

**Drainage Report For
The Pines Phase I**

Prepared For:
Presidio Engineering, Inc.
4582 N. 1st Ave #120
Tucson, AZ 85718

Prepared By:
CMG Drainage Engineering, Inc.
4574 N First Avenue, Ste. 100
Tucson, Arizona 85718

Job #25044

June 6, 2005
Revised August 18, 2005



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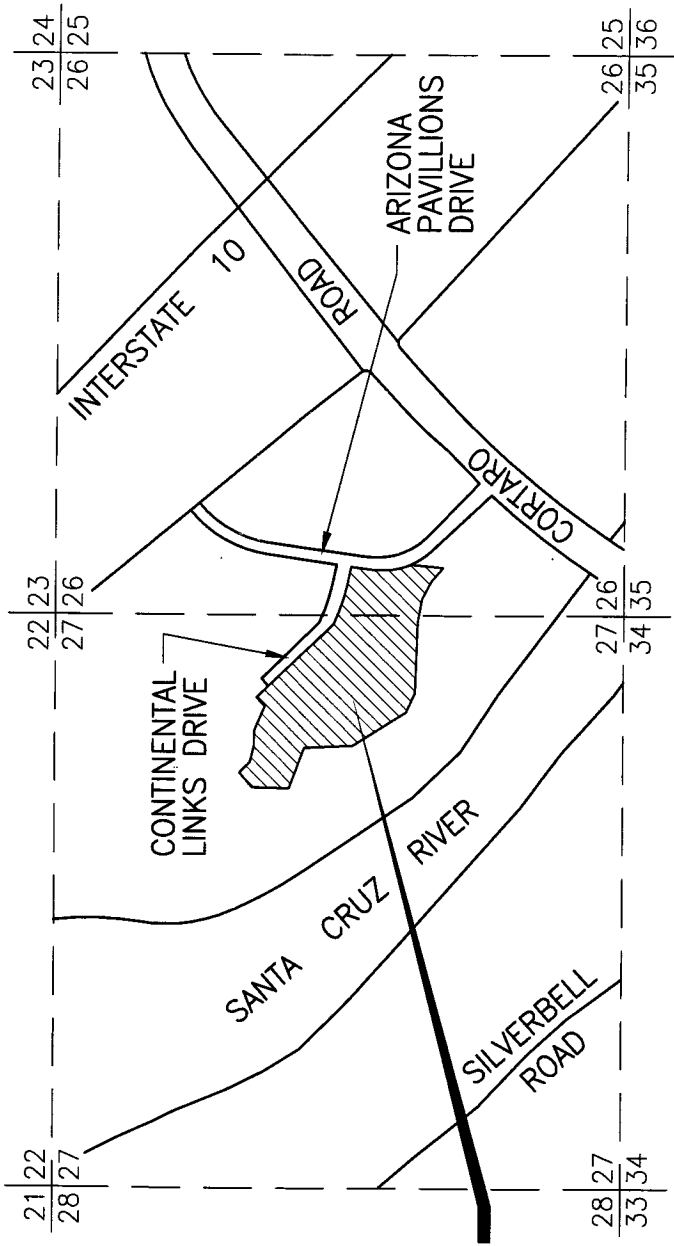
- Appendix A - Hydrologic Design Data Sheets
- Appendix B – Curb Opening/Storm Drain/Catch Basin Capacity Computations
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I Introduction

This report presents results of hydrologic and hydraulic analysis that have been conducted to develop an onsite drainage plan for The Pines, Phase I. Phase I is located within a portion of Section 26&27, Township 12 South, Range 12 East, G&SRB&M, Town of Marana, Pima County, Arizona. A location map for Phase I is provided on Figure 1.

The approximate area of Phase I is approximately 34.0 acres. The land use plan for Phase I proposes subdividing the site into 129 residential lots. Drainage from Phase I will discharge into the sand and gravel pit within the Santa Cruz River that is located southwest of this project site.



THIS PROJECT

FIGURE 1: LOCATION MAP

A PORTION OF THE W 1/2 OF SECTION 26 AND A PORTION OF THE E 1/2 OF SECTION 27, T-12-S, R-12-E, G.&S.R.M., TOWN OF MARANA, PIMA CO., ARIZONA

II Hydrology

2.1 Offsite Hydrology

There are two points of concentration for offsite stormwater runoff. These points of concentration are located within the Continental Links Drive along the northeast property boundary. CP-1 drains to the existing Continental Links Drive with the 100-year runoff of 15.5 cfs. CP-2 (including runoff from CP-1) has 100-year runoff of 36.7 cfs. The boundaries of the watersheds draining to CP-1 and CP-2 are provided on Figure 3.

2.2 Onsite Hydrology

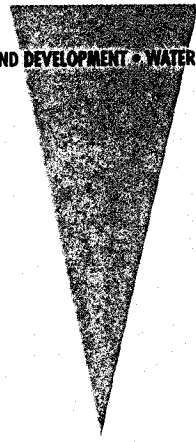
There are ten points of concentration for onsite stormwater runoff. These points of concentration are located within the subdivision streets. These concentration points have drainage areas ranging from 1.82 to 5.47 acres. The location of the concentration points, their drainage areas, and the computed 100-year discharge rates are shown on Table 1 and Figure 3. Hydrologic design data sheets for the discharge determinations are provided in Appendix A.

Table 1: Onsite Discharge Summary Table

Concentration Point	Drainage Area (acre)	Q₁₀₀ (cfs)
A	3.09	22.5
B	3.26	23.8
C	1.94	14.2
D	2.32	16.9
E	2.18	15.9
F	5.44	40.0
G	3.91	28.5
H	1.95	14.2
I	1.82	13.3
J	2.92	21.3



August 23, 2005



Mr. Tim Bolton
Planner I
Town of Marana
Development Services Center
11555 W. Civic Center Drive
Marana, AZ 85653

Subject: Response Letter to First Submittal Review Comments for
The Pines Phase I Preliminary Plat, PRV-05066
Presidio Engineering Job No.: 104023-03-0105

Dear Tim:

This letter has been prepared in order to respond to your August 2, 2005 first submittal review comment letter regarding the Preliminary Plat on the above referenced project. Our response is in the same order as your comments. This letter also contains a response to the other review agencies whose review comments you have included with your letter.

I. Planning Comments (August 2, 2005)

Sheet 1 of 10

1. The Town of Marana case number has been added to the bottom of each sheet.
2. General Note #1 has been revised to indicate the net area of the subdivision.
3. General Note #35 has been added to indicate the total area in drainage ways.
4. General Note #31 has been added with the verbiage requested.
5. General Note #32 has been added with the verbiage requested.
6. General Note #6 has been revised as requested.
7. General Note #24 has been revised as requested.
8. General Note #24 has been revised as requested.
9. General Note #24 has been revised as requested.
10. General Note #26 has been revised as requested.
11. General Note #33 has been added with the requested verbiage.
12. The total area of on-site active recreational facilities is stated in General Note #26. It is acknowledged that a Recreation Area Plan is required prior to the plat being forwarded to Planning Commission.
13. General Note #22 has been revised as requested.
14. General Note #30 has been added to indicate the largest, smallest, and average lot area.
15. General Note #18 has been revised to indicate an assured water supply.
16. General Note #32 has been added with the requested verbiage.
17. An additional section tie has been shown on Sheet No. 3 of the plat within the boundary detail.

SUBMITTAL NO. 2

18. The typical lot layout has been revised to indicate that "corner" on the corner side yard setback. Note that the detail has been moved to be on Sheet No. 8.
19. The lot layout detail has been revised as requested.
20. The location map has been revised to show Cracker Barrel Drive. However, Arizona Pavilions is currently shown in the correct place and has not been moved.
21. According to the developer, should a common mailbox be implemented, they will be placed at several locations in common areas throughout the subdivision. Further, the mailboxes will be designed in accordance with what is accepted by the United States Postal Service.
22. Per an August 8, 2005 phone conversation that Erin Donovan, from this office, had with Tim Bolton, there is no note required on the plat. It is acknowledged that a licensing agreement will be required for work within the right-of-way.

Sheets 2-5

1. The width of Lots 64 and 65 has already been increased by 5' to account for the increase in corner side yard setback. No additional change is necessary.
2. Common Area "B" has been extended to the rear of Lots 119 and 120. This common area will be landscaped to decrease the lack of aesthetics.
3. A 15' buffer yard has been designated in Common Areas "A" and "B" along Continental Links Drive. This 15' extends into the right of way and has been noted to require a licensing agreement.
4. Per an August 8, 2005 phone conversation with Tim Bolton, the 4' sidewalk as shown on the Continental Links Drive cross section is sufficient. The developer has chosen not to have the sidewalk meander as they feel it is not aesthetically pleasing and serves no purpose.
5. The active on-site recreation area has been identified on the Plat (Common Area "A") and a boxed note has been added noting to refer to the approved Landscape Plan for details.
6. The perimeter and common area walls have been called out with Keynote #34 and all wall details are referenced to the Landscape Plan as approved in an August 8, 2005 phone conversation that Erin Donovan, from this office, had with Tim Bolton.
7. The cross section detail of the Recreation Area is to be shown on the Landscape Plan and referenced in the Preliminary Plat as approved in an August 8, 2005 phone conversation that Erin Donovan, from this office, had with Tim Bolton.
8. The common areas are noted individually in the Title Block on Sheet 1 of the Preliminary Plat. For further clarity, Common Area "A" has been specifically identified as Active On-Site Recreational Facilities.
9. The size of Common Areas has been noted on the Plat.
10. The entrance design treatments have been called out on the Plat as Keynote #36 with a reference to the details to be shown on the Landscape Plan as approved in an August 8, 2005 phone conversation that Erin Donovan, from this office, had with Tim Bolton.

11. Handicap ramps have been shown at all crosswalk locations and have been identified as Keynote #35.
12. The sides of Lots 16, 17, 75, and 115 will consist of solid walls. Additionally, landscaping will be provided in the Common Areas. Since the Common Areas all have street frontage, there will be no security issue.
13. All plottable easements listed in Schedule B of the Title Report have been shown on the Plat. Additional blanket easements have been addressed in General Note #37, as shown on Sheet No. 9.
14. The developer agrees that street trees should be placed in front yards. However, there is no requirement that these trees be shown on the Preliminary Plat or on the Landscape Plan. It is acknowledged that a landscape easement may be required in addition to the 10' public utility easement.
15. Per an August 8, 2005 phone conversation that Erin Donovan, from this office, had with Tim Bolton, this comment is not applicable to this project.
16. Access stars have been shown for the double frontage lots (Lots 119 and 120).
17. The sewer and manhole information has been moved to Sheet #6 to avoid clutter on the other plan sheets. As approved in an August 8, 2005 phone conversation that Erin Donovan, from this office, had with Tim Bolton, this sheet is set up at 1:100 scale and only shows sewer information.
18. 1' no vehicle access easements have been added to the rear of all lots that back to common areas.
19. There is no existing well at the corner of Arizona Pavilions Drive and Continental Links Drive. However, the existing wall has been noted to be removed in Keynote #33.
20. A 4' sidewalk has been shown in the Typical Section of Continental Links Drive. Additionally, the 15' buffer yard has been shown in the section for clarity.
21. The right-of-way widths for Continental Links Drive, Arizona Pavilions Drive and Hospitality Drive have been shown on the Plat.
22. The location of Active On-Site Recreational Facilities has been shown on Sheet #5 of the Plat in Common Area "A".
23. Common Area "B" drainage ways have been shown to be landscaped on the Landscape Plan. Due to commitments to the current owner of the property, it is not possible to create a pathway through these Common Areas and along the perimeter of the subdivision. The current owner of the property has requested that there be no access to the golf course from the subdivision and that foot traffic onto the golf course be discouraged.
24. Per an August 8, 2005 phone conversation that Erin Donovan, from this office, had with Tim Bolton, this comment should be ignored.
25. Additional access stars have been provided for Lots 107, 127, 95, 99, 94 and 49.

Detail Sheet

1. As approved in an August 8, 2005 phone conversation that Erin Donovan, from this office, had with Tim Bolton, details related to the design treatments for main entry points are to be shown on the Landscape Plan and referenced with Keynote #36 on the Plat.
2. As approved in an August 8, 2005 phone conversation that Erin Donovan, from this office, had with Tim Bolton, details related to the perimeter/common area walls are to be shown on the Landscape Plan and referenced with Keynote #34 on the Plat.
3. Per the developer, the 3:1 slope will not be planted for safety and maintenance issues due to the large depth of fills along the perimeter of the subdivision.
4. The 15' buffer yard has been shown in the typical section for Continental Links Drive. The landscaping in this buffer yard is shown on the Landscape Plan.
5. The table of Minimum FFE's has been revised to include lot size in square footage. The largest, smallest and average lot areas have been noted on Sheet 1 in General Note #30.

Title Report

1. The title report and plat have been checked for consistency and the plat has been revised as necessary. The title report has not changed and therefore a revised title report has not been submitted.

II. Castro Engineering (July 5, 2005)

Review of Drainage Report

See attached August 18, 2005 letter from CMG Drainage addressing these comments as well as the revised Drainage Report.

Review of Soils Report

1. It is acknowledged that the Soils Report is acceptable.

Review of Preliminary Plat

Sheet 1 of 7:

2. The Town of Marana case number has been added to each sheet.
3. The acceptance block has been updated as requested.
4. The bearing above Lot 5 has been revised to reflect the accurate bearing.
5. The bearing below Lot 52 has been revised to reflect the accurate bearing.
6. General Note #18 has been revised to indicate an assured water supply.
7. CP2 is a drainage concentration point for off-site flow and a symbol has been added adjacent to the A in a circle on the Legend.
8. The survey monument symbol and description has been added to the Legend.
9. The 1' no access line has been depicted more clearly and is no longer obscured.
10. The sewer keynote table has been moved to Sheet #6 for clarity.
11. The sewer keynote table has been moved to Sheet #6 for clarity.

12. The sewer in Scotch Pine Lane ends in a terminal manhole adjacent to Lot 106. Consequently, there is no manhole at the intersection of Mountain Stone Pine Way and Scotch Pine Lane. The sewer manhole and keynote information has been moved to Sheet #6 for clarity.
13. The sewer manhole and keynote information has been moved to Sheet #6 for clarity.
14. The invert direction was incorrect and has been changed.
15. The sewer manhole and keynote information has been moved to Sheet #6 for clarity.
16. The invert directions were incorrect and have been changed.
17. The legend has been changed to identify that symbol as Modified Catch Basin.
18. The catch basin symbol was removed from the legend as it is not applicable to the project.
19. It is not intended to have a normal 2% crown adjacent to trench drains. This level of detail is to be addressed on the improvement plans.
20. Elevation difference has been increased to 0.60 by raising the high point to an elevation of 34.82.
21. The Drainage Report and the plat are now consistent.
22. The Drainage Report and the plat are now consistent
23. It is acknowledged that easements by separate instrument will be required for the off-site storm drains prior to approval of the Final Plat.
24. See attached August 19, 2005 letter from Snell & Wilmer addressing the property owner's approval of the storm drain construction.

III. Pima Co. Wastewater Management & Environmental Quality (June 30, 2005)

1. See attached August 10, 2005 response, CR05-117 (Reference CR04-158) from Ilene Deckard stating that treatment and conveyance capacity is available for the subdivision.
2. It is acknowledged that this project will qualify for non-participating rates.
3. The project number has been added to the title block of each sheet.
4. The reference project number has been added to the title block of Sheet 1.
5. General Notes #28 and #29 have been added as requested.
6. The project will consist of public sewers and General Note #28 has been added to address this situation.
7. The sewer information for Reach #23 has been shown on the Plat. In addition, the sewer manhole and keynote information has been moved to Sheet #6 for clarity.
8. The sewer has been redesigned to consist of 8" pipe in its entirety.
9. It is acknowledged that a flow management plan will be required for this project.
10. A revised set of drawings is attached to this response letter for your review and approval.

IV. Pima County Addressing (June 23, 2005)

1. The spelling of Arizona Pavilions Drive has been corrected on all sheets.
2. Scotch Pine Avenue has been changed to Scotch Pine Lane on all sheets.

V. Town of Marana Traffic Division (June 22, 2005)

Preliminary Plat

1. The design speed for Continental Links Drive has been noted in General Note #34.
2. The typical section for Continental Links Drive has been shown to extend to the intersection with Arizona Pavilions Drive. Additionally, a 40' curb return radii has been used.
3. The spelling of Arizona Pavilions Drive has been corrected on all sheets.

VI. Town of Marana Engineering (June 21, 2005)

Drainage Report

1. - 3. See attached August 18, 2005 letter from CMG Drainage and attached revised Drainage Report.

Plan Sheets

4. The last sentence in General Note #27 has been removed.
5. 1' private no vehicular access easements have been shown on the Plat on the rear of all lots that back to right-of-way or common area.
6. General Note #36 has been added as requested.
7. It is acknowledged that details shown on the Preliminary Plat are subject to additional review during the grading, development, and improvement plan reviews.

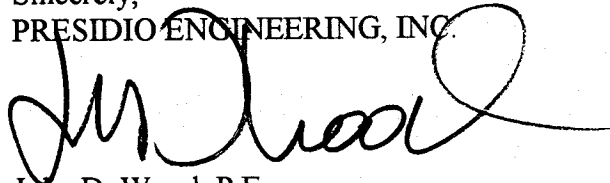
Additional

8. At this time, it is not proposed that the Pines Phase II utilize pit drainage. Currently, all drainage through Phase II is to be conveyed in a large open channel that discharges on to Fairway #5 of The Pines Golf Course. Therefore, none of the drainage from The Pines Phase II affects Phase I.

Consequently, in accordance with the above response please find attached ten copies of this letter, ten full size copies of the revised Preliminary Plat, three 11" x 17" reductions of the revised Preliminary Plat and three copies of the revised Drainage Report.

Let me know if you have any questions or if you require additional information.

Sincerely,
PRESIDIO ENGINEERING, INC.



John D. Wood, P.E.
PRESIDENT

Attachments

cc: Paula Meade, Standard Pacific Homes w/o attachment
File w/ attachment



PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
201 NORTH STONE AVENUE
TUCSON, ARIZONA 85701-1207

MICHAEL GRITZUK, P.E.
DIRECTOR

PH: (520) 740-6500
FAX: (520) 620-0135

August 10, 2005

Presidio Engineering, Inc.
2302 E. Speedway Suite 214
Tucson, AZ 85719
Attention: Erin Donovan

CR05-117 Update (Reference CR04-158)

Dear Ms. Donovan:

We have reviewed your request regarding the availability of sewer service for the proposed Pines Phase 1.

The development is tributary to the Continental Ranch Interceptor and Pumping System and the Ina Road Water Pollution Control Facility. There is capacity in the Continental Ranch Interceptor and the pumping system.

A 12.5 MGD expansion of treatment capacity is currently under construction at the Ina Road Water Pollution Control Facility. Completion of this expansion is anticipated early next year.

Under existing conditions (actual developments and commitments for service through approved Sewer Service Agreements), there is capacity for this proposed development at the Ina Road Water Pollution Control Facility to which this development is tributary.

This response is not to be construed as a commitment for conveyance and treatment capacity allocation, but rather an analysis of the existing sewerage system as of this date.

Sincerely,


Ilene Deckard, Sr. C.E.A.

Xc: Tim Rowe, Development Services
File T12,R12, Sec 22,26,27

104023-03-0105

AUG 19 2005 09:44 FR SNELL WILMER TUC 1 520 884 1294 TO 8794726

P. 02/05

Snell & Wilmer

LLP
LAW OFFICE
One South Church Avenue
Suite 1300
Tucson, Arizona 85701-1630
(520) 884-1200
Fax (520) 884-1294
www.ssnw.com

Jeff Saffer
520-882-1213
jsaffer@snwlaw.com

August 19, 2005

TUCSON, ARIZONA
PHOENIX, ARIZONA
DENVER, COLORADO
MEMPHIS, TENNESSEE
DENVER, COLORADO
LA JOLLA, CALIFORNIA

VIA FACSIMILE

Celeste M. Stoen
Lewis and Ross LLP
One South Church Avenue, Suite 700
Tucson, Arizona 85701

VIA FACSIMILE

United Metro Materials, Inc.
701 N. 44th Street
Phoenix, Arizona 85008
Attention: Bryan Fowler

Re: Understanding of Drainage Agreements

Ladies and Gentlemen:

Seller and Purchaser hereby agree that pursuant to the terms of that certain Sixth Amendment to Real Estate Purchase Agreement dated July 14, 2005 (the "Sixth Amendment"), purchaser has the right to divert natural storm water onto Seller's property at those locations shown on Exhibit A hereto in accordance with the following:

Seller shall grant to Purchaser up to ten (10) drainage easements to allow for drainage over the portion of Seller's property adjacent to the west boundary of the Property (the "Drainage Easements"). The appropriate number, location and initial design of the Drainage Easements shall be determined by Purchaser and its engineers in accordance with the requirements of this Paragraph 2 of the Sixth Amendment. Seller shall reasonably agree to all such Drainage Easements, provided they are located between the locations designated as Point "A" and Point "B" on the attached Exhibit A hereto and meet the conditions set forth in Paragraph 2 of the Sixth Amendment. The drainage facilities within the Drainage Easements shall only be permitted to discharge water in that area designated as Area "C" on Exhibit A attached hereto.

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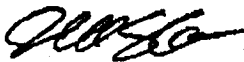
Snell & Wilmer
LLP

Celeste M. Steen
United Metro Materials, Inc.
August 19, 2005
Page 2

Nothing herein shall be construed to change, modify or supersede the rights of the parties as set forth in the Sixth Amendment, including, without limitations, the provisions of Paragraph 2 of the Sixth Amendment. In the event there is any conflict between this letter understanding and the Sixth Amendment, the Sixth Amendment shall control.

Yours truly,

Snell & Wilmer




Jeff Saffir

- cc: Ms. Paula Meade (via facsimile)
- Mike Botos, Esq. (via facsimile)
- Mr. David Graham (via facsimile)
- Mary Beth Savel, Esq. (via facsimile)
- Mike Egan, Esq. (via facsimile)
- Marc Simon, Esq.

UNITED METRO MATERIALS INC., an
Arizona corporation

By: 
 Name: Michael Botos
 Title: VICE PRESIDENT

MARANA GOLF, INC., a Delaware corporation

By: 
 Name: Michael Botos
 Title: VICE PRESIDENT

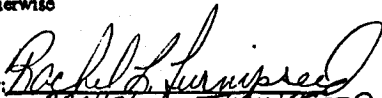
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P. 04/05

Snell & Wilmer
LLP

Celeste M. Steen
United Metro Materials, Inc.
August 19, 2005
Page 3

FIRST AMERICAN TITLE INSURANCE
COMPANY, a California corporation, as Trustee
under Trust No. 4738 dated February 7, 1997, and
Trust No. 4737 dated February 7, 1997, and not
otherwise

By: 
Name: RACHEL L. TURUBEED
Title: TRUST OFFICER

"SELLER"

STANDARD PACIFIC OF TUCSON, INC.,
A Delaware corporation

By: _____
Name: _____
Title: _____

"PURCHASER"

AUG 19 2005 09:44 PR SNELL WILMER TUC 1 520 884 1294 TO 8794726

P.04/05

Snell & Wilmer
LLP

Celeste M. Steen
United Metro Materials, Inc.
August 19, 2005
Page 3

FIRST AMERICAN TITLE INSURANCE
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Trust No. 4737 dated February 7, 1997, and not
otherwise

By: _____
Name: _____
Title: _____

"SELLER"

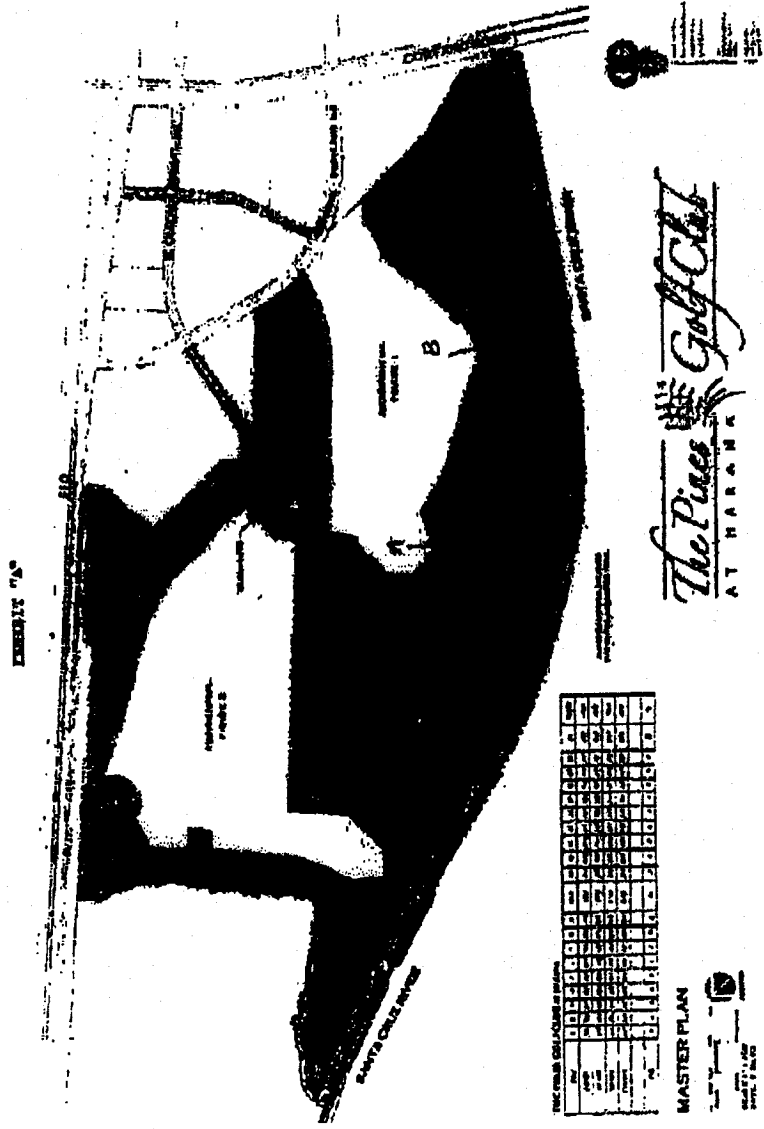
STANDARD PACIFIC OF TUCSON, INC.,
A Delaware corporation

By: Paula Truade
Name: Paula Truade
Title: VIC. PRESIDENT

"PURCHASER"

AUG 19 2005 09:44 FR SNELL WILMER TUC 1 520 884 1294 TO 8794726

P.05/05



THE CLUBS DESIGNATION BY SYMBOL

SYMBOL	DESCRIPTION
[Symbol]	CLUBHOUSE
[Symbol]	PARKING
[Symbol]	LANDSCAPED AREA
[Symbol]	ROAD
[Symbol]	UTILITY
[Symbol]	WATER
[Symbol]	SEWER
[Symbol]	IRIGATION
[Symbol]	BOUNDARY
[Symbol]	EXISTING
[Symbol]	PROPOSED

MASTER PLAN
DATE: 8/19/05
SCALE: 1" = 40'



**CMG DRAINAGE
ENGINEERING, INC.**

CLINTON M. GLASS, P.E., PRESIDENT

4574 N. FIRST AVENUE, SUITE 100 TUCSON, AZ 85718 PHONE (520) 882-4244 FAX (520) 882-3006 EMAIL cmgde@cmgdrainage.com

August 18, 2005

John Wood P.E.
Presidio Engineering, Inc.
4582 N 1st Ave #120
Tucson, Arizona 85718

Re: The Pines Phase I
Response to Drainage Report Review Comments

Dear John,

The information attached with this letter is being provided to you in response to review comments on the first submittal of the drainage report. The response to those comments is as follows:

Review from Mr. Keith Brann P.E.

Comment 1: Please provide flow arrows on Fig 3.

Response: Flow arrows are added on Figure 3.

Comment 2: Page 4 – Revise shaded-X definition to include “areas protected by levees”

Response: The definition for shaded-X is revised to include “areas protected by levees”.

Comment 3: Page 8 states that retention is provided in the old sand & gravel pit along the west property boundary. This pit is not within subdivision boundary, Is this property owner willing to accept this use of his property for retention for the life of this subdivision? Provide correspondence w/ this property owner.

Response: The pit owner is willing to accept this use of his property for retention for the life of this subdivision. A copy of the correspondence with this property owner is attached.

Comment 4: A minimum 0.1 ft drop should be provided across Inlet C and J-1 on Storm Drain System I.

Response: 0.1 feet drop is provided across Inlet C and J-1 on Storm Drain System I.

Comment 5: Provide a 0.1' minimum drop across Storm Drain System III manhole.

Letter to John Wood P.E.

Page 2

August 18, 2005

Response: 0.1 feet drop across Storm Drain System III manhole is provided.

Comment 6: Provide a 0.1 minimum drop across Inlet I and J-1 on Storm Drain System II.

Response: 0.1 feet drop across Inlet I and J-1 on Storm Drain System II is provided.

Comment 7: Grate inlets in sag conditions operate indefinitely as a weir or orifice between 0.4' and 1.4'. As a result, the capacity should be calculated with both the weir and orifice equations and whichever resulting depth is greater is the result that should be used. It appears that only the weir equation was used.

Response: In the revised drainage report, grate inlet with both weir and orifice condition are computed. All of the grate inlets have a size of 2'x32', which satisfy both weir and orifice conditions.

Comment 8: It is not clear if/how headloss at junctions, inlets, and pipe bends were calculated.

Response: The headloss at junctions and inlets (except these very upstream inlets of each Storm Drain System) used headloss coefficient of at least 1.5. These very upstream inlets of each Storm Drain System used headloss coefficient of 0.5. The headloss at pipe bends are accounted by adding additional headloss coefficient (from 0.2 to 0.5) at nearby junctions or inlets. For example, pipe bends roughly 90 degree at CP-A, CP-F, CP-H, and CP-I included an additional 0.5 headloss coefficient to account for the pipe bend resulting in a total headloss coefficient of 2.0. For minor pipe bend near CP-B, an additional 0.2 headloss coefficient is which results in a total headloss coefficient is 1.7.

Review from Paul Baughman EIT

Comment 1: Please cite the standards manual used as the source of the equations used for the Grate Computations and Curb Opening Length Computations.

Response: The equations used for Grate Inlet Computations and Curb Opening Computations were obtained from the *City of Tucson Department of Transportation, Engineering Division, Standards Manual for Drainage Design and Floodplain Management in Tucson, Arizona.*

Letter to John Wood P.E.
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Comment 2: The Storm CAD model should give the Manning's n value for the HDPE pipe.

Response: . The manning's n value for the HDPE pipes in the Storm CAD is 0.024.

Comment 3: The watercourse lengths in the drainage report appear longer than what can be scaled from Figure 3 for the various concentration points, please revised.

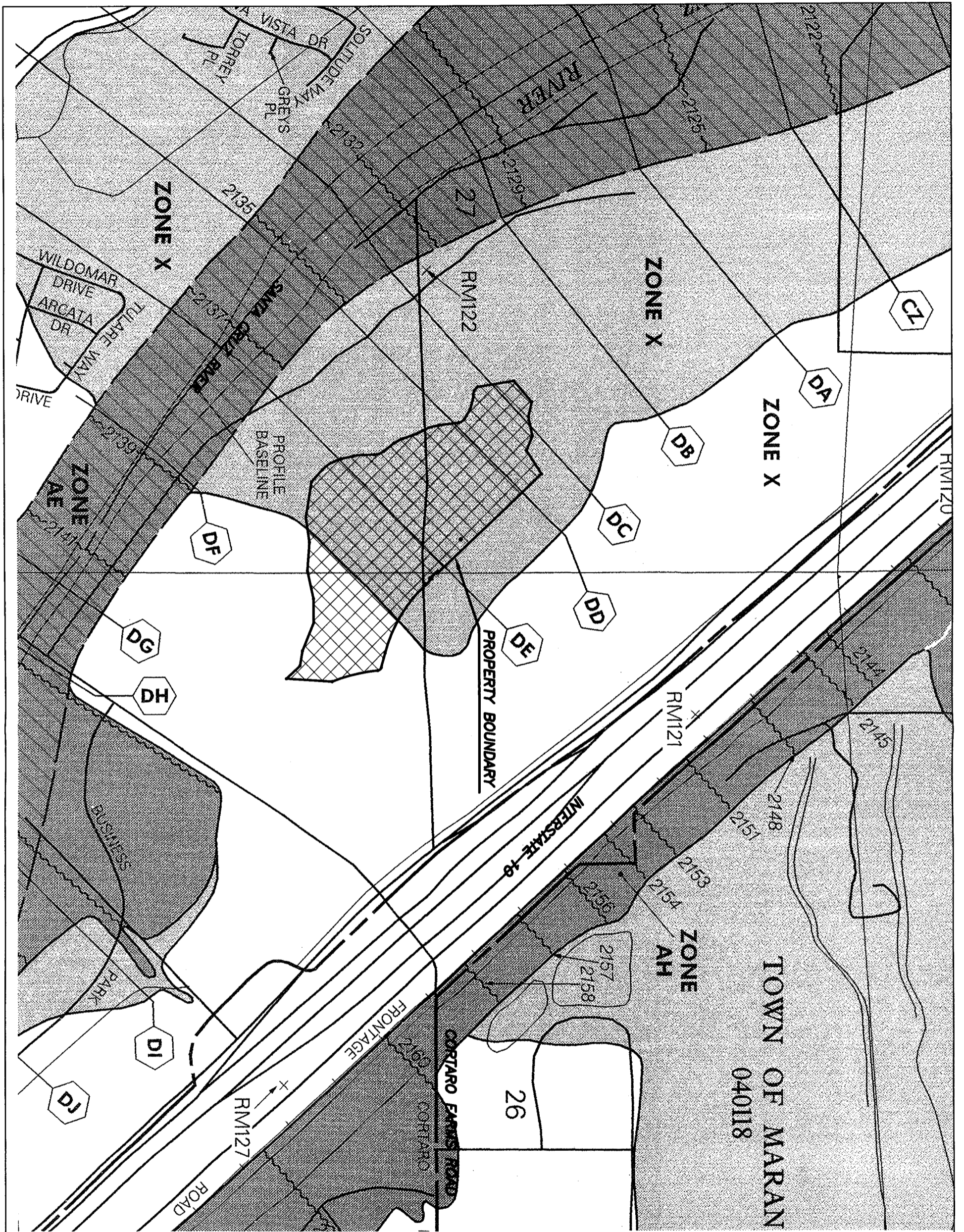
Response: All the watercourse lengths for each concentration point are checked and revised if necessary.

If you have any questions please call.

Yours truly,

Clinton M. Glass P.E.

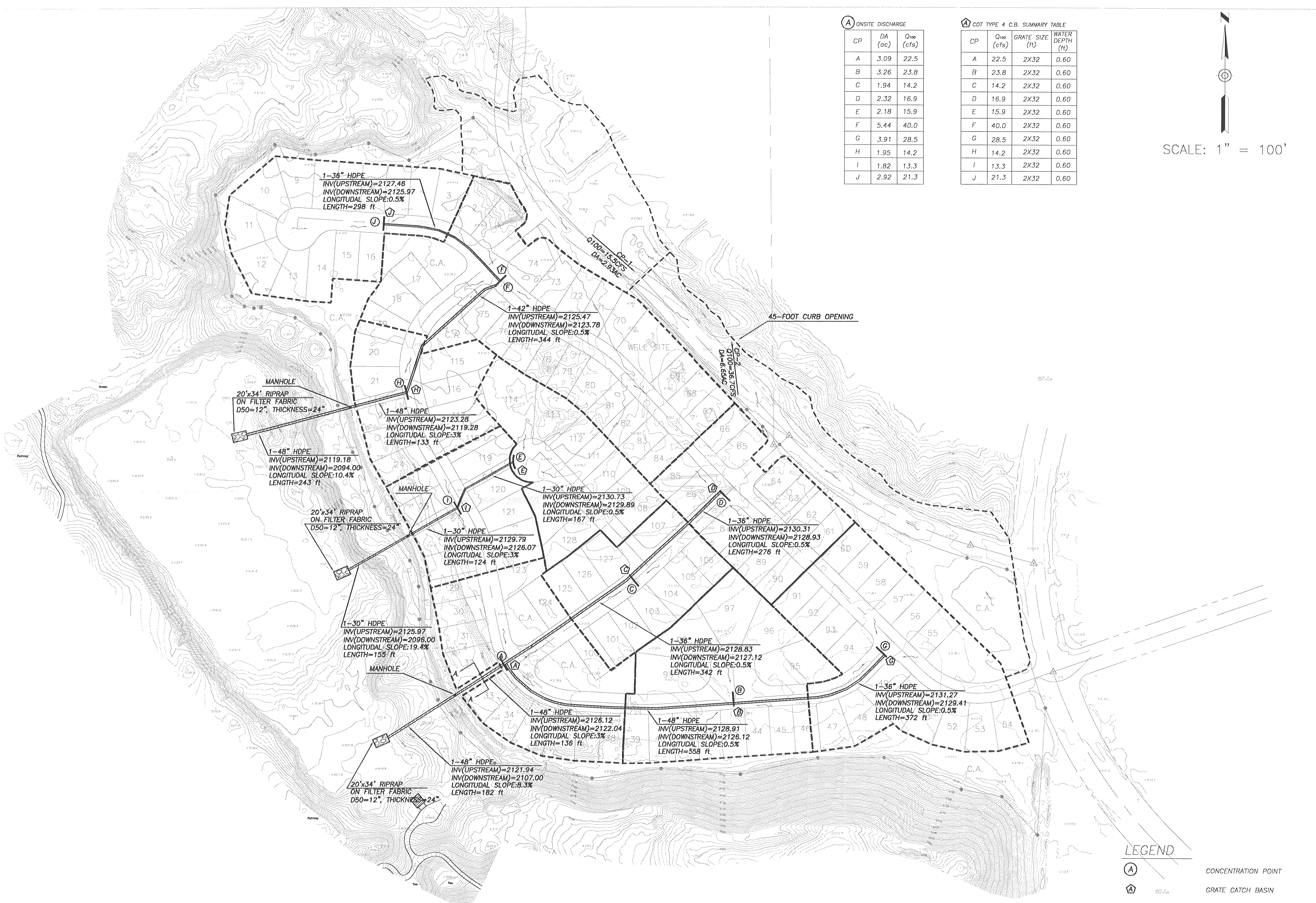




SCALE: 1" = 600'



FIGURE 2:
FEMA MAP
CMG JOB No. 25044

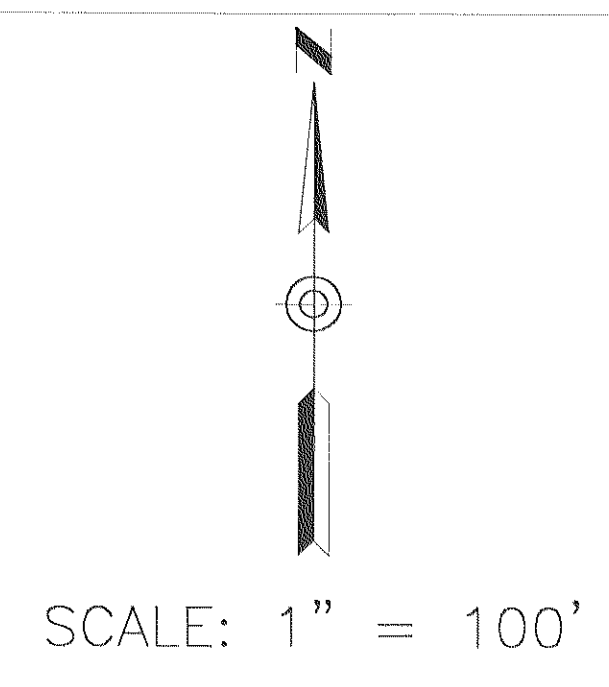


(A) ONSITE DISCHARGE

CP	DA (ac)	Q ₁₀₀ (cfs)
A	3.09	22.5
B	3.26	23.8
C	1.94	14.2
D	2.32	16.9
E	2.18	15.9
F	5.44	40.0
G	3.91	28.5
H	1.95	14.2
I	1.82	13.3
J	2.92	21.3

(A) COT TYPE 4 C.B. SUMMARY TABLE

CP	Q ₁₀₀ (cfs)	GRATE SIZE (ft)	WATER DEPTH (ft)
A	22.5	2X32	0.60
B	23.8	2X32	0.60
C	14.2	2X32	0.60
D	16.9	2X32	0.60
E	15.9	2X32	0.60
F	40.0	2X32	0.60
G	28.5	2X32	0.60
H	14.2	2X32	0.60
I	13.3	2X32	0.60
J	21.3	2X32	0.60



**FIGURE 3:
ONSITE DRAINAGE PLAN**

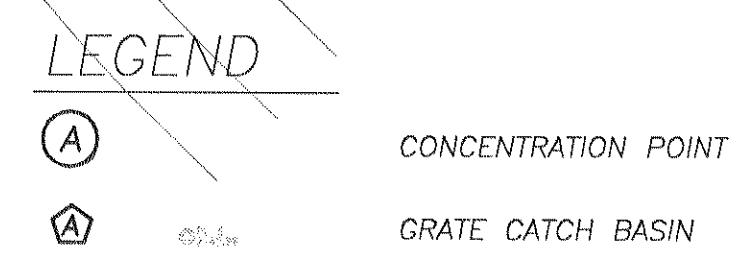
**CMG DRAINAGE
ENGINEERING, INC.**
4574 N. 1st AVE. Tucson, Arizona 85718
Phone (520) 882-4244 Fax (520) 882-3006

SEAL: _____

PROJECT NO.:	25044
DATE:	AUGUST 2005
FILE:	-
DESIGN:	CMG
CHECKED:	CMG
DRAWN:	JKW

SHEET NAME:
**FIGURE 3:
ONSITE DRAINAGE
PLAN**

SHEET NUMBER:
1/1



III 100-Year Floodplain Limits and Erosion setback Limits

Per the Flood Insurance Rate Map (FIRM) panel No. 04019C 1605K, effective on February 8, 1999, A portion of this project site is located within a shaded FEMA zone X of the Santa Cruz River. Shaded Zone X means the area is subject to 100-year flooding to a depth of less than one foot or is within a 500-year floodplain area or is protected by levees. Therefore, all the lots on this project site are raised at least 0.1 foot above the 100-year base water surface elevations, which was shown on the FIRM panel No. 04019C 1605K.

The banks of the Santa Cruz River near the project site are bank protected and are constructed to contain the 100-year flood with enough freeboard. Therefore, no erosion setback for the Santa Cruz River near the project site is necessary. In addition, the property site located 500-feet or more from the Santa Cruz River channel.

IV Onsite Drainage Plan

4.1 Conveyance of Offsite Drainage

Runoff from CP-1 (15.5 cfs) will drain to the existing Continental Links Drive within the newly built section of the street.

Runoff from CP-2 (36.7 cfs, including runoffs from CP-1) will drain to the golf course on the north side of the Continental Lines Drive via a 45-foot curb opening.

4.2 Conveyance of Onsite Drainage

All of the concentration points for this project are located in sag points within the street. Stormwater runoff from the subdivision will be conveyed within the streets and then utilizing grated catch basins to enter the HDPE pipes that convey the flow to the old gravel pit along the west boundary of the Phase I. As shown on Figure 2, there are three locations that the onsite stormwater runoff will discharge to the sand & gravel pit. StormCAD is used for the hydraulic calculation for the pipe system. HY-8 is used for calculating the riprap apron size at the pipe outlet.

Storm Drain System I

The 100-year runoff at CP-D is 16.9 cfs. The runoff will drain to a 36-inch HDPE pipe via 2'x32' grate within the street and flow to CP-C.

The 100-year runoff at CP-C is 14.2 cfs. The runoff will drain to a 36-inch HDPE pipe via 2'x32' grate within the street and flow to CP-A.

The 100-year runoff at CP-G is 28.5 cfs. The runoff will drain to a 36-inch HDPE pipe via 2'x32' grate within the street and flow to CP-B.

The 100-year runoff at CP-B is 23.8 cfs. The runoff will drain to a 48-inch HDPE pipe via 2'x32' grate within the street and flow to CP-A.

The 100-year runoff at CP-A is 22.5 cfs. The runoff will drain to a 48-inch HDPE pipe via 2'x32' grate within the street and flow to the manhole outside the property boundary. The stormwater will then flow to the bottom of the sand & gravel pit at an approximately 8.3% longitudinal slope. A 20'x34' riprap basin on filter fabric with D50=12" thickness=24" will be provided at the pipe outlet to prevent erosion.

Storm Drain System II

The 100-year runoff at CP-E is 15.9 cfs. The runoff will drain to a 30-inch HDPE pipe via 2'x32' grate within the street and flow to CP-I.

The 100-year runoff at CP-I is 13.3 cfs. The runoff will drain to a 30-inch HDPE pipe via 2'x32' grate within the street and flow to the manhole outside the property boundary. The stormwater will then flow to the bottom of the sand & gravel pit at an approximately 19.4% longitudinal slope. A 20'x34' riprap basin on filter fabric with D50=12" thickness=24" will be provided at the pipe outlet to prevent erosion.

Storm Drain System III

The 100-year runoff at CP-J is 21.3 cfs. The runoff will drain to a 36-inch HDPE pipe via 2'x32' grate within the street and flow to CP-F.

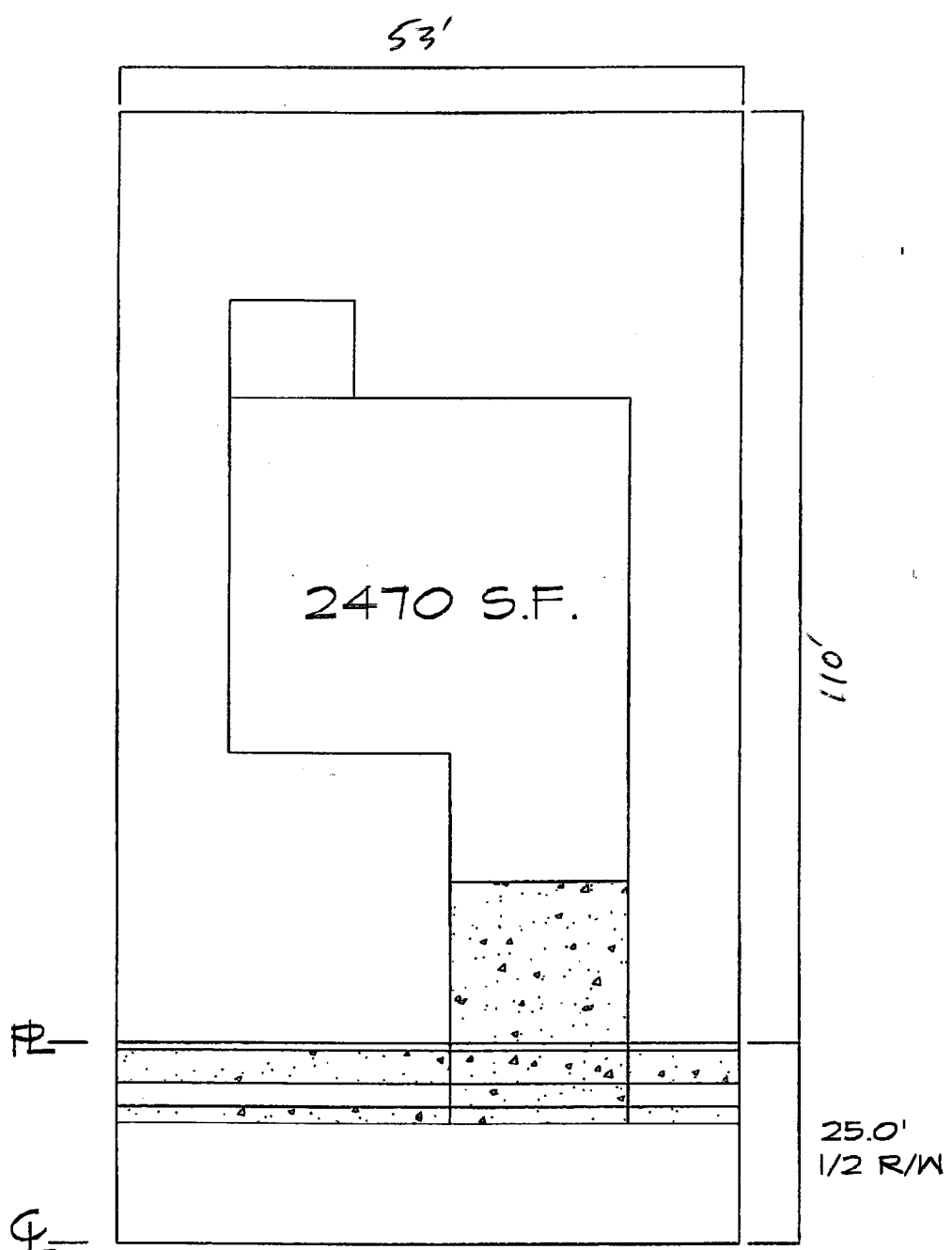
The 100-year runoff at CP-F is 40.0 cfs. The runoff will drain to a 42-inch HDPE pipe via 2'x32' grate within the street and flow to CP-H.

The 100-year runoff at CP-H is 14.2 cfs. The runoff will drain to a 48-inch HDPE pipe via 2'x32' grate within the street and flow to the manhole outside the property boundary. The stormwater will then flow to the bottom of the sand & gravel pit at an approximately 10.4% longitudinal slope. A 20'x34' riprap basin on filter fabric with D50=12" thickness=24" will be provided at the pipe outlet to prevent erosion.

Hydraulic computations for the curb opening, grate, and pipe system are provided in Appendix B of this report. Street flow depth computations are provided in Appendix C.

4.3 Retention/Detention Plan

The project site is located in a undesignated basin, as designated by Pima County. Retention (100%) for the project is provided in the old sand & gravel pit along the west property boundary.



TOTAL AREA = 8580 FT²

% IMP. = 49% (4195 FT²)

TYPICAL 110' x 53' LOT

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: B (POST DEVELOPMENT, 06.02.05)

WATERSHED AREA (A): 3.26 acres

LENGTH OF WATERCOURSE (Lc): 255. ft

LENGTH TO CENTER OF GRAVITY (Lca): 150. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft INCREMENTAL CHANGE IN ELEV (Hi) - ft

304.

1.7

MEAN SLOPE (Sc): .0056 ft BASIN FACTOR (Nb): .0200

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
P 1	1.19	1.58	1.84	2.17	2.47	2.77
P 2	1.33	1.77	2.06	2.44	2.78	3.12
P 3	1.43	1.90	2.21	2.62	2.99	3.35
P 6	1.60	2.14	2.50	2.96	3.38	3.80
P24	2.00	2.69	3.15	3.74	4.27	4.80

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %

IMPERVIOUS COVER= 50. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.507	.589	.636	.685	.722	.751
Tc (FUNCTION OF i) :	5.94	5.60	5.43	5.27	5.16	5.08
SOLUTION OF Tc (MINUTES):	5	5	5	5	5	5
RAINFL INT. @ Tc (IN/HR):	4.158	5.498	6.395	7.545	8.592	9.623
RUNOFF RATE @ Tc (IN/HR):	2.108	3.240	4.066	5.170	6.201	7.230
PEAK DISCHARGE (CFS) :	6.93	10.65	13.36	16.99	20.38	23.76

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: C (POST DEVELOPMENT, , 06.02.05)

WATERSHED AREA (A): 1.94 acres

LENGTH OF WATERCOURSE (Lc): 161. ft

LENGTH TO CENTER OF GRAVITY (Lca): 110. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft INCREMENTAL CHANGE IN ELEV (Hi) - ft

220.

1.5

MEAN SLOPE (Sc): .0068 ft BASIN FACTOR (Nb): .0200

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
P 1	1.19	1.58	1.84	2.17	2.47	2.77
P 2	1.33	1.77	2.06	2.44	2.78	3.12
P 3	1.43	1.90	2.21	2.62	2.99	3.35
P 6	1.60	2.14	2.50	2.96	3.38	3.80
P24	2.00	2.69	3.15	3.74	4.27	4.80

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %

IMPERVIOUS COVER= 50. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.507	.589	.636	.685	.722	.751
Tc (FUNCTION OF i) :	4.36	4.10	3.98	3.86	3.78	3.72
SOLUTION OF Tc (MINUTES):	5	5	5	5	5	5
RAINFL INT. @ Tc (IN/HR):	4.158	5.498	6.395	7.545	8.592	9.623
RUNOFF RATE @ Tc (IN/HR):	2.108	3.240	4.066	5.170	6.201	7.230
PEAK DISCHARGE (CFS) :	4.12	6.34	7.95	10.11	12.13	14.14

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: D (POST DEVELOPMENT,06.02.05)

WATERSHED AREA (A): 2.32 acres

LENGTH OF WATERCOURSE (Lc): 266. ft

LENGTH TO CENTER OF GRAVITY (Lca): 210. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft INCREMENTAL CHANGE IN ELEV (Hi) - ft

420.

2.5

MEAN SLOPE (Sc): .0060 ft BASIN FACTOR (Nb): .0200

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	2-YR	5-YR	EVENT			
			10-YR	25-YR	50-YR	100-YR
P 1	1.19	1.58	1.84	2.17	2.47	2.77
P 2	1.33	1.77	2.06	2.44	2.78	3.12
P 3	1.43	1.90	2.21	2.62	2.99	3.35
P 6	1.60	2.14	2.50	2.96	3.38	3.80
P24	2.00	2.69	3.15	3.74	4.27	4.80

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %
IMPERVIOUS COVER= 50. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	2-YR	5-YR	EVENT			
			10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.507	.589	.636	.685	.722	.751
Tc (FUNCTION OF i) :	6.49	6.11	5.93	5.76	5.64	5.55
SOLUTION OF Tc (MINUTES):	5	5	5	5	5	5
RAINFL INT. @ Tc (IN/HR):	4.158	5.498	6.395	7.545	8.592	9.623
RUNOFF RATE @ Tc (IN/HR):	2.108	3.240	4.066	5.170	6.201	7.230
PEAK DISCHARGE (CFS) :	4.93	7.58	9.51	12.09	14.50	16.91

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: E (POST DEVELOPMENT, 06.02.05)

WATERSHED AREA (A): 2.18 acres

LENGTH OF WATERCOURSE (Lc): 330. ft

LENGTH TO CENTER OF GRAVITY (Lca): 240. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft INCREMENTAL CHANGE IN ELEV (Hi) - ft
486. 3.4

MEAN SLOPE (Sc): .0070 ft BASIN FACTOR (Nb): .0200

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	2-YR	5-YR	EVENT			
			10-YR	25-YR	50-YR	100-YR
P 1	1.19	1.58	1.84	2.17	2.47	2.77
P 2	1.33	1.77	2.06	2.44	2.78	3.12
P 3	1.43	1.90	2.21	2.62	2.99	3.35
P 6	1.60	2.14	2.50	2.96	3.38	3.80
P24	2.00	2.69	3.15	3.74	4.27	4.80

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %
IMPERVIOUS COVER= 50. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	2-YR	5-YR	EVENT			
			10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.507	.589	.636	.685	.722	.751
Tc (FUNCTION OF i) :	6.76	6.36	6.17	5.99	5.87	5.78
SOLUTION OF Tc (MINUTES):	5	5	5	5	5	5
RAINFL INT. @ Tc (IN/HR):	4.158	5.498	6.395	7.545	8.592	9.623
RUNOFF RATE @ Tc (IN/HR):	2.108	3.240	4.066	5.170	6.201	7.230
PEAK DISCHARGE (CFS) :	4.63	7.12	8.93	11.36	13.63	15.89

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: G (POST DEVELOPMENT, 06.02.05)

WATERSHED AREA (A): 3.91 acres

LENGTH OF WATERCOURSE (Lc): 310. ft

LENGTH TO CENTER OF GRAVITY (Lca): 190. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft	INCREMENTAL CHANGE IN ELEV (Hi) - ft
380.	2.3

MEAN SLOPE (Sc): .0061 ft BASIN FACTOR (Nb): .0200

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
P 1	1.19	1.58	1.84	2.17	2.47	2.77
P 2	1.33	1.77	2.06	2.44	2.78	3.12
P 3	1.43	1.90	2.21	2.62	2.99	3.35
P 6	1.60	2.14	2.50	2.96	3.38	3.80
P24	2.00	2.69	3.15	3.74	4.27	4.80

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %
 IMPERVIOUS COVER= 50. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.507	.589	.636	.685	.722	.751
Tc (FUNCTION OF i) :	6.55	6.17	5.99	5.81	5.69	5.60
SOLUTION OF Tc (MINUTES):	5	5	5	5	5	5
RAINFL INT. @ Tc (IN/HR):	4.158	5.498	6.395	7.545	8.592	9.623
RUNOFF RATE @ Tc (IN/HR):	2.108	3.240	4.066	5.170	6.201	7.230
PEAK DISCHARGE (CFS) :	8.31	12.77	16.02	20.38	24.44	28.50

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: H (POST DEVELOPMENT, 06.02.05)

WATERSHED AREA (A): 1.95 acres

LENGTH OF WATERCOURSE (Lc): 170. ft

LENGTH TO CENTER OF GRAVITY (Lca): 160. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft	INCREMENTAL CHANGE IN ELEV (Hi) - ft
330.	2.0

MEAN SLOPE (Sc): .0061 ft BASIN FACTOR (Nb): .0200

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	2-YR	5-YR	EVENT		50-YR	100-YR
			10-YR	25-YR		
P 1	1.19	1.58	1.84	2.17	2.47	2.77
P 2	1.33	1.77	2.06	2.44	2.78	3.12
P 3	1.43	1.90	2.21	2.62	2.99	3.35
P 6	1.60	2.14	2.50	2.96	3.38	3.80
P24	2.00	2.69	3.15	3.74	4.27	4.80

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %
 IMPERVIOUS COVER= 50. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	2-YR	5-YR	EVENT		50-YR	100-YR
			10-YR	25-YR		
RUNOFF SUPPLY RATE (q/i):	.507	.589	.636	.685	.722	.751
Tc (FUNCTION OF i) :	5.19	4.89	4.75	4.61	4.51	4.44
SOLUTION OF Tc (MINUTES):	5	5	5	5	5	5
RAINFL INT. @ Tc (IN/HR):	4.158	5.498	6.395	7.545	8.592	9.623
RUNOFF RATE @ Tc (IN/HR):	2.108	3.240	4.066	5.170	6.201	7.230
PEAK DISCHARGE (CFS) :	4.14	6.37	7.99	10.16	12.19	14.21

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: I (POST DEVELOPMENT, 06.02.05)

WATERSHED AREA (A): 1.82 acres

LENGTH OF WATERCOURSE (Lc): 160. ft

LENGTH TO CENTER OF GRAVITY (Lca): 150. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft INCREMENTAL CHANGE IN ELEV (Hi) - ft
 300. 2.0

MEAN SLOPE (Sc): .0067 ft BASIN FACTOR (Nb): .0200

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	2-YR	5-YR	EVENT			50-YR	100-YR
			10-YR	25-YR	50-YR		
P 1	1.19	1.58	1.84	2.17	2.47	2.77	
P 2	1.33	1.77	2.06	2.44	2.78	3.12	
P 3	1.43	1.90	2.21	2.62	2.99	3.35	
P 6	1.60	2.14	2.50	2.96	3.38	3.80	
P24	2.00	2.69	3.15	3.74	4.27	4.80	

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %
IMPERVIOUS COVER= 50. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	2-YR	5-YR	EVENT			50-YR	100-YR
			10-YR	25-YR	50-YR		
RUNOFF SUPPLY RATE (q/i):	.507	.589	.636	.685	.722	.751	
Tc (FUNCTION OF i) :	4.82	4.54	4.40	4.27	4.18	4.12	
SOLUTION OF Tc (MINUTES):	5	5	5	5	5	5	
RAINFL INT. @ Tc (IN/HR):	4.158	5.498	6.395	7.545	8.592	9.623	
RUNOFF RATE @ Tc (IN/HR):	2.108	3.240	4.066	5.170	6.201	7.230	
PEAK DISCHARGE (CFS) :	3.87	5.94	7.46	9.48	11.38	13.26	

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: J (POST DEVELOPMENT, 06.02.05)

WATERSHED AREA (A): 2.92 acres

LENGTH OF WATERCOURSE (Lc): 250. ft

LENGTH TO CENTER OF GRAVITY (Lca): 140. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft INCREMENTAL CHANGE IN ELEV (Hi) - ft

290.

2.0

MEAN SLOPE (Sc): .0069 ft BASIN FACTOR (Nb): .0200

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
P 1	1.19	1.58	1.84	2.17	2.47	2.77
P 2	1.33	1.77	2.06	2.44	2.78	3.12
P 3	1.43	1.90	2.21	2.62	2.99	3.35
P 6	1.60	2.14	2.50	2.96	3.38	3.80
P24	2.00	2.69	3.15	3.74	4.27	4.80

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %

IMPERVIOUS COVER= 50. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.507	.589	.636	.685	.722	.751
Tc (FUNCTION OF i) :	5.32	5.01	4.86	4.72	4.62	4.55
SOLUTION OF Tc (MINUTES):	5	5	5	5	5	5
RAINFLL INT. @ Tc (IN/HR):	4.158	5.498	6.395	7.545	8.592	9.623
RUNOFF RATE @ Tc (IN/HR):	2.108	3.240	4.066	5.170	6.201	7.230
PEAK DISCHARGE (CFS) :	6.21	9.54	11.97	15.22	18.25	21.28

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: 1 (PRE DEVELOPMENT, 05.23.05)

WATERSHED AREA (A): 2.93 acres

LENGTH OF WATERCOURSE (Lc): 480. ft

LENGTH TO CENTER OF GRAVITY (Lca): 240. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft INCREMENTAL CHANGE IN ELEV (Hi) - ft

480.

8.0

MEAN SLOPE (Sc): .0167 ft BASIN FACTOR (Nb): .0400

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
P 1	1.19	1.58	1.84	2.17	2.47	2.77
P 2	1.33	1.77	2.06	2.44	2.78	3.12
P 3	1.43	1.90	2.21	2.62	2.99	3.35
P 6	1.60	2.14	2.50	2.96	3.38	3.80
P24	2.00	2.69	3.15	3.74	4.27	4.80

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %
IMPERVIOUS COVER= 0. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	EVENT					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.109	.251	.335	.424	.491	.545
Tc (FUNCTION OF i) :	19.77	14.15	12.62	11.48	10.83	10.38
SOLUTION OF Tc (MINUTES):	13	8	6	5	5	5
RAINFL INT. @ Tc (IN/HR):	2.915	4.724	6.101	7.545	8.592	9.623
RUNOFF RATE @ Tc (IN/HR):	.318	1.187	2.041	3.201	4.218	5.246
PEAK DISCHARGE (CFS) :	.94	3.51	6.03	9.45	12.46	15.49

PROJECT NAME AND LOCATION: THE PINES PHASE I (25044)

DRAINAGE CONCENTRATION POINT: 2 (POST DEVELOPMENT, INCLUDING CP-1, 06.03.05)

WATERSHED AREA (A): 6.65 acres

LENGTH OF WATERCOURSE (Lc): 1005. ft

LENGTH TO CENTER OF GRAVITY (Lca): 500. ft

INCREMENTAL CHANGE IN LENGTH (Li) - ft INCREMENTAL CHANGE IN ELEV (Hi) - ft
1005. 12.0

MEAN SLOPE (Sc): .0119 ft BASIN FACTOR (Nb): .0400

WATERSHED TYPE(S): FOOTHILL

RAINFALL VALUES

	2-YR	5-YR	EVENT			
			10-YR	25-YR	50-YR	100-YR
P 1	1.19	1.58	1.84	2.17	2.47	2.77
P 2	1.33	1.77	2.06	2.44	2.78	3.12
P 3	1.43	1.90	2.21	2.62	2.99	3.35
P 6	1.60	2.14	2.50	2.96	3.38	3.80
P24	2.00	2.69	3.15	3.74	4.27	4.80

SOIL GROUPS

100. % B, CN= 82, COVER TYPE= DESERT BRUSH , COVER DENSITY= 25 %
IMPERVIOUS COVER= 20. %

RAINFALL/RUNOFF AND PEAK DISCHARGE DATA

	2-YR	5-YR	EVENT			
			10-YR	25-YR	50-YR	100-YR
RUNOFF SUPPLY RATE (q/i):	.268	.386	.455	.529	.583	.628
Tc (FUNCTION OF i) :	24.51	21.18	19.84	18.69	17.97	17.45
SOLUTION OF Tc (MINUTES):	17	12	11	9	8	7
RAINFL INT. @ Tc (IN/HR):	2.581	3.982	4.796	6.157	7.382	8.711
RUNOFF RATE @ Tc (IN/HR):	.692	1.539	2.183	3.255	4.306	5.467
PEAK DISCHARGE (CFS) :	4.64	10.31	14.63	21.82	28.86	36.65

**APPENDIX B: CURB OPENING/STORM DRAIN/CATCH BASIN
CAPACITY COMPUTATIONS**

Grate Computations

Project # 25044
The Pines Phase I

$$Q_i = 3.0LY^{3/2}$$

EQ. 10.10

$$L = Q / 3Y^{(3/2)} * C_f$$

Q = Rate of discharge into the opening; in cubic feet per second.

L = Perimeter of grate opening; in feet, disregarding bars and neglecting the side against the curb

Y = Depth of water at the grate; in feet

C_f = Clogging Factor (2)

Concentration Point	Q total cfs	Y ft	L (Qtotal) ft
A	22.5	0.60	32.3
B	23.8	0.60	34.1
C	14.2	0.60	20.4
D	16.9	0.60	24.2
E	15.9	0.60	22.8
F	40.0	0.60	57.4
G	28.5	0.60	40.9
H	14.2	0.60	20.4
I	13.3	0.60	19.1
J	21.3	0.60	30.6

Grate Computations

Project # 25044
The Pines Phase I

$$Q_i = 5.35AY^{1/2} \quad \text{EQ. 10.11}$$

$$A = Q / 5.35Y^{(1/2)} * C_f$$

Q = Rate of discharge into the opening; in cubic feet per second.

A = Clear-opening area of the grate, in square feet; and,

Y = Depth of water at the grate; in feet

C_f = Clogging Factor (2)

Concentration Point	Q100 cfs	Y ft	A* ft
A	22.5	0.60	10.9
B	23.8	0.60	11.5
C	14.2	0.60	6.9
D	16.9	0.60	8.2
E	15.9	0.60	7.7
F	40.0	0.60	19.3
G	28.5	0.60	13.8
H	14.2	0.60	6.9
I	13.3	0.60	6.4
J	21.3	0.60	10.3

* Assume 50% of the grate inlet area is clear opening area

Curb Opening Length Computations

Project # 25044
THE PINES PHASE I

$$Q = 2.3 LY^{(3/2)}/Cf \quad \text{EQ. 10.14}$$

$$L = Q / 2.3Y^{(3/2)} * Cf$$

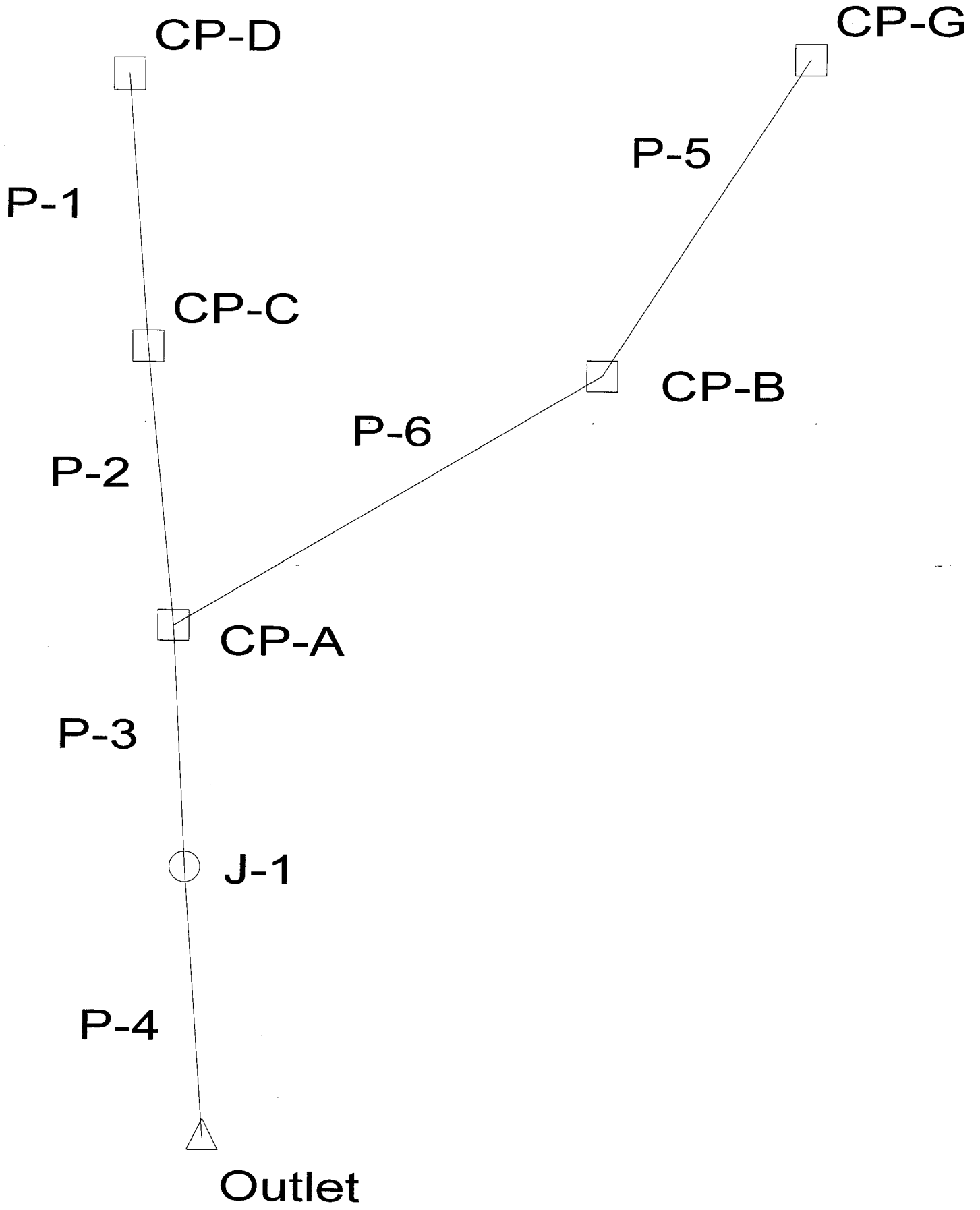
Q = Rate of discharge into the opening; in cubic feet per second.

L = Length of curb inlet; in feet

Y = Depth of lip to curb inlet; in feet

Cf = Clogging Factor (1)

Concentration	Q total	Y	L (Qtotal)
Point	cfs	ft	ft
2	36.7	0.50	45.1



----- Beginning Calculation Cycle -----

Discharge: 16.90 cfs at node CP-D
 Discharge: 31.10 cfs at node CP-C
 Discharge: 28.50 cfs at node CP-G
 Discharge: 52.30 cfs at node CP-B
 Discharge: 105.90 cfs at node CP-A
 Discharge: 105.90 cfs at node J-1
 Discharge: 105.90 cfs at node Outlet

Beginning iteration 1

Discharge: 16.90 cfs at node CP-D
 Discharge: 31.10 cfs at node CP-C
 Discharge: 28.50 cfs at node CP-G
 Discharge: 52.30 cfs at node CP-B
 Discharge: 105.90 cfs at node CP-A
 Discharge: 105.90 cfs at node J-1
 Discharge: 105.90 cfs at node Outlet

Discharge Convergence Achieved in 1 iterations: relative error: 0.0

Warning: No Duration data exists in IDF Table

Information: P-2 Surcharged condition
 Information: P-6 Surcharged condition
 Information: P-1 Surcharged condition
 Information: P-5 Surcharged condition

----- Calculations Complete -----

** Analysis Options **

Friction method: Manning's Formula
 HGL Convergence Test: 0.001000
 Maximum Network Traversals: 5
 Number of Pipe Profile Steps: 5
 Discharge Convergence Test: 0.001000
 Maximum Design Passes: 3

----- Network Quick View -----

Label	Length	Size	Discharge	Hydraulic Grade	
				Upstream	Downstream
P-1	276.00	36 inch	16.90	2,135.99	2,135.38
P-2	342.00	36 inch	31.10	2,134.93	2,132.40
P-3	136.00	48 inch	105.90	2,129.23	2,127.43
P-4	182.00	48 inch	105.90	2,125.05	2,110.11
P-5	372.00	36 inch	28.50	2,137.69	2,135.38
P-6	558.00	48 inch	52.30	2,134.92	2,132.40

Label	Discharge	Ground	Elevations	
			Upstream HGL	Downstream HGL
CP-D	16.90	2,137.29	2,135.99	2,135.99
CP-C	31.10	2,136.50	2,135.38	2,134.93
CP-A	105.90	2,136.18	2,132.40	2,129.23
J-1	105.90	2,136.80	2,127.43	2,125.05
Outlet	105.90	2,113.00	2,110.11	2,110.11
CP-G	28.50	2,137.77	2,137.69	2,137.69
CP-B	52.30	2,137.23	2,135.38	2,134.92

Elapsed: 0 minute(s) 0 second(s)

Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Downstream Cover (ft)	Upstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Roughness
P-5	CP-G	CP-B	372.00	36 inch	4.03	2,131.27	2,129.41	0.005000	4.82	3.50	2,137.69	2,135.38	0.024
P-6	CP-B	CP-A	558.00	48 inch	4.16	2,128.91	2,126.12	0.005000	6.06	4.32	2,134.92	2,132.40	0.024
P-1	CP-D	CP-C	276.00	36 inch	2.39	2,130.31	2,128.93	0.005000	4.57	3.98	2,135.99	2,135.38	0.024
P-2	CP-C	CP-A	342.00	36 inch	4.40	2,128.83	2,127.12	0.005000	6.06	4.67	2,134.93	2,132.40	0.024
P-3	CP-A	J-1	136.00	48 inch	9.26	2,126.12	2,122.04	0.030000	10.76	6.06	2,129.23	2,127.43	0.013
P-4	J-1	Outlet	182.00	48 inch	10.09	2,121.94	2,107.00	0.082088	2.00	10.86	2,125.05	2,110.11	0.024
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

DOT Report

Pipe	-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Roughness
P-5	CP-G	2,137.77	2,137.69	0.006224	28.50	Circular	372.00	4.03	0.024
	CP-B	2,137.23	2,135.38	0.005000	25.55	36 inch			
P-6	CP-B	2,137.23	2,134.92	0.004519	52.30	Circular	558.00	4.16	0.024
	CP-A	2,136.18	2,132.40	0.005000	55.01	48 inch			
P-1	CP-D	2,137.29	2,135.99	0.002188	16.90	Circular	276.00	2.39	0.024
	CP-C	2,136.50	2,135.38	0.005000	25.55	36 inch			
P-2	CP-C	2,136.50	2,134.93	0.007411	31.10	Circular	342.00	4.40	0.024
	CP-A	2,136.18	2,132.40	0.005000	25.55	36 inch			
P-3	CP-A	2,136.18	2,129.23	0.016808	105.90	Circular	136.00	9.26	0.013
	J-1	2,136.80	2,127.43	0.030000	248.78	48 inch			
P-4	J-1	2,136.80	2,125.05	0.082088	105.90	Circular	182.00	10.09	0.024
	Outlet	2,113.00	2,110.11	0.082088	222.91	48 inch			

FHWA CULVERT ANALYSIS, HY-8, VERSION 6.1

CURRENT DATE CURRENT TIME FILE NAME FILE DATE
 06-03-2005 11:41:10 5044R_A 06-03-2005

AA
 CULVERT AND CHANNEL DATA
 AAA

CULVERT NO. 1	DOWNSTREAM CHANNEL
CULVERT TYPE: 4.000 ft CIRCULAR	CHANNEL TYPE : TRAPEZOIDAL
CULVERT LENGTH = 182.620 ft	BOTTOM WIDTH = 20.000 ft
NO. OF BARRELS = 1.0	TAILWATER DEPTH = 2107.000 ft
FLOW PER BARREL = 95.310 cfs	TOTAL DESIGN FLOW = 95.310 cfs
INVERT ELEVATION = 2107.000 ft	BOTTOM ELEVATION = 99.990 ft
OUTLET VELOCITY = 18.040 fps	NORMAL VELOCITY = 8.086 fps
OUTLET DEPTH = 1.750 ft	

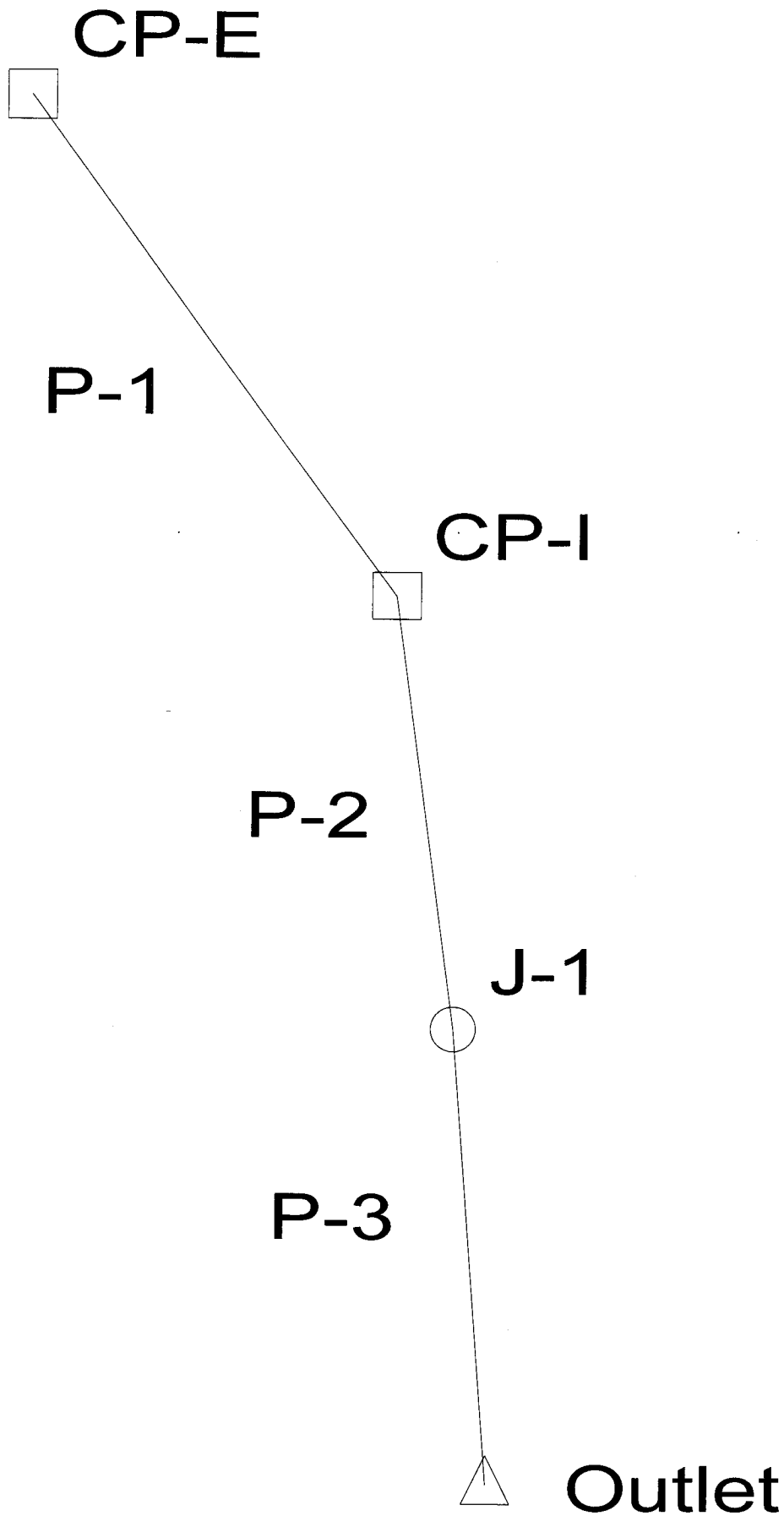
AA

AA
 RIPRAP STILLING BASIN -- FINAL DESIGN
 AAA

THE LENGTH OF THE BASIN	= 33.947 ft
THE LENGTH OF THE POOL	= 22.631 ft
THE LENGTH OF THE APRON	= 11.316 ft
THE WIDTH OF THE BASIN AT THE OUTLET	= 20.000 ft
THE DEPTH OF POOL BELOW CULVERT INVERT	= 2.263 ft
THE THICKNESS OF THE RIPRAP ON THE APRON	= 4.000 ft
THE THICKNESS OF THE RIPRAP ON THE REST OF THE BASIN	= 3.000 ft
THE BASIN OUTLET VELOCITY	= 8.699 fps
THE DEPTH OF FLOW AT BASIN OUTLET	= 0.548 ft

AA

Riprap Apron at CP-A's outlet



----- Beginning Calculation Cycle -----

Discharge: 15.90 cfs at node CP-E

Discharge: 29.20 cfs at node CP-I

Discharge: 29.20 cfs at node J-1

Discharge: 29.20 cfs at node Outlet

Beginning iteration 1

Discharge: 15.90 cfs at node CP-E

Discharge: 29.20 cfs at node CP-I

Discharge: 29.20 cfs at node J-1

Discharge: 29.20 cfs at node Outlet

Discharge Convergence Achieved in 1 iterations: relative error: 0.0

Warning: No Duration data exists in IDF Table

Information: P-1 Surcharged condition

----- Calculations Complete -----

** Analysis Options **

Friction method: Manning's Formula

HGL Convergence Test: 0.001000

Maximum Network Traversals: 5

Number of Pipe Profile Steps: 5

Discharge Convergence Test: 0.001000

Maximum Design Passes: 3

----- Network Quick View -----

Label	Length	Size	Discharge	Hydraulic Grade	
				Upstream	Downstream
P-1	167.00	30 inch	15.90	2,134.25	2,133.39
P-2	124.00	30 inch	29.20	2,131.63	2,129.13
P-3	155.00	30 inch	29.20	2,127.81	2,096.94

Label	Discharge	Elevations		
		Ground	Upstream HGL	Downstream HGL
CP-E	15.90	2,136.13	2,134.25	2,134.25
CP-I	29.20	2,135.30	2,133.39	2,131.63
J-1	29.20	2,135.30	2,129.13	2,127.81
Outlet	29.20	2,101.00	2,096.94	2,096.94

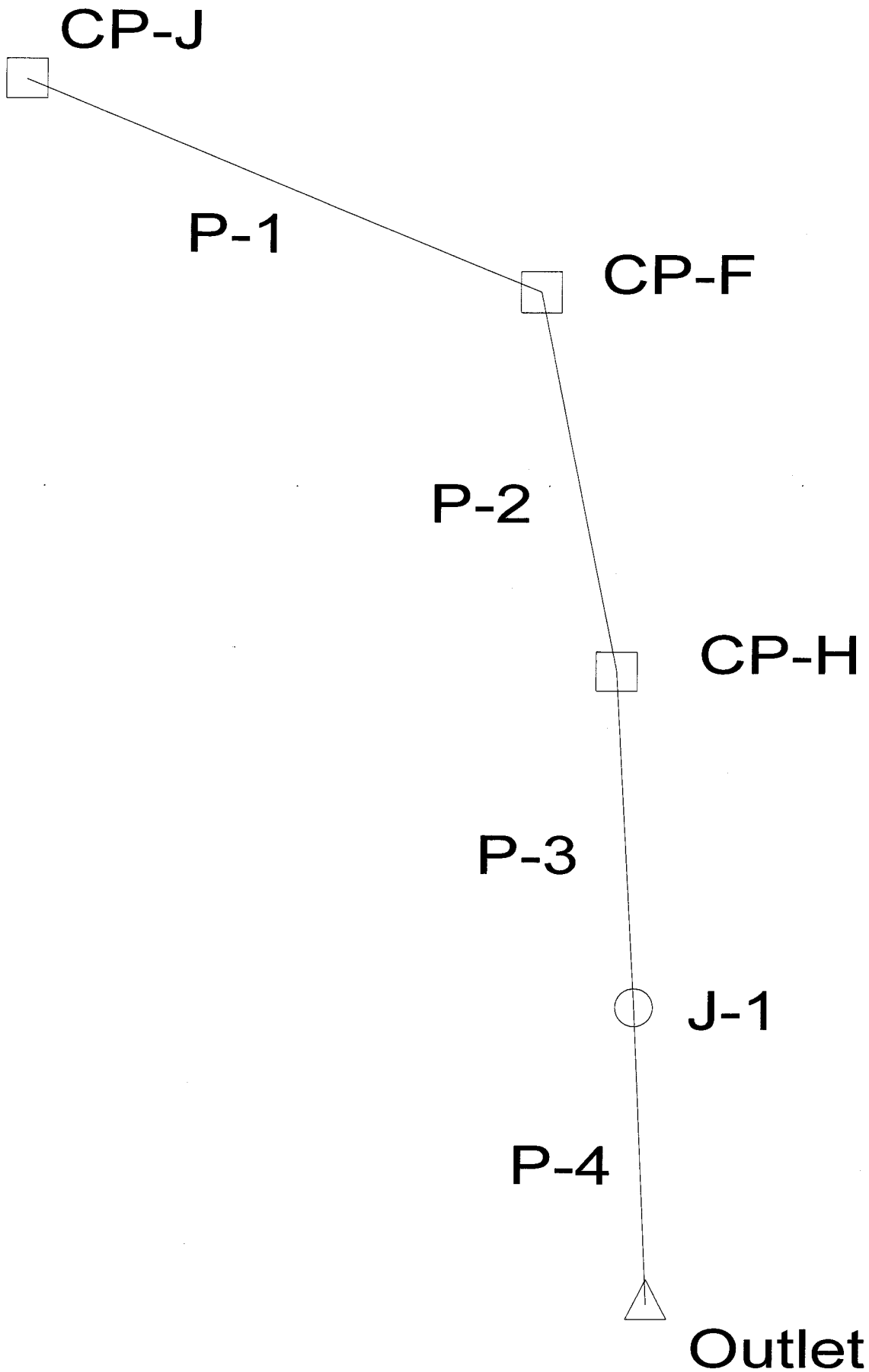
Elapsed: 0 minute(s) 1 second(s)

Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Downstream Cover (ft)	Upstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Roughness
P-1	CP-E	CP-I	167.00	30 inch	3.24	2,130.73	2,129.89	0.005030	2.91	2.90	2,134.25	2,133.39	0.024
P-2	CP-I	J-1	124.00	30 inch	6.74	2,129.79	2,126.07	0.030000	6.73	3.01	2,131.63	2,129.13	0.024
P-3	J-1	Outlet	155.00	30 inch	12.45	2,125.97	2,096.00	0.193355	2.50	6.83	2,127.81	2,096.94	0.024
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

DOT Report

Pipe	-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Roughness
P-1	CP-E	2,136.13	2,134.25	0.005122	15.90	Circular	67.00	3.24	0.024
	CP-I	2,135.30	2,133.39	0.005030	15.76	30 inch			
P-2	CP-I	2,135.30	2,131.63	0.022820	29.20	Circular	124.00	6.74	0.024
	J-1	2,135.30	2,129.13	0.030000	38.48	30 inch			
P-3	J-1	2,135.30	2,127.81	0.174599	29.20	Circular	55.00	12.45	0.024
	Outlet	2,101.00	2,096.94	0.193355	97.69	30 inch			



----- Beginning Calculation Cycle -----

Discharge: 21.30 cfs at node CP-J
 Discharge: 61.30 cfs at node CP-F
 Discharge: 75.50 cfs at node CP-H
 Discharge: 75.50 cfs at node J-1
 Discharge: 75.50 cfs at node Outlet

Beginning iteration 1

Discharge: 21.30 cfs at node CP-J
 Discharge: 61.30 cfs at node CP-F
 Discharge: 75.50 cfs at node CP-H
 Discharge: 75.50 cfs at node J-1
 Discharge: 75.50 cfs at node Outlet

Discharge Convergence Achieved in 1 iterations: relative error: 0.0

Warning: No Duration data exists in IDF Table

Information: P-2 Surcharged condition

Information: P-1 Surcharged condition

----- Calculations Complete -----

** Analysis Options **

Friction method: Manning's Formula
 HGL Convergence Test: 0.001000
 Maximum Network Traversals: 5
 Number of Pipe Profile Steps: 5
 Discharge Convergence Test: 0.001000
 Maximum Design Passes: 3

----- Network Quick View -----

Label	Length	Size	Discharge	Hydraulic Grade	
				Upstream	Downstream
P-1	298.00	36 inch	21.30	2,133.79	2,132.76
P-2	338.00	42 inch	61.30	2,131.50	2,127.22
P-3	133.00	48 inch	75.50	2,124.91	2,122.54
P-4	243.00	48 inch	75.50	2,120.81	2,095.52

Label	Discharge	Elevations		
		Ground	Upstream HGL	Downstream HGL
CP-J	21.30	2,133.96	2,133.79	2,133.79
CP-F	61.30	2,134.22	2,132.76	2,131.50
CP-H	75.50	2,134.26	2,127.22	2,124.91
J-1	75.50	2,134.26	2,122.54	2,120.81
Outlet	75.50	2,102.00	2,095.52	2,095.52

Elapsed: 0 minute(s) 0 second(s)

Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Downstream Cover (ft)	Upstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Roughness
P-1	CP-J	CP-F	298.00	36 inch	3.01	2,126.46	2,124.97	0.005000	6.25	4.50	2,133.79	2,132.76	0.024
P-2	CP-F	CP-H	338.00	42 inch	6.37	2,124.47	2,122.78	0.005000	7.98	6.25	2,131.50	2,127.22	0.024
P-3	CP-H	J-1	133.00	48 inch	7.31	2,122.28	2,118.28	0.030075	11.98	7.98	2,124.91	2,122.54	0.024
P-4	J-1	Outlet	243.00	48 inch	12.90	2,118.18	2,094.00	0.099506	4.00	12.08	2,120.81	2,095.52	0.024
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

DOT Report

Pipe	-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Roughness
P-1	CP-J	2,133.96	2,133.79	0.003476	21.30	Circular	298.00	3.01	0.024
	CP-F	2,134.22	2,132.76	0.005000	25.55	36 inch			
P-2	CP-F	2,134.22	2,131.50	0.012654	61.30	Circular	338.00	6.37	0.024
	CP-H	2,134.26	2,127.22	0.005000	38.53	42 inch			
P-3	CP-H	2,134.26	2,124.91	0.022271	75.50	Circular	133.00	7.31	0.024
	J-1	2,134.26	2,122.54	0.030075	134.93	48 inch			
P-4	J-1	2,134.26	2,120.81	0.089916	75.50	Circular	243.00	12.90	0.024
	Outlet	2,102.00	2,095.52	0.099506	245.42	48 inch			

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-A, June 6th, 2005)

STA: .00 5.00 7.00 23.00 39.00 41.00 46.00
 ELEV: .60 .50 .00 .32 .00 .50 .60

DISCHARGE = 23. WSEL = .41 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #:		
		1	2	3
DISCHARGE (CFS) =	22.57	.00	22.57	.00
VELOCITY (FT/S) =	2.58	.83	2.58	.83
AREA (SQUARE FT) =	8.74	.00	8.74	.00
TOPWIDTH (FT) =	35.30	.00	35.30	.00
DEPTH (FT) =	.41	.00	.41	.00
HYD. DEPTH (FT) =	.25	.09	.25	.09
WET. PERIM. (FT) =	35.40	.00	35.40	.00
HYD. RADIUS (FT) =	.25	.09	.25	.09
FROUDE NUMBER =	.91	.49	.91	.49
MANNINGS N VALUE =	.0160	.0250	.0160	.0250
SUBSECTION 1 = STATION .00 TO STATION 5.00				
SUBSECTION 2 = STATION 5.00 TO STATION 41.00				
SUBSECTION 3 = STATION 41.00 TO STATION 46.00				

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-B, June 6th, 2005)

STA: .00 5.00 7.00 23.00 39.00 41.00 46.00
 ELEV: .60 .50 .00 .32 .00 .50 .60

DISCHARGE = 24. WSEL = .42 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #:		
		1	2	3
DISCHARGE (CFS) =	23.86	.00	23.86	.00
VELOCITY (FT/S) =	2.64	.86	2.64	.86
AREA (SQUARE FT) =	9.04	.00	9.04	.00
TOPWIDTH (FT) =	35.36	.00	35.36	.00
DEPTH (FT) =	.42	.00	.42	.00
HYD. DEPTH (FT) =	.26	.09	.26	.09
WET. PERIM. (FT) =	35.47	.00	35.47	.00
HYD. RADIUS (FT) =	.25	.09	.25	.09
FROUDE NUMBER =	.92	.50	.92	.50
MANNINGS N VALUE =	.0160	.0250	.0160	.0250

SUBSECTION 1 = STATION .00 TO STATION 5.00
 SUBSECTION 2 = STATION 5.00 TO STATION 41.00
 SUBSECTION 3 = STATION 41.00 TO STATION 46.00

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-C, June 6th, 2005)

STA: .00 5.00 7.00 23.00 39.00 41.00 46.00
 ELEV: .60 .50 .00 .32 .00 .50 .60

DISCHARGE = 14. WSEL = .35 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #:		
		1	2	3
DISCHARGE (CFS) =	14.17	.00	14.17	.00
VELOCITY (FT/S) =	2.16	.49	2.16	.49
AREA (SQUARE FT) =	6.57	.00	6.57	.00
TOPWIDTH (FT) =	34.80	.00	34.80	.00
DEPTH (FT) =	.35	.00	.35	.00
HYD. DEPTH (FT) =	.19	.04	.19	.04
WET. PERIM. (FT) =	34.89	.00	34.89	.00
HYD. RADIUS (FT) =	.19	.04	.19	.04
FROUDE NUMBER =	.87	.43	.87	.43
MANNINGS N VALUE =	.0160	.0250	.0160	.0250
SUBSECTION 1 = STATION .00 TO STATION 5.00				
SUBSECTION 2 = STATION 5.00 TO STATION 41.00				
SUBSECTION 3 = STATION 41.00 TO STATION 46.00				

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-D, June 6th, 2005)

STA:	.00	5.00	7.00	23.00	39.00	41.00	46.00
ELEV:	.60	.50	.00	.32	.00	.50	.60

DISCHARGE = 17. WSEL = .37 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #:		
		1	2	3
DISCHARGE (CFS) =	17.08	.00	17.08	.00
VELOCITY (FT/S) =	2.32	.62	2.32	.62
AREA (SQUARE FT) =	7.36	.00	7.36	.00
TOPWIDTH (FT) =	34.98	.00	34.98	.00
DEPTH (FT) =	.37	.00	.37	.00
HYD. DEPTH (FT) =	.21	.06	.21	.06
WET. PERIM. (FT) =	35.08	.00	35.08	.00
HYD. RADIUS (FT) =	.21	.06	.21	.06
FROUDE NUMBER =	.89	.46	.89	.46
MANNINGS N VALUE =	.0160	.0250	.0160	.0250
SUBSECTION 1 = STATION	.00	TO	STATION	5.00
SUBSECTION 2 = STATION	5.00	TO	STATION	41.00
SUBSECTION 3 = STATION	41.00	TO	STATION	46.00

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-E, June 6th, 2005)

STA: .00 5.00 7.00 23.00 39.00 41.00 46.00
 ELEV: .60 .50 .00 .32 .00 .50 .60

DISCHARGE = 16. WSEL = .37 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #:		
		1	2	3
DISCHARGE (CFS) =	16.22	.00	16.22	.00
VELOCITY (FT/S) =	2.27	.56	2.27	.56
AREA (SQUARE FT) =	7.14	.00	7.14	.00
TOPWIDTH (FT) =	34.93	.00	34.93	.00
DEPTH (FT) =	.37	.00	.37	.00
HYD. DEPTH (FT) =	.20	.05	.20	.05
WET. PERIM. (FT) =	35.03	.00	35.03	.00
HYD. RADIUS (FT) =	.20	.05	.20	.05
FROUDE NUMBER =	.89	.45	.89	.45
MANNINGS N VALUE =	.0160	.0250	.0160	.0250
SUBSECTION 1 = STATION .00 TO STATION 5.00				
SUBSECTION 2 = STATION 5.00 TO STATION 41.00				
SUBSECTION 3 = STATION 41.00 TO STATION 46.00				

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-F, June 6th, 2005)

STA: .00 5.00 7.00 23.00 39.00 41.00 46.00
 ELEV: .60 .50 .00 .32 .00 .50 .60

DISCHARGE = 40. WSEL = .51 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #:		
		1	2	3
DISCHARGE (CFS) =	39.87	.00	39.86	.00
VELOCITY (FT/S) =	3.21	.16	3.22	.16
AREA (SQUARE FT) =	12.40	.01	12.39	.01
TOPWIDTH (FT) =	37.42	.71	36.00	.71
DEPTH (FT) =	.51	.01	.51	.01
HYD. DEPTH (FT) =	.33	.01	.34	.01
WET. PERIM. (FT) =	37.55	.71	36.13	.71
HYD. RADIUS (FT) =	.33	.01	.34	.01
FROUDE NUMBER =	.98	.32	.97	.32
MANNINGS N VALUE =	.0156	.0250	.0160	.0250
SUBSECTION 1 = STATION .00 TO STATION 5.00				
SUBSECTION 2 = STATION 5.00 TO STATION 41.00				
SUBSECTION 3 = STATION 41.00 TO STATION 46.00				

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-G, June 6th, 2005)

STA:	.00	5.00	7.00	23.00	39.00	41.00	46.00
ELEV:	.60	.50	.00	.32	.00	.50	.60

DISCHARGE = 29. WSEL = .45 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL	SUBSECTION #:		
	SECTION	1	2	3
DISCHARGE (CFS) =	28.52	.00	28.52	.00
VELOCITY (FT/S) =	2.83	.78	2.83	.78
AREA (SQUARE FT) =	10.09	.00	10.09	.00
TOPWIDTH (FT) =	35.60	.00	35.60	.00
DEPTH (FT) =	.45	.00	.45	.00
HYD. DEPTH (FT) =	.28	.08	.28	.08
WET. PERIM. (FT) =	35.72	.00	35.72	.00
HYD. RADIUS (FT) =	.28	.08	.28	.08
FROUDE NUMBER =	.94	.49	.94	.49
MANNINGS N VALUE =	.0160	.0250	.0160	.0250

SUBSECTION 1 = STATION .00 TO STATION 5.00
 SUBSECTION 2 = STATION 5.00 TO STATION 41.00
 SUBSECTION 3 = STATION 41.00 TO STATION 46.00

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-H, June 6th, 2005)

STA: .00 5.00 7.00 23.00 39.00 41.00 46.00
 ELEV: .60 .50 .00 .32 .00 .50 .60

DISCHARGE = 14. WSEL = .35 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #:		
		1	2	3
DISCHARGE (CFS) =	14.17	.00	14.17	.00
VELOCITY (FT/S) =	2.16	.49	2.16	.49
AREA (SQUARE FT) =	6.57	.00	6.57	.00
TOPWIDTH (FT) =	34.80	.00	34.80	.00
DEPTH (FT) =	.35	.00	.35	.00
HYD. DEPTH (FT) =	.19	.04	.19	.04
WET. PERIM. (FT) =	34.89	.00	34.89	.00
HYD. RADIUS (FT) =	.19	.04	.19	.04
FROUDE NUMBER =	.87	.43	.87	.43
MANNINGS N VALUE =	.0160	.0250	.0160	.0250
SUBSECTION 1 = STATION .00 TO STATION 5.00				
SUBSECTION 2 = STATION 5.00 TO STATION 41.00				
SUBSECTION 3 = STATION 41.00 TO STATION 46.00				

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-I, June 6th, 2005)

STA: .00 5.00 7.00 23.00 39.00 41.00 46.00
 ELEV: .60 .50 .00 .32 .00 .50 .60

DISCHARGE = 13. WSEL = .34 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #:		
		1	2	3
DISCHARGE (CFS) =	13.26	.00	13.26	.00
VELOCITY (FT/S) =	2.10	.44	2.10	.44
AREA (SQUARE FT) =	6.31	.00	6.31	.00
TOPWIDTH (FT) =	34.74	.00	34.74	.00
DEPTH (FT) =	.34	.00	.34	.00
HYD. DEPTH (FT) =	.18	.03	.18	.03
WET. PERIM. (FT) =	34.83	.00	34.83	.00
HYD. RADIUS (FT) =	.18	.03	.18	.03
FROUDE NUMBER =	.87	.42	.87	.42
MANNINGS N VALUE =	.0160	.0250	.0160	.0250

SUBSECTION 1 = STATION .00 TO STATION 5.00
 SUBSECTION 2 = STATION 5.00 TO STATION 41.00
 SUBSECTION 3 = STATION 41.00 TO STATION 46.00

THE PINES PHASE I (Project 25044)
 CROSS-SECTION - (CP-J, June 6th, 2005)

STA: .00 5.00 7.00 23.00 39.00 41.00 46.00
 ELEV: .60 .50 .00 .32 .00 .50 .60

DISCHARGE = 21. WSEL = .40 SLOPE = .0050

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #:		
		1	2	3
DISCHARGE (CFS) =	21.39	.00	21.39	.00
VELOCITY (FT/S) =	2.53	.80	2.53	.80
AREA (SQUARE FT) =	8.46	.00	8.46	.00
TOPWIDTH (FT) =	35.23	.00	35.23	.00
DEPTH (FT) =	.40	.00	.40	.00
HYD. DEPTH (FT) =	.24	.08	.24	.08
WET. PERIM. (FT) =	35.34	.00	35.34	.00
HYD. RADIUS (FT) =	.24	.08	.24	.08
FROUDE NUMBER =	.91	.49	.91	.49
MANNINGS N VALUE =	.0160	.0250	.0160	.0250

SUBSECTION 1 = STATION .00 TO STATION 5.00
 SUBSECTION 2 = STATION 5.00 TO STATION 41.00
 SUBSECTION 3 = STATION 41.00 TO STATION 46.00