City of Albuquerque

June 15, 2000

John MacKenzie, P.E.
Mark Goodwin & Associates, P. A.
P. O. Box 90606
Albuquerque, NM 87199

RE: ENGINEER'S CERTIFICATION FOR THE JPD WAREHOUSE, (H-16/D126), ENGINEER'S STAMP DATED 10/27/99,

Dear Mr. MacKenzie,

Approval of the Certificate of Occupancy requires a signed statement on the as-built plan, per the DPM, and, in the case of an SO 19, a copy of the plan signed off by the street maintenance inspector.

If you have any questions, please call me at 924-3988.

Sincerely,

Stuart Reeder, P.E.

Stuart Reeder, P.E.
Hydrology Division

xc: Whitney Reierson
File

DRAINAGE INFORMATION SHEET

D126

PROJECT TITLE: JPD Warehouse ZONE ATLAS/DRNG,FILE#: H-16/D

DRB #: EPC #: WORK ORDER #:

LEGAL DESCRIPTION: Lot E-3, Menaul Development Area

CITY ADDRESS:

ENGINEERING FIRM: Mark Goodwin & Assoc. CONTACT: J MacKenzie

ADDRESS: Box 90606 PHONE: 828-2200

OWNER: Sadler Southwest CONTACT: Mike Pugach

ADDRESS: 1564 Eagle Ridge Ct. NE PHONE: 856-7939

ARCHITECT: CONTACT:

ADDRESS: PHONE:

SURVEYOR: CONTACT:

ADDRESS: PHONE:

CONTRACTOR: CONTACT:

ADDRESS: PHONE:

TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- _X_ DRAINAGE PLAN
- ____ CONCEPTUAL GRADING & DRAINAGE PLAN
- _X_ GRADING PLAN
- ____ EROSION CONTROL PLAN
- _X_ ENGINEER'S CERTIFICATION
- ____ OTHER

PRE-DESIGN MEETING:

- ____ YES
- _X_ NO
- ____ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ____ SKETCH PLAT APPROVAL
- ____ PRELIMINARY PLAT APPROVAL
- ____ S. DEV. PLAN FOR SUB'D APPROVAL
- ____ S. DEV. PLAN FOR BLDG PERMIT APPROVAL
- ____ SECTOR PLAN APPROVAL
- ____ FINAL PLAT APPROVAL
- ____ FOUNDATION PERMIT APPROVAL
- _X_ BUILDING PERMIT APPROVAL
- _X_ CERTIFICATION OF OCCUPANCY APPROVAL
- ____ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ S.A.D. DRAINAGE REPORT
- ____ DRAINAGE REQUIREMENTS
- ____ OTHER ____ (Specify)

RECEIVED
JUN 1 4 2000
HYDROLOGY SECTION

DATE SUBMITTED: 6.14.00

BY: John MacKenzie

City of Albuquerque

July 19, 2000

John MacKenzie, P.E.
Mark Goodwin & Associates, P.A.
P. O. Box 90606
Albuquerque, NM 87199

RE: ENGINEER'S CERTIFICATION FOR JPD WAREHOUSE,(H-16/ D126), ENGINEER'S STAMP DATED 10/27/99, CERTIFICATION DATED 6/14/2000.

Dear Mr. MacKenzie,

Based upon the information provided in your submittal dated July 17, 2000, the Engineering Certification for Certificate of Occupancy for the project referred to above is approved.

If you have any questions, please call me at 924-3988.

Sincerely,

Stuart Reeder, P.E.

Stuart Reeder, P.E.
Hydrology Division

xc: Whitney Reierson
✓File

D126

DRAINAGE INFORMATION SHEET

PROJECT TITLE: JPD Warehouse ZONE ATLAS/DRNG,FILE#: H-16/Z

DRB #: ______ EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lot E-3, Menaul Development Area

CITY ADDRESS: 2601 Princeton NE

ENGINEERING FIRM: Mark Goodwin & Assoc. CONTACT: J MacKenzie

ADDRESS: Box 90606 PHONE: 828-2200

OWNER: Sadler Southwest CONTACT: Mike Pugach

ADDRESS: 1564 Eagle Ridge Ct. NE PHONE: 856-7939

ARCHITECT: ______ CONTACT: ______

ADDRESS: ______ PHONE: ______

SURVEYOR: ______ CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: ______ CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

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

PRE-DESIGN MEETING:

- ___ YES
- X NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

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

DATE SUBMITTED: ~~6-14-00~~ 7-17-00

BY: John MacKenzie

RECEIVED
JUL 17 2000
HYDROLOGY SECTION

7 July 2000
Project 9917

Sadler Southwest, Ltd.
Attn: Mike Pugach, Project Manager
P.O. Box 21640
Albuquerque, NM 87154-1640

Re: JPD Office/Warehouses
2601 Princeton NE
Albuquerque, New Mexico

Dear Mike:

I conducted a Site Observation Visit today of the completed facility particularly to confirm the construction of the site improvements.

My observation reveals that the site improvements are in compliance with the City of Albuquerque approved Traffic Circulation Plan.

If you need any additional information, please call.

Sincerely,

James B Clark

James B. Clark, RA
Vice President

MASTERWORKS ARCHITECTS, INC.

RETURN TO THE STANDARDS OF THE MASTER BUILDERS

516 Eleventh St. NW, Albuquerque, NM 87102-1806 (505) 242-1866 FAX (505) 242-1802

PUBLIC WORKS DEPARTMENT

SIDEWALK & DRIVEPAD INSPECTION

APPROVED

Inspector

	Permits	Dispatch	Insp. Office
Phone:	768-2551	857-8025	857-8036

Date 5-5-00 Permit No. 2032245

Contractor M.C.E. inc

Location 2601 Prinston rd.

Time

5-0-19 Drain Inlet.

DRAINAGE INFORMATION SHEET

PROJECT TITLE: JPD Warehouse ZONE ATLAS/DRNG,FILE#: H-16/D126

DRB #: ______ EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lot E-3, Menaul Development Area

CITY ADDRESS: ______

ENGINEERING FIRM: Mark Goodwin & Assoc. CONTACT: J MacKenzie

ADDRESS: Box 90606 PHONE: 828-2200

OWNER: Sadler Southwest CONTACT: Mike Pugach

ADDRESS: 1564 Eagle Ridge Ct. NE PHONE: 856-7939

ARCHITECT: ______ CONTACT: ______

ADDRESS: ______ PHONE: ______

SURVEYOR: ______ CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: ______ CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

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

PRE-DESIGN MEETING:

- ___ YES
- X NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

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

RECEIVED
AUG 30 1999
HYDROLOGY SECTION

DATE SUBMITTED: 8-27-99

BY: John MacKenzie

City of Albuquerque

October 13, 1999

John MacKenzie PE
Mark Goodwin & Associates
P.O. Box 90606
Albuquerque, NM 87199

Re: JPD Warehouse Grading and Drainage Plan (H16/D126)

Dear Mr. MacKenzie,

After review of your submittal dated 8-27-99, the above referenced plan is approved for Building, Foundation and SO#19 permits, with the following modification: In lieu of retrofitting existing inlet, replace type 'C' inlet with type 'D' inlet, shown on Princeton Drive, at your new driveway.

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

Also, a separate permit is required for construction within City R/W. A copy of this approval letter must be on hand when applying for the excavation permit.

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

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

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Hydrology Review Engineer

C: Arlene Portillo
file

PUBLIC WORKS DEPARTMENT

October 13, 1999

INTEROFFICE CORRESPONDENCE HYDROLOGY DIVISION

TO: Glen Jurgenson, Storm Drain Maintenance Division

FROM: Bradley L. Bingham PE, Hydrology Div., PWD

SUBJECT: **MODIFICATIONS TO DRAINAGE FACILITIES WITHIN PUBLIC RIGHT-OF-WAY DRAINAGE FILE NUMBER (H16/D126).**

Transmitted herewith is a copy of the approved drainage plan for the referenced project incorporating the SO #19 design.

This plan is being submitted to you for permitting and inspection. Please provide this section with a signed-off copy per the signature block upon construction and acceptance by your office.

As you are aware, the signed off SO#19 is required by this office for Certificate of Occupancy release; therefore your expeditious processing of this plan would be greatly appreciated and would avoid any unnecessary delay in the release of Certificate of Occupancy.

Thank you for your cooperation and if you should have any questions and/or comments, please feel free to call me at 924-3986.

Attachment

City of Albuquerque

James Clark
Masterworks Architects, Inc.
516 Eleventh St. NW
Albuquerque, NM 87102

October 1, 1999

RE: TRAFFIC CIRCULATION LAYOUT REVIEW FOR BUILDING PERMIT APPROVAL
JPD OFFICE/WAREHOUSES, H16-D126, Architect Stamp dated August 23, 1999

Dear Mr. Clark:

The above referenced Traffic Circulation Layout (TCL) requires modifications to the site plan prior to review for Building Permit. The comments are indicated in red ink on the attached marked-up site plan.

Please add the following note on the site plan: "The engineer's certification required by the Hydrology section needs to include certification that this site was constructed in accordance with the TCL before Certificate of Occupancy (C.O.) is released."

Please return the attached marked-up site plan with your next submittal.

You can reach me at 924-3993 to set up a meeting to discuss this project.

Sincerely,

Afsaneh Yavari
Associate Engineer

Attachments
cc: John MacKenzie, Mark Goodwin & Associates

```
AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
      RUN DATE (MON/DAY/YR) = 08/20/1999
      START TIME (HR:MIN:SEC) = 14:34:44     USER NO.= M_GOODWN.I01
      INPUT FILE = JPD.DAT

START                TIME=0.0

*****   HYDROGRAPH FOR JPD WAREHOUSE

RAINFALL             TYPE=1 RAIN QUARTER=0.0 IN
                     RAIN ONE=2.00 IN RAIN SIX=2.30 IN
                     RAIN DAY=2.80 IN DT=0.033 HR

              COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2
              DT =     .033000 HOURS        END TIME =      5.973000 HOURS
                 .0000    .0013    .0025    .0038    .0052    .0065    .0079
                 .0094    .0108    .0123    .0139    .0155    .0171    .0187
                 .0205    .0222    .0240    .0259    .0279    .0299    .0320
                 .0341    .0364    .0387    .0411    .0436    .0463    .0491
                 .0520    .0551    .0583    .0631    .0689    .0750    .0834
                 .1088    .1489    .2076    .2887    .3965    .5351    .7088
                 .9219   1.1791   1.2941   1.3747   1.4453   1.5090   1.5675
                1.6216   1.6720   1.7193   1.7637   1.8056   1.8451   1.8825
                1.9180   1.9516   1.9835   2.0138   2.0426   2.0618   2.0676
                2.0731   2.0784   2.0834   2.0881   2.0927   2.0970   2.1012
                2.1053   2.1092   2.1130   2.1166   2.1202   2.1236   2.1270
                2.1302   2.1334   2.1365   2.1395   2.1424   2.1453   2.1481
                2.1508   2.1535   2.1561   2.1587   2.1612   2.1637   2.1661
                2.1685   2.1708   2.1731   2.1754   2.1776   2.1798   2.1819
                2.1841   2.1861   2.1882   2.1902   2.1922   2.1942   2.1961
                2.1980   2.1999   2.2018   2.2036   2.2054   2.2072   2.2090
                2.2107   2.2124   2.2142   2.2158   2.2175   2.2192   2.2208
                2.2224   2.2240   2.2256   2.2271   2.2287   2.2302   2.2317
                2.2332   2.2347   2.2362   2.2376   2.2390   2.2405   2.2419
                2.2433   2.2447   2.2461   2.2474   2.2488   2.2501   2.2514
                2.2528   2.2541   2.2554   2.2566   2.2579   2.2592   2.2604
                2.2617   2.2629   2.2641   2.2654   2.2666   2.2678   2.2690
                2.2701   2.2713   2.2725   2.2736   2.2748   2.2759   2.2771
                2.2782   2.2793   2.2804   2.2815   2.2826   2.2837   2.2848
                2.2858   2.2869   2.2880   2.2890   2.2901   2.2911   2.2921
                2.2932   2.2942   2.2952   2.2962   2.2972   2.2982   2.2992

*HYDROGRAPHS FOR ON-SITE PROPOSED CONDITIONS COVERING 2.4 AC. SITE WILL
*BE DIVIDED INTO TWO BASINS

*HYDROGRAPH FOR ON-SITE BASIN A (1.9 ACRES)

COMPUTE NM HYD       ID=1 HYD NO=101.1 AREA=0.0030 SQ MI
                     PER A=0.0 PER B=15.0 PER C=0.0 PER D=85.0
                     TP=0.1333 HR MASS RAINFALL=-1

    K =    .072649HR     TP =    .133300HR    K/TP RATIO =    .545000     SHAPE
    UNIT PEAK =    10.068     CFS    UNIT VOLUME =     .9983        B =   526.28
    AREA =       .002550 SQ MI     IA =     .10000 INCHES     INF =    .04000 I
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT


    K =    .131967HR     TP =    .133300HR    K/TP RATIO =    .990000     SHAPE
```

```
    UNIT PEAK =    1.0976    CFS   UNIT VOLUME =     .9876        B =   325.15
    AREA =       .000450 SQ MI     IA =     .50000 INCHES     INF =   1.25000 I
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT

PRINT HYD             ID=1 CODE=1

                                          PARTIAL HYDROGRAPH   101.10


    RUNOFF VOLUME =      1.87057 INCHES      =         .2993 ACRE-FEET
    PEAK DISCHARGE RATE =        8.21 CFS   AT    1.518 HOURS   BASIN AREA =



*HYDROGRAPH FOR ON-SITE BASIN B (0.5 ACRES)

COMPUTE NM HYD        ID=2 HYD NO=101.2 AREA=0.0008 SQ MI
                      PER A=0.0 PER B=15.0 PER C=0.0 PER D=85.0
                      TP=0.1333 HR MASS RAINFALL=-1

    K =    .072649HR    TP =    .133300HR    K/TP RATIO =   .545000     SHAPE
    UNIT PEAK =    2.6847     CFS   UNIT VOLUME =     .9954        B =   526.28
    AREA =       .000680 SQ MI     IA =     .10000 INCHES     INF =     .04000 I
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT

    K =    .131967HR    TP =    .133300HR    K/TP RATIO =   .990000     SHAPE
    UNIT PEAK =    .29270     CFS   UNIT VOLUME =     .9522        B =   325.15
    AREA =       .000120 SQ MI     IA =     .50000 INCHES     INF =   1.25000 I
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT

PRINT HYD             ID=2 CODE=1

                                          PARTIAL HYDROGRAPH   101.20


    RUNOFF VOLUME =      1.87057 INCHES      =         .0798 ACRE-FEET
    PEAK DISCHARGE RATE =        2.20 CFS   AT    1.518 HOURS   BASIN AREA =



ADD HYD               ID=3 HYD NO=102.1 ID=1 ID=2
PRINT HYD             ID=3 CODE=1

                                          PARTIAL HYDROGRAPH   102.10


    RUNOFF VOLUME =      1.87042 INCHES      =         .3791 ACRE-FEET
    PEAK DISCHARGE RATE =       10.41 CFS   AT    1.518 HOURS   BASIN AREA =



FINISH

    NORMAL PROGRAM FINISH          END TIME (HR:MIN:SEC) = 14:34:44
```

CITY OF
Albuquerque

2615 Princeton NE

March 30, 1998

Karen Stearns
URS Greiner
5971 Jefferson NE
Suite 101
Albuquerque, NM 87109

RE: PREFERRED PUMP CO. (H16-D126). ENGINEER'S CERTIFICATION FOR CERTIFICATE OF OCCUPANCY APPROVAL. ENGINEER'S CERTIFICATION DATED MARCH 16, 1998.

Dear Ms. Stearns:

Based on the information provided on your March 16, 1998 submittal, the above referenced project is approved for Certificate of Occupancy.

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

Sincerely,

Lisa Ann Manwill, P.E.
Hydrology

c: Andrew Garcia
File

Good for You, Albuquerque!

CITY OF
Albuquerque

March 24, 1998

Karen Banks
URS Greiner
5971 Jefferson NE
Suite 101
Albuquerque, NM 87109

RE: PREFERRED PUMP CO. (H16-D126). ENGINEER'S CERTIFICATION FOR CERTIFICATE OF OCCUPANCY APPROVAL. ENGINEER'S CERTIFICATION DATED MARCH 16, 1998.

Dear Ms. Banks:

Based on the information provided on your March 16, 1998 submittal, the above referenced project is approved for a 30-day Temporary Certificate of Occupancy only. Prior to Final Certificate of Occupancy, please address the following comment:

> According to our files, the approved grading and drainage plan had an engineer's stamp date of November 24, 1998. The plan you've certified has a stamp date of October 18, 1997. Please certify the approved drawing.

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

Sincerely,

Lisa Ann Manwill, P.E.
Hydrology

c: Andrew Garcia
File

DRAINAGE INFORMATION SHEET

F

PROJECT TITLE: PREFERRED PUMP CO. ZONE ATLAS/DRNG. FILE #: H-16 D 126

DRB #: ______ EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lot E-3, Menaul Development Area w/in Sect. 10, T10N, R3E, NMPM

CITY ADDRESS: 2615 Princeton NE.

ENGINEERING FIRM: URS Greiner CONTACT: Karen Banks

ADDRESS: 5971 Jefferson NE, #101, 87109 PHONE: 345-3999

OWNER: Sadler Southwest, Ltd. CONTACT: Lou Sadler

ADDRESS: P.O. Box 21640 PHONE: 856-7939

ARCHITECT: Masterworks CONTACT: Jim Clark

ADDRESS: 516 Eleventh St. NW, 87102 PHONE: 242-1866

SURVEYOR: Land Links Co., Ltd. CONTACT: Glen Thurow

ADDRESS: 8415 Washington Pl. NE #B1 PHONE: 856-9899

CONTRACTOR: ______ CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

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

PRE-DESIGN MEETING:

- X YES
- ___ NO
- X COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

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

30 day Temp CO. issued on 3-17-98

DATE SUBMITTED: 3-16-98

BY: Karen Banks

RECEIVED
MAR 16 1998
HYDROLOGY SECTION

URS Greiner

URS Greiner, Inc.
5971 Jefferson Boulevard, N.E.
Suite 101
Albuquerque, New Mexico 87109
Telephone: (505) 345-3999
Facsimile: (505) 345-8393
Offices in Principal Cities Nationwide

March 16, 1998

Mr. Bernie J. Montoya, Associate Engineer
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Re: **Engineer Certification for Preferred Pump Co. (H16-D126)**
URS Greiner Project E30119500

Dear Mr. Montoya:

The purpose of this letter is to submit the Engineer Certification for the aforementioned project and request approval for Certificate of Occupancy. Per the DPM Engineer's Certification Checklist, attached are the Drainage Information Sheet and an as-built plan containing the following information:

- As-built pad and finish floor elevations;
- As-built spot elevations for pipe inlets and outlets, swales, retaining walls and other spots necessary to demonstrate compliance with the approved drainage plan;
- An outline of the as-built drainage basins and roof drain locations; and
- Mark Holstad's professional certification of substantial compliance with the approved drainage plan, engineer's stamp, dated and signed.

Please contact me or Mark Holstad if you have any questions or comments regarding this request. Thank you.

Sincerely,

URS Greiner, Inc.

Karen M. Stearns

Karen M. Stearns, EIT
Project Engineer Intern

Enclosure

cc: Mike Pugach, Sadler Southwest
File E30119500

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

December 5,1997

Karen Banks
USR Greiner
5971 Jefferson NE Suite 101
Albuquerque, New Mexico 87109

RE: REVISED DRAINAGE PLAN FOR PREFERRED PUMP CO. (H16-D126) REVISION DATED 11/24/97

Dear Ms. Banks:

Based on the information provided on your November 25,1997 resubmittal, the above referenced site is approved for Building Permit.

Please be advised that if the building permit has already been issued, it will be your responsibility to assure that the contractor is provided with a copy of this revised plan.

Also, all the items identified on my last approval letter are still valid.

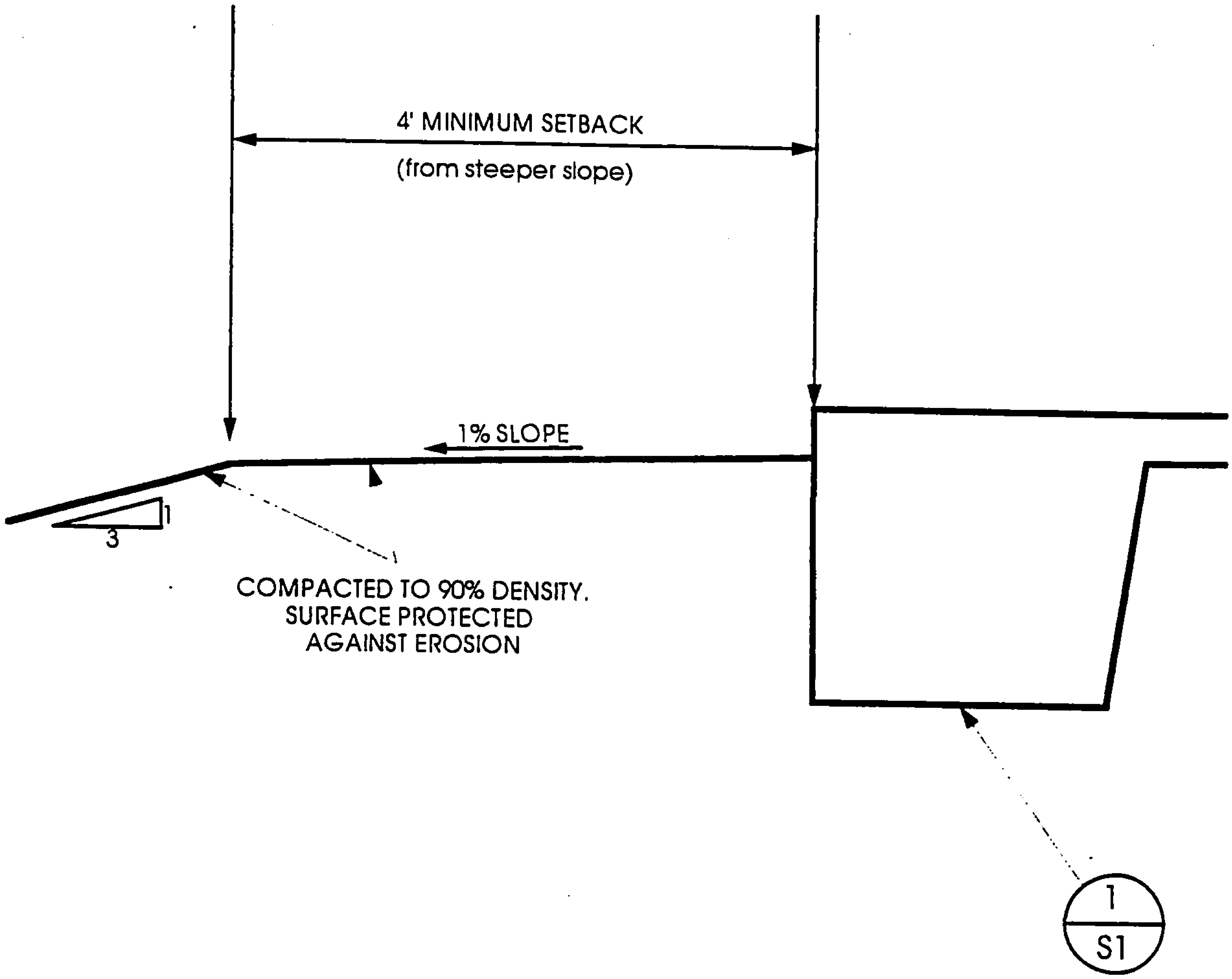
If I can be of further assistance, please feel free to contact me at 924-3986.

C: Andrew Garcia
File

Sincerely

Bernie J. Montoya CE
Associate Engineer

H-16/D124



1 / S3 BUILDING SETBACK FROM 3:1 SLOPE
SCALE 3/4" = 1'-0"

ROBERT C. SPEAKE
NEW MEXICO
12367
REGISTERED PROFESSIONAL ENGINEER

Robert C. Speake
12/3/97

ROBERT C. SPEAKE, PE
Principal
HMS CONSULTING
1940 Dartmouth NE
Albuquerque, NM 87106

Addendum to Sheets S1 & S2 of Preferred Pump Project

CITY OF
Albuquerque

Martin J. Chávez, Mayor

October 30,1997

Mark Holstad
URS Greiner
5971 Jefferson NE Suite 101
Albuquerque, New Mexico 87109

RE: REVISED DRAINAGE PLAN FOR PREFFERRED PUMP CO. (H16-D126) REVISION DATED 10/18/97 PARCEL A & B

Dear Mr. Holstad:

Based on the information provided on your October 20,1997 resubmittal, the above referenced site is approved for Foundation and Building Permit.

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

Also, please be advised that a separate permit is required for construction within City R/W. A copy of this approval letter must be on hand when applying for the excavation permit.

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

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

C: Andrew Garcia
Arlene Portillo
File

Sincerely

Bernie J. Montoya CE
Associate Engineer

PROJECT TITLE: PREFERRED PUMP ZONE ATLAS/DRNG. FILE #: H16/D126

DRB #: EPC #: WORK ORDER #:

LEGAL DESCRIPTION: LOT E-3 MENAUL DEVELOPMENT AREA

CITY ADDRESS: 2615 PRINCETON NE

ENGINEERING FIRM: URS GREINER CONTACT: KAREN BANKS

ADDRESS: 5971 JEFFERSON BLVD. NE PHONE: 345-3999

OWNER: JDP L.L.C CONTACT:

ADDRESS: 1116 PENNSYLVANIA NE PHONE:

ARCHITECT: MASTERWORKS - JIM CLARK CONTACT: JIM CLARK

ADDRESS: 516 ELEVENTH ST. NW PHONE: 242-1866

SURVEYOR: LAND LINKS CONTACT: GLEN THUROW

ADDRESS: 8415 WASHINGTON PL SUITE B-1 PHONE: 856-9899

CONTRACTOR: SADLER SOUTHWEST LTD. CONTACT: LOU SADLER/ MIKE PUGACH

ADDRESS: PO BOX 21640 87154-1640 PHONE: 856-7939

TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ✓ DRAINAGE PLAN REVISED
- ____ CONCEPTUAL GRADING & DRAINAGE PLAN
- ✓ GRADING PLAN REVISED
- ____ EROSION CONTROL PLAN
- ____ ENGINEER'S CERTIFICATION
- ____ OTHER ____

PRE-DESIGN MEETING:

- ____ YES
- ____ NO
- ____ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

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

DATE SUBMITTED: NOVEMBER 25, 97

BY: MICHAEL PUGACH - SADLER SOUTHWEST LTD.

RECEIVED
NOV 25 1997
HYDROLOGY SECTION

DRAINAGE INFORMATION SHEET

ROJECT TITLE: PREFERRED PUMP CO. ZONE ATLAS/DRNG. FILE #: H-16/D126

RB #: EPC #: WORK ORDER #:

EGAL DESCRIPTION: Lot E-3, Menaul Development Area w/in Sect. 10, T10N, R3E, NMPM

ITY ADDRESS:

NGINEERING FIRM: URS Greiner CONTACT: Karen Banks

ADDRESS: 5971 Jefferson NE, #101, 87109 PHONE: 345-3999

WNER: Sadler Southwest, Ltd. CONTACT: Lou Sadler MK 856-7939

ADDRESS: P.O. Box 21640 PHONE: 856-7939

ARCHITECT: Masterworks CONTACT: Jim Clark

ADDRESS: 516 Eleventh St. NW, 87102 PHONE: 242-1866

SURVEYOR: Land Links Co., Ltd. CONTACT: Glen Thurow

ADDRESS: 8415 Washington Pl. NE #B1 PHONE: 856-9899

CONTRACTOR: CONTACT:

ADDRESS: PHONE:

TYPE OF SUBMITTAL:

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

PRE-DESIGN MEETING:

- X YES
- ___ NO
- X COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D. APPROVAL
- ___ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- X FOUNDATION PERMIT APPROVAL
- X BUILDING PERMIT APPROVAL
- ___ CERTIFICATE OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- X OTHER SO19 (SPECIFY)

DATE SUBMITTED: 10-20-97

BY: Karen Banks

RECEIVED
OCT 20 1997
HYDROLOGY SECTION

CITY OF
Albuquerque

Martin J. Chávez, Mayor

September 19,1997

Mark Holstad
URS Greiner
5971 Jefferson NE Suite 101
Albuquerque, New Mexico 87109

RE: DRAINAGE PLAN FOR PREFFERRED PUMP COMPANY (H16-D126) ENGINEER'S STAMP DATED 8/25/97

Dear Mr. Holstad:

Based on the information provided on your September 2,1997 submittal, listed are some concerns that will need to addressed prior to final approval:

1. Divide the area into two Drainage Basins addressing the existing & proposed flowrates and volumes. Identify how you propose to drainage each basin.

2. What type of erosion and sediment control do you propose on the paved area.

3. One foot water block is required at the property line adjacent to the street. Especially at the drivepads.

4. Please identify the City of Albuquerque Spec. No. For the tie into the existing catchbasin.

5. Finish floor elevations and the TBM must be shown to full-mean-sea-level designation.

6. Until time the future phase is developed, a sedimentation pond will need to be incorporated to assure that the run-off entering the existing catchbasin is sediment free.

7. Please include spot elevations on all your sections and details.

8. Your plan drawing indicates that there is off-site run-off entering the site from the west. Please address.

9. Please change the sign-off block for the SO19 from ACE/DESIGN to HYDROLOGY.

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

C: Andrew Garcia
File

Sincerely

Bernie J. Montoya CE
Associate Engineer

URS Greiner, Inc.
5971 Jefferson Boulevard, N.E.
Suite 101
Albuquerque, New Mexico 87109
Telephone: (505) 345-3999
Facsimile: (505) 345-8393
Offices in Principal Cities Nationwide

URS Greiner

October 20, 1997

Mr. Bernie J. Montoya
City of Albuquerque
Development & Building Services Center
600 2nd Street
Plaza Del Sol, 2nd Floor West
Albuquerque, New Mexico 87102

RE: Drainage Plan Resubmittal for Preferred Pump Co. (H16-D126)

Dear Bernie:

Attached are the revised Drainage Management Scheme and Grading & Drainage Plan for Lot E-3 of the Menaul Development Area, located near the northwest corner of Princeton Drive and Phoenix Avenue. We request approval for Building Permit and SO19 Permit purposes. Please note that your comments on the original submittal are addressed below.

Comments #1 & 8: The attached Drainage Management Scheme was modified to report the existing and proposed hydrologic conditions for two onsite basins and one offsite basin and to identify the means for draining each basin. Basin A represents the onsite drainage basin which drains overland to the Princeton Drive right-of-way. Basin B represents the onsite drainage basin which drains to two proposed culverts to be connected to the back of an existing double inlet. Basin O represents an offsite drainage basin located west of the site which currently drains to Basin B and will continue to do so under developed conditions.

Comment #2: The attached Grading & Drainage Plan was modified to include the construction of a temporary sediment barrier along the edge of the drivepad and sidewalk on the southern (undeveloped) portion of the site. This barrier is designed to prevent silt from reaching the pavement within the Princeton Drive right-of-way. We chose to use a silt fence sediment barrier instead of a straw bale dike, because silt fences trap a higher percentage of sediment and can function twice longer than straw bale dikes.

Comment #3: The attached Grading & Drainage Plan was modified to construct a minimum 1' high water block at the property line adjacent to Princeton Drive, including drivepads.

Comment #4: The attached Grading & Drainage Plan was modified to identify City of Albuquerque Standard Drawing 2237 for the culvert connection to the existing storm inlet. The culvert was changed from one 18" diameter pipe to two 12" diameter pipes.

Comment #5: The attached Grading & Drainage Plan was modified to reflect full-mean-sea-level designation for finish floor elevations and the TBM.

Comment #6: The attached Grading & Drainage Plan was modified to include the construction of a sediment trap near the intake of the proposed culverts connecting to the existing double inlet. The size of the sediment trap was designed so that particles of size 0.074 mm and larger will settle to the bottom of the trap prior to reaching the culverts and existing double inlet. More than half of the soil particles are larger than 0.0074 mm. The sediment trap depth was designed with 2.2' for headwater and 0.5' for sediment storage. A rip-rap apron was designed to protect the pipe culverts from erosion. The apron is to be 6' long, 6.2' wide and 1' deep with 6" stones.

Comment #7: The attached Grading & Drainage Plan was modified to include spot elevations on all sections and details.

Comment #9: The sign-off block for the SO19 Permit was modified from ACE/DESIGN to HYDROLOGY.

Please contact me if you have any questions or comments regarding this request. Thank you.

Sincerely,

Karen M. Banks

Karen Banks, EIT
Project Engineer Intern

Enclosures (2)

cc: Mike Pugach, Sadler Southwest

DRAINAGE MANAGEMENT SCHEME

INTRODUCTION

This Drainage Management Scheme supports the development of Lot E-3 of the Menaul Development Area. This parcel is located near the northwest corner of Princeton Drive and Phoenix Avenue. AGIS Map H-16 illustrates the location of these properties and shows that this parcel is zoned M-1.

METHODOLOGY

Existing undeveloped and proposed developed conditions were analyzed using the Rational Method in accordance with the revised Section 22.2, Hydrology, of the Development Process Manual for the City of Albuquerque (DPM), January 1993. Proposed site hydraulics were analyzed in accordance with Section 22.3, Hydraulics, of the DPM. The Haestad Methods FlowMaster computer program was used to analyze all hydraulics based on Manning's equation.

EXISTING CONDITIONS

The site consists of 2.7332 acres of undeveloped land with minimal vegetation and a small masonry storage shed (113 sq. ft.). The slopes range up to 50% slopes, with an average slope of 5% toward the southern portion of the site. This site is not located within a floodplain.

The *Phase I Environmental Site Assessment & Limited Subsurface Assessment* prepared for this site by Western Technologies, dated 7/17/97, lists the top 15' of soil as SM, silty sand. The *Soils Manual for Design of Asphalt Pavement Structures* by the Asphalt Institute states that SM soils have the following characteristics: (1) more than half of the soil particles are larger than the U.S. Standard Sieve No. 200, (2) more than half of the coarse fraction is smaller than the U.S. Standard Sieve No. 4, and (3) mostly sands with an appreciable amount of fines.

The site currently has one offsite and two onsite drainage basins. Basin A represents the onsite drainage basin which drains overland to the Princeton Drive right-of-way. Basin B represents the onsite drainage basin which drains overland to the adjacent property to the south. Basin O represents an offsite drainage basin which currently drains to Basin B. The land treatment distribution for these basins is tabulated below.

LAND TREATMENT DISTRIBUTION FOR EXISTING UNDEVELOPED CONDITIONS				
Basin ID	Land Treatment			
	A	B	C	D
A	68.4%	28.6%	3.0%	------
B	74.5%	10.2%	15.2%	0.1%
O	33.8%	1.1%	65.2%	------

Currently, this site generates approximately 5.08 cfs during the 100-year, 6-hour storm event. Basin A drains 0.85 cfs overland to the Princeton Drive right-of-way. Basins B and O, combined, drain 4.40 cfs overland to the adjacent property to the south. The following table lists the peak discharge, weighted excess precipitation and volumetric runoff for each basin.

EXISTING HYDROLOGIC CONDITIONS				
Basin ID	Peak Discharge $Q_{100yr\text{-}6hr}$ (cfs)	Weighted Excess Precipitation $E_{100yr\text{-}6hr}$ (inch)	Volumetric Runoff	
			$V_{100yr\text{-}6hr}$ (acre-feet)	$V_{100yr\text{-}24hr}$ (acre-feet)
A	0.85	0.62	0.0243	0.0243
B	4.23	0.65	0.1219	0.1220
O	0.17	2.23	0.0123	0.0123

PROPOSED DEVELOPED CONDITIONS

This submittal proposes to develop this site in two phases. Ultimately, the site will contain two buildings, paved parking and drive aisles, utility services, landscaping (including a drainage swale) and two culverts connecting to the back of an existing double inlet in the Princeton Drive right-of-way. The slopes within the paved areas will range from 1% to 8%. The slopes within the landscaped areas will range up to 3:1 horizontal to vertical slope.

In Phase 1 of construction, the northern portion of the site will be developed with one building, paved parking and drive aisles, utility services and landscaping. The southern portion of the site will be partially developed in Phase 1, including one graded building pad, a fully graded site (including the swale) and two culverts. In Phase 2 of construction, the southern portion of the site will be developed with one building, paved parking and drive aisles, utility services and landscaping. The following section, *Erosion Control*, discusses the proposed erosion control measures for all phases of construction.

Under proposed, developed conditions, Basin A will continue draining overland to the Princeton Drive right-of-way. Basin B will drain to two proposed culverts in the southeast corner of the site. These culverts will be connected to an existing double inlet in the Princeton Drive right-of-way. Offsite Basin O will continue draining overland to Basin B. The following table shows the land treatment distribution for these basins under proposed, ultimately developed conditions.

LAND TREATMENT DISTRIBUTION FOR PROPOSED DEVELOPED CONDITIONS				
Basin ID	Land Treatment			
	A	B	C	D
A	------	11.2%	2.7%	88.4%
B	------	7.5%	17.9%	74.7%
O	33.8%	1.1%	65.2%	------

Based on the proposed land treatment distribution shown previously, this site will generate approximately 12.00 cfs during the 100-year, 6-hour storm event. Basin A will drain 2.43 cfs overland to the northernmost double "C" inlet adjacent to the site within the Princeton Drive right-of-way. Basins B and O, combined, will drain 9.74 cfs to two proposed private 12" culverts, which we propose to connect to the back of the southernmost double "C" inlet adjacent to the site within the Princeton Drive right-of-way. The culvert is designed to have 2.2' of headwater with 0.5' of freeboard. The culvert will slope at 2% and flow 79.1% full. The invert of the culvert will be approximately 1' higher than the invert of the 4'-deep inlet. The following table lists the peak discharge, weighted excess precipitation and volumetric runoff for each basin.

PROPOSED HYDROLOGIC CONDITIONS				
Basin ID	Peak Discharge $Q_{100yr\text{-}6hr}$ (cfs)	Weighted Excess Precipitation $E_{100yr\text{-}6hr}$ (inch)	Volumetric Runoff	
			$V_{100yr\text{-}6hr}$ (acre-feet)	$V_{100yr\text{-}24hr}$ (acre-feet)
A	2.43	1.94	0.0897	0.1055
B	9.57	1.84	0.3467	0.4028
O	0.17	2.23	0.0123	0.0123

Erosion Control

Ultimately, the entire site (except for the two buildings) will be either paved or landscaped; therefore, no additional erosion control measures are required. However, erosion control measures are required prior to Phase 2 construction is completed. Aside from the standard erosion control measures, such as grading a temporary erosion control berm at the property lines and periodically wetting the soil, this report discusses two additional measures: a sediment barrier and a sediment trap.

In Phase 1, a temporary sediment barrier will be built along the edge of the drivepad and sidewalk on the southern (undeveloped) portion of the site. This barrier is designed to prevent silt from reaching the pavement within the Princeton Drive right-of-way and will remain in operation until Phase 2 construction is complete. We chose to use a silt fence sediment barrier instead of a straw bale dike, because silt fences trap a higher percentage of sediment and can function twice longer than straw bale dikes. The silt fence shall be 18-inches high, 125-feet long and have an equivalent opening size (EOS) as large as the opening in the U.S. Standard Sieve No. 70 [0.0083" (0.21 mm)]. To prevent clogging, the silt fence fabric shall not have an EOS smaller than the opening in the U.S. Standard Sieve No. 100 [0.0059" (0.15 mm)].

In Phase 1, a permanent sediment trap will be built near the intake of the proposed culverts connecting to the existing double inlet. The size of the sediment trap was designed so that particles of size 0.074 mm and larger will settle to the bottom of the trap prior to reaching the culverts and existing double inlet. As mentioned previously in *Existing Conditions* section, more than half of the soil particles are larger than 0.0074 mm. The sediment trap depth was designed with 2.2' for headwater and 0.5' for sediment storage. A rip-rap apron was designed to protect the pipe culverts from erosion. The apron is to be 6' long, 6.2' wide and 1' deep with 6" stones.

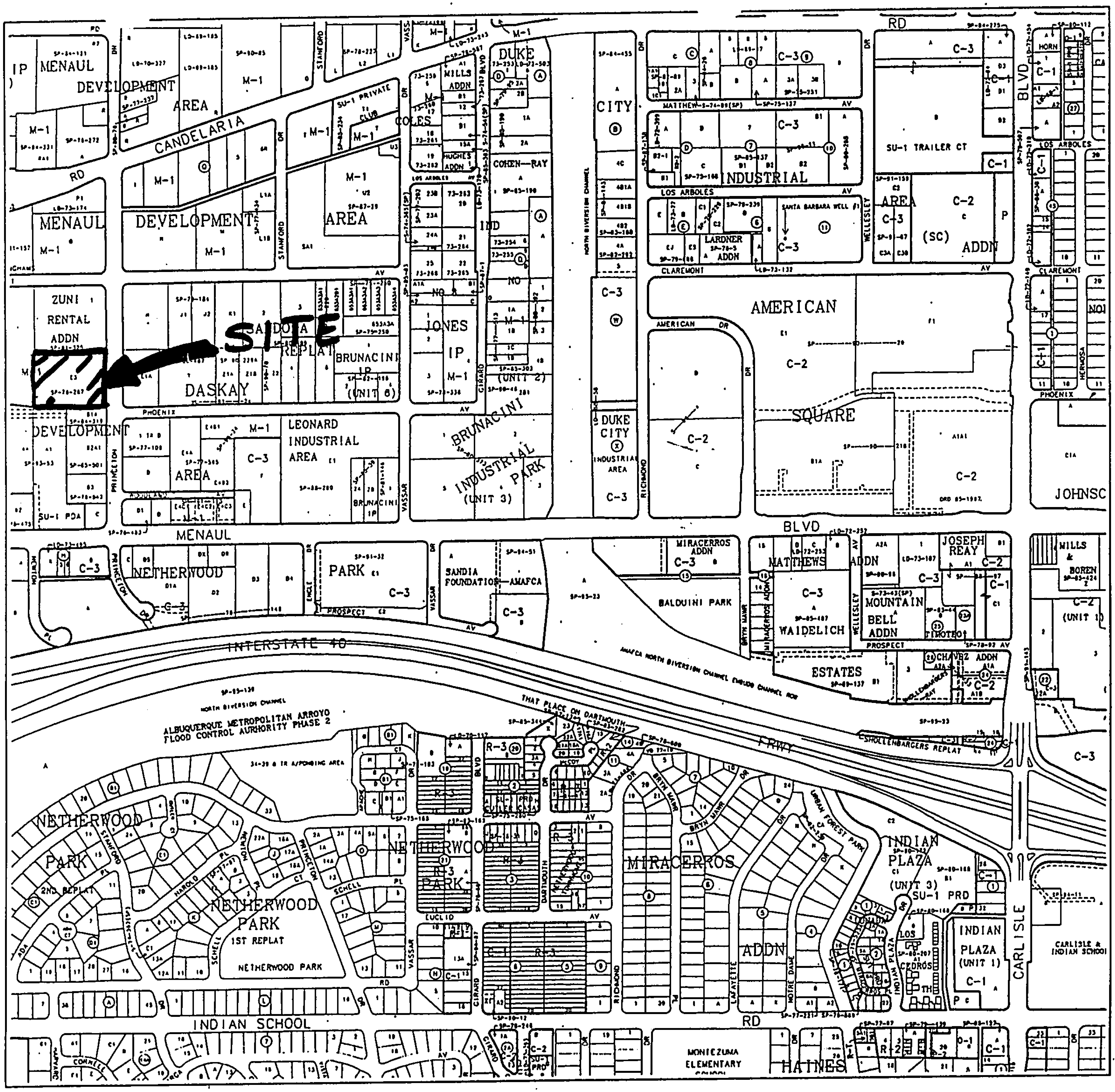
Existing Drainage Capacity

During the Pre-Design Meeting with Lisa Manwill on July 28, 1997, we discussed the existing drainage capacity of the public storm drain in Princeton Drive right-of-way and the Menaul Detention Basin. Ms. Manwill explained that there is not a capacity problem in the Menaul Detention Basin and that we could discharge all flows from the site to the storm drain. Since there is a problem with the battery of inlets downstream of the site at the intersection of Princeton and Phoenix, tying to the back of the existing Type "C" inlets adjacent to the site is preferable.

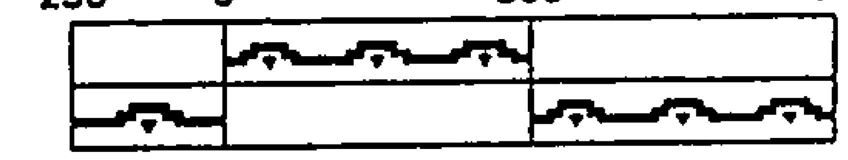
CONCLUSION

This plan has provided hydrologic, hydraulic and erosion control considerations of the proposed development of Lot E-3 of the Menaul Development Area. This information provides adequate supporting documentation and guidance for approval of this plan.

AGIS MAP H-16



GRAPHIC SCALE IN FEET

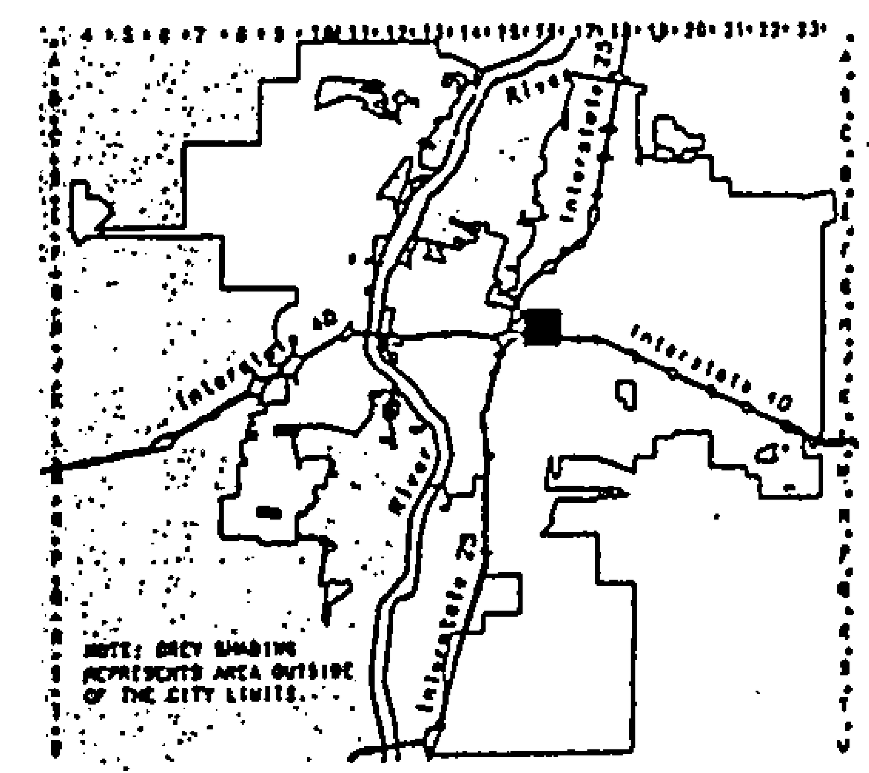


CITY OF Albuquerque

Albuquerque Geographic Information System

PLANNING DEPARTMENT

Map Amended through September 01, 1995



LEGAL DESCRIPTION

TION
R3E
SEC 10

UNIFORM PROPERTY CODE

1-016-059

H-16-Z

PRE-DESIGN MEETING MINUTES

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION/DESIGN HYDROLOGY SECTION

CONFERENCE RECAP

DRAINAGE FILE/ZONE ATLAS PAGE NO.: H16 DATE: 7-28-97

PLANNING DIVISION NOS: EPC: ______ DRB: ______

SUBJECT: ______

STREET ADDRESS (IF KNOWN): PRINCETON & PHOENIX (NW corner)

SUBDIVISION NAME: ______

APPROVAL REQUESTED:

____	PRELIMINARY PLAT	____	FINAL PLAT
____	SITE DEVELOPMENT PLAN	X	BUILDING PERMIT
____	OTHER	____	ROUGH GRADING

	WHO	REPRESENTING
ATTENDANCE:	KAREN BANKS	GRIENER
	MARK HOLSTAD	" "
	LISA MANWILL	COA

FINDINGS:

- There is no capacity problem in the Memorial Detention Basin => Free discharge.
- There is a problem w/ the type "D" inlets @ the intersection of Princeton & Phoenix.
- Divert your discharge to the type "C" inlets on Princeton.
- Can tie into back of existing Type "C" w/ an SO#19 permit.

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: Lisa Manwill SIGNED: ______

TITLE: Drainage Engr. TITLE: ______

DATE: 7-28-97 DATE: ______

NOTE PLEASE PROVIDE A COPY OF THIS RECAP WITH THE DRAINAGE SUBMITTAL

HYDROLOGY CALCULATIONS

URS Greiner

Job Preferred Pump Co — Project No. E30119500 — Sheet 1 of 6
Description Hydrology Site Characteristics — Computed By Karen B — Date 10-9-97
Checked By ______ — Date ______

Site Characteristics

Location: Northwest corner of Princeton & Phoenix

Zone Atlas Map # H-16

Hydrology Methodology: Rational Method according to the City of Albuquerque Development Process Manual, Vol. 2 Design Criteria, Sect. 22.2 Hydrology.

Precipitation Zone #2

	Land Treatment A	B	C	D
Excess Precipitation (inches)	0.53	0.78	1.13	2.12
Peak Discharge (cfs/acre)	1.56	2.28	3.14	4.70

Basin notation:

Basin A will drain to Princeton right-of-way in a sheet flow manner.
Basin B will drain to a proposed culvert connected to an existing inlet (southern-most inlet adjacent to site.

Basin Notation (cont.)

Basin O is the only offsite basin and will continue draining to Basin B.

Basin A currently sheet-flows to Princeton right-of-way.

Basin B currently sheet-flow to adjacent property south of site.

Existing Hydrologic Conditions

Basin ID	Land Treatment Areas (acres) A	B	C	D
A	0.3225	0.1348	0.0140	—
B	1.6817	0.2305	0.3419	0.0026
O	0.0224	0.0007	0.0432	—

Calculate Peak Discharge (cfs):

Basin A:

$$Q_{100yr-6hr} = 0.3225\,Ac\,(156\,\tfrac{cfs}{Ac}) + 0.1348\,Ac\,(2.28\,\tfrac{cfs}{Ac}) + 0.0140\,Ac\,(3.14\,\tfrac{cfs}{Ac}) = 0.85\,cfs$$

Basin B:

$$Q_{100yr-6hr} = 1.6817\,Ac\,(1.56\,\tfrac{cfs}{Ac}) + 0.2305\,Ac\,(2.28\,\tfrac{cfs}{Ac}) + 0.3419\,Ac\,(3.14\,\tfrac{cfs}{Ac}) + 0.0026\,Ac\,(4.70\,\tfrac{cfs}{Ac}) = 4.23\,cfs$$

Basin O:

$$Q_{100yr-6hr} = 0.0224\,Ac\,(1.56\,\tfrac{cfs}{Ac}) + 0.0007\,Ac\,(2.28\,\tfrac{cfs}{Ac}) + 0.0432\,Ac\,(3.14\,\tfrac{cfs}{Ac}) = 0.17\,cfs$$

Calculate Excess Precipitation (inches)

Basin A:

$$E = \frac{[0.3225\,Ac\,(0.53'') + 0.1348\,Ac\,(0.78'') + 0.0140\,Ac\,(1.13'')]}{(0.3225\,Ac + 0.1348\,Ac + 0.0140\,Ac)} \quad \rightarrow 0.04713\,Ac$$

$$E = 0.62''$$

Basin B:

$$E = [1.6817\,Ac\,(0.53'') + 0.2305\,Ac\,(0.78'') + 0.3419\,Ac\,(1.13'') + 0.0026\,Ac\,(2.12'')] \,/\, (1.6817\,Ac + 0.2305\,Ac + 0.3419\,Ac + 0.0026\,Ac)$$

$$E = 0.65''$$

URS Greiner

Job: Preferred Pump Co.
Description: Hydrology Existing Conditions
Project No. E30119500
Computed By: Karen B
Checked By:

Date: 10-9-97
Date:

Basin O: $$E = \frac{0.0224\,Ac(0.53") + 0.0007\,Ac(0.78") + 0.0432\,Ac(3.14")}{(0.0224\,Ac + 0.0007\,Ac + 0.0432\,Ac)}$$

$$E = 2.23"$$

Calculate Volume (acre-feet)

Basin A: $$V_{100yr-6hr} = \frac{0.62"}{12"/1'}[0.3225\,Ac + 0.1348\,Ac + 0.0140\,Ac]$$

$$V_{100yr-6hr} = 0.0243 \text{ ac-ft}$$

$$V_{100yr-24hr} = V_{100yr-6hr} + A_0^{0}(P_{24hr} - P_{6hr})/(12in/ft)$$

$$V_{100yr-24hr} = 0.0243 \text{ ac-ft}$$

Basin B: $$V_{100yr-6hr} = \frac{0.65"}{12"/ft}[1.6817\,Ac + 0.2305\,Ac + 0.3419\,Ac + 0.0026\,Ac]$$

$$V_{100yr-6hr} = 0.1219 \text{ ac-ft}$$

$$V_{100yr-24hr} = 0.1219 \text{ ac-ft} + \frac{0.0026\,Ac(2.75" - 2.35")}{12in/ft} = 0.1220 \text{ ac-ft}$$

Basin O: $$V_{100yr-6hr} = \frac{2.23"}{12in/ft}(0.0224\,Ac + 0.0007\,Ac + 0.0432\,Ac)$$

$$V_{100yr-6hr} = 0.0123 \text{ ac-ft}$$

$$V_{100yr-24hr} = V_{100yr-6hr} = 0.0123 \text{ ac-ft}$$

Basin ID	$Q_{100YR-6HR}$ (cfs)	$E_{100YR-6HR}$ (in)	$V_{100YR-6HR}$ (ac-ft)	$V_{100YR-6HR}$ (ac-ft)
A	0.85	0.62	0.0243	0.0243
B	4.23	0.65	0.1219	0.1220
O	0.17	2.23	0.0123	0.0123

URS Greiner

Job: Preferred Pump Co. | Project No. E30119500 | Sheet 5 of 6
Description: Hydrology Proposed Conditions | Computed By: Karen B. | Date: 10-9-97
Checked By: ______ | Date: ______

Proposed Hydrologic Conditions

Basin ID	Land Treatment Areas (Acres) A	B	C	D
A	—	0.0623	0.0150	0.4766
B	—	0.1682	0.4029	1.6856
O	0.0224	0.0007	0.0432	—

Calculate Peak Discharge (cfs):

Basin A: $Q_{100-6} = 0.0623\,Ac(2.28\,\frac{cfs}{Ac}) + 0.0150\,Ac(3.14\,\frac{cfs}{Ac}) + 0.4766\,Ac(4.70\,\frac{cfs}{Ac}) = 2.43\text{ cfs}$

Basin B: $Q_{100-6} = 0.1682\,Ac(2.28\,\frac{cfs}{Ac}) + 0.4029\,Ac(3.14\,\frac{cfs}{Ac}) + 1.6856\,Ac(4.70\,\frac{cfs}{Ac}) = 9.57\text{ cfs}$

Basin O: $Q_{100-6} = 0.17$ cfs (same as existing conditions)

Calculate Weighted Excess Precipitation (inches):

Basin A: $E = \frac{0.0623\,Ac(0.78'') + 0.0150\,Ac(1.13'') + 0.4766\,Ac(2.12'')}{(0.0623\,Ac + 0.0150\,Ac + 0.4766\,Ac)}$

$E = 1.94''$

Basin B: $E = \frac{0.1682\,Ac(0.78'') + 0.4029\,Ac(1.13'') + 1.6856\,Ac(2.12'')}{(0.1682\,Ac + 0.4029\,Ac + 1.6856\,Ac)}$

$E = 1.84''$

Basin O: $E = 2.23''$ (same as existing conditions)

URS Greiner

Job Preferred Pump Co | Project No. E30119500 | Sheet 6 of 6
Description Hydrology Proposed Conditions | Computed By Karen B | Date 10-9-97
Checked By | Date

Calculate Volume (ac-ft):

Basin A: $V_{100-6} = \frac{1.94''}{12 in/ft}(0.0623 Ac + 0.0150 Ac + 0.4766 Ac)$

$V_{100-6} = 0.0897$ ac-ft

$V_{100-24} = 0.0897 \text{ ac-ft} + \frac{0.4766 Ac(2.75''-2.35'')}{12 in/ft} = 0.1055$

Basin B: $V_{100-6} = \frac{1.84''}{12 in/ft}(0.1682 Ac + 0.4029 Ac + 1.6856 Ac)$

$V_{100-6} = 0.3467$ ac-ft

$V_{100-24} = 0.3467 \text{ ac-ft} + \frac{1.6856 Ac(2.75''-2.35'')}{12 in/ft} = 0.4028$ ac-ft

Basin O: $V_{100-6} = V_{100-24} = 0.0123$ ac-ft (same as existing conditions)

Basin ID	$Q_{100YR-6HR}$ (cfs)	$E_{100YR-6HR}$ (in.)	$V_{100YR-6HR}$ (ac-ft)	$V_{100YR-24HR}$ (ac-ft)
A	2.43	1.94	0.0897	0.1055
B	9.57	1.84	0.3467	0.4028
O	0.17	2.23	0.0123	0.0123

HYDRAULIC CALCULATIONS

URS Greiner

Job Preferred Pump Co.	Project No. E30119500	Sheet 1 of 5
Description Hydraulics Culverts	Computed By Karen B	Date 10-10-97
	Checked By [illegible]	Date 10-18-97

Hydraulics

Basins B & O will drain 9.74 cfs to an existing inlet via culvert(s) connecting to back of inlet. A swale will carry runoff to sediment trap, where it will then enter culvert(s).

Calculate size of drainage swale using Haestad computer program "FlowMaster."

Given: 1% longitudinal slope
3:1 side slopes
$Q = 9.74$ cfs
$n = 0.22$ (clean earth)

Size: Top width = 5.50'
Depth = 0.92'

(See attached FlowMaster output.)

The City will only allow up to 12" diameter pipe to be connected to the back of an inlet. Any pipe larger than 12" dia jeopardizes the structural integrity of the inlet.

Check Headwater req'd for culvert:

① Try 12" diameter ($A = 0.785 \text{ ft}^2$)

$Q = 0.6A\sqrt{2gh}$ (orifice equation)

$$h = \left(\frac{Q}{0.6A}\right)^2 \frac{1}{2g} = \left(\frac{9.74}{0.6(0.785)}\right)^2 \frac{1}{2(32.2)} = 6.63'$$

$HW = 6.63' + 0.5' = 7.13'$ ← From invert to springline.

Culvert Headwater (cont.)

(2) Try 2-12" diameter pipes

$Q = \frac{9.74 \text{ cfs}}{2} = 4.87 \text{ cfs}$

$h = \left(\frac{Q}{0.6A}\right)^2 \frac{1}{2g} = \left(\frac{4.87}{0.6(0.785)}\right)^2 \frac{1}{2(32.2)} = 1.66 \text{ ft}$

HW = 1.66' + 0.5' = 2.16' (from pipe invert to WSEL)

Use 2-12" diameter culverts

Check WSEL in pipe:

Use 2-12" dia. culverts
Q = 9.74 cfs / 2 pipes = 4.87 cfs / pipe
S = 0.02 ft per ft
n = 0.013

∴ Depth = 9.5" (See attached FlowMaster output)

EARTH DRAINAGE SWALE
Worksheet for Triangular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	3:1 swale
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.022	
Channel Slope	0.010000	ft/ft
Left Side Slope	3.000000	ft/ft (H:V)
Right Side Slope	3.000000	ft/ft (H:V)
Discharge	9.74	cfs

Results		
Depth	0.92	ft
Flow Area	2.51	ft^2
Wetted Perimeter	5.79	ft
Top Width	5.49	ft
Critical Depth	0.92	ft
Critical Slope	0.009805	ft/ft
Velocity	3.87	ft/s
Velocity Head	0.23	ft
Specific Energy	1.15	ft
Froude Number	1.01	
Flow is supercritical.		

12" CULVERT
Worksheet for Circular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	12" CULVERT
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

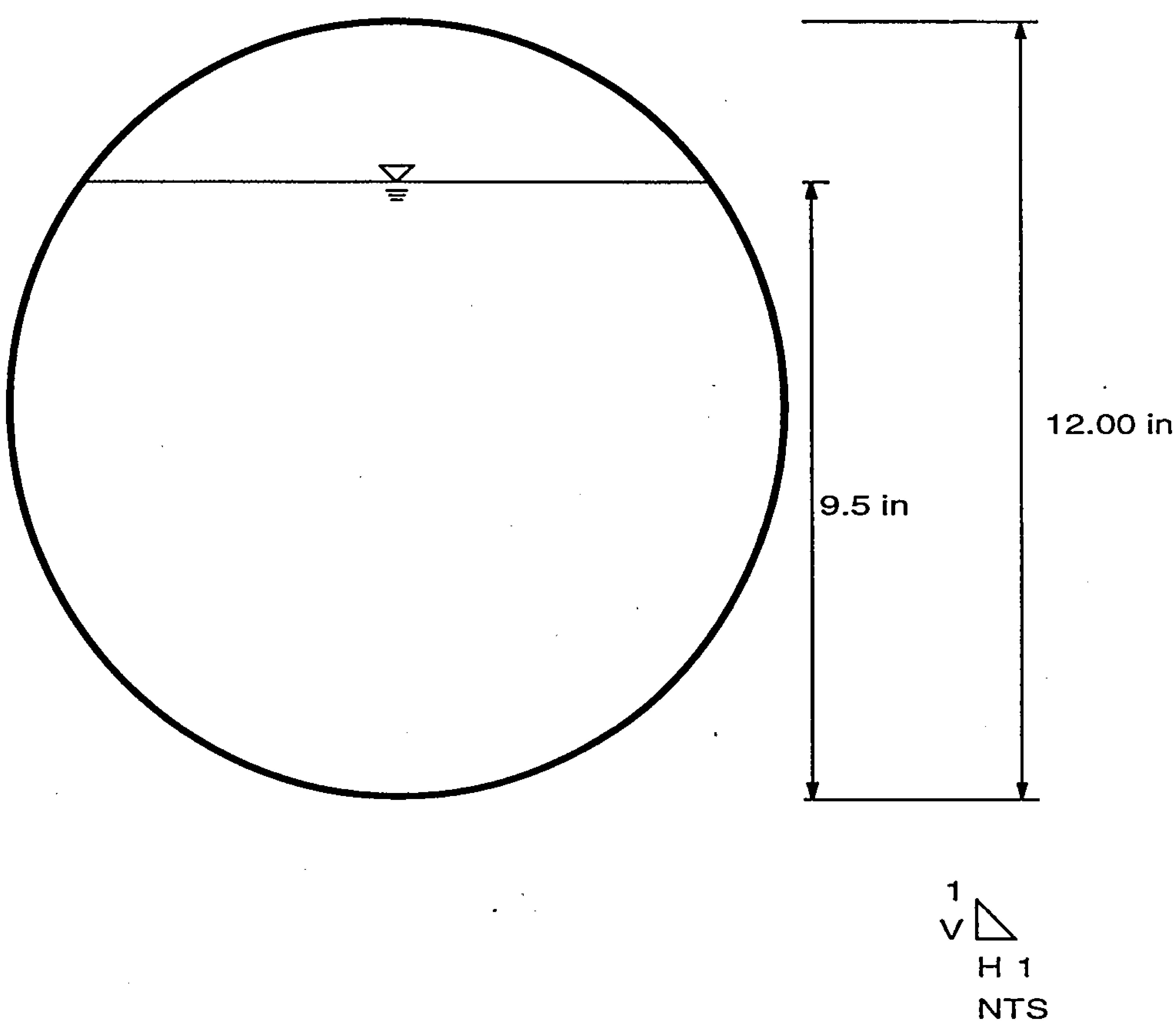
Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.020000	ft/ft
Diameter	12.00	in
Discharge	4.87	cfs

Results		
Depth	9.5	in
Flow Area	0.67	ft^2
Wetted Perimeter	2.19	ft
Top Width	0.81	ft
Critical Depth	0.91	ft
Percent Full	79.11	
Critical Slope	0.016320	ft/ft
Velocity	7.31	ft/s
Velocity Head	0.83	ft
Specific Energy	1.62	ft
Froude Number	1.42	
Maximum Discharge	5.42	cfs
Full Flow Capacity	5.04	cfs
Full Flow Slope	0.018686	ft/ft
Flow is supercritical.		

12" CULVERT
Cross Section for Circular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	12" CULVERT
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Channel Slope	0.020000	ft/ft
Depth	9.5	in
Diameter	12.00	in
Discharge	4.87	cfs



EROSION CONTROL CALCULATIONS

URS Greiner

Job: Preferred Pump Co	Project No. E30119500	Sheet 1 of 14
Description: Sediment Barrier Design	Computed By: Karen B	Date: 10-10-97
	Checked By: [signature]	Date: 10-18-97

Soil Classification

The Phase I Environmental Site Assessment & Limited Subsurface Assessment for this site (Western Tech., 7-17-97) lists the top 15' of soil as SM, silty sand.

The Soils Manual for Design of Asphalt Pavement Structures (MS-10) by the Asphalt Institute states that SM soil have the following characteristics:

coarse-grained soil: more than half of material is larger than #200 sieve size. ↳ (0.074mm)

sands: more than half of coarse fraction is smaller than #04 sieve size.

sands w/ appreciable amount of fines

① Silt fence:

Equivalent Opening Size (EOS) should be no larger than the openings in the U.S. Standard Sieve No. 70 (0.0083" or 0.21 mm)

(Ref: Erosion & Sediment Control Handbook, by Steven Goldman & Katharine Jackson

No fabric should be specified w/ an EOS smaller than U.S. Std. Sieve #100 (0.0059" or 0.15mm)

URS Greiner

Job: Preferred Pump Co. | Project No. E30119500 | Sheet 2 of 14
Description: Sediment Barrier Design | Computed By: Karen B | Date: 10-10-97
Checked By: [signature] | Date: 10-17-97

Sediment Trap

① More than half of soil is larger than #200 sieve (0.074 mm)
② More than half of coarse fraction is smaller than #4 sieve

From Particle Settling Velocity Curves:

if: Particle Size, y = 0.08 mm

then: Fall velocity, x = 0.02 ft/sec = v_s

Q = 9.74 cfs

A_s = basin surface area $\geq \frac{1.2Q}{v_s} = \frac{1.2(9.74\ ft^3/sec)}{0.02\ ft/sec}$

$A_s = 921\ ft^2$ ≥ ✓ $\frac{1.2Q}{v_s} = 584\ ft^2$

Calculate actual fall velocity for sediment trap:

$A_s = 1.2Q / v_s$

$v_s = 1.2Q / A_s = \frac{1.2(9.74\ ft^3/sec)}{921\ ft^2} = 0.0127\ \frac{ft}{sec}$

From Particle Settling Velocity Curves:

At 32°F : v_s = 0.0127 fps, particle size = 0.09 mm

At 86°F : v_s = 0.0127 fps, particle size = 0.06 mm

Sediment Trap Depth: d = 2.16′ (from HW calcs on p.7 of Hydraulics)
(Plus 0.54′ freeboard)

Sediment Trap (cont)

Length-to-width ratio: (should be greater than 2:1)
Length = 49'
Width = range from 13' to 23'

L:W ratio ranges from 2.1:1 to 3.8:1

Calculate Sediment Storage:

Freeboard = 0.54'

$V_{sed} = 0.54' (921 ft^2) = 497 ft^3$

Total Basin Area:

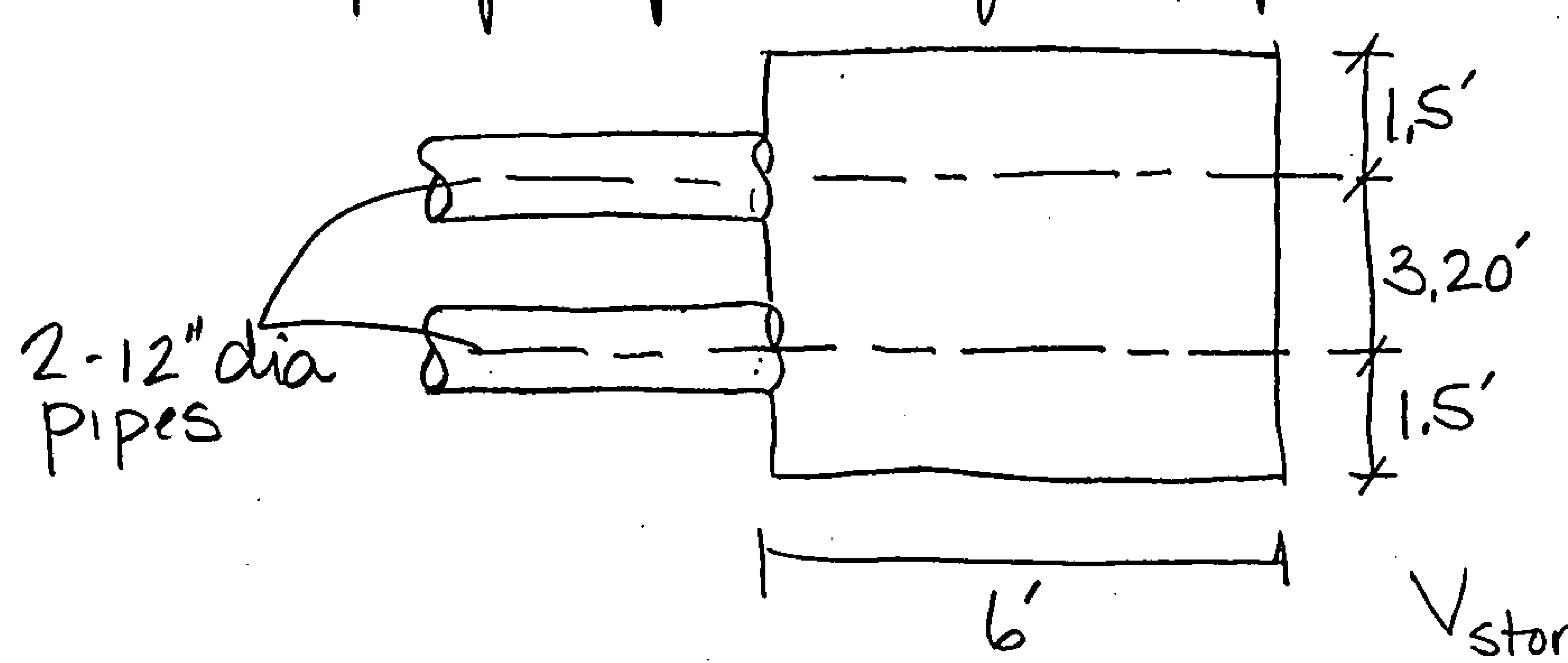
Basin B ⟹ $A_T = 0.1682 + 0.4029 + 1.6856 = 2.2567$ ac

Basin O ⟹ $A_T = 0.0224 + 0.0007 + 0.0432 = 0.0663$ ac

Basins B & O ⟹ $A_T = 2.3230$ ac

Sediment Storage = $\frac{497 ft^3 \text{ sediment}}{2.3230 \text{ Ac land}}$
$= 214 ft^3/ac = 8 yd^3/ac$

Use a riprap apron for pipe outlet



6" dia stone
Apron d = 1'

$V_{stone} = 37.2 ft^3$
$= 1.38 yd^3$

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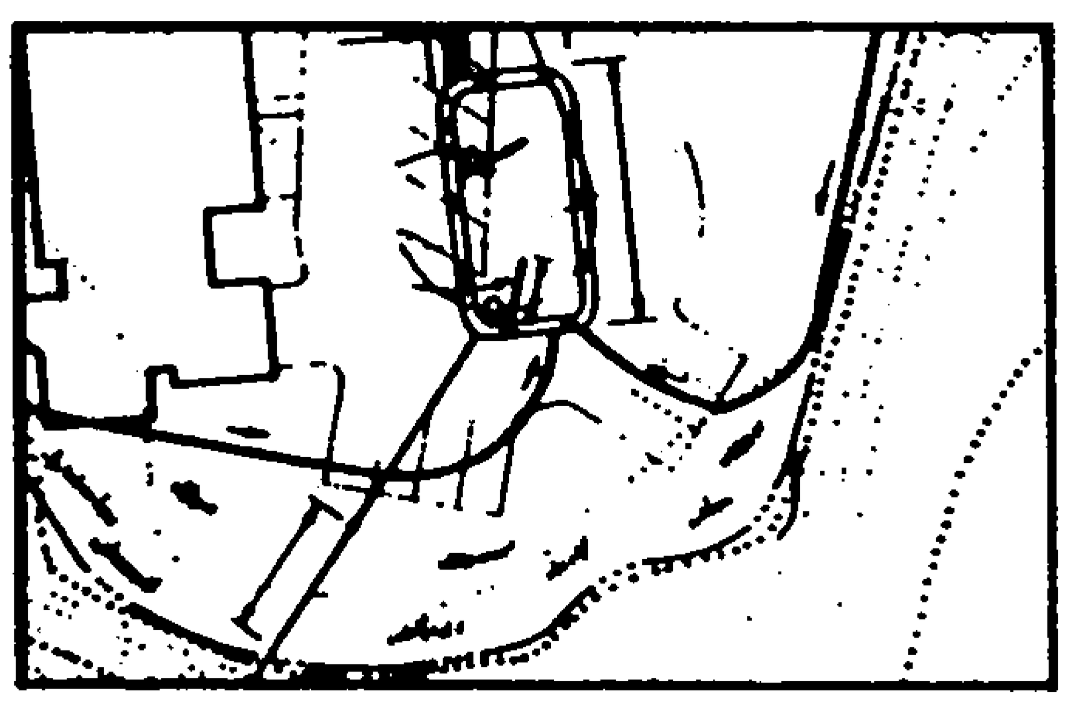
EROSION & SEDIMENT ·CONTROL· HANDBOOK



Steven J. Goldman
Katharine Jackson

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19. *Given:* The 15-acre (6-ha) site in Review Question 17 of Chap. 5.
Find: (1) The surface area of a sediment basin designed to capture the 0.02-mm particle in a basin serving the entire site.
(2) The depth necessary to provide storage for one year's predicted soil loss. (Answer provided in Appendix C.)

20. Compare the effectiveness of sediment basins and traps with on-slope measures such as vegetation and sediment barriers.

REFERENCES

1. Association of Bay Area Governments, *Manual of Standards for Erosion and Sediment Control Measures,* Oakland, Calif., 1981.
2. G. M. Fair, J. C. Geyer, and D. A. Okun, *Water and Wastewater Engineering,* vol. 2, John Wiley & Sons, Inc., New York, 1966.
3. A. Hazen, "On Sedimentation," *Transactions ASCE,* vol. 53, 1904.
4. M. McMillan, "Selection of Filter Fabrics for Use in Silt Fences," *Water Quality Technical Memorandum No. 63,* Association of Bay Area Governments, Oakland, Calif., 1981.
5. Metcalf and Eddy, Inc., *Wastewater Engineering,* McGraw-Hill Book Company, New York, 1972.
6. T. R. Mills and M. L. Clar, *Erosion and Sediment Control, Surface Mining in the Eastern U.S.,* U.S. Environmental Protection Agency, Washington, D.C., 1976.
7. E. L. Pemberton and J. M. Lara, *A Procedure to Determine Sediment Deposition in a Settling Basin,* U.S. Department of the Interior, Bureau of Reclamation Sedimentation Investigations Technical Guidance Series, Section E, Part 2, Denver, Colo., 1971.
8. V. L. Streeter, *Fluid Mechanics,* McGraw-Hill Book Company, New York, 1958.
9. U.S. Department of Agriculture, Soil Conservation Service, *Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas,* USDA, SCS, College Park, Md., 1975.
10. U.S. Department of the Interior, Bureau of Reclamation, *Design of Small Dams,* GPO, Washington, D.C., 1973.
11. Virginia Soil and Water Conservation Commission, *Virginia Erosion and Sediment Control Handbook,* Richmond, Va., 1980.

it. Although the fabric retains some soil particles by filtration at its surface, the portion of eroded soil that contacts the fabric is only a small portion of the total volume of retained solids. The reduction in runoff velocity at the fence causes suspended soil particles to settle.

Design Guidelines

A silt fence has the same design limitations as a straw bale dike:

- Drainage area 1 acre or less
- Maximum slope steepness 2:1
- Maximum flow path length to the fence 100 ft (30 m)
- No concentrated flows greater than 1 ft^3/sec

Figure 8.41 illustrates what can happen when a silt fence is placed on a slope that is too long and too steep.

A silt fence can last up to 6 months or longer, about twice as long as a straw bale dike. A properly installed silt fence is more effective than a straw bale dike and also more costly. The greater effectiveness of the silt fence is due to stronger construction, greater depth of ponding, and better installation practices. In addition, filter fabric allows fewer soil particles to pass through it.

Table 8.2 lists various commercially produced filter fabrics and some of their engineering characteristics; these fabrics are called *geotextiles* in the trade. The products are listed in alphabetical order by manufacturer, and no ranking or rating is implied. The addresses and phone numbers of the manufacturers are listed in Table 8.3. Because of the need to match the product to the job, and because product availability changes from year to year, it is best to contact the manufacturer when deciding which product to use for a particular application. For example, a fabric suitable for a silt fence is often unsuitable for a riprap lining, and vice versa. Manufacturers will also advise on local suppliers of their products.

Fig. 8.41 Silt fence collapsing at base of slope that was too long and too steep.

Selection of a filter fabric is based on soil conditions at the construction site [which affect the equivalent opening size (EOS) selection] and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet will have openings large enough to permit drainage and prevent clogging. The U.S. Army Corps of Engineers, in its Civil Works Construction Guide Specification for Plastic Filter Fabric, Specification CW-02215 (4), recommends the following criteria for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, is fine particles smaller than the U.S. standard sieve No. 200, the EOS should be equal to or smaller than the sieve size that 85 percent of the soil can pass through.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 [0.0083 in (0.21 mm)].

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than the openings of a U.S. Standard Sieve No. 100 [0.0059 in (0.15 mm)]. If 85 percent or more of a soil, by weight, is fine particles smaller than the openings in a No. 200 sieve [0.0029-in (0.074-mm)], filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS were too large, and they would clog the fabric quickly if the EOS were small enough to capture the soil.

Selection of fabric tensile strength and bursting strength characteristics depends on the support fence. Fabric attached to chain-link fence need not possess the same strength as one attached to a fence of 6- by 6-in (15- by 15-cm) reinforcing wire. Selection is thus based on standard engineering principles. Recommended fabric tensile strengths for various filter fence designs are listed in Table 8.4.

Other fabric characteristics also are important, such as retained strength after exposure to many hours of ultraviolet light. Many of the available fabrics meet a standard of better than 90 percent retained strength after exposure to 500 hr of light from a carbon arc. When comparing characteristics of fabrics made by different manufacturers, check to see if the fabrics were tested by using the same test standards.

Installation Procedure

As with straw bales, proper installation is important. Trenching, firmly setting posts, and securely stapling wire and fabric are key construction details. Figure 8.42 illustrates the basic steps outlined below.

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TABLE 8.2 Filter Fabric Characteristics*

Manufacturer	Fabric name	Material	Equiv. opening size (U.S. std. sieve size)	Permeability coefficient, cm/sec	Tensile strength, lb (kg)	Burst strength, lb/in² (kg/cm²)
American Enka	Stabilenka T-80	Polyester	230–270	0.065		
	Stabilenka T-100	Polyester	100	0.124	64 (29)	100 (7)
	Stabilenka T-140 N	Polyester	80–100	0.097	90 (41)	140 (10)
Amoco Fabrics	Propex 1199	Polypropylene	70–100	0.02	125 (57)	150 (11)
	Propex Silt Stop	Polypropylene	30–50	0.02	230 × 350 (106 × 159)	510 (36)
	Propex 4551	Polypropylene	70	0.02	175 (80)	300 (21)
Bradley Materials	Filterweave SF II	Polypropylene	40	0.01	120 (55)	300 (21)
	Filterweave 40	Polypropylene	40	0.01	150 (68)	300 (21)
	Filterweave 70	Polypropylene	70	0.02	300 × 225 (136 × 102)	500 (35)
	Polyfelt TS 500	Polypropylene	70–100	0.03	380 × 280 (173 × 127)	540 (38)
	Polyfelt TS 600	Polypropylene	70–100	0.03	140 (64)	Unknown
	Polyfelt TS 700	Polypropylene	70–100	0.03	200 × 185 (91 × 84)	Unknown
	Polyfelt TS 750	Polypropylene	70–100	0.03	320 × 260 (145 × 118)	Unknown
	Polyfelt TS 800	Polypropylene	70–100	0.03	330 × 325 (150 × 148)	Unknown
Carthage Mills	Polyfilter X	Polypropylene	70	0.033–0.038	400 × 380 (182 × 173)	Unknown
	Polyfilter GB	Polypropylene	40	0.2+	380 × 220 (173 × 100)	540 (38)
	Fabric 11	Polypropylene	40	0.005	200 × 200 (91 × 91)	600 (42)
					120 (55)	200 (14)
Dupont	Typar 3201	Polypropylene	30	0.027	67 (30)	
	Typar 3341	Polypropylene	50	0.032	125 (57)	
	Typar 3401	Polypropylene	70–100	0.02	135 (61)	
	Typar 3471	Polypropylene	100	0.02	200 (91)	220 (16)
	Typar 3601	Polypropylene	140–170	0.014	203 (92)	263 (19)
Exxon	GTF 100S	Polypropylene	50–100	—	100 (45)	235 (17)
	GTF 400E	Polypropylene	70–100	0.01	390 × 250 (177 × 114)	525 (37)
Foss	Geomat 400	Polyester	100	7.6	185 (84)	337 (24)
	Geomat 600	Polyester	120	5.4	250 (114)	468 (33)
	Geomat 700	Polyester	120	4.9	320 (145)	564 (40)
Hoechst	Trevira Spunbond 1115	Polyester	70–100	0.3	130 × 110 (59 × 50)	220 (15)
	Trevira Spunbond 1120	Polyester	50–70	0.3	175 × 155 (80 × 70)	290 (20)
	Trevira Spunbond 1127	Polyester	70–100	0.3	260 × 225 (118 × 102)	380 (27)
Mirafi	Mirafi 100X	Polypropylene	40–70	0.04	120 (55)	200 (14)
	Mirafi 140S	Polypropylene	70–100	0.10	125 (57)	125 (9)
Nicolon	Nicolon 40/30A	Polypropylene	40	0.16	300 × 225 (136 × 102)	440 (31)
	Nicolon 70/06	Polypropylene	70	0.41	375 × 250 (170 × 114)	490 (35)
	Nicolon 100/08	Polypropylene	80–100	0.10	375 × 300 (170 × 136)	575 (41)
	Kontrol Fence	Polypropylene	70		150 (68)	180 (13)
Phillips	Supac 4½ (UV)	Polypropylene	70–100	0.2	140 (64)	260 (18)
	Supac 3WS (UV)	Polypropylene	40	0.01	125 (57)	230 (16)
	Supac 8NP	Polypropylene	70–100	0.22	260 (118)	450 (32)

*Based on manufacturers' data. Not intended to be a complete list.

TABLE 8.3 Filter Fabric Manufacturers*

American Enka Company Enka, NC 28728 (704) 667-7713	Foss Manufacturing Company P.O. Box 277 Haverhill, MA 01830 (617) 374-0121
Amoco Fabrics Company 550 Interstate North Parkway Suite 150 Atlanta, GA 30099 (404) 955-0935	Hoechst Fibers Industries Spunbond Business Group P.O. Box 5887 Spartanburg, SC 29304 (800) 845-7597; from AK, HI, SC, and Canada, (803) 579-5282
Bradley Materials Company P.O. Box 368 Valparaiso, FL 32580 (904) 678-1105	Mirafi, Inc. P.O. Box 240967 Charlotte, NC 28224 (800) 438-1855; from NC, (704) 523-7477
Carthage Mills 1821 Summit Road Cincinnati, OH 45237 (513) 242-2740	Nicolon Corporation 3150 Holcomb Bridge Road Suite 300 Norcross, GA 30071 (404) 447-6272
E. I. DuPont de Nemours and Co., Inc. Explosives Products Division 1007 Market Street Wilmington, DE 19898	Phillips Fibers Corp. Engineered Products Marketing P.O. Box 66 Greenville, SC 29602 (803) 242-6600 or (800) 845-5737
Exxon Chemical Americas 380 Interstate North Suite 375 Atlanta, GA 30339 (404) 955-2300	

*Not intended to be a complete list

TABLE 8.4 Recommended Tensile Strength for Filter Fabric (4)

Structure	Tensile strength,* lb	(kg)
3-ft (0.9-m) silt fence with reinforced backing of 6-in (15-cm) wire mesh; posts 10 ft (3 m) apart	120	(54)
3-ft (0.9-m) silt fence without reinforced backing; posts 6 ft (1.8 m) apart	200	(91)
18-in (0.5-m) silt fence without reinforced backing; posts 10 ft (3 m) apart	100	(45)
18-in (0.5-m) silt fence without reinforced backing; posts 3 ft (0.9 m) apart	30	(14)

*Tensile strength measured by test procedure ASTM D-1682G, as commonly reported in manufacturers' literature.

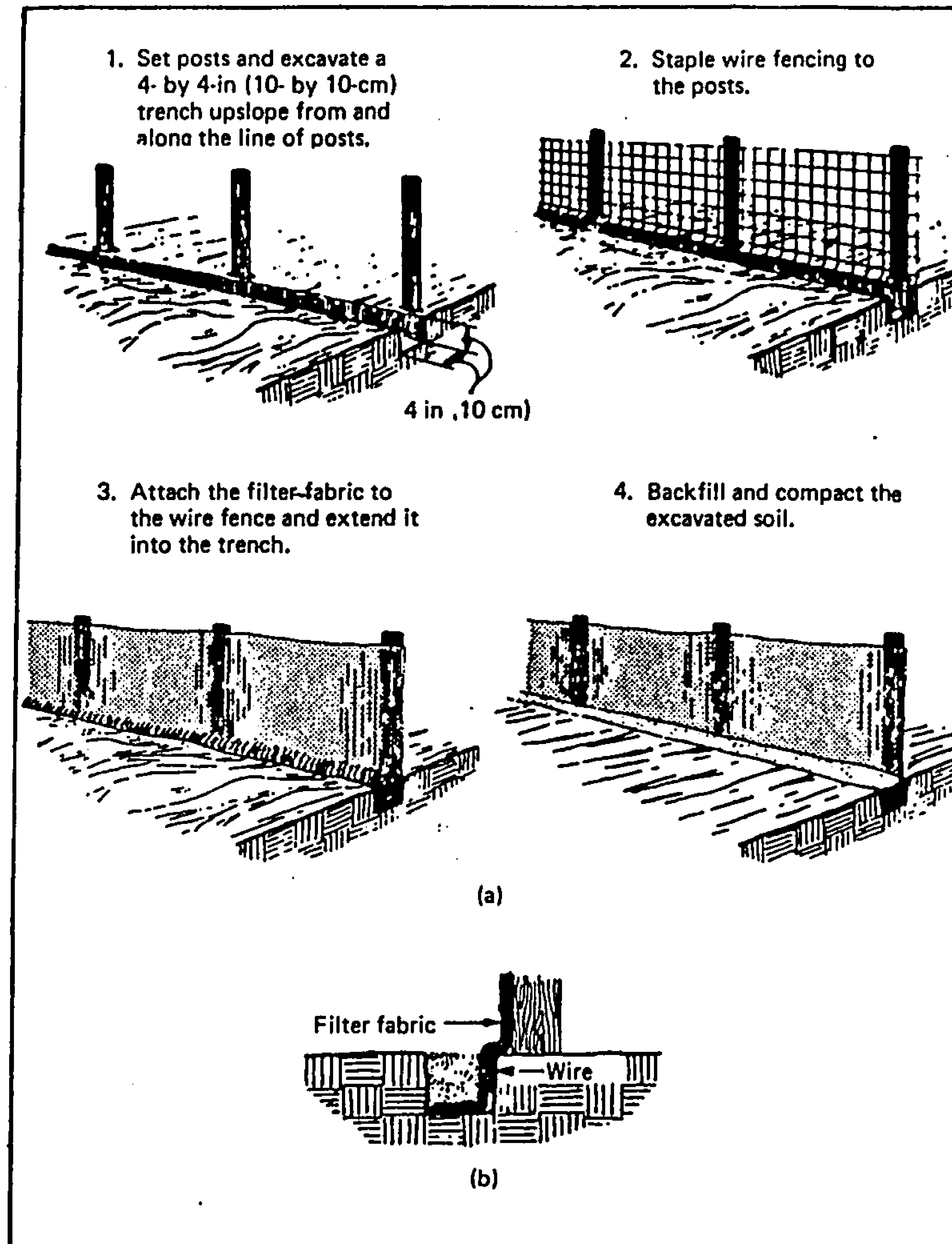

Fig. 8.42 Construction of a silt fence. (*a*) Installation sequence. (*b*) Extension of fabric and wire into the trench.

1. Lay out a suitable fence line and set posts along it. On slopes, align the fence *along the contour* as closely as possible. In small swales, curve the fence line upstream at the sides to direct the flow toward the middle of the fence. The sides should be higher than the center as illustrated in Fig. 8.36.
Space posts a maximum of 10 ft (3 m) apart and drive them at least 12 in (30 cm) into the ground. [When extra-strength fabric is used without the wire support fence, post spacing must not exceed 6 ft (1.8 m).] Posts for silt fences can be either 4-in- (10-cm-) diameter wood or 1.33 lb/ft (1.97 kg/m) steel with

a minimum length of 5 ft (1.5 m). Steel posts must have projections for fastening wire to them.

Excavate a trench approximately 4 in (10 cm) wide and 4 in (10 cm) deep along the line of posts and upslope from the barrier.

2. Fasten wire mesh securely to the upslope side of the posts. Use heavy-duty wire staples at least 1 in (2.5 cm) long and tie wires or hog rings. Extend the wire 6 in (15 cm) into the trench. Wire fence reinforcement for silt fences must be a minimum of 42 in (107 cm) wide, be a minimum of 14 gauge, and have a maximum mesh spacing of 6 in (15 cm). The 42-in (107-cm) length is needed so that 6 in (15 cm) can be extended into the trench and leave a 36-in (92-cm) support fence above the ground. (*Note:* When extra-strength fabric is used and fence posts are more closely spaced, the wire mesh can be omitted.)
3. Fasten the filter fabric to the uphill side of the fence posts, and extend it 6 to 8 in (15 to 20 cm) into the trench. The height of the fence should not exceed 36 in (0.9 m). Do *not* staple fabric onto trees. Cut the filter fabric from a continuous roll to avoid the use of joints. When joints are necessary, splice the filter cloth at a support post, with a minimum 6-in (15-cm) overlap, and securely fasten both ends to the post.
4. Backfill the trench over the toe of the fabric and compact the soil.

8.5c Straw Bale–Filter Fabric Combinations

Straw bales and filter fabric can be used together to construct a sediment barrier. The combination, although more expensive than either material used separately, compensates for the shortcomings of each. Straw bale dikes are frequently ineffective because they are not firmly staked and are not butted tightly together. When wrapped and secured with fabric, the bales have additional support and the gaps between bales are covered with filter material.

Figure 8.10 shows a straw bale–filter sediment barrier across a swale. Figure 8.43 shows a pair of straw bale–filter fabric barriers placed above and below a storm drain inlet on a paved street. Fabric has been secured on the upstream side of the first row of bales. To avoid damaging the pavement by staking, gravel has been piled behind the bales to hold them in place. Note that the bales extend across the curb. Loose straw has been packed under the bale in the gutter to prevent silt from escaping there.

Installation Procedure

1. Excavate a trench a few inches wider than the bales. Place the bales against the downslope side of the trench and anchor as described in Sec. 8.5a.
2. Place filter fabric or burlap against the upstream face of the bales and extend it into the trench. Staple the fabric to the bales with 6- to 9-in (15- to 23-cm) U-shaped wires.
3. Backfill the trench and compact the soil against the fabric and bales.

Fig. 8.43 Straw bale–filter fabric sediment barrier anchored with gravel.

8.5d Storm Drain Inlet Protection

A storm drain often carries runoff before its drainage area is stabilized, and it can convey large amounts of sediment to a stream or lake. If erosion is extensive, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the storm drain inlets.

The best way to prevent sediment from entering the storm drain system is to stabilize the site with vegetation as quickly as possible, trap sediment near its source with sediment barriers, and pave streets and install curbs and gutters on schedule. That is not always possible, so inlet protection should be provided to reduce the sediment load entering the storm drain system. Common materials used for that purpose include straw bales, filter fabric, gravel, and sand bags. Several types of inlet filters are described below. The choice of filter structure depends upon site conditions and type of inlet.

Sometimes it is convenient and cost-effective to construct the permanent storm drain system at the beginning of a project and use certain inlets as the risers for sediment basins or traps. The area around the inlet is excavated to form the storage area of the trap (Fig. 8.31).

The following inlet protection devices are for drainage areas of *less than 1 acre (0.4 ha)*. They are designed to keep sediment out of the storm drain, and they do *not* have a sediment storage area. Excavating an area around the inlet for deposition of sediment will improve the capture rate, reduce frequency of maintenance, and allow the device to serve an area larger than 1 acre (0.4 ha).

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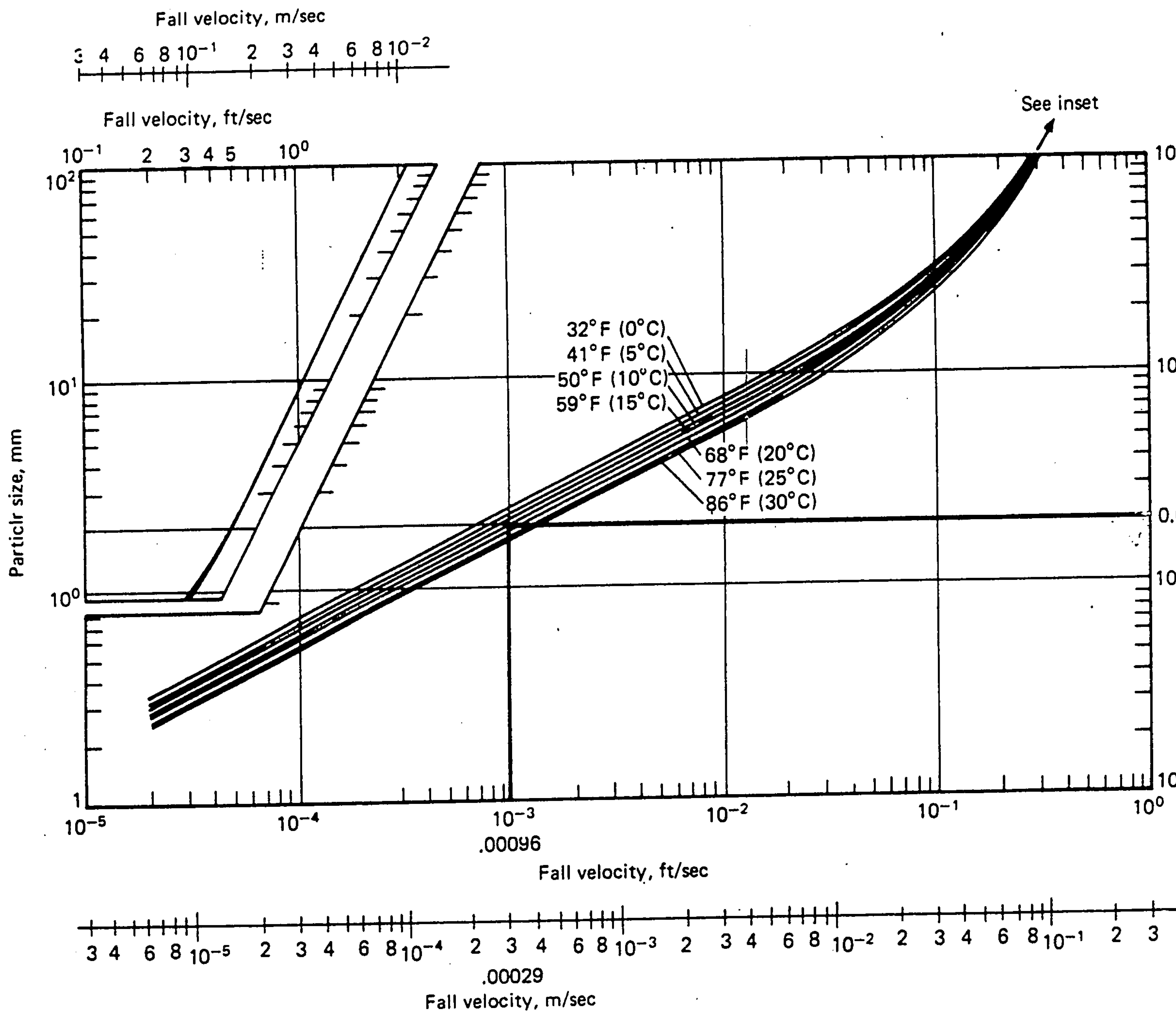


Fig. 8.12 Particle settling velocity curves. (7)

8.3d Outlet Protection

The outflow from a sediment basin may discharge into a storm drain system or into a natural drainageway. In the latter situation, outlet protection is required to ensure that erosion of the embankment and the natural channel does not occur. Figure 8.27 depicts a pipe protruding in midair; water falling out the end of the pipe eroded the embankment and completely filled the channel below with sediment.

The pipe outlet should be at the bottom of the embankment. The bottom of the pipe should be flush with the ground. Outlet protection, such as a riprap apron, should be provided (see Chap. 7).

8.4 DESIGN AND INSTALLATION OF SEDIMENT TRAPS

8.4a Design Factors

Surface Area

A sediment trap is a small sediment basin that drains an area of less than 5 acres (2 ha). It is sized by using a rule of thumb based on applying the surface area formula, $A = 1.2Q/V_s$, to a set of typical local conditions. To simplify the design process, a design storm and design particle size are preselected for a given geographical area. The rational method is applied to a hypothetical 1-acre (0.4-ha) site to find the Q to be used in the surface area formula. The design capacity is

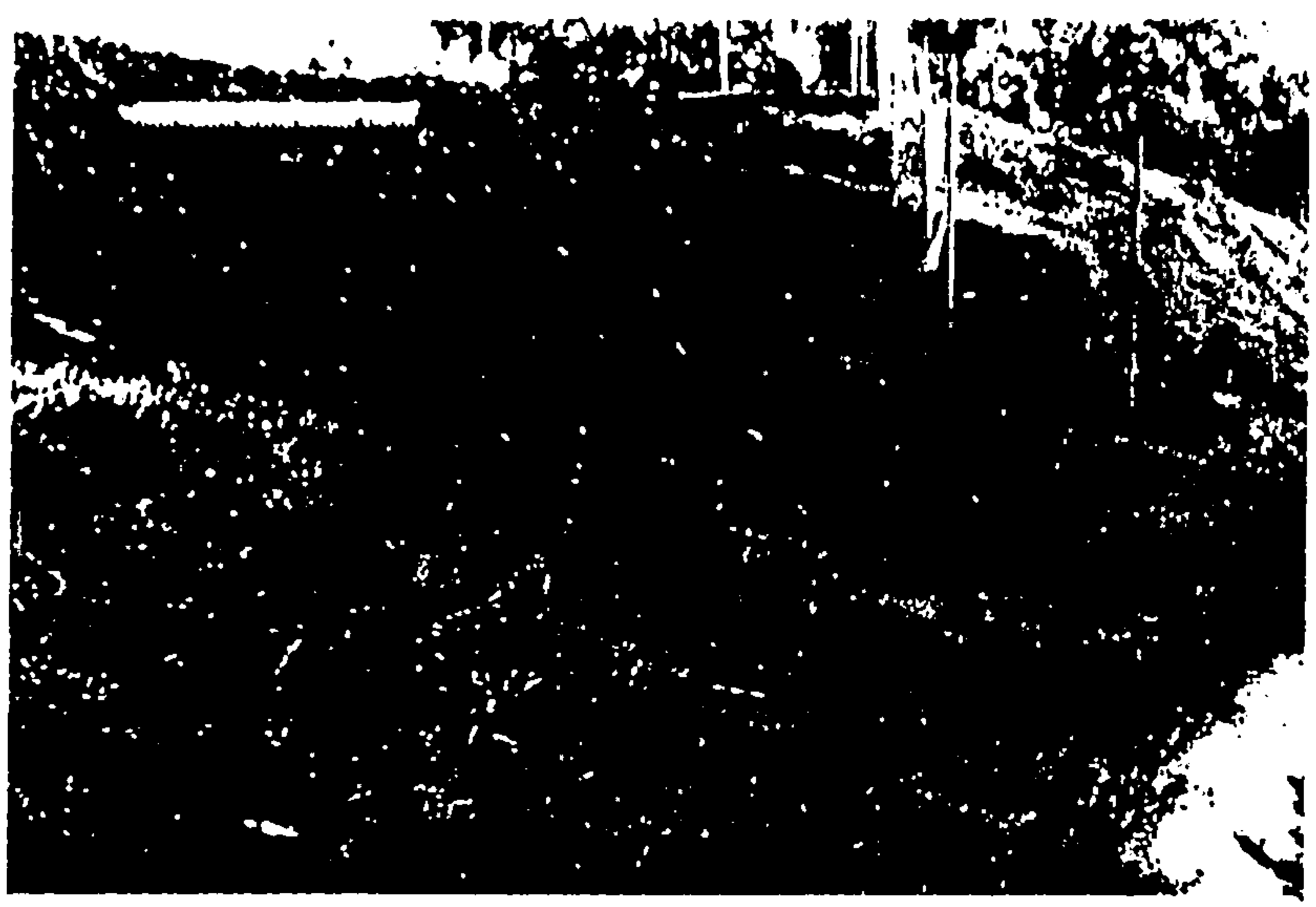


Fig. 8.27 Improper installation: pipe extends beyond embankment.

then expressed in square feet (square meters) of surface area required per acre (hectare) of drainage area.

In the San Francisco Bay Area, for example, the authors designed the standard sediment trap on the basis of a moderately high rainfall of 30 in (762 mm) per year and a 0.02-mm design particle size. The 10-year, 6-hr storm at a site in the Bay Area with 30 in (762 mm) annual rainfall is 2.5 in (64 mm), or 0.42 in/hr (11 mm/hr). A runoff coefficient C of 0.5 was chosen to represent a smooth, graded area with no vegetation (Table 4.1). Applying the rational method, we have

$$Q = C \times i \times A = 0.5(0.42 \text{ in/hr})(1 \text{ acre}) = 0.21 \text{ ft}^3/\text{sec}$$

Using the surface area formula and the 0.02-mm particle's settling velocity gives us

$$A = \frac{1.2Q}{V_s} = \frac{1.2(0.21 \text{ ft}^3/\text{sec})}{0.00096 \text{ ft/sec}} = 263 \text{ ft}^2/\text{acre} \ (60 \text{ m}^2/\text{ha})$$

This formula means that there should be 263 ft^2 of sediment trap surface area (when the trap is full of water) for each acre of drainage area to the trap. For areas with significantly different rainfalls or soil textures, trap sizes can be adjusted by reapplying the formula.

Determining a standard trap size per acre of drainage area makes design simpler. Because the drainage area of traps is small, precise sizing is normally not necessary. If, however, the downstream impacts would be substantial were the structure to fail or a different design storm or design particle size is desired, the trap should be sized by applying the sediment basin sizing procedures.

Depth

If a sediment trap is to be effective, sufficient settling depth must be provided and must be supplemented with a certain amount of storage depth. In the trap designed for the San Francisco Bay Area, a minimum depth of 2 ft (0.6 m) was chosen; this provides 1 ft (0.3 m) of settling and 1 ft (0.3 m) of storage. That is equivalent to 19.4 yd^3/acre (36.7 m^3/ha) of drainage area, of which 9.7 yd^3 (8.4 m^3) is intended for sediment storage. For many sites this minimum depth may not provide storage capacity for an entire season's sediment yield.

To plan for a season's storage capacity, calculate the sediment yield and find the depth required on the basis of the surface area of the trap. If the soils in an area are relatively uniform, a standard depth per acre could be calculated by making assumptions about the factors in the USLE in much the same way as the standard surface area was determined by using the rational method and surface area formulas.

Cleaning

If depth for one season's sediment yield *cannot* be provided, either because of the site conditions or because a maximum depth limit is imposed by a local jurisdiction, periodic cleaning will have to be done. Since cleaning is difficult to guarantee, it is worthwhile to look for other ways to reduce the required depth (e.g., reduce sediment yield).

Additional midslope diversions to shorten slope length or the use of more sediment barriers may help. Installing several traps instead of one will provide more storage volume while minimizing the need to excavate. Example 8.4 illustrates the calculation of sediment storage volume, and some possible trade-offs are discussed.

Length-to-Width Ratio

The minimum length of flow through the trap should be 10 ft (3 m) where that is feasible. For traps draining less than 1 acre (0.4 ha), a minimum L/W ratio of 2:1 is suggested. Traps handling runoff from 1 to 5 acres (0.4 to 2 ha) should have an L/W ratio greater than 2:1.

Siting

A sediment trap should be built as close as possible to the source of sediment. It should be sited to impound runoff from the disturbed area only. In most cases, *the trap should not be built in a watercourse.* A sediment basin or trap located in a stream channel will needlessly impound clean runoff from undisturbed areas and necessitate a larger and more costly structure.

By using the natural depressions and the existing topography for storage areas and treating only the on-site runoff, it is often possible to construct several small traps and avoid construction of larger, more expensive basins. A trap can be built across a small drainageway as long as the drainage area does not exceed 5 acres (2 ha). Make sure, however, that the trap discharge structure can handle the peak flows from the area.

Never build basins or traps in series. A sediment basin or trap should *never* discharge into another basin or trap. A basin or trap is sized to remove suspended sediment from a certain flow. Placing several small basins in series overloads each one with the total flow from the entire drainage area above it. Also, the load may cause failure of the embankments.

EXAMPLE 8.4 Calculation of Sediment Storage in a Sediment Trap

Given: The 4-acre (1.6-ha) site in Example 5.6. A sediment trap will be constructed to capture sediment eroded from the entire site.

Find: The annual soil loss from the site, the volume of sediment that the trap should capture in 1 year, and the required frequency of cleaning.

Solution: The trap will be designed to capture particles 0.02 mm and larger by using the formula 263 ft²/acre (60 m²/ha) of drainage (see Sec. 8.4a). The trap will be 2 ft (0.6 m) deep.

STEP 1. *Soil Loss.* In the example in Sec. 5.2i, we calculated the soil loss as follows:

$$\text{Soil loss} = R \times K \times LS \times C \times P = 34(0.34)(8.16)(1.0)(0.9)$$

$$= 84.9 \text{ tons/(acre)(year)} \qquad 190.5 \text{ t/(ha)(yr)}$$

We assume that 1 ton of sediment deposited in a trap will occupy approximately 1 yd³ (assume 1 t = 0.84 m³), so the volume of eroded soil is estimated to be 85 yd³/acre (160 m³/ha). Multiplying by the area of the site gives us

$$(85 \text{ yd}^3/\text{acre})(4 \text{ acres}) = 340 \text{ yd}^3 \; [(160 \text{ m}^3/\text{ha})(1.6 \text{ ha}) = 256 \text{ m}^3] \text{ soil loss per year}$$

STEP 2. *Sediment Capture.* The volume of soil captured in the trap is estimated by multiplying the soil loss by the trap efficiency. Trap efficiency is defined as the percent by weight of soil particles larger than or equal to the design particle size. Because 79.1 percent of this soil is larger than or equal to 0.02 mm, trap efficiency for this soil type is, ideally, about 79 percent.

$$(340 \text{ yd}^3)(0.79) = 269 \text{ yd}^3 \; [(256 \text{ m}^3)(0.79) = 202 \text{ m}^3]$$

STEP 3. *Cleaning Frequency.* The available storage in a sediment trap designed with 263 ft²/acre (60 m²/ha) of drainage with a 1-ft (0.3-m) settling depth and a 1-ft (0.3-m) storage is:

$$(263 \text{ ft}^2)(1 \text{ ft})(4 \text{ acres}) = 1050 \text{ ft}^3 \text{ storage}$$

$$[(60 \text{ m}^2/\text{ha})(0.3 \text{ m})(1.6 \text{ ha}) = 29 \text{ m}^3 \text{ storage}]$$

Convert cubic yards of sediment captured to cubic feet and compare with the storage volume:

$$\frac{(269 \text{ yd}^3)(27 \text{ ft}^3/\text{yd}^3)}{1050 \text{ ft}^3} = 6.9 \qquad \left(\frac{202 \text{ m}^3}{29 \text{ m}^3} = 6.6\right)$$

Thus, sediment would have to be cleaned out of the trap at least 6 times in a normal year.

Note: There are several ways to reduce soil loss. *Straw mulch* is very effective at reducing erosion. If 1.5 tons/acre (3.4 t/ha) of straw mulch were applied and tacked into the soil, C would decrease from 1.0 to 0.2 (see Table 5.6). Thus the soil loss would be reduced by 80 percent:

New $C = 0.2$

Soil loss $= R \times K \times LS \times C \times P = 85(0.2) = 17$ tons/acre = approximately 17 yd³/acre (32 m³/ha)

Multiplying by site acreage and trap efficiency and comparing with the storage volume gives us

$$\frac{(17 \text{ yd}^3)(4 \text{ acres})(0.79)(27 \text{ ft}^3/\text{yd}^3)}{1050 \text{ ft}^3} = 1.4 \text{ times per season}$$

$$\frac{[(32 \text{ m}^3)(1.6 \text{ ha})(0.79)}{29 \text{ m}^3} = 1.4$$

With 1.5 tons/acre (3.4 t/ha) of straw mulch punched into the soil, soil loss is extremely small. This amount provides complete surface coverage, so no raindrop impact occurs and infiltration of water is maximized.

8.4b Construction Considerations

Sediment traps are constructed by:

- Excavating a hole in the ground
- Creating an impoundment with a low-head dam

Sediment traps should be located outside the area being graded and should be built prior to the start of grading activities or removal of existing vegetation. Constructing the traps first will provide protection from the first erosion. To minimize the area disturbed by them, the sediment traps should be located in natural depressions or in small swales or drainageways. Traps should be dimensioned to fit the site conditions and be so located as to facilitate periodic cleaning and not interfere with construction operations.

Embankments

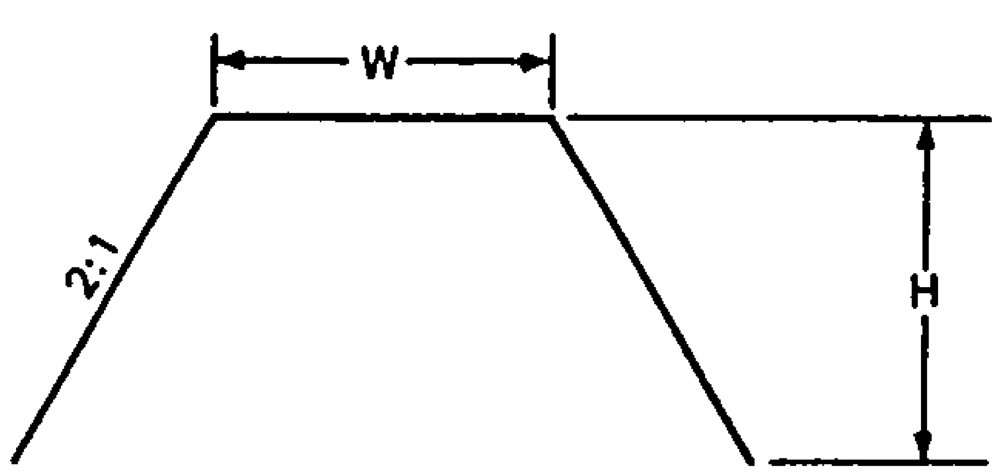
The embankments can be up to 5 ft (1.5 m) high and should be constructed and compacted in 8-in (20-cm) lifts. Minimum top widths for various embankment heights are listed in Fig. 8.28. Side slopes should not be steeper than 2:1. The embankment should be seeded with temporary vegetation.

Outlets

The outlet can be a spillway in the embankment, a gravel section of the embankment, or a pipe (Fig. 8.29). The width, in feet, of earth or stone outlets should be roughly equal to 2 to 3 times the number of acres draining to the trap. The outlet crest should be at least 1 ft (0.3 m) below the top of the embankment. The outlet should be free of any restriction to flow.

The portion of the embankment below a stone outlet must be relatively impervious (e.g., timber, concrete block, or straw bales) to cause ponding. This impervious core should be covered by 6 in (15 cm) of stone. The crushed stone or gravel used in the outlet should meet American Association of State Highway Transportation Officials (AASHTO) M43, size No. 2 or 24, or its equivalent (such as MSHA No. 2).

A pipe outlet is commonly used in a sediment trap. Either plastic or corrugated pipe is installed as the embankment is built. The fill material around the pipe should be compacted in 4-in (10-cm) lifts. A minimum of 1.5 ft (0.5 m) of



H, ft (m)	*W*, ft (m)
1.5 (0.46)	2.0 (0.61)
2.0 (0.61)	2.0 (0.61)
2.5 (0.76)	2.5 (0.76)
3.0 (0.91)	2.5 (0.76)
3.5 (1.1)	3.0 (0.91)
4.0 (1.2)	3.0 (0.91)
4.5 (1.4)	4.0 (1.2)
5.0 (1.5)	4.5 (1.4)

Spillway elevation should be 1 ft (0.3 m) below the top of the embankment. Pipe riser elevation should be at least 1.5 ft (0.46 m) below embankment top.

Fig. 8.28 Minimum top widths for sediment trap embankments of various weights. (11)

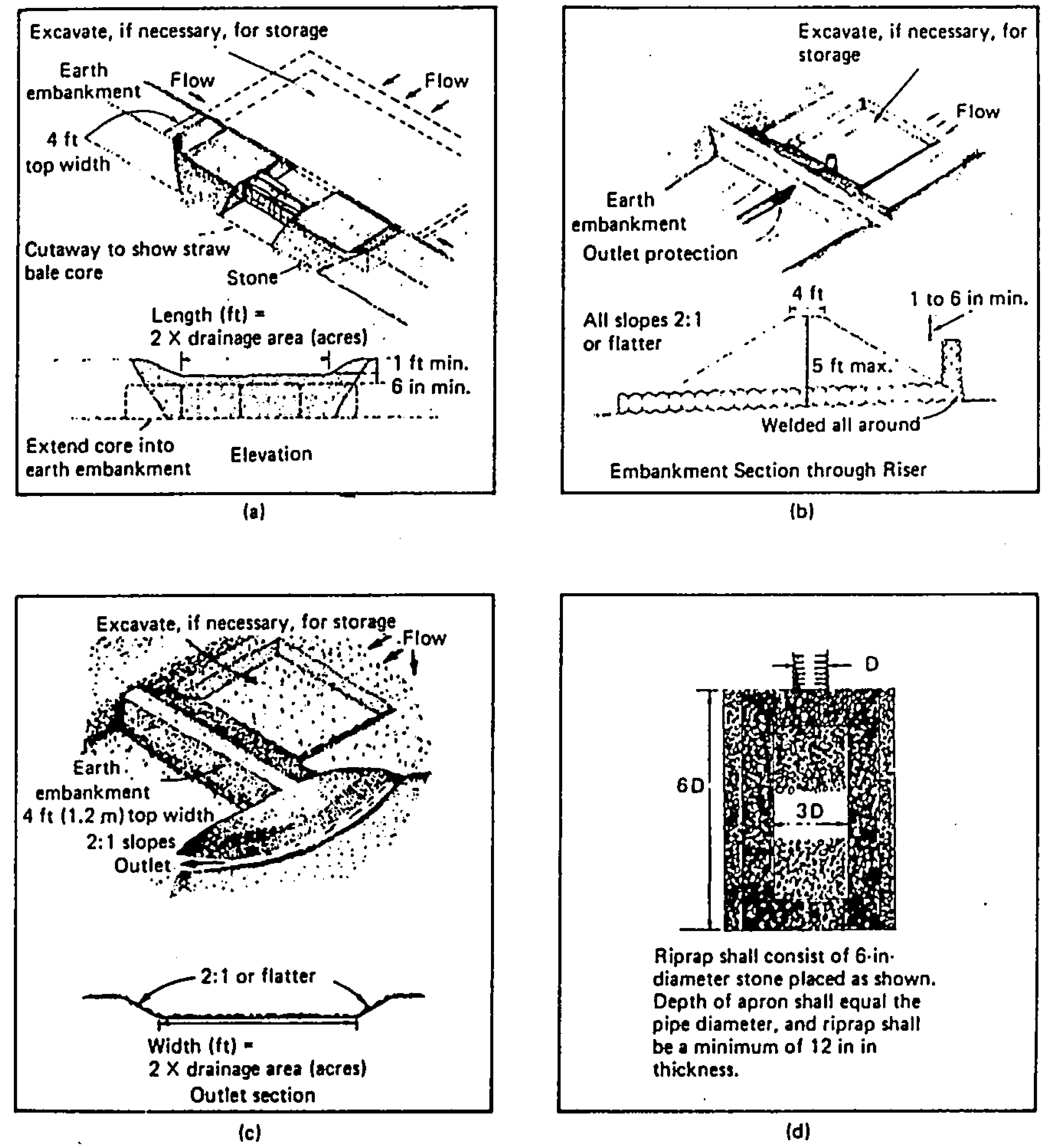


Fig. 8.29 Example of sediment trap outlets for drainage areas of less than 5 acres: (*a*) stone outlet; (*b*) pipe outlet; (*c*) earth outlet; (*d*) riprap apron for pipe outlets. (Adapted from 9)

fill should cover the pipe—2 ft (0.6 m) if equipment will be crossing over the embankment.

The pipe outlet should be constructed with a riser so that the trap fills to a depth of at least 1 ft (0.3 m) for storage and 1 ft (0.3 m) for settling. Figure 8.30 shows a sediment trap without a riser. This trap will not capture much sediment. The riser pipe can be of the same type as the pipe through the embankment. The diameter of the riser may be equal to or greater than the diameter of the pipe through the embankment, but the connection between the two pipes must be watertight. The top of the embankment should be at least 1.5 ft (0.5 m) above

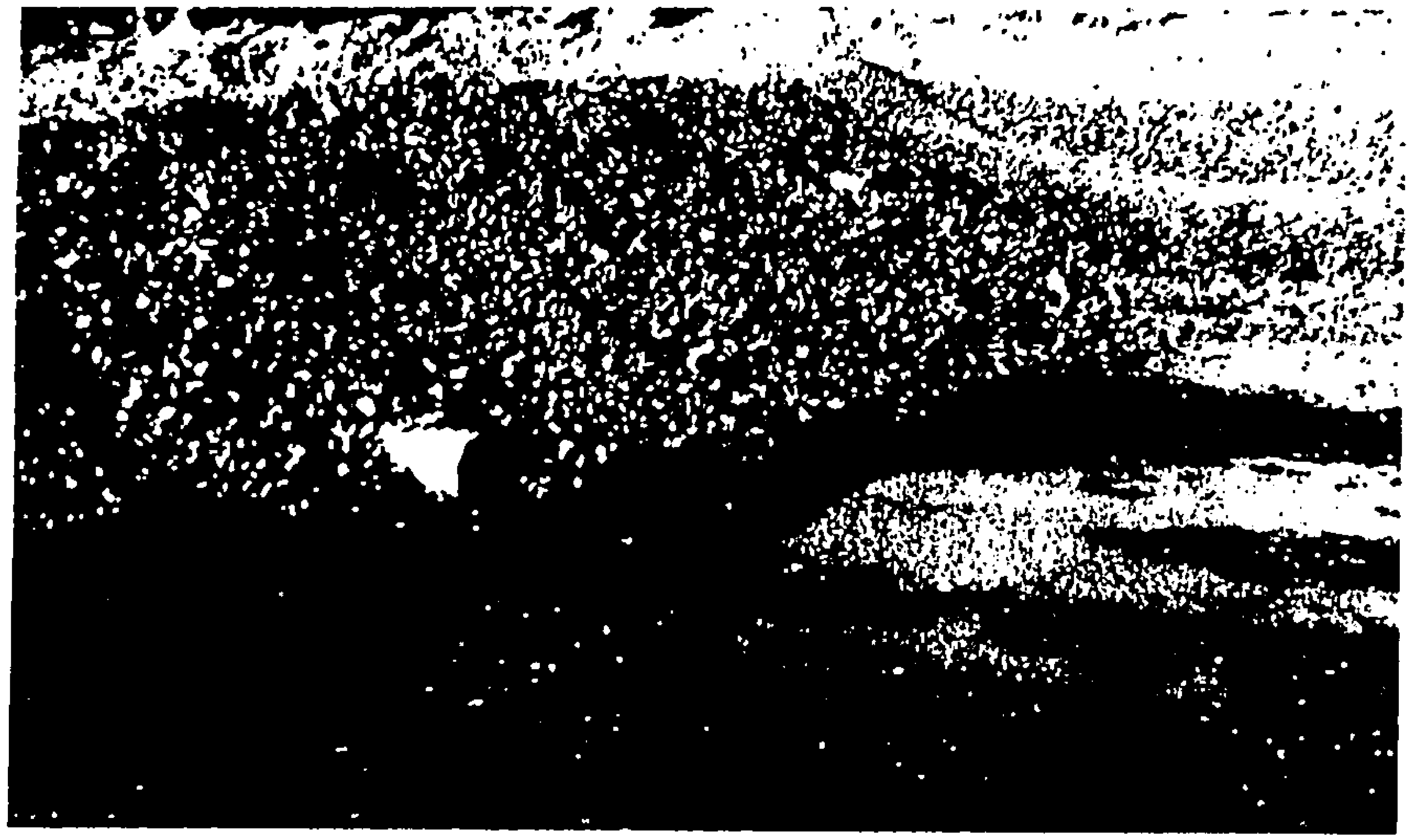


Fig. 8.30 Ineffective sediment trap: no settling or storage depth.

the crest of the riser. Perforations in the riser should be kept to a *minimum.* A gravel base may be used to reduce flotation of the riser. (See the discussion of sediment basin design for further details.) Pipe diameter can be selected from the following table (9), but it should be checked by an engineer to ensure that the pipe has the capacity to carry peak flows:

Min. pipe diameter, in (cm)	Max. drainage area, acres (ha)
12 (30)	1 (0.4)
18 (46)	2 (0.8)
21 (53)	3 (1.2)
24 (61)	4 (1.6)
30 (76)	5 (2.0)

Outlet Protection

Whenever a flow of water is channeled or concentrated, protection from erosion at the outlet is usually needed. A pipe outlet should have a riprap apron below it. Figure 8.29 includes a sample drawing of a riprap apron for a pipe outlet. The apron should be 3 times as wide and 6 times as long as and equal in depth to the diameter of the pipe. The stones should be 6 in (15 cm) in diameter and be placed at least 12 in (20 cm) deep. The soil beneath the apron must be excavated so that the top of the stones will be roughly level with the bottom of the pipe. This apron is sized for flows from a drainage area of 5 acres (2 ha) or less. Outlet protection is discussed in more detail in Sec. 7.8b. If a sediment trap discharges into a paved street or a lined channel, additional outlet protection is probably unnecessary.

Excavated Sediment Traps

An excavated trap is simpler to build than an impoundment: A hole of the proper size is dug, and an outlet is provided. Excavated sediment traps can have the same kinds of outlets as are illustrated in Fig. 8.29. More frequently, though, excavated traps are constructed around storm drain inlets. Use of permanent storm drain inlets lowers the cost of the erosion control measures by avoiding the need to construct separate temporary structures. Outlet and channel bed erosion, a frequent and difficult problem on many sites, does not occur when storm drains serve as sediment trap outlets. Figure 8.31 is a sample drawing of an excavated trap around a storm drain inlet. The trap should be 2 ft (0.6 m) deep and have a surface area calculated by using the surface area formula. The shape can be suited to the location, but long, narrow shapes work best. One or two weep holes in the inlet will allow dewatering. Cleaning is required when the depth is reduced to 1 ft (0.3 m).

An excavated trap can be built in a small swale. This type of trap is similar to a check dam. The primary difference is the greater volume of sediment storage

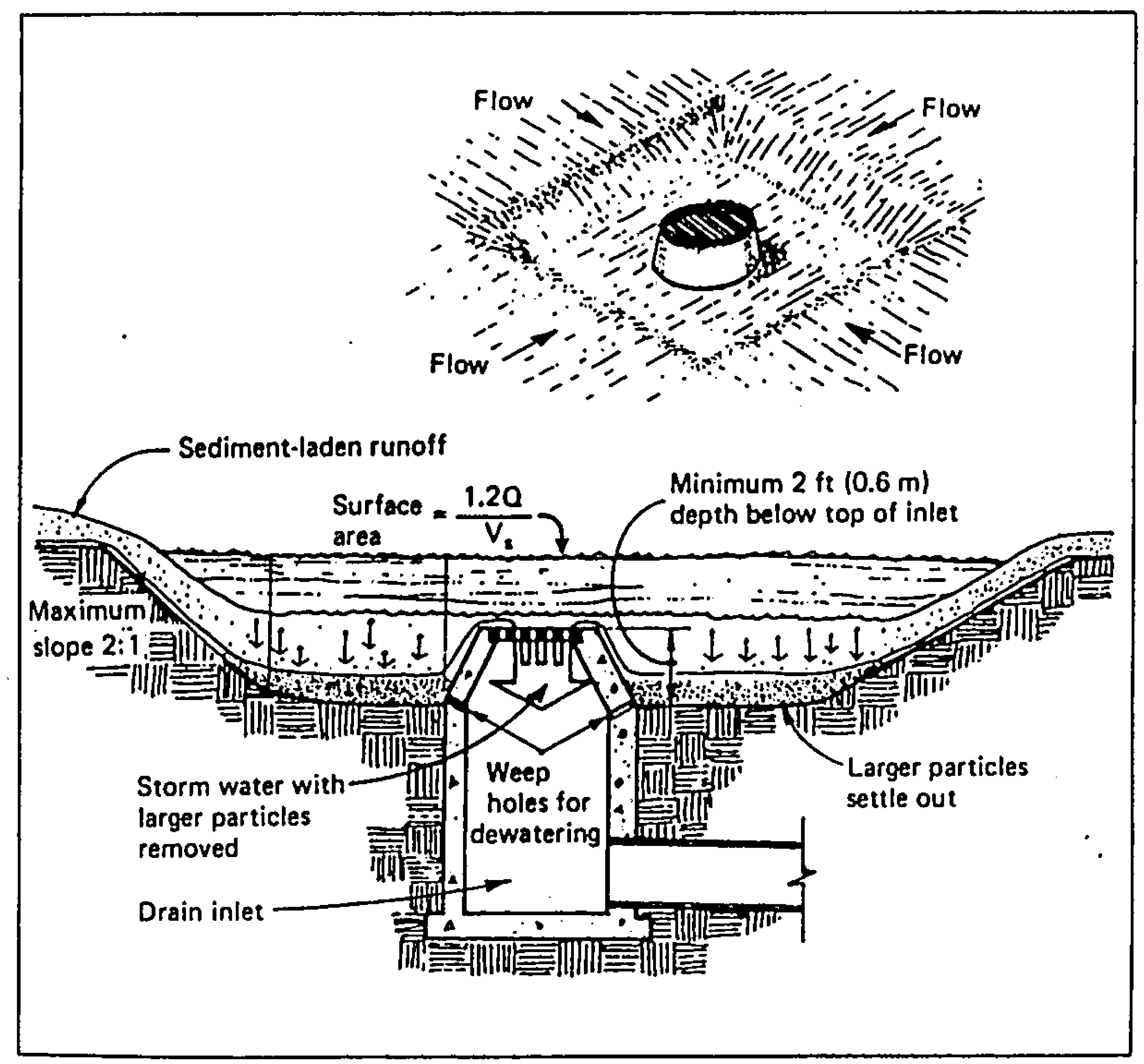


Fig. 8.31 Sample drawing: excavated sediment trap with storm drain inlet as outlet. (Adapted from 11)

H/H

DRAINAGE INFORMATION SHEET

PROJECT TITLE: PREFERRED PUMP CO. ZONE ATLAS/DRNG. FILE #: H-16 126

DRB #: ______ EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lot E-3, Menaul Development Area w/in Sect. 10, T10N, R3E, NMPM

CITY ADDRESS: ______

ENGINEERING FIRM: URS Greiner CONTACT: Karen Banks

ADDRESS: 5971 Jefferson NE, #101, 87109 PHONE: 345-3999

OWNER: Sadler Southwest, Ltd. CONTACT: Lou Sadler

ADDRESS: P.O. Box 21640 PHONE: 856-7939

ARCHITECT: Masterworks CONTACT: Jim Clark

ADDRESS: 516 Eleventh St. NW, 87102 PHONE: 242-1866

SURVEYOR: Land Links Co., Ltd. CONTACT: Glen Thurow

ADDRESS: 8415 Washington Pl. NE #B1 PHONE: 856-9899

CONTRACTOR: ______ CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

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

PRE-DESIGN MEETING:

- X YES
- ___ NO
- X COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D. APPROVAL
- ___ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- X BUILDING PERMIT APPROVAL
- ___ CERTIFICATE OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- X OTHER SO 19 (SPECIFY)

DATE SUBMITTED: 9-2-97

BY: Karen Banks

RECEIVED
SEP 02 1997
HYDROLOGY SECTION

URS Greiner

URS Greiner, Inc.
5971 Jefferson Boulevard, N.E.
Suite 101
Albuquerque, New Mexico 87109
Telephone: (505) 345-3999
Facsimile: (505) 345-8393
Offices in Principal Cities Nationwide

September 2, 1997

Mrs. Lisa Manwill
City of Albuquerque
Development and Building Services Center
600 2nd Street NW
Plaza Del Sol 2nd Floor
Albuquerque, New Mexico 871

RE: GRADING & DRAINAGE PLAN FOR LOT E-3, MENAUL DEVELOPMENT AREA, ZONE ATLAS MAP H-16

Dear Lisa:

Attached is the Drainage Management Scheme for Lot E-3 of the Menaul Development Area, located near the northwest corner of Princeton Drive and Phoenix Avenue. Zone Atlas Map #H-16 illustrates the vicinity and zoning of the property. We request approval of this Drainage Management Scheme for Building Permit and SO19 Permit purposes.

Please contact me if you have any questions or comments regarding this request.

Sincerely,

Karen M. Banks

Karen Banks, EIT
Project Engineer Intern

Enclosures

cc: FILE E30119500

DRAINAGE MANAGEMENT SCHEME

INTRODUCTION

This Drainage Management Scheme supports the development of Lot E-3 of the Menaul Development Area. This parcel is located near the northwest corner of Princeton Drive and Phoenix Avenue. AGIS Map H-16 illustrates the location of these properties and shows that this parcel is zoned M-1.

METHODOLOGY

Existing undeveloped and proposed developed conditions were analyzed for the 100-year, 6-hour storm event using the Rational Method in accordance with the revised Section 22.2, Hydrology, of the Development Process Manual (DPM) for the City of Albuquerque, January 1993. Proposed site hydraulics were analyzed using Haestad Methods FlowMaster computer program (based on Manning's equation) and culvert nomagraphs of the U.S. Department of Transportation Federal Highway Administration Hydraulic Design of Culverts.

EXISTING CONDITIONS

The site consists of 2.7332 acres of undeveloped land with minimal vegetation and a small masonry storage shed (113 sq. ft.). The slopes range up to 50% slopes, with an average slope of 5% toward the southern portion of the site. Based on the land treatment distribution shown below, this site generates approximately 5.24 cfs during the 100-year, 6-hour storm event. Currently, the site drains mostly to the Princeton Drive right-of-way.

LAND TREATMENT DISTRIBUTION FOR EXISTING UNDEVELOPED CONDITIONS				
Land Treatment	A	B	C	D
Area Percentage	70.1%	13.6%	16.2%	0.1%

PROPOSED DEVELOPED CONDITIONS

This submittal proposes to develop this site with one building, one graded building pad, paved parking and drive aisles and landscaping. The slopes within the paved areas will range from 1% to 8%. The slopes within the landscaped areas will range up to 3:1 horizontal to vertical slope.

Based on the proposed land treatment distribution shown below (fully developed site), this site generates approximately 12.20 cfs during the 100-year, 6-hour storm event. Approximately 2.2 cfs will drain on the surface to the northernmost double "C" inlet adjacent to the site within the Princeton Drive right-of-way. The remainder of the site runoff (approximately 10 cfs) will drain to the proposed private 18" RCP culvert, which we propose to connect to the back of the southernmost double "C" inlet adjacent to the site within the Princeton Drive right-of-way. The culvert is designed to have 2.3' of headwater with 0.5' freeboard. The culvert will slope at 1% and flow 77.8% full. The invert of the culvert will be approximately 1' higher than the invert of the 4'-deep inlet.

LAND TREATMENT DISTRIBUTION FOR PROPOSED DEVELOPED CONDITIONS				
Land Treatment	A	B	C	D
Area Percentage	0%	5.8%	5.8%	88.4%

Hydrology Summary

Site Area = 2.7332 acres
Design Storm = 100-year, 6-hour

	Existing Conditions	Proposed Conditions
Excess Precipitation, E	0.66"	1.98"
Volume, V	0.150 ac-ft	0.451 ac-ft
Peak Discharge, Q	5.24 cfs (1.92 cfs/ac)	12.20 cfs (4.46 cfs/ac)

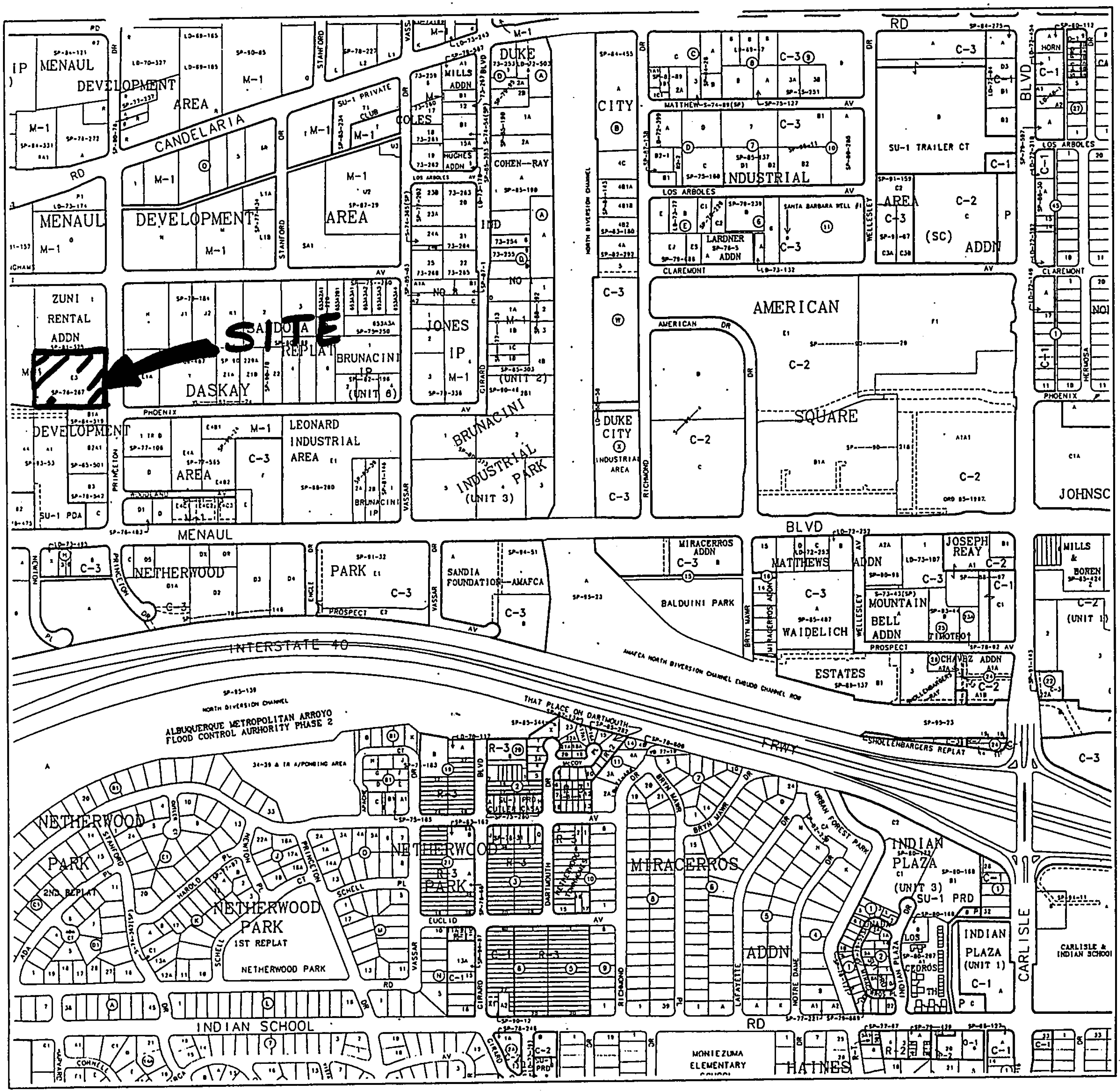
Existing Drainage Capacity

During the Pre-Design Meeting with Lisa Manwill on July 28, 1997, we discussed the existing drainage capacity of the public storm drain in Princeton Drive right-of-way and the Menaul Detention Basin. Ms. Manwill explained that there is not a capacity problem in the Menaul Detention Basin and that we could discharge all flows from the site to the storm drain. Since there is a problem with the battery of inlets downstream of the site at the intersection of Princeton and Phoenix, tying to the back of the existing Type "C" inlets adjacent to the site is preferable.

CONCLUSION

This plan has provided hydrologic and hydraulic considerations of the proposed development of Lot E-3 of the Menaul Development Area. This information provides adequate supporting documentation and guidance for approval of this plan.

AGIS MAP H-16



GRAPHIC SCALE IN FEET

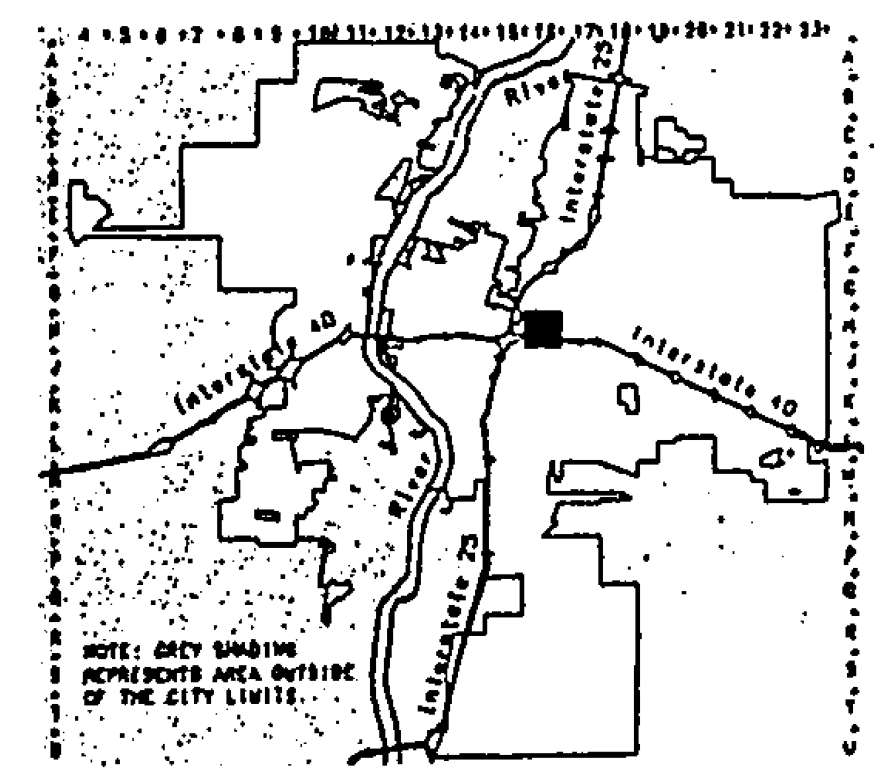
250 0 500 1000

CITY OF Albuquerque

Albuquerque Geographic Information System

PLANNING DEPARTMENT

Map Amended through September 01, 1995



LEGAL DESCRIPTION

T10N

R3E

SEC 10

UNIFORM PROPERTY CODE

1-016-060

H-16-Z

PRE-DESIGN MEETING MINUTES

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION/DESIGN HYDROLOGY SECTION

CONFERENCE RECAP

DRAINAGE FILE/ZONE ATLAS PAGE NO.: H16 DATE: 7-28-97

PLANNING DIVISION NOS: EPC: _____ DRB: _____

SUBJECT: _____

STREET ADDRESS (IF KNOWN): PRINCETON & PHOENIX (NE corner)

SUBDIVISION NAME: _____

APPROVAL REQUESTED:

____	PRELIMINARY PLAT	____	FINAL PLAT
____	SITE DEVELOPMENT PLAN	X	BUILDING PERMIT
____	OTHER	____	ROUGH GRADING

	WHO	REPRESENTING
ATTENDANCE:	KAREN BANKS	GRIENER
	MARK HOLSTAD	" "
	LISA MANWILL	COA

FINDINGS:

- There is no capacity problem in the Menaul Detention Basin => Free discharge.
- There is a problem w/ the type "D" inlets @ the intersection of Princeton & Phoenix.
- Direct your discharge to the type "C" inlets on Princeton.
- Can tie into back of existing Type "C" w/ an SO#19 permit.

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED:	Lisa Manwill	SIGNED:	
TITLE:	Drainage Engr	TITLE:	
DATE:	7-28-97	DATE:	

NOTE PLEASE PROVIDE A COPY OF THIS RECAP WITH THE DRAINAGE SUBMITTAL

HYDROLOGY CALCULATIONS

Greiner

Job LOT E-3, MENAUL DEVELOPMENT AREA | Project No. E30119500 | Sheet 1 of ___

Description HYDROLOGY EXISTING CONDITIONS | Computed By KMB | Date 7-31-97

Checked By [signature] | Date 8/15/97

Site Location: Zone Map H-16, Princeton & Phoenix

Precipitation Zone #2

Existing Hydrology (Per DPM 22.2)

Land Treatment	Area (SF)	Area (Ac)	Area (%)
A	83,357	1.9136	70.1
B	16,145	0.3706	13.6
C	19,248	0.4419	16.2
D	113	0.0026	0.1
Total	—	2.7332	100

Intensity = 5.05 in/hr (100-YR)

Land Treatment

	A	B	C	D
E	0.53	0.78	1.13	2.12
C	0.31	0.45	0.62	0.93

Excess Precipitation

$E = 0.701(0.53'') + 0.136(0.78'') + 0.162(1.13'') + 0.001(2.12'')$

$E = 0.66''$ (100-YR, 6-HR) $V = \frac{0.66}{12}(2.7332) = 0.150$ ac-ft

Peak Discharge ($Q = CIA$)

$Q = 5.05 \frac{in}{hr}(2.7332 Ac)[0.701(0.31) + 0.136(0.45) + 0.162(0.62)$

$+ 0.001(0.93)] = 5.24$ cfs $Q_{100-6} = 5.24$ cfs

Greiner

Job LOT E-3, MENAUL DEVELOPMENT AREA	Project No. E30119500	Sheet 2 of
Description HYDROLOGY	Computed By KMB	Date 7-31-97
PROPOSED CONDITIONS	Checked By [signature]	Date 8/15/97

Proposed Hydrology (Per DPM 22.1)

Land Treatment	Area (SF)	Area (AC)	Area (%)
A			
B	6904	0.1585	5.8
C	6905	0.1585	5.8
D		2.4162	88.4
Total		2.7332	100.0

120′ X 150′ = 18,000 SF Phase II building footprint
100′ X 90′ = 9,000 SF Phase I building footprint

4/5 area = 0.15 [43560(2.7332) − 18,000 − 9,000]
= 13,809 SF (50% "B" & 50% "C")

$I = 5.05$ in/hr

Excess Precipitation

$E = 0.058(0.78") + 0.058(1.13") + 0.884(2.12") = 1.98"$

$E_{100-6} = 1.98"$ $V_{100-6} = \frac{1.98"}{12}(2.7332\,ac) = 0.451$ ac-ft

Peak Discharge ($Q = CIA$)

$Q = 5.05\frac{in}{hr}(2.7332\,ac)[(0.058)(0.45) + (0.058)(0.62) + 0.884(0.93)]$

$Q_{100-6} = 12.20$ cfs

Greiner

Job	LOT E-3, MENAUL DEVELOPMENT AREA	Project No.	E30119500	Sheet	3 of
Description	HYDROLOGY SUMMARY	Computed By	KMB	Date	7-31-97
		Checked By	[illegible]	Date	8/15/97

Hydrology Summary

Site Area = 2.7332 acres

Design Storm = 100 YR, 6HR

	Existing Conditions	Proposed Conditions
Excess Precipitation, E	0.66"	1.98"
Volume, V	0.150 ac-ft	0.451 ac-ft
Peak Discharge, Q	5.24 cfs 1.92 cfs/ac	12.20 cfs 4.46 cfs/ac

HYDRAULIC CALCULATIONS

Greiner

Job LOT E-3, MENAUL DEV. AREA | Project No. E30119500 | Sheet 1 of ___

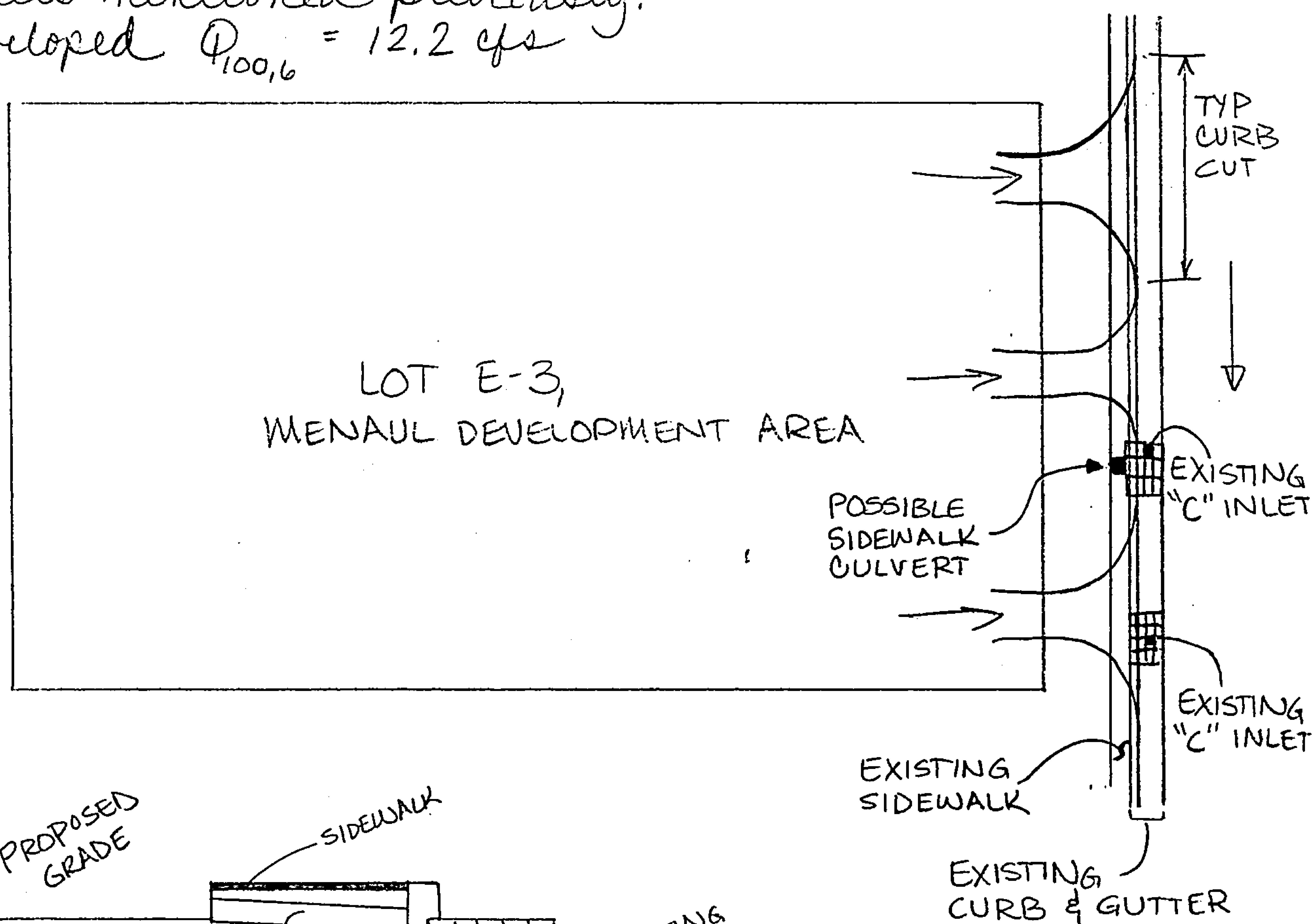
Description HYDRAULICS | Computed By KMB | Date 8-4-97

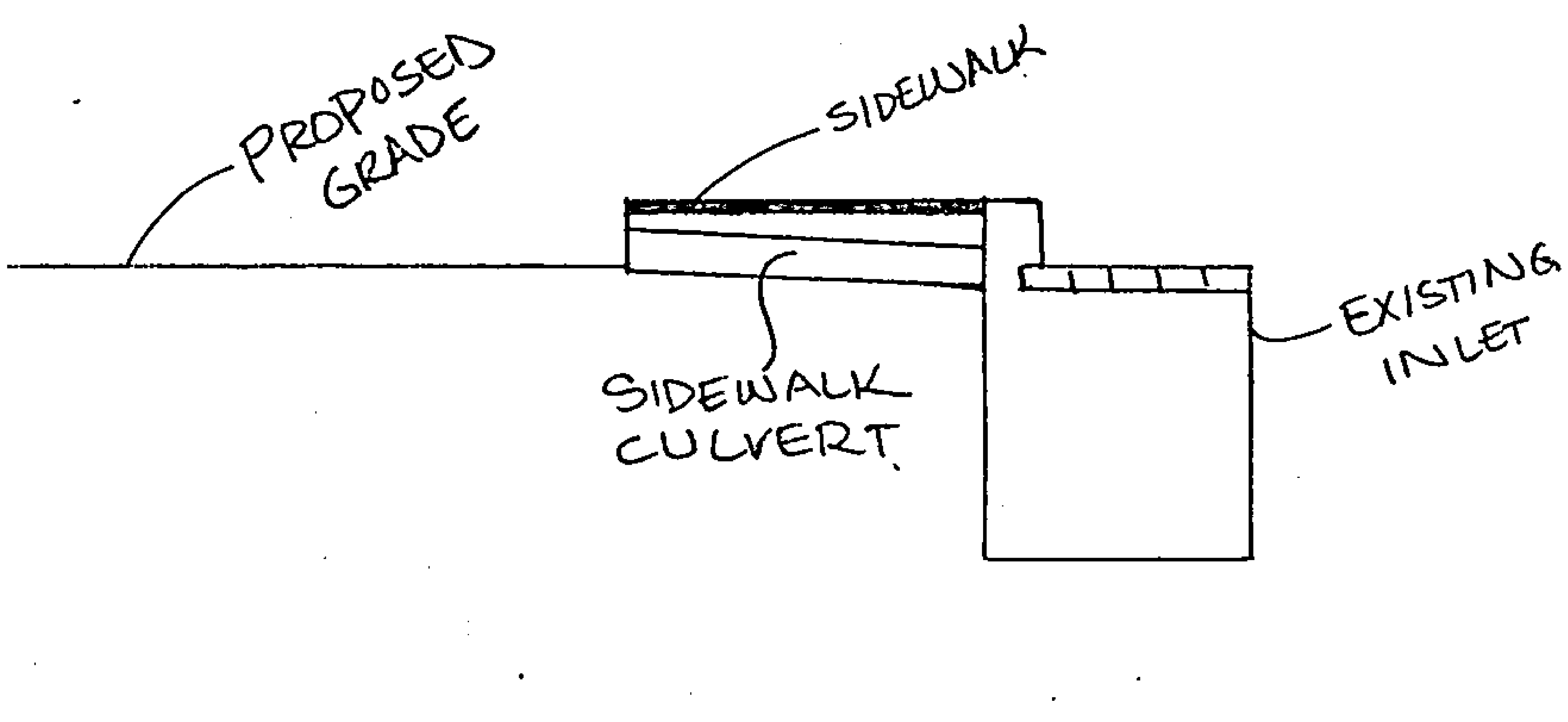
Checked By [signature] | Date 8/15/97

Drainage Scheme

There are two inlets in Princeton Drive alongside the site. The site will be graded so that it will free discharge to both existing inlets. Where feasible, the site will be graded so that it drains directly into the back of an inlet (via area drain or sidewalk culvert) Otherwise, the site will be graded so that it drains to the gutter in Princeton Drive upstream of the existing inlets mentioned previously.

Developed $Q_{100,6} = 12.2$ cfs





Greiner

Job LOT E-3, MENAUL DEV. AREA Project No. E30119500 Sheet 2 of ____

Description HYDRAULICS Computed By KMB Date 8-4-97

Checked By [signature] Date 8/15/97

Check hydraulics of driveways, using Haestad computed program "FlowMaster."

Given : 4% cross slope
6% slope driveways
6" curb ∴ WSEL = TOP OF CURB = 0.5'

① 40' driveway : $Q_{CAPACITY}$ = 34.53 cfs ✓

② 25' driveway : $Q_{CAPACITY}$ = 34.53 cfs ✓

(See attached FlowMaster Output)

LOT E-3, MENAUL DEVELOPMENT AREA
Worksheet for Irregular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	40' Driveway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data

Channel Slope	0.060000 ft/ft ← 6% SLOPE
Water Surface Elevation	0.50 ft

Elevation range: 0.00 ft to 2.10 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.50	0.00	40.33	0.013
0.17	0.00			
40.17	1.60			
40.33	2.10			

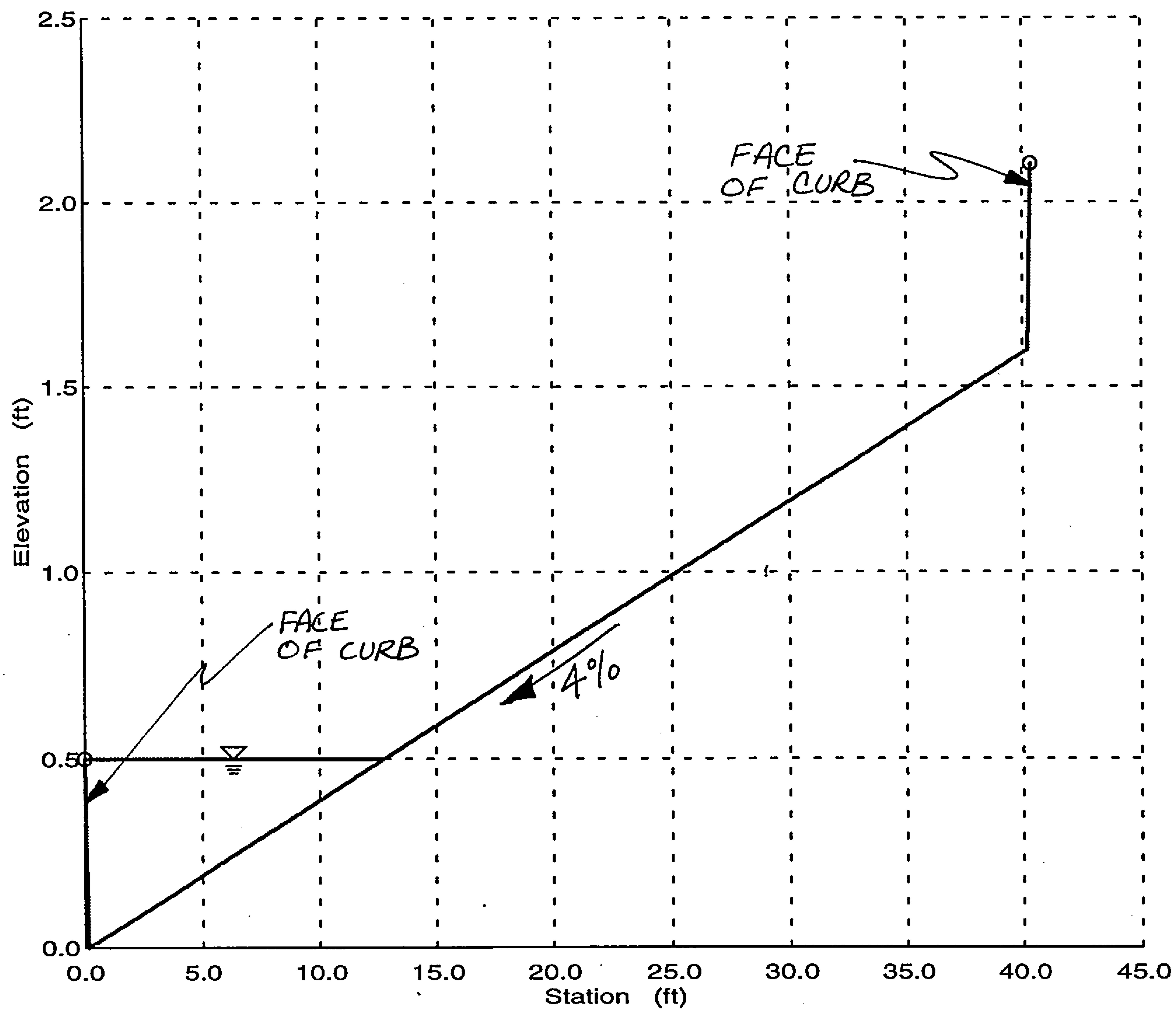
← 4% CROSS SLOPE

Results		
Wtd. Mannings Coefficient	0.013	
Discharge	34.53	cfs
Flow Area	3.17	ft²
Wetted Perimeter	13.04	ft
Top Width	12.67	ft
Height	0.50	ft
Critical Depth	0.86	ft
Critical Slope	0.003411	ft/ft
Velocity	10.90	ft/s
Velocity Head	1.85	ft
Specific Energy	2.35	ft
Froude Number	3.84	
Flow is supercritical.		

LOT E-3, MENAUL DEVELOPMENT AREA
Cross Section for Irregular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	40' Driveway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.013	
Channel Slope	0.060000	ft/ft
Water Surface Elevation	0.50	ft
Discharge	34.53	cfs



LOT E-3, MENAUL DEVELOPMENT AREA
Worksheet for Irregular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	25' Driveway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data

Channel Slope	0.060000 ft/ft	← 6% SLOPE
Water Surface Elevation	0.50	ft

Elevation range: 0.00 ft to 1.50 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.50	0.00	25.33	0.013
0.17	0.00			
25.17	1.00			
25.33	1.50			

← 4% CROSS SLOPE

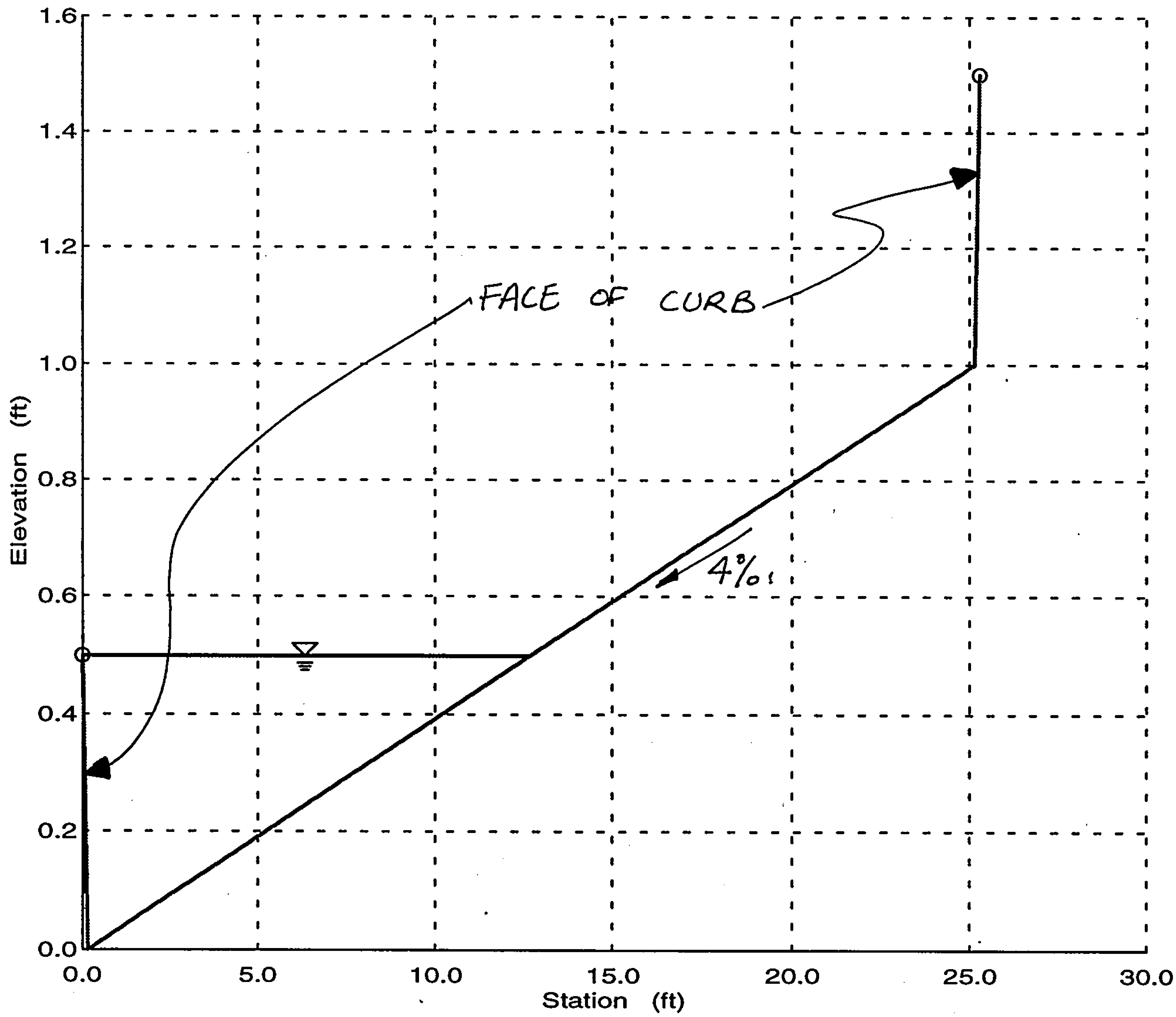
Results		
Wtd. Mannings Coefficient	0.013	
Discharge	34.53	cfs
Flow Area	3.17	ft²
Wetted Perimeter	13.04	ft
Top Width	12.67	ft
Height	0.50	ft
Critical Depth	0.86	ft
Critical Slope	0.003411	ft/ft
Velocity	10.90	ft/s
Velocity Head	1.85	ft
Specific Energy	2.35	ft
Froude Number	3.84	

Flow is supercritical.

LOT E-3, MENAUL DEVELOPMENT AREA
Cross Section for Irregular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	25' Driveway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.013	
Channel Slope	0.060000	ft/ft
Water Surface Elevation	0.50	ft
Discharge	34.53	cfs



HYDRAULIC DESIGN OF HIGHWAY CULVERTS

Research, Development, and Technology

Turner-Fairbank Highway
Research Center
6300 Georgetown Pike
McLean, Virginia 22101

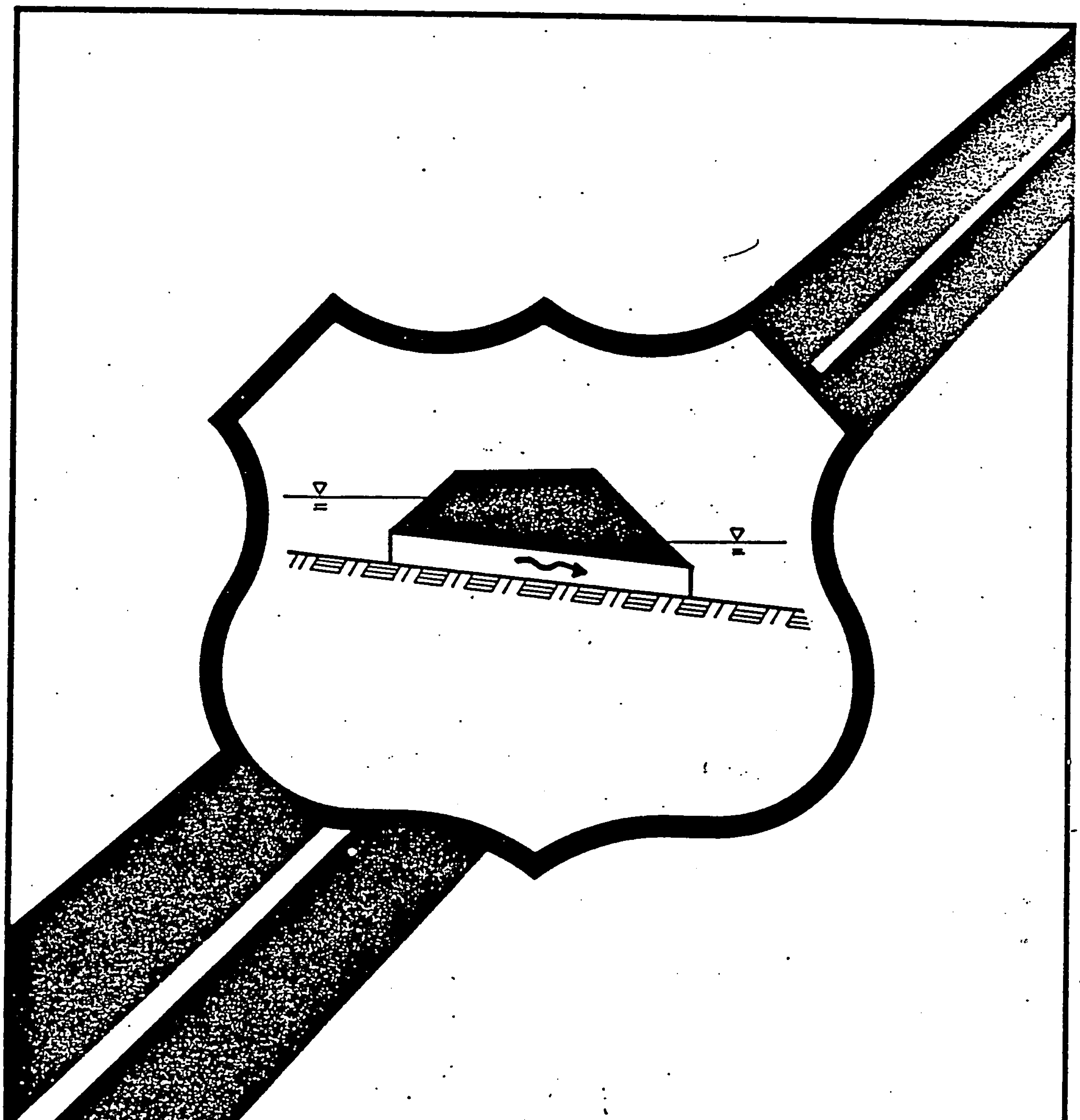
U.S. Department
of Transportation

Federal Highway Administration

Hydraulic Design
Series No. 5

Report No.
FHWA-IP-85-15

September 1985

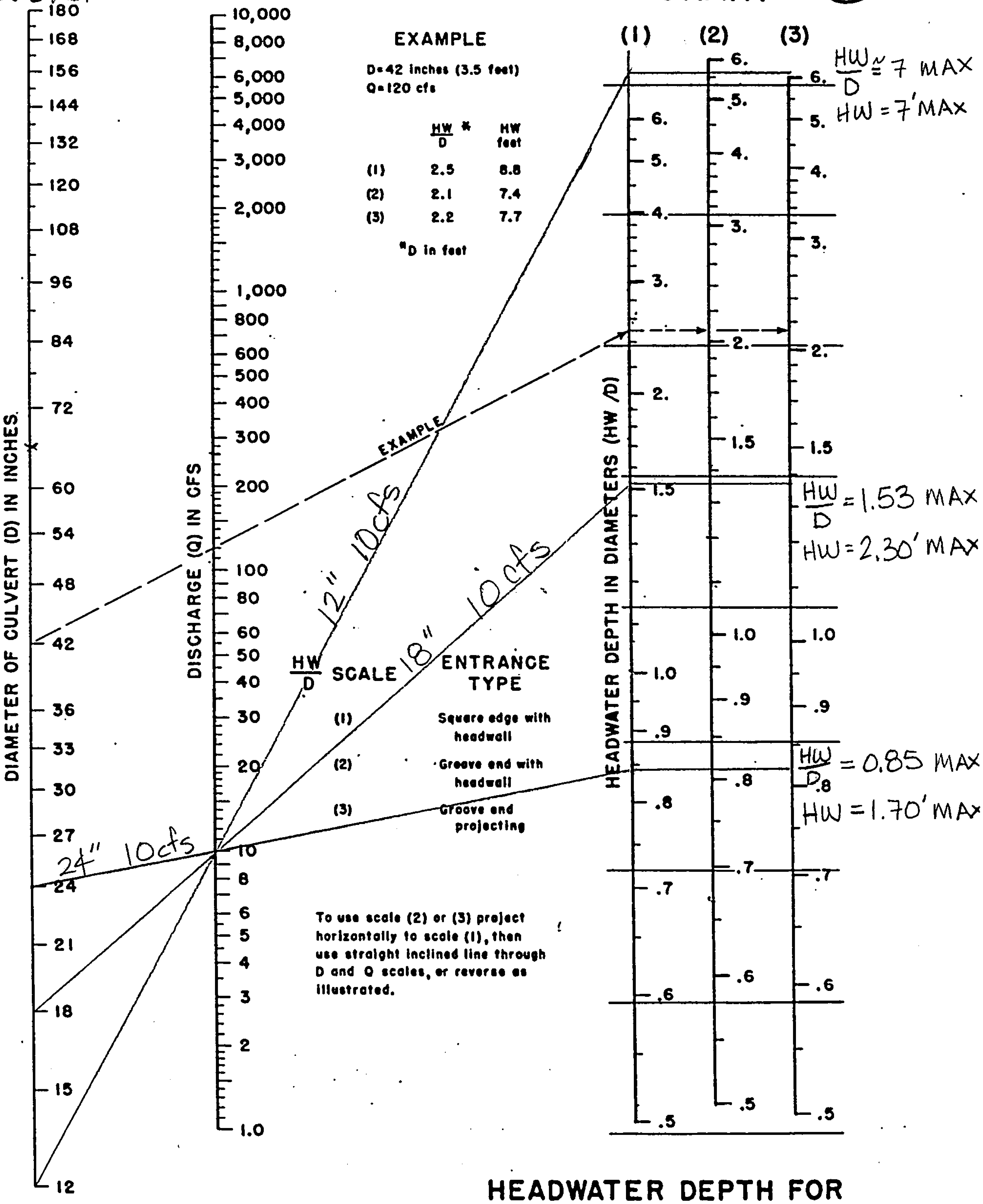


LOT E-3, MENAUL DEV. AREA

18" CULVERT Q100 = 10 cfs

24" CULVERT

CHART 1



HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

LOT E-3 18" CULVERT
Worksheet for Circular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	18" CULVERT
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

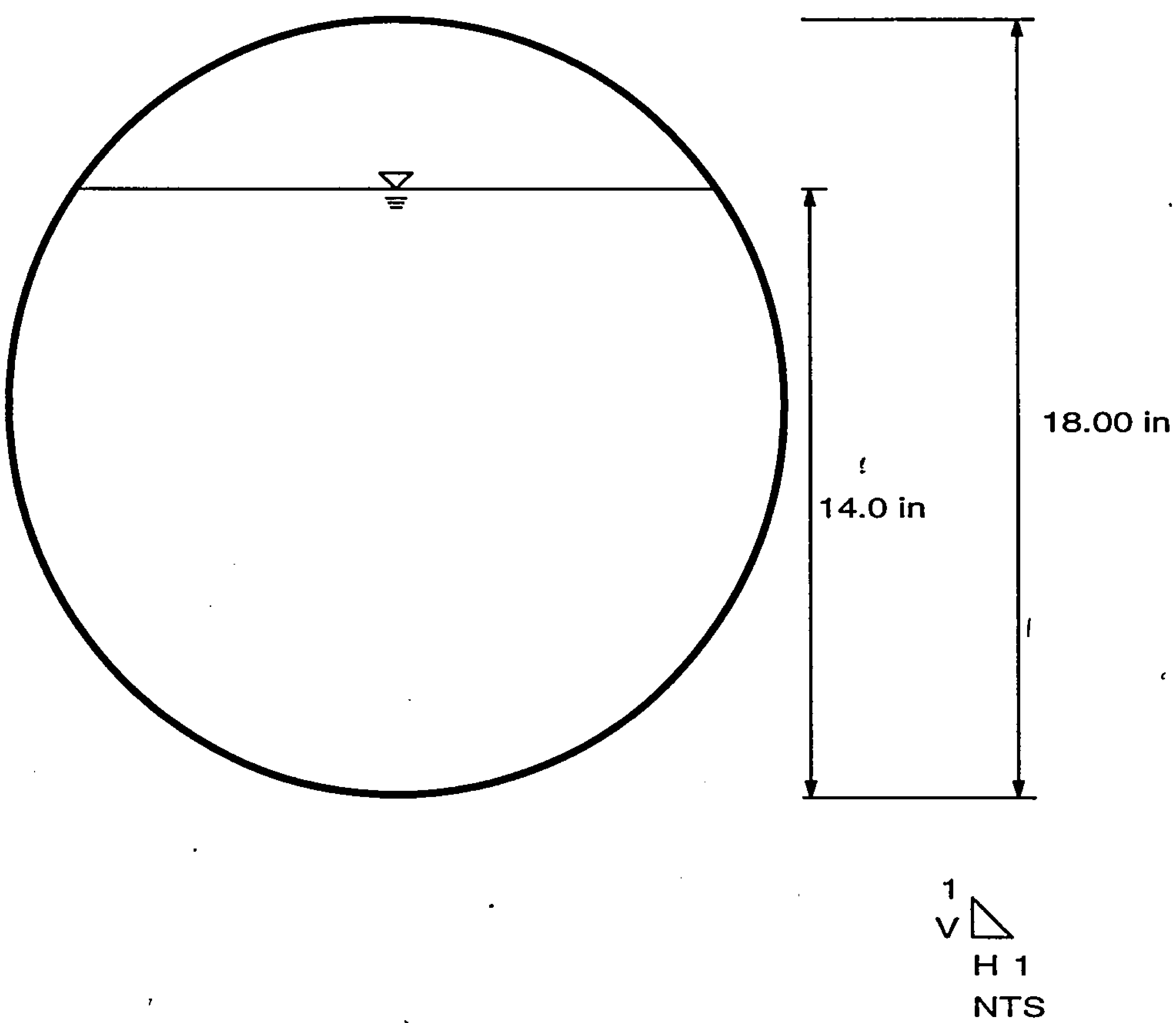
Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	18.00	in
Discharge	10.00	cfs

Results		
Depth	14.0	in
Flow Area	1.48	ft^2
Wetted Perimeter	3.25	ft
Top Width	1.24	ft
Critical Depth	1.22	ft
Percent Full	77.96	
Critical Slope	0.009206	ft/ft
Velocity	6.77	ft/s
Velocity Head	0.71	ft
Specific Energy	1.88	ft
Froude Number	1.09	
Maximum Discharge	11.30	cfs
Full Flow Capacity	10.50	cfs
Full Flow Slope	0.009064	ft/ft
Flow is supercritical.		

LOT E-3 18" CULVERT
Cross Section for Circular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	18" CULVERT
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000 ft/ft	
Depth	14.0	in
Diameter	18.00	in
Discharge	10.00	cfs



LOT E-3 18" CULVERT
Worksheet for Circular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	18" CULVERT
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Slope

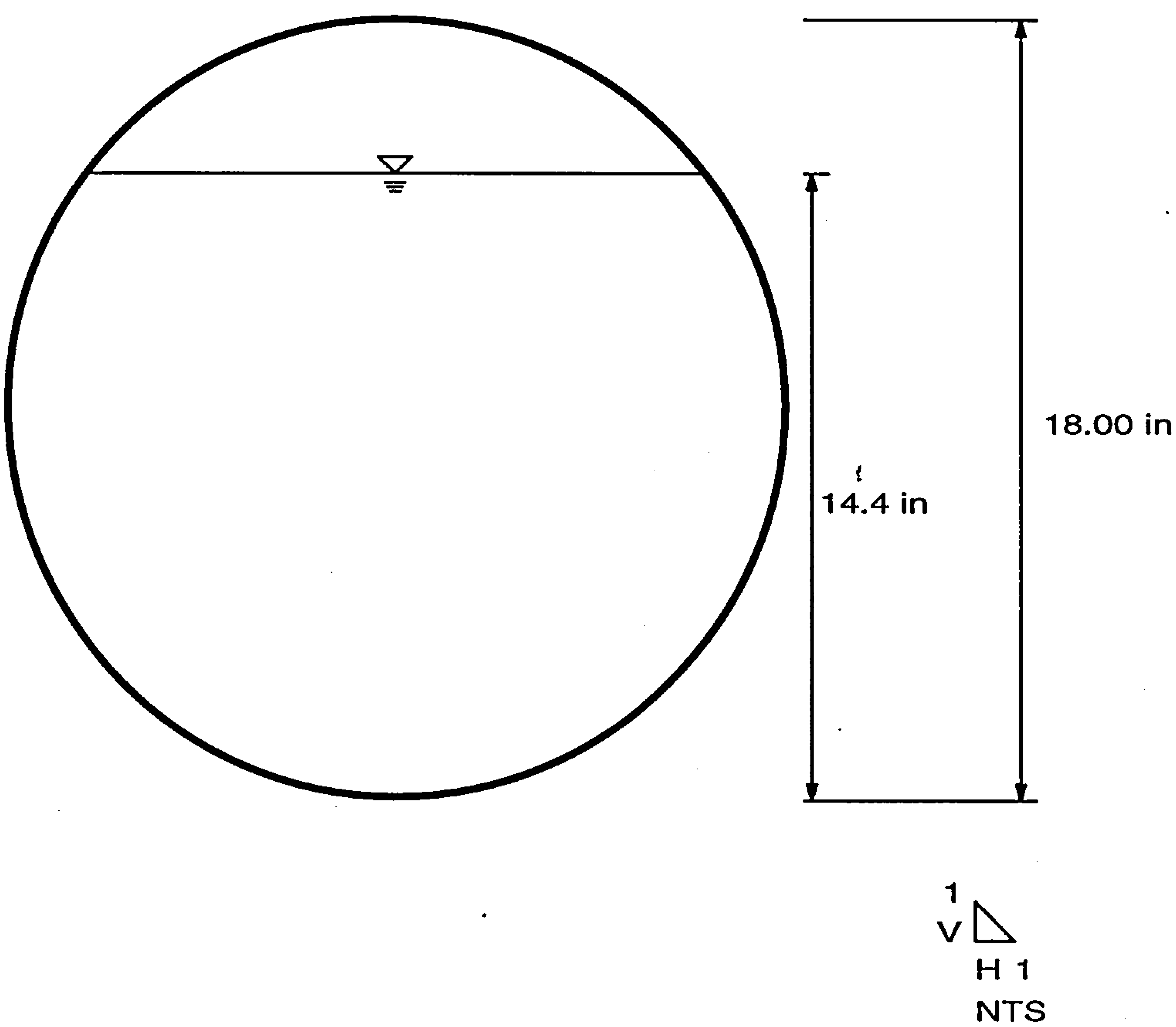
Input Data		
Mannings Coefficient	0.013	
Depth	14.4	in
Diameter	18.00	in
Discharge	10.00	cfs

Results		
Channel Slope	0.009486	ft/ft
Flow Area	1.52	ft^2
Wetted Perimeter	3.32	ft
Top Width	1.20	ft
Critical Depth	1.22	ft
Percent Full	80.00	
Critical Slope	0.009206	ft/ft
Velocity	6.60	ft/s
Velocity Head	0.68	ft
Specific Energy	1.88	ft
Froude Number	1.04	
Maximum Discharge	11.01	cfs
Full Flow Capacity	10.23	cfs
Full Flow Slope	0.009064	ft/ft
Flow is supercritical.		

LOT E-3 18" CULVERT
Cross Section for Circular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	18" CULVERT
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Slope

Section Data		
Mannings Coefficient	0.013	
Channel Slope	0.009486	ft/ft
Depth	14.4	in
Diameter	18.00	in
Discharge	10.00	cfs



LOT E-3 18" CULVERT FULL FLOW SLOPE
Worksheet for Circular Channel

Project Description	
Project File	p:\engr\zuni.fm2
Worksheet	18" CULVERT
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Slope

Input Data		
Mannings Coefficient	0.013	
Diameter	18.00	in
Discharge	10.00	cfs

Results		
Channel Slope	0.009064	ft/ft
Depth	18.0	in
Flow Area	1.77	ft^2
Wetted Perimeter	4.71	ft
Top Width	0.00	ft
Critical Depth	1.22	ft
Percent Full	100.00	
Critical Slope	0.009207	ft/ft
Velocity	5.66	ft/s
Velocity Head	0.50	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	10.76	cfs
Full Flow Capacity	10.00	cfs
Full Flow Slope	0.009064	ft/ft