    .133300HR    K/TP RATIO =    .545000
SHAPE CONSTANT, N =  7.106420
          UNIT PEAK =   59.082    CFS   UNIT VOLUME =    .9992        B =
526.28       P60 = 2.0500
          AREA =       .014965 SQ MI    IA =    .10000 INCHES    INF =
.04000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =    .033330


          K =    .132570HR    TP =    .133300HR    K/TP RATIO =    .994525
SHAPE CONSTANT, N =  3.549967
          UNIT PEAK =   7.4491    CFS   UNIT VOLUME =    .9985        B =
323.96       P60 = 2.0500
          AREA =       .003065 SQ MI    IA =    .50000 INCHES    INF =
1.25000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =    .033330

     PRINT HYD            ID=6 CODE=1

                                        PARTIAL HYDROGRAPH   106.10


          RUNOFF VOLUME =     2.09844 INCHES     =         2.0178 ACRE-FEET
          PEAK DISCHARGE RATE =      51.05 CFS  AT    1.500 HOURS   BASIN
AREA =    .0180 SQ. MI.


     ***** HYDORGRAPH FOR RIO ARRIBA AVE OFFSITE BASIN 2
     COMPUTE NM HYD       ID=7 HYD NO=107.1 AREA=0.012234 SQ MI
                          PER A=0 B=44 C=0 D=56
                          TP=0.1333 HR MASS RAINFALL=-1

          K =    .072649HR    TP =    .133300HR    K/TP RATIO =    .545000
SHAPE CONSTANT, N =  7.106420
          UNIT PEAK =   27.048    CFS   UNIT VOLUME =    .9989        B =
526.28       P60 = 2.0500
          AREA =       .006851 SQ MI    IA =    .10000 INCHES    INF =
.04000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =    .033330


          K =    .132570HR    TP =    .133300HR    K/TP RATIO =    .994525
SHAPE CONSTANT, N =  3.549967
          UNIT PEAK =   13.082    CFS   UNIT VOLUME =    .9992        B =
323.96       P60 = 2.0500
```

```
          AREA =       .005383 SQ MI     IA =     .50000 INCHES     INF =
1.25000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =    .033330

     PRINT HYD            ID=7 CODE=1

                                          PARTIAL HYDROGRAPH   107.10


          RUNOFF VOLUME =     1.70363 INCHES      =        1.1116 ACRE-FEET
          PEAK DISCHARGE RATE =      29.83 CFS  AT    1.500 HOURS   BASIN
AREA =    .0122 SQ. MI.


     ***** HYDORGRAPH FOR KIRTLAND SWALE OFFSITE BASIN 1
     COMPUTE NM HYD       ID=8 HYD NO=108.1 AREA=0.004340 SQ MI
                          PER A=100 B=0 C=0 D=0
                          TP=0.1333 HR MASS RAINFALL=-1

          K =    .159146HR    TP =    .133300HR    K/TP RATIO =  1.193894
SHAPE CONSTANT, N =  2.975114
          UNIT PEAK =   9.1093    CFS   UNIT VOLUME =    .9982        B =
279.79       P60 = 2.0500
          AREA =       .004340 SQ MI     IA =     .65000 INCHES     INF =
1.67000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =    .033330

     PRINT HYD            ID=8 CODE=1

                                          PARTIAL HYDROGRAPH   108.10


          RUNOFF VOLUME =       .63017 INCHES      =         .1459 ACRE-FEET
          PEAK DISCHARGE RATE =        5.01 CFS  AT    1.500 HOURS   BASIN
AREA =    .0043 SQ. MI.


     ***** HYDORGRAPH FOR RATON AVE OFFSITE BASIN 6
     COMPUTE NM HYD       ID=9 HYD NO=109.1 AREA=0.084017 SQ MI
                          PER A=0 B=50 C=0 D=50
                          TP=0.1333 HR MASS RAINFALL=-1

          K =    .072876HR    TP =    .133300HR    K/TP RATIO =    .546710
SHAPE CONSTANT, N =  7.077969
          UNIT PEAK =   165.43    CFS   UNIT VOLUME =    .9993        B =
524.94       P60 = 2.0500
          AREA =       .042009 SQ MI     IA =     .10000 INCHES     INF =
.04000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =    .033330


          K =    .131065HR    TP =    .133300HR    K/TP RATIO =    .983234
SHAPE CONSTANT, N =  3.591405
          UNIT PEAK =   103.03    CFS   UNIT VOLUME =    1.000        B =
326.94       P60 = 2.0500
          AREA =       .042009 SQ MI     IA =     .50000 INCHES     INF =
```

```
1.25000 INCHES PER HOUR
        RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =   .033330

     PRINT HYD           ID=9 CODE=1

                                        PARTIAL HYDROGRAPH   109.10


        RUNOFF VOLUME =     1.61590 INCHES     =       7.2406 ACRE-FEET
        PEAK DISCHARGE RATE =     197.77 CFS  AT   1.500 HOURS   BASIN
AREA =   .0840 SQ. MI.


     ***** HYDORGRAPH FOR COA OPEN SPACE OFFSITE BASIN 8
     COMPUTE NM HYD      ID=10 HYD NO=110.1 AREA=0.031837 SQ MI
                         PER A=100 B=0 C=0 D=0
                         TP=0.1333 HR MASS RAINFALL=-1

        K =   .159146HR    TP =   .133300HR    K/TP RATIO =  1.193894
SHAPE CONSTANT, N =  2.975114
        UNIT PEAK =   66.823    CFS   UNIT VOLUME =    .9996       B =
279.79      P60 = 2.0500
        AREA =       .031837 SQ MI    IA =    .65000 INCHES    INF =
1.67000 INCHES PER HOUR
        RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =   .033330

     PRINT HYD           ID=10 CODE=1

                                        PARTIAL HYDROGRAPH   110.10


        RUNOFF VOLUME =      .63017 INCHES     =       1.0700 ACRE-FEET
        PEAK DISCHARGE RATE =      36.72 CFS  AT   1.500 HOURS   BASIN
AREA =   .0318 SQ. MI.


     ***** HYDORGRAPH FOR COA OPEN SPACE OFFSITE BASIN 9
     COMPUTE NM HYD      ID=11 HYD NO=111.1 AREA=0.000641 SQ MI
                         PER A=100 B=0 C=0 D=0
                         TP=0.1333 HR MASS RAINFALL=-1

        K =   .159146HR    TP =   .133300HR    K/TP RATIO =  1.193894
SHAPE CONSTANT, N =  2.975114
        UNIT PEAK =   1.3454    CFS   UNIT VOLUME =    .9894       B =
279.79      P60 = 2.0500
        AREA =       .000641 SQ MI    IA =    .65000 INCHES    INF =
1.67000 INCHES PER HOUR
        RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =   .033330

     PRINT HYD           ID=11 CODE=1

                                        PARTIAL HYDROGRAPH   111.10


        RUNOFF VOLUME =      .63017 INCHES     =        .0215 ACRE-FEET
        PEAK DISCHARGE RATE =        .75 CFS  AT   1.500 HOURS   BASIN
```

```
AREA =    .0006 SQ. MI.


     ***** HYDORGRAPH FOR COA OPEN SPACE OFFSITE BASIN 10
     COMPUTE NM HYD       ID=12 HYD NO=112.1 AREA=0.002545 SQ MI
                          PER A=100 B=0 C=0 D=0
                          TP=0.1333 HR MASS RAINFALL=-1

          K =   .159146HR    TP =   .133300HR    K/TP RATIO =  1.193894
SHAPE CONSTANT, N =  2.975114
          UNIT PEAK =   5.3418    CFS   UNIT VOLUME =    .9970        B =
279.79       P60 = 2.0500
          AREA =       .002545 SQ MI    IA =    .65000 INCHES    INF =
1.67000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =   .033330
     PRINT HYD            ID=12 CODE=1

                                        PARTIAL HYDROGRAPH   112.10

          RUNOFF VOLUME =       .63017 INCHES     =         .0855 ACRE-FEET
          PEAK DISCHARGE RATE =       2.94 CFS  AT   1.500 HOURS   BASIN
AREA =    .0025 SQ. MI.


     ***** HYDORGRAPH FOR COA OPEN SPACE OFFSITE BASIN 11
     COMPUTE NM HYD       ID=13 HYD NO=113.1 AREA=0.001289 SQ MI
                          PER A=100 B=0 C=0 D=0
                          TP=0.1333 HR MASS RAINFALL=-1

          K =   .159146HR    TP =   .133300HR    K/TP RATIO =  1.193894
SHAPE CONSTANT, N =  2.975114
          UNIT PEAK =   2.7055    CFS   UNIT VOLUME =    .9946        B =
279.79       P60 = 2.0500
          AREA =       .001289 SQ MI    IA =    .65000 INCHES    INF =
1.67000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =   .033330
     PRINT HYD            ID=13 CODE=1

                                        PARTIAL HYDROGRAPH   113.10

          RUNOFF VOLUME =       .63017 INCHES     =         .0433 ACRE-FEET
          PEAK DISCHARGE RATE =       1.49 CFS  AT   1.500 HOURS   BASIN
AREA =    .0013 SQ. MI.


     ***** HYDORGRAPH FOR RIO ARRIBA AVE OFFSITE BASIN 2A
     COMPUTE NM HYD       ID=14 HYD NO=114.1 AREA=0.001727 SQ MI
                          PER A=0 B=100 C=0 D=0
                          TP=0.1333 HR MASS RAINFALL=-1

          K =   .132570HR    TP =   .133300HR    K/TP RATIO =   .994525
SHAPE CONSTANT, N =  3.549967
```

```
          UNIT PEAK =   4.1971    CFS   UNIT VOLUME =    .9971        B =
323.96       P60 = 2.0500
          AREA =       .001727 SQ MI    IA =    .50000 INCHES    INF =
1.25000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =   .033330

     PRINT HYD            ID=14 CODE=1

                                        PARTIAL HYDROGRAPH   114.10


          RUNOFF VOLUME =      .88478 INCHES     =         .0815 ACRE-FEET
          PEAK DISCHARGE RATE =       2.81 CFS  AT   1.500 HOURS   BASIN
AREA =    .0017 SQ. MI.

     ***** HYDORGRAPH FOR RIO ARRIBA AVE OFFSITE BASIN 3
     COMPUTE NM HYD       ID=15 HYD NO=115.1 AREA=0.001628 SQ MI
                          PER A=0 B=100 C=0 D=0
                          TP=0.1333 HR MASS RAINFALL=-1

          K =   .132570HR    TP =   .133300HR    K/TP RATIO =   .994525
SHAPE CONSTANT, N =  3.549967
          UNIT PEAK =   3.9565    CFS   UNIT VOLUME =    .9968        B =
323.96       P60 = 2.0500
          AREA =       .001628 SQ MI    IA =    .50000 INCHES    INF =
1.25000 INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER
METHOD - DT =   .033330

     PRINT HYD            ID=15 CODE=1

                                        PARTIAL HYDROGRAPH   115.10


          RUNOFF VOLUME =      .88478 INCHES     =         .0768 ACRE-FEET
          PEAK DISCHARGE RATE =       2.65 CFS  AT   1.500 HOURS   BASIN
AREA =    .0016 SQ. MI.

FINISH

     NORMAL PROGRAM FINISH          END TIME (HR:MIN:SEC) = 14:10:18
```

CITY OF ALBUQUERQUE

July 25, 2014

Mark Goodwin, PE
Mark Goodwin & Associates, PA
PO Box 90606
Albuquerque, NM 87199

Re: Juan Tabo Hills Unit 1
West end of Raton Ave.
Drainage Certification
Engineer's Stamp dated: 5-20-14 (M21D015)
Certification dated: 7-18-14

Dear Mr. Goodwin,

Thank you for submitting the certification for the water block between Four Hills and Juan Tabo Hills on Raton Avenue. This certification will be kept in our records for future reference.

Sincerely,

Curtis Cherne, P.E.
Principal Engineer, Planning Dept.
Development and Review Services

RR/CC
C: CO Clerk—Katrina Sigala
email

PO Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV 02/2013)

Project Title: JTH Unit 1 - Raton Grading & Drainage Plan Building Permit #: _____ City Drainage #: M21D013

DRB#: _____ EPC#: _____ Work Order#: 756183

Legal Description: Juan Tabo Hills Subdivision Unit 1 and Unit 1 at West End of Raton Ave.

City Address: _____

Engineering Firm: Mark Goodwin & Associates, PA Contact: Kelly Klein

Address: PO BOX 90606, Albuquerque, NM 87199

Phone#: 828-2200 Fax#: 797-9539 E-mail: kelly@goodwinengineers.c

Owner: JTH HOA Contact: Scott Grady

Address: PO BOX 1443, Corrales, NM 87084

Phone#: 338-1438 Fax#: _____ E-mail: rvsg7@rayleehomes.com

Architect: _____ Contact: _____

Address: _____

Phone#: _____ Fax#: _____ E-mail: _____

Surveyor: Aldrich Land Surveying, Inc. Contact: Tim Aldrich

Address: PO BOX 30701, Albuquerque, NM 87190

Phone#: 328-3988 Fax#: _____ E-mail: tim.aldrich@comcast.net

Contractor: Salls Brothers Construction, Inc. Contact: Fred Salls

Address: 7301 Reading Ave, Albuquerque, NM 87105

Phone#: 873-8780 Fax#: _____ E-mail: fsalls@sallsbrothers.com

TYPE OF SUBMITTAL:

___ DRAINAGE REPORT
___ DRAINAGE PLAN 1st SUBMITTAL
___ DRAINAGE PLAN RESUBMITTAL
___ CONCEPTUAL G & D PLAN
___ GRADING PLAN
___ EROSION & SEDIMENT CONTROL PLAN (ESC)
X ENGINEER'S CERT (HYDROLOGY)
___ CLOMR/LOMR
___ TRAFFIC CIRCULATION LAYOUT (TCL)
___ ENGINEER'S CERT (TCL)
___ ENGINEER'S CERT (DRB SITE PLAN)
___ ENGINEER'S CERT (ESC)
___ SO-19
___ OTHER (SPECIFY)

CHECK TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

___ SIA/FINANCIAL GUARANTEE RELEASE
___ PRELIMINARY PLAT APPROVAL
___ S. DEV. PLAN FOR SUB'D APPROVAL
___ S. DEV. FOR BLDG. PERMIT APPROVAL
___ SECTOR PLAN APPROVAL
___ FINAL PLAT APPROVAL
X CERTIFICATE OF OCCUPANCY (PERM)
___ CERTIFICATE OF OCCUPANCY (TCL TEMP)
___ FOUNDATION PERMIT APPROVAL
___ BUILDING PERMIT APPROVAL
___ GRADING PERMIT APPROVAL
___ PAVING PERMIT APPROVAL
___ WORK ORDER APPROVAL
___ GRADING CERTIFICATION
___ SO-19 APPROVAL
___ ESC PERMIT APPROVAL
___ ESC CERT. ACCEPTANCE
___ OTHER (SPECIFY)

RECEIVED
JUL 23 2014
LAND DEVELOPMENT SECTION

WAS A PRE-DESIGN CONFERENCE ATTENDED: X Yes ___ No ___ Copy Provided

DATE SUBMITTED: July 23, 2014 By: Mark Goodwin, PE

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

1 **Conceptual Grading and Drainage Plan**: 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 subdivision containing more than ten (10) lots or constituting five (5) acres or more
4 **Erosion and Sediment Control Plan:** Required for any new development and redevelopment site with 1-acre or more of land disturbing area, including project less than 1-acre than are part of a larger common plan of development

Kay Brashear

From: Kay Brashear
Sent: Wednesday, July 23, 2014 9:34 AM
To: 'Ortiz, Monica'; Tim Sims (tsims@cabq.gov)
Cc: Kelly Klein; Curtis Cherne (ccherne@cabq.gov)
Subject: Engineer's Cert - Raton Ave. CPN 756183
Attachments: Drainage Info Sheet 2014-07-23.pdf; Temp01768.PDF

Monica and Tim,

We are unsure if we needed to email this to your department before delivering, so we are sending it to you just to be safe. A hard copied will be delivered this afternoon.

Thank you,

Kay Brashear
Mark Goodwin & Associates, PA
Office Manager
PO BOX 90606
Albuquerque, NM 87119
(505) 828-2200



CITY OF ALBUQUERQUE

June 4, 2014

Mark Goodwin, P.E.
Mark Goodwin & Associates, PA
P.O. Box 90606
Albuquerque, NM 87199

Re: Juan Tabo Hills Unit 1-Raton Ave, Grading and Drainage Plan
Engineer's Stamp Date 5-10-14 (M21/D015)

Dear Mr. Goodwin,

Based upon the information provided in your submittal received 5-21-14, the above referenced plan is approved for Grading Permit, Paving Permit and for Work in the City ROW, if necessary.

Upon completion of the work, submit an engineer's certification.

Thank you for your cooperation in this matter.

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

Sincerely,

Curtis Cherne, P.E.
Principal Engineer, Hydrology
Planning Department

C: e-mail

PO Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

DRAINAGE AND TRANSPORTATION INFORMATION SHEET
(Rev. 12/05)

M21 D015

PROJECT TITLE: Juan Tabo Hills Unit 1 – Raton Grading and Drainage Plan ZAP/DRG. FILE ~~M21~~/M22
DRB#:_____ EPC#: _____ WORK ORDER#: 756183

LEGAL DESCRIPTION: Juan Tabo Hills Subdivision Unit 2 and Unit 1 at West End of Raton Ave.
CITY ADDRESS: _____

ENGINEERING FIRM: Mark Goodwin & Associates, PA — CONTACT: Kelly Klein
ADDRESS: PO Box 90606 — PHONE: 828-2200
CITY, STATE: Albuquerque, NM — ZIP CODE: 87199

OWNER: JTH HOA — CONTACT: Scott Grady
ADDRESS: PO BOX 1443 — PHONE: 338-1438
CITY, STATE: Corrales, NM — ZIP CODE: 87048

ARCHITECT: N/A — CONTACT: _____
ADDRESS: _____ — PHONE: _____
CITY, STATE: _____ — ZIP CODE: _____

SURVEYOR: Aldrich Land Surveying — CONTACT: Tim Aldrich
ADDRESS: PO Box 30701 — PHONE: 884-1990
CITY, STATE: Albuquerque,NM — ZIP CODE: 87190

CONTRACTOR: Salls Brothers Construction, Inc. — CONTACT: Fred Salls
ADDRESS: 7301 Reading Ave. — PHONE: 873-8780
CITY, STATE: Albuquerque, NM — ZIP CODE: 87105

TYPE OF SUBMITTAL:
_____ DRAINAGE REPORT
X DRAINAGE PLAN 1st SUBMITTAL
_____ DRAINAGE PLAN RESUBMITTAL
_____ CONCEPTUAL G & D PLAN
X GRADING PLAN
_____ EROSION CONTROL PLAN
_____ ENGINEER'S CERT (HYDROLOGY)
_____ CLOMR/LOMR
_____ TRAFFIC CIRCULATION LAYOUT
_____ ENGINEER/ARCHITECT CERT (TCL)
_____ ENGINEER/ARCHITECT (DRB SITE PLAN)
_____ OTHER (Percolation Testing

CHECK TYPE OF APPROVAL SOUGHT:
_____ SIA/FINANCIAL GUARANTEE RELEASE
_____ PRELIMINARY PLAT APPROVAL
_____ S. DEV. PLAN FOR SUB'D APPROVAL
_____ S. DEV. FOR BLDG. PERMIT APPROVAL
_____ SECTOR PLAN APPROVAL
_____ FINAL PLAT APPROVAL
_____ FOUNDATION PERMIT APPROVAL
_____ BUILDING PERMIT APPROVAL
_____ CERTIFICATE OF OCCUPANCY (PERM)
_____ CERTIFICATE OF OCCUPANCY (TEMP)
X GRADING PERMIT APPROVAL
X PAVING PERMIT APPROVAL
_____ WORK ORDER APPROVAL
_____ OTHER (Construction Plans Approval)

WAS A PRE-DESIGN CONFERENCE ATTENDED:
x YES
_____ NO
_____ COPY PROVIDED

RECEIVED
MAY 21 2014
LAND DEVELOPMENT SECTION

SUBMITTED BY: Mark Goodwin, PE DATE: May 20, 2014

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

1. **Conceptual Grading and Drainage Plan**: 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 subdivision containing more than ten (10) lots or constituting five (5) acres or more.

D. Mark Goodwin & Associates, P.A.
Consulting Engineers
P.O. BOX 90606, ALBUQUERQUE,NM 87199
(505) 828-2200 FAX 797-9539

~ 2012 ACEC/NM Award Winner for Engineering Excellence ~
~ 2008 ACEC/NM Award Winner for Engineering Excellence ~

May 21, 2014

Mr. Curtis Cherne
City Engineer
PO Box 1293
Albuquerque, NM 87103

Re: Stormwater Entering Juan Tabo Hills Subdivision Unit 2 and Unit 1 at the West End of Raton Avenue, City Project Number 756183

Dear Mr. Cherne;

Mark Goodwin & Associates, PA, has performed a site visit, and calculated the effects of a 100 year-6 hour rainfall on the referenced property. It is our recommendation that the offsite flows can be contained by changing the inlet to a sump condition by adding a waterblock downstream. We have attached a drawing that summarizes our calculations and design of the waterblock.

If you have any further questions, please feel free to contact our office.

Sincerely,
MARK GOODWIN & ASSOCIATES, PA

Kelly M. Klein

Kelly Klein, EI

Cert w/ 15 cm inspection?

Enclosures: Grading and Drainage plans for Juan Tabo Hills Unit 1 – Raton Avenue

RECEIVED
MAY 21 2014
LAND DEVELOPMENT SECTION

F:\1-Projects\2014\A14010 - Raton Ave\Outgoing\submittal Letter 5.21.14.docx

7/11/12 Juan Tabo Hills Unit 2 End of Blue Ribbon Rd.



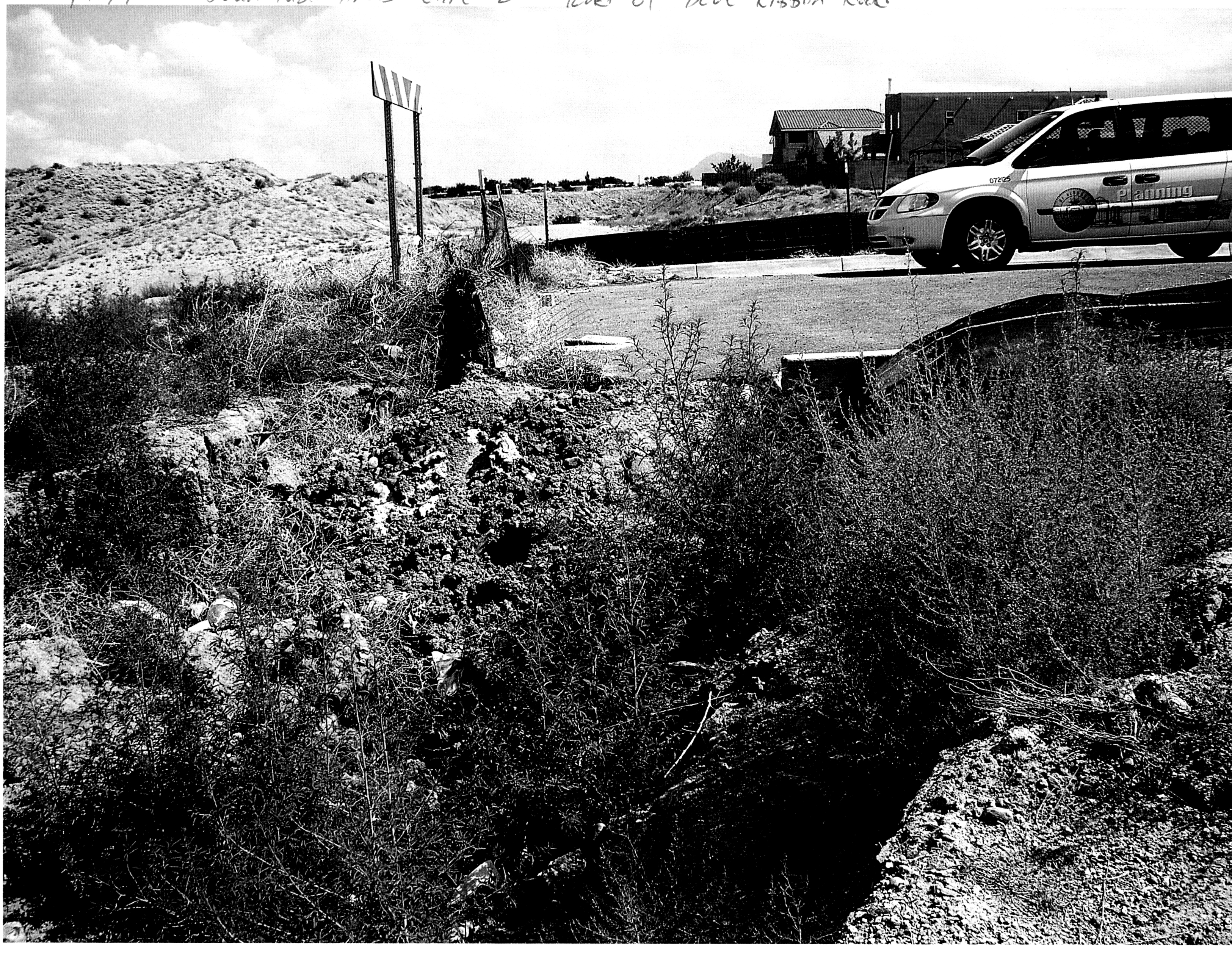
7/11/12 Juan Tabo Hills Unit 2 End of Blue Ribbon Rd.



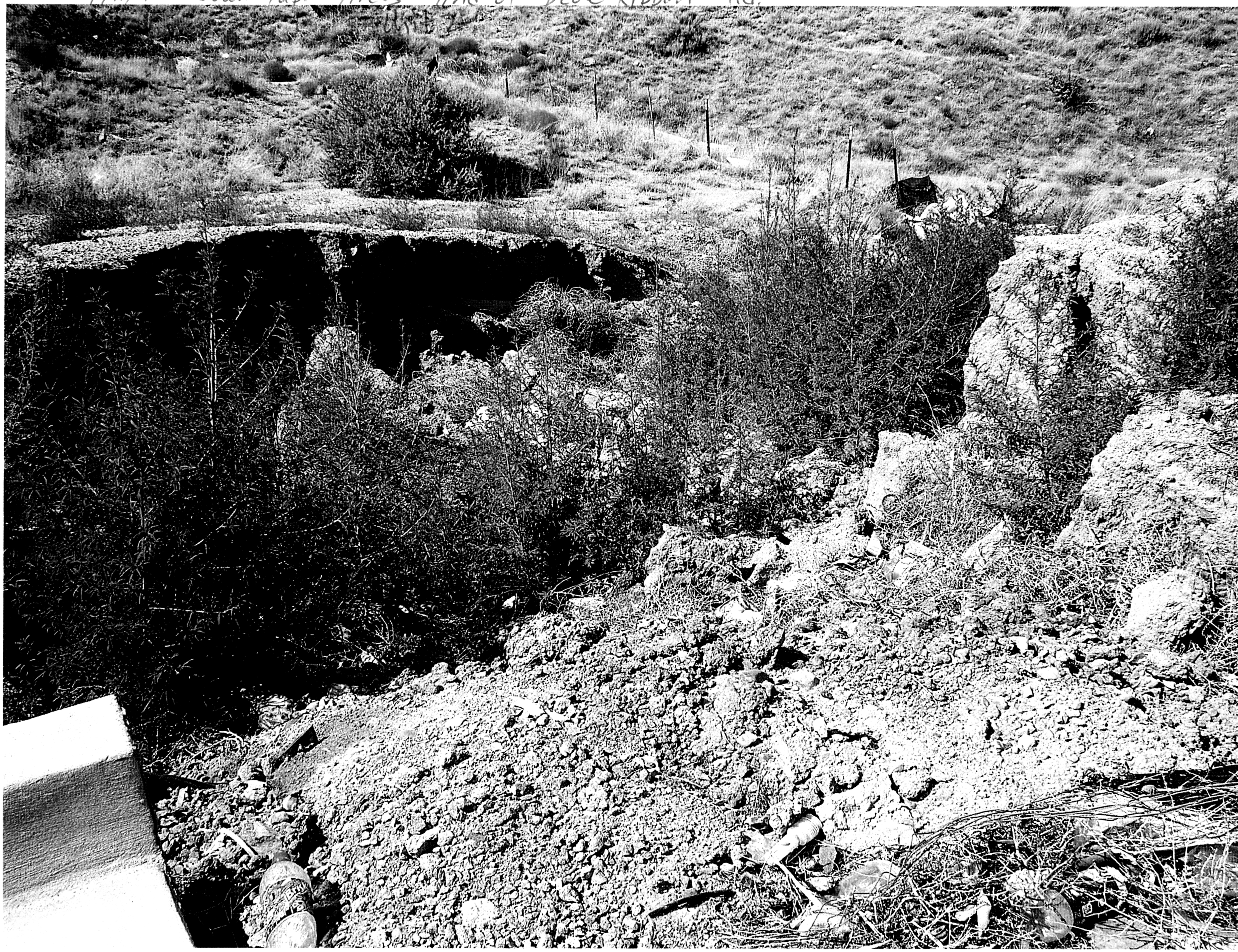
7/11/12 Juan Tabo Hills Unit 2 End of Blue Ribbon Rd



7/11/12 Juan Tabo Hills Unit 2 End of Blue Ribbon Road



7/11/12 Juan Tabo Hills End of Blue Ribbon Rd.



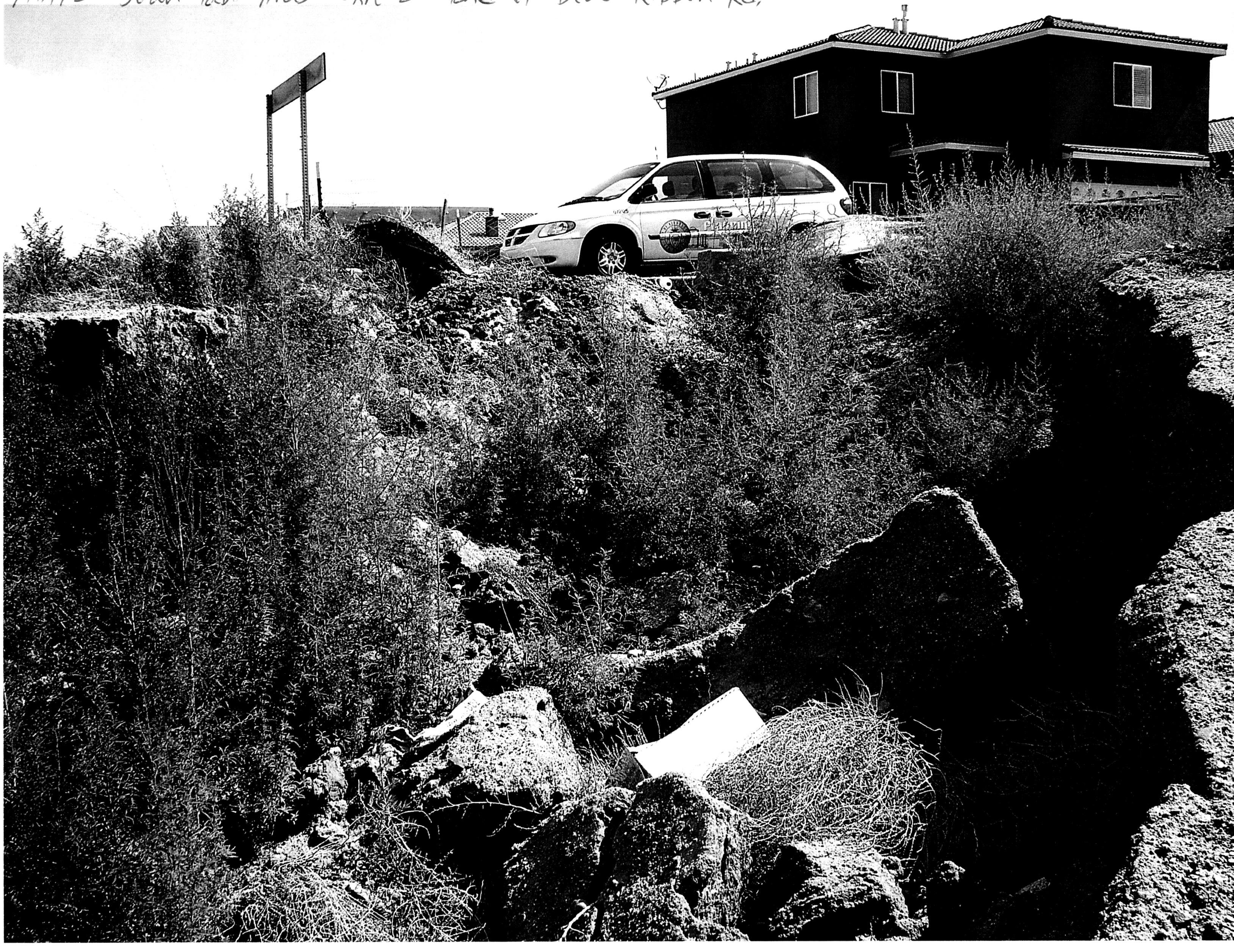
7/11/12 Juan Tabo Hills Unit 2 End of Blue Ribbon Road



7/11/12 Juan Tabo Hills Unit 2 End of Blue Ribbon Rd.



7/11/12 Juan Tabo Hills Unit 2 End of Blue Ribbon Rd,



7/11/12 Juan Tabo Hills Unit 1 End of 96" pipe Near Gallant Fox



maintain by HOA
city redo Architecture owned by party maintain by HOA / object to HOA review/approval



(Unsuitable time, below July


JUAN TABO DR
SALVATOR DR
DESERT
NASHUA RD
RED MILE RD
POMPANO
POCONO
THISTLEDOWN
FERNDALE DR
VERNON DR
BEULAH DR
BUSHER RD
BOLD RULER
BLACK
GOLD
JONES ST
GULFSTREAM
SMART
MAN O WAR ST
SUNKIST
GALLANT FOX
SHADOWFAX
NATIVE DANCER
1 KELSO CT
2 RED RUM CT
3 JOHN HENRY
4 PETESKY
5 SIR BARTON RD
6 A DAR
7 NASRULLAH
1 SUMMERSIDE DR
2 RETAM CT
3 ROCKIMS CT

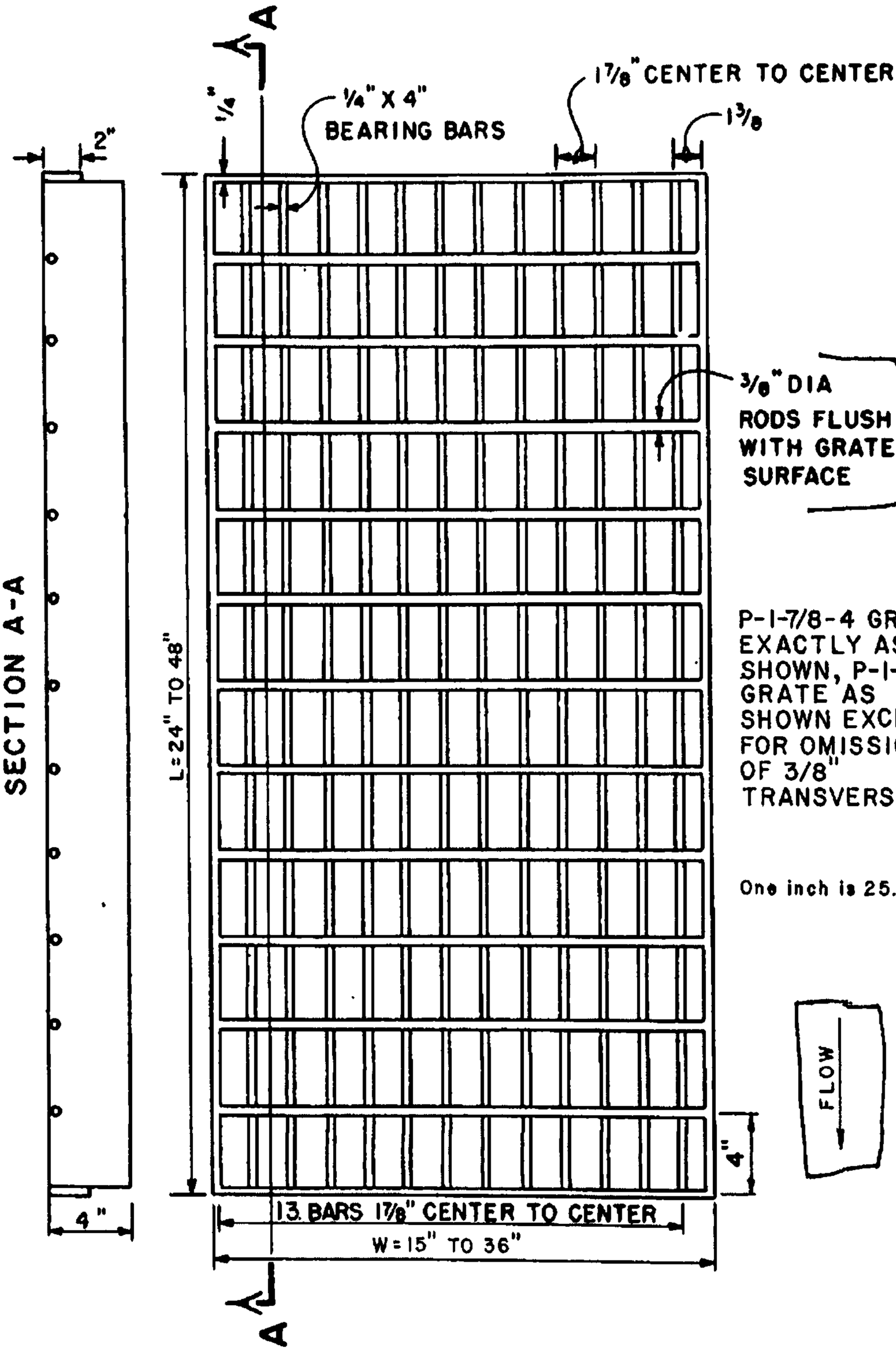


Figure 8. P-1-7/8 and P-1-7/8-4 grates.

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Consulting Engineers
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PROJECT
SUBJECT
BY DATE
CHECKED DATE
SHEET 2 OF

$h = 0.5$

$Q = .6 \times 74 \sqrt{64.4 \times .5} = 251$ cfs

RATON AVE

Orifice

$Q = C a \sqrt{2gh} = .6 \times 74 ft^2 \sqrt{2 \times 32.2 \times .25}$

$= 178.2$ cfs

A) EXISTING TRENCH DRAIN IN SUMP USING AREA

$Q/A = 5.37 H^{1/2}$

$Q = 198$ cfs

$Q = 178$

$H = 0.25'$

AREA = 36" x 18.5" = 666 in²
= 4.625 FT PER GRATE

AREA OF 16 GRATES = 74 SF

FNR)

$\frac{V^2}{2g} = \frac{(10.5 \frac{ft}{sec})^2}{2 \times 32.2}$

$= \frac{110}{64} = 1.7$ ft

A 6'-8" WATER BLOCK OF SOME SORT WEST OF THE GRATE WOULD WORK - A RECYCLED ASPHALT HUMP.

B) INSTALL 2 DBL A INLETS EAST OF TRENCH DRAIN

$d = 0.85$

$Q_{GRATE} = 18$ cfs

$Q_{PAST\ INLETS} = 198 - 2(18)$
$= 162$ cfs

FIND d IN NO CROWN SECTION WITH Q = 162 cfs

$d = .62$
$WP = 33.24$
$A = 16.09$
$V = 10.06$
$Q = 161.87$ cfs ≈ 162 OK

C) INSTALL 2 'B' INLETS EAST OF TRENCH DRAIN

$d = 0.85$
$Q_{GRATE} = 25$ cfs
$Q_{POST\ INLETS} = 198 - 2(25) = 148$ cfs

$d = 0.60$
$WP = 33.20$
$A = 15.45$
$V = 9.80$
$Q = 151.36$ cfs ≈ 148 OK

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PROJECT _____
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BY _____ DATE _____
CHECKED _____ DATE _____
SHEET 3 OF ____

- Find d so V = 6.75 cfs for P-1-7/8-4 Grate

d = .45	d = .46	d = .5	d = .51	d = .515
wP = 32.90	wP = 32.92	wP = 33.00	wP = 33.02	wP = 33.03
A = 6.73	A = 7.05	A = 8.33	A = 8.65	A = 8.81
V = 5.67 F/s	V = 5.84	V = 6.52	V = 6.68	V = 6.76 F/s ≈ 6.75
Q = 38.14 cfs	Q = 41.17	Q = 54.30	Q = 57.80	Q = 59.58 cfs OK

- Find additional Q to be removed after new inlets

2-Dbl 'A' → Q = 162 − 59.58 = 102.42 cfs
2 Type 'B' → Q = 148 − 59.58 = 88.42 cfs

- It is not possible to add any 'A' inlets - not efficient enough
- Add two more type 'B' inlets

Q grate = 20 cfs
Q past inlets = 148 − 2(20) = 108 cfs

d = 0.50
wP = 33.00
A = 12.25
V = 8.428 F/s
Q = 103.24 cfs ≈ 108

- Add two more type 'B' inlets

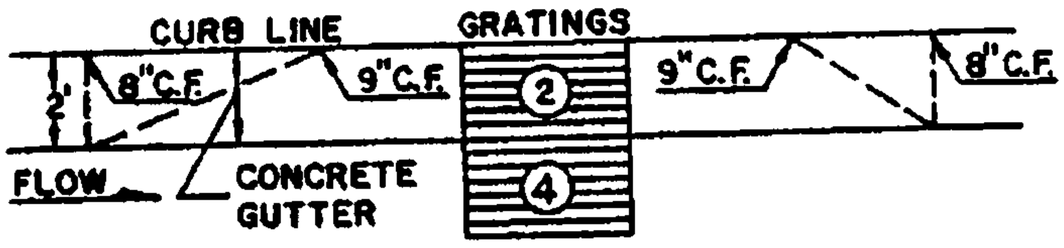
Q grate = 14.75 cfs
Q past inlets = 108 − 2(14.75) = 78.50 cfs

d = 0.44
wP = 32.88
A = 10.33
V = 7.54 F/s
Q = 77.91 cfs ≈ 78.50

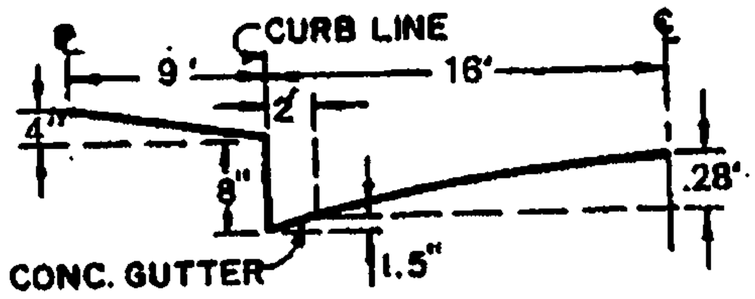
- Add two more type 'B' inlets

Q grate = 11.5 cfs
Q past inlets = 78.50 − 2(11.5) = 55.50 cfs < 59.58 cfs
OK V will be below 6.75 F/s for 100% efficiency

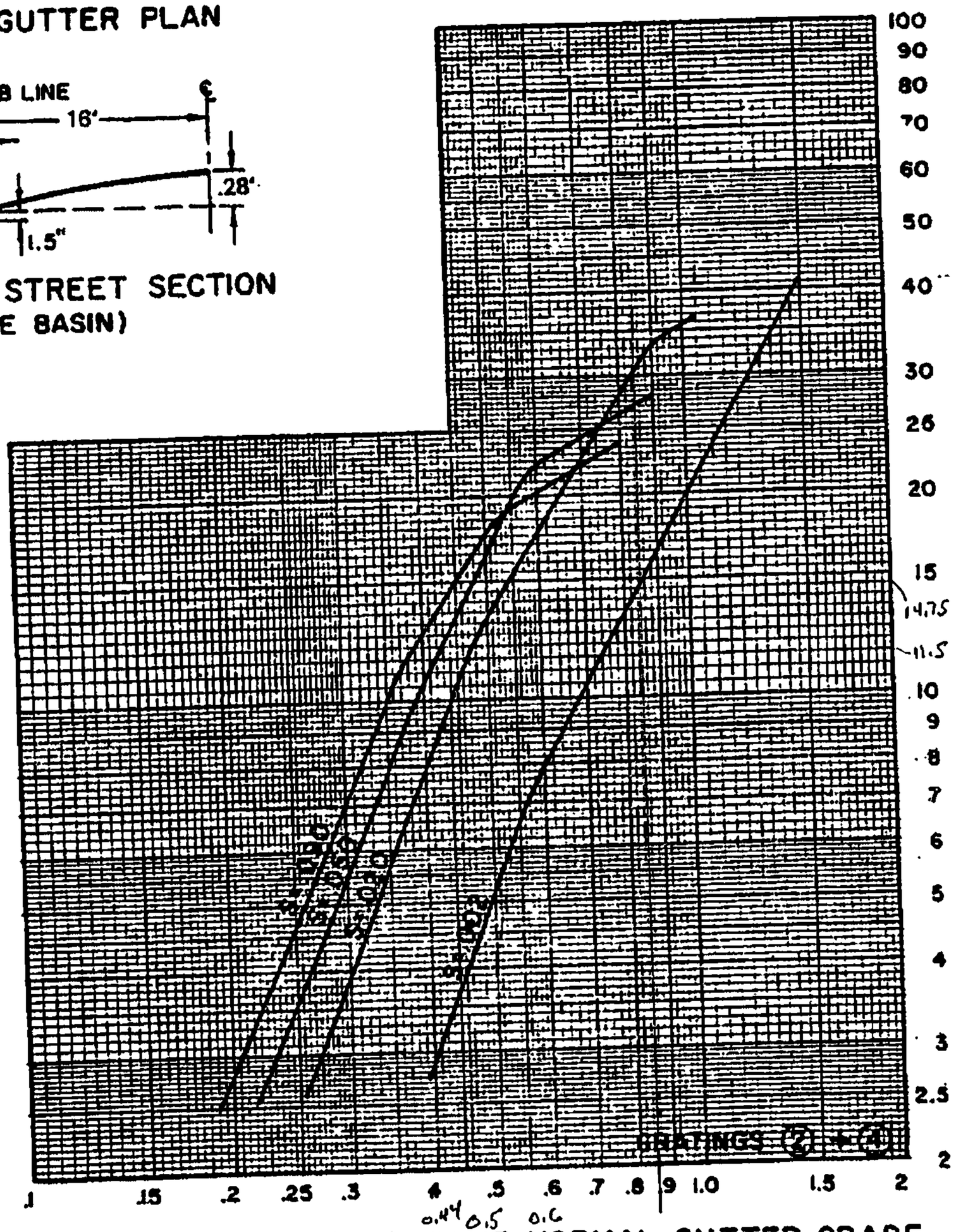
GRATING CAPACITIES FOR TYPE "B"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)



I just calculated the capacity of Raton's ROW which has a slope of 3.48%...d = 0.85, WP = 51.34, A = 21.15, V=9.03 f/s, Q = 191.06 cfs...as you can see, the ROW does not have the capacity for the flows (198 cfs) coming down the street let alone for a street section that loads up one side to make things worse.

Please be more specific in what you mean by a 'solution'. We installed the trench drain; we removed the crown and then removed more of the crown because of this same problem. To see the whole picture, substantial survey work will need to be done up Raton. With this additional information please let me know how you want us to proceed.
Greg

From: Cherne, Curtis [mailto:CCherne@cabq.gov]
Sent: Tuesday, August 09, 2011 3:57 PM
To: Gregory Krenik
Subject: RE: Raton Ave Runoff

Greg,
I agree with the WOW on the 200 cfs.
There seems to be some discontinuity between the calcs for the street with the crown and then without the crown, d, A, V and then the Q that the grate will accept. Also, where does the efficiency number come into play?

If you apply a 50% clog to the grate part of the inlet, this leaves a substantial gap.
I am not sure two A inlets will be enough. May need the inlets and the header curb.

I would like for you to redo the calcs and provide a solution. The improvement will be the responsibility of someone other than the City, except of course, our help with the approval process.

Curtis

From: Gregory Krenik [mailto:Greg@goodwinengineers.com]
Sent: Friday, August 05, 2011 1:22 PM
To: Cherne, Curtis
Subject: Raton Ave Runoff

Curtis,
I've attached the pages from the JTH Report that concern Raton. It is Basin 6 and the basin size is 53.7706 AC. The Q produced is 197.77 CFS...WOW that's a lot of runoff with no storm drain system! As you can see from Sheet 37 of the calcs the existing runoff was more than the existing street could handle by 73.24 CFS. Then I calced removing the crown and it came up OK. If the street is not level, as is the case, and the water stays to the north side then we will have the issue of it going over the curb, which it is doing. The trench drain is right at its max for incoming flow...can't have any blockage it seems.

Option 1 - install a water block west of the trench drain out of asphalt millings
Option 2 - install a header curb along the north half of Raton and a water block along the

south half out of asphalt millings
Option 3 - install two SD inlets to the east of the trench drain and extend the SD up to those inlets to reduce the runoff in Raton before it gets to the trench drain.

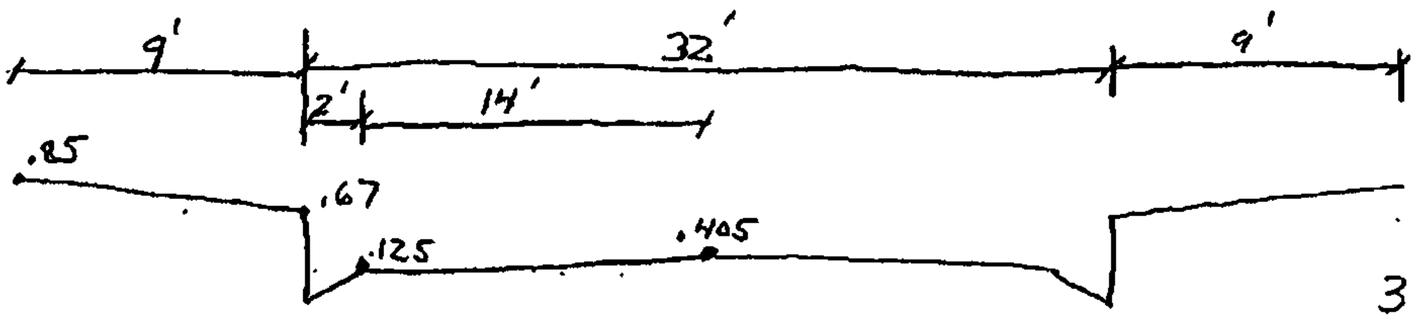
Let me know what you think.
Greg

Gregory J. Krenik, PE
D. Mark Goodwin & Associates
PO Box 90606
Albuquerque, NM 97199
505-828-2200
505-235-9338 cell

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PROJECT _____
SUBJECT _____
BY _____ DATE _____
CHECKED _____ DATE _____
SHEET 1 OF ____

CROWN SECTION

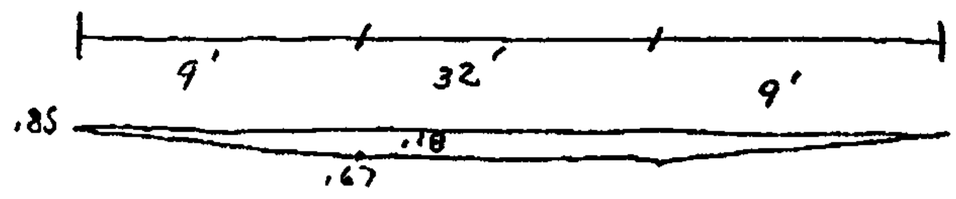


32'F-F S=3.46%

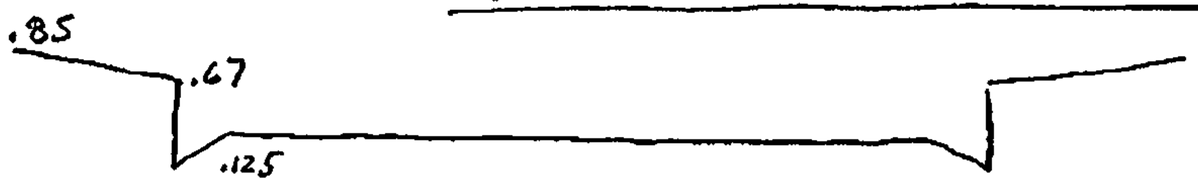
d = .405
WP = 32.81
A = 2(.125) + 14(.405-.125) +(4 x .28) = 5.29
V = 4.84 F/s
Q = 25.58

d = .67
WP = 33.34
A = 13.77
V = 9.65 F/s
Q = 124.60 CFS < 198 NG

d = .85
WP = 51.34
A = 21.15
V = 9.03 F/s
Q = 191.06 CFS < 198 NG



NO CROWN SECTION



32' F-F
3,48 %

d=.67
WP= 33,34
A= 17.69
V= 10.69 F/s
Q= 189.14 CFS < 198 NG

d = .68
WP = 34.34
A = 18.015
V = 10.61 F/s
Q = 191.16 CFS < 198 NG

d = .69
WP = 35.34
A = 18.35
V = 10.54 F/s
Q = 193.39 CFS < 198

d = .71
WP = 37.34
A = 19.01
V = 10.40
Q = 197.73 CFS ≈ 198 OK

Cherne, Curtis

From: Gregory Krenik [Greg@goodwinengineers.com]
Sent: Monday, August 15, 2011 12:00 PM
To: Cherne, Curtis
Subject: RE: Raton Ave Runoff
Attachments: sharp_copier@goodwinengineers.com_20110815_114809.pdf

Curtis,
I think I figured out part of the problem...in my drainage report I state a P-1-7/8 grate to be used in Raton, but per the plans, the COA Std Detail 2220 (P-1-7/8-4) was shown and installed (accepts only about 65% of flow)...the difference is that there are no perpendicular bars on the P-1-7/8, the bars only run parallel with the flow...see attached. We can go out and cut the transverse bars off the grates and the inlet should perform according to design. There still is the issue of too much flow coming down the street and being over the top of the curb..

The trench drain on Rio Arriba called for the P-1-7/8-4 in the design and that was what was constructed, so it functions properly.

Attached are design sheets showing how the trench drain would work in sump if using the existing COA grates. It shows a depth of 3". This would mean a water block of 6" - 8" should be sufficient but it would need to go from ROW line to ROW line.

The design sheets also show the installation of two double 'A' inlets or two 'B' inlets and what the resulting depth in the street would be after the inlets. It also shows that the interception efficiency of these depths is around 110% for the P-1-7/8 grate...the transverse bars would still need to be removed from the grates.

For the existing grates to be able to function correctly the runoff velocity would need to be lowered to approximately 6.75 F/S. Only the Type 'B' inlets will work, the type 'A' inlets are not efficient enough. In fact six more Type 'B' inlets, for a total of eight, would have to be added to make the existing trench drain grates work. This is not an affordable option, the first inlets would have to be place 250 feet upstream and you would have 4 manholes in addition to the RCP plus the pavement removal and replacement and any water/sewer conflicts.

I propose these options:
1) Leave the inlet grates as they are and build a 6"-8" waterblock from recycled asphalt millings or a combination curb and millings
2) Cutting and removing the transverse bars on the inlet grates and build a smaller

waterblock

Let me know what you think
Greg

From: Cherne, Curtis [mailto:CCherne@cabq.gov]
Sent: Friday, August 12, 2011 10:41 AM
To: Gregory Krenik
Subject: RE: Raton Ave Runoff

Greg,

After our lengthy discussion. We agreed that you would submit some calculations to support a fix. We talked about building a sump condition for the cattle guard, installing an inlet(s), and picking up flows in the inlet west of the fence.
Thanks.

Curtis

From: Gregory Krenik [mailto:Greg@goodwinengineers.com]
Sent: Tuesday, August 09, 2011 4:43 PM
To: Cherne, Curtis
Cc: Heather Foote; june.wilson@kirtland.af.mil; sarah@hoamco.com; Lopez, Anthony C.; Mark Goodwin
Subject: RE: Raton Ave Runoff

Curtis,
The difference in the d, A, V and the Q is because I was comparing an apple and an orange. They were the difference in the road section from the crowned section and then with the crown removed. The d=0.67 was the top of curb with the crown in place, we always try to verify the street capacity at the top of curb which is what that was. It failed by a lot as you can see. The d=0.565 was what it would be if the crown was removed, that is why they all differ, the existing conditions the COA approved did not work, the crown had to be removed. As we saw at the site, Raton does not have a symmetrical section, it slopes to the north thus loading the north side of the ROW and overflowing the curb.

No help from the COA because they approved the dumping of 198 cfs onto our clients property? Are you sure about that? How about the COA keeping the inlets clear, isn't that street maintenance's job? There might not be a problem if the inlets are clear but we need to actually see it correct?

When you say redo the calcs, you mean obtain asbuilt conditions all the way up Raton to determine how much water is on the northside of the ROW because of the settled road section and rerun the inlet capacity, correct? My calcs that were in the report are good...

MDL/D015

5525
5520
5515
5510
5505
5500
5495
5490
5485
5480
5475
5470
5465
5460

440' VC LT. & RT.
MO = 3.99'
R = 60.60'

PVT 11+80.00
FL = 5518.40

NEW SLOPE, LT. & RT.

14+15.00

280'
90'
100'
90'

15+05.00

16+05.00

PVC 16+40.00
FL = 5481.60

16+95.00

520' VC LT. & RT.
MO = 6.19'
K = 50 REQUIRED FOR COLLECTOR
35 mph DESIGN SPEED

PVI 19+00.00
(5460.80) 5466.76

NEW FILL SLOPE
SHOT-CRETE

1:1

8" SHOT-CRETE

1.5' DEEP
ORDINARY HIGH
WATER MARK

8" SHOT-CRETE

1:1
14.75'

NORTH
BRAID

SOUTH
BRAID

1' DEEP
ORDINARY HIGH
WATER MARK
BEFORE FILL

N

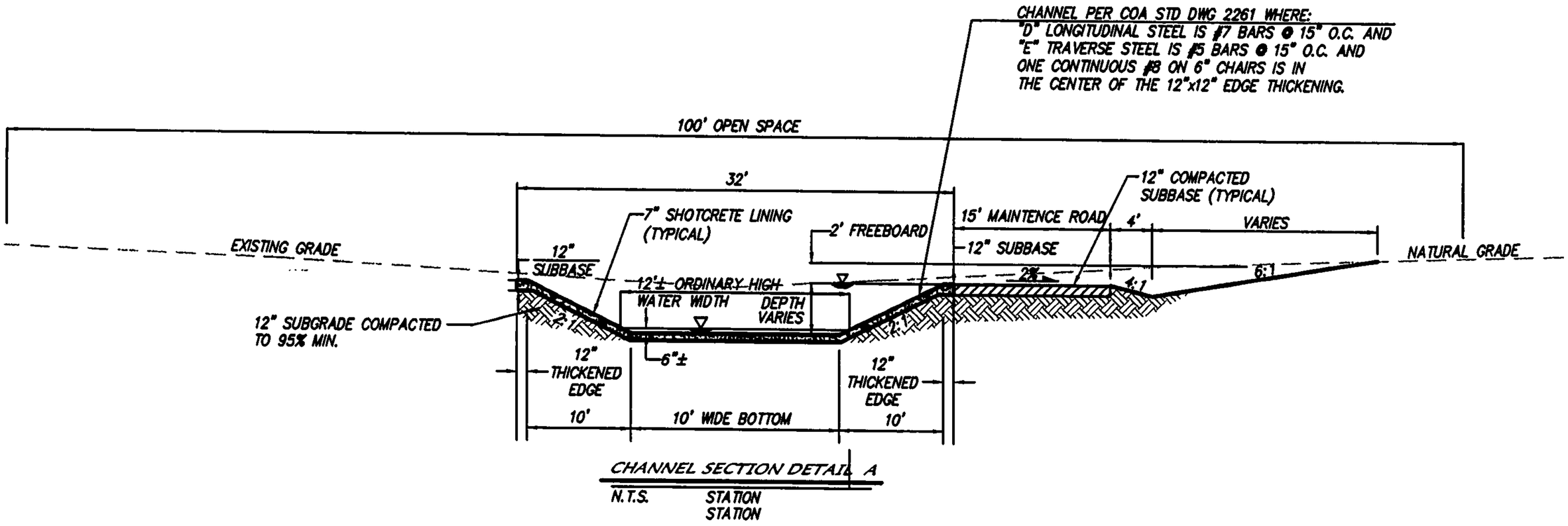
SCALE: 1:=100' (HORZ.)
SCALE: 1:=10' (VERT.)

13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00

JUAN TABO HILLS

BRIDGE PROFILE - FIGURE #5

dmg
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CHANNEL SECTION DETAIL A

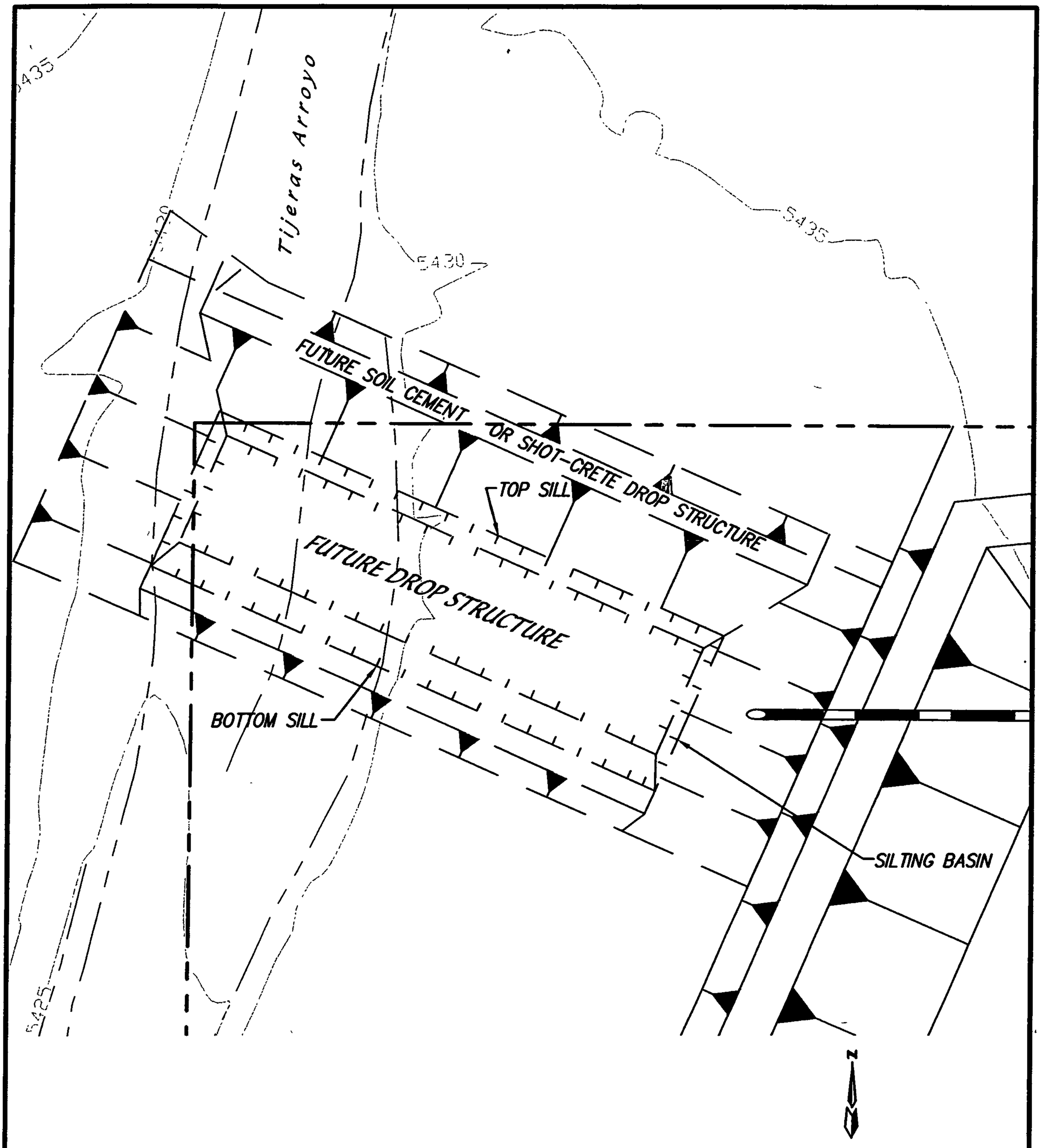
N.T.S. STATION STATION

JUAN TABO HILLS

TYPICAL SECTION 4 HILLS ARROYO HIGH WATER MARK - FIGURE #6

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(505)828-2200, FAX (505)797-9539

A02\JOBS\A2079_4 Hills\Exhibit\404-Typical-section.dwg\11-23-04\DER



SCALE: 1: =40'

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FUTURE DROP STRUCTURE DETAIL - FIGURE #7

dmg
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ALBUQUERQUE, NEW MEXICO 87199
(505)828-2200, FAX (505)797-9539

A02JOBS\A2079 4 Hills\Exhibit\404-permit-OUTFALL.dwg\01-13-05\DER

Information Required to Complete
Application No. 2004 00184
Juan Tabo Hills Subdivision
December 2, 2004

1. Please identify Four Hills Arroyo in the project description and on the drawings by its waterway name, not solely as Arroyo 5.

2. Several of the drawings have no space for the Corps' labeling for the public notice. Please provide public notice-ready drawings with a 1" x 4" space (or larger) without losing current map and drawing information.

3. Tijeras Arroyo bridge description.

a. Provide a complete description (fill types, placement) and dimensions of the fills for the Tijeras Arroyo bridge and abutments.

b. There is a contradiction in the description for the bridge: the application states that there will be filling of the north braid, yet also describes that the bridge will span the arroyo footprint. Please clarify and/or correct. All braids of the arroyo within the ordinary high water mark are considered jurisdictional waters of the United States.

c. The description of fills notes a 1-ft deep fill at the bridge. This does not accurately describe the abutment fills. Please fully describe.

d. Label the "new fill slope" on the bridge cross-section (short-dash line?). Alternatively, cross-hatch fill areas on the cross-section to clarify fill areas.

e. Label the ordinary high water mark in all braids to be filled at the bridge site.

f. Label fill types, berms, etc., on the Tijeras Arroyo bridge plan view (or provide a clarification legend).

g. The annotated "existing floodway" does not match current flow paths (assorted long/short dash lines). Please clarify both on the plan view and in the project description (i.e., what changes are proposed to the floodway, flood plain). Also, "floodway" has a specific definition pursuant to FEMA regulations. Is this a designated floodway, or is flood plain more appropriate terminology?

4. Provide a drawing, complete description and purpose, and information on materials for the Tijeras Arroyo drop structure/basin.

5. The cultural resources report notes an existing archeology site eligible for listing on the Historic Register. What are the intentions of the project for this site (the development appears to avoid portions of the site). Will the site be avoided, covered, or otherwise protected? Has the report been approved by the SHPO? If the Corps is to coordinate the report with the SHPO, please submit 2 additional copies.

Pete Doug client

6. OHWM determinations. Please provide a copy of your report on jurisdictional delineation for the site, including photos. How were the dimensions in Table 1 and shown on Fig. #2 calculated?

-- Specifically describe the braiding and alluvial fan characteristics of Four Hills Arroyo and the determination of ordinary high water mark transitions to braiding then to swale/aluvial fan.

-- Show and label the alluvial fan on Fig. #2.

Doug client

7.a During our initial discussions with your consultants, the design included a village center south of Tijeras Arroyo and north of the residential areas. This center is not shown on the drawings. Is it still planned? Will flood plain fills and/or berming of Tijeras Arroyo be required? Please discuss and describe in the application, and show in drawings.

Doug

7b Describe (and show in drawing(s)) the connection of the new Four Hills Channel to the existing outfall.

Doug

8. Please provide names and addresses of adjacent property owners in Four Hills whose property adjoin the proposed subdivision and the arroyos draining from Four Hills onto the Juan Tabo Hills Subdivision (Sagebrush, Raton Ave, Rio Arriba Ave, etc.). Kirtland AFB will also be an interested party; please provide a contact for the military installation.

Doug

9. Piping, filling and/or hard-lining of channels could increase flow volumes and rates exiting the property. Please provide analysis results that show the design maintains flow volumes and rates at the property exit point.

Pete

10. A mitigation plan prepared pursuant to our Mitigation and Monitoring Guidelines will be required for the project (see our web page at www.spa.usace.army.mil/reg, topic Mitigation Guidance). Specific information on replacement habitat, including dimensions, will be needed. For example, how will the ponds function to collect adequate water to support aquatic habitat. We will include the broad mitigation description of bio-retention ponds from the application in the public notice. Mitigation for loss of burrowing owl habitat will also be required.

Doug

11. Alternatives analysis (not needed for public notice, but will be required for 404(b)(1) analysis).

-- Why are arroyos 1 and 3 being put into pipes? Since there will be open space, why not leave the channels open?

-- Why will Four Hills Arroyo be shot-creted?

JUAN TABO HILLS

EXISTING CONDITIONS - FIGURE #2

dmg
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SCALE: 1: =500'

Juan Tabo Blvd

Arroyo

UNPLATTED

BRIDGE CROSSING
0.533 AC

PRUDENT LINE

Via Posada

FOUR HILLS VILLAGE

TRACT A
AMAFCA
PARCEL

TR. D

ARROYO #6
0.492 AC EXIST.
WATERS OF US

UNPLATTED

TRACT A

TRACT B

ARROYO #4
0.080 AC EXIST.
WATERS OF US

PROPOSED
STILLING BASIN
0.241 AC

ARROYO #5
1.468 AC EXIST.
WATERS OF US

FOUR HILLS ARROYO

Sagebrush

ARROYO #3C
0.056 AC EXIST.
WATERS OF US

ARROYO #3B
0.010 AC EXIST.
WATERS OF US

ARROYO #3A
0.045 AC EXIST
WATERS OF US

Four Hills Village

UNPLATTED

UNPLATTED

Raton Ave

ARROYO #3
1.361 AC EXIST.
WATERS OF US

TRACT A
Reserve at
Four Hills

ARROYO #2
0.005 AC EXIST.
WATERS OF US

ARROYO #1
0.660 AC EXIST.
WATERS OF US

A02JOBS\A2079_4 Hills\Exhibit\404-permit-Existing.dwg\01-18-05\DER

COMMENT RESPONSES TO CORPS OF ENGINEERS
FOR JUAN TABO HILLS 404 APPLICATION

1) A project description is represented and now indicates previously identified Arroyo #5 as Four Hills Arroyo. On Figure 2 & 3

2) All drawings now provide a 1" x 4" space for Corps labeling for the public notice.

3.a)

3.b) The proposed bridge will span the south braid of Tijeras Arroyo, as indicated in the plan view of FIGURE 4 and cross section of FIGURE 5.

3.c) The north braid of Tijeras Arroyo (FIGURE 5) will have 1 foot of earth fill placed below the ordinary high water mark. A total height of 38 feet of earth abutment fill will be placed above the north braid (FIGURE 5).

3.d) The "new fill slope" is labeled on the bridge cross section (FIGURE 5). ~~Additionally, fill areas are cross hatched in FIGURE 5 to clarify fill areas.~~ 4

3.e) The current ordinary high water mark is delineated on the plan view of FIGURE 4, and is also indicated on the FIGURE 5 cross section for the north braid, which will be filled, and for the south braid which will be spanned.

3.f) FIGURE 5, bridge plan view, indicates by cross hatching the waters of hte US to be filled.

3.g) Fill will be placed within the floodway, as indicated in FIGURE 4. ~~The floodplain will remain unchanged.~~ The floodplain will be remapped, by FEMA. Narrowing the floodway from about 300' to 200' and floodway

4) The purpose of the drop structure and stilling basin planned downstream of the proposed bridge and along the west boundary of the project area (FIGURE 2) is to stabilize the outlet for [redacted] drainage from the project area. The construction material will be a soil cement. A plan view of the structure is included as FIGURE 7. & buried below Grade

5) Correspondence between HPD and TRC regarding cultural resources matters at the Juan Tabo Hills Subdivision property is attached. In particular, LA1877 is planned to be avoided entirely (see January 13, 2004 correspondence).

According to Michelle Ensey at HPD, the SHPO has previously reviewed the cultural resources report and archived it. So we request that the Corps coordinate with the SHPO. Two additional copies of the report and previous

correspondence are attached for this process.

6)

7.a) FIGURE 3 indicates the location of the multi-use area for the village center which is planned for the subdivision development. The village center will be within the floodplain, but no encroach into waters of the US delineated in FIGURE 2.

7.b) FIGURE 3 shows the alignment of the proposed shotcrete-lined Four Hills Channel in the eastern half of the subdivision and its transition into buried concrete storm sewer pipe across the western half of the subdivision to the proposed drop structure (FIGURE 7).

8) (names and addresses)

9) The City of Albuquerque determined in a pre-design conferral that the design will allow free discharge for infrequent storms (100 year). Frequent storm flows will be mitigated by the proposed bio-retention ponds (FIGURE 3) which will have both a storm water retnetion and water quality function. The ponds ~~will have as best management retention volume, but their~~ principal function is water quality. by providing a Best Management Retention Volume.

10) (mitigation plan)

11) The City of Albuquerque will not maintain unlined channels, such as Arroyos #1 and #3 (FIGURE 2). The existing earth channels are deep and generally hazardous to the public in a prospective subdivision area, particularly Arroyo #3. Potential erosive flows have been determined upstream of the subdivision. The proposed pipe system will provide for non-erosive conveyance of storm water. Shotcrete is planned for Four Hills Arroyo in order to prevent further erosion, and because the arroyo is deeply incised and hazardous to the public.

JUAN TABO HILLS

DEVELOPED CONDITONS OVERALL- FIGURE #3

dmg
MARK GOODWIN & ASSOCIATES, P.A.
CONSULTING ENGINEERS
P.O. BOX 90606
ALBUQUERQUE, NEW MEXICO 87199
(505)828-2200, FAX (505)797-9539

SCALE: 1: =500'

Blvd

VILLAGE CENTER

OPEN SPACE

Via Posada

FOUR HILLS VILLAGE

TRACT A
AMAFCA
PARCEL

NORTH 1 AC. SHALLOW WATER QUALITY POND

MULTI-USE AREA (VILLAGE CENTER)

TR. D'

100 YR CONC. PIPE (TYP)
Q100=

FUTURE DROP STRUCTURE

WEST 0.88 AC. WATER QUALITY POND

ARCHEOLOGICAL SITE TO BE AVOIDED

100 YR SHOTCRETE CHANNEL
Q100=

EAST 0.33 AC. WATER QUALITY POND

FOUR HILLS CHANNEL

#10

BIO RETENTION AREA

#8

#7

#9

100 YR CONC. PIPE (TYP)
Q100=

#6

#5

#4

#3

#2

#1

RETENTION PONDS

100 YR CONC. PIPE (TYP)
Q100=

BIO RETENTION AREA

Sagebrush

Four Hills Village

Raton Ave

TRACT A

Reserve at Four Hills

Rio Arriba Ave

LEGEND

- IMPROVED UPLAND HABITAT
- NEW STORM SEWER
- NEW CONCRETE CHANNEL
- NEW PONDS
- UNPLATTED

A02.JOBS\A2079_4_Hills\Exhibit\404-permit-proposed.dwg\01-13-05\DER

JUAN TABO HILLS

BRIDGE PLAN - FIGURE 4

dmg
MARK GOODWIN & ASSOCIATES, P.A.
CONSULTING ENGINEERS
P.O. BOX 90606
ALBUQUERQUE, NEW MEXICO 87199
(505)828-2200, FAX (505)797-9539

N

SCALE: 1: =100'

JUAN TABO BLVD. S.E. (86' R/W)

10+00

00 ST

WATERS OF THE U.S. FILLED THIS PROJECT

EXISTING

FLOODWAY

LIMITS OF WATERS OF US

TIJERAS ARROYO

73.5'

A02\OBS\A2079.4 Hills\Exhibit\2004-Bridge-plan.dwg\01-10-05\DER

D. Mark Goodwin & Associates, P.A.
Consulting Engineers
P.O. BOX 90606, ALBUQUERQUE,NM 87199
(505) 828-2200 FAX 797-9539

M22/D001 File

June 17, 2005

Mr. Loren Meinz
AMAFCA
2600 Prospect Avenue NE
Albuquerque, NM 87107

Re: Juan Tabo Blvd. – Bridge

Dear Mr. Meinz:

Thank you and Ayres Associates, Inc. for your prompt review. In response to the concern about sediment deposition upstream of the bridge, we modeled 4' sediment accumulation at the upstream edge of the bridge in HEC-RAS. The result was a 4' increase in Water Surface Elevation for the 100-year and 500-year events. So we raised the levee at the South East corner of the bridge 4'. The shot-crete under the bridge will act as a grade control structure to protect upstream utilities and can not be lowered. The remaining concerns by Ayres were primarily technical issues like the spacing of the cross-sections and the use of "mixed" flow-regime, which can be addressed in response to FEMA comments if FEMA makes an issue out of them. The other concerns that you expressed regarding bank stabilization upstream and downstream of the bridge can be addressed prior to signature on the Final Plat.

Please contact our office if you have any questions.

Sincerely,

MARK GOODWIN & ASSOCIATES, P.A.

James D. Hughes, PE
Project Engineer

JDH/wp

XC: Robert Lupton
Brad Bingham

F:\1-Projects\2002\A02079 - Juan Tabo Hills\Sediment accumulation ltr.doc

AYRES ASSOCIATES

RECEIVED
JUN 0 2 2005

June 1, 2005

Mr. Loren Meinz
Albuquerque Metropolitan Arroyo
Flood Control Authority
2600 Prospect Avenue NE
Albuquerque, New Mexico 87101

Re: Review of Proposed Juan Tabo Boulevard Crossing of Tijeras Arroyo

Dear Loren,

This letter summarized our review of the proposed 3-span Juan Tabo Boulevard bridge crossing of Tijeras Arroyo. The review was carried out to address concerns about potential flooding impacts to the Hidden Valley subdivision caused by deposition due to the extreme backwater from the proposed bridge. There were also concerns about long-term maintenance of the channel if the deposition persists. The following steps were carried out as part of our review:

1. Initial review of the proposed bridge design and identification of potential problems
2. Brief review of the HEC-RAS model
3. Sediment continuity analysis to evaluate potential sedimentation problems associated with bridge backwater
4. Review of bridge plans with respect to scour mitigation measures

Initial Review

Bridge plans and hydraulic modeling results were reviewed to become familiar with the bridge design and to identify potential problems. The following general observations resulted from the review:

- Proposed bridge is a 3-span structure with pile-supported abutments and two pile-supported piers
- Bridge width is 280 feet (measured along the alignment of the bridge) and the bridge is skewed 26°16'16" with the alignment of the arroyo (piers are aligned with the flow)
- Bridge and approach embankment create a significant encroachment of the arroyo
- Encroachment causes significant backwater that begins at flows greater than about a 2-year event; flow depths are approximately doubled just upstream of the bridge for the 100-year event
- Model is predicting Class B low flow through the bridge opening (flow passes through critical depth at the bridge) with very severe hydraulic conditions and, therefore, very high scour potential
- Guide banks consisting of shot-crete lined levees direct flow into and through the bridge opening; the levees appear to be aligned well and tied back adequately upstream of the bridge
- Channel bottom is lined with shot-crete beneath the bridge opening

Owen Ayres & Associates, Inc.
Engineers/Scientists/Surveyors
3665 JFK Parkway, Building 2, Suite 200, P O Box 270460, Fort Collins, CO 80527
(970) 223-5556, Denver Metro (303) 572-1806, FAX (970) 223-5578

Printed on recycled paper

Review of HEC-RAS Model

A brief review of the HEC-RAS hydraulic model developed to support the bridge design was carried out to identify any significant modeling deficiencies. The following are general comments and observations regarding the modeling:

- Cross-section spacing in the model is too high; there are many warnings related to this in the output. To determine the potential effects of the cross section spacing on the results, we re-ran the model with interpolated cross sections and compared the results with the original model. In general the results with the interpolated cross sections did not change significantly, although there were three or four cross sections with significant differences (computed water-surface elevations of the 100-year event up to 1.6 feet different).
- The model was run in "mixed" flow-regime mode; there were some very high Froude Numbers downstream of the bridge (up to 2.2 for the 100-year event). This is unlikely for a sand-bed channel bed such as Tijeras Arroyo, and water-surface elevations should be based on the sequent depth as described in the AMAFCA Sediment and Erosion Design Guide (Design Guide, Mussetter et al. 1994, Chapter 3).
- Selection of bank stations seemed inconsistent.
- Selected main-channel Manning's n = 0.035 and overbank n = 0.045 are reasonable. The main-channel n was lowered to 0.02 through the bridge opening, presumably to reflect the shot-crete lined channel. This may not be a good assumption (at least for evaluating water-surface rise) as sediment will likely cover the shot-crete from transport upstream.
- Bridge deck is significantly above the computed water-surface elevations so there is no pressure or weir flow. The low-flow hydraulics through the bridge were modeled by selecting the highest energy solution between the energy, momentum, and Yarnell methods. The momentum equation governed which is reasonable for the flow conditions. The Yarnell method is not appropriate for the flow conditions at this location.

Sediment Continuity Analysis

We performed a simple sediment continuity analysis to evaluate sediment transport rates and potential aggradation volumes in the backwater area upstream of the bridge. Flow hydrographs for the 2- through 100-year events were taken from a previous Ayres study of Tijeras Arroyo just upstream (Ayres Associates 1999). Hydraulics were based on the HEC-RAS model provided to us, but run in subcritical mode with additional flows to capture the entire range of flows up through the 100-year peak. By running the model in subcritical mode the solution at many of the cross sections defaults to critical depth, which we believe to be more representative of actual hydraulic conditions than the supercritical solution that results at many of these cross sections when the model is run in "mixed" flow-regime mode.

Three subreaches were identified for carrying out the sediment continuity analysis: Sub-reach 1: "supply" reach upstream of bridge backwater; Sub-reach 2: backwater area upstream of bridge; and Sub-reach 3: representative reach downstream of bridge encroachment. The hydraulic results in each sub-reach were averaged for use in the sediment transport calculations. We used the MPM-Woo regression equation from the Design Guide to compute sediment transport rates. A median diameter sediment size of 2.45mm was used in the calculations based on the Ayres study just upstream (Ayres Associates 1999).

Sub-reach 1 was used to estimate the sediment supply to the backwater area upstream of the bridge (Sub-reach 2). This reach represents current conditions upstream of the backwater area, and provides a reasonable means to estimate the short-term sediment supply to the bridge. Due to upstream watershed conditions this reach is currently degrading, which means that long-term sediment supply will decrease. There is a significant volume of sediment stored in the reach between the proposed bridge and a grade-control structure located upstream, however, and the short-term sediment supply based on current conditions provides a reasonable, if somewhat conservative, estimate of what could occur in a single storm event in the short- to medium-term future.

Table 1 summarizes the sediment continuity results. The following general observations can be drawn from the data:

- Due to the short duration of the storm hydrographs (6 hours), the sediment volumes are not that significant when compared to typical representative reaches along the arroyo.
- Due to the short reach length of the backwater area upstream of the bridge (Sub-reach 2), there is a potential for significant local aggradation in this area for the larger flood events (greater than about the 10-year event). Computed average aggradation depths are greater than 4 feet for the 50- and 100-year events. This amount of aggradation would result in significant changes in computed water-surface elevations.
- Due to the relatively small sediment volumes, downstream impacts of the stored sediment upstream of the bridge are not likely to be significant (Sub-reach 3). This is especially true as accumulated sediment would likely flush through during low flows (there is a net degradational potential in Sub-reach 2 for the 2-year flood).

Table 1. Summary of Sediment Continuity Calculations.

Sub-reach	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Average Annual*
Sediment Transport Capacity (ft^3, bulked)							
1 (Supply)	35,400	107,300	246,500	599,000	1,101,500	1,158,100	113,200
2 (Backwater Area)	50,800	86,300	155,400	294,600	334,900	329,500	71,700
3 (Downstream)	64,400	140,900	232,700	461,300	777,600	810,800	114,800
Aggradation/Degradation Volume (ft^3, bulked)							
2 (Backwater Area)	-15,400	21,000	91,100	304,400	766,500	828,600	41,400
3 (Downstream)	-13,700	-54,600	-77,300	-166,700	-442,700	-481,400	-43,100
Approximate Aggradation/Degradation Depth (feet)**							
2 (Backwater Area)	-0.1	0.1	0.5	1.6	4.1	4.4	0.2
3 (Downstream)	0.0	-0.1	-0.1	-0.3	-0.8	-0.9	-0.1

*From Equation 1.1 in the Design Guide.

**Aggradation/Degradation volume divided by average effective width and approximate reach length.

Review of Scour Mitigation Measures

We reviewed the design of the scour mitigation measures as shown on the bridge plans. The following are our observations and comments:

- Scour mitigation consists of tinted shot-crete. It is our understanding that the shot-crete application being considered will consist of a rebar cage and a concrete thickness that would be durable and sufficient to resist the very high velocities expected in the vicinity of the bridge.
- The channel bed is lined underneath the bridge, which will mitigate for potential contraction scour and scour at the bridge piers. The bed lining is toed-down at the upstream and downstream ends of the bridge to match toe-downs for bank lining upstream and downstream of the bridge. These toe-downs equal 12.6 feet downstream and 9.3 feet upstream and appear adequate (see below).
- Toe-downs for bank lining upstream and downstream of the bridge were computed using the wall-scour equations from the Design Guide. Although zero angle of attack was assumed (which may be only approximately correct), the computed depths appear adequate. Toe-downs were increased at the head of the guide banks using the equation in the Design Guide for spurs and abutments. The computed scour depth of 35 feet is conservative.
- As noted above backwater from the bridge during large flood events will result in significant aggradation potential upstream of the bridge. If allowed to occur, contraction scour through the bridge opening could be large enough to increase the conveyance capacity of the bridge, and hence would lower the backwater and aggradation potential (contraction scour potential is very significant at this bridge). This could be accomplished in the design by lowering the elevation of the hardened channel bottom enough to allow a specified amount of scour to occur. Lowering the hardened channel bottom by about 4 feet would result in a significant increase in the conveyance capacity during peak flows, and thus would reduce the aggradation potential upstream of the bridge. The lowered hardened channel bottom would have to tie into the hardened channel banks as in the original design and future inspection of the buried portions of the protection would require excavation.
- Although we did not check the specific dimensions of the guide banks per the design equations in HEC-23 (Lagasse et al. 2001), the orientation and configuration of the guide banks appear reasonable.

We hope the information provided in this letter provides a satisfactory review of the proposed bridge crossing. If you have any questions, please feel free to give us a call.

Sincerely,

Ayres Associates Inc

C. Gary Wolff
Senior Hydraulic Engineer

Lyle Zevenbergen
Manager of River Engineering

CGW/LWZ/sp

MEINZ6L.DOC
32-0395.02

References

Ayres Associates, Inc., 1999. Tijeras Arroyo - Flooding and Erosion Potential in the Hidden Valley Reach, prepared for Albuquerque Metropolitan Arroyo Flood Control Authority.

Mussetter, R.A., Lagasse, P.F., and Harvey, M.D., 1994. Sediment and Erosion Design Guide, prepared for Albuquerque Metropolitan Arroyo Flood Control Authority.

Lagasse, P.F., Zevenbergen, L.W., Schall, J.D., and Clopper, P.E., 2001. "Bridge Scour and Stream Instability Countermeasures," Hydraulic Engineering Circular No. 23, Second Edition, FHWA NHI 01-003, Federal Highway Administration, Washington, D.C.

Cherne, Curtis

From: Cherne, Curtis
Sent: Friday, November 09, 2012 3:53 PM
To: Tapia, Daniel A.
Cc: Romo, Phillip A.; Rinkenberger, Carl C.; 'John MacKenzie'
Subject: RE: Blue Ribbon Rd/ Case id 9638868

Daniel,
I agree that it is a design issue and that you should not be maintaining the area in private property. I have copied the engineer representing the developer.

John,
The street was to continue into the proposed Juan Tabo Hills West (called something else "Four Hills estates?"). The proposed development does not Blue Ribbon continuing through.
What do you propose?

Curtis

From: Tapia, Daniel A.
Sent: Friday, November 09, 2012 8:13 AM
To: Cherne, Curtis
Cc: Romo, Phillip A.; Rinkenberger, Carl C.
Subject: FW: Blue Ribbon Rd/ Case id 9638868

Mr. Cherne

Regarding 311 case id number 9638868, this is erosion at the dead end of Blue Ribbon road S.E.. Mr. Cherne I have no problem doing maintenance on the roadway or even the curb and gutter, but the erosion is at the back of curb and even goes into private property. I don't believe this would be ours to maintain, I believe this might be a design issue, I don't believe the silt fence will help in anyway with all the run off water rising and finding its way over the curb and gutter. I believe there should have been a drop inlet put in at this location, but that is just my opinion. I know something has to been done at this location before we lose part of the roadway, but I am not sure if we are the right department to get this done.

Respectfully

Daniel A. Tapia
Operations & Maintenance Superintendent
Department of Municipal Development
Street Maintenance Division

E-Mail: datapia@cabq.gov
Office: 505-857-8038
Cell: 505-228-6874
Fax: 505-857-8042

CITY OF ALBUQUERQUE

Planning Department
Suzanne Lubar, Director

Richard J. Berry, Mayor

February 5, 2014

Mark Goodwin, P.E.
Mark Goodwin and Associates
P.O. Box 90606
Albuquerque, NM 87199

Re: Stormwater Entering Juan Tabo Hills Subdivision Unit 2 and Unit 1 at the West End of Raton Avenue, City Project Number 756183

Dear Mr. Goodwin,

Hydrology has received drainage complaints, July of 2011 and September of 2013, concerning stormwater bypassing the storm drainage cattle guard inlet built at the west end of Raton Ave, Exhibit 1. The inlet was built with City Project Number 756183, Juan Tabo Hills Subdivision, Unit 1. I have included the pertinent record drawing sheets for reference, Exhibit 2. The cattle guard inlet was designed to protect Juan Tabo Hills Unit 1 and Unit 2 from the offsite flows from Four Hills. The stormwater is eroding the emergency access road and the Homeowner Association (HOA) open space area, Exhibit 3. This is due to the stormwater bypassing the inlet. The HOA is paying to maintain the erosion concern.

Hydrology was working with Gregory Krenik of your office in the summer of 2011 to determine a solution to the drainage problem. I have included the e-mail correspondence for reference, Exhibit 4. Please refer to them for details.

It appears a portion of the drainage from Raton Avenue bypasses the cattle guard inlet. Per the approved drainage report, 198 cfs is flowing in Raton Avenue. It also appears that the inlet was designed without a clogging factor. The Development Process Manual recommends a 15% clogging factor for Type "C" inlets when there is not a Type "A" inlet upstream, which there is not.

Per a site visit September 26, 2013 the inlet was mostly clean, with some debris on the cattle guard inlet grate near the north side of the street. It appears that the stormwater is at too high of a velocity to be captured by one inlet. Mr. Krenik also indicated in his e-mail dated August 5, 2011, the street is not level and the stormwater stays to the north side. A similar cattle guard inlet was built at the end of Arriba Avenue. It seems to be functioning properly. Per the approved drainage report, 30 cfs is flowing in Arriba Avenue.

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

The City requests that Mark Goodwin and Associates correct the drainage problem at the end of Raton Avenue. Please contact our City Hydrologist, Curtis Cherne, to schedule a meeting to discuss.

If you have any questions, please contact me at the phone number or email address listed below.

Sincerely,

Bryan Wolfe, P.E.
City Engineer

Phone: (505) 924-3999
Email: bwolfe@cabq.gov

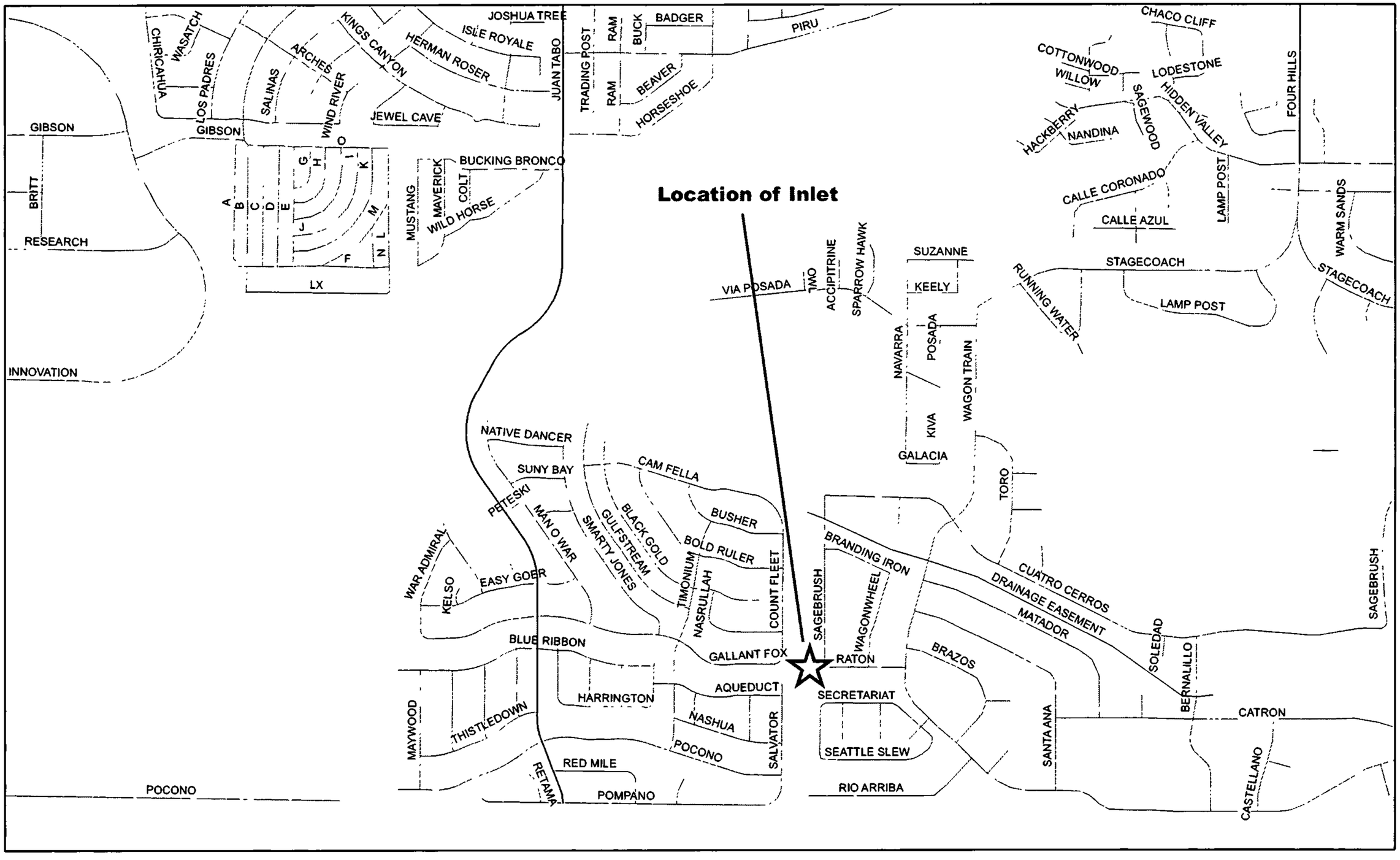
Enclosures: Exhibit 1, Site Location
Exhibit 2, Pertinent Sheets from Record Drawings
Exhibit 3, Emergency Access Road Erosion Picture
Exhibit 4, Correspondence

cc: Curtis Cherne, City Hydrologist
Matthew Conrad, Associate Director, Planning Department

File: \\dmdview\Hydrology\M\M21\M21D015

Exhibit 1
Cattle Guard Inlet Location

0 405 810 1,620 Feet



SCANNED BY PLANNING

CONSTRUCTION PLANS

FOR

JUAN TABO HILLS SUBDIVISION - UNIT 1 IMPROVEMENTS

ALBUQUERQUE, NEW MEXICO

INDEX TO DRAWINGS

SHEET NO	SHEET
1	TITLE SHEET
2-3 (20 SHEETS)*	PLAT (Unit 2, Unit 2A, Unit 2B)
4-16	GRADING PLANS
17A-17B	MASTER PAVING PLAN
18-47	PAVING IMPROVEMENTS
48-49	MASTER UTILITY PLAN
50-76	UTILITY IMPROVEMENTS
77-83	STORMDRAIN IMPROVEMENTS

* Numbered 2 (11/09)

SURVEYORS CERTIFICATION

I, Russ P Hupp, New Mexico Professional Surveyor Number 9750, hereby certify that the as-built information shown hereon is the result of an actual field survey performed by me or under my direct supervision and that the same is true and correct to the best of my knowledge and belief.

Russ P Hupp
NMPS No 9750
9.19, 2007

RECORD DRAWING
CERTIFICATE OF SUBSTANTIAL COMPLIANCE ON PLANS

I Gregory J Kronk, NMPE 11939, of the firm Mark Goodwin & Associates, P.A., a Registered Professional Engineer in the State of New Mexico, do hereby certify, to the best of my knowledge and belief, that the infrastructure installed as part of the project has been inspected by me or by a qualified person under my direct supervision, and has been constructed in accordance with the plans and specifications approved by the City Engineer and that the original design intent of the approved plans has been [illegible] by me on the as-built construction drawings. This Certification is based on site inspections by me or [illegible] direction and survey information provided by Russ P. Hupp, NMPS number 9750.

9-19-07
Gregory J Kronk NMPE 11939

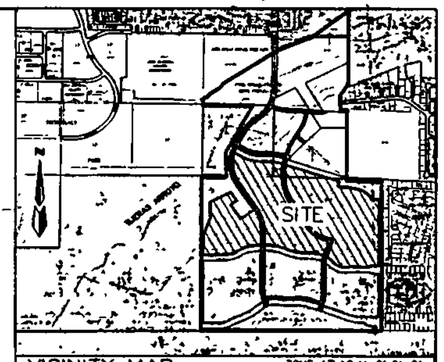
I, Gregory J Kronk, certify that the [illegible] is identical to the original reproducible APPROVED FOR CONSTRUCTION drawings signed by me on [illegible], 20 07.

This set of drawings is accepted for RECORD purposes by _____ on _____, 2007

THE SUBJECT PROPERTY IS LOCATED NEAR A FORMER LANDFILL. DUE TO THE SUBJECT PROPERTY BEING NEAR A FORMER LANDFILL CERTAIN PRECAUTIONARY MEASURES MAY NEED TO BE TAKEN TO ENSURE THE HEALTH AND SAFETY OF THE PUBLIC. RECOMMENDATIONS MADE BY A PROFESSIONAL ENGINEER WITH EXPERTISE IN LANDFILLS AND LANDFILL GAS ISSUES (AS REQUIRED BY THE MOST CURRENT VERSION OF THE INTERIM GUIDELINES FOR DEVELOPMENT WITHIN CITY DESIGNATED LANDFILL BUFFER ZONES) SHALL BE CONSULTED PRIOR TO DEVELOPMENT OF THE SITE.

[illegible] 24, 2006
CITY OF ALBUQUERQUE ENVIRONMENTAL HEALTH DEPT DATE

DRB NO 1004073



VICINITY MAP ZONE ATLAS M-21/N-21
SCALE NONE

GENERAL NOTES

NOTICE TO CONTRACTORS

1. AN EXCAVATION/CONSTRUCTION PERMIT WILL BE REQUIRED BEFORE BEGINNING ANY WORK WITHIN THE CITY RIGHT-OF-WAY
2. ALL WORK DETAILED ON THESE PLANS TO BE PERFORMED UNDER CONTRACT SHALL, EXCEPT AS OTHERWISE STATED OR PROVIDED FOR HEREON, BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF ALBUQUERQUE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 1986 EDITION AS REVISED THROUGH UPDATE #7
3. TWO WORKING DAYS PRIOR TO ANY EXCAVATION, THE CONTRACTOR MUST CONTACT NEW MEXICO ONE CALL SYSTEM (260-1990) FOR LOCATION OF EXISTING UTILITIES.
4. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXCAVATE AND VERIFY THE HORIZONTAL AND VERTICAL LOCATIONS OF ALL OBSTRUCTIONS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY SO THAT THE CONFLICT CAN BE RESOLVED WITH A MINIMUM AMOUNT OF DELAY
5. FIVE (5) WORKING DAYS PRIOR TO BEGINNING OF CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT TO CONSTRUCTION COORDINATION DIVISION A DETAILED CONSTRUCTION SCHEDULE.

   TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL OBTAIN A BARRICADING PERMIT FROM THE CONSTRUCTION COORDINATION DIVISION. CONTRACTOR SHALL NOTIFY THE CONSTRUCTION COORDINATION ENGINEER (924-3400) PRIOR TO OCCUPYING AN INTERSECTION. REFER TO SECTION 49 OF THE GENERAL CONDITIONS OF THE STANDARD SPECIFICATIONS.
6. ALL WORK AFFECTING ARTERIAL ROADWAYS REQUIRES TWENTY-FOUR HOUR CONSTRUCTION.
7. ALL STREET STRIPING ALTERED OR DESTROYED SHALL BE REPLACED WITH PLASTIC REFLECTORIZED PAVEMENT MARKING BY CONTRACTOR TO THE SAME LOCATION AS WAS EXISTING, OR AS INDICATED BY THIS PLAN SET
8. CONTRACTOR SHALL NOTIFY THE ENGINEER NOT LESS THAN SEVEN (7) DAYS PRIOR TO STARTING WORK IN ORDER THAT THE CITY SURVEYOR MAY TAKE NECESSARY MEASURES TO INSURE THE PRESERVATION OF SURVEY MONUMENTS. CONTRACTOR SHALL NOT DISTURB PERMANENT SURVEY MONUMENTS WITHOUT THE CONSENT OF THE CITY SURVEYOR AND SHALL NOTIFY THE CITY SURVEYOR AND BEAR THE EXPENSE OF REPLACING ANY THAT MAY BE DISTURBED WITHOUT PERMISSION. REPLACEMENT SHALL BE DONE ONLY BY THE CITY SURVEYOR. WHEN A CHANGE IS MADE IN THE FINISHED ELEVATIONS OF THE PAVEMENT OF ANY ROADWAY IN WHICH A PERMANENT SURVEY MONUMENT IS LOCATED, CONTRACTOR SHALL, AT HIS OWN EXPENSE, ADJUST THE MONUMENT TO COVER THE NEW GRADE UNLESS OTHERWISE SPECIFIED REFER TO SECTION 44 OF THE GENERAL CONDITIONS OF THE STANDARD SPECIFICATIONS.
9. CONTRACTOR SHALL RECORD DATA ON ALL UTILITY LINES AND ACCESSORIES AS REQUIRED BY THE CITY OF ALBUQUERQUE FOR THE PREPARATION OF "AS CONSTRUCTED" DRAWINGS. CONTRACTOR SHALL NOT COVER UTILITY LINES AND ACCESSORIES UNTIL ALL DATA HAVE BEEN RECORDED.
10. CONTRACTOR SHALL MAINTAIN A GRAFFITI-FREE WORK SITE. CONTRACTOR SHALL PROMPTLY REMOVE ANY GRAFFITI FROM ALL EQUIPMENT, WHETHER PERMANENT OR TEMPORARY
11. CONTRACTOR SHALL COORDINATE WITH THE CITY OF ALBUQUERQUE WATER SYSTEMS DIVISION (857-8200) SEVEN (7) WORKING DAYS IN ADVANCE OF ANY WORK THAT MAY AFFECT EXISTING PUBLIC WATER OR SEWER UTILITIES. EXISTING VALVES TO BE OPERATED BY CITY PERSONNEL ONLY. CONTRACTOR SHALL CONTACT THE WATER SYSTEMS DIVISION SEVEN (7) WORKING DAYS PRIOR TO NEEDING VALVES TURNED ON OR OFF
12. FOR STORM DRAIN CONSTRUCTION, ROP JOINTS SHALL NOT BE GROUTED PRIOR TO FINAL INSPECTION. FINAL INSPECTION WILL DETERMINE JOINTS TO BE GROUTED FOR FINAL ACCEPTANCE OF THE CONSTRUCTION.
13. ALL EXCAVATION, TRENCHING AND SHORING ACTIVITIES MUST BE CARRIED-OUT IN ACCORDANCE WITH OSHA 29 CFR 1926.650, SUBPART P
14. ELECTRONIC MARKER DISKS (EMD) WILL BE PLACED ACCORDING TO SECTION 170 OF THE CITY OF ALBUQUERQUE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 1986 EDITION AS REVISED THROUGH UPDATE #7

THE FOLLOWING NOTES ALSO APPLY WHEN CHECKED

- [x] ALL UTILITIES AND UTILITY SERVICE LINES SHALL BE INSTALLED PRIOR TO PAVING
- [x] BACKFILL COMPACTION SHALL BE ACCORDING TO SPECIFIED STREET USE.
- [ ] TACK COAT REQUIREMENTS SHALL BE DETERMINED BY THE ENGINEER
- [x] SIDEWALK AND WHEELCHAIR RAMPS WITHIN THE CURB RETURNS SHALL BE CONSTRUCTED WHEREVER A NEW CURB RETURN IS CONSTRUCTED
- [ ] IF CURB IS DEPRESSED FOR A DRIVEPAD, THE DRIVEPAD SHALL BE CONSTRUCTED PRIOR TO ACCEPTANCE OF CURB AND GUTTER
- [x] ALL STORM DRAINAGE FACILITIES SHALL BE COMPLETED PRIOR TO FINAL ACCEPTANCE.

APPROVED AS RECORD DRAWINGS
DESIGN REVIEW SECTION
CITY CONSTRUCTION ENGINEER
DATE 10/24/07

CAUTION
NOTE THAT ALL EXISTING UTILITIES MAY NOT BE SHOWN. ALL EXISTING SERVICE CONNECTIONS ARE NOT SHOWN. ANY EXISTING UTILITIES THAT ARE SHOWN ARE APPROXIMATE LOCATION ONLY. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT ALL THE UTILITY OWNERS AND TO CONDUCT ALL NECESSARY FIELD INVESTIGATIONS PRIOR TO ANY EXCAVATIONS TO DETERMINE THE ACTUAL LOCATION OF UTILITIES AND OTHER IMPROVEMENTS.

dmg D MARK GOODWIN & ASSOCIATES, P.A.
CIVIL ENGINEERING CONSULTING ENGINEERS
P O BOX 90606
ALBUQUERQUE, NEW MEXICO 87199
(505) 828-2200, FAX (505) 797-9539

REV	SHEETS	CITY ENGINEER	DATE	USER DEPARTMENT	DATE	USER DEPARTMENT	DATE

ENGINEER'S STAMP & SIGNATURE

APPROVALS	ENGINEER	DATE
DRC CHAIRMAN		3-27-07
TRANSPORTATION		3/16/07
WATER/WASTEWATER		3/16/07
HYDROLOGY		3/16/07
CIP		
CONSTR MNGMT		
CONSTR COORD		3-27-07

APPROVED FOR CONSTRUCTION
CITY ENGINEER DATE

CITY PROJECT NO 756183

SHEET 1 OF 83

A2079 4 HILLS/UNIT-1/PLANS/ACAD-A2079-TITLE.dwg/03-02-08/NDG ACH

\\ADC085\c107$ 4 HILLS\UNIT 1\PLANS\C-0 A2079-Title.dwg 2/6/2008 9:46:32 PM Mountain

SCANNED BY PLANNING

RECORD DRAWING
CERTIFICATE OF SUBSTANTIAL COMPLIANCE ON PLANS

I Gregory J. Krenik, NMPE 11829, of the firm Mark Goodwin & Associates, P.A. a Registered Professional Engineer in the State of New Mexico do hereby certify, to the best of my knowledge and belief that the infrastructure installed as part of the project has been inspected by me or by a qualified person under my direct supervision, and has been constructed in accordance with the plans and specifications approved by the City Engineer and that the original design intent of the approved plans has been substantially complied with except as noted by me on the as-built construction drawings. This Certification is based on the inspections performed under my direction, and survey information provided by Russ P. Hugg, NMPS number 9750.

5-1-06
Gregory J. Krenik

I Gregory J. Krenik, certify that the electronic version is identical to the original reproducible APPROVED FOR CONSTRUCTION drawings submitted on 3-6 2006

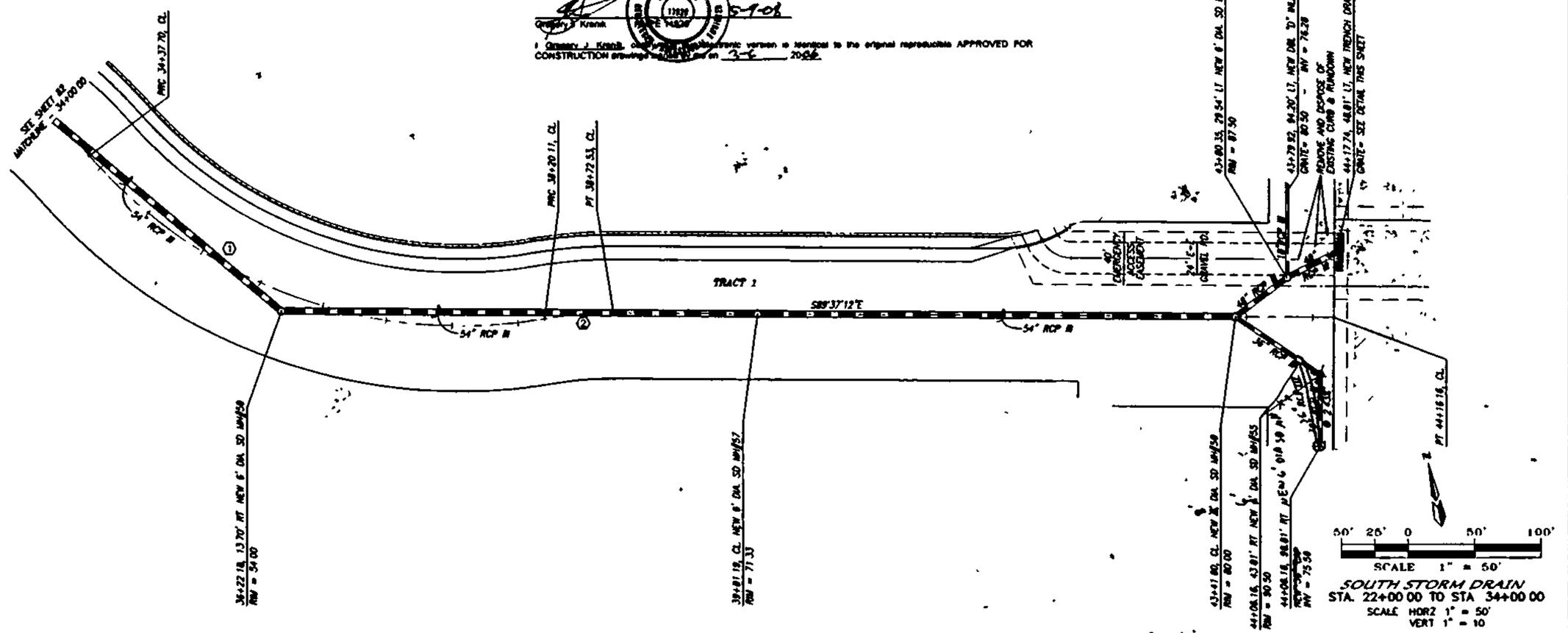
NOTES
1 ALL STATIONING IS CENTERLINE STATIONING

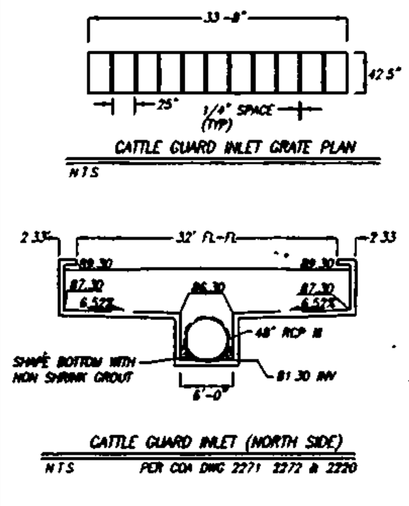
CURVE DATA - DESCRIBES CENTERLINE
① Δ = 58°25'41" R = 375.00' L = 382.41' T = 209.70'
② Δ = 10°00'45" R = 300.00 L = 52.43' T = 26.28'

BENCH MARKS
STATION "3-427" IS LOCATED 8.7 MI. SE OF BOOTHUM ALBUQUERQUE ON THE EAST SIDE OF THE MUNICIPAL LIMITS LINE IN THE FOUR HILLS SUBDIVISION AREA. STATION IS 600 FT. EAST OF MUNICIPAL LIMITS LINE, 179' SE OF POWER POLE #6431 & 196.0' NW OF POWER POLE #44. STATION IS A STANDARD ADS BRASS DISK SET IN A CONCRETE MONUMENT IN THE GROUND. STATION IS STAMPED "3-427, 1975" ACS
N= 424,001.761, E= 1,473,700.00, (NAD 1927), Z= 5594.518 (USD 1929)

AS BUILT INFORMATION
CONTRACTOR SALAS BROS DATE 5/8/07
ENGINEER SURV-TEK DATE 5/8/07
SURVEYOR SURV-TEK DATE 5/8/07
FIELD CREW SURV-TEK DATE 5/8/07
VERTICAL DATUM NGVD 29
HORIZONTAL DATUM NAD 83
MICRO-FILM INFORMATION
RECORDED BY DATE
NO

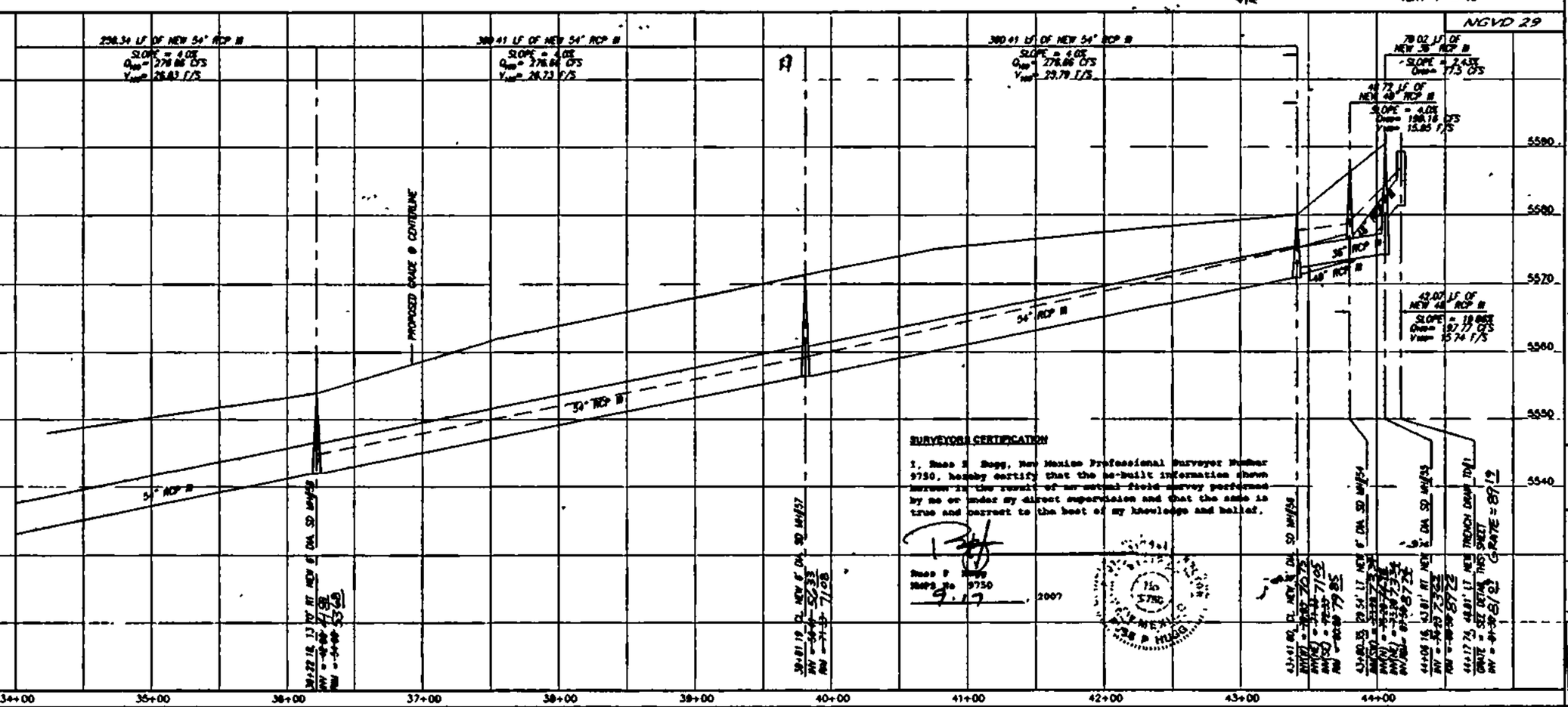
SURVEY INFORMATION
FIELD NOTES BY DATE NO





CATTLE GUARD INLET GRATE PLAN
N.T.S.

CATTLE GUARD INLET (NORTH SIDE)
N.T.S. PER COA DWG 2271 2272 & 2220



SURVEYOR'S CERTIFICATION

I, Russ P. Hugg, New Mexico Professional Surveyor Number 9750, hereby certify that the as-built information shown hereon is the result of an actual field survey performed by me or under my direct supervision and that the same is true and correct to the best of my knowledge and belief.

Russ P. Hugg
NMPS No. 9750
9.19 2007

ENGINEER'S SEAL

NO	DATE	REMARKS	BY
		REVISIONS	
		DESIGNED BY GJK DATE 07/05	
		DRAWN BY ACH DATE 07/05	
		CHECKED BY DMG DATE 07/05	

dmg MARK GOODWIN & ASSOCIATES, P.A.
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CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

TITLE
JUAN TABO HILLS - UNIT 1
SOUTH STORM DRAIN
STORM DRAIN IMPROVEMENTS

DRB APPROVAL TITLE — APPROVED — MAR 24 2006 — DESIGN REVIEW COMMITTEE
CITY ENGINEER APPROVAL — CITY ENGINEER
LAST DESIGN UPDATE — MO./DAY/YR
MO./DAY/YR

CITY PROJECT NO 756183
ZONE MAP NO M-21 & M-22
SHEET 83 OF 83

A02JOBS/A2079 4 HILLS/UNIT-1/PLANS/ACAD-UP-STORM-3/01-29-06/ACH RDQ

I:\102JOBS\A2079 4 HILLS\UNIT-1\PLANS\ACAD-UP-STORM-3 Sep 27, 2006 1:58:28 PM chris
Default 1006L (Temporary).ctb

ЕХНІВІТ 3



EXHIBIT 4, Page1 of 3

Cherne, Curtis

From: Cherne, Curtis
Sent: Friday, August 12, 2011 10:41 AM
To: 'Gregory Krenik'
Subject: RE: Raton Ave Runoff

Greg,

After our lengthy discussion. We agreed that you would submit some calculations to support a fix. We talked about building a sump condition for the cattle guard, installing an inlet(s), and picking up flows in the inlet west of the fence.
Thanks.

Curtis

From: Gregory Krenik [mailto:Greg@goodwinengineers.com]
Sent: Tuesday, August 09, 2011 4:43 PM
To: Cherne, Curtis
Cc: Heather Foote; june.wilson@kirtland.af.mil; sarah@hoamco.com; Lopez, Anthony C.; Mark Goodwin
Subject: RE: Raton Ave Runoff

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EXHIBIT 4, Page2 of 3

capacity for the flows (198 cfs) coming down the street let alone for a street section that loads up one side to make things worse.

Please be more specific in what you mean by a 'solution'. We installed the trench drain; we removed the crown and then removed more of the crown because of this same problem. To see the whole picture, substantial survey work will need to be done up Raton. With this additional information please let me know how you want us to proceed.
Greg

From: Cherne, Curtis [mailto:CCherne@cabq.gov]
Sent: Tuesday, August 09, 2011 3:57 PM
To: Gregory Krenik
Subject: RE: Raton Ave Runoff

Greg,
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From: Gregory Krenik [mailto:Greg@goodwinengineers.com]
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To: Cherne, Curtis
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Curtis,
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EXHIBIT 4, Page3 of 3

those inlets to reduce the runoff in Raton before it gets to the trench drain.

Let me know what you think.
Greg

Gregory J. Krenik, PE
D. Mark Goodwin & Associates
PO Box 90606
Albuquerque, NM 97199
505-828-2200
505-235-9338 cell

8/12/2011

October 2, 2013

Mark Goodwin, P.E.
Mark Goodwin and Associates
P.O. Box 90606
Albuquerque, NM 87199

Re: Stormwater Entering Juan Tabo Hills Unit 2 at the West End of Raton Ave.

Dear Mr. Goodwin,

Hydrology received drainage complaint in July of 2011 and this September concerning stormwater bypassing the storm drainage inlet built at the west end of Raton Ave that was designed to protect Juan Tabo Hills Unit 2 from the offsite flows coming from Four Hills. The stormwater is eroding the emergency access road and HOA open space area, which the HOA is paying to maintain.

Hydrology was working with Gregory Krenik of your office in the summer of 2011 to determine a solution to the drainage problem. I have included the e-mails. Please refer to them for details.

It appears the drainage from Raton Ave bypasses the inlet from approximately the middle of the inlet to the curb on the north side of Raton Ave. Per the approved drainage report, 197.8 cfs is flowing in Raton Ave. The inlet was designed without a factor for clogging. The Development Process Manual recommends a 15% clogging factor for Type "C" inlets when there is not a Type "A" inlet upstream, which there is not.

Per a site visit September 26th, 2013 the inlet was mostly clean, with some debris on the inlet grate near the south side of the street. It appears there is too much water at too high a velocity to be captured by one inlet. As Mr. Krenik stated in his e-mail dated August 5th, 2011, the street is not level and the water stays to the north side.

A similar inlet was built at the end of Arriba Ave. and it seems to functioning properly. Per the approved drainage report there is only 29.8 cfs draining to this inlet.

The City requests Mark Goodwin and Associates and the developer of Juan Tabo Hills Unit 2 participate in correcting the drainage problem at the end of Raton Ave. Please contact me to schedule a meeting to discuss the level of participation expected.

If you have any questions, you can contact me at 924-3999 or bwolfe@cabq.gov.

Bryan Wolfe, P.E.

City Engineer, Planning Dept.
Development and Review Services

Copy: File M21D015

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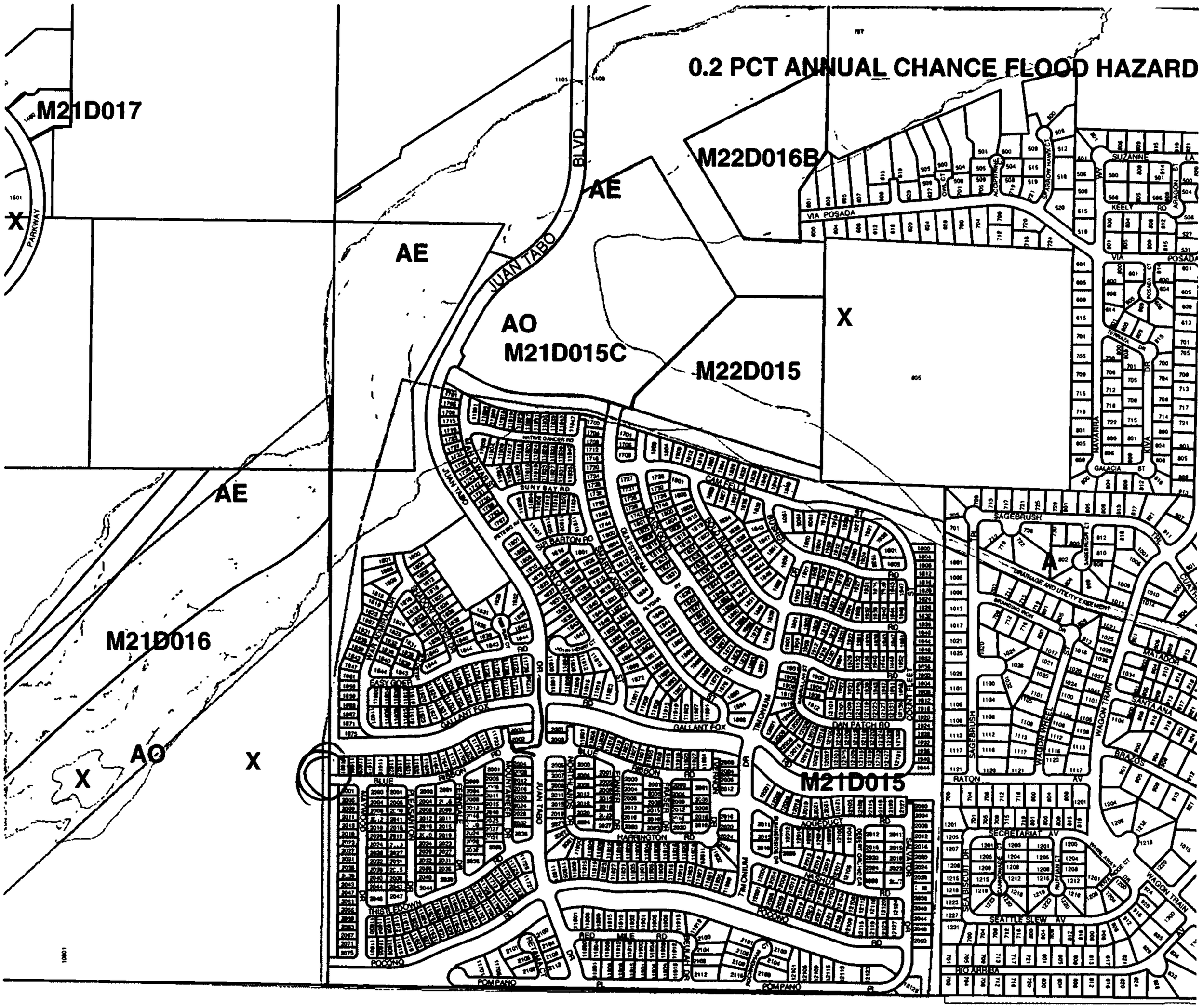
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those inlets to reduce the runoff in Raton before it gets to the trench drain.

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0.2 PCT ANNUAL CHANCE FLOOD HAZARD
M21D017
M22D016B
AE
AE
JUAN TABO BLVD
AO
M21D015C
M22D015
X
AE
M21D016
AO
X
X
M21D015
PARKWAY
VIA POSADA
KEELY RD
SUZANNE LA
SAGEBRUSH
GALACIA ST
NAVARRA WAY
SUNY BAY RD
SIR BARTON RD
GALLANT FOX
DAN PATCH RD
BLUE RIBBON
HARRINGTON RD
POCONO
POMPANO
RED MILE RD
AQUEDUCT
SECRETARIAT AV
SEATTLE SLEW AV
RIO ARRIBA
SANTA ANA
BRAZOS
RATON
MATADOR
WAGON TRAIN
SAGEBRUSH
TRAIL
BRANDING IRON
WAGON WHEEL
CAM FELT
TRIONUM
COUNT FLEET
SEA BISCUIT DR
CANNONADE
RIVA RIDGE CT
RUFFIAN CT
WHIRL AWAY CT
SWAPS
KENTUCKY DERBY
MOUNTAINEER
PLEASANTON
FERNDALE
THISTLEDOWN
JUAN TABO
NORTHERN DANCER
FRASER
CONNER
SUNNY SANDS
MAN O WAR
PETER PAN
GUSTAV
SWAPS
ACOPPINE
OWL CT
SPARROW HAWK CT
POSADA CT
TEMBLOR
DR
PL
CT
ST
RD
AV
WY
LA
A
D

Cherne, Curtis moving to High Desert

Subject: Meet with Aliso and Sarah of JTH HOA
Location: where Raton dumps into JTH

Start: Thu 9/26/2013 3:00 PM
End: Thu 9/26/2013 5:00 PM

Recurrence: (none)

HOA

Action

plan implementation



I would like to know the Administration/

Council position on how strongly who is going

to pay for it



Cherne, Curtis

To: Gregory Krenik

Subject: RE: Raton Ave Runoff

Greg,
Good catch on the grate.
I'm with ya for the most part.
I'm thinkin' to cut the bars and provide a 0.5 ft sump. I did some quick calcs assuming an orifice.
Q=CA*square root (2gh)
C=0.6
A=74 sq ft
h=0.5
Q=251
Th only thing is how to do the waterblock on the access part, so that it doesn't blow right over it. Would have to be higher than EGL. If I remember right the energy term is V squared over 2g. Height=(10.5*10.5)/2*32 2=1.7 feet.
Therefore HGL + EGL=0.85+1.7=2.55 ft.
Maybe HGL ısn't 0 85 due to some going down grate, say HGL=.4, then 0.4+1.7=2.1 ft. Of course now ıt is blowing way over the curb.

I'll stop now.

Curtis

From: Gregory Krenik [mailto:Greg@goodwinengineers.com]
Sent: Monday, August 15, 2011 12:09 PM
To: Cherne, Curtis
Subject: FW: Raton Ave Runoff

I forgot the inlet efficiency nomo.

From: Gregory Krenik
Sent: Monday, August 15, 2011 12:00 PM
To: 'Cherne, Curtis '
Subject: RE: Raton Ave Runoff

Curtis,
I think I figured out part of the problem...in my drainage report I state a P-1-7/8 grate to be used in Raton, but per the plans, the COA Std Detail 2220 (P-1-7/8-4) was shown and installed (accepts only about 65% of flow)...the difference is that there are no perpendicular bars on the P-1-7/8, the bars only run parallel with the flow...see attached. We can go out and cut the transverse bars off the grates and the inlet should perform according to design. There still is the issue of too much flow coming down the street and being over the top of the curb..

The trench drain on Rio Arriba called for the P-1-7/8-4 in the design and that was what

was constructed, so it functions properly.

Attached are design sheets showing how the trench drain would work in sump if using the existing COA grates. It shows a depth of 3". This would mean a water block of 6" - 8" should be sufficient but it would need to go from ROW line to ROW line.

The design sheets also show the installation of two double 'A' inlets or two 'B' inlets and what the resulting depth in the street would be after the inlets. It also shows that the interception efficiency of these depths is around 110% for the P-1-7/8 grate...the transverse bars would still need to be removed from the grates.

For the existing grates to be able to function correctly the runoff velocity would need to be lowered to approximately 6.75 F/S. Only the Type 'B' inlets will work, the type 'A' inlets are not efficient enough. In fact six more Type 'B' inlets, for a total of eight, would have to be added to make the existing trench drain grates work. This is not an affordable option, the first inlets would have to be place 250 feet upstream and you would have 4 manholes in addition to the RCP plus the pavement removal and replacement and any water/sewer conflicts.

I propose these options:
1) Leave the inlet grates as they are and build a 6"-8" waterblock from recycled asphalt millings or a combination curb and millings
2) Cutting and removing the transverse bars on the inlet grates and build a smaller waterblock

Let me know what you think
Greg

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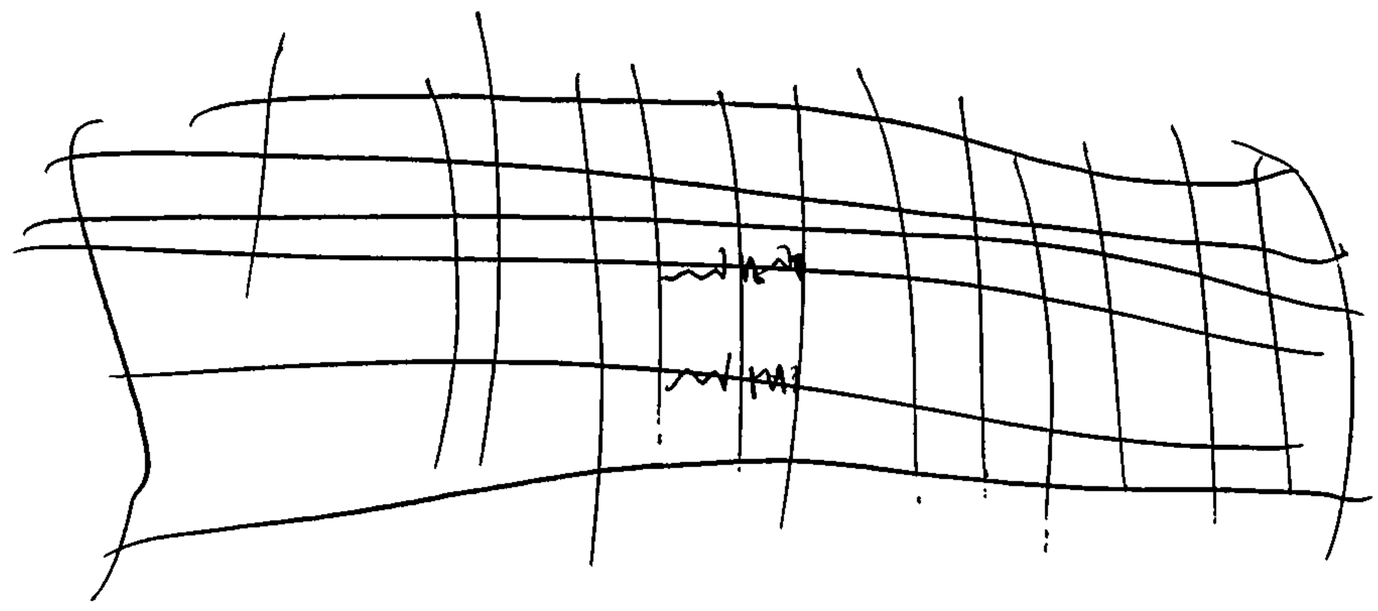
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CITY OF ALBUQUERQUE

April 22, 2009

Gregory J. Krenik, P.E.
Mark Goodwin & Associates, P.A.
P.O. Box 90606
Albuquerque, NM 87199

RE: Juan Tabo Hills – Unit II, (M-21/D015)
Engineers Certification for Release of Financial Guaranty
Engineers Stamp dated 11/02/2006
Engineers Certification dated 03/18/2008

Dear Mr. Krenik,

Based upon your Engineer's Certification submitted on 4/09/2009, the above referenced plan is adequate and satisfies the Grading and Drainage Certification for Release of Financial Guaranty.

If you have any questions, you can contact me at 924-3982.

Sincerely,

Timothy E. Sims
Plan Checker, Planning Dept. - Hydrology
Development and Building Services

C: Marilyn Maldonado, COA# 756185
File

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 1/28/2003rd)

M-21/D015

PROJECT TITLE: Juan Tabo Hills – UNIT 2
DRB #: 1004715 EPC#:_____

ZONE MAP/DRG. FILE #: ~~M-21/M-22~~
WORK ORDER#: 756185

LEGAL DESCRIPTION: Tracts 6 & 7, Juan Tabo Hills, Unit 1
CITY ADDRESS:_____

ENGINEERING FIRM: Mark Goodwin & Associates, PA
ADDRESS: PO Box 90606
CITY, STATE: Albuquerque, NM

CONTACT: Gregory J. Krenik, PE
PHONE: 828-2200
ZIP CODE: 87199

OWNER: JTH, LLC
ADDRESS: PO Box 1443
CITY, STATE: Corrales, NM

CONTACT: Scott Grady
PHONE: 892-5533
ZIP CODE: 87048

ARCHITECT: _____
ADDRESS: _____
CITY, STATE: _____

CONTACT: _____
PHONE:
ZIP CODE: _____

SURVEYOR: Surv-Tek
ADDRESS: 9384 Valley View Drive
CITY, STATE: Albuquerque, NM

CONTACT: Russ Hugg
PHONE: 897-3366
ZIP CODE: 87114

CONTRACTOR: _____
ADDRESS: _____
CITY, STATE: _____

CONTACT: _____
PHONE: _____
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
- ☒ 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:

- ☒ SIA / FINANCIAL 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)

WAS A PRE-DESIGN CONFERENCE ATTENDED:

- ☐ YES
- ☒ NO
- ☐ COPY PROVIDED

DATE SUBMITTED: 4-9-09

BY: Gregory J. Krenik, PE

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

1. **Conceptual Grading and Drainage Plan**: 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.

Cherne, Curtis

To: Gregory Krenik

Subject: RE: Raton Ave Runoff

Greg,
I agree with the WOW on the 200 cfs.
There seems to be some discontinuity between the calcs for the street with the crown and then without the crown, d, A, V and then the Q that the grate will accept. Also, where does the efficiency number come into play?

If you apply a 50% clog to the grate part of the inlet, this leaves a substantial gap.
I am not sure two A inlets will be enough. May need the inlets and the header curb.

I would like for you to redo the calcs and provide a solution. The improvement will be the responsibilty of someone other than the City, except of course, our help with the approval process.

Curtis

From: Gregory Krenik [mailto:Greg@goodwinengineers.com]
Sent: Friday, August 05, 2011 1:22 PM
To: Cherne, Curtis
Subject: Raton Ave Runoff

Curtis,
I've attached the pages from the JTH Report that concern Raton. It is Basin 6 and the basin size is 53.7706 AC. The Q produced is 197.77 CFS...WOW that's a lot of runoff with no storm drain system! As you can see from Sheet 37 of the calcs the existing runoff was more than the existing street could handle by 73.24 CFS. Then I calced removing the crown and it came up OK. If the street is not level, as is the case, and the water stays to the north side then we will have the issue of it going over the curb, which it is doing. The trench drain is right at its max for incoming flow...can't have any blockage it seems.

Option 1 - install a water block west of the trench drain out of asphalt millings
Option 2 - install a header curb along the north half of Raton and a water block along the south half out of asphalt millings
Option 3 - install two SD inlets to the east of the trench drain and extend the SD up to those inlets to reduce the runoff in Raton before it gets to the trench drain.

Let me know what you think.
Greg

Gregory J. Krenik, PE
D. Mark Goodwin & Associates
PO Box 90606
Albuquerque, NM 97199
505-828-2200
505-235-9338 cell

Cherne, Curtis

From: Gregory Krenik [Greg@goodwinengineers.com]
Sent: Friday, August 05, 2011 1:22 PM
To: Cherne, Curtis
Subject: Raton Ave Runoff
Attachments: sharp_copier@goodwinengineers.com_20110805_130245.pdf

Curtis,
I've attached the pages from the JTH Report that concern Raton. It is Basin 6 and the basin size is 53.7706 AC. The Q produced is 197.77 CFS...WOW that's a lot of runoff with no storm drain system! As you can see from Sheet 37 of the calcs the existing runoff was more than the existing street could handle by 73.24 CFS. Then I calced removing the crown and it came up OK. If the street is not level, as is the case, and the water stays to the north side then we will have the issue of it going over the curb, which it is doing. The trench drain is right at its max for incoming flow...can't have any blockage it seems.

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Greg

Gregory J. Krenik, PE
D. Mark Goodwin & Associates
PO Box 90606
Albuquerque, NM 97199
505-828-2200
505-235-9338 cell

CITY OF ALBUQUERQUE

March 18, 2008

David Soule, P.E.
Rio Grande Engineering
2105 Golf Course Road SE, Suite B
Rio Rancho, NM 87124

Re: Juan Tabo Hills Lots 4A-6A, Grading and Drainage Plan
Engineer's Stamp dated 2-13-08 (M21/D015)

Dear Mr. Soule,

Based upon the information provided in your submittal received 2-14-08, the above referenced plan is approved for Preliminary Plat action by the DRB and for Grading Permit. Prior to signing the Final Plat, an Engineer's Certification of this grading plan will be required.

Sincerely,

Curtis A. Cherne, P.E.
Senior Engineer, Planning Dept.
Development and Building Services

C: file

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 01/28/2003rd)

M-21/D015

PROJECT TITLE: ***Lots 4A-6A Juan Tabo Hills*** ZONE MAP/DRG. FILE #: ~~B-13~~

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

LEGAL DESCRIPTION: **Lots 4-7, block 7 Juan Tabo Hills unit 1**

CITY ADDRESS: **Smarty Jones Street WE**

ENGINEERING FIRM:	Rio Grande Engineering	CONTACT:	David Soule, PE
ADDRESS:	2105 Golf Course Road SE, Suite B	PHONE:	(505)321-9099
CITY, STATE:	Rio Rancho , New Mexico	ZIP CODE:	87124
OWNER:	***Kim Brooks***	CONTACT:	David Soule
ADDRESS:	PO Box 90925	PHONE:	321-9099
CITY, STATE:	Albuquerque, NM 87199-0925	ZIP CODE:	87122
ARCHITECT:		CONTACT:	
ADDRESS:		PHONE:	
CITY, STATE:		ZIP CODE:	
SURVEYOR:	Terra Land survey	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
- x GRADING PLAN
- ____ EROSION CONTROL PLAN
- ____ ENGINEER'S CERTIFICATION (HYDROLOGY)
- ____ CLOMR/LOMR
- ____ TRAFFIC CIRCULATION LAYOUT (TCL)
- ____ ENGINEERS CERTIFICATION (TCL)
- ____ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
- ____ OTHER

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- ____ 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.)
- x GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ WORK ORDER APPROVAL
- ____ OTHER (SPECIFY)

RECEIVED

FEB 14 2008

HYDROLOGY SECTION

WAS A PRE-DESIGN CONFERENCE ATTENDED:

- x YES
- ____ NO
- ____ COPY PROVIDED

DATE SUBMITTED: 2/14/2008 BY: David Soule

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100 403

D. Mark Goodwin & Associates, P.A.
Consulting Engineers
P.O. BOX 90606, ALBUQUERQUE,NM 87199
(505) 828-2200 FAX 797-9539

March 21, 2007

Mr. Brad Bingham
Hydrology Department
City of Albuquerque
PO Box 1293
Albuquerque, NM 87103

Re: Juan Tabo Hills, Unit 3 Revised Grading

Dear Mr. Bingham:

Please find attached:

1. *Revised sheets 15 and 16 of 83, Juan Tabo Hills, Unit 1 Grading Plans with original engineer's stamp dated February 9, 2006 and revision date March 20, 2007.*
2. *Letter to John Kelly dated September 8, 2005*
3. *Drainage Information Sheet*

Please administratively approve these amended grading plans per the 4' design change dictated by AMAFCA to accommodate 4' of sediment deposition they predicted above the Juan Tabo Bridge. The bridge guide banks were already constructed to the higher elevation but the adjacent Unit 3 grading plans have not been changed until now.

Please contact our office with any questions.

Sincerely,

MARK GOODWIN & ASSOCIATES, P.A.

James D. Hughes, PE
Senior Engineer

JDH/a

cc: Fred Salls – Salls Brothers Construction
Kevin Grannan – Raylee Homes, Inc.

F:\1-Projects\2002\A02079 - Juan Tabo Hills\Revised Grading Ltr.doc

D. Mark Goodwin & Associates, P.A.
Consulting Engineers
P.O. BOX 90606, ALBUQUERQUE,NM 87199
(505) 828-2200 FAX 797-9539

September 8, 2005

Mr. John Kelly
Executive Director
AMAFCA
2600 Prospect Avenue NE
Albuquerque, NM 87107

Re: Juan Tabo Bridge

Dear Mr. Kelly:

The purpose of this letter is to provide the additional information requested in the AMAFCA letter dated August 3, 2005 (see attached). Please find attached two copies of the HEC RAS printouts and digital copies on CD, including the latest geometry model of 4' sediment accumulation immediately upstream of the bridge. The backwater effects are illustrated both on an attached Plan and Profile, and on the inundation map. The analysis shows that there will be no change in water surface elevations on the upstream off-site properties for the 100-year and/or the 500-year events. All of the increased water surface elevations will be properly contained within this development.

Since the backwater pool does not spread off the property, we are not inclined to pursue the more expensive suggestions recommended in the August 3rd letter. The shot-crete lining under the bridge extends all the way up the side slopes to the abutments, and the lining of the arroyo under the bridge will act as a grade control structure that will serve to protect the upstream utilities.

This analysis concludes this phase of the Juan Tabo Subdivision. The bridge analysis will be combined with a separate report on the Four Hills Arroyo to request CLOMR and LOMR approval for Unit 1 of the Subdivision. Then at a later date we will develop a plan to stabilize banks and reclaim floodplain next to Unit 3, east of the bridge.

Please contact our office if you have any questions.

Sincerely,

MARK GOODWIN & ASSOCIATES, P.A.

James D. Hughes, PE
Project Engineer

JDH/wp

Attachments

xc: Robert Lupton – JTH, LLC
Brad Bingham – Floodplain Administrator

F:\1-Projects\2002\A02079 - Juan Tabo Hills\ltr to John Kelly.doc

Ronald D. Brown, Chair
Daniel F. Lyon, Vice Chair
Tim Eichenberg, Secretary-Treasurer
Janet Saiers, Asst. Secretary-Treasurer
Danny Hernandez, Director

John P Kelly, P.E
Executive Engineer

Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority
2600 Prospect N.E. Albuquerque, NM 87107
Phone: (505) 884-2215 Fax: (505) 884-0214

August 3, 2005

Doug Hughes, P.E.
Mark Goodwin & Associates
P.O. Box 90606
Albuquerque, NM 87199

Re: Juan Tabo Boulevard Bridge Crossing at Tijeras Arroyo

Dear Doug:

Following AMAFCA's initial comments on the proposed bridge crossing of the Tijeras Arroyo, we received from Ayres and Associates a report on potential sediment issues regarding the design of the bridge crossing. A copy of that report was forwarded to your office. A particular concern on the part of the sediment analysis was the potential for additional aggradation in the Tijeras Arroyo caused by the backwater pool associated with the bridge structure. As indicated in your initial report, the upstream water surface for the 100 year event immediately above the bridge could increase by as much as 5.2 feet, which obviously would cause a backwater pool that eventually could deposit sediment. Conclusions by Ayres and Associates was that up to 4 feet of accumulated sediment is possible in the backwater pool since there is available sediment for that deposition in the upper Tijeras Arroyo.

Per your letter of June 17th, you indicated that additional HEC-RAS information was modeled, assuming a 4 foot sediment accumulation at the bridge opening. Results were that if a 4 foot accumulation occurred immediately above the bridge, that the upstream water elevation would increase by 4 feet. Please submit that HEC-RAS analysis as additional information for the Drainage Report as soon as possible, in the normal form showing input data and the input cross-sections, and the resulting output information, so that we have a complete HEC-RAS file on the information that has been accumulated to date. I am not aware that the additional HEC-RAS information has been submitted to date.

As indicated in my original comments, please submit an inundation map that would provide data for the extent of the inundation pool upstream of the proposed crossing, for the 100 year and 500 year events. An additional inundation map including the additional 4 feet of water elevation increase should also be prepared and submitted to determine the upstream effect of the potential 4 foot deposition of sediment. The information submitted to date on your indicated sheets 3 and 8 is not sufficient to identify where the upstream water pool elevation increases will occur, relative to the upstream properties. The inundation map should reflect the water surface elevations for those areas that would receive an increase in water elevation above the normal 100 and 500 year water elevations for the existing channel. The inundation map should show the existing flood plain areas that will be impacted by the backwater from the bridge.

It would appear from the Ayres report that scour depths, and in general the hydraulic analysis of the bridge, is reasonable. Ayres suggested a design modification to lower the hard surfacing under

the bridge 4 feet to allow for additional scour through the bridge opening in the case of a very large event. There appears to be no reason why the hard lining under the bridge could not be lowered and then backfilled to the current flow elevation, using typical erosive bed materials that would provide the suggested bed erosion to increase conveyance capacity for very large events. The upstream utilities can be protected with a hard-lined capping over those utilities to prevent possible washout in the case of such an erosive event. It may also be possible that, in lieu of capping, a cutoff wall downstream of those utilities could be installed that would effectively prevent erosion below a certain elevation to act as a protection barrier for those utilities. For a bridge of this type, crossing a major arroyo like the Tijeras, with potential flows in the 20,000 cfs range, and lacking any additional input for design for the sediment/erosion potentials for the Tijeras Arroyo, AMAFCA recognizes the information from Ayres and Associates as a significant contribution to a conservative design that should be incorporated into the final plan.

The original data prepared by Leedshill-Herkenhoff for sediment and erosion analysis of the Tijeras Arroyo is still valid. Keep in mind, however, the bridge structure will totally change the character of this section of the arroyo upstream and downstream, and will result in significant changes to the erosion characteristics identified by Leedshill-Herkenhoff.

It would appear on the cross-section of the bridge, plan sheet S3, that the backspans provide significantly less channel opening than the mainspan with the low-flow channel. With the narrower opening, the potential for debris clogging may become a reality. Please provide a HEC-RAS analysis of the main bridge area, assuming that the backspans are blocked out, and the center span low-flow channel is the only area available for conveyance. This condition should be analyzed only for the low-flow, using the 10-year flow, since significantly higher flows would most likely push potential debris downstream. Also, reviewing the layout of the shotcrete immediately adjacent to the bridge structure, it is somewhat difficult to determine the vertical extent of the shotcrete. I assume that, from the data presented, the shotcrete extends all the way up the slope to the bridge abutments, so that no scour under the bridge will occur. Please verify that this is the case, and final plans should reflect the extent of the backslope protection with shotcrete.

Since the 100 year floodplain will be altered by the project, coordinate with the City Floodplain Administrator on meeting FEMA requirements for map revision.

If you have any questions, please contact me at 884-2215.

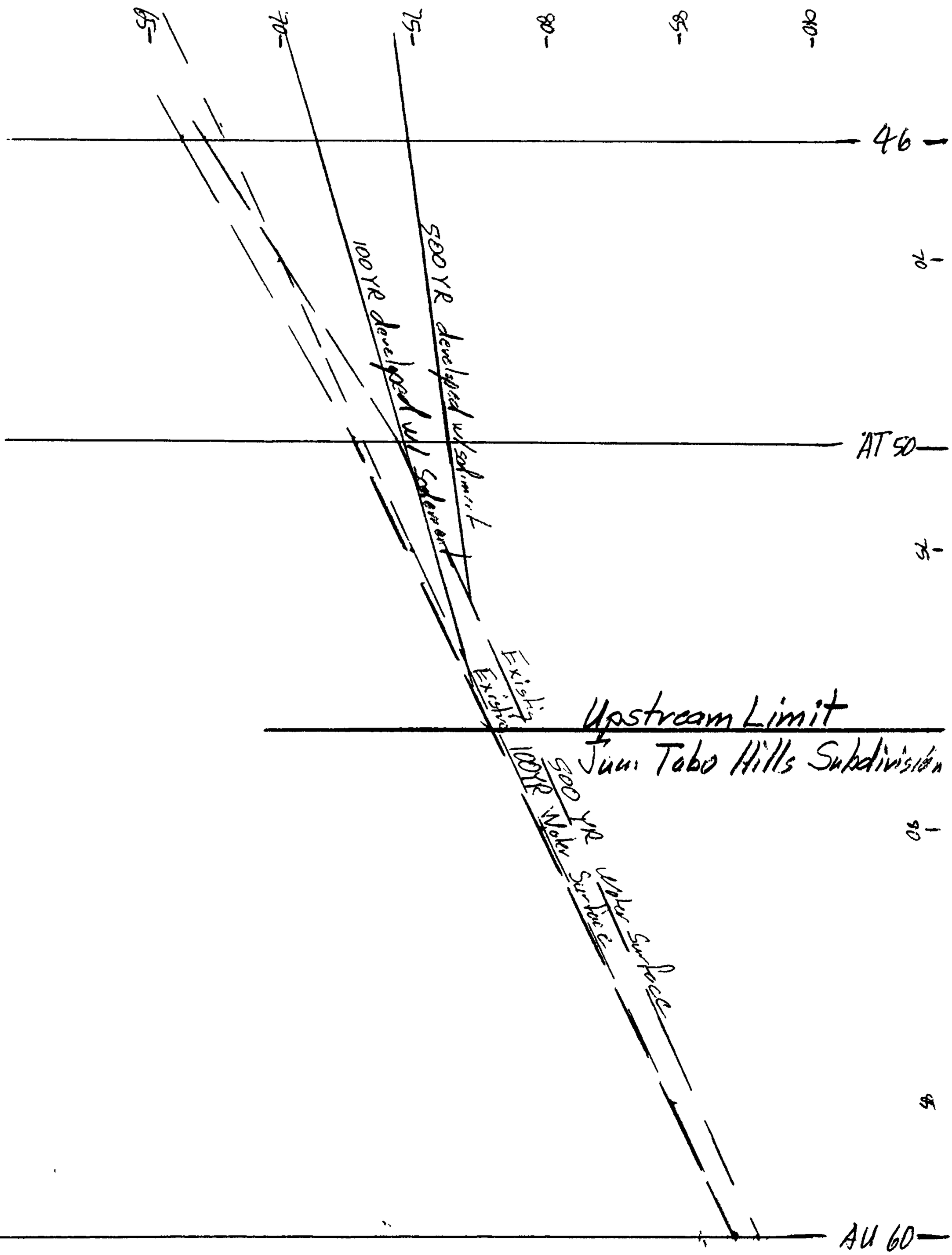
Sincerely,
AMAFCA

Loren D. Meinz, P.E.
Drainage Engineer

Cc: Brad Bingham, City of Albuquerque

D. Mark Goodwin & Associates, P.A.
Consulting Engineers
P.O. BOX 90606, ALBUQUERQUE,NM 87199
(505) 828-2200 FAX 797-9539
e-mail: goodwinengrs@comcast.net

PROJECT Juan Tabo Hills
SUBJECT Bridge Backwater w/ Sediment
BY JDH DATE 9-6-05
CHECKED _____ DATE _____
SHEET ___ OF ___



HEC-RAS Plan: sed6-10-05 River: Tijeras Arroyo Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	10	PF 3	18065.00	5424.00	5429.05	5430.09	5432.33	0.024444	18.02	1618.21	744.50	1.50
1	10	PF 4	30500.00	5424.00	5430.01	5431.20	5433.99	0.025159	20.80	2354.37	795.12	1.57
1	20	PF 3	18065.00	5429.50	5438.94	5438.94	5440.77	0.007449	13.76	2062.75	515.05	0.89
1	20	PF 4	30500.00	5429.50	5440.57	5440.57	5442.90	0.008042	16.03	2955.82	576.28	0.95
1	30	PF 3	18065.00	5437.00	5444.42	5442.99	5445.34	0.004089	8.53	2542.47	565.25	0.64
1	30	PF 4	30500.00	5437.00	5446.36	5444.62	5447.63	0.003963	10.25	3718.98	648.60	0.66
1	40	PF 3	18065.00	5451.50	5456.01	5456.01	5457.90	0.011529	11.09	1646.02	441.55	1.00
1	40	PF 4	30500.00	5451.50	5457.53	5457.60	5460.25	0.010682	13.30	2327.74	452.29	1.02
1	41	PF 3	18065.00	5451.90	5456.21	5457.95	5462.39	0.066020	19.95	906.55	367.37	2.23
1	41	PF 4	30500.00	5451.90	5457.16	5459.72	5466.33	0.064268	24.32	1256.97	371.73	2.32
1	42	PF 3	18065.00	5455.38	5462.00	5463.36	5467.01	0.007896	17.96	1005.63	220.84	1.48
1	42	PF 4	30500.00	5455.38	5463.91	5465.87	5470.94	0.007205	21.29	1432.72	226.57	1.49
1	43	PF 3	18065.00	5455.73	5462.77	5463.96	5467.46	0.006560	17.39	1039.06	208.10	1.37
1	43	PF 4	30500.00	5455.73	5464.89	5466.56	5471.42	0.005927	20.50	1487.95	214.47	1.37
1	43.5		Bridge									
1	44	PF 3	18065.00	5456.33	5467.44	5464.60	5468.88	0.000973	9.62	1878.68	216.21	0.57
1	44	PF 4	30500.00	5456.33	5471.16	5467.25	5473.14	0.000892	11.28	2703.57	227.31	0.58
1	45	PF 3	18065.00	5459.61	5467.38	5467.76	5470.85	0.004103	14.94	1208.81	213.25	1.11
1	45	PF 4	30500.00	5459.61	5470.33	5470.33	5474.55	0.003015	16.48	1850.70	222.05	1.01
1	46	PF 3	18065.00	5465.70	5471.44	5471.44	5473.20	0.010757	11.77	1834.21	506.01	0.99
1	46	PF 4	30500.00	5465.70	5474.75		5476.03	0.003878	10.09	3534.11	521.25	0 65
1	50	PF 3	18065.00	5468.00	5474.68	5472.89	5475.47	0.002924	7.31	2662.60	552.62	0.54
1	50	PF 4	30500.00	5468.00	5476.33	5474.47	5477.58	0.003384	9.31	3613.78	602.79	0.61
1	60	PF 3	18065.00	5484.00	5487.27	5487.48	5488.69	0.018664	10 66	2023.60	965.23	1.19
1	60	PF 4	30500.00	5484.00	5488.08	5488.50	5490.16	0.019309	13.07	2834.78	1041.47	1 27

NEW BRIDGE W/ SEDIMENT

(Bed raised at section 45 & 44)

HEC-RAS Plan: sed6-10-05 River: Tijeras Arroyo Reach: 1 (Continued)

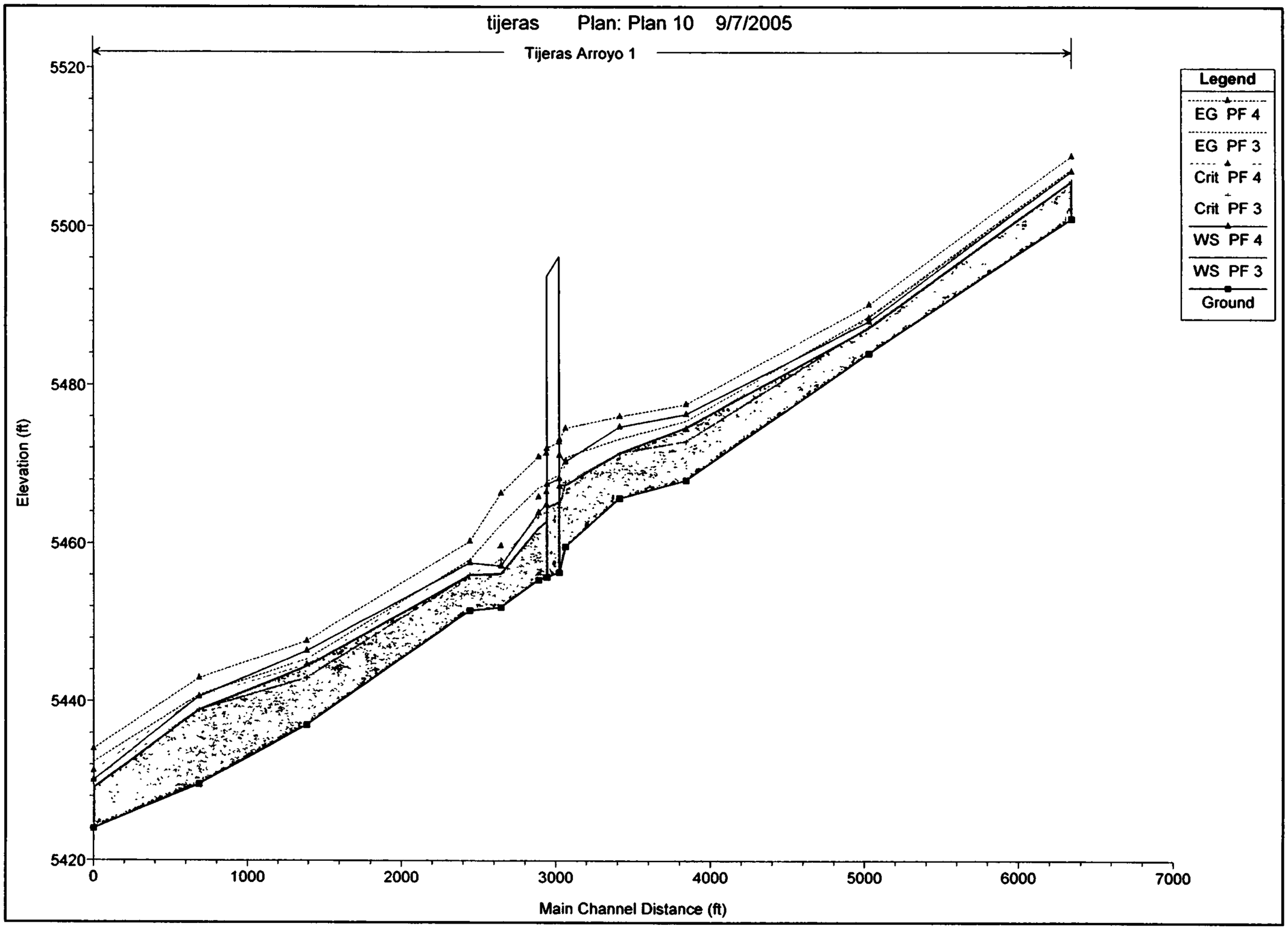
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	70	PF 3	18065.00	5501.00	5505.79	5505.83	5507.26	0.010768	11.63	2145.69	743.29	0.99
1	70	PF 4	30500.00	5501.00	5506.99	5507.03	5508.94	0.010666	13.65	3061.82	773.60	1.03

HEC-RAS Plan: sed6-10-05 River: Tijeras Arroyo Reach: 1

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
1	10	PF 3	5432.33	5429.05	3.27	8.30	0.14	2208.29	10483.89	5372.82	744.50
1	10	PF 4	5433.99	5430.01	3.98	8.75	0.16	4378.51	14685.56	11435.93	795.12
1	20	PF 3	5440.77	5438.94	1 83	5.17	0.16	8608.43	9456.57		515.05
1	20	PF 4	5442.90	5440.57	2.33	5.69	0.16	17020.14	13475.88	3 98	576.28
1	30	PF 3	5445.34	5444.42	0.92	4.48	0 09	1315.44	11430.65	5318.91	565.25
1	30	PF 4	5447.63	5446.36	1.27	4.63	0.11	3412.46	18495.71	8591.84	648.60
1	40	PF 3	5457.90	5456.01	1.90	6.77	0.29		17870.45	194.55	441.55
1	40	PF 4	5460.25	5457.53	2.71	4.19	1.96		30057.34	442.66	452.29
1	41	PF 3	5462.39	5456.21	6.18	4.27	0.35		18056.81	8.19	367.37
1	41	PF 4	5466.33	5457.16	9.18	3.96	0.64		30462.06	37.94	371.73
1	42	PF 3	5467.01	5462.00	5.01	0.36	0.10		18065.00		220.84
1	42	PF 4	5470.94	5463.91	7.04	0.33	0.15		30500.00		226.57
1	43	PF 3	5467.46	5462.77	4.69				18065.00		208.10
1	43	PF 4	5471.42	5464.89	6.52				30500.00		214.47
1	43.5		Bridge								
1	44	PF 3	5468.88	5467.44	1.44				18065.00		216.21
1	44	PF 4	5473.14	5471.16	1.98				30500.00		227.31
1	45	PF 3	5470.85	5467.38	3.47	2.19	0.17		18065.00		213.25
1	45	PF 4	5474.55	5470.33	4.22	0.06	1.12		30500.00		222.05
1	46	PF 3	5473.20	5471.44	1.76	1.92	0.13	4978.14	13086.86		506.01
1	46	PF 4	5476.03	5474.75	1.28	1.19	0.29	10693.42	19806.58		521.25
1	50	PF 3	5475.47	5474.68	0.79	2.17	0.10	851.64	17017.13	196.23	552.62
1	50	PF 4	5477.58	5476.33	1.26	1.55	0.00	2046 91	27981.46	471.63	602.79
1	60	PF 3	5488.69	5487.27	1.42	18.55	0.01	114.33	12074.03	5876.64	965.23

HEC-RAS Plan: sed6-10-05 River: Tijeras Arroyo Reach: 1 (Continued)

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
1	60	PF 4	5490.16	5488.08	2.09	18 76	0.01	438.02	19598.19	10463.79	1041.47
1	70	PF 3	5507.26	5505.79	1.47			3257.56	10478.42	4329 02	743.29
1	70	PF 4	5508.94	5506.99	1.95			6915.80	15732.21	7851.99	773.60


tijeras Plan: Plan 10 9/7/2005
Tijeras Arroyo 1
Legend
EG PF 4
EG PF 3
Crit PF 4
Crit PF 3
WS PF 4
WS PF 3
Ground
Elevation (ft)
5520
5500
5480
5460
5440
5420
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 70 Profile: PF 3

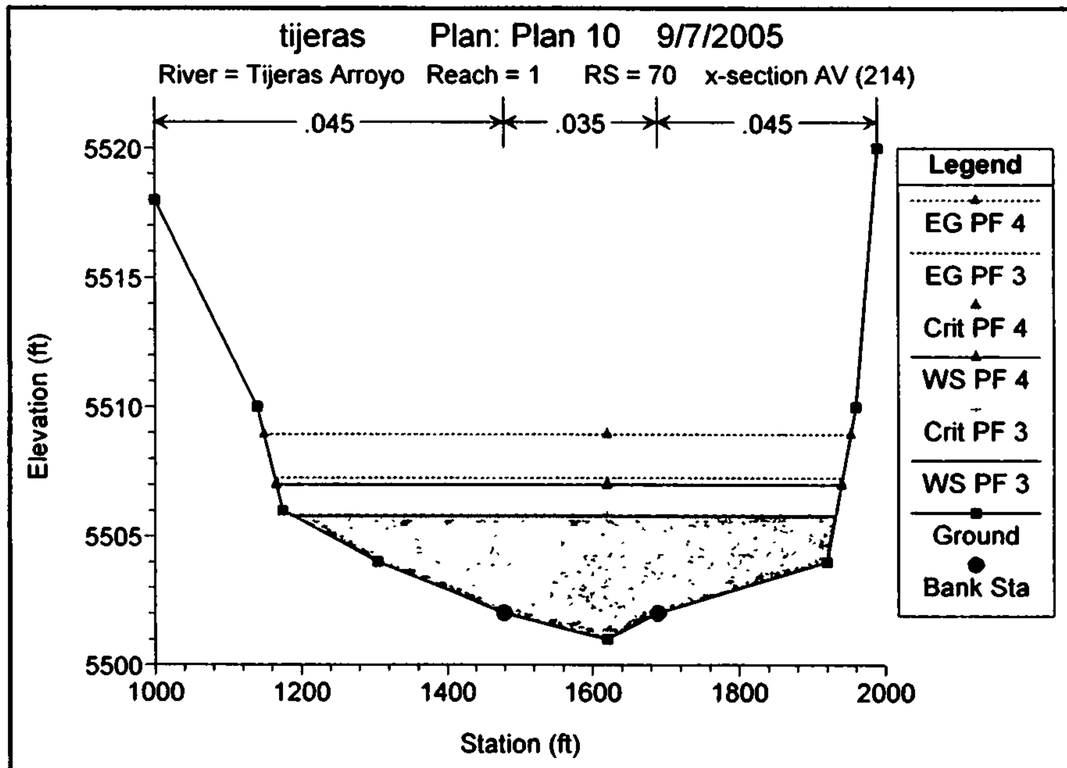
E.G. Elev (ft)	5507.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.47	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	5505.79	Reach Len. (ft)	1380.00	1310.00	1370.00
Crit W.S. (ft)	5505.83	Flow Area (sq ft)	592.39	900.91	652.39
E.G. Slope (ft/ft)	0.010768	Area (sq ft)	592.39	900.91	652.39
Q Total (cfs)	18065.00	Flow (cfs)	3257.56	10478.42	4329.02
Top Width (ft)	743.29	Top Width (ft)	291.35	210.00	241.93
Vel Total (ft/s)	8.42	Avg. Vel. (ft/s)	5.50	11.63	6.64
Max Chl Dpth (ft)	4.79	Hydr. Depth (ft)	2.03	4.29	2.70
Conv. Total (cfs)	174090.8	Conv. (cfs)	31392.8	100979.6	41718.3
Length Wtd. (ft)	1333.48	Wetted Per. (ft)	291.38	210.01	242.08
Min Ch El (ft)	5501.00	Shear (lb/sq ft)	1.37	2.88	1.81
Alpha	1.33	Stream Power (lb/ft s)	7.52	33.54	12.02
Frctn Loss (ft)		Cum Volume (acre-ft)	59.81	182.24	61.25
C & E Loss (ft)		Cum SA (acres)	24.14	43.65	24.38

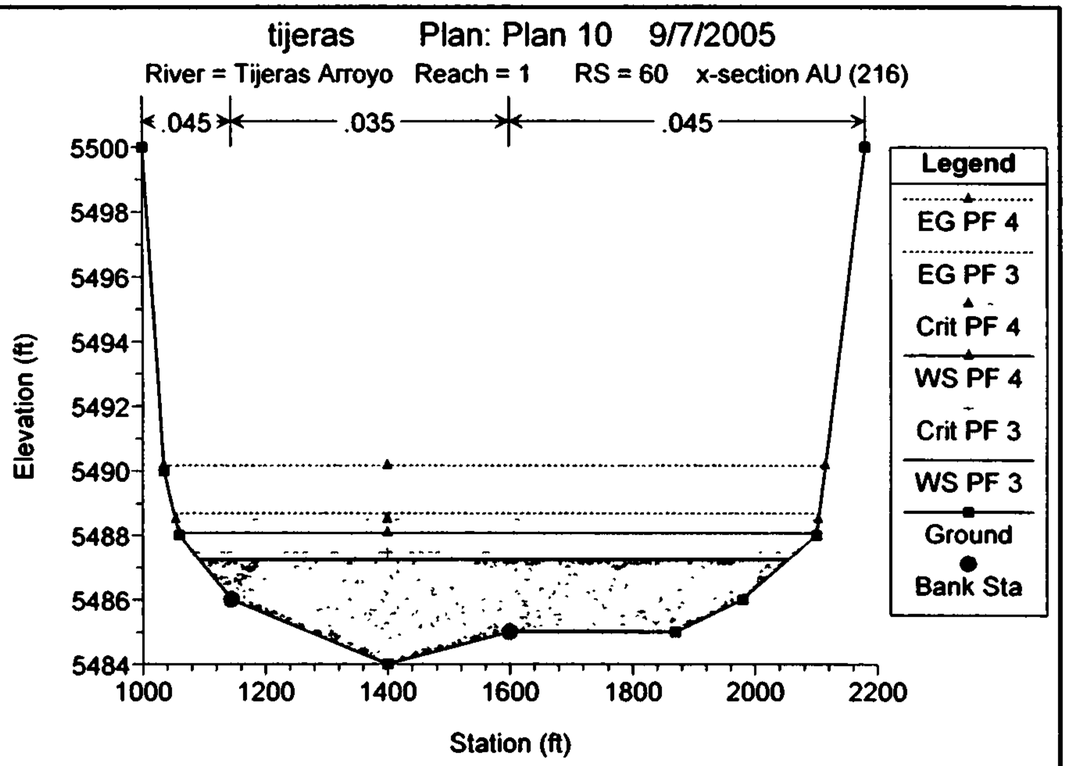
Plan: sed6-10-05 Tijeras Arroyo 1 RS: 60 Profile: PF 3

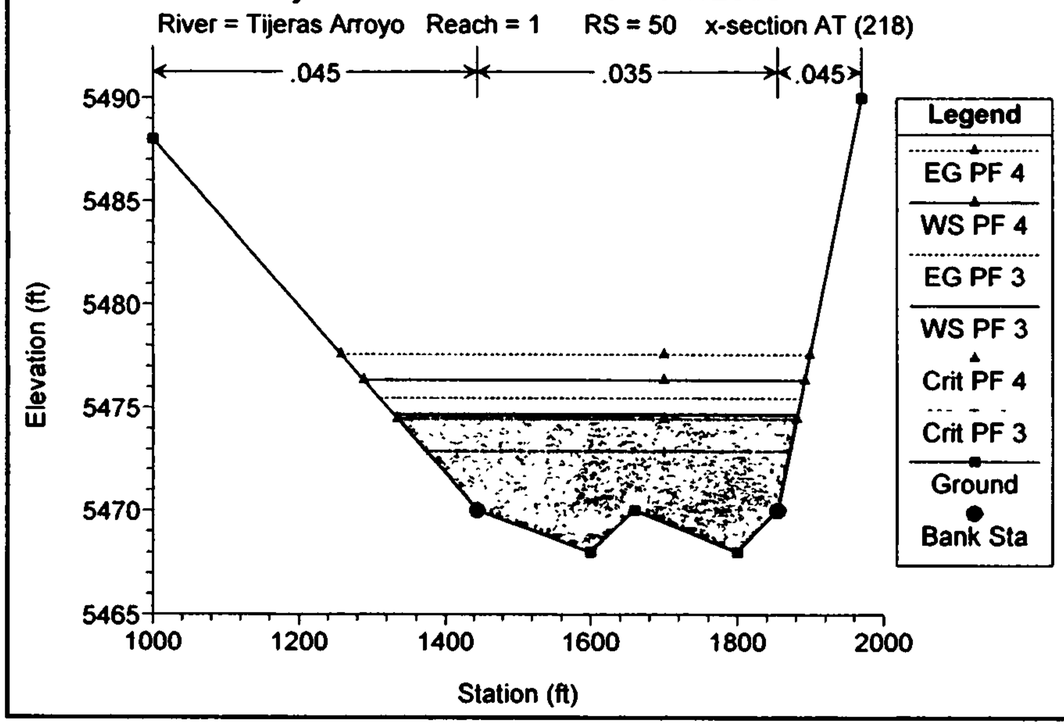
E.G. Elev (ft)	5488.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.42	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	5487.27	Reach Len. (ft)	1185.00	1185.00	1185.00
Crit W.S. (ft)	5487.48	Flow Area (sq ft)	34.30	1133.08	856.22
E.G. Slope (ft/ft)	0.018664	Area (sq ft)	34.30	1133.08	856.22
Q Total (cfs)	18065.00	Flow (cfs)	114.33	12074.03	5876.64
Top Width (ft)	965.23	Top Width (ft)	54.00	455.00	456.23
Vel Total (ft/s)	8.93	Avg. Vel. (ft/s)	3.33	10.66	6.86
Max Chl Dpth (ft)	3.27	Hydr. Depth (ft)	0.64	2.49	1.88
Conv. Total (cfs)	132231.1	Conv. (cfs)	836.9	88378.8	43015.5
Length Wtd. (ft)	1185.00	Wetted Per. (ft)	54.01	455.01	456.25
Min Ch El (ft)	5484.00	Shear (lb/sq ft)	0.74	2.90	2.19
Alpha	1.15	Stream Power (lb/ft s)	2.47	30.92	15.01
Frctn Loss (ft)	18.55	Cum Volume (acre-ft)	49.88	151.65	37.53
C & E Loss (ft)	0.01	Cum SA (acres)	18.66	33.65	13.40

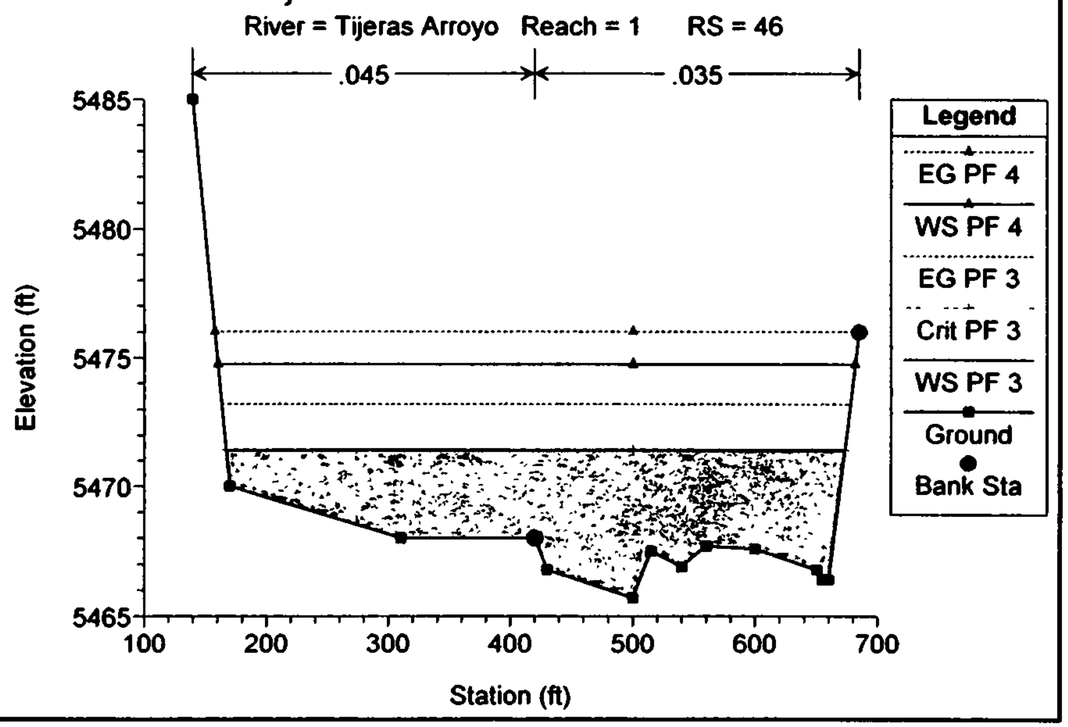
Plan: sed6-10-05 Tijeras Arroyo 1 RS: 50 Profile: PF 3

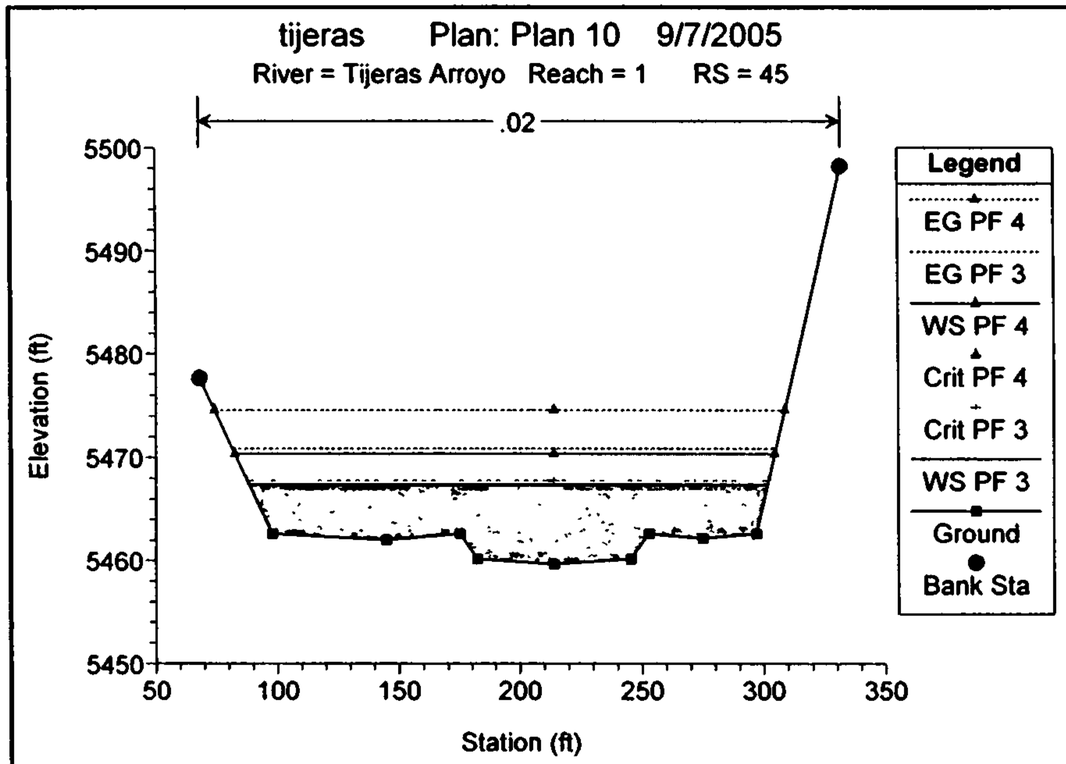
E.G. Elev (ft)	5475.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.79	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	5474.68	Reach Len. (ft)	425.00	430.00	435.00
Crit W.S. (ft)	5472.89	Flow Area (sq ft)	270.76	2328.87	62.97
E.G. Slope (ft/ft)	0.002924	Area (sq ft)	270.76	2328.87	62.97
Q Total (cfs)	18065.00	Flow (cfs)	851.64	17017.13	196.23
Top Width (ft)	552.62	Top Width (ft)	115.70	410.00	26.91
Vel Total (ft/s)	6.78	Avg. Vel. (ft/s)	3.15	7.31	3.12
Max Chl Dpth (ft)	6.68	Hydr. Depth (ft)	2.34	5.68	2.34
Conv. Total (cfs)	334090.3	Conv. (cfs)	15750.1	314711.2	3629.0
Length Wtd. (ft)	429.22	Wetted Per. (ft)	115.80	410.10	27.31
Min Ch El (ft)	5468.00	Shear (lb/sq ft)	0.43	1.04	0.42
Alpha	1.11	Stream Power (lb/ft s)	1.34	7.57	1.31
Frctn Loss (ft)	2.17	Cum Volume (acre-ft)	45.73	104.56	25.02
C & E Loss (ft)	0.10	Cum SA (acres)	16.36	21.88	6.83

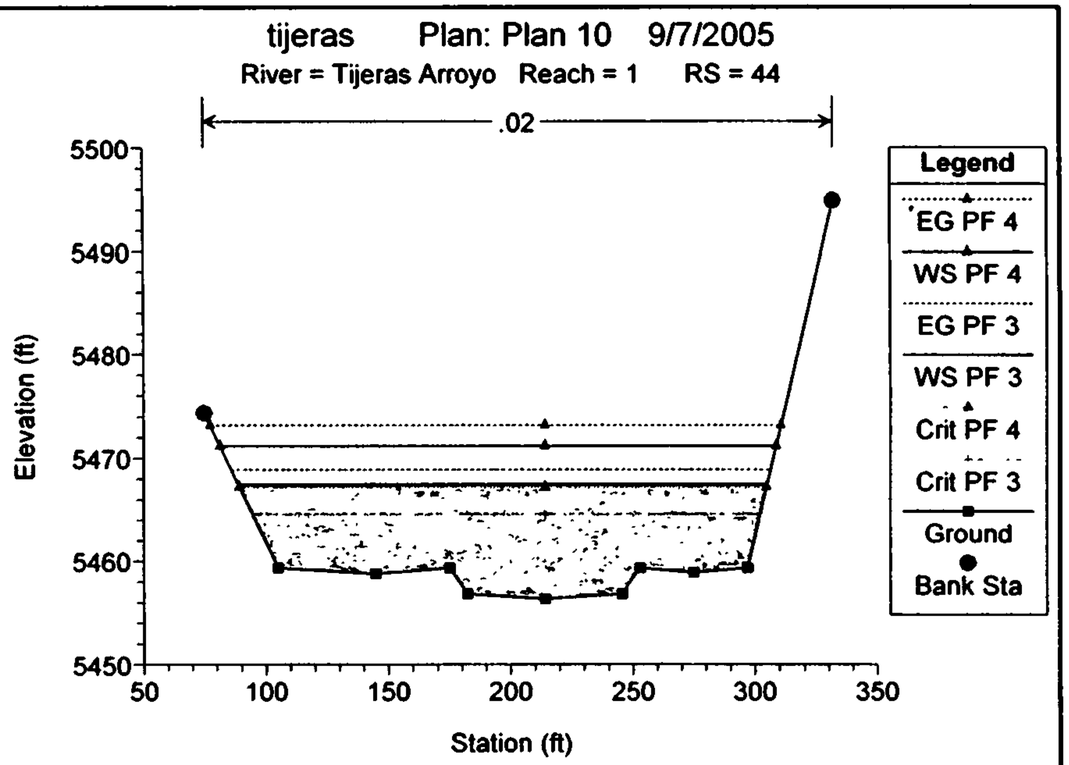

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 70 x-section AV (214)
.045
.035
.045
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
Crit PF 4
WS PF 4
Crit PF 3
WS PF 3
Ground
Bank Sta

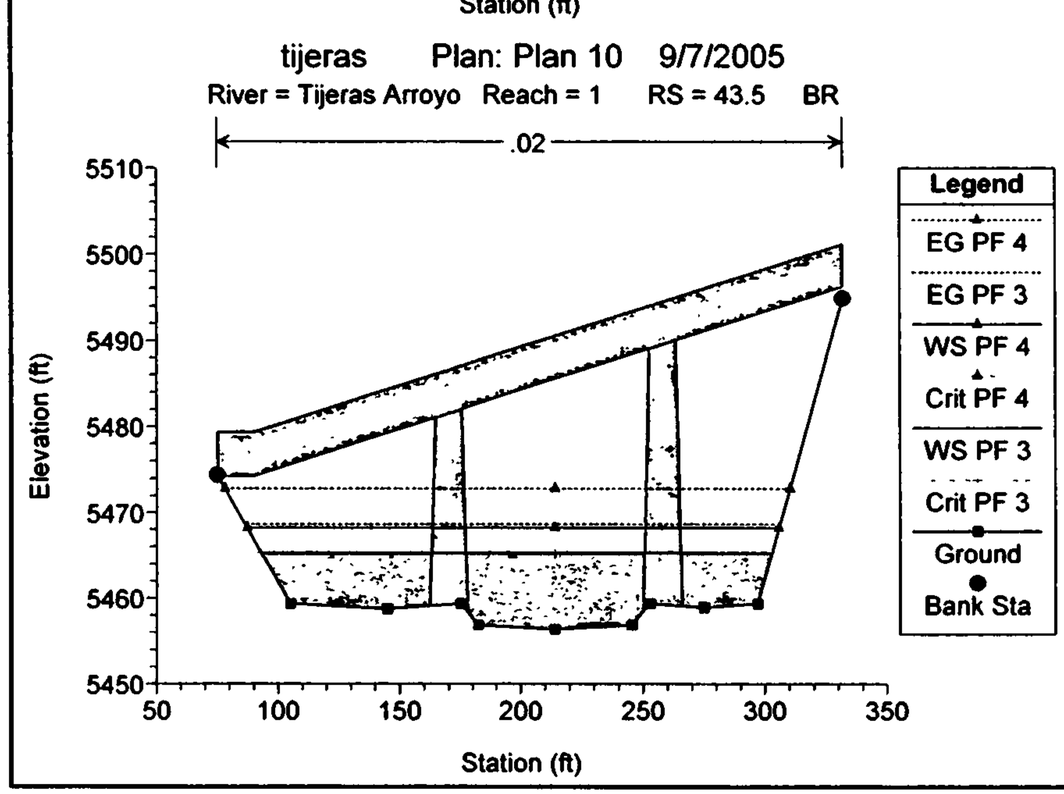

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 60 x-section AU (216)
.045
.035
.045
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
Crit PF 4
WS PF 4
Crit PF 3
WS PF 3
Ground
Bank Sta

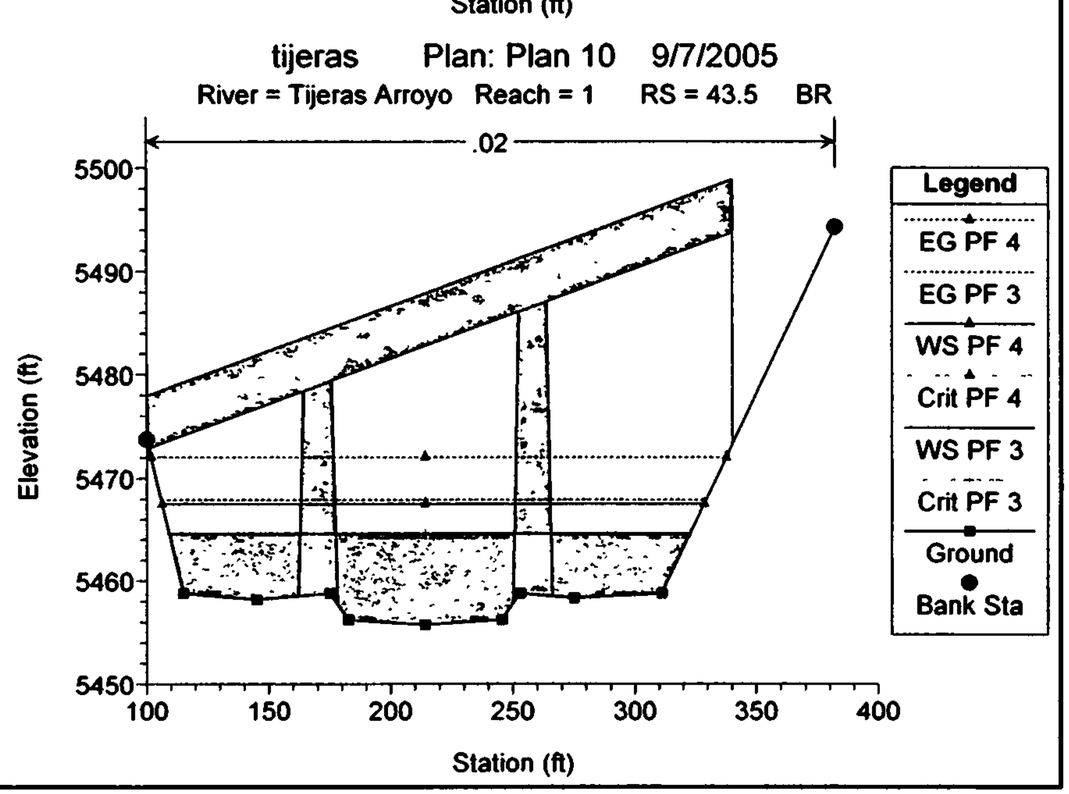

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 50 x-section AT (218)
.045
.035
.045
Elevation (ft)
Station (ft)
Legend
EG PF 4
WS PF 4
EG PF 3
WS PF 3
Crit PF 4
Crit PF 3
Ground
Bank Sta

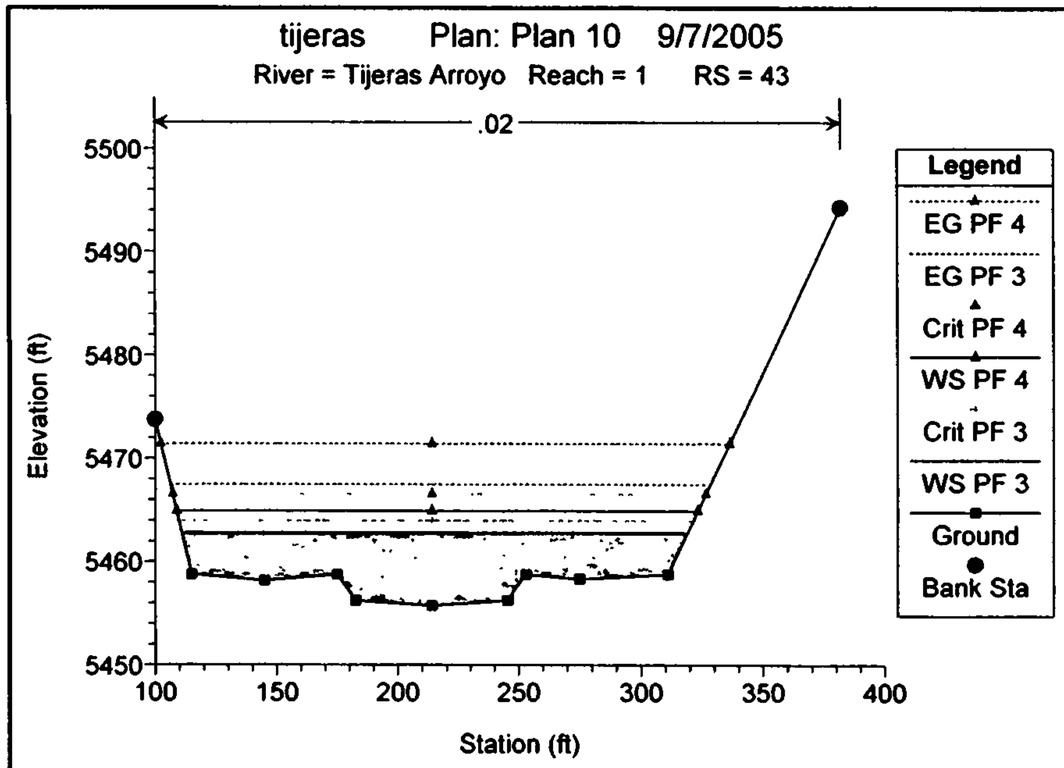

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 46
.045
.035
Elevation (ft)
Station (ft)
Legend
EG PF 4
WS PF 4
EG PF 3
Crit PF 3
WS PF 3
Ground
Bank Sta

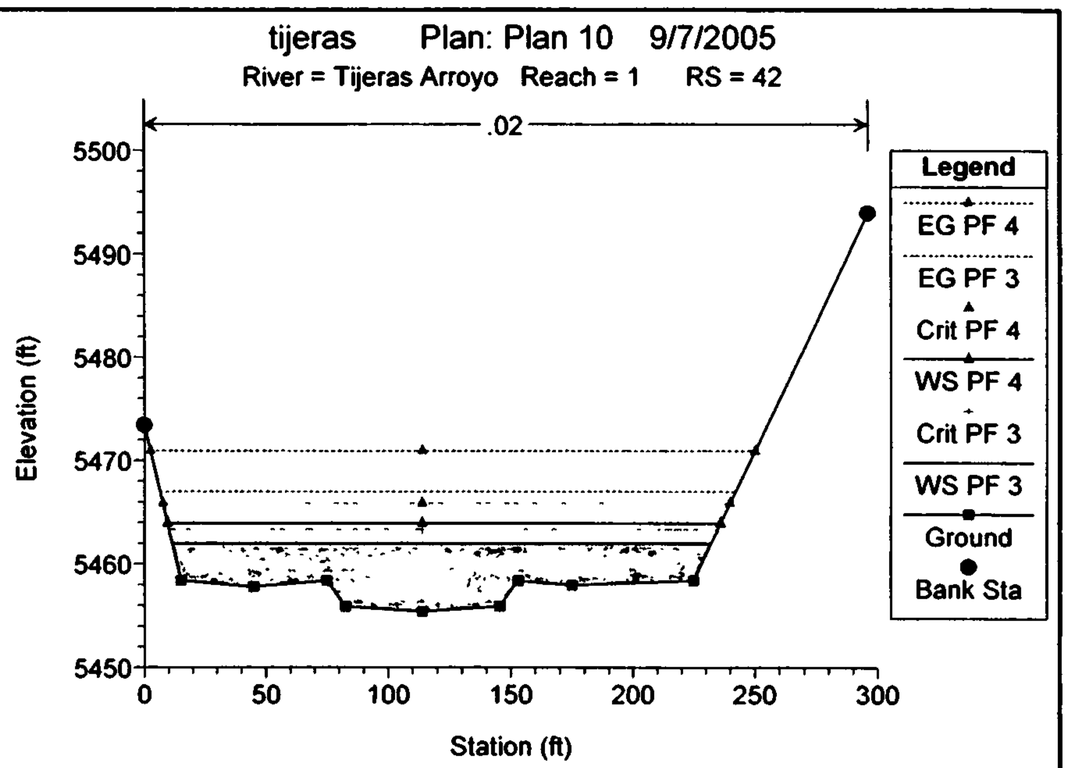

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 45
.02
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
WS PF 4
Crit PF 4
Crit PF 3
WS PF 3
Ground
Bank Sta

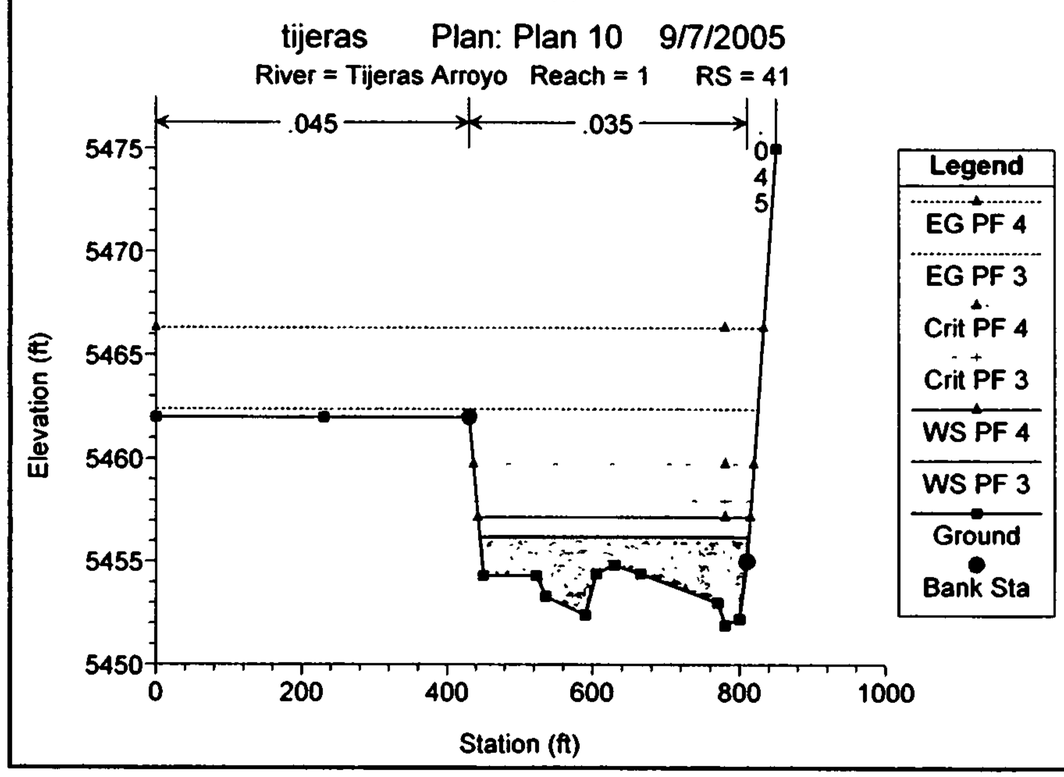

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 44
.02
Elevation (ft)
Station (ft)
Legend
EG PF 4
WS PF 4
EG PF 3
WS PF 3
Crit PF 4
Crit PF 3
Ground
Bank Sta

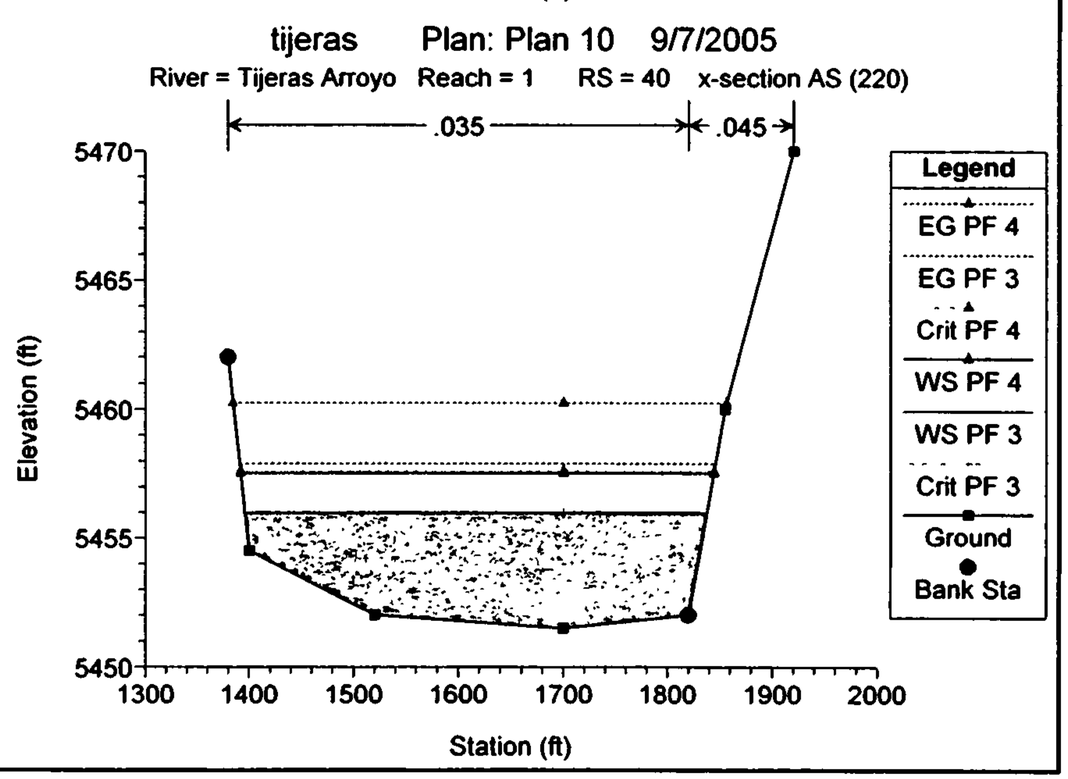

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 43.5 BR
.02
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
WS PF 4
Crit PF 4
WS PF 3
Crit PF 3
Ground
Bank Sta

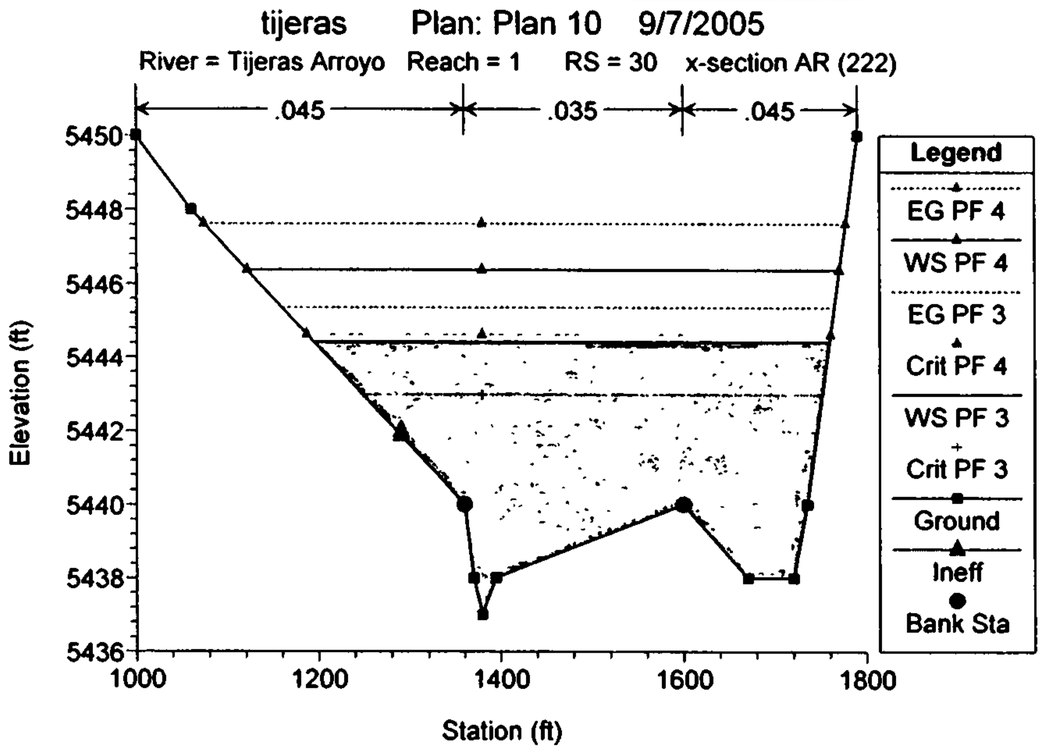

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 43.5 BR
.02
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
WS PF 4
Crit PF 4
WS PF 3
Crit PF 3
Ground
Bank Sta

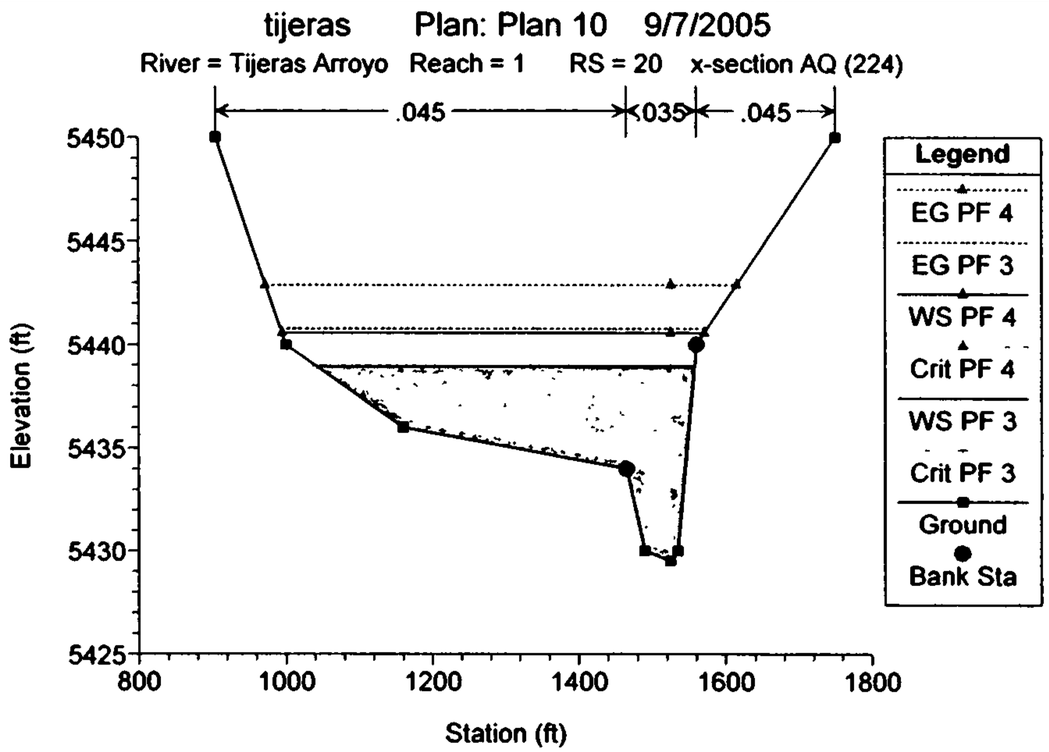

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 43
.02
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
Crit PF 4
WS PF 4
Crit PF 3
WS PF 3
Ground
Bank Sta

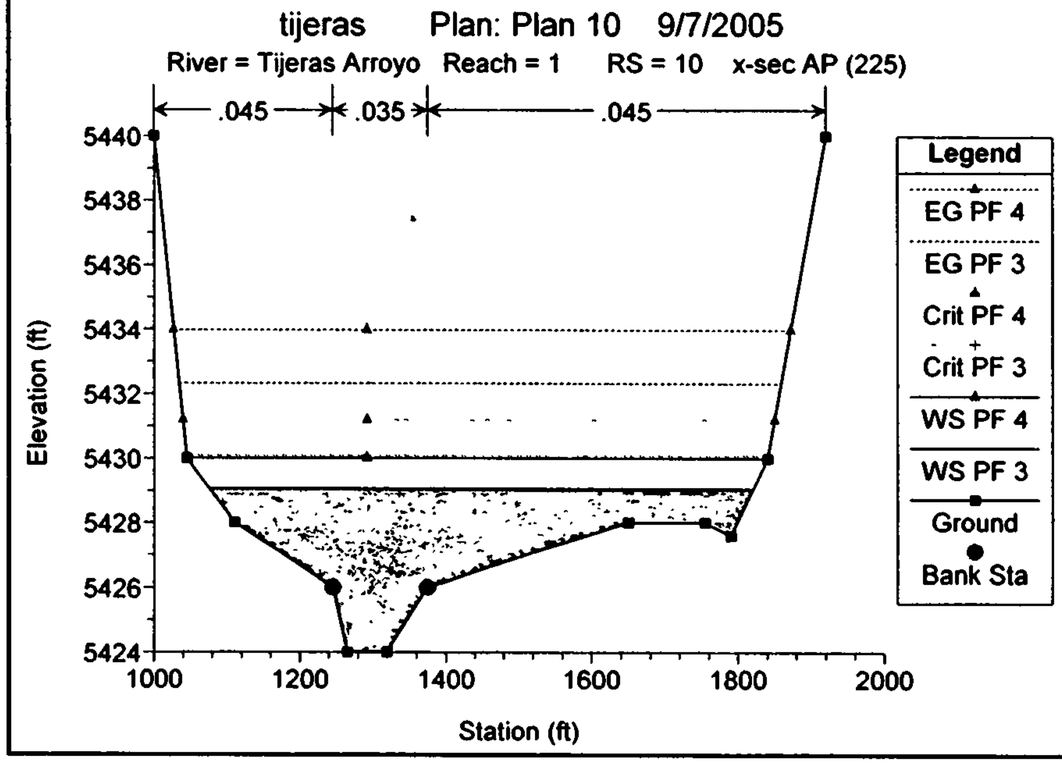

tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 42
.02
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
Crit PF 4
WS PF 4
Crit PF 3
WS PF 3
Ground
Bank Sta


tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 41
.045
.035
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
Crit PF 4
WS PF 4
Crit PF 3
WS PF 3
Ground
Bank Sta


tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 40 x-section AS (220)
.035
.045
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
Crit PF 4
WS PF 4
WS PF 3
Crit PF 3
Ground
Bank Sta


tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 30 x-section AR (222)
.045
.035
.045
5450
5448
5446
5444
5442
5440
5438
5436
1000
1200
1400
1600
1800
Elevation (ft)
Station (ft)
Legend
EG PF 4
WS PF 4
EG PF 3
Crit PF 4
WS PF 3
Crit PF 3
Ground
Ineff
Bank Sta


tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 20 x-section AQ (224)
.045
035
.045
5450
5445
5440
5435
5430
5425
800
1000
1200
1400
1600
1800
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
WS PF 4
Crit PF 4
WS PF 3
Crit PF 3
Ground
Bank Sta


tijeras Plan: Plan 10 9/7/2005
River = Tijeras Arroyo Reach = 1 RS = 10 x-sec AP (225)
.045
.035
.045
5440
5438
5436
5434
5432
5430
5428
5426
5424
1000
1200
1400
1600
1800
2000
Elevation (ft)
Station (ft)
Legend
EG PF 4
EG PF 3
Crit PF 4
Crit PF 3
WS PF 4
WS PF 3
Ground
Bank Sta

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 46 Profile: PF 3

E.G. Elev (ft)	5473.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.76	Wt. n-Val.	0.045	0.035	
W.S. Elev (ft)	5471.44	Reach Len. (ft)	340.00	350.00	360.00
Crit W.S. (ft)	5471.44	Flow Area (sq ft)	722.55	1111.65	
E.G. Slope (ft/ft)	0.010757	Area (sq ft)	722.55	1111.65	
Q Total (cfs)	18065.00	Flow (cfs)	4978.14	13086.86	
Top Width (ft)	506.01	Top Width (ft)	252.88	253.13	
Vel Total (ft/s)	9.85	Avg. Vel. (ft/s)	6.89	11.77	
Max Chl Dpth (ft)	5.74	Hydr. Depth (ft)	2.86	4.39	
Conv. Total (cfs)	174173.7	Conv. (cfs)	47996.8	126176.9	
Length Wtd. (ft)	348.62	Wetted Per. (ft)	253.24	254.30	
Min Ch El (ft)	5465.70	Shear (lb/sq ft)	1.92	2.94	
Alpha	1.17	Stream Power (lb/ft s)	13.20	34.56	
Frctn Loss (ft)	1.92	Cum Volume (acre-ft)	40.89	87.58	24.71
C & E Loss (ft)	0.13	Cum SA (acres)	14.56	18.61	6.69

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 45 Profile: PF 3

E.G. Elev (ft)	5470.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.47	Wt. n-Val.		0.020	
W.S. Elev (ft)	5467.38	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	5467.76	Flow Area (sq ft)		1208.81	
E.G. Slope (ft/ft)	0.004103	Area (sq ft)		1208.81	
Q Total (cfs)	18065.00	Flow (cfs)		18065.00	
Top Width (ft)	213.25	Top Width (ft)		213.25	
Vel Total (ft/s)	14.94	Avg. Vel. (ft/s)		14.94	
Max Chl Dpth (ft)	7.77	Hydr. Depth (ft)		5.67	
Conv. Total (cfs)	282039.4	Conv. (cfs)		282039.4	
Length Wtd. (ft)	40.00	Wetted Per. (ft)		217.21	
Min Ch El (ft)	5459.61	Shear (lb/sq ft)		1.43	
Alpha	1.00	Stream Power (lb/ft s)		21.30	
Frctn Loss (ft)	2.19	Cum Volume (acre-ft)	38.07	78.26	24.71
C & E Loss (ft)	0.17	Cum SA (acres)	13.57	16.74	6.69

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 44 Profile: PF 3

E.G. Elev (ft)	5468 88	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.44	Wt. n-Val.		0 020	
W.S. Elev (ft)	5467.44	Reach Len. (ft)	2.00	2.00	2.00
Crit W.S. (ft)	5464.60	Flow Area (sq ft)		1878.68	
E.G. Slope (ft/ft)	0.000973	Area (sq ft)		1878.68	
Q Total (cfs)	18065.00	Flow (cfs)		18065.00	
Top Width (ft)	216 21	Top Width (ft)		216.21	
Vel Total (ft/s)	9.62	Avg. Vel. (ft/s)		9.62	
Max Chl Dpth (ft)	11.11	Hydr. Depth (ft)		8.69	
Conv. Total (cfs)	578997.4	Conv. (cfs)		578997.4	
Length Wtd. (ft)	2.00	Wetted Per. (ft)		222.36	
Min Ch El (ft)	5456.33	Shear (lb/sq ft)		0.51	
Alpha	1.00	Stream Power (lb/ft s)		4.94	
Frctn Loss (ft)		Cum Volume (acre-ft)	38.07	76.84	24.71
C & E Loss (ft)		Cum SA (acres)	13.57	16.54	6.69

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 70 Profile: PF 3

E.G. Elev (ft)	5507.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.47	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	5505.79	Reach Len. (ft)	1380.00	1310.00	1370.00
Crit W.S. (ft)	5505.83	Flow Area (sq ft)	592.39	900.91	652.39
E.G. Slope (ft/ft)	0.010768	Area (sq ft)	592.39	900.91	652.39
Q Total (cfs)	18065.00	Flow (cfs)	3257.56	10478.42	4329.02
Top Width (ft)	743.29	Top Width (ft)	291.35	210.00	241.93
Vel Total (ft/s)	8.42	Avg. Vel. (ft/s)	5.50	11.63	6.64
Max Chl Dpth (ft)	4.79	Hydr. Depth (ft)	2.03	4.29	2.70
Conv. Total (cfs)	174090.8	Conv. (cfs)	31392.8	100979.6	41718.3
Length Wtd. (ft)	1333.48	Wetted Per. (ft)	291.38	210.01	242.08
Min Ch El (ft)	5501.00	Shear (lb/sq ft)	1.37	2.88	1.81
Alpha	1.33	Stream Power (lb/ft s)	7.52	33.54	12.02
Frctn Loss (ft)		Cum Volume (acre-ft)	59.81	182.24	61.25
C & E Loss (ft)		Cum SA (acres)	24.14	43.65	24.38

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 70 Profile: PF 3

E.G. Elev (ft)	5507.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.47	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	5505.79	Reach Len. (ft)	1380.00	1310.00	1370.00
Crit W.S. (ft)	5505.83	Flow Area (sq ft)	592.39	900.91	652.39
E.G. Slope (ft/ft)	0.010768	Area (sq ft)	592.39	900.91	652.39
Q Total (cfs)	18065.00	Flow (cfs)	3257.56	10478.42	4329.02
Top Width (ft)	743.29	Top Width (ft)	291.35	210.00	241.93
Vel Total (ft/s)	8.42	Avg. Vel. (ft/s)	5.50	11.63	6.64
Max Chl Dpth (ft)	4.79	Hydr. Depth (ft)	2.03	4.29	2.70
Conv. Total (cfs)	174090.8	Conv. (cfs)	31392.8	100979.6	41718.3
Length Wtd. (ft)	1333.48	Wetted Per. (ft)	291.38	210.01	242.08
Min Ch El (ft)	5501.00	Shear (lb/sq ft)	1.37	2.88	1.81
Alpha	1.33	Stream Power (lb/ft s)	7.52	33.54	12.02
Frctn Loss (ft)		Cum Volume (acre-ft)	59.81	182.24	61.25
C & E Loss (ft)		Cum SA (acres)	24.14	43.65	24.38

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 43 Profile: PF 3

E.G. Elev (ft)	5467.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.69	Wt. n-Val.		0.020	
W.S. Elev (ft)	5462.77	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	5463.96	Flow Area (sq ft)		1039.06	
E.G. Slope (ft/ft)	0 006560	Area (sq ft)		1039.06	
Q Total (cfs)	18065.00	Flow (cfs)		18065.00	
Top Width (ft)	208.10	Top Width (ft)		208.10	
Vel Total (ft/s)	17.39	Avg. Vel. (ft/s)		17.39	
Max Chl Dpth (ft)	7.04	Hydr. Depth (ft)		4.99	
Conv. Total (cfs)	223047.3	Conv. (cfs)		223047.3	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		211.57	
Min Ch El (ft)	5455.73	Shear (lb/sq ft)		2.01	
Alpha	1.00	Stream Power (lb/ft s)		34.97	
Frctn Loss (ft)		Cum Volume (acre-ft)	38.07	74.43	24.71
C & E Loss (ft)		Cum SA (acres)	13.57	16.18	6.69

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 42 Profile: PF 3

E.G. Elev (ft)	5467.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.01	Wt. n-Val.		0.020	
W.S. Elev (ft)	5462.00	Reach Len. (ft)	200.00	245.00	275.00
Crit W.S. (ft)	5463.36	Flow Area (sq.ft)		1005.63	
E.G. Slope (ft/ft)	0.007896	Area (sq ft)		1005.63	
Q Total (cfs)	18065.00	Flow (cfs)		18065.00	
Top Width (ft)	220.84	Top Width (ft)		220.84	
Vel Total (ft/s)	17.96	Avg. Vel. (ft/s)		17.96	
Max Chl Dpth (ft)	6.62	Hydr. Depth (ft)		4.55	
Conv. Total (cfs)	203304.3	Conv. (cfs)		203304.3	
Length Wtd. (ft)	245.01	Wetted Per. (ft)		224.04	
Min Ch El (ft)	5455.38	Shear (lb/sq ft)		2.21	
Alpha	1.00	Stream Power (lb/ft s)		39.75	
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	38.07	73.25	24.71
C & E Loss (ft)	0.10	Cum SA (acres)	13.57	15.94	6.69

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 41 Profile: PF 3

E.G. Elev (ft)	5462 39	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.18	Wt. n-Val.		0.035	0.045
W.S. Elev (ft)	5456.21	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	5457.95	Flow Area (sq ft)		905.09	1.46
E.G. Slope (ft/ft)	0.066020	Area (sq.ft)		905.09	1.46
Q Total (cfs)	18065.00	Flow (cfs)		18056.81	8.19
Top Width (ft)	367.37	Top Width (ft)		364.95	2.41
Vel Total (ft/s)	19.93	Avg. Vel. (ft/s)		19.95	5.62
Max Chl Dpth (ft)	4.31	Hydr. Depth (ft)		2.48	0.60
Conv. Total (cfs)	70307.2	Conv. (cfs)		70275.3	31.9
Length Wtd. (ft)	200.00	Wetted Per. (ft)		365.95	2.70
Min Ch El (ft)	5451.90	Shear (lb/sq ft)		10.19	2.22
Alpha	1.00	Stream Power (lb/ft s)		203.37	12.51
Frctn Loss (ft)	4.27	Cum Volume (acre-ft)	38.07	67.88	24.70
C & E Loss (ft)	0.35	Cum SA (acres)	13.57	14.29	6.68

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 40 Profile: PF 3

E.G. Elev (ft)	5457.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.90	Wt. n-Val.		0.035	0.045
W.S. Elev (ft)	5456.01	Reach Len. (ft)	1010.00	1055.00	1060.00
Crit W.S. (ft)	5456.01	Flow Area (sq ft)		1610.90	35.12
E.G. Slope (ft/ft)	0.011529	Area (sq ft)		1610.90	35.12
Q Total (cfs)	18065.00	Flow (cfs)		17870.45	194.55
Top Width (ft)	441.55	Top Width (ft)		424.02	17.53
Vel Total (ft/s)	10.97	Avg. Vel. (ft/s)		11.09	5.54
Max Chl Dpth (ft)	4.51	Hydr. Depth (ft)		3.80	2.00
Conv. Total (cfs)	168247.3	Conv. (cfs)		166435.3	1811.9
Length Wtd. (ft)	1054.13	Wetted Per. (ft)		424.32	17.98
Min Ch El (ft)	5451.50	Shear (lb/sq ft)		2.73	1.41
Alpha	1.01	Stream Power (lb/ft s)		30.31	7.79
Frctn Loss (ft)	6.77	Cum Volume (acre-ft)	38.07	62.10	24.62
C & E Loss (ft)	0.29	Cum SA (acres)	13.57	12.48	6.64

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 30 Profile: PF 3

E.G. Elev (ft)	5445.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.92	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	5444 42	Reach Len. (ft)	1000.00	705.00	1000.00
Crit W.S. (ft)	5442.99	Flow Area (sq ft)	367.02	1339.34	836.11
E.G. Slope (ft/ft)	0.004089	Area (sq ft)	367.02	1339.34	836.11
Q Total (cfs)	18065.00	Flow (cfs)	1315.44	11430.65	5318.91
Top Width (ft)	565.25	Top Width (ft)	165.91	240.00	159.33
Vel Total (ft/s)	7.11	Avg. Vel. (ft/s)	3.58	8.53	6.36
Max Chl Dpth (ft)	7.42	Hydr. Depth (ft)	2.21	5.58	5.25
Conv. Total (cfs)	282499.8	Conv. (cfs)	20570.8	178752.2	83176.9
Length Wtd. (ft)	829.46	Wetted Per. (ft)	165.97	240.29	159.89
Min Ch El (ft)	5437.00	Shear (lb/sq ft)	0.56	1.42	1.33
Alpha	1.17	Stream Power (lb/ft s)	2.02	12.14	8.49
Frctn Loss (ft)	4.48	Cum Volume (acre-ft)	33.81	26.38	14.02
C & E Loss (ft)	0.09	Cum SA (acres)	11.65	4.44	4.49

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 20 Profile: PF 3

E.G. Elev (ft)	5440.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.83	Wt. n-Val.	0.045	0.035	
W.S. Elev (ft)	5438.94	Reach Len. (ft)	720.00	685.00	520.00
Crit W.S. (ft)	5438.94	Flow Area (sq ft)	1375.58	687.17	
E.G. Slope (ft/ft)	0.007449	Area (sq ft)	1375.58	687.17	
Q Total (cfs)	18065.00	Flow (cfs)	8608.43	9456.57	
Top Width (ft)	515.05	Top Width (ft)	422.70	92.36	
Vel Total (ft/s)	8.76	Avg. Vel. (ft/s)	6.26	13.76	
Max Chl Dpth (ft)	9.44	Hydr. Depth (ft)	3.25	7.44	
Conv. Total (cfs)	209310.6	Conv. (cfs)	99741.8	109568.8	
Length Wtd. (ft)	670.94	Wetted Per. (ft)	422.74	94.41	
Min Ch El (ft)	5429.50	Shear (lb/sq ft)	1.51	3.38	
Alpha	1.54	Stream Power (lb/ft s)	9.47	46.58	
Frctn Loss (ft)	5.17	Cum Volume (acre-ft)	13.81	9.98	4.42
C & E Loss (ft)	0.16	Cum SA (acres)	4.89	1.75	2.66

Plan: sed6-10-05 Tijeras Arroyo 1 RS: 10 Profile: PF 3

E.G. Elev (ft)	5432.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.27	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	5429.05	Reach Len. (ft)			
Crit W.S. (ft)	5430.09	Flow Area (sq ft)	295.21	581.92	741.08
E.G. Slope (ft/ft)	0.024444	Area (sq ft)	295.21	581.92	741.08
Q Total (cfs)	18065.00	Flow (cfs)	2208.29	10483.89	5372.82
Top Width (ft)	744.50	Top Width (ft)	169.23	130.00	445.27
Vel Total (ft/s)	11.16	Avg. Vel. (ft/s)	7.48	18.02	7.25
Max Chl Dpth (ft)	5.05	Hydr. Depth (ft)	1.74	4.48	1.66
Conv. Total (cfs)	115544.2	Conv. (cfs)	14124.3	67055.2	34364.7
Length Wtd. (ft)		Wetted Per. (ft)	169.26	130.14	445.32
Min Ch El (ft)	5424.00	Shear (lb/sq ft)	2.66	6.82	2.54
Alpha	1.69	Stream Power (lb/ft s)	19.91	122.94	18.41
Frctn Loss (ft)	8.30	Cum Volume (acre-ft)			
C & E Loss (ft)	0.14	Cum SA (acres)			

CITY OF ALBUQUERQUE

March 19, 2008

Gregory J. Krenik, PE
MARK GOODWIN & ASSOCIATES
P.O. Box 90606
Albuquerque, NM 87119

RE: Juan Tabo Hills Subdivision, Tract 5, (M-21/D015)
Engineers Certification for SIA/Release of Financial Guarantee
Engineers Stamp dated 02/09/2006
Engineers Certification dated 1/09/2007

Mr. Krenik:

Based upon the information provided in your Engineer's Certification Submittal dated 03/19/2008, the above referenced plan **cannot** be approved for Engineer's Certification for SIA/Release of Financial Guarantee until the following comments are addressed:

1. The site will need more as built elevations to accurately represent the final conditions of this project. Include roadway and curb elevations to adequately reflect drainage to the streets.
2. Clearly identify which Unit 1 will be released. Does this include 1A and 1B? Are these Units guaranteed separately?
3. The work order number is required for release of financial guarantee for all units as well.
4. The LOMR will need to be accepted by FEMA prior to the "complete" release of SIA/Financial Guarantee.
5. Amend the surveyor on the drainage information sheet.

If you have any questions, you can contact me at 924-3982.

Sincerely,

Timothy Sims
Plan Checker, Planning Dept.- Hydrology
Development and Building Services

C: Bradley L. Bingham
File

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

DRAINAGE INFORMATION SHEET
(REV. 1/28/2003rd)

M-21/D015

PROJECT TITLE: Juan Tabo Hills ZONE MAP/DRG #: ~~M-21/M-22~~

DRB#: 1001370 EPC #: W.O.#:

LEGAL DESCRIPTION: TRACT 5, JUAN TABO HILLS

CITY ADDRESS.

ENGINEERING FIRM:	Mark Goodwin & Associates, PA	CONTACT.	Gregory J Krenik, PE
ADDRESS:	PO Box 90606	PHONE:	828-2200
CITY, STATE:	Albuquerque, NM	ZIP CODE:	87199
OWNER	JTH, LLC	CONTACT:	Robert Lupton
ADDRESS:	PO Box 1443	PHONE.	892-5533
CITY, STATE:	Corrales, NM	ZIP CODE.	87124
ARCHITECT		CONTACT.	
ADDRESS:		PHONE:	
CITY, STATE:		ZIP CODE:	
SURVEYOR	Aldrich Land Surveying	CONTACT.	Tim Aldirch
ADDRESS	P.O Box 30701	PHONE:	884-1990
CITY, STATE	Albuquerque, NM	ZIP CODE.	87190-0701
CONTRACTOR.		CONTACT.	
ADDRESS.		PHONE:	
CITY, STATE.		ZIP CODE.	

CHECK TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ____ DRAINAGE PLAN 1ST SUBMITTAL, req. 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)
- ____ ENGINEER'S CERTIFICATION (TCL)
- ____ ENGINEER'S CERTIFICATION (DRB APPR. SITE PLAN)
- ____ OTHER

CHECK TYPE OF APPROVAL SOUGHT:

- X SIA / FINANCIAL 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)

WAS A PRE-DESIGN CONFERENCE ATTENDED?

- ____ YES
- ____ NO
- ____ COPY PROVIDED

RECEIVED
MAR 19 2008
HYDROLOGY SECTION

DATE SUBMITTED: 3-19-08 BY:

Gregory J. Krenik, PE

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage 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 submittal may be required based on the following:

1 **Conceptual Grading and Drainage Plan**: 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.

CITY OF ALBUQUERQUE

April 24, 2006

Greg Krenik, PE
Mark Goodwin & Associates
P.O. 90606
Albuquerque, NM 87199

Re: Juan Tabo Hills Subdivision Drainage Report
Engineer's Stamp dated 2-9-06 (M21/D15)

Dear Mr. Krenik,

Based upon the information provided in your submittal dated 2-14-06, the above referenced report is approved as revised. This will now be the plan that must be certified for Release of Financial Guarantees. The infrastructure list must be amended in order to facilitate your closeout package for the Work Order. I will still need to work with you on this plan to make sure that the City has adequate access to all manholes.

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

Sincerely,

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

C: file

P.O. Box 1293

Albuquerque

New Mexico 87103

www.cabq.gov

8-5-17

drainage down factor St appears to bounce or run over the cattle guard

mostly on north and south ends evidenced by the erosion. However, there is debris along most of the fence which indicates that runoff is leaving over most of the inlet

homeowners cleared grate ← is reason for debris against fence

contact June and Sarah with progress

1. Greg and I figure out the engineering fix
2. how to get funding to do project.

3. tumbleweeds are clogging grate.

HOMEOWNERS ASSOCIATION MANAGEMENT COMPANY

ARIZONA · NEW MEXICO HOAMCO

Sarah Hoey
Community Association Manager

sarah@hoamco.com

PO Box 67590
Albuquerque, NM 87193
505-888-4479 ext. 29
505-888-4483 fax
www.hoamco com

Cherne, Curtis

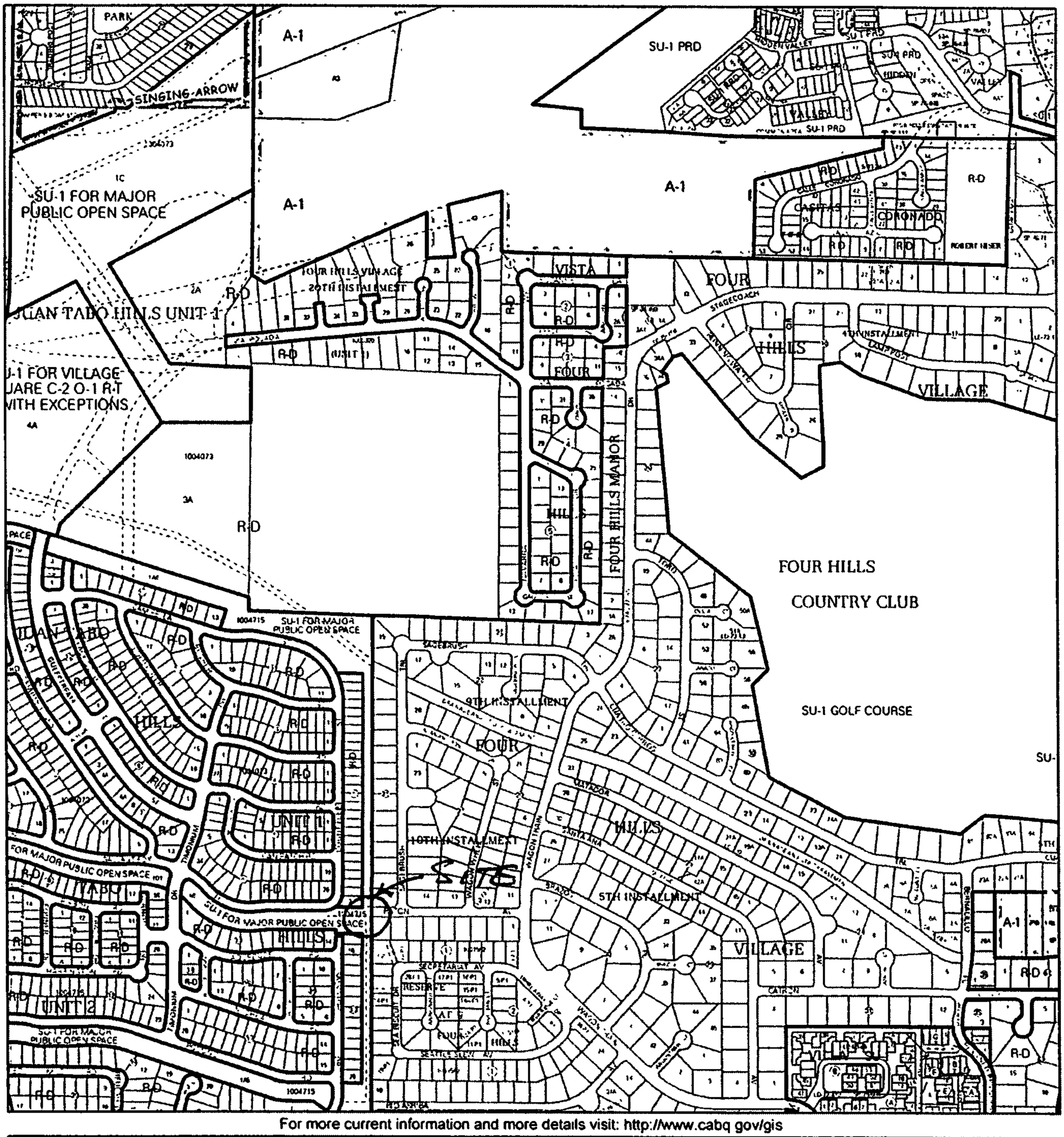
From: Gregory Krenik [Greg@goodwinengineers.com]
Sent: Tuesday, August 02, 2011 11:40 AM
To: Cherne, Curtis ; Lopez, Anthony C.
Cc: Heather Foote
Subject: Juan Tabo Hills Unit 1 at Raton Ave.
Attachments: sharp_copier@goodwinengineers.com_20110802_113406.pdf

Curtis & Anthony,
It was brought to my attention by the owner that there is still a problem with runoff from Four Hills at the termination of Raton Ave where it meets JTH Unit 1. To try and remedy the problem in the past, after meeting with the COA at the site, the owners removed the crown of the road back to the intersection of Sagebrush Ter. to try and get all the water from Sagebrush and Raton to enter the trench drain that the owners installed. The issue back then was there was too much water flowing in Raton Ave...over it's capacity...the runoff goes over the curb as it tries to turn the corner, actually up a driveway and out of the street. This runoff that bypasses the trench drain keeps eroding the trail that was installed for Open Space but is to be maintained by the JTH HOA.

It seems to me now, that the COA is responsible for repairing this problem. My reasons are 1) the runoff should never have been allowed to exit the Four Hills property...there was no easement on JTH's property for the runoff to cross, 2) the owner has had to install inlets to accept all this runoff, the design works but the water leaves the street before it gets to the inlet and 3) the owner is having to keep repairing, at their cost, the City Open Space trail which is being damaged by runoff from a City street.

I would like to meet out at the site to discuss what can be done to prevent any further problems. Are you available to meet Friday morning at 10:00? See attached Zone Map.
Thanks, Greg

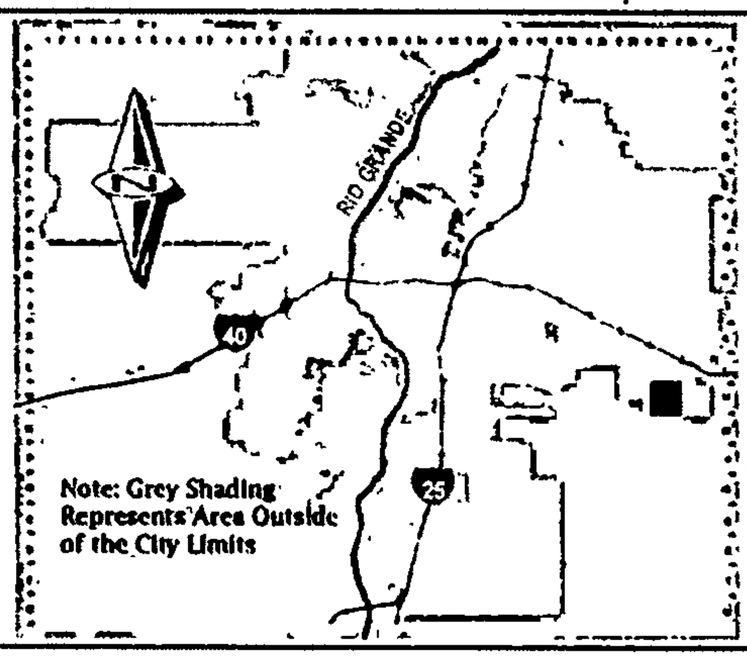
Gregory J. Krenik, PE
D. Mark Goodwin & Associates
PO Box 90606
Albuquerque, NM 97199
505-828-2200
505-235-9338 cell



For more current information and more details visit: http://www.cabq.gov/gis

Albuquerque Geographic Information System

Map amended through: 2/4/2010



Zone Atlas Page:

M-22-Z

Selected Symbols

- SECTOR PLANS
- Design Overlay Zones
- City Historic Zones
- H-1 Buffer Zone
- Petroglyph Mon.
- Escarpment
- 2 Mile Airport Zone
- Airport Noise Contours
- Wall Overlay Zone

0 750 1,500 Feet

CITY OF ALBUQUERQUE

December 11, 2006

Greg Krenik, PE
Mark Goodwin & Associates
P.O. 90606
Albuquerque, NM 87199

Re: Juan Tabo Hills Revised Grading Plan
Engineer's Stamp dated 11-2-06 (M21/D15)

Dear Mr. Krenik,

Based upon the information provided in your submittal dated 11-7-06, the above referenced plan is approved as submitted. This will now be the plan that must be certified for release of SIA and financial guarantees.

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

Sincerely,

Bradley L. Bingham

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

C: file

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


DR
TRD
KA