MASTER DEVELOPMENT DRAINAGE PLAN

FOR

STETSON HILLS SUBDIVISION
PHASE I

JOB NO. 212-1127

JANUARY 9, 1995
REVISED MAY, 1997

Prepared for:

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Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

20730

Barney J. Fix, P.E. #20730

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BARNEY J. FIX

6/19/97
Date

Developer's Statement:

I, the developer have read and will comply with all of the requirements specified in this drainage report and plan.

U.S. Home Corporation
Business Name

By:

Title: Agent

Address: 31 N. Tejon, Suite 410

Colorado Springs, CO 80903

City of Colorado Springs:

Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

Timothy R. Mitros for
City Engineer

June 19, 1997
Date

Conditions:

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I. Introduction

A. Purpose

The purpose of this Master Development Drainage Plan (MDDP) is to identify major drainageways, ponding/detention areas, locations of culverts, bridges, open channels and drainage areas which are tributary to the Stetson Hills Phase I Development Site. The MDDP also presents alternate solutions to identified drainage problems and assesses the ability of downstream drainage facilities to pass developed runoff from the Stetson Hills site. Criteria for preparation of the MDDP are obtained from Drainage Criteria Manual, City of Colorado Springs & El Paso County, Revised November 1991 (Criteria Manual) as also revised by City of Colorado Springs letter dated October 12, 1994.

B. Background

The Stetson Hills site was previously master planned in the mid-1980's. Results of the previous master planning efforts are contained in Master Drainage Study for Stetson Hills, April 1985, Greiner Engineering. This report was filed in accordance with the requirements of the City of Colorado Springs on September 10, 1985 and served as the Master Drainage Plan for Phases I (South) and II (North) of the Stetson Hills site. At the time, Phase I and II were anticipated to cover approximately 2,183 acres within Sections 17, 18, 19, 20, 29 and 30, Township 13 South, Range 65 West of the Sixth Principal Meridian, City of Colorado Springs, El Paso County Colorado. The boundary between Phase I and Phase II was Bridlespur Boulevard (currently Stetson Hills Boulevard).

Drainage facilities were proposed for Phase I of Stetson Hills in Final Drainage Study for Stetson Hills Filing No. 1 and 2, April 1985 (Revised November 1985), Greiner Engineering. Filings 1 and 2 consist of the arterial and collector streets for Phase I of Stetson Hills. This Final Drainage Report was filed in conformance with the requirements of the City of Colorado Springs on November 20, 1985 and some of the proposed drainage facilities were designed and constructed in conformance with the then current criteria. Construction of these facilities proceeded concurrently with development of numerous filings within the Phase I site.

Changes occurring since the original work on Stetson Hills, such as revised criteria, change in ownership and proposed revisions to the original land plan, have created a need to review the original master planning efforts and to revise accordingly. The preparation of this MDDP follows the generalized drainage pathways and storm water runoff system presented in the aforementioned drainage studies and drainage reports for the following filings:

No. 3 (Filed with City of Colorado Springs November 8, 1985)
No. 4 (Filed with City of Colorado Springs November 8, 1985)
No. 5 (Filed with City of Colorado Springs November 14, 1985)
No. 6 (Dated November 1995)
No. 7 (Dated February 11, 1986)
No. 8 (Filed with City of Colorado Springs July 14, 1986)
No. 9 (Filed with City of Colorado Springs July 24, 1986)
Nos. 10 and 11 (Filed with City of Colorado Springs February 2, 1987)

C. Location and Description of Study Area

The Stetson Hills Phase I Development study area covered by this MDDP is located in Sections 19, 20 and 30, Township 13 South, Range 65 West of the Sixth Principal Meridian, City of Colorado Springs, El Paso County Colorado. The estimated total area of the study area, excluding off-site areas, is approximately 933 acres. A vicinity map is included in the appendix.

The study area is located within the Sand Creek Basin. Originating in the Black Forest approximately 6 miles North of the property, Sand Creek flows in a southerly direction from its headwaters through the center of the study area. Several major tributaries to Sand Creek enter the major channel through Stetson Hills. The natural channels are generally meandering, intermittent streams with side banks prone to erosion. The channel bottoms consist of bare soil with relatively no vegetative cover. The existing Sand Creek Channel slope is 1.45% through the site and the average tributary slopes range from 1.2% to 2.6%.

Existing land use in undeveloped areas of the basin are basically fair to poor native range grasslands. Soils in the basin belong to the A, B and D Hydrologic Soils Groups as identified by the Soil Conservation Service. The majority of the basin, however, consists of A and B soils. These soils are characterized by high to moderate infiltration rates. Runoff from these types of soils is low to medium. Within the site, a small portion of Type D soil can be found. This soil group is characterized by slow infiltration and high runoff potential. A soils distribution map is included in the appendix.

Development within the study area consists, or is planned to consist of single family residential dwellings with areas of multi-family residential dwellings and commercial/business development, including parkland and open space. This MDDP proposes to provide a positive drainage network within the site consisting of a combination of streets, inlets and storm sewers to convey the storm water runoff into the major tributaries of Sand Creek. The tributaries will then convey runoff into Sand Creek, prior to exiting the site at Barnes Road.

II. Hydrologic Parameters

A. General

The Criteria Manual restricts the use of specific runoff models based on drainage area as follows:

Drainage Basin Size	Runoff Methodology
100 acres or less	Rational Method
Greater than 100 acres	SCS Hydrograph Procedure
Major Basins (greater than 10 square miles)	Statistical or Computer Models

For the Stetson Hills MDDP the contributory area to design points are typically less than 100 acres, indicating use of the Rational Method for computing storm runoff. Notable exceptions are Sand Creek and certain tributary channels to Sand Creek that convey off-site runoff through the Stetson Hills development. Runoff for these systems was computed based on the SCS Hydrograph procedure using HEC-1, a rainfall runoff simulation computer model. The results are contained in the Stetson Hills Phase I Technical Addendum. Storm water runoff was computed for the major and minor storm events as defined by the Criteria Manual and the revision letter dated October 12, 1994. In Colorado Springs, the major storm is the 100-year storm and the minor storm is the 5-year storm. The minor storm definition was changed from the 10-year event to the 5-year event per the October 12, 1994 revision letter. Since this is a recent change, all of the parameters in the Criteria Manual have not been revised to reflect the 5-year event as the minor storm. In such cases, the 10-year event parameters were used for the 5-year event.

B. Rational Method

The Rational Method relates peak runoff to drainage area, rainfall intensity and basin surface characteristics by the formula

$$Q = CIA$$

Where:

Q = peak runoff rate (cfs)
C = runoff coefficient
I = average runoff intensity (inches/hour)
A = drainage area in acres

Runoff coefficients used in the rational formula are obtained from Table 5-1 of the Criteria Manual, which presents recommended coefficients as a function of land use and hydrologic soil group for 10-year and 100-year runoff events. The coefficients for the 10-year event were used for estimating runoff for the 5-year event.

Rainfall intensity values for use in the rational formula were obtained from the intensity/duration/frequency curves presented in the October 12, 1994 revision to the Criteria Manual. These curves relate average rainfall intensity to storm duration. The intensity value used in the Rational Formula is the critical intensity occurring when the storm duration equals the time of concentration of the drainage basin.

Time of concentration is the time taken for runoff from the most hydraulically remote point of a drainage basin to reach the basin discharge point. Times of concentration are estimated based on the sum of overland flow, storm sewer and/or road gutter flow and channel flow travel time components. The overland flow component of time of concentration is obtained from Figure 5-2 of the Criteria Manual. Travel times in storm sewers, road gutters or channels is based on flow length and average velocity from Manning's equation, a hydraulic formula relating average velocity to slope, friction characteristics of the flow path and the cross-sectional geometry of the flow section.

C. SCS Hydrograph Procedure

The SCS Hydrograph procedure relates basin rainfall to direct basin runoff through use of a runoff curve number. Direct basin runoff is used to develop a storm specific hydrograph from a dimensionless unit hydrograph. Basin rainfall and its distribution were obtained from the Criteria Manual. The Criteria Manual provides rainfall for 2-hour and 24-hour durations and specifies that the duration creating the greatest runoff volume and/or rate be used as the critical storm duration, depending on the structure being designed. For the Stetson Hills Phase I MDDP, the 24-hour storm duration was critical.

HEC-1, a rainfall/runoff simulation model was used in computing runoff using the SCS Hydrograph Procedure. Hydrologic parameters required in the HEC-1 model are basin area, gross precipitation, temporal precipitation distribution, basin runoff curve number and basin lag. Basin areas were planimetered from topographic mapping and other hydrologic parameters were computed in conformance with criteria and methodologies presented in the Criteria Manual.

III. Hydraulic Criteria

A. General

Hydraulic criteria used to layout and conceptually design proposed facilities is in conformance with criteria contained in the Criteria Manual. The Criteria Manual provides criteria for streets and roadways, storm sewers and open channels. Site specific geometric data for hydraulic design of proposed facilities, such as slope, are obtained from conceptual grading plans which are subject to modification during final design of project phases. As such, the facilities proposed in this MDDP present the generalized drainage system and are subject to refinement as more detailed final design plans are prepared.

B. Streets, Roadways and Inlets

Allowable street capacity is a function of the allowable ponding encroachment and gutter depth of flow as specified in Table 6-1 of the Criteria Manual as revised by the City of Colorado Springs letter dated October 12, 1994. Street capacity is calculated using the modified Manning's formula presented in Section 7.3 of the Criteria Manual. The first inlet of a storm sewer system is located to intercept storm runoff prior to exceeding the calculated allowable street capacity. Additional inlets are located along the proposed storm sewer at a spacing to prevent storm runoff collected in the street from exceeding the allowable street capacity. Inlet capacities for the types of inlets allowed by the City of Colorado Springs and using site-specific geometry were developed in conformance with Section 7 of the Criteria Manual.

C. Storm Sewers

Proposed storm sewers are sized based on Manning's equation and sewer grades are based on proposed street grades. Storm sewers are also sized based on a free water surface.

D. Open Channels

Open channels are proposed at various locations to convey both off-site and intercepted on-site flows through the study area to Sand Creek. Preliminary design of open channels is based on conveying the 100-year runoff with freeboard in accordance with the Criteria Manual. A maintenance access road is provided as part of the design. Open channels are proposed to be rip-rap lined and include drop structures to control velocities.

IV. Results

A. Off-site Basins

1. Descriptions

Runoff from off-site basins enters the Stetson Hills Phase I Development at the following locations: Peterson Boulevard just south of Stetson Hills Boulevard (Basin O4), Stetson Hills Boulevard at Tutt Avenue (Basin O3), Stetson Hills Boulevard at Charlotte Parkway (Basin O1), Stetson Hills Boulevard between Charlotte Parkway and Anna Lee Way (Basin O2), northeast corner of site (Basins O5 and O9), east side of site approximately 1000 feet south of Stetson Hills Boulevard (Basins O6, O7 and O8). Locations and descriptions of these off-site basins were taken from the 1985 Greiner report. Off-site basin locations are shown on the vicinity map included in the appendix.

2. Runoff

Results of the runoff calculations for the off-site flows entering the Stetson Hills Phase I Development are summarized in the following table. Also shown is the size of a culvert that will pass the 100-year flow without overtopping the road. Detailed calculations are included in the Appendix and Technical Addendum. Runoff entering from Sand Creek is discussed in Section IV-C.

BASIN	Q(100)	CULVERT
O1	719	10'x8' RCBC
O2	569	10'x6' RCBC
O3	279	84" RCP
O4	698	Existing 2-60" CSP
O5	50	48" RCP (Includes flow from 09)
O6	50	N/A
O7	200	N/A
O8	613	N/A
O9	64	See 05

B. On-Site Basins

1. General Approach

Runoff for the minor and major storm events was estimated using the Rational formula methodology for inlets and collector storm sewer systems and the SCS Unit Hydrograph method for major channel facilities with contributory areas greater than 100 acres. Hydrologic parameters applicable to these methodologies were determined and applied in conformance with the Criteria Manual. Detailed hydrologic calculations are presented in the Technical Appendix of this MDDP.

Proposed drainage improvements were sized in conformance with hydraulic criteria contained in the Criteria Manual. The proposed drainage system is depicted in the attached MDDP plan.

Layout of proposed drainage improvements is based on construction of a system of inlets and collector storm sewers to intercept and convey minor storm event runoff. First inlet location and inlet spacing is based on intercepting minor storm runoff prior to exceeding street capacity as defined in the Criteria Manual. Collector storm sewers discharge to open channels designed to convey runoff to Sand Creek, the ultimate outfall from the Stetson Hills Development. Channels are located based on the location of off-site flows presently entering the development site.

2. Basin Descriptions

a. Basin A

Basin A is located on the southwest part of the Stetson Hills Development and is approximately 81.2 acres in area. The basin is bounded by Basin B on the North, Tutt Avenue on the East, Barnes Road on the South and Powers Boulevard on the West. For analysis purposes, Basin A is divided into 12 sub-basins. All 81.2 acres of Basin A are zoned as commercial development.

Runoff from Basin A drains south on Tutt Avenue and east on Barnes Road to the Tutt Avenue/Barnes Road intersection, where it combines with runoff from Basin C. A new 30" and 36" storm sewer system will be located in Tutt Avenue and will connect to the existing 54" storm sewer system in Barnes Road. This system outfalls to an open unlined channel south of Barnes Road. This channel carries the runoff to an existing 60"CMP which crosses the Sky Sox Stadium parking lot and outfalls at Sand Creek to the south. The unlined channel is approximately 450 feet in length and should be lined by the developer of Stetson Hills to protect it from erosion when Basin A is developed.

For the minor storm, the existing storm sewer system in Barnes Road does not appear to violate the current criteria. For the 100-year storm, per the current criteria, the depth of flow in Barnes Road (north side, east of Tutt Avenue, west of the transition section) is exceeded; runoff overtops the curb by approximately 4 inches and the street is flooded, however, water does not encroach within 15' of the median. This runoff continues east in Barnes Road to the low point at the existing 6'x4' double RCBC. It is recommended that no additional storm drainage improvements be made to Barnes Road within Basin A.

b. Basin B

Basin B is located on the northwest part of the Stetson Hills Development and is approximately 161.5 acres in area. The basin is bounded by Stetson Hills Boulevard on the North, Charlotte Parkway on the East, basins A, C and E on the South and Powers Boulevard on the West. For analysis purposes, Basin B is divided into 24 sub-basins. Basin B includes the following development types:

Land-Use Type	**Area (acres)**
Commercial	66.1
Multi-Family	23.7
Single-Family	71.7

Runoff from Basin B drains to the west tributary channel to Sand Creek at three main locations: Tutt Avenue crossing, Jackpot Drive crossing and Charlotte Parkway crossing. New storm sewer systems in Tutt Avenue and Jackpot Drive will collect and convey minor storm runoff to the tributary channel. Sump curb opening inlets located at these crossings will collect minor storm runoff without exceeding the maximum allowable ponding depth. For the major storm, it is assumed that runoff collecting at these low spots will overtop the curb and drain to the tributary channel without exceeding the maximum allowable ponding depth of 1.0 foot. The 100 year overflow area will be protected with erosion resistant materials such as riprap. The crossing at Charlotte Parkway is not in a sump condition, however, special inlets and/or diversion structures will be located in Charlotte Parkway at this location to divert all street flows to the tributary channel.

Sub-basins B1.1, B1.3, B4.1 and B5.1 drain directly to the west tributary channel and are not collected by the new storm sewer system.

Runoff from both the major and minor storm events draining to Charlotte Parkway does not appear to exceed allowable flow depths, per the current criteria.

c. Basin C

Basin C is located on the southwest part of the Stetson Hills Development and is approximately 93.4 acres in area. The basin is bounded by Basin B on the North, Jackpot Drive on the East, Barnes Road on the South and Tutt Avenue on the West. For analysis purposes Basin C is divided into 15 sub-basins. Basin C includes the following development types:

Land-Use Type	**Area (acres)**
Commercial	56.2
Single-Family	37.2

Runoff from Basin C drains to low spots in Comstock Loop and Barnes Road then off-site to the south via a proposed riprap lined channel and an existing double 6'x4' reinforced concrete box culvert. New storm sewer systems in Jackpot Drive and Comstock

Loop will collect and convey runoff to the new channel at the low point in Comstock Loop. Sump curb opening inlets located at this crossing will collect minor storm runoff without exceeding the maximum allowable ponding depth. During the major storm, it is assumed that runoff collecting at this low spot will overtop the crown and curb and drain to the channel without exceeding the maximum allowable ponding depth of 1.0 foot. The 100 year overflow area will be protected with erosion resistant materials such as riprap.

For the minor storm, the existing storm sewer system in Barnes Road does not appear to violate the current criteria, with the exception of inlet I-C1.5. Minor storm runoff ponds to a depth of approximately 0.63' at inlet I-C1.5, which exceeds the allowable minor storm ponding depth of 0.5'. In this case, the curb is not overtopped and the water does not encroach within approximately 20' of the median.

For the 100-year storm, runoff on the north side of Barnes Road will overtop the median. This occurs in the special section of Barnes Road in which the cross slope of the westbound lane drains toward the median. Runoff overtops the north median curb as it flows east toward the low point at the box culverts. The depth of flow at the median gutter is approximately 10 inches, which meets current cross flow criteria for arterial streets. Runoff that overtops the median then ponds at the low point of the eastbound lane. It is assumed that ponded water at the existing inlet will overtop the curb and flow into the channel downstream of the existing box culvert. Erosion protection will be placed at the overflow area to the channel.

The existing double 6'x4' reinforced concrete box culvert in Barnes Road appears to be adequate to pass runoff from the major and minor storms per the current criteria.

It is recommended that no additional storm drainage improvements be made to Barnes Road within Basin C.

d. Basin D

Basin D is located on the north central part of the Stetson Hills Development and is approximately 50.5 acres in area. The basin is bounded by Stetson Hills Boulevard on the North, Basin P and Anna Lee Way on the East and South, and Charlotte Parkway on the West. For analysis purposed, Basin D is divided into 6 sub-basins. Sub-basins D5 and D6 are developed as Filing 10. Basin D includes the following development types:

Land-Use Type	**Area (acres)**
Commercial	2
School	25.7
Single-Family	22.8

Runoff from sub-basins D1 and D4 drain to the riprap lined channel located in Basin D, which discharges to the west tributary channel to Sand Creek. The channel also conveys off-site flows to the west tributary channel. A 72" RCP exists at the Charlotte Parkway crossing. Per the current criteria, this pipe appears inadequate to convey the major storm runoff without overtopping Charlotte Parkway. An additional 72" RCP would be required.

A new inlet at the low spot in Stetson Hills Boulevard (south side) will collect runoff from the major and minor storms and discharge it to the channel.

Runoff from sub-basins D2, D3, D5 and D6 drain to Charlotte Parkway. A new inlet and pipe in Charlotte Parkway north of Anna Lee Way will collect minor storm street flows from sub-basin D2 and discharge to the west tributary channel. The existing storm sewer system in Charlotte Parkway south of Anna Lee Way collects minor storm street flows from sub-basins D5 and D6 and discharges to the west tributary channel. Water ponds at the existing inlet at the Anna Lee Way/Charlotte Parkway intersection (I-D5), but overtops the Anna Lee Way crown prior to all runoff being intercepted. The carry-over runoff flows south on Charlotte Parkway to inlet I-D6. Ponding occurs at inlet I-D6 to a depth of 0.6', exceeding criteria by 0.1' prior to overtopping Charlotte Parkway to the south. With these exceptions for the minor storm, the existing storm sewer system in Charlotte Parkway does not appear to violate the current criteria for the major and minor storm events. It is recommended that no additional storm drainage improvements be made to Charlotte Parkway within Basin D.

e. Basin E

Basin E is located on the southwest part of the Stetson Hills Development and is approximately 56.5 acres in area. The basin is bounded by Jackpot Drive and Basin B on the North, Charlotte Parkway on the East, Barnes Road on the South, and Jackpot Drive, Comstock Loop and Basin C on the West. For analysis purposes, Basin E is divided into 10 sub-basins. Basin E includes the following development types:

Land-Use Type	**Area (acres)**
Commercial	11.2
Single-Family	45.3

Basin E drains south on Charlotte Parkway and east on Barnes Road to the Charlotte Parkway/Barnes Road intersection, then east to the low point in Barnes Road at Sand Creek, where it combines with flow from the west. An existing storm sewer system in Charlotte Parkway and Barnes Road collects minor storm runoff and discharges to Sand Creek.

For the minor storm, per the current criteria, the existing storm sewer (24", 27", and 36" RCP) cannot carry the entire minor storm runoff, and the excess runoff becomes street flow. Street flow criteria appears to be met in Charlotte Parkway, but it is exceeded in Barnes Road as the street grade flattens near the low point. The storm sewer pipe at the sump inlet (I-E1.6) is surcharged, therefore water will pond at I-E1.6 until the median is overtopped. On the south side of Barnes Road, water ponds at inlet I-E2.4 until the curb is overtopped and water flows into Sand Creek.

For the major storm, per the current criteria, street flow criteria is exceeded in Charlotte Parkway north of Jackpot Drive by approximately 0.1'. Street flow criteria is not exceeded in the remainder of Charlotte Parkway. Street flow criteria is also exceeded on Barnes Road. The curb is overtopped on the north side of Barnes Road. At the two sump inlets in Barnes Road, water ponds at inlet I-E1.6 until it overtops the median and flows to inlet I-E2.4, and water ponds at inlet I-E2.4 until the curb is overtopped and the runoff flows to Sand Creek.

A new inlet and pipe system installed between Charlotte Parkway and the low point in Barnes Road west of Sand Creek will keep the runoff in Barnes Road westbound lane from encroaching within 10' of the median. An additional 20' curb opening inlet and 42" RCP will be required at the northwest curb return of the Charlotte Parkway/Barnes Road intersection. An additional 12' curb opening inlet and 36" RCP will be required at the low point of the westbound lane of Barnes Road. The pipes will discharge to Sand Creek.

Runoff on the south side of Barnes Road will pond at the low point of the eastbound lane. Approximately 95' of curb opening inlet is required to keep the water from encroaching within 10' of the median. Since this is unreasonable, it is recommended that runoff be allowed to overtop the curb at the low point and flow into Sand Creek. A future roadway turnout and curb opening could also be constructed to convey the excess flows. This should be a future capital improvements project since the flows are existing and the need is necessitated by the change in runoff criteria. An overflow swale should be constructed to carry the excess runoff to Sand Creek.

f. Basin G

Basin G is located on the northeast part of the Stetson Hills Development and is approximately 24.7 acres in area. The basin is bounded by Stetson Hills Boulevard on the North, Peterson Road on the East, Basin K on the South, and Jedediah Smith Road on the West. For analysis purposes, Basin G is divided into 5 sub-basins. All 24.7 acres of Basin G are zoned as single family residential development.

Runoff from basin G drains north on Jedediah Smith Road and west on Stetson Hills Boulevard to the low spot in Stetson Hills Boulevard at Sand Creek. A new storm sewer system in Stetson Hills Boulevard will convey the minor storm runoff to Sand Creek in pipes and major storm runoff in the streets. A new inlet at the low spot in Stetson Hills Boulevard (south side) will collect runoff from the major and minor storms and discharge it to the channel.

g. Basin H

Basin H is located on the east part of the Stetson Hills Development and is approximately 79.1 acres in area. The basin is bounded by Stetson Hills Boulevard on the North, Basin M and the Stetson Hills property line on the East, Barnes Road on the South, and Peterson Road on the West. For analysis purposes, Basin H is divided into 15 sub-basins. Sub-basins H6.1 and H6.2 are developed as Filing 9. All 79.1 acres of Basin H are zoned as single family residential development.

Runoff from Basin H drains to the east tributary channel to Sand Creek. Sump curb opening inlets in Peterson Road and Brahma Trail collect street flows from the major and minor storms and discharge to the east tributary channel. An existing and new storm sewer system in Peterson Road collects minor storm runoff and discharges to the east tributary channel. The storm sewer system is existing south of the Peterson Road/Brahma Trail intersection, and is adequate, per the new criteria, to convey the minor storm runoff plus the major storm runoff from Filing No.13.

For the minor storm, per the current criteria, flow in Brahma Trail between Filing 9 and Peterson Road, exceeds street flow criteria; the crown is overtopped but the curb is not. A new inlet is located just east of the Brahma Trail/Peterson Road intersection to intercept the excess runoff.

Sub-basins H8, H12 and H13 drain directly to Sand Creek.

h. Basin J

Basin J is located on the southeast part of the Stetson Hills Development and is approximately 16.9 acres in area. The basin is bounded by Barnes Road and Basin L on the North, the Stetson Hills property line on the East and South, Pring Ranch Road on the South and Sand Creek on the West. For analysis purposes, Basin J is divided into 10 sub-basins. The majority of Basin J is developed or platted as the following filings: 3 (J8), 4 (J5, J11), 5 (J2), 6 (J9), 8 (J8) and 13 (J1). All 16.9 acres of Basin J are zoned as single family residential development.

Basin J drains to Barnes Road and west to the low spot at Sand Creek. The existing storm sewer system in Barnes Road collects minor storm runoff and discharges to Sand Creek. Major storm runoff flows east in Barnes Road to the low spot, where it combines with flow from the west.

For the minor storm, per the current criteria, runoff violates street criteria west of the Barnes Road/Pring Ranch Road intersection (depth of flow is approximately 0.55'), but does not overtop the curb. For the major storm, per the current criteria, runoff violates street criteria west of the Barnes Road/Pring Ranch Road intersection (depth of flow is approximately 0.75'). The curb is overtopped but the crown is not, and a 12' drive lane is left clear on each side of the median. At the low point in Barnes Road, per the current criteria, the maximum ponding depth is exceeded for both storms, as previously described for Basin E above. It is recommended that no additional storm drainage improvements be made to Barnes Road within Basin J.

The current allowable flow depth for the minor storm is also exceeded in Pring Ranch Road. Minor storm runoff flowing north from Filings No. 4 and No. 16 overtops the crown, but does not overtop the curb.

Major and minor storm runoff from sub-basin J1 is collected by the existing Peterson storm sewer system and piped north to the east tributary channel. Per the current criteria, inlet I-J1 is adequate to intercept minor storm flows, but criteria is exceeded during the major storm; water ponds to a depth of 0.93', which exceeds the maximum allowable of 0.67'. The limits of ponding extend from the flowline to the island approximately 60' on each side of the inlet. It is recommended that no additional storm drainage improvements be made to this intersection.

I. Basin K

Basin K is located on the northeast part of the Stetson Hills Development and is approximately 52 acres in area. The basin is bounded by Basin G on the North, Peterson Road on the East and Jedediah Smith Road on the South and West. For analysis purposes, Basin K is divided into 8 sub-basins. All 52 acres of Basin K are zoned as single family residential development.

Runoff from Basin K drains to the east tributary channel to Sand Creek. Curb opening inlets in Peterson Road and Jedediah Smith Road collect street flows from the major and minor storms and discharge to the east tributary channel. A new storm sewer system in Jedediah Smith Road collects runoff from the minor storm and discharges to the east tributary channel. Major storm runoff is conveyed by the streets. Sub-basin K3 drains directly to the channel.

A curb opening inlet exists at the low point in Jedediah Smith Road (north side) just east of the Jedediah Smith Road/Pring Ranch Road intersection. Per the current criteria, this inlet is adequate for the minor storm. For the major storm, water overtops the crown and combines with runoff from Filing 14. It is assumed that each half of the street carries one half of the combined flow. On the north side, the existing 6' inlet is inadequate to intercept the flow and water overtops the curb. An additional 7' inlet with an 18" pipe is required to intercept the excess runoff and keep it from overtopping the curb.

On the south side of Jedediah Smith Road, carry-over flow from the inlets just north of the Jedediah Smith Road/Pring Ranch Road intersection flow south to the low point in Pring Ranch Road.

j. Basin L

Basin L is located on the central part of the Stetson Hills Development and is approximately 138.1 acres in area. The basin is bounded by Stetson Hills Boulevard on the North, Jedediah Smith Road, Pring Ranch Road, Peterson Road and Barnes Road on the East, the Stetson Hills property line on the South, and Sand Creek on the West. For analysis purposes, Basin L is divided into 5 sub-basins. Basin L is partially developed or platted as follows: Filing No. 5 (L2), Filing No. 6 (L3), Filings No. 3 and No. 8 (L5), and Filing No. 14 (L1). All 138.1 acres of Basin L are zoned as single family residential development.

Runoff from Basin L drains directly to Sand Creek.

The current minor storm and major storm street flow criteria is exceeded in Pring Ranch Road. The existing curb opening inlets at the low spot in Pring Ranch Road are not adequate to intercept the street flows from the major and minor storms. Excess runoff will overtop the west curb and flow into Sand Creek. The water will pond to a depth of 0.9' prior to overtopping. The limits of ponding extend across the right-of-way, 30' into Purcell Drive, to the north flowline of Purcell Drive and to a point 30' south of the inlets. An additional 9' of curb opening inlet on the east side and an additional 17' of curb opening inlet on the west side, with a 48" pipe, are required to keep the runoff from overtopping the curb and flowing into Sand Creek.

k. Basin M

Basin M is located on the northeast part of the Stetson Hills Development and is approximately 27.1 acres in area. The basin is bounded by Stetson Hills Boulevard on the North, the Stetson Hills property line on the East, and Basin H on the South and West. For analysis purposes, Basin M is divided into 2 sub-basins. All 27.1 acres of Basin M is zoned as single family residential development.

Runoff from sub-basin M1 drains to the low point in Stetson Hills Boulevard. A new inlet will collect the major and minor storm runoff and discharge it to the channel. The pipe is sized to carry the intercepted street flow plus the major storm runoff from off-site basins O5 and O9.

Runoff from sub-basin M2 drains directly to the east tributary channel.

l. Basin P

Basin P is located on the central part of the Stetson Hills Development and is approximately 105.6 acres in area. The basin is bounded by Stetson Hills Boulevard on the North, Sand Creek on the East, Barnes Road on the South, and Charlotte Parkway and Anna Lee Way on the West. For analysis purposes, Basin P is divided into 3 sub-basins. Basin P is developed or platted as follows: Filing No. 7 (P2), Filings No.10 and No. 11 (P1), and Filing No. 12 (P3). All 105.6 acres of Basin P are zoned as single family residential development.

Runoff from Basin P drains directly to Sand Creek.

3. Runoff

Results of the runoff calculations for the Stetson Hills Development are presented in the runoff calculations in the Technical Appendix of this MDDP.

4. Review of Existing Filings

a. General

All developed filings within the Stetson Hills site were evaluated using the current drainage criteria. Runoff was determined using the Rational Method, using information contained in the original drainage reports (i.e. areas, times of concentrations, land use, etc.) A brief analysis of each filing follows; detailed calculations are included in the Technical Addendum.

b. Filing 3

Per the new criteria, during the minor storm, street flow criteria is slightly exceeded on Holt Drive by 1.6 cfs near the Filing 8 boundary. This excess runoff will overtop the street crown, however, the curbs are not overtopped. Major storm criteria is not violated.

c. Filing 4

Per the new criteria, during the major and minor storms, street flow criteria is not exceeded within the filing. Minor storm street flow criteria is exceeded on Pring Ranch Road as described above (Basin J).

d. Filing 5

Per the new criteria, during the major and minor storms, street flow criteria is not exceeded within the filing, however, street flow criteria is exceeded on Pring Ranch Road as described above (Basin L).

e. Filing 6

Per the current criteria, the inlets at the low point of Purcell are inadequate to intercept the major and minor storm runoff flowing to them. Street flow criteria is violated as the water ponds, overtops the crown and curbs. No overflow swale exists between the two lots to the west. It is estimated that the runoff will pond 1 to 2 feet above the top of the curb before it can flow between the homes to Sand Creek.

f. Filing 7

Per the current criteria, the inlets at the low point of Blazing Star are inadequate to intercept the major and minor storm runoff flowing to them. Street flow criteria is violated as the water ponds and overtops the crown and curbs. The adjacent lots to the east are vacant with no overflow swale. Currently, water must pond 1' to 2' above the top of the curb before it can flow east to Sand Creek.

g. Filing 8

Per the new criteria, during the minor storm, street flow criteria is exceeded on Ashley Drive and Holt Drive. The crown in Ashley Drive is overtopped at Isabella Place, and remains overtopped until Ashley Drive intersects Holt Drive. The crown of Holt Drive is also overtopped. In each case, the water remains in the street and does not overtop the curbs. Water ponds at the sump inlet at the low point in Holt Drive. Runoff not collected by the inlet overtops the curb. The adjacent lots have existing homes with no overflow swale between them. Therefore, water must pond 1' to 2' above the existing curb before it can flow between the houses to Sand Creek.

During the major storm, per the current criteria, street flow criteria is not violated. However, the grass swale east of Isabella Place does not exist as shown in the Filing 8 drainage study.

h. Filing 9

Per the new criteria, during the minor storm, street flow criteria is exceeded on Riva Road and Weaver Drive near the Riva/Weaver intersection causing the street crowns to overtop. The curbs, however, do not overtop. Major storm criteria is not violated.

I. Filings 10 and 11

Per the new criteria, during the minor storm, street flow criteria is exceeded on Blazing Star south of Desoto, causing the crown to overtop. The curbs, however, do not overtop. Major storm criteria is not violated.
An additional 15' curb opening inlet is recommended just north of the inlets at the Anna Lee Way/Emma Lane intersection.

C. Sand Creek and Major Tributary Channels

1. Sand Creek

A previous study was conducted on Sand Creek for the City of Colorado Springs. This report, entitled Sand Creek Drainage Basin Planning Study, Preliminary Design Report,(1993 study) was prepared for the City of Colorado Springs in by Kiowa Engineering Corporation. The study was adopted in November of 1995. This report, along with the accompanying Technical Addendum, was reviewed as part of the drainage planning effort for Stetson Hills.

A review of the input data and the results of the 1993 study were reviewed. Based on this review, it appears the data and results of that planning effort are reasonable and provide useful data for the determination of off-site runoff in Sand Creek. Specifically, the following input parameters have been reviewed, with the following observations:

1. Point rainfall values are consistent with the values summarized in the Criteria Manual.

2. Rainfall distributions are similar to, but not identical to, those contained in the Criteria Manual. These differences are nested at the beginning and end of the storm distribution and probably have no affect on the computed peak flows. The most intense rainfall remains consistent with the Type-IIA distribution.

3. Curve Numbers used to represent the runoff potential of the site appear to be established based on the requirements of the Criteria Manual and on the soil types depicted on the area maps.

4. The basin above the site currently being analyzed appears to be properly delineated and the area computations seem reasonable.

5. The structure and organization of the model represent the apparent drainage patterns of the off-site basin.

The results of the 1993 study were used to establish design flow rates for incoming channels and other off-site tributary areas. Flow rates entering the site at Stetson Hills Road are summarized as follows:

Developed Condition	**10-Year**	**100-Year**
Existing	840 cfs	3230 cfs
Future	3060 cfs	6690 cfs

On-site basins were modeled using HEC-1 to determine the total runoff hydrograph from the site. This model was combined with the results of the 1993 study to establish the runoff from the site with the proposed development in place. The HEC-1 model represents the development proposed within the Stetson Hills development and differs in some cases from the assumptions made in the 1993 study. However, the methodologies and approaches used in the 1993 study were similar to those used in this current study. The results of the current study compare closely to the results presented in the 1993 study. Comparison of flows exiting the site at Barnes Road are as follows:

Model	**10-Year**	**100-Year**
1993 Study (Future Conditions)	4070 cfs	9070 cfs
Current HEC-1 Analysis	3920 cfs	8340 cfs

The Sand Creek Drainage Basin Planning Study requires regional detention upstream from the Stetson Hills project. Detaining upstream flows will result in a flow of 3270 cfs at Stetson Hills Blvd. and a flow of 3600 cfs at Barnes Road.

The adopted Sand Creek Drainage Planning Study recommends a selective channel improvement concept for Sand Creek. The study recommends riprap bank linings at selective locations along with grade control structures. Lining of the channel banks will be accomplished where lots adjoin the channel at locations where erosion of these banks could cause property damage. Areas of high bank velocities and the outside of curves will also have proper bank lining. The banks will be graded as necessary to provide a stable slope for riprap placement. Concrete sills will be placed across the channel at select locations to control long term erosion of the channel invert. The remainder of the channel will remain undisturbed in its natural state as open space, habitat and wetlands.

2. Major Tributary Channels

Two major tributary channels to Sand Creek are proposed; one in the east half of the site from the east property line to Sand Creek, and one in the west half of the site from Powers Boulevard along Stetson Hills Boulevard and Charlotte Parkway to Sand Creek. The channels are designed as described in Section III, with flow rate and sizing calculations included in the Appendix and Technical Addendum.

Discrepancies exist between the flows calculated in the DBPS and the MDDP for the east and west tributaries. Both studies utilized SCS methodology for determining peak runoff. The 100 year, 24 hour storm, Type II distribution was used for each study. The total rainfall utilized in the DBPS was 4.4 inches while the total MDDP rainfall was 4.5 inches. The primary cause for the different developed peak flowrates generated by the two studies is differences in contributing areas. A significant amount of land was assumed to drain directly to Sand Creek in the DBPS. These same areas are now routed to Sand Creek through the East and West tributary channels. The increased flows in the MDDP compare closely with the "Master Drainage Study for Stetson Hills" by Greiner Engineering dated April, 1985. These increased flows result in larger box culverts and channels than those shown in the DBPS. The corresponding costs are therefore greater.

Box culverts will be located at all street crossings to pass the 100-year flow rate without overtopping the street. For the east tributary channel, a 12'x8' reinforced concrete box culvert (RCBC) is required at Brahma Trail and a 12'x10' RCBC is required at Peterson Road. The existing double 10'x8' RCBC at Jedediah Smith Road is adequate to convey the 100-year flow rate without overtopping the street.

For the west tributary channel, a 10'x6' RCBC is required at Tutt Avenue and a double 10'x10' RCBC is required at Jackpot Drive. The existing triple 10'x8' RCBC at Charlotte Parkway is adequate to convey the 100-year flow rate without overtopping the street. The channel downstream of the triple 10'x8' RCBC is existing and is adequate to convey the 100-year flowrate with 0.9' of freeboard. A small section of this channel at Sand Creek has not yet been constructed. This section should be constructed when Sand Creek channel improvements are constructed in this area.

3. Major Channel Improvement Phasing- Sand Creek and Tributaries

The Sand Creek channel and major tributaries have been divided into phases which will be constructed when an associated parcel is developed. This phasing has been discussed and agreed upon with City personnel and the Developer of Stetson Hills. The channel phasing and the associated development "trigger points" for construction are shown on a map at the back of this report. The phases are discussed as follows:

a. Sand Creek Channel Reach 1 from Barnes Road to the West Tributary Channel north of Stetson Hills #12.

This channel and the adjacent unimproved portion of the west tributary will be constructed as a part of Filing #12 as stated in the drainage study for this filing.

b. Sand Creek Channel Reach 2 from the West Tributary north of Stetson Hills #12 to a point south of the East tributary south of Stetson Elementary.

This section of the channel will be improved at the same time as Reach 1 of the channel by utilizing funds from the $778 per lot cost collected on building permits being issued for all Stetson Hills Filings preceding Filing 12. The channel will be improved as far north as the funds will allow. If funds do not allow for the extension to the east tributary, the remainder will be constructed as part of the Filing #14 channel construction.

c. Sand Creek Channel Reach 3 from the north end of Reach 2 to the East Tributary

This section of the channel will be improved with Stetson Hills Filing #14.

d. Sand Creek Channel Reach 4 from the East Tributary to the north boundary of Stetson Elementary.

This reach will be constructed with the southerly 3/4 of Filing #10. The existing per lot fee of $778.00 will be discontinued.

e. Sand Creek Channel Reach 5 from the north boundary of Stetson Elementary to Stetson Hills Blvd.

The final reach will be constructed when any of the land between Sand Creek and Jedediah Smith Road and north of Stetson Elementary is platted or when the parcel between Jedediah Smith Road and Peterson Road which drains to Stetson Hills Boulevard is platted.

f. East Tributary from Peterson Road to Sand Creek Channel (Tributary "A").

This tributary will be constructed as a part of Filing #15 or with Tributary "B" parcels if they are constructed prior to Filing #15.

g. East tributary from Peterson Road to east boundary of Stetson Hills Development (Tributary "B").

This tributary will be constructed as contributing parcels north and south of the tributary and east of Peterson Road are platted.

h. West Tributary from Charlotte Parkway to Powers Blvd.

This tributary will be constructed as platting occurs in parcels adjacent to the channel.

I. Channel southeast of the High School Site (Tributary "SC").

This channel will be constructed when the three most northerly cul-de-sacs (northern one quarter) of Stetson Hills Filing #10 are developed.

4. Detention Pond

The 1993 Sand Creek DBPS (Revised October 1995) by Kiowa Engineering states the need for five regional detention ponds along Sand Creek. Pond number one and pond number two are located south of Stetson Hills within the Colorado Springs Ranch development. These facilities will control the runoff from upstream and release flows at predevelopment levels. This control is needed since the downstream channel improvements south of The Colorado Springs Ranch are not adequate to convey the developed 100 year runoff as calculated utilizing current City criteria.

The construction of the regional detention basins within the Ranch property will be dependent upon the rate of development within the areas tributary to the detention basins. In general, a funding plan with financial assurances has been developed between the developers of the Springs Ranch and Stetson Hills for the Sand Creek Detention Basin Number 1, located upstream of Constitution Avenue. An agreement is being developed between the two developers and the City. This agreement sets up a funding mechanism for the construction of the pond. The "Sand Creek Channel Detention Pond Fee" will be paid at the rate determined in the Sand Creek DBPS. The fees paid by the Stetson Hills and Springs Ranch developers will go into a special escrow account. Another fee known as the "Detention Pond Additional Assurance" will be paid into separate account by the two developers to help meet the anticipated costs of construction. The pond will be needed when 600 acres in the immediate pond area are developed. The time frame for construction of this detention facility has been estimated at six to eight years from the present time assuming that development of the Ranch and Stetson Hills continue at their present pace. Funds for construction of the pond will be taken from the escrow account first and then from the Sand Creek Detention Pond Fee fund.

The final design for Sand Creek Detention Basin Number 1 was initiated in January of 1996 by Kiowa Engineering and is currently being reviewed by the State Engineer's office. Agreements for the transfer of the land to the City of Colorado Springs for construction of pond number one are currently being considered.

Design and construction timing for Sand Creek Detention Basin Number 2 located near Sky Sox Stadium has not been addressed at this time. Sand Creek Detention Basin Number 2 should be constructed when the area north of the Stetson Hills begins development. There is an opportunity at this time to construct a portion of the embankment for Detention Basin Number 2 as part of the development of the Springs Ranch Golf Course. This has been recommended by the Springs Ranch as a way of avoiding future disturbances within the golf course once the need for the basin is warranted based upon the level of development in the Sand Creek basin as a whole.

V. Cost Estimates

Proposed drainage facility quantities were estimated from preliminary and final construction plans and the layouts depicted on the attached MDDP plans. Costs are included for the Sand Creek channel, the east tributary channel from Sand Creek to the east boundary of Stetson Hills (Section DD & EE), the west tributary channel from Sand Creek to Powers Blvd.(Section BB), channel "SC" from Stetson Hills Blvd. to Charlotte Pkwy. (Section CC), the channel from Barnes Road to Sand Creek east of the Sky Sox Stadium (Section GG), and the channel from Barnes Road to the existing storm sewer west of Sky Sox Stadium (Section HH). Costs for initial storm sewer systems have been included for informational purposes only since these costs were not included in the DBPS for the calculation of the drainage basin fee.

This study has analyzed Stetson Hills in more detail with more site specific information than was available when the DBPS was performed. The two major east and west tributaries will carry more runoff than assumed in the DBPS. The DBPS assumes that a significant area of Stetson Hills will drain directly to Sand Creek. Current major roadway and local subdivision street layouts will cause the runoff to be intercepted by the streets and storm sewer systems and directed to the tributary channels which drain to Sand Creek. Major storm runoff from the land due north of Stetson Hills Blvd. and west of Sand Creek will be conveyed through Stetson Hills in channel section CC to the west tributary channel. This channel "SC" was not included in the DBPS cost estimates. A channel east of the Sky Sox stadium and Barnes Road (Section GG) will also be needed to convey 100 year flows from Basin "C" to Sand Creek. This channel was included in the DBPS. The channel section "HH" west of Sky Sox Stadium is needed to convey the flows from the Barnes Road storm sewer outfall to the existing Sky Sox storm sewer system. This cost will not be reimbursible and is included for information only. The flows in Sand Creek were also analyzed in detail and preliminary channel plans have been designed. Additional riprap and concrete sill structures will be needed due to the planned location of lots along the channel and the necessity to protect against erosive stream velocities along channel banks.

The Sand Creek DBPS estimates a total cost of $2,481,067.50 for major 100 year drainage facilities. Estimated costs for the proposed on-site drainage improvements are presented in the cost section of this report. The total cost of proposed major drainage improvements is approximately $6,805,306.47. These costs include a 5 percent construction contingency allowance and a 10 percent allowance for design and construction engineering. This is an increase of $4,324,238.97 over the costs calculated for the DBPS study. The bridge costs for Stetson Hills consist of the Sand Creek crossing at Stetson Hills Blvd. The estimated bridge cost is $296,887.45 including 5% contingency and 10% engineering. This is an increase of $41,587.45 over the DBPS cost of $255,300.00. These major storm facilities are needed to serve the drainage needs of Stetson Hills and surrounding areas. The developer of Stetson Hills will therefore make a request to the drainage board to approve as a reimbursible drainage basin cost the full cost of those facilities which are in excess of, or in addition to, the costs identified in the DBPS.

VI. REFERENCES

A. The following documents were used in the preparation of this MDDP:

Drainage Criteria Manual, City of Colorado Springs and El Paso County

"Master Drainage Study For Stetson Hills," prepared by Greiner Engineering Sciences, Inc., April, 1985

"Final Drainage Study For Stetson Hills Filings 1 and 2," prepared by Greiner Engineering Sciences, Inc., April, 1985

"Sand Creek Drainage Basin Planning Study, Preliminary Design Report," prepared by Kiowa Engineering Corporation, January, 1993, revised April, 1993

"Sand Creek Drainage Basin Planning Study, Hydrology Report, Technical Addendum," prepared by Kiowa Engineering Corporation, August, 1991, revised January, 1992

"Drainage Report For Stetson Hills Filing No. 3," prepared by Greiner Engineering Sciences, Inc., November, 1985

"Drainage Report For Stetson Hills Filing No. 4," prepared by Greiner Engineering Sciences, Inc., November, 1985

"Drainage Report For Stetson Hills Filing No. 5," prepared by Greiner Engineering Sciences, Inc., November, 1985

"Drainage Report For Stetson Hills Filing No. 6," prepared by Greiner Engineering Sciences, Inc., November, 1985

"Final Drainage Study For Stetson Hills Filing No. 7," prepared by JR Engineering, LTD., February 11, 1986

"Drainage Report For Stetson Hills Filing No. 8," prepared by Greiner Engineering Sciences, Inc., July, 1986

"Drainage Report For Stetson Hills Filing No. 9," prepared by Greiner Engineering Sciences, Inc., July, 1986

"Drainage Report For Stetson Hills Filings No. 10 & 11," prepared by Greiner Engineering Sciences, Inc., January, 1987

"Final Drainage Study For Powers Boulevard, Phase 2, Waynoka Road To Woodmen Road," prepared by KKBNA, Inc., July, 1987, revised April 4, 1988

APPENDIX

COST ESTIMATE

COST COMPARISON MDDP VS. DBPS File-CSTCOMP.XLS

MAJOR REIMBURSIBLE DRAINAGE FACILITIES

REACH DESCRIPTION	**MDDP DESIGNATION**	**MDDP COSTS**	**DBPS DESIGNATION**	**DBPS COSTS**	**INCREASE**
SAND CREEK					
Channel	Sand Cr. Confl. to Exist. W. Trib.	$ 148,790.00	131-1	$ 92,400.00	$ 56,390.00
Channel	Barnes to W. Trib.	$ 306,180.00	125	$ 84,900.00	$ 221,280.00
Channel	W. Trib. to E. Trib.	$ 553,600.00	184	$ 64,800.00	$ 488,800.00
Channel	E. Trib. to Stet. Hills Blvd.	$ 880,136.00	129	$ 493,750.00	$ 386,386.00
SUBTOTAL		**$ 1,888,706.00**		**$ 735,850.00**	**$ 1,152,856.00**
EAST TRIBUTARY					
Channel	T13-T15	$ 371,118.80	127-1	$ 190,400.00	$ 180,718.80
Channel	T10-T13	$ 811,881.20	128	$ 410,800.00	$ 401,081.20
Box @ Peterson Rd.	10'x12' RCBC	$ 132,750.00	Dbl. 6'x12' RCBC	$ 104,400.00	$ 28,350.00
Box @ Brahma Tr.	8'x12' RCBC	$ 52,810.00	Not Included	$ -	$ 52,810.00
SUBTOTAL		**$ 1,368,560.00**		**$ 705,600.00**	**$ 662,960.00**
WEST TRIBUTARY					
Channel	T1-T5	$ 1,613,249.80	131-2	$ 495,600.00	$ 1,117,649.80
Box @ Jackpot Dr.	Dbl. 10x10 RCBC	$ 157,500.00	Not Included	$ -	$ 157,500.00
Box @ Tutt Ave.	10'x6' RCBC	$ 79,900.00	Not Included	$ -	$ 79,900.00
Box at Stetson Hills Blvd.	10'x8' RCBC	$ 120,060.00	Not Included	$ -	$ 120,060.00
SUBTOTAL		**$ 1,970,709.80**		**$ 495,600.00**	**$ 1,475,109.80**
SECTION AA&GG @ SKY SOX					
Channel	Sections AA & GG	$ 187,029.00	124	$ 220,400.00	$ (33,371.00)
SUBTOTAL		**$ 187,029.00**		**$ 220,400.00**	**$ (33,371.00)**
CHANNEL "SC" @ STETSON #10					
Channel	Section CC	$ 375,833.00	Not Included	$ -	$ 375,833.00
Box @ Stetson Hills Blvd.	10'x6' RCB	$ 85,650.00	Not Included	$ -	$ 85,650.00
Pipe @ Charlotte Blvd.	72" RCP	$ 41,170.00	Not Included	$ -	$ 41,170.00
SUBTOTAL		**$ 502,653.00**		**$ -**	**$ 502,653.00**
TOTAL		**$ 5,917,657.80**		**$ 2,157,450.00**	**$ 3,760,207.80**
5% CONSTRUCTION CONTINGENCY		$ 295,882.89		$ 107,872.50	$ 188,010.39
10% ENGINEERING		$ 591,765.78		$ 215,745.00	$ 376,020.78
GRAND TOTAL		**$ 6,805,306.47**		**$ 2,481,067.50**	**$ 4,324,238.97**

MAJOR REIMBURSIBLE BRIDGE FACILITIES

REACH DESCRIPTION	**MDDP DESIGNATION**	**MDDP COSTS**	**DBPS DESIGNATION**	**DBPS COSTS**	**INCREASE**
SAND CREEK					
Box @ Stetson Hills Blvd.	8'x10' Triple RCBC	$ 258,163.00	8'x10' Triple RCBC	$ 222,000.00	$ 36,163.00
TOTAL		**$ 258,163.00**		**$ 222,000.00**	**$ 36,163.00**
5% CONSTRUCTION CONTINGENCY		$ 12,908.15		$ 11,100.00	$ 1,808.15
10% ENGINEERING		$ 25,816.30		$ 22,200.00	$ 3,616.30
GRAND TOTAL		**$ 296,887.45**		**$ 255,300.00**	**$ 41,587.45**

Engineer's Estimate of Probable Cost			File-COSTEST3.XLS	
Stetson Hills Sand Creek Channel				
Phase I-Barnes Road (Sta. 0+00) to East Tributary (Sta. 28+00)				
4/30/1997 SWT				
Item	**Quantity**	**Units**	**Unit Price**	**Total Price**
Sand Creek Main Channel				
Sta. 0+00 to Sta. 11+00				
Barnes Road to West Trib. Confluence				
Clear and Grub	2.5	Acres	$ 1,000.00	$ 2,500.00
Unclassified Excavation	3,170	CY	$ 6.00	$ 19,020.00
Embankment	240	CY	$ 8.00	$ 1,920.00
D50=12" Riprap *	2,950	CY	$ 30.00	$ 88,500.00
Type II Bedding (8"Thick) *	670	CY	$ 26.00	$ 17,420.00
Filter Cloth *	3,010	SY	$ 2.00	$ 6,020.00
Class 4 Agg. Base Course (8" Thick) Trail	290	CY	$ 25.00	$ 7,250.00
Grouted Riprap Trail	90	CY	$ 55.00	$ 4,950.00
Concrete Sill	260	CY	$ 200.00	$ 52,000.00
Riprap @ Sill	1,860	CY	$ 30.00	$ 55,800.00
8" Bedding @ Sill	620	CY	$ 26.00	$ 16,120.00
Filter Cloth @ Sill	2,790	SY	$ 2.00	$ 5,580.00
Revegetation	4.5	Acres	$ 5,000.00	$ 22,500.00
Erosion Control Silt Fence	2,200	LF	$ 3.00	$ 6,600.00
SUBTOTAL				**$ 306,180.00**
West Trib. Channel Confluence to Exist.				
Clear and Grub	1.0	Acres	$ 1,000.00	$ 1,000.00
Unclassified Excavation	2,200	CY	$ 6.00	$ 13,200.00
D50=18" Riprap	620	CY	$ 35.00	$ 21,700.00
D50=12" Riprap Cutoff Wall	470	CY	$ 30.00	$ 14,100.00
Type II Bedding (8"Thick)	240	CY	$ 26.00	$ 6,240.00
Filter Cloth	1,080	SY	$ 2.00	$ 2,160.00
Reinforced Concrete Channel Lining	260	CY	$ 250.00	$ 65,000.00
Reinforced Concrete Cutoff Wall	25	CY	$ 250.00	$ 6,250.00
Concrete Sill	30	CY	$ 200.00	$ 6,000.00
Riprap @ Sill	120	CY	$ 30.00	$ 3,600.00
8" Bedding @ Sill	40	CY	$ 26.00	$ 1,040.00
Filter Cloth @ Sill	170	SY	$ 2.00	$ 340.00
Class 4 Agg. Base Course (8" Thick) Trail	100	CY	$ 25.00	$ 2,500.00
4" Perforated Drain	210	LF	$ 3.00	$ 630.00
Filter Cloth for Subdrain	140	SY	$ 2.00	$ 280.00
Aggregate for Subdrain	30	CY	$ 25.00	$ 750.00
Revegetation	0.5	Acres	$ 5,000.00	$ 2,500.00
Erosion Control Silt Fence	500	LF	$ 3.00	$ 1,500.00
SUBTOTAL				**$ 148,790.00**

Sand Creek Main Channel				
Sta. 11+00 to Sta. 28+00				
W. Trib. Confluence to E. Trib. Confluence				
Clear and Grub	3.0	Acres	$ 1,000.00	$ 3,000.00
Unclassified Excavation	11,340	CY	$ 6.00	$ 68,040.00
Embankment	1,250	CY	$ 8.00	$ 10,000.00
D50=12" Riprap *	9,430	CY	$ 30.00	$ 282,900.00
Type II Bedding (8"Thick) *	2,200	CY	$ 26.00	$ 57,200.00
Filter Cloth *	9,890	SY	$ 2.00	$ 19,780.00
Class 4 Agg. Base Course (8" Thick) Trail	550	CY	$ 25.00	$ 13,750.00
Grouted Riprap Trail	30	CY	$ 55.00	$ 1,650.00
Concrete Sill	120	CY	$ 200.00	$ 24,000.00
Riprap @ Sill	910	CY	$ 30.00	$ 27,300.00
8" Bedding @ Sill	310	CY	$ 26.00	$ 8,060.00
Filter Cloth @ Sill	1,360	SY	$ 2.00	$ 2,720.00
Revegetation	5.0	Acres	$ 5,000.00	$ 25,000.00
Erosion Control Silt Fence	3,400	LF	$ 3.00	$ 10,200.00
SUBTOTAL				**$ 553,600.00**
Sand Creek Main Channel				
Sta. 28+00 to Sta. 59+30				
E. Trib. Confluence to Stetson Hills Blvd.				
Clear and Grub	8.6	Acres	$ 1,000.00	$ 8,600.00
Unclassified Excavation	8,500	CY	$ 6.00	$ 51,000.00
Embankment	3,000	CY	$ 8.00	$ 24,000.00
D50=12" Riprap *	13,613	CY	$ 30.00	$ 408,390.00
Type II Bedding (8"Thick) *	5,036	CY	$ 26.00	$ 130,936.00
Filter Cloth *	22,660	SY	$ 2.00	$ 45,320.00
Class 4 Agg. Base Course (8" Thick) Trail	1,160	CY	$ 25.00	$ 29,000.00
Grouted Riprap Trail	30	CY	$ 55.00	$ 1,650.00
Concrete Sill	227	CY	$ 200.00	$ 45,400.00
Riprap @ Sill	1,765	CY	$ 30.00	$ 52,950.00
8" Bedding @ Sill	589	CY	$ 26.00	$ 15,314.00
Filter Cloth @ Sill	2,648	SY	$ 2.00	$ 5,296.00
Revegetation	8.7	Acres	$ 5,000.00	$ 43,500.00
Erosion Control Silt Fence	6,260	LF	$ 3.00	$ 18,780.00
SUBTOTAL				**$ 880,136.00**
Stetson Hills Blvd. Crossing				
Triple 8'x10' RCBC	929	LF	$ 245.00	$ 227,605.00
Wingwalls/Headwalls	64	LF	$ 190.00	$ 12,160.00
Riprap	384	CY	$ 45.00	$ 17,280.00
Type II Bedding	43	CY	$ 26.00	$ 1,118.00
SUBTOTAL				**$ 258,163.00**

SUBTOTAL OF ALL FOUR PHASES				**$ 2,146,869.00**
MOBILIZATION (1%)				**$ 21,468.69**
10% ENGINEERING				**$ 214,686.90**
5% CONSTRUCTION CONTINGENCY				**$ 107,343.45**
TOTAL				**$ 2,490,368.04**
* Riprap quantities are dependent on the depth to bedrock from the surface.				
An estimate of the necessary depth of riprap was made based on soil borings.				
The riprap, bedding and filter cloth quantities could therefore vary				
considerably depending on actual field conditions.				
THIS ESTIMATE HAS BEEN PREPARED USING PRELIMINARY PLANS.				
THIS ESTIMATE IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY				
AND IS NOT A GUARANTEE OF PROJECT COSTS NOR SHOULD IT BE USED AS SUCH.				

ENGINEERS ESTIMATE OF PROBABLE COST				File-ETRIBCST.XLS	
STETSON HILLS DEVELOPMENT					
SAND CREEK EAST TRIBUTARY CHANNEL					
5/1/97					
Description	Quantity	Unit	Unit Cost		Total Cost
SAND CREEK TO PETERSON	**T13-T15**				
12" RIPRAP	5,240	CY	$ 25.00		$ 131,000.00
8" BEDDING	1,760	CY	$ 25.00		$ 44,000.00
MIRAFI 500X FILTER CLOTH	7,916	SQYD	$ 1.80		$ 14,248.80
3' DROP STRUCTURE	120	CY	$ 300.00		$ 36,000.00
6' CONCRETE SILL	9	CY	$ 250.00		$ 2,250.00
18" GROUTED BOULDERS	622	CY	$ 40.00		$ 24,880.00
GRAVEL (TRAIL)	416	CY	$ 15.00		$ 6,240.00
EXCAVATION (SAND) CUT	10,000	CY	$ 1.25		$ 12,500.00
BAFFLE CHUTE DROP	1	LS	$ 100,000.00		$ 100,000.00
SUBTOTAL					**$ 371,118.80**
Brahma Trail Box					
12'X8' RCBC (Brahma Trail)	85	LF	$ 496.00		$ 42,160.00
WINGWALLS	1	LS	$ 10,650.00		$ 10,650.00
SUBTOTAL					**$ 52,810.00**
Peterson Road Box					
12'X10' RCBC (Peterson Road)	185	LF	$ 660.00		$ 122,100.00
WINGWALLS	1	LS	$ 10,650.00		$ 10,650.00
SUBTOTAL					**$ 132,750.00**
PETERSON TO BOUNDARY	**T10-T13**				
12" RIPRAP	10,524	CY	$ 25.00		$ 263,100.00
4" TYPE I BEDDING	1,748	CY	$ 25.00		$ 43,700.00
4" TYPE II BEDDING	1,748	CY	$ 25.00		$ 43,700.00
6" TYPE II BEDDING	360	CY	$ 25.00		$ 9,000.00
MIRAFI 500X FILTER CLOTH	15,734	SQYD	$ 1.80		$ 28,321.20
3' DROP STRUCTURE	77	CY	$ 300.00		$ 23,100.00
4' DROP STRUCTURE	25	CY	$ 300.00		$ 7,530.00
3.5' CONCRETE SILL	10	CY	$ 250.00		$ 2,500.00
6' CONCRETE SILL	60	CY	$ 250.00		$ 15,000.00
18" GROUTED BOULDERS	773	CY	$ 40.00		$ 30,920.00
GRAVEL (TRAIL)	1,884	CY	$ 15.00		$ 28,260.00
CONCRETE (NORTH REACH)	485	CY	$ 200.00		$ 97,000.00
EXCAVATION (ROCK) CUT	30,335	CY	$ 5.00		$ 151,675.00
EXCAVATION (SAND) CUT	54,460	CY	$ 1.25		$ 68,075.00
SUBTOTAL					**$ 811,881.20**
TOTAL					**$ 1,368,560.00**

5% CONSTRUCTION CONTINGENCY					$ 68,428.00
10% ENGINEERING					$ 136,856.00
GRAND TOTAL					**$ 1,573,844.00**
THIS ESTIMATE HAS BEEN PREPARED USING PRELIMINARY PLANS.					
THIS ESTIMATE IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY					
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ENGINEERS ESTIMATE OF PROBABLE COST File-WTRIBCST.XLS

STETSON HILLS DEVELOPMENT

SAND CREEK WEST TRIBUTARY CHANNEL- Charlotte Blvd. to Powers Blvd. **(Final Design)**

5/1/97

Description	Quantity	Unit	Unit Cost		Total Cost
Charlotte Blvd. to Jackpot Drive*	**Section T4-T5**				
GROUTED RIPRAP	2867	CY	$ 75.00		$ 215,025.00
12" RIPRAP CHANNEL LINING W/FILTER	5,070	CY	$ 38.50		$ 195,195.00
CONCRETE DROP STRUCTURES	6	EA	$ 14,250.00		$ 85,500.00
EXCAVATION	1	LS	$ 42,500.00		$ 42,500.00
TRIPLE 10X8 BOX EXTENSION	1	EA	$ 30,000.00		$ 30,000.00
WINGWALLS	2	EA	$ 20,000.00		$ 40,000.00
RETAINING WALLS	2,430	SF	$ 28.50		$ 69,255.00
SUBTOTAL					**$ 677,475.00**
JACKPOT DRIVE BOX					
DBL. 10'X10' BOX CULVERT (Jackpot)	105	LF	$ 1,500.00		$ 157,500.00
SUBTOTAL					**$ 157,500.00**
Jackpot Drive to Tutt Blvd.	**Section T2-T4**				
12" RIPRAP CHANNEL LINING	6,880	CY	$ 25.00		$ 172,000.00
6" TYPE II BEDDING	2,295	CY	$ 25.00		$ 57,375.00
MIRAFI 500X FILTER CLOTH	10,236	SQYD	$ 1.80		$ 18,424.80
4' DROP STRUCTURE WALL	245	CY	$ 300.00		$ 73,500.00
18" GROUTED BOULDERS	1,765	CY	$ 40.00		$ 70,600.00
6' CONCRETE SILL	73	CY	$ 250.00		$ 18,250.00
AGGREGATE BASE COURSE (TRAIL)	375	CY	$ 15.00		$ 5,625.00
EXCAVATION (ROCK)	12,000	CY	$ 5.00		$ 60,000.00
EXCAVATION (SAND)	12,000	CY	$ 1.25		$ 15,000.00
RETAINING WALLS**	4,000	SF	$ 15.00		$ 60,000.00
SUBTOTAL					**$ 550,774.80**
STETSON HILLS BLVD. BOX					
10'x8' BOX CULVERT (Stetson Hills Blvd.)	280	LF	$ 392.00		$ 109,760.00
WINGWALLS	1	LS	$ 10,300.00		$ 10,300.00
SUBTOTAL					**$ 120,060.00**
WEST TRIBUTARY TUTT TO POWERS (Preliminary Design)			**Section T1-T2**		
RIPRAP CHANNEL	1400	LF	$ 275.00		$ 385,000.00
SUBTOTAL					**$ 385,000.00**

TUTT BLVD. BOX					
10'X6' RCBC (Tutt)	200	LF	$ 354.00		$ 70,800.00
WINGWALLS	1	LS	$ 9,100.00		$ 9,100.00
SUBTOTAL					**$ 79,900.00**
TOTAL					**$ 1,970,709.80**
5% CONSTRUCTION CONTINGENCY					$ 98,535.49
10% ENGINEERING					$ 197,070.98
GRAND TOTAL					**$ 2,266,316.27**
*COSTS FOR T4-T5 CHANNEL ARE BASED ON CONTRACTOR BID					
**NOTE: RETAINING WALL COSTS ALONG T2-T4 CHANNEL ARE PRELIMINARY SINCE ACTUAL DESIGN					
HAS NOT BEEN COMPLETED.					
THIS ESTIMATE HAS BEEN PREPARED USING PRELIMINARY PLANS.					
THIS ESTIMATE IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY					
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Engineer's Estimate of Probable Cost					File-SOXCST.XLS
Stetson Hills Development					
Tributary Channel Section AA&GG- Barnes Rd. @ Sky Sox					
4/28/1997 SWT					
Description	Quantity	Unit	Unit Cost		Total Cost
12" RIPRAP CHANNEL LINING	4,352	CY	$ 25.00		$ 108,800.00
6" TYPE II BEDDING	800	CY	$ 25.00		$ 20,000.00
MIRAFI FILTER CLOTH	4,766	SY	$ 1.80		$ 8,578.80
EXCAVATION	4,500	CY	$ 3.00		$ 13,500.00
AGGREGATE BASE COURSE (TRAIL)	450	CY	$ 15.00		$ 6,750.00
CUTOFF WALLS	70	CY	$ 300.00		$ 21,000.00
54" PIPE HEADWALL/WINGWALL	9	CY	$ 300.00		$ 2,700.00
6'X4' HEADWALLS/WINGWALLS	19	CY	$ 300.00		$ 5,700.00
SUBTOTAL					**$ 187,028.80**
5% CONSTRUCTION CONTINGENCY					$ 9,351.44
10% ENGINEERING					$ 18,702.88
GRAND TOTAL					**$ 215,083.12**
THIS ESTIMATE HAS BEEN PREPARED USING PRELIMINARY DATA.					
THIS ESTIMATE IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY					
AND IS NOT A GUARANTEE OF PROJECT COSTS NOR SHOULD IT BE USED AS SUCH.					

Engineer's Estimate of Probable Cost File- SCOOLCST.XLS

Stetson Hills Development

Tributary Channel SC- Stetson Hills Blvd. to Charlotte Pkwy.

4/30/1997 SWT

Description	Quantity	Unit	Unit Cost	Total Cost
Earthwork	1	LS	$ 43,000.00	$ 43,000.00
24" Water Lowering	1	EA	$ 19,000.00	$ 19,000.00
Riprap Lined Channel	1,422	CY	$ 38.00	$ 54,036.00
Grouted Riprap Channel	364	CY	$ 68.00	$ 24,752.00
Riprap Protection (N. End)	176	CY	$ 35.00	$ 6,160.00
Concrete Lined Channel	954	LF	$ 161.50	$ 154,071.00
Headwall	1	EA	$ 3,000.00	$ 3,000.00
Transition Structure	1	EA	$ 46,000.00	$ 46,000.00
Gravel Access Road	2,633	SY	$ 5.75	$ 15,139.75
Hand Rail	122	LF	$ 87.50	$ 10,675.00
SUBTOTAL				**$ 375,833.75**
Stetson Hills Blvd. Crossing				
10'x6' RCB Culvert	225	LF	$ 354.00	$ 79,650.00
10'X6' Headwalls/Wingwalls	20	CY	$ 300.00	$ 6,000.00
SUBTOTAL				**$ 85,650.00**
Charlotte Blvd. Crossing				
72" RCP	179	LF	$ 230.00	$ 41,170.00
SUBTOTAL				**$ 41,170.00**
TOTAL				**$ 502,653.75**
5% CONSTRUCTION CONTINGENCY				$ 25,132.69
10% ENGINEERING				$ 50,265.38
GRAND TOTAL				**$ 578,051.81**

THIS ESTIMATE HAS BEEN PREPARED USING PRELIMINARY PLANS.
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Engineer's Estimate of Probable Cost
Stetson Hills Development File-CHANHCST.XLS
Tributary Channel Section HH- Barnes Rd. @ Sky Sox *NONREIMBURSABLE*
4/28/1997 SWT

Description	Quantity	Unit	Unit Cost		Total Cost
12" RIPRAP CHANNEL LINING	1,250	CY	$ 25.00		$ 31,250.00
6" TYPE II BEDDING	208	CY	$ 25.00		$ 5,200.00
MIRAFI FILTER CLOTH	1,250	SY	$ 1.80		$ 2,250.00
EXCAVATION	800	CY	$ 3.00		$ 2,400.00
CUTOFF WALLS	25	CY	$ 300.00		$ 7,500.00
54" PIPE HEADWALL/WINGWALL	9	CY	$ 300.00		$ 2,700.00
60" HEADWALL/WINGWALL	9	CY	$ 300.00		$ 2,700.00
SUBTOTAL					$ 54,000.00
5% CONSTRUCTION CONTINGENCY					$ 2,700.00
10% ENGINEERING					$ 5,400.00
GRAND TOTAL					**$ 62,100.00**

THIS ESTIMATE HAS BEEN PREPARED USING PRELIMINARY DATA.
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FOR INFORMATION ONLY

CONSTRUCTION COST ESTIMATES FOR MINOR SYSTEMS

ITEM	UNIT PRICE	UNIT	BASIN H		BASIN J		BASIN K		BASIN L		BASIN M	
			QTY	TOTAL COST	QTY	TOTAL COST	QTY	TOTAL COST	QTY	TOTAL COST	QTY	TOTAL COST
PIPE												
18-INCH	$31.00	LF	50	$1,550	0	$0	120	$3,720	0	$0	0	$0
21-INCH	$35.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0
24-INCH	$38.00	LF	60	$2,280	0	$0	0	$0	0	$0	0	$0
27-INCH	$40.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0
30-INCH	$42.00	LF	10	$420	0	$0	1050	$44,100	0	$0	0	$0
36-INCH	$46.00	LF	500	$23,000	0	$0	0	$0	0	$0	0	$0
42-INCH	$65.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0
48-INCH	$84.00	LF	0	$0	0	$0	200	$16,800	0	$0	300	$25,200
54-INCH	$105.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0
72-INCH	$180.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0
84-INCH	$243.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0
INLETS	$250.00	LF	105	$26,250	0	$0	75	$18,750	0	$0	21	$5,250
MANHOLES												
48-INCH	$2,000.00	EA	0	$0	0	$0	0	$0	0	$0	0	$0
60-INCH	$2,500.00	EA	3	$7,500	0	$0	4	$10,000	0	$0	0	$0
ESTIMATED CONSTRUCTION COST				$61,000		$0		$93,370		$0		$30,450
CONSTRUCTION CONTINGENCY @ 10%				$6,100		$0		$9,337		$0		$3,045
DESIGN/CONSTRUCTION ENGR @ 10%				$6,100		$0		$9,337		$0		$3,045
SUBTOTAL				**$73,200**		**$0**		**$112,044**		**$0**		**$36,540**

FOR INFORMATION ONLY

CONSTRUCTION COST ESTIMATES FOR MINOR SYSTEMS

ITEM	UNIT PRICE	UNIT	DRAINAGE BASIN BASIN A		BASIN B		BASIN C		BASIN D		BASIN E		BASIN G	
			QTY	TOTAL COST	QTY	TOTAL COST	QTY	TOTAL COST	QTY	TOTAL COST	QTY	TOTAL COST	QTY	TOTAL COST
PIPE														
18-INCH	$31.00	LF	130	$4,030	470	$14,570	80	$2,480	50	$1,550	0	$0	0	$0
21-INCH	$35.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
24-INCH	$38.00	LF	0	$0	0	$0	700	$26,600	200	$7,600	0	$0	0	$0
27-INCH	$40.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
30-INCH	$42.00	LF	1100	$46,200	850	$35,700	1000	$42,000	0	$0	0	$0	0	$0
36-INCH	$46.00	LF	1400	$64,400	0	$0	0	$0	0	$0	0	$0	500	$21,000
42-INCH	$65.00	LF	0	$0	600	$39,000	700	$45,500	0	$0	0	$0	50	$2,300
48-INCH	$84.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
54-INCH	$102.00	LF	0	$0	0	$0	150	$15,300	0	$0	0	$0	0	$0
72-INCH	$180.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
84-INCH	$243.00	LF	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
INLETS	$250.00	LF	93	$23,250	160	$40,000	121	$30,250	28	$7,000	0	$0	71	$17,750
MANHOLES														
48-INCH	$2,000.00	EA	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
60-INCH	$2,500.00	EA	8	$20,000	5	$12,500	10	$25,000	0	$0	0	$0	2	$5,000
ESTIMATED CONSTRUCTION COST				$157,880		$141,770		$187,130		$16,150		$0		$46,050
CONSTRUCTION CONTINGENCY @ 10%				$15,788		$14,177		$18,713		$1,615		$0		$4,605
DESIGN/CONSTRUCTION ENGR @ 10%				$15,788		$14,177		$18,713		$1,615		$0		$4,605
SUBTOTAL				**$189,456**		**$170,124**		**$224,556**		**$19,380**		**$0**		**$55,260**

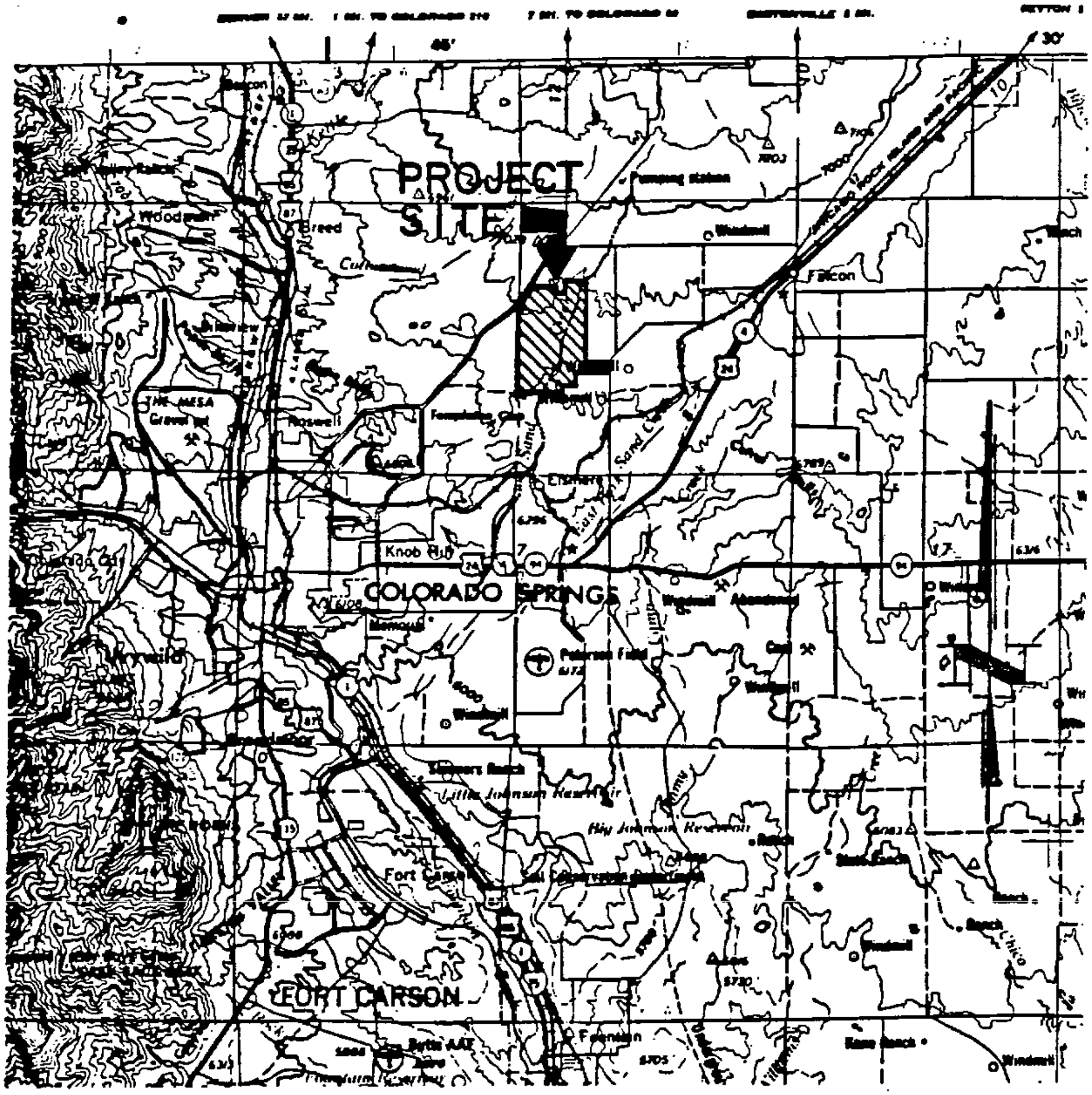
FOR INFORMATION ONLY

CONSTRUCTION COST ESTIMATES FOR MINOR SYSTEMS

ITEM	UNIT PRICE	UNIT	WEST TRIB		EAST TRIB	
			QTY	TOTAL COST	QTY	TOTAL COST
PIPE						
18-INCH	$31.00	LF	0	$0	0	$0
21-INCH	$35.00	LF	0	$0	0	$0
24-INCH	$38.00	LF	0	$0	0	$0
27-INCH	$40.00	LF	0	$0	0	$0
30-INCH	$42.00	LF	0	$0	0	$0
36-INCH	$46.00	LF	0	$0	0	$0
42-INCH	$65.00	LF	0	$0	0	$0
48-INCH	$84.00	LF	0	$0	0	$0
54-INCH	$102.00	LF	0	$0	0	$0
72-INCH	$180.00	LF	230	$41,400	0	$0
84-INCH	$243.00	LF	380	$92,340	0	$0
INLETS	$250.00	LF		$0		$0
MANHOLES						
48-INCH	$2,000.00	EA	0	$0	0	$0
60-INCH	$2,500.00	EA	0	$0	0	$0
ESTIMATED CONSTRUCTION COST				$133,740		$0
CONSTUCTION CONTINGENCY @ 10%				$13,374		$0
DESIGN/CONSTRUCTION ENGR @ 10%				$13,374		$0
SUBTOTAL				**$160,488**		**$0**

TOTAL ESTIMATED COST STORM SEWER **$1,041,048**

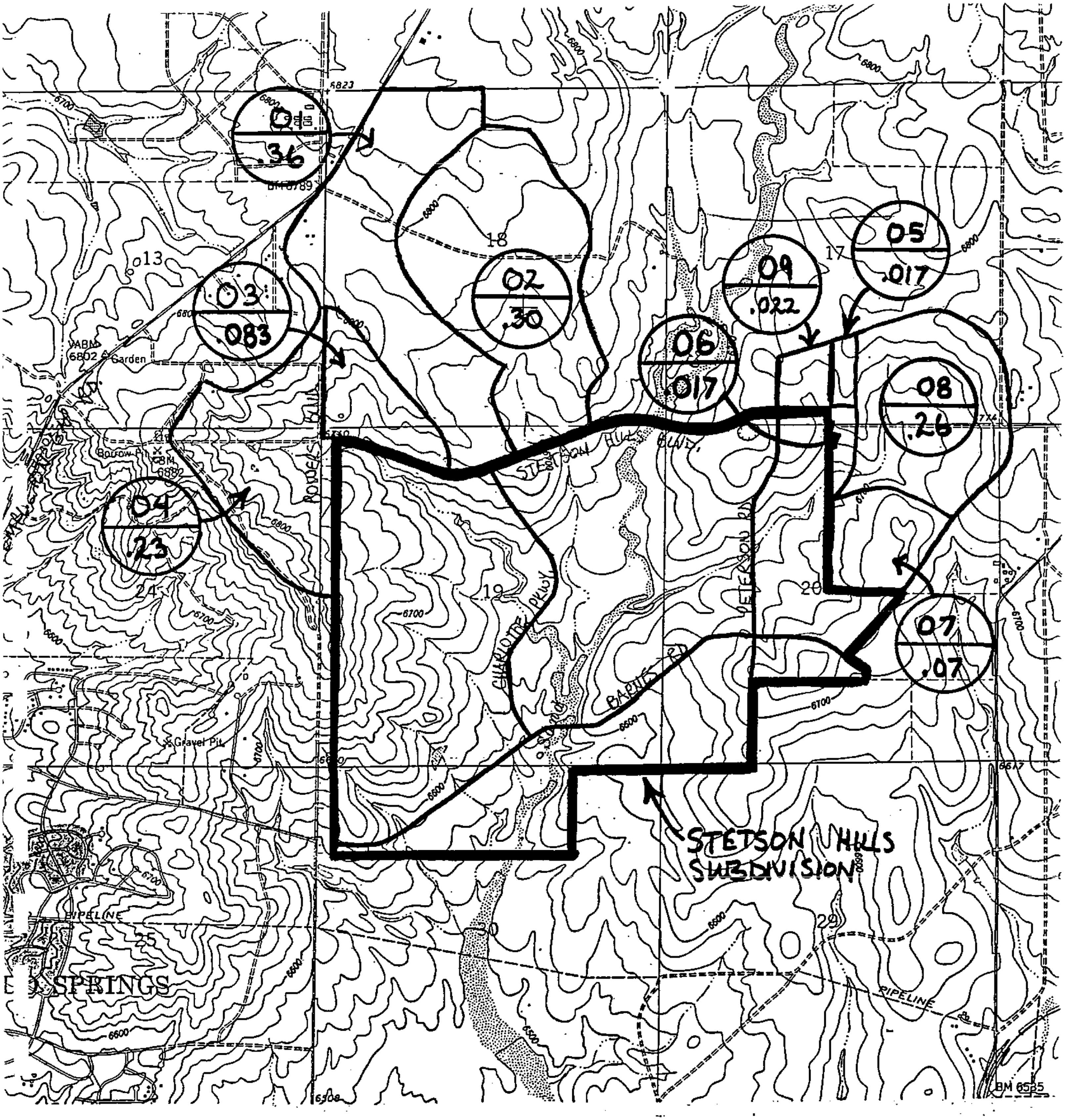
MISCELLANEOUS INFORMATION AND ASSUMPTIONS



SCALE: 1' = 250,000'

FALCON NW QUADRANGLE
SECTIONS 17,18,19,20,29 & 30
T. 13 S., R. 65 W.

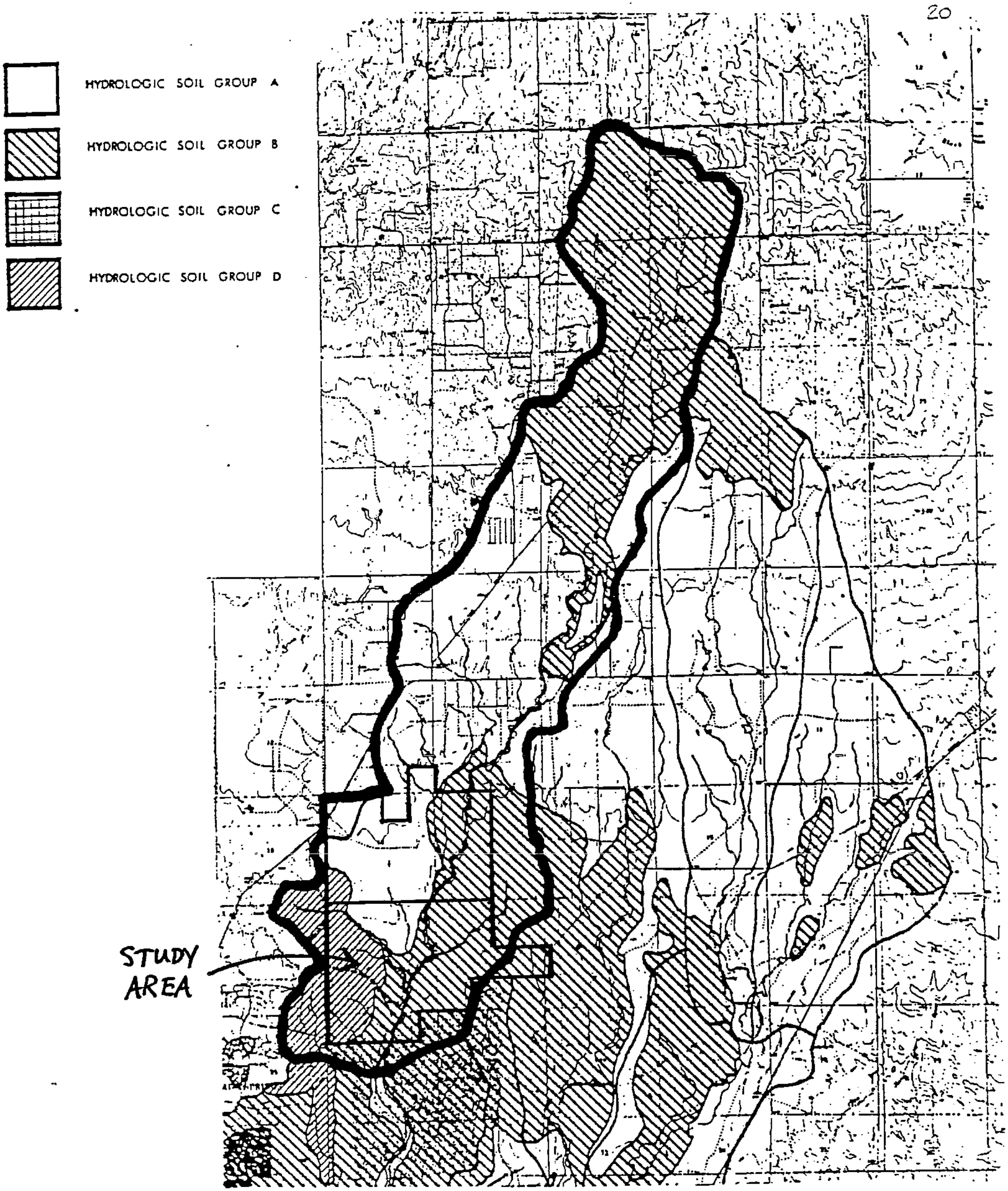
VICINITY MAP



VICINITY MAP

01 / .36 OFF-SITE BASIN DESIGNATION
AREA IN SM.

USGS
FALCON NW QUAD
1" = 2000'



SCS SOILS

REFERENCE : FINN AND ASSOCIATES - IMPACT STUDY

RATIONAL METHOD ASSUMPTIONS

1. FOR SFD AND MFD, l_i=50' @ 2.0%
   FOR RETAIL/OFFICE/COMMERCIAL, l_i=300' @ 1.0%
   FOR RETAIL/OFFICE/COMMERCIAL NEAR THE STREET ROW, l_i=150' @ 1.0%

2. IN COMPUTING THE TIME OF CONCENTRATION, ALL TRAVEL TIME (BESIDES INITIAL TIME) IS COMPUTED ASSUMING GUTTER FLOW (EXCEPT WHERE CHANNEL FLOW IS OBVIOUS).

   THE VELOCITY IS COMPUTED AS FOLLOWS:

   v = (1.49/n)(R^.67)(S^.5), n = .016

   R = A/(WP) = d*s/(d+s)

   d = depth
   s = spread

   Assume d is much less than s

   R = d*s/s = d

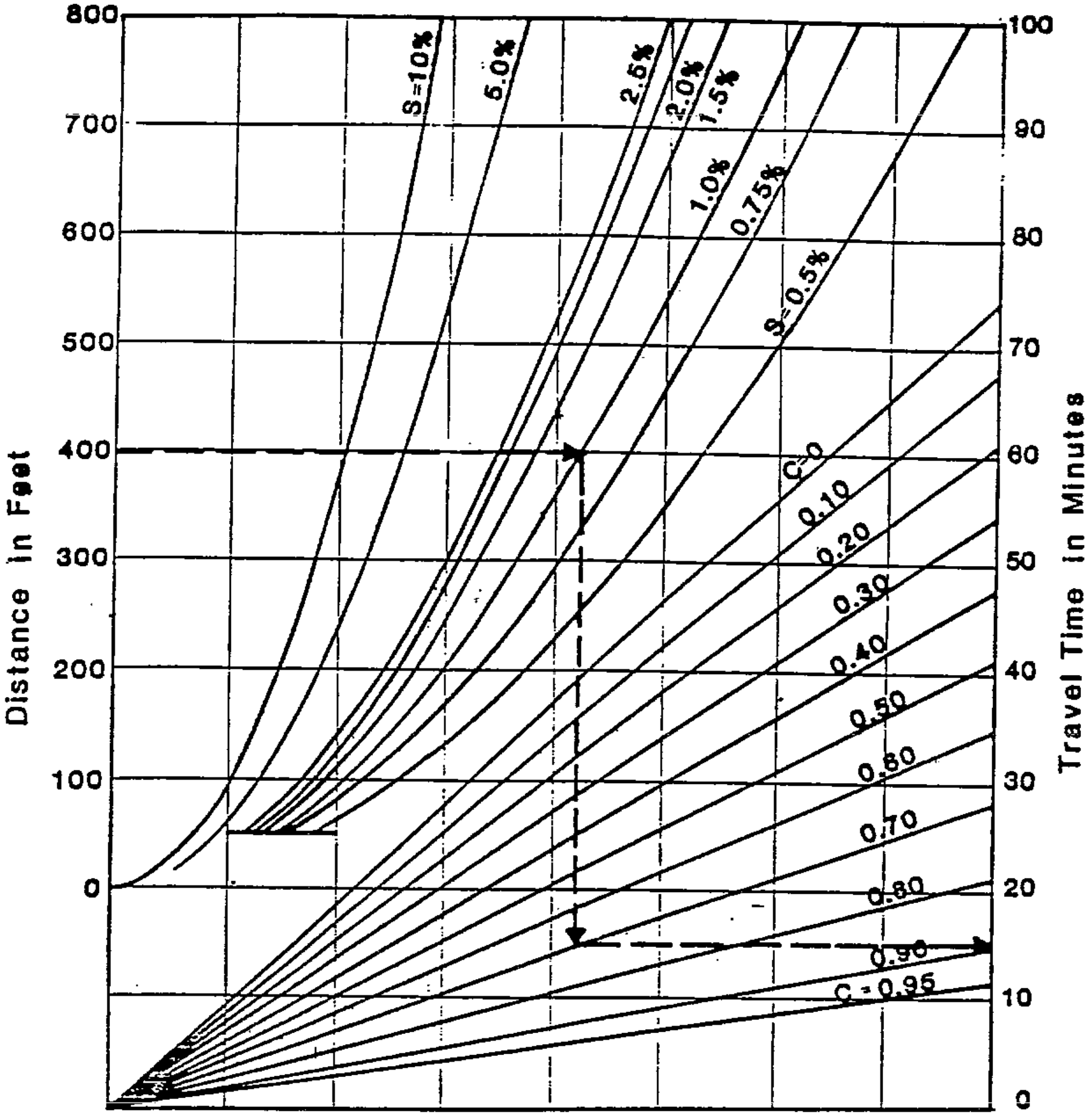
   Assume d = 8"

   v = 71.21(S^.5)

   (SEE PAGE 5-12 OF THE CRITERIA MANUAL)

3. IT IS ASSUMED THAT 100' ON EACH SIDE OF THE STREET ROW DRAINS TO THE STREET. THE REST OF THE BASIN IS ASSUMED TO FLOW TO INLETS WITHIN THE BASIN - TO BE SIZED AND LOCATED WHEN THE BASIN IS DEVELOPED. THE PIPES IN THE COLLECTOR AND ARTERIAL STREETS ARE SIZED TO CARRY THIS FLOW.

4. INLETS ARE SIZED FOR A 60% INTERCEPTION RATIO. THE MAXIMUM SIZE INLET IS 20'.



REFERENCE : Wright – McLaughlin Engineers, Urban Storm Drainage Criteria Manual, Vol. 1, Denver Regional Council of Governments, Denver, Co. 1977

$t_i = 1,87 (1,1 - C_{10}) \ell^{,5} S^{-,33}$

4%

HDR Infrastructure, Inc.
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date
OCT. 1987

Figure
5-2

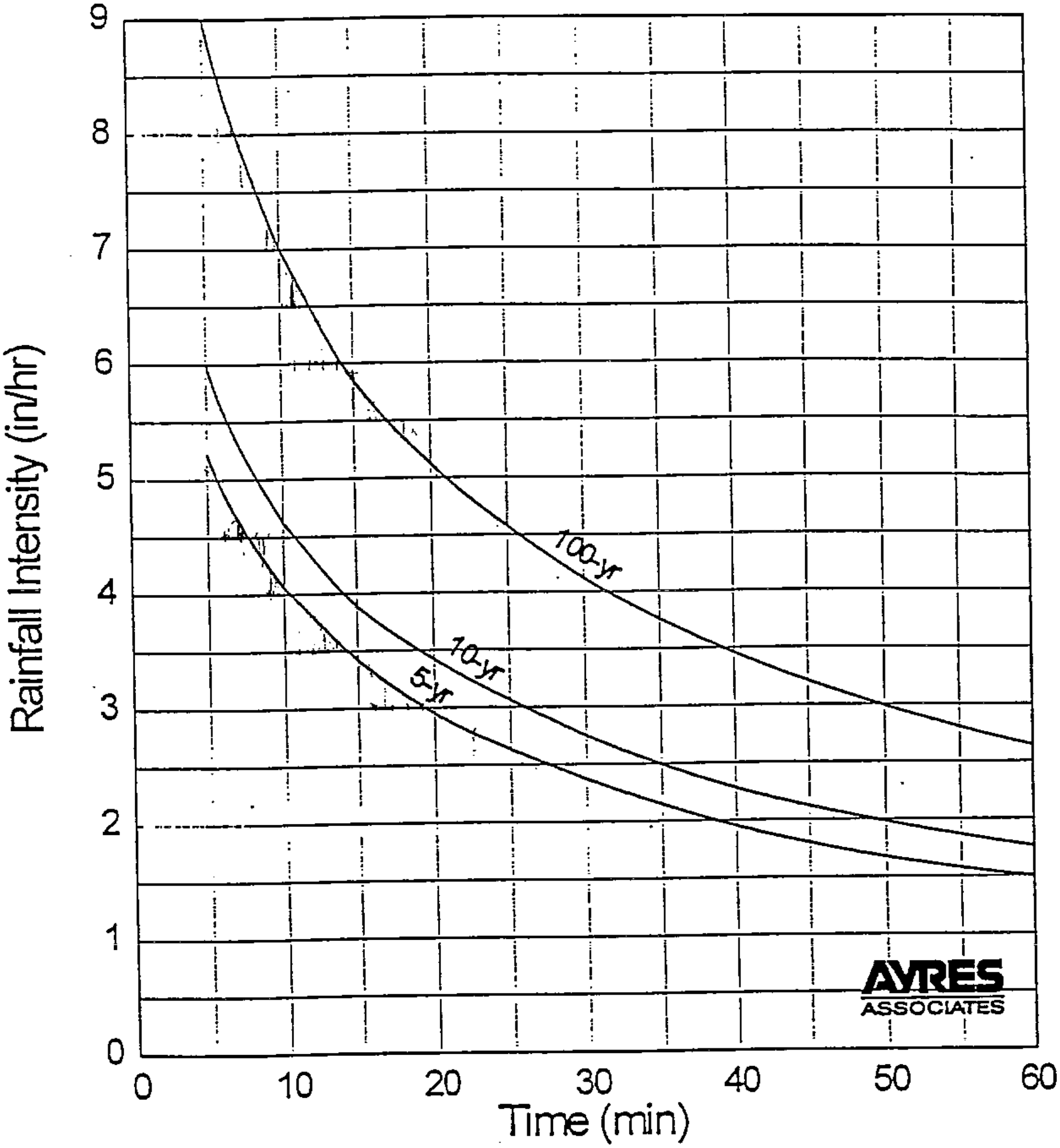
Overland Flow Curves

TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

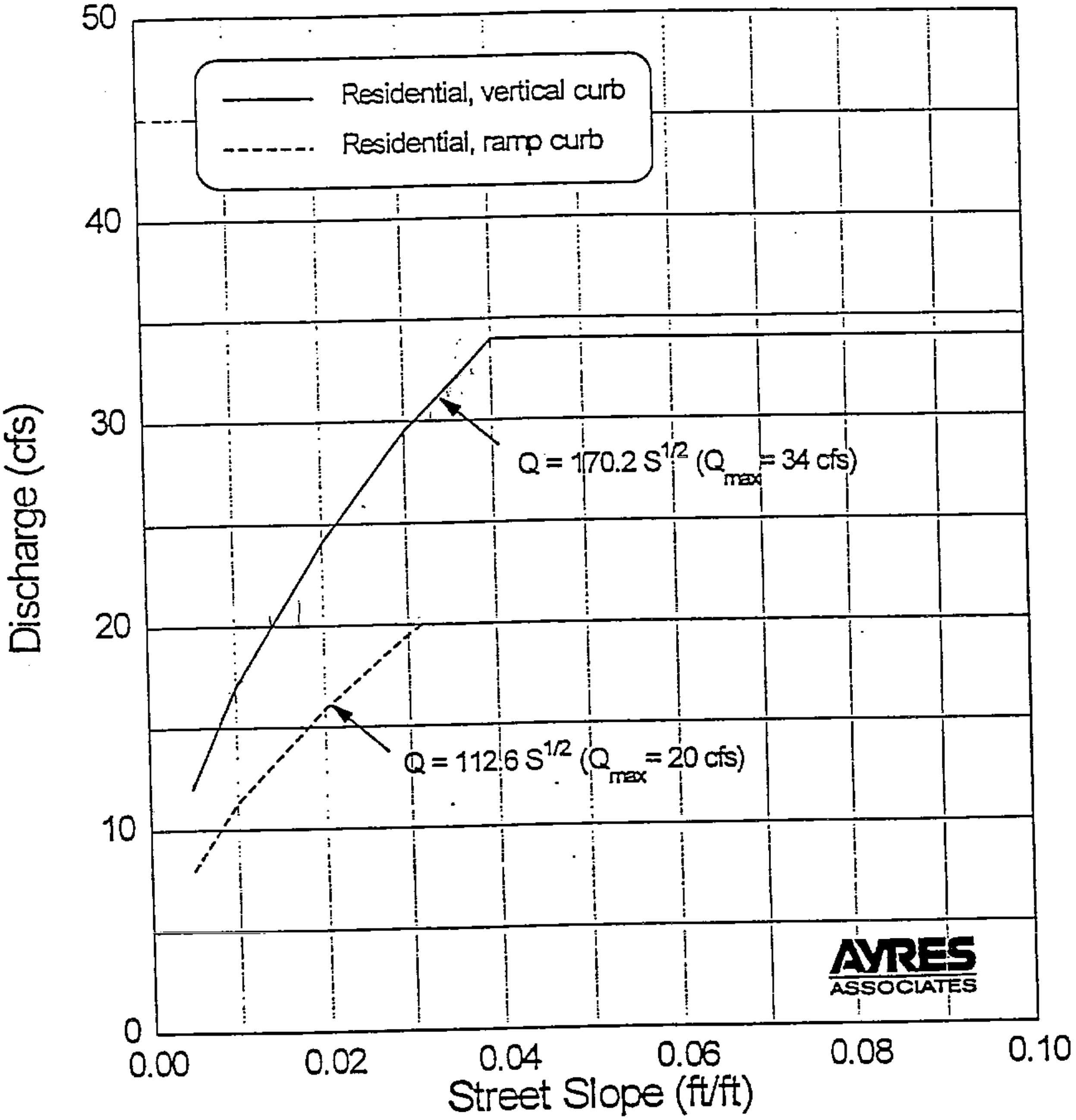
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY			
		10		100	
		A&B*	C&D*	A&B*	C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis- Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

* Hydrologic Soil Group



Interim Release October 12, 1994 , Rainfall Intensity Curves
City Of Colorado Springs Drainage Criteria Manual

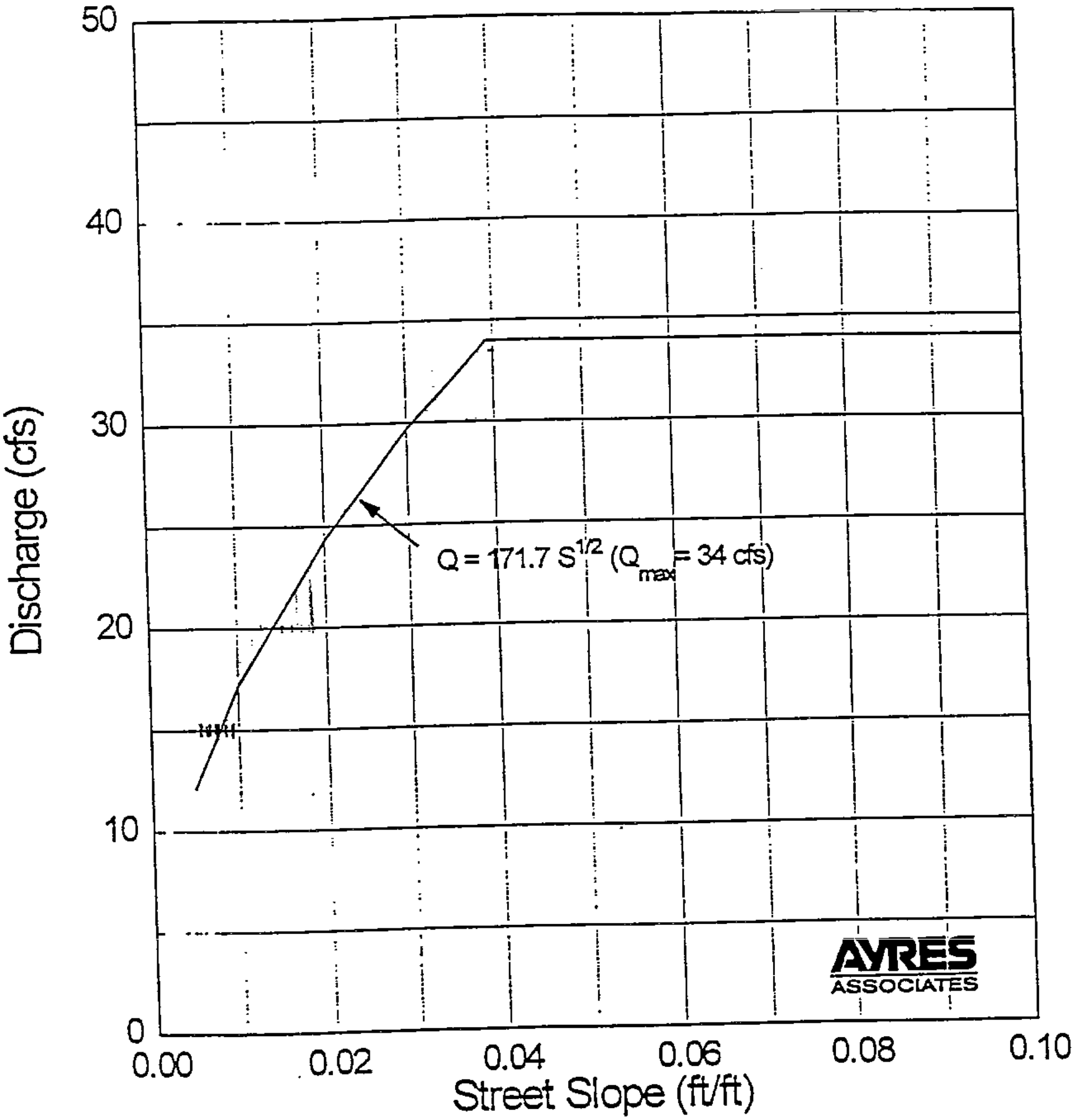
RESIDENTIAL STREET (34′ Flowline to flowline)



Interim Release October 12, 1994
City of Colorado Springs

Use this graph to determine the allowable street capacity per side, initial storm, for the typical street section using a 2% crown.

COLLECTOR STREETS (Major and Minor)



Interim Release October 12, 1994
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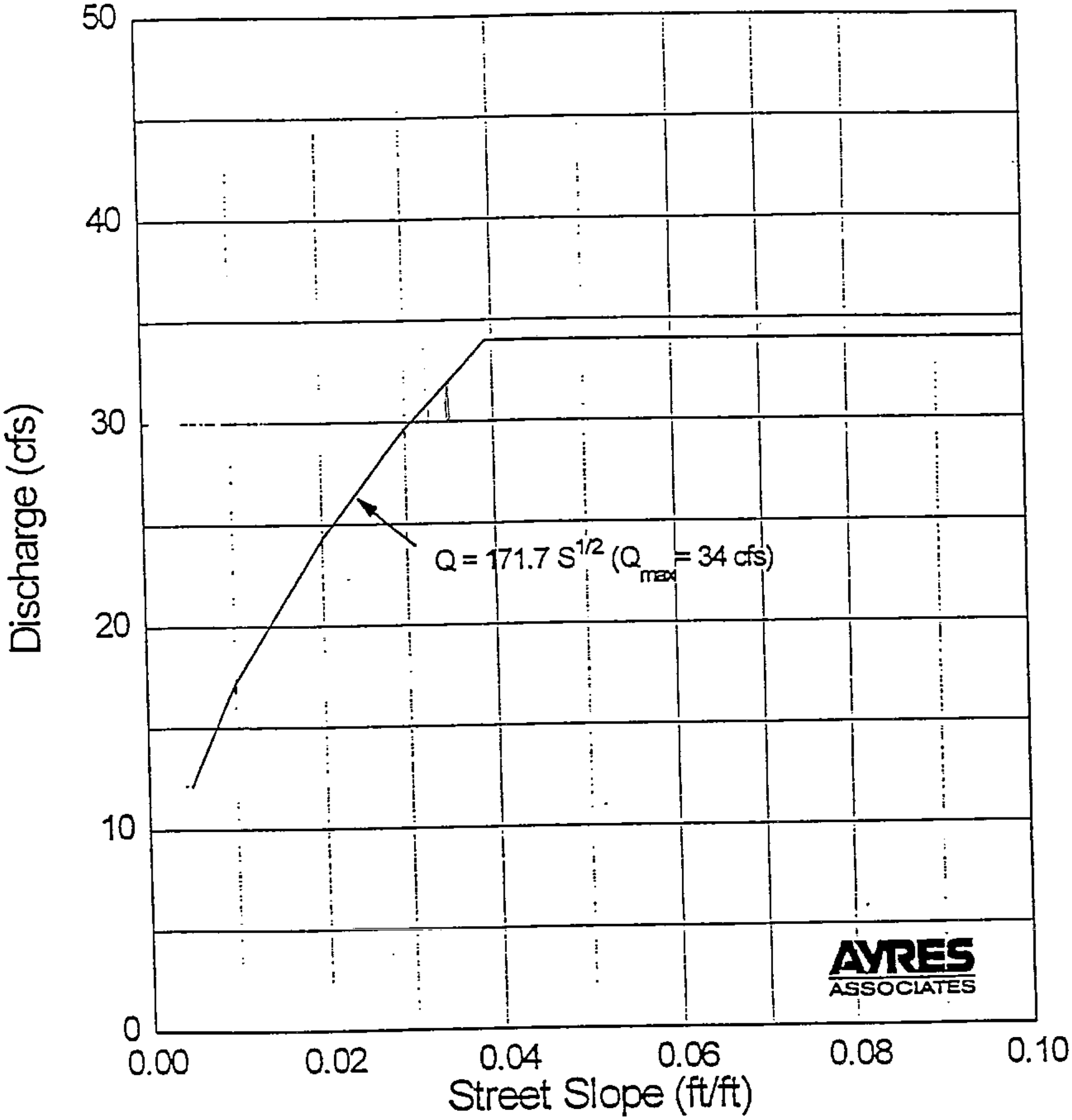
Use this graph to determine the allowable street capacity per side, initial storm, for the typical street section using a 2% crown. No flow may cross the crown.

ARTERIAL STREETS (Major and Minor)



Interim Release October 12, 1994
City of Colorado Springs

Use this graph to determine the allowable street capacity per side, initial storm, for the typical street section using a 2% crown. The curve corresponds to 6" depth @ flowline, 20 foot flow spread. No flow may cross the crown. Must keep one ten foot lane free of water in each direction.

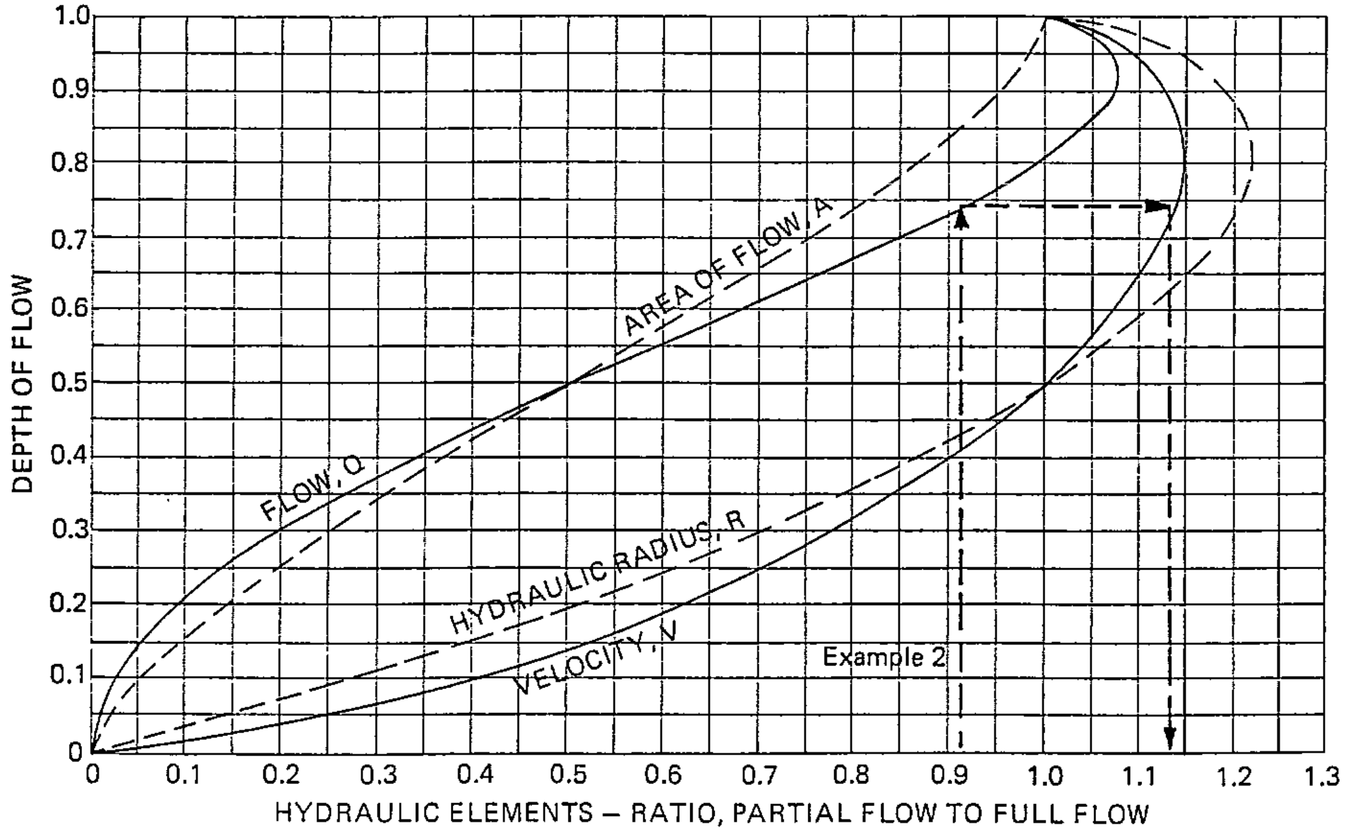
TABLE I: Values of $S_o^{1/2}$ in Manning's Formula.

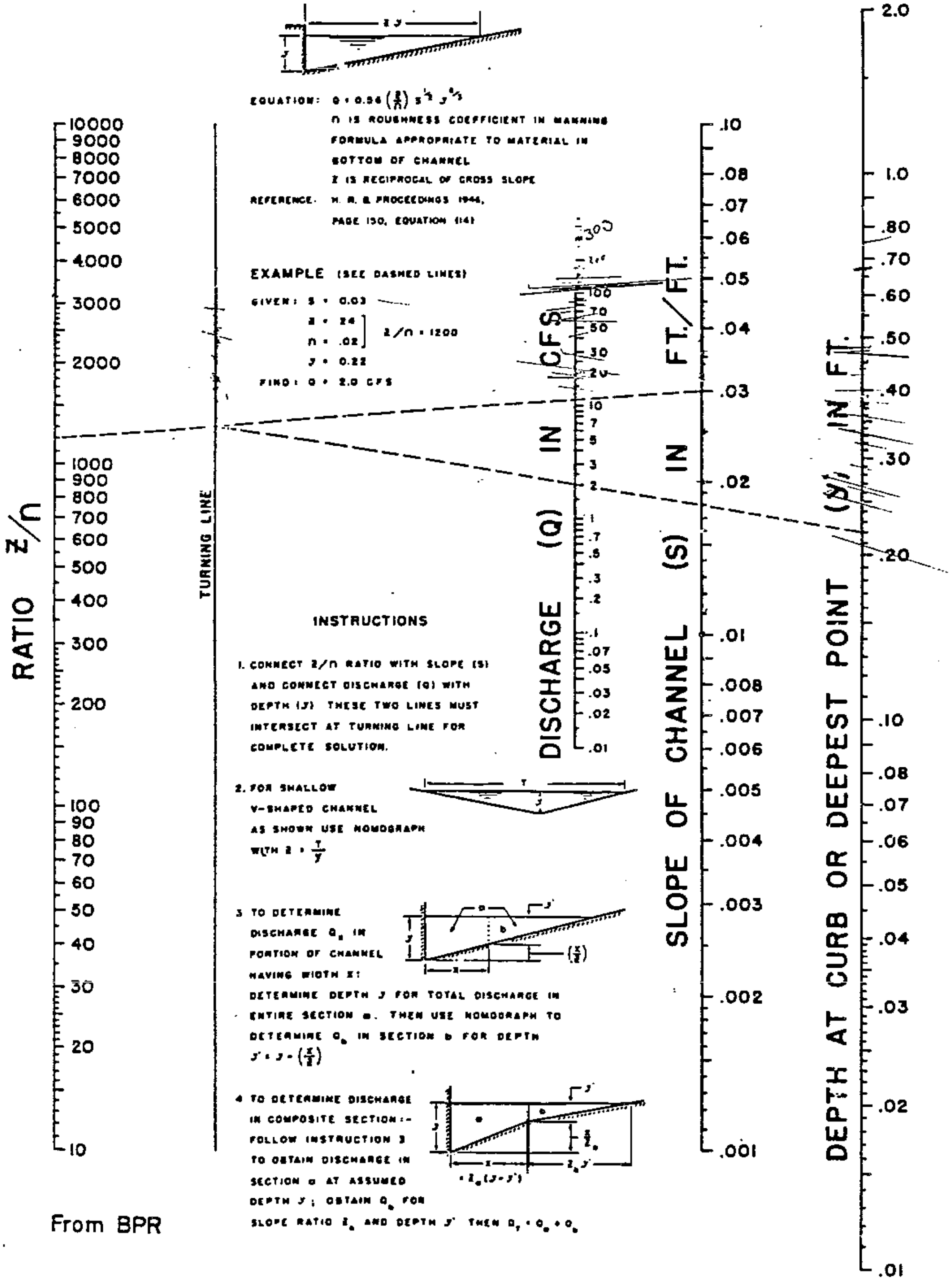
S	—0	—1	—2	—3	—4	—5	—6	—7	—8	—9
.000	.00000	.01000	.01414	.01732	.02000	.02236	.02449	.02646	.02828	.03000
.001	03162	.03317	.03464	.03606	.03742	.03873	.04000	.04123	.04243	.04359
.002	.04472	.04583	.04690	.04796	.04899	.05000	.05099	.05196	.05292	.05385
.003	.05477	.05568	05657	.05745	.05831	.05916	.06000	.06083	.06164	.06245
.004	.06325	.06403	.06481	.06557	.06633	.06708	.06782	.06856	.06928	.07000
.005	.07071	.07141	07211	.07280	.07348	.07416	.07483	.07550	.07616	.07681
.006	.07746	.07810	.07874	.07937	.08000	.08062	.08124	.08185	.08246	.08307
.007	.08367	.08426	.08485	.08544	.08602	.08660	.08718	.08775	.08832	.08888
.008	.08944	.09000	.09055	.09110	.09165	.09220	.09274	.09327	.09381	.09434
.009	.09487	.09539	.09592	.09644	.09695	.09747	.09798	.09849	.09899	.09950
.010	.10000	.10050	.10100	.10149	.10198	.10247	.10296	.10344	.10392	.10440
.01	.1000	.1049	.1095	.1140	.1183	.1225	.1265	.1304	.1342	.1378
.02	.1414	.1449	.1483	.1517	.1549	.1581	.1612	.1643	.1673	.1703
.03	.1732	.1761	.1789	.1817	.1844	.1871	.1897	.1924	.1949	.1975
.04	.2000	.2025	.2049	.2074	.2098	.2121	.2145	.2168	.2191	.2214
.05	.2236	.2258	.2280	.2302	.2324	.2345	.2366	.2387	.2408	.2429
.06	.2449	.2470	.2490	.2510	.2530	.2550	.2569	.2588	.2608	.2627
.07	.2646	.2665	.2683	.2702	.2720	.2739	.2757	.2775	.2793	.2811
.08	.2828	.2846	.2864	.2881	.2898	.2915	.2933	.2950	.2966	.2983
.09	.3000	.3017	.3033	.3050	.3066	.3082	.3098	.3114	.3130	.3146
.10	.3162	.3178	.3194	.3209	.3225	.3240	.3256	.3271	.3286	.3302

TABLE II: Full Flow Coefficient Values Circular Concrete Pipe.

D Pipe Diameter (inches)	A Area (Square Feet)	R Hydraulic Radius (Feet)	Value of $C_1 = \frac{1.486}{n}$ x A x $R^{2/3}$			
			n=0.010	n=0.011	n=0.012	n=0.013
8	0.349	0.167	15.8	14.3	13.1	12.1
10	0.545	0.208	28.4	25.8	23.6	21.8
12	0.785	0.250	46.4	42.1	38.6	35.7
15	1.227	0.312	84.1	76.5	70.1	64.7
18	1.767	0.375	137	124	114	105
21	2.405	0.437	206	187	172	158
24	3.142	0.500	294	267	245	226
27	3.976	0.562	402	366	335	310
30	4.909	0.625	533	485	444	410
33	5.940	0.688	686	624	574	530
36	7.069	0.750	867	788	722	666
42	9.621	0.875	1308	1189	1090	1006
48	12.566	1.000	1867	1698	1556	1436
54	15.904	1.125	2557	2325	2131	1967
60	19.635	1.250	3385	3077	2821	2604
66	23.758	1.375	4364	3967	3636	3357
72	28.274	1.500	5504	5004	4587	4234
78	33.183	1.625	6815	6195	5679	5242
84	38.485	1.750	8304	7549	6920	6388
90	44.170	1.875	9985	9078	8321	7681
96	50.266	2.000	11850	10780	9878	9119
102	56.745	2.125	13940	12670	11620	10720
108	63.617	2.250	16230	14760	13530	12490
114	70.882	2.375	18750	17040	15620	14420
120	78.540	2.500	21500	19540	17920	16540
126	86.590	2.625	24480	22260	20400	18830
132	95.033	2.750	27720	25200	23100	21330
138	103.870	2.875	31210	28370	26010	24010
144	113.100	3.000	34960	31780	29130	26890

FIGURE 1: Relative Velocity and Flow in Circular Pipe for Any Depth of Flow.





EQUATION: $Q = 0.56 \left(\frac{z}{n}\right) S^{\frac{1}{2}} y^{\frac{8}{3}}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B. PROCEEDINGS 1944, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN: $S = 0.03$

$z = 24$

$n = .02$] $z/n = 1200$

$y = 0.22$

FIND: $Q = 2.0$ CFS

INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.

2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $z = \frac{T}{y}$

3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - \left(\frac{x}{z}\right)$

4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3 TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH y' THEN $Q_T = Q_a + Q_b$

From BPR

NONOGRAPH FOR FLOW IN TRIANGULAR GUTTERS
(From U.S. Dept. of Commerce, Bureau of Public Roads, 1965)

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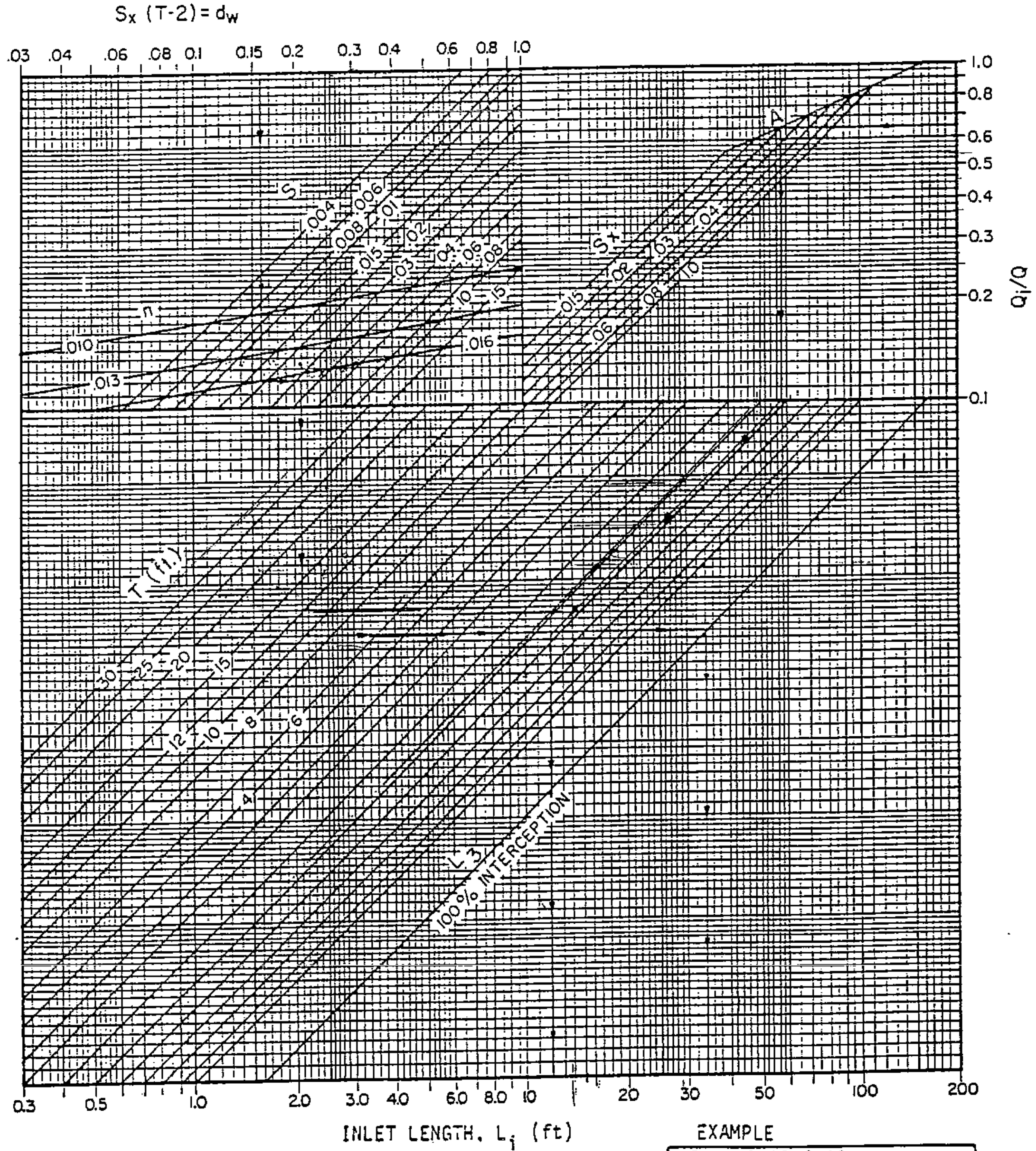
Drainage Criteria Manual

NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

Date
OCT. 1987

Figure
7 - 2



EXAMPLE

Given — S_x = 0.02 ft/ft
T = 10 ft.
S = 0.03 ft/ft

Find — L_i = 11.8 ft L_i = 34 ft.
Q_i/Q= 0.65 Q_i/Q=1.0

This chart assumes, w=2 ft., a = 2" and h=6in.

REFERENCE :

Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

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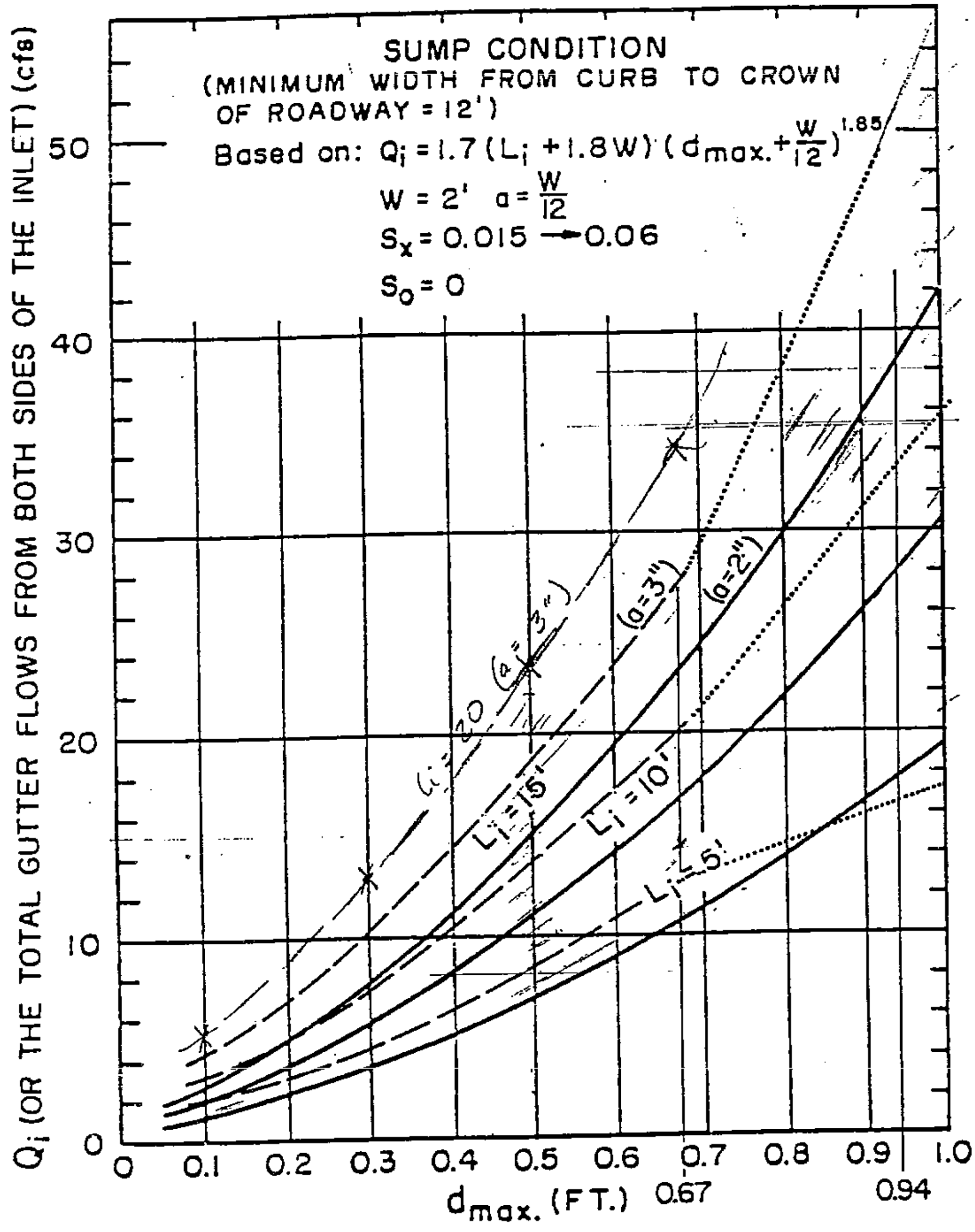
CONTINUOUS GRADE
Standard Curb-Opening Inlet Chart

Date
OCT. 1987

Figure
7-9



REFERENCE : Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

——— (As Modified by El Paso County, per Type R Inlet)

Note: Depth of ponding measured at curb above depressed area ; a = 3", For d $\leq$ .67

$Q_i = (1.7\,L_i + 6.12)(d_{max} + .25)^{1.85}$; $Q_i = 3.60\,L_i\,(d - .08)^{.5}$ For d $\geq$ .94; Note : No Clogging Factor

9/30/90

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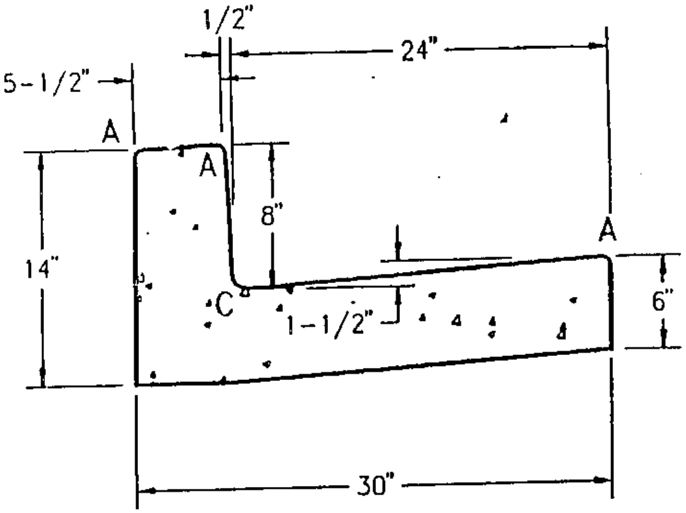
Figure
7-11

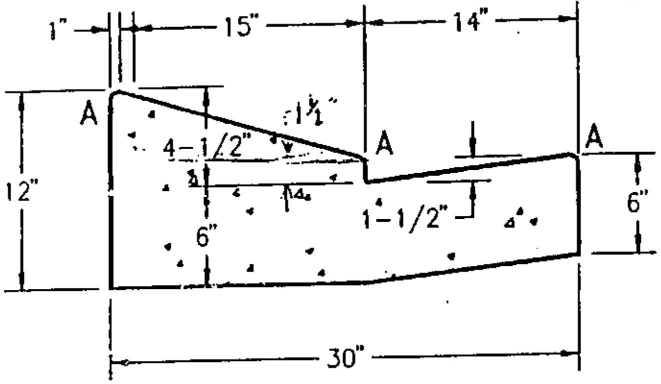
Sump Capacity for Curb-opening Inlets



TYPE 1

VERTICAL CURB AND GUTTER
SCALE: 1" = 1'-0"

wrong

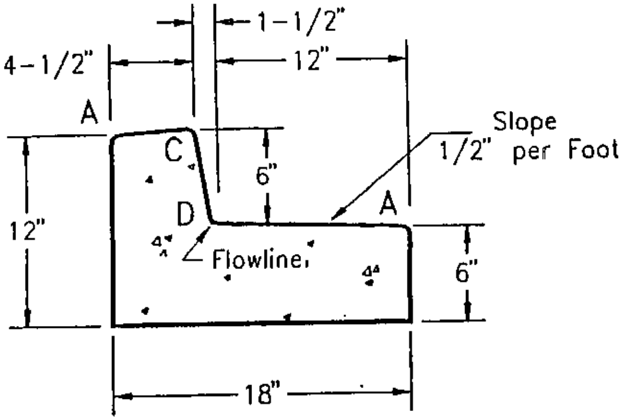


TYPE 2

RAMP CURB AND GUTTER
SCALE: 1" = 1'-0"

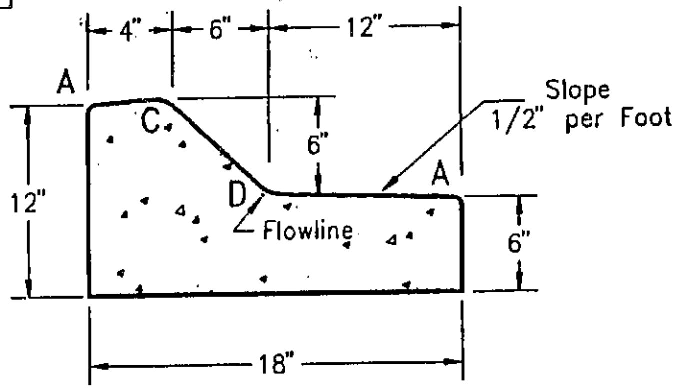
LENGTH FOR RADII

A = 1/2"
C = 1-1/2"
D = 1-1/2" TO 2"



TYPE 3

STANDARD MEDIAN CURB AND GUTTER
SCALE: 1" = 1'-0"



TYPE 4

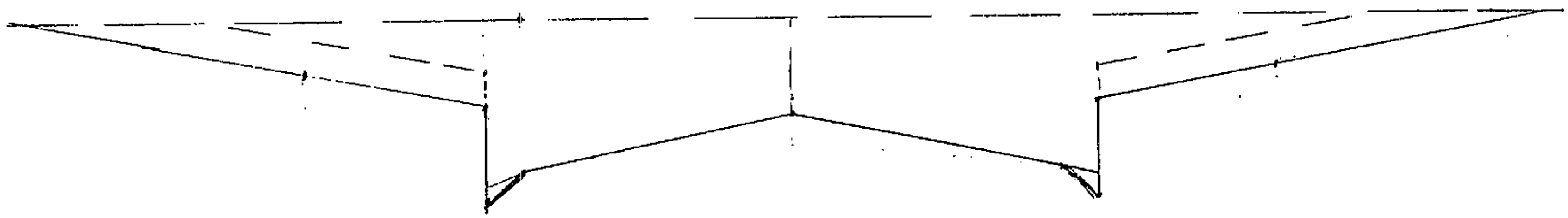
MOUNTABLE MEDIAN CURB AND GUTTER
SCALE: 1" = 1'-0"

CITY OF COLORADO SPRINGS

Standard Curb & Gutter
Type 1,2,3, & 4

approved by: Gary R. Haynes City Engineer
Drawn BY: JJD DATE: 04/93 STD. D-6

BY Poling DATE 12/28/94 SUBJECT STETSON HILLS MDDP SHEET NO. ___ OF ___
CHKD. BY ___ DATE ___ JOB NO. 212-1127



AT 12" @ FL

$A = 35.96$ SF
$WP = 84.8'$
$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$ $n = .016$
$Q = 1885 S^{1/2}$ CFS (6")

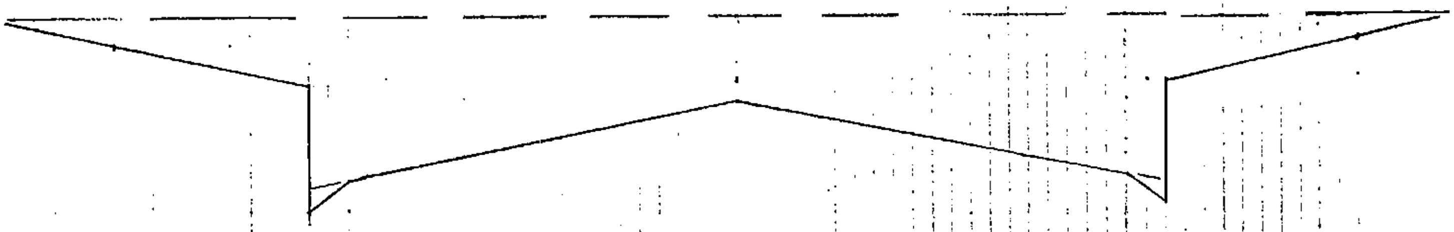
$A = 40.27$
$WP = 63.16$
$Q = 2774 S^{1/2}$ (8")

100-YR CAPACITY OF RESIDENTIAL STREETS (34' FL-FL)

Q WHEN CROWN OVERTOPS
$A = 2.89$ SF $WP = 17.34$
$Q = 81.5^{1/2}$

Q WHEN CURB OVERTOPS (6") (8")
$A = 7.14$ SF $WP = 34.92'$
$Q = 229 S^{1/2}$

$A = 12.92$ SF $WP = 35.26'$
$Q = 614 S^{1/2}$



AT 12' @ FL

$A = 33.44$ SF
$WP = 80.87$ F

$R = A/WP = .41$ $n = .016$

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

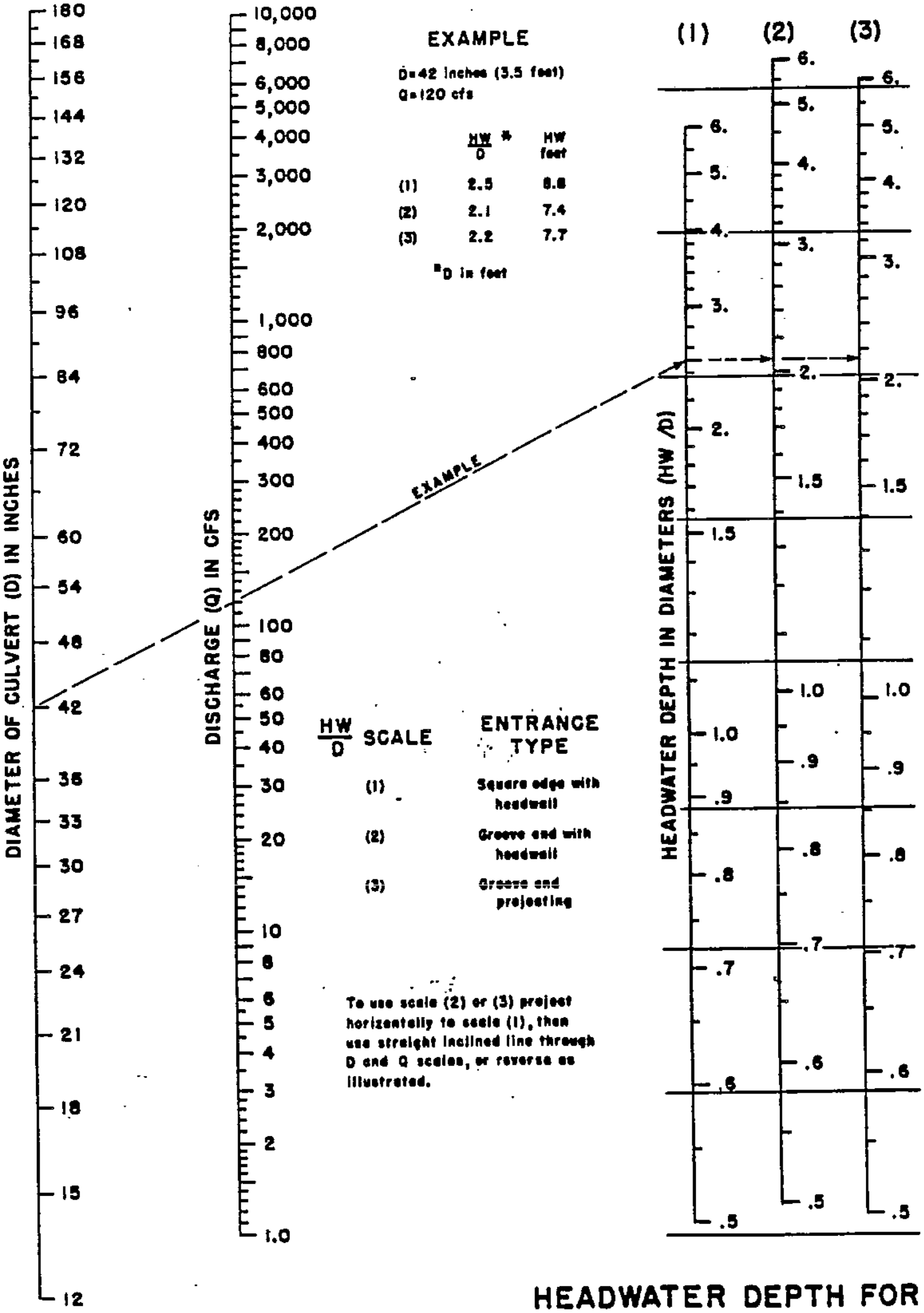
$$Q = 1713.6 S^{1/2} \text{ CFS}$$

Q PER SIDE PRIOR TO OVERTOPPING CREST
$A = 4.4$ SF
$WP = 22.4$ F
$A/WP = .2$
$Q = 139.4 S^{1/2}$ CFS

100-YR CAPACITY OF COLLECTOR AND RESIDENTIAL STREETS
(44' FL-FL) @ 1.0' DEPTH

1" = 10'
1" = 1'

CHART 1



EXAMPLE

D=42 inches (3.5 feet)
Q=120 cfs

	$\frac{HW}{D}$ *	HW feet
(1)	2.5	8.8
(2)	2.1	7.4
(3)	2.2	7.7

*D in feet

$\frac{HW}{D}$ SCALE	ENTRANCE TYPE
(1)	Square edge with headwall
(2)	Groove end with headwall
(3)	Groove end projecting

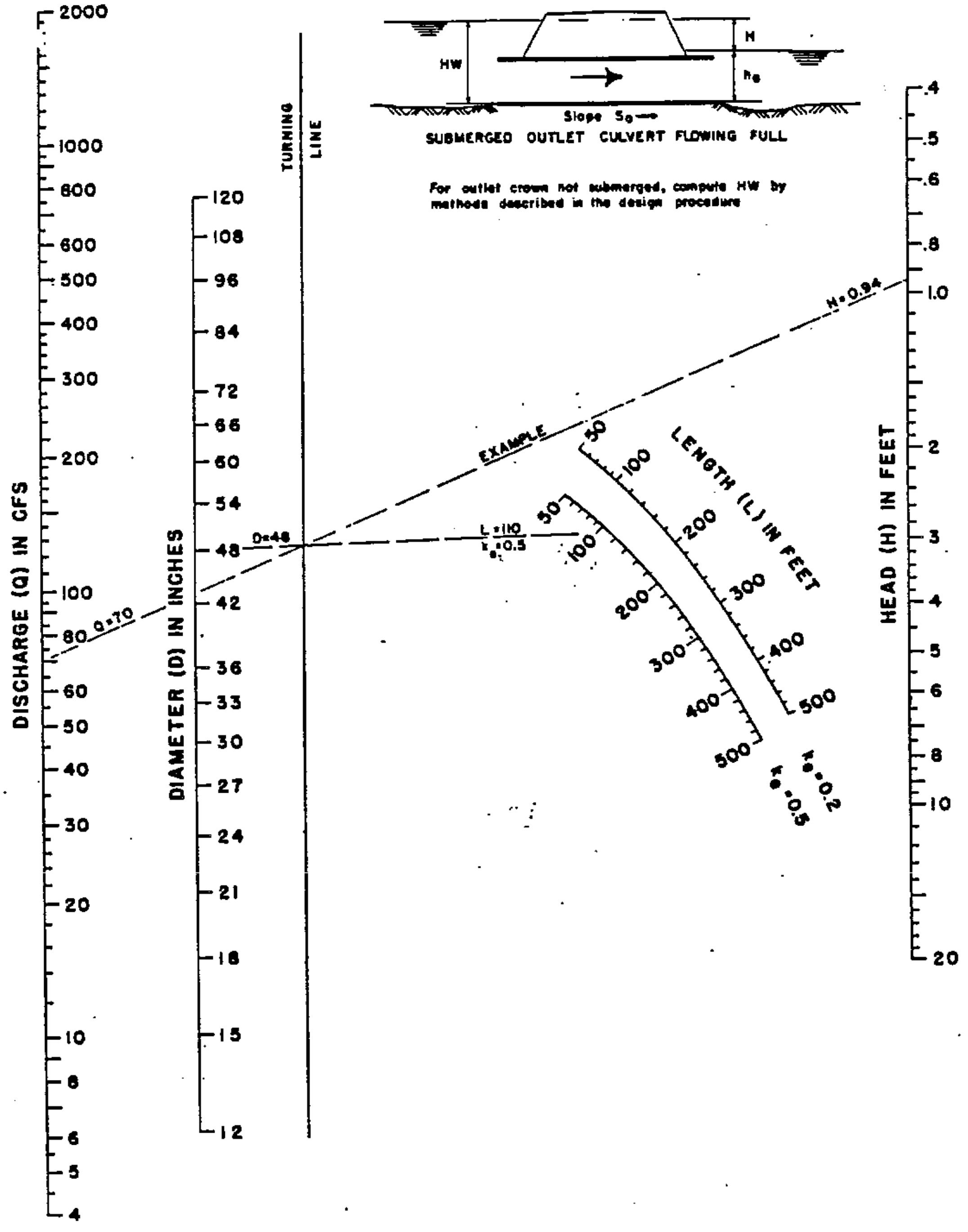
To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

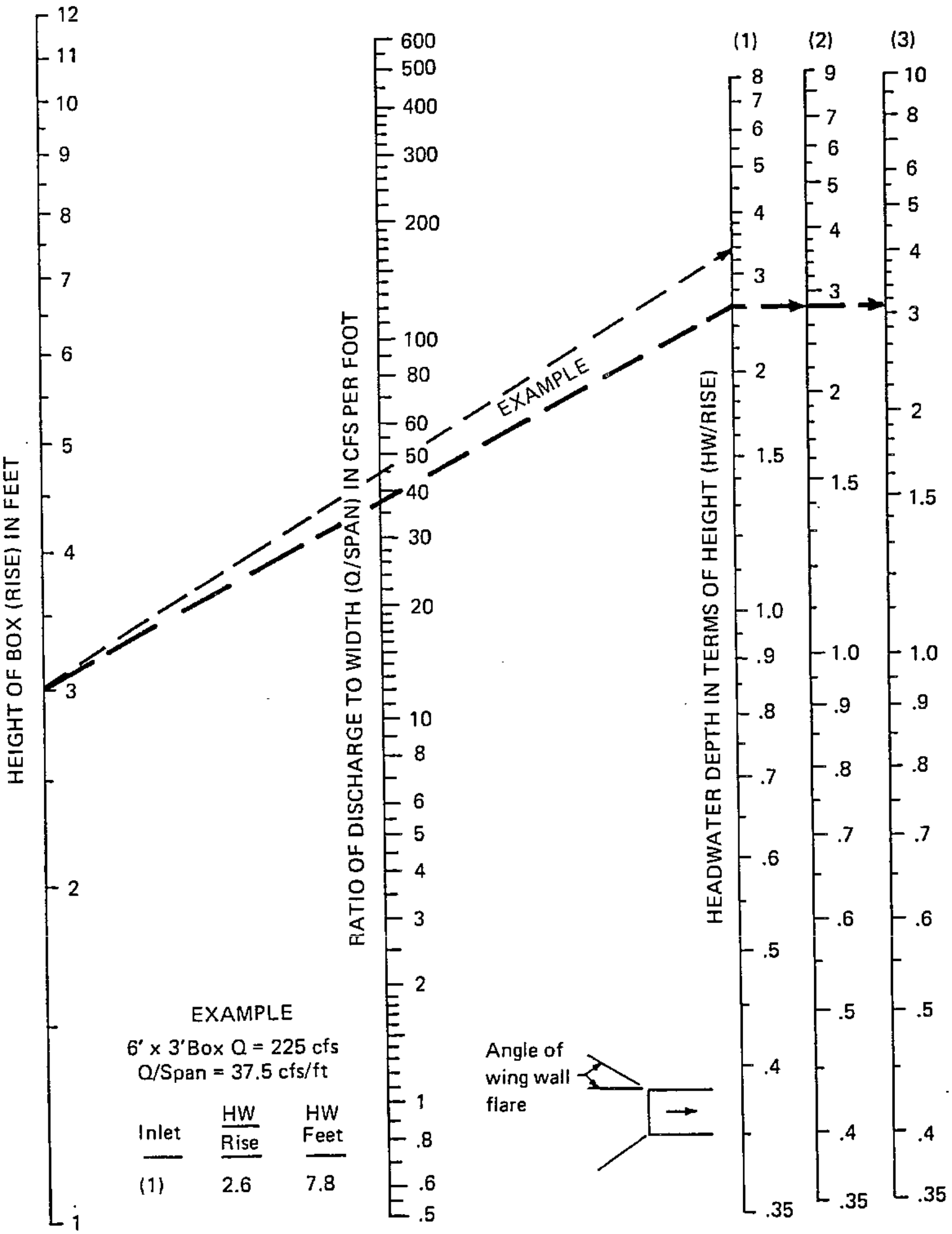
CHART 5



HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 3: Headwater Depth for Concrete Box Culverts With Inlet Control



EXAMPLE

6′ x 3′Box Q = 225 cfs

Q/Span = 37.5 cfs/ft

Inlet	HW/Rise	HW Feet
(1)	2.6	7.8

HW/Rise SCALE	WING WALL FLARE
(1)	30° to 75°
(2)	90° and 15°
(3)	0° (extensions of sides)

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through rise and Q scales, or reverse as illustrated.

BUREAU OF PUBLIC ROADS - JAN 1963

TABLE 5: Entrance Loss Coefficients

Coefficient k_e to apply to velocity head $V^2/2g$ for determination of head loss at entrance to a structure, such as a culvert or conduit, operating full or partly full with *control at the outlet.*

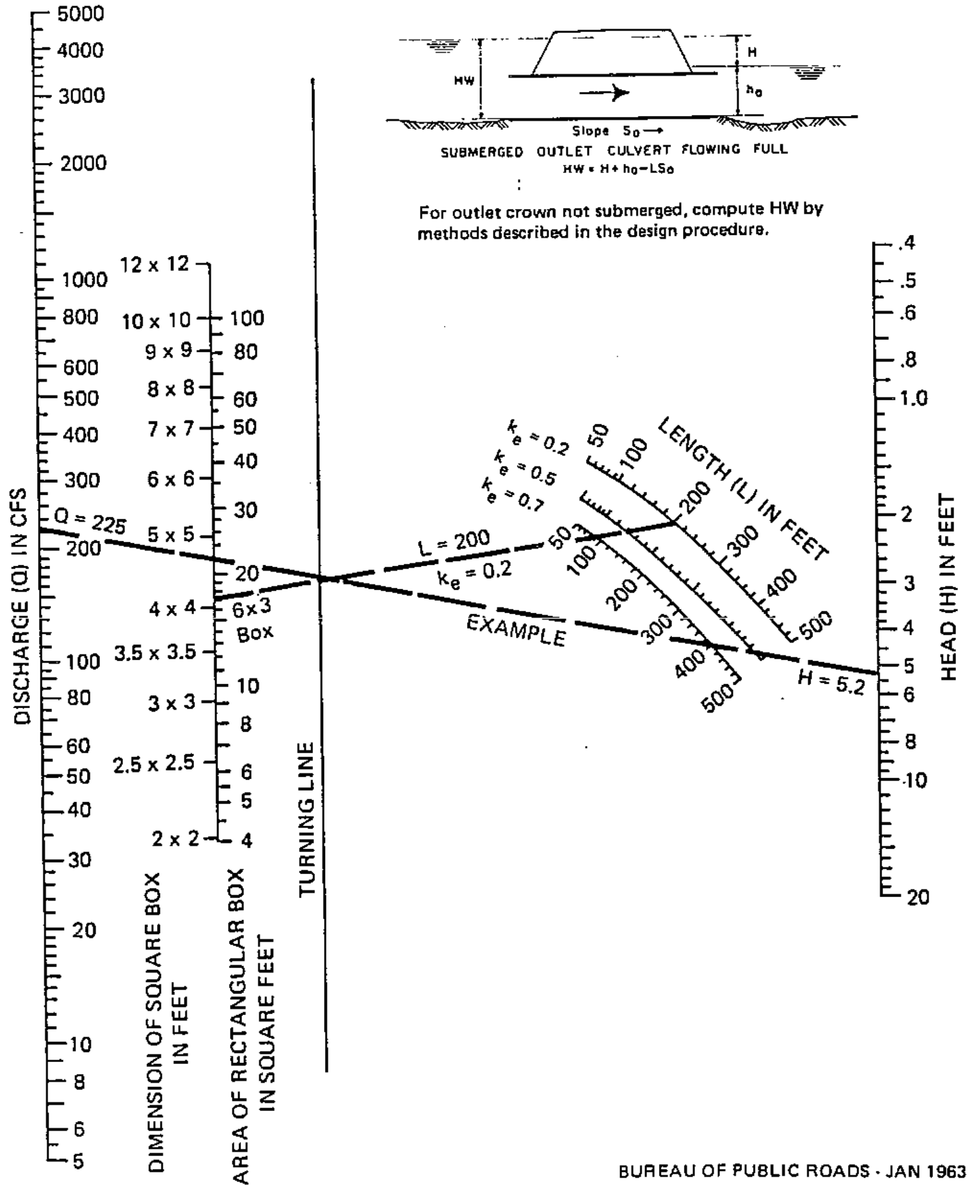
Entrance head loss $H_e = k_e\ V^2/2g$

Type of Structure and Design of Entrance Box, Reinforced Concrete	Coefficient k_e
Headwall parallel to embankment (no wing walls)	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension	0.2
Wing walls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of 1/12 barrel dimension	0.2

Type of Structure and Design of Entrance Box, Reinforced Concrete	Coefficient k_e
Wing walls at 10° to 25° to barrel	
Square-edged at crown	0.5
Wing walls parallel (extension of sides)	
Square-edged at crown	0.7

BUREAU OF PUBLIC ROADS - JAN. 1963

FIGURE 4: Head for Concrete Box Culverts Flowing Full, n = 0.012



For outlet crown not submerged, compute HW by methods described in the design procedure.

BUREAU OF PUBLIC ROADS - JAN 1963

RUNOFF CALCULATIONS

BASIN A

A1.1) $A = 4.3$ Ac $C_5 = .75$

$l_i = 150'$ @ 1.0%

$t_i = 8.0$ MIN

$l_t = 1400$ $S = 1.57\%$ $V = 8.9$ FPS

$t_t = l/60V = 2.6$ MIN

$t_c = 10.6$ MIN

DESIGN INLET

$Q = 14.4$ CFS $S = 1.82\%$ $Q_{ALLOW} = 23$ CFS

$y = .35$

$T = 17.5' < 22$

$Q_i/Q = .6$

USE 15' C.O. INLET

$Q_i = 8.6$ CFS

$Q_{CO} = 5.8$ CFS

A1.2) $A = 16.0$ Ac $C_5 = .75$

$l_i = 300'$ @ 1.0%

$t_i = 11.3$ MIN

$l_t = 1330'$ @ 1.5% $V = 8.7$ FPS

$t_t = 2.5$ MIN

$t_c = 13.8$ MIN

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BY Poling DATE 12/19/94 SUBJECT STETSON HILLS MDDP SHEET NO. 2 OF 7
CHKD. BY DATE JOB NO. 212 1127

A1.3) $A = 3.5$ Ac $C_5 = .75$

$t_i = 8.0$ MIN

$l_t = 930'$ @ 7.0% $V = 18.8$ FPS

$t_t = .8$

$t_c = 8.8$ MIN

SIZE INLET $Q = 15.5$ CFS $S = 3.8\%$ $Q_{ALLOW} = 34$ CFS

$y = .32$

$T = 16.0 > 22'$

$Q_i/Q = .6$

USE 20' C.O. INLET

$Q_i = 9.3$ CFS

$Q_{co} = 6.2$ CFS

A1.4) $A = 11.3$ Ac $C_5 = .75$

$t_i = 11.3$ MIN

$l_t = 950$ @ 6.32% $V = 17.9$ FPS

$t_t = .9$ MIN

$t_c = 12.2$ MIN

BY Poling DATE 12/19/94 SUBJECT STETSON HILLS MDDP SHEET NO. 3 OF 7
CHKD. BY ___ DATE / / JOB NO. 212-1127

A1.5) $A = 3.8$ AC $C_5 = .75$

$t_i = 8.0$ MIN

$L_t = 1000'$ @ 6.9 % $V = 18.4$ FPS

$t_t = .9$ MIN

$t_c = 8.9$ MIN

SIZE INLET $Q = 16.6$ CFS $S = 5.26\%$ $Q_{ALLOW} = 34$ CFS

$Y = .3$
$T = 15.0$

$Q_i/Q = .6$

21' C.O. INLET.

20' IS MAX → USE 20' C.O. INLET

$Q_i/Q \sim .59$

$Q_i = 9.8$ CFS
$Q_{co} = 6.8$ CFS

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BY Poling DATE 12/9/94 SUBJECT STETSON HILLS MDDP SHEET NO. 4 OF 7
CHKD. BY / DATE / / JOB NO. 212-1127

A1.6) $A = 8.0$ Ac $C_5 = .75$

$t_i = 8.0$ MIN (150' @ 1.0%)

$l_t = 2400'$ $S = 3.5\%$ $V = 13.3$ FPS

$t_t = l/60V = 3.0$ MIN

$t_c = 11.0$ MIN

INLET - $Q = 20.4$ CFS $S = 38\%$ $Q_{ALLOW} = 34$ CFS

$Y = .34'$
$T = 17.0' < 22$

$Q_i/Q = .6 \rightarrow$ USE 22' INLET

NO → MAX INLET SIZE IS 20'

$Q_i/Q = .57$

$Q_i = 11.6$ CFS
$Q_c = 8.8$ CFS

BY Poling DATE 12/7/94 SUBJECT STETSON HILLS MDDP SHEET NO. 5 OF 7
CHKD. BY DATE JOB NO. 612-1127

A1.7) $A = 4.3$ AC $C_S = .75$

$t_i = 8.0$ MIN (150 @ 1.0%)

$l_t = 1000'$ $S = .047$ $V = 15.4$ FPS

$t_t = 1.1$ MIN

$t_c = 9.1$ MIN

EXISTING 6' C.O. INLET IN SUMP

MAX POND = .25 $Q_{MAX} = 4.$ CFS

SIZE INLET NORTH OF INTERSECTION

80% OF FLOW → $Q = .8 \cdot 13.5 = 10.8$ $S = 4.8\%$

$y = .27$

$T = 13.5'$

$Q_i/Q = .6$ → USE 18' C.O. INLET

$Q_i = .6 \cdot 10.8 = 6.5$ CFS

$Q_c = 4.3$ CFS $+ (13.5 - 10.3) = 7$ CFS

7 CFS CARRY-OVER TO 6' C.O. INLET IN SUMP
PONDS TO .26', INTERCEPTS 4.1 CFS
REMAINDER FLOWS EAST ON BARNES
TO C1.1, $Q = 2.9$ CFS

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BY Poling DATE 12/7/94 SUBJECT STETSON HILLS MDDP SHEET NO. 6 OF 7
CHKD. BY ______ DATE ______ JOB NO. 212-1127

A2

A2.1) A = 2.2 Ac C_5 = .75 C_{100} = .8

l_i = 150' @ 1.0% t_i = 8.0 MIN

l_t = 580' . S = 1.81 %

V = 9.6 FPS

t_t = 1.0

t_c = 9.0 MIN

EXISTING 6' C.O. INLET — APPROX 80% OF TOTAL BASIN AREA DRAINS TO THIS INLET
S = 3.33 %

Q = .8 · 6.9 = 5.5 CFS

y = .23
T = 11.5'
Q_i/Q = .3
Q_{INT} = 1.7 CFS
Q_{co} = 3.8 CFS

EXISTING 4' CO INLET
Q = 3.8 + (6.9-5.5) = 5.2 CFS
S = 3.54 %

y = .22'
T = 11.0'
Q_i/Q = .2'
Q_i = 1.0 CFS
Q_{co} = 4.2 CFS
Q_i (TOTAL) = 2.7 CFS

A2.2) A = 2.5 Ac C_5 = .75 C_{100} = .8
t_i = 8.0 MIN
l_t = 600' S = 2.5 %
V = 11.3 FPS t_t = .9 MIN

t_c = 8.9 MIN

EXISTING 16' C.O. INLET IN SUMP
MAX POND = .5' Q_{MAX} = 20 CFS
Q = 17.2 CFS → ALL IS INTERCEPTED

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A2.3) $A = 2.0$ AC $C_5 = .9$

$l_i = 100'$ @ 2.0%

$t_i = 3.0$ MIN

$l_t = 1000'$ $S = 2.4\%$ $V = 11.1$ FPS

$t_t = 1.5$ MIN

$t_c = 5.0$ MIN

EXISTING 4' C.O. INLET $S = 1.0\%$

$Q_{ALLOW} = 17$ CFS

$Q = 9.4$ CFS

$y = .33$

$T = 16.5$

$Q_i/Q = .25$

$Q_i = 2.4$ CFS

$Q_c = 7.0$ CFS

A2.4) $A = 22.1$ AC $C_5 = .75$

$t_i = 11.3$ MIN

$l_t = 1300'$ $S = 5.0\%$ $V = 15.9$ FPS

$t_t = 1.4$ MIN

$t_c = 12.7$ MIN

ASSUME FLOW FROM A2.4 IS COLLECTED W/IN THE BASIN AND DISCHARGE TO THE PIPE A A1.6

A2.5) $A = .7$ $C_5 = .9$

$t_c = 5.0$ MIN

EXISTING 4' C.O. INLET IN SUMP

MAX POND = .26'

$Q_i = 3.3$

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

P. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	TUTT	A1.1	A1.1	4.8	.75	10.6	3.6	4.0	14.4					7.0	5.8				1040	18.8	.9	Q_{allow} = 23 CFS Q_i = 8.6 CFS
2	TUTT-STREET	A1.1	→	A1.3						11.5	1.44											Q_{co} = 5.8 CFS CA_i = 2.16
3	TUTT	A1.1	A1.2	16.0	.75	13.8	12.0	3.6	43.2													CA_{co} = 1.44
4	TUTT-PIPE	ΣA1.1								13.8	14.16	3.6	51.0			50	2.0	30	1040	13.4	1.3	
5	TUTT-PIPE	A1.1	→	A1.3						15.1	14.16											
6																						
7	TUTT	A1.3	A1.3	3.5	.75	8.8	2.63	4.3	11.3													
8	TUTT-STREET	ΣA1.3								11.5	4.07	3.8	15.5	6.9	6.2				1100	18.4	1.0	Q_{allow} = 34 CFS Q_i = 9.3 CFS
9	TUTT-STREET	A1.3	→	A1.5						12.5	1.63											Q_{co} = 6.2 CFS CA_i = 2.44
10	TUTT	A1.3	A1.4	11.3	.75	12.2	8.48	3.8	32.2													CA_{co} = 1.63
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

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DESIGN STORM 5
p. 2

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	TUTT	A1.6	A1.6	8.0	.75	11.0	6.0	3.4	20.4					3.5	8.8				1250	13.3	1.6	Qallow = 34 CFS Qi = 11.6 CFS
2	TUTT - STREET	A1.6	→	C3.1						12.6	2.58											Qco = 8.8 CFS CAi = 3.42
3																						CAco = 2.58
4	TUTT - PIPE	ΣA1.3								15.1	28.5	3.4	96.9			96.9	2.5	36	1100	16.8	1.1	
5	TUTT - PIPE	A1.3	→	A1.5						16.2	28.5											
6																						
7	TUTT	A1.5	A1.5	3.8	.75	8.9	2.85	4.3	12.3													Qallow = 34 CFS Qi = 9.8 CFS
8	TUTT - STREET	ΣA1.5								12.5	4.48	3.7	16.6									Qco = 6.8 CFS CAi = 2.64
9	TUTT - STREET	A1.5	→	A2.2						12.5	1.84											CAco = 1.84
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

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PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p.3

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	TUTT	A1.7	A1.7	4.3	.75	9.1	3.22	4.2	13.5					.5	2.9				900	5.0	3.0	Q_{allow} = 17 CFS Q_i = 6.5 (7.1A)
2	BARNES -STREET	A1.7B	→	C1.1						12.1	.69											Q_i = 44 (7.1B) Q_{co} = 2.9 CFS
3	TUTT-PIPE	A1.5	A2.4	22.1	.75	12.7	16.58	3.7	61.3													CA_i = 1.55 (7.1A) CA_i = .98 (7.1B)
4	TUTT-PIPE	ΣA1.	5							16.2	49.27	3.3	162.6			107.9	1.5	48	75	14.6	.1	CA_{co} = .69
5	TUTT-PIPE	A1.5	→	A2.2						16.3	49.27											
6																						
7																						
8																						
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

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P. 4

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	A2.1	A2.1	2.2	.75	9.0	1.65	4.2	6.9					2.5	4.2				650	11.3	1.0	Q_{ALLOW} = 37 CFS Q_{INT} = 2.7 CFS
2	BARNES-STREET	A2.1	→	A2.2						7.6	.99					2.7	2.0	21	825	6.5	2.1	Q_{CO} = 4.2 CFS CA_i = .66
3	BARNES-PIPE	A2.1	→	A2.3						8.7	.66											CA_{CO} = .99 (EXISTING INLETS)
4																						(EXISTING PIPE)
5	BARNES	A2.2	A2.2	2.5	.75	8.9	1.88	4.2	7.9													
6																						
7																						
8																						
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

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DESIGN STORM 5

p. 5

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES/TUTT -STREET			ΣA2	.2					12.5	4.71	3.7	17.4									Q_{INT} = 17.4 (EXISTING INLET)
2	BARNES/TUTT -PIPE			ΣA2	.2					16.3	53.98	3.3	178.1			178.1	1.6	54	220	16.8	.2	(EXISTING PIPE)
3	BARNES/TUTT -PIPE			A22	→	A1.7	B			16.5	53.98											
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

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p. 6

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	A2.3	A2.3	2.0	.9	5.0	1.8	5.2	9.4													Q_{allow} = 17 CFS Q_i = 2.4 CFS
2	BARNES-STREET	A2.3 → OFF-SITE								5.0	1.35					2.4	1.4	24	280	5.4	.9	Q_c = 7.0 CFS CA_i = .45
3	BARNES-PIPE	A2.3 → A2.5								5.9	.45											CA_c = 1.35
4																						
5	BARNES	A2.5	A2.5	.7	.9	5.0	.63	5.2	3.3													Q_i = 3.3
6	BARNES-PIPE	ΣA2.5								5.9	1.08	5.0	5.4			5.4	1.5	24	220	6.9	.5	
7	BARNES-PIPE	A2.5 → A1.8								6.4	1.08											
8																						
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
P. 7

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES -PIPE	ΣA1.	7B							16.5	54.96	3.3	181.3			181.3	1.6	54	257	16.9	.3	EXISTING PIPE
2	BARNES -PIPE	A1.7	B→	A1.8						16.8	54.96											
3																						
4	BARNES -PIPE	ΣA1	.8							16.8	56.04	3.3	184.9			184.9	1.6	54	120	17.1	.1	EXISTING PIPE
5	BARNES-PIPE	A1.B	→	OFF-	SITE					16.9	56.04											
6																						
7																						
8																						
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	TUTT	A1.1	A1.1	4.8	.8	10.6	3.84	6.9	26.5													
2	TUTT	A1.1	A1.2	16.0	.8	13.8	12.8	6.1	78.1													
3	TUTT	ΣA1.1								13.8	16.64	6.1	101.5	7.0	101.5				1040	18.8	.9	S = 1.82% Qflow = 231 CFS
4	TUTT	A1.1 → A1.3								14.7	16.64											
5	TUTT	A1.3	A1.3	3.5	.8	8.8	2.8	7.4	20.7													
6	TUTT	A1.3	A1.4	11.3	.8	12.2	9.04	6.5	58.8													
7	TUTT	A1.3	A1.6	8.0	.8	11.0	6.4	6.8	43.5													
8	TUTT	ΣA1.3								14.7	34.88	6.0	209.3									S = 3.8% Qflow = 334.0 CFS
9																						
10	FLOW OVERTOPS CROWN AND IS SPLIT EVENLY ACROSS THE STREET SECTION. ASSUME																					
11	1/2 Q IN EAST LANE (OR Q TOTAL /4) FLOWS TO COMSTOCK.																					

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1		SUBTRACT Q PIPE TO GET Q STREET.												ASSUME Qs.					Qs = 96.9 → Qstreet = 112.4			
2		Q TO COMSTOCK = 28.1 (CA = 4.68)																				
3		Q TO BARNES = 84.3 (CA = 14.05)																				
4																						
5	COMSTOCK	A1.3 → C3.1								16.3	4.68			3.5	28.1				1250	13.3	1.6	
6	TUTT	A1.3 → A1.5								15.7	14.05			6.9	84.3				1100	18.4	1.0	
7																						
8	TUTT	A1.5	A1.5	3.8	.8	8.9	3.04	7.4	22.5													
9	TUTT	A1.5	A2.4	22.1	.8	12.7	17.68	6.4	113.2													
10	TUTT	A1.7	A1.7	4.3	.8	9.1	3.44	7.3	25.1													
11	TUTT	Σ(A1.5 + A1.7)								15.7	38.21	5.7	217.8									S = 5.26% Qallow = 393. CFS

BASIN B

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B1.2) A= 16.2 AC C_5 = .75 13.9

l_i = 300' @ 1.0%

t_i = 11.3 MIN

l_t = 1100' S= 2.0% V= 10.0 FPS [illegible]

t_t = l/60V = 1.8 MIN

t_c = 13.1 MIN

B1.3) A = 18.5 Ac C_5 = .75 .43

t_1 = 11.3 MIN

l_t = 1400' S = 4.6 % V= 15.3 FPS

t_t = l/60 V = 1.5 MIN

t_c = 12.8 MIN

B1.4) A = 2.5 Ac C_5 = .75

l_i = 150' @ 1.0%

t_i = 8.0 MIN

l_t = 700' S = 3.8% V= 13.9 FPS

t_t = l/60V = 0.8 MIN

t_c = 8.8 MIN

SIZE INLET — SUMP CONDITION Q= 19.6 CFS

MAX POND = .5"

USE 18' C.O. INLET Q_i = 19.6 CFS

B2.2) $A = 3.4$ Ac $C_5 = .75$

$t_i = 8.0$ MIN

$l_t = 950'$ $S = 3.2\%$ $V = 12.8$ FPS

$t_t = l/60V = 1.2$ MIN

$t_c = 9.2$ MIN

SIZE INLET $Q = 10.7$ CFS $S = 5.0\%$ $Q_{ALLOW} = 34$ CFS

$y = .26$

$T = 13.0$

$Q_i/Q = .6$ → USE 18' C.O. INLET

$Q_i = 6.4$ CFS

$Q_{co} = 4.3$ CFS

B1.5) $A = 2.1$ Ac $C_5 = .9$

$l_i = 100'$ @ 2.0%

$t_i = 3.0$ MIN

$l_t = 1220'$ $S = 3.0\%$ $V = 12.4$ FPS

$t_t = l/60V = 1.6$

$t_c = 5.0$ MIN

B1.6) $A = 4.1$ Ac $C_5 = .75$

$t_i = 8.0$ MIN

$l_t = 1150'$ $S = 3.2\%$ $V = 12.8$ FPS

$t_t = 1.5$ MIN

$t_c = 9.5$ MIN

SIZE INLET $Q = 12.6$ CFS $S = 4.2\%$ $Q_{ALL} = 34$ CFS

$y = .29'$

$T = 14.5'$

$Q_i/Q = .6$ → USE 19' C.O. INLET

$Q_i = 7.6$ CFS

$Q_{co} = 5.0$ CFS

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B2.3) $A = 3.7$ Ac $C_5 = .65$

$l_i = 50'$ @ 2.0%

$t_i = 4.7$ MIN

$l_t = 1100'$ $S = 2.9\%$ $V = 12.4$ FPS

$t_t = 1.5$ MIN

$t_c = 6.2$ MIN

SIZE INLET $Q = 11.6$ CFS $S = 2.0\%$ $Q_{ALL} = 24.0$ CFS

$y = .31'$

$T = 15.5'$

$Q_i/Q = .6$ → USE 14' C.O. INLET

$Q_i = 7.0$ CFS

$Q_{co} = 4.6$ CFS

B3.2) $A = 5.5$ Ac $C_5 = .65$

$t_i = 4.7$ MIN

$l_t = 1530'$ $S = 4.1\%$ $V = 14.4$ FPS

$t_t = 1.8$ MIN

$t_c = 6.5$ MIN

SIZE INLET $Q = 17.9$ CFS $S = 2.5\%$ $Q_{allow} = 27$ CFS

$y = .35'$

$T = 17.5'$

$Q_i/Q = .6$ → USE 18' C.O. INLET

$Q_i = 10.7$ CFS

$Q_{co} = 7.2$ CFS

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 12/13/94 SUBJECT STETSON HILLS MDDP SHEET NO. 4 OF 7
CHKD. BY / DATE / JOB NO. 212-1127

B6.3) $A = 5.6$ AC $C_5 = .66$

$l_i = 50'$ @ 2.0%

$t_i = 4.6$ MIN

$l_t = 1530'$ $S = 4.1\%$ $V = 14.4$ FPS

$t_t = 1.8$ MIN

$t_c = 6.4$ MIN

SIZE INLET $Q = 17.4$ CFS $S = 2.5\%$ $Q_{ALL} = 27$ CFS

$y = .35$

$T = 17.5$

$Q_i/Q = .6$ → USE 18' C.O. INLET

$Q_i = 10.4$ CFS

$Q_{CO} = 7.0$ CFS

B6.2) $A = 1.5$ AC $C_5 = .65$

$t_i = 4.7$ MIN

$l_t = 450'$ $S = 2.5\%$ $V = 11.3$ FPS

$t_t = 0.7$ MIN

$t_c = 5.4$ MIN

SIZE INLET - ASSUME SUMP $Q = 26.9$ CFS

MAX POND $= .5'$

USE 20' C.O INLET $Q_i = 26.9$ CFS

WATER PONDS TO .56'

B4.2) $A = 5.4$ AC $C = .55$

$t_i = 5.8$ MIN

$l_t = 1650'$ $S = 2.8\%$ $V = 12.0$ FPS

$t_t = 2.3$ MIN

$t_c = 8.1$ MIN

SIZE INLET - ASSUME SUMP $Q = 13.1$ CFS

MAX POND $= .5'$

USE 10' C.O. INLET $Q_i = 13.1$ CFS

CARDER
CONCRETE PRODUCTS
Employee Owned Company
CARDER CONCRETE PRODUCTS COMPANY
8311 W. CARDER CT
LITTLETON CO 80125
(303) 791-1600 (303) 791-1710 FAX

DATE

BASIN B

B1.1) A = 6.9 Ac C_5 = .75
t_i = 11.3 MIN
l_t = 600' @ 1.0% V = 7.3 FPS
t_T = 1.4 MIN
t_c = 12.7 MIN

B5.3) A = 1.1 Ac C_5 = .9
t_i = 3.0 MIN
l_t = 600' S = 1.3% V = 8.2 FPS
t_t = 1.2 MIN
t_c = 5.0 MIN

B5.1) A = 17.1 Ac C_5 = .7
t_i = 11.3 MIN
l_t = 1850' @ 1.0% V = 9.5 FPS
t_T = 3.2 MIN
t_c = 14.5 MIN

B5.2) A = 2.6 Ac C_5 = .75
t_i = 8.0 MIN (150' @ 1.0%)
l_t = 650' @ 3.8% V = 13.9 FPS
t_t = $l/60v$ = .8
t_c = 8.8 MIN

SIZE INLET - SUMP CONDITION Q = 12.6 CFS
MAX POND = .5'
USE 10' C.O. INLET Q_i - 12.6 CFS

B2.1) $A = 15.0$ Ac $C_5 = .68$

$t_i = 11.3$ MIN

$l_t = 1500'$ $S = 5.0\%$ $V = 15.9$ FPS

$t_t = l/60V = 1.6$ MIN

$t_c = 12.9$ MIN

B3.1) $A = 14.3$ Ac $C_5 = .68$

$t_i = 11.3$ MIN

$l_t = 1200'$ $S = 5.3\%$ $V = 16.4$ FPS

$t_t = l/60V = 1.2$ MIN

$t_c = 14.5$ MIN

B4.1) $A = 17.5$ Ac $C_5 = .55$

$t_i = 5.8$ MIN (50' @ 2.0%)

$l_t = 1050'$ $S = 3.6\%$ $V = 13.5$

$t_t = 1.3$ MIN

$t_c = 7.1$ MIN

B6.1) $A = 12.3$ Ac $C_5 = .67$

$t_i = 5.8$ MIN

$l_t = 1500'$ $S = 3.67\%$ $V = 13.6$ FPS

$t_t = l/60V = 1.8$ MIN

$t_c = 15.0$ MIN

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 12/20/94 SUBJECT STETSON HILLS MDDP SHEET NO. 7 OF 7
CHKD. BY DATE JOB NO. 212-1127

B5.4) $A = 0.8$ AC $C_5 = .9$

$t_i = 3.0$ MIN

$l_t = 360'$ $S = 1.8\%$ $V = 9.6$ FPS

$t_t = .6$ MIN

$t_c = 5.0$ MIN

B5.5) $A = 1.9$ AC $C_5 = .9$

$t_i = 3.0$ MIN

$l_t = 1140'$ $S = 3.6\%$ $V = 13.6$ FPS

$t_t = 1.4$ MIN

$t_c = 5.0$ MIN

SIZE INLET $Q = 3.6$ CFS $S = 2.0\%$ $Q_{AL} = 24$ CFS

$y = .21'$

$T = 10.5$

$Q_i/Q = .6 \rightarrow$ USE 9' C.O. INLET

$Q_i = 2.2$ CFS

$Q_{CO} = 1.4$ CFS

B4.3) $A = 1.1$ AC $C_5 = .9$

$t_i = 3.0$ MIN

$l_t = 500'$ $S = 3.9\%$ $V = 14.0$ FPS

$t_t = .6$

$t_c = 5.0$ MIN

6.0' C.O. INLET IN SUMP, PONDS TO .53'

$Q = 5.1$ CFS $Q_i = 5.1$ CFS

B4.4)
B4.5) ASSUME $t_c = 5.0$ MIN (SIMILAR TO B4.3)

MERRICK Form 47 Rev 12/81

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DATE 12/19/94
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS
DESIGN STORM 5

p.1

STREET		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	TUTT	B1.6	B1.6	4.1	.75	9.5	3.08	4.1	12.6					3.8	5.0				850	13.9	1.0	$Q_{ALLOW} = 34$ CFS $Q_i = 7.6$ CFS
2	TUTT-STREET	B1.6	→	B1.4						10.5	1.23											$Q_{co} = 5.0$ CFS $CA_i = 1.85$
3																						$CA_{co} = 1.23$
4																						
5	TUTT	B1.2	B1.2	16.2	.75	13.1	12.15	3.7	45.0													
6																						
7	TUTT	B2.2	B2.2	3.4	.75	9.2	2.55	4.2	10.7					4.1	4.3				1750	14.4	2.0	$Q_{ALLOW} = 34$ CFS $Q_i = 6.4$ CFS
8	TUTT-STREET	B2.2	→	B3.2						11.2	1.02											$Q_{co} = 4.3$ CFS $CA_i = 1.53$
9	TUTT-PIPE	B2.2	→	B1.6						9.2	1.53											$CA_{co} = 1.02$
10																						
11																						

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
p. 2

STREET		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	TUTT-PIPE	ΣB	1.6							13.1	15.53	3.7	57.5			57.5	2.5	30	850	14.9	1.0	
2	TUTT PIPE	B1.6	→	B1.4	(CHANNEL)					14.1	15.53											
3																						
4	STETSON HILLS	B1.4	B1.5	2.1	.9	5.0	1.89	5.2	9.8													
5	TUTT	B1.4	B1.4	2.5	.75	8.8	1.88	4.3	8.1													
6	TUTT-STREET	ΣB	1.4							10.5	5.0	4.0	20.0									Q_{INT} = 19.6 CF
7	TUTT-PIPE	B1.4	→	CHANNEL						10.5	5.0											
8																						
9	STETSON HILLS	B5.2	B5.3	1.1	.9	5.0	.99	5.2	5.1													
10	TUTT	B5.2	B5.2	2.6	.75	8.8	1.95	4.3	8.4													
11	TUTT-STREET	ΣB5.2								8.8	2.94	4.3	12.6									Q_i = 12.6

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
p. 3

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	TUTT -PIPE	B5.2	→	CHANNEL						8.8	2.94											
2																						
3	TUTT	B1.3	B1.3	18.5	.75	12.8	13.88	3.7	51.4													
4	TUTT	B1.3	→	CHANNEL						12.8	13.88											
5																						
6	TUTT	B1.1	B1.1	6.9	.75	12.7	5.18	3.7	19.2													
7	TUTT	B1.1	→	CHANNEL						12.7	5.18											
8																						
9	AJAX	B5.1	B5.1	17.1	.7	14.5	11.97	4.1	49.1													
10	AJAX	B5.1	→	CHANNEL						14.5	11.97											
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
p. 4

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW(CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	B2.3	B2.3	3.7	.65	6.2	2.41	4.8	11.6					2.5	4.6				670	11.3	1.0	Q_{Allow} = 24 CFS Q_i = 7.0 CFS
2	JACKPOT -STREET	B2.3	→ B6.2							7.2	.96											Q_{co} = 4.6 CFS CA_i = 1.45
3																						CA_{co} = .96
4		B3.2	B3.2	5.5	.65	6.5	3.58	4.7	16.8													
5	AJAX -STREET	ΣB3.2								11.2	4.6	3.9	17.9	2.5	7.2				670	11.3	1.0	Q_{Allow} = 27.0 CFS Q_i = 10.7 CFS
6	JACKPOT - STREET	B3.2	→	B6.2						12.2	1.84											Q_{co} = 7.2 CFS CA_i = 2.76
7																						CA_{co} = 1.84
8	AJAX	B6.3	B6.3	5.6	.66	6.4	3.7	4.7	17.4					2.5	7.0				670	11.3	1.0	Q_{Allow} = 27.0 CFS Q_i = 10.4 CFS
9	AJAX -STREET	B6.3	→	B6.2						7.4	1.48											Q_{co} = 7.0 CFS CA_i = 2.22
10																						CA_{co} = 1.48
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127

PROJECT STETSON HILLS MDDP

DESIGN STORM 5

p.5

STREET		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	B2.3	B2.1	15.0	.68	12.9	10.2	3.7	37.7													
2	JACKPOT	B3.2	B3.1	14.3	.68	14.5	9.72	3.5	34.0													
3	JACKPOT	B6.3	B6.1	12.3	.67	15.0	8.21	3.4	28.0													
4	JACKPOT/ASAY	- PI	PE	Σ(B2.3+B3.2+B6.3)				(B6.3)		15.0	33.85	3.4	115.1			115.1	2.0	42	670	16.4	.7	
5	JACKPOT/ASAY	- PI	B 6.3 PE	→	CHANNEL (B6.2)					15.7	33.85											
6																						
7	STETSON HILLS	B5.4	B5.4	.8	.9	5.0	.72	5.2	3.6					3.6	1.4				1200	13.6	1.5	Qallow = 24 CFS Qi = 2.2 CFS
8	CHARLOTTE -STREET	B5.4	→	B6.2						6.5	.29											Qco = 1.4 CFS CAi = .43
9	STETSON HILLS - PIPE		B5.4	→	CHANNEL					5.0	.43											CAco = .29
10																						
11	CHARLOTTE	B6.2	B5.5	1.9	.9	5.0	1.71	5.2	8.9													

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p. 6

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	B6.2	B6.2	1.5	.65	5.4	.98	5.1	5.0													
2	JACKPOT -STREET	ΣB6.2								12.2	7.26	3.7	26.9									Qi = 26.9 CFS
3	JACKPOT -PIPE	B6.2	→	CHANNEL						12.2	7.26											
4																						
5	JACKPOT	B4.2	B4.2	5.4	.55	8.1	2.97	4.4	13.1													Qi = 13.1 CFS
6	JACKPOT -PIPE	B4.2	→	CHANNEL						8.1	2.97											
7																						
8	CHARLOTTE	B4.1	B4.1	17.5	.55	7.1	9.63	4.6	44.3													
9	CHARLOTTE -PIPE	B4.1	→	CHANNEL						7.1	9.63											
10																						
11	CHARLOTTE	B4.3	B4.3	1.1	.9	5.0	.99	5.2	5.1													Qi = 5.1 CFS

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DATE 12/27/94
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p. 7

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHARLOTTE	ΣB4.3		(FROM BASIN D)						22.5	10.28	2.8	28.8			28.8	1.5	27	51	10.5	.1	
2	CHARLOTTE	B4.3 → CHANNEL								22.6	10.28											
3																						
4	CHARLOTTE	B4.4	B4.4	1.2	.9	5.0	1.08	5.2	5.6					DRAINS TO CHANNEL THROUGH CURB CUTS								
5	CHARLOTTE	B4.4 → CHANNEL								5.0	1.08											
6																						
7	CHARLOTTE	B4.5	B4.5	1.2	.9	5.0	1.08	5.2	5.6													
8	CHARLOTTE -STREET	ΣB4.5		(INCLUDES D6)						24.0	7.57	2.7	20.4	DRAINS TO CHANNEL THROUGH CURB CUTS								
9	CHARLOTTE	B4.5 → CHANNEL								24.0	7.57											
10																						

CALCULATED BY Poling
DATE 12/21/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p.1

STREET		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	B2.3	B23	3.7	.75	6.2	2.78	8.5	23.6													
2	JACKPOT	B2.3	B2.1	15.0	.77	12.9	11.55	6.3	72.8													
3	JACKPOT	ΣB2.3								12.9	14.33	6.3	90.3									QALLOW = 242 CFS S = 2.0%
4																						
5	JACKPOT	(	B6.	3) →		B	2.3			15.1	45.44	5.8	263.6									
6						B B	3.2 6.3							SUBTRACT		PIPE	FLOW			QS =	115.1	
7														QSTREET =		263.6 -		115.1		=	148	.5 CFS
8														WATER		OVERTOPS		CROWN.				QALLOW = 271 CFS S = 2.5%
9														ASSUME		Q	ON	EACH	SIDE	= =	148.5/2 74.3 CFS	
10														CA =		74.3/263.6			(45.44)	=	12.81	
11	JACKPOT	(ΣB2	.3 +	B3.2)	→		B6.	2/B	4.2	16.1	12.81			2.5	74.3				670	11.3	1.0	

CALCULATED BY Poling
DATE 12/27/94
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	B6.2	B6.2	1.5	.75	5.4	1.13	8.9	10.1													
2	JACKPOT	ΣB6.2								16.1.	16.51	5.7	94.1	ASSUME Q100 DISCHARGES TO CHANNEL WITHOUT PONDING OVER 1.0 FT AT INLET								
3	JACKPOT	B6.2 →	CHANNEL							16.1	16.51											
4																						
5	JACKPOT	B4.2	B4.2	5.4	.65	7.1	3.51	8.9	31.2													
6	JACKPOT	ΣB4.2								16.1	16.32	5.7	93.0	ASSUME Q100 DISCHARGES TO CHANNEL WITHOUT PONDING OVER 1.0 FT AT INLET								
7	JACKPOT	B4.2 →	CHANNEL							16.1	16.32											
8																						
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

p. 1

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	TUTT	B1.6	B1.6	4.1	.8	9.5	3.28	7.1	23.3													
2	TUTT	B1.6	B1.2	16.2	.8	13.1	12.96	6.2	80.4													
3	TUTT	B1.6	B2.2	3.4	.8	9.2	2.72	7.2	19.6													
4	TUTT	ΣB1.6								13.1	18.96	6.2	117.6									Q ALLOW = 35.2 CFS S = 4.2%
5	FLOW OVERTOPS CROWN AND IS SPLIT EVENLY ACROSS STREET SECTION. ASSUME 1/2 EAST SIDE FLOWS																					
6	DOWN AJAX (Q/4). DETERMINE Q STREET BY SUBTRACTING Q PIPE (QS) Q = 57.5 CFS Q STREET = 117.6 - 57.5 = 60.1 Q AJAX = 15.0 CFS (CA = 2.42) Q TUTT = 45.1 CFS (CA = 7.27)																					
7																						
8	AJAX	B1.6	→	B3.2						15.1	2.42			4.1	15.0				1750	14.4	2.0	
9	TUTT	B1.6	→	B1.4						16.1	7.3			3.8	45.1				850	13.9	1.0	
10																						
11	TUTT	B1.4	B1.4	2.5	.8	8.8	2.0	7.4	14.8													

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	TUTT	B1.4	B1.5	2.1	.95	5.0	2.0	9.0	18.0													
2	TUTT	BS.2	BS.2	2.6	.8	8.8	2.08	7.4	15.4													
3	TUTT	BS.2	BS.3	1.1	.95	5.0	1.05	9.0	9.45													
4	TUTT	Σ B1.4/BS2								16.1	14.4	5.7	82.1									QALLOW = 334.0 CFS
5	TUTT	B1.4/BS.2 →				CHANNEL				16.1	82.1			ASSUME Q(100) DISCHARGES TO								S = 3.8%
6														CHANNEL W/O PONDING OVER 1.0' FT AT INLETS								
7	TUTT	B1.1	B1.1	6.9	.8	12.7	5.52	6.4	35.3													
8	TUTT	B1.1	→	CHANNEL						12.7	5.52											
9	TUTT	B1.3	B1.3	18.5	.8	12.8	14.80	6.4	94.7													
10	TUTT	B1.3	→	CHANNEL						12.8	14.80											
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p.1

STREET			DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	AJAX	B1.6	→	B3.2						15.1	2.42											
2																						
3	AJAX	B3.2	B3.2	5.5	.75	6.5	4.13	8.2	33.9													
4	AJAX	B3.2	B3.1	14.3	.77	14.5	11.01	5.9	65.0													
5	AJAX	B6.3	B6.3	5.6	.75	6.4	4.2	8.2	34.4													
6	AJAX	B6.3	B6.1	12.3	.76	15.0	9.35	5.9	55.2													
7	AJAX	Σ B6.3								15.1	31.11	5.8	180.4									Qallow = 271 CFS S = 2.5%
8																						
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

STREET		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHANNEL	B5.1	B5.1	17.1	.79	14.5	13.51	5.9	79.7													
2		B5.1	→	CHANNEL						14.5	13.51											
3	CHANNEL	B4.1	B4.1	17.5	.65	7.1	11.38	7.9	89.9													
4		B4.1	→	CHANNEL						7.1	11.38											
5																						
6																						
7																						
8																						
9																						
10																						
11																						

BASIN C

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BY Poling DATE 12/8/94 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF 6
CHKD. BY DATE JOB NO. 212-1127

BASIN C

C1.1) A = 3.0 Ac $C_5 = .75$

$t_i = 8.0$ MIN

$l_t = 700'$ $s = 1.0\%$ $V = 7.1$ FPS

$t_t = l/60V = 1.6$ MIN

$t_c = 9.6$ MIN

ASSUME 10' INLET D/S OF TUTT IS NEGLIGIBLE DUE TO TAPER + SPECIAL SECTION

EXISTING 8' INLET $Q = 11.2$ CFS $S = 1.2\%$ $Q_{ALLOW} = 17$ CFS

$y = .35$

$T = 17.5$

$Q_i/Q = .4$

$Q_i = 4.5$ CFS

$Q_c = 6.7$ CFS

C1.2) A = 1.0 Ac $C_5 = .75$

$t_i = 8.0$ MIN

$l_t = 250'$ $s = .5\%$ $V = 5.0$ FPS

$t_t = l/60V = .8$ MIN

$t_c = 8.8$ MIN

EXISTING 10' INLET IN SUMP MAX POND = .19'

$Q = 9.0$ CFS

$Q_i = 5.0$ CFS

$Q_{co} = 4.0$ CFS

C1.3) $A = 7.2$ AC $C_5 = .75$

$t_i = 8.0$ MIN

$l_t = 1500'$ $S = 3.5\%$ $V = 13.3$ FPS

$t_t = l/60V = 1.9$ MIN

$t_c = 9.9$ MIN

DESIGN SUMP INLET

MAX POND = .5'

USE 20' C.O. INLET

ALL IS INTERCEPTED

C1.4) $A = 11.3$ $C_5 = .75$

$t_i = 11.3$ MIN

$l_t = 1400'$ $S = 2.36\%$ $V = 10.9$ FPS

$t_t = l/60V = 2.1$ MIN

$t_c = 13.4$ MIN

C1.5) $A = 2.2$ AC $C_5 = .9$

$l_i = 100'$ @ 2.0%

$t_i = 3.0$ MIN

$l_t = 1170'$ $S = 1.2\%$ $V = 7.8$ FPS

$t_t = l/60V = 2.5$

$t_c = 5.5$ MIN

EXISTING 6' C.O. INLET IN SUMP MAX POND = 6"

$Q = 12.4$ CFS

$Q_i = 9$ CFS ⟶ WATER CANNOT FLOW ANYWHERE ELSE, THEREFORE, 12.4 CFS IS INTERCEPTED, WATER PONDS TO .62'

BY Poling DATE 12/8/94 SUBJECT STETSON HILLS MDDP SHEET NO. 3 OF 6
CHKD. BY / DATE JOB NO. 212-1127

C3.2) $A = 21.1$ $C_5 = .75$

$l_i = 300'$ @ 1.0%

$t_i = 11.3$ MIN

$l_t = 1600'$ $S = 7.2\%$ $V \cong 19.1$ FPS

$t_t = l/60V = 1.4$ MIN

$t_c = 12.7$ MIN

C4.3) $A = 2.8$ $C_5 = .65$

$t_i = 4.7$ MIN

$l_t = 500'$ $S = .8\%$ $V = 6.4$ FPS

$t_t = 1.3$

$t_c = 6.0$

DESIGN INLET $Q = 16.9$ CFS

SUMP - USE 14' C.O. INLET

$Q_i = 16.9$ CFS

(C4.4) $A = 1.7$ $C_5 = 0.55$

$t_i = 5.8$

$l_t = 450'$ $S = 7.1\%$ $V = 19$ fps

$t_t = = 0.4$ min

$t_c = 6.2$ min

Design Inlet $Q = 8.6$ $S = 3.8\%$

$Q_i/Q = 0.6$ $y = 0.25$ $L = 19'$ Type R

(C4.5) $A = 10.3$ Ac. $C_5 = 0.55$

$t_c = 5.8$ min

$l_t = 1200'$ $S = 6.3\%$ $V = 17.9$ fps

$t_t = 1.1$ min

$t_c = 6.9$ min

C4.2) A = 7.6 AC C_5 = .65

t_i = 4.7 MIN

l_t = 1000' S = 7.5 % V = 19.5 FPS

t_t = $l/60V$ = .9 MIN

t_c = 5.6 MIN

C4.1) A = 1.7 AC t_i = 4.7 MIN C_5 = .65

l_t = 450' S = 7.1% V = 19.0 FPS

t_t = .4 MIN

t_c = 5.1 MIN

Q = 9.1 AC S = .05

Q_{ALLOW} = 34 CFS

Y = .25'

T = 12.5'

Q_i/Q = .6 → USE 17' TYPE R

Q_i = 5.5 CFS

Q_{CO} = 3.6 CFS

C3.1) A = 4.4 AC C_5 = .75

l_i = 50' @ 2.0%

t_i = 4.2 MIN

l_t = 1120' S = 3.5% V = 13.3 FPS

t_t = $l/60V$ = 1.4 MIN

t_c = 5.6 MIN

SIZE INLET Q = 19.4 CFS S = 4.2% Q_{ALLOW} = 34 CFS

Y = .33'

T = 16.5'

Q_i/Q = .6 → USE 22' C.O. INLET

MAX INLET LENGTH IS 20'

Q_i/Q = .55

Q_i = 10.7 CFS Q_{CO} = 8.7 CFS

C6.1) A = 2.8 Ac C_5 = .65

t_i = 4.7 MIN (50' @ 2.0%)

l_t = 840' S = 1.31 % V = 8.1 FPS

t_t = $l/60v$ = 1.7 MIN

t_c = 6.4 MIN

Q = 8.7 CFS S = .017 Q_{Allow} = 22 CFS

y = .29

T = 14.0

Q_i/Q = .6 → USE 14' C.O. INLET

Q_i = 5.2 CFS

Q_{co} = 3.5 CFS

C6.2) A = 11.8 Ac C_5 = .68

l_i = 300' @ 1.0%

t_i = 13.6 MIN

l_t = 1100 S = .052 V = 16.2 FPS

t_t = $l/60v$ = 1.1 MIN

t_c = 14.7 MIN

C5.1) A = 2.4 Ac C_5 = .65

t_i = 4.7 MIN

l_t = 675' S = 4.7 % V = 15.4 FPS

t_t = .7 MIN

t_c = 5.4 MIN

Q = 10.5 CFS S = 7.7% Q_{Allow} = 34 CFS

y = .25

T = 12.5'

Q_i/Q = .6 → USE 18' C.O. INLET

Q_i = 6.3 CFS

Q_{co} = 4.2 CFS

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BY Poling DATE 12/8/94 SUBJECT STETSON HILLS MDDP SHEET NO. 6 OF 6
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C5.2) $A = 9.0$ Ac $C_5 = .68$

$l_i = 300'$ @ 1.0%

$t_i = 13.6$ MIN

$l_t = 1100'$ $S = .026$ $V = 11.6$ FPS

$t_t = l/60V = 1.6$ MIN

$t_c = 15.2$ MIN

C5.3) $A = 4.6$ Ac $C_5 = .55$

$t_c = 5.8$ MIN (50' @ 2.0%)

$l_t = 840'$ $S = 1.31\%$ $V = 8.1$ FPS

$t_t = 1.7$ MIN

$t_c = 7.5$ MIN

SIZE INLET $Q = 11.4$ CFS $S = 7.7\%$ $Q_{allow} = 34$ CFS

$Y = .75'$
$T = 12.5'$

$Q_i/Q_c = .6$ → USE 18' C.O. INLET

$Q_i = 6.8$ CFS
$Q_{co} = 4.6$ CFS

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	C6.1	C6.1	2.8	.65	6.4	1.82	4.8	8.7													Q_{ALLOW} = 17 CFS
2	JACKPOT -STREET	C6.1	→	C5.1						7.1	.73			3.3	3.5				700	16.2	.7	Q_i = 5.2 CFS Q_{co} = 3.5 CFS
3	JACKPOT	C6.1	C6.2	11.8	.68	14.7	8.02	3.4	27.3													CA_i = 1.09 CA_{co} = .73
4	JACKPOT - PIPE	ΣC6.1								14.7	9.11	3.4	31.0									
5	JACKPOT - PIPE	C6.1	→	C5.1						15.6	9.11					31.0	2.5	24	700	12.9	.9	
6																						
7	JACKPOT	C5.1	C5.1	2.4	.65	5.4	1.56	5.1	8.0													
8	JACKPOT -STREET	ΣC5.1								7.1	2.29	4.6	10.5									Q_{ALLOW} = 34 CFS
9	JACKPOT -STREET	C5.1	→	C4.1						7.5	.92			7.1	3.2				500	19.0	.4	Q_i = 6.3 CFS Q_{co} = 4.2 CFS
10																						CA_i = 1.37 CA_{co} = .92
11	JACKPOT	C5.1	C5.2	9.0	.68	15.2	6.12	3.4	20.8													

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127

PROJECT STETSON HILLS MDDP

DESIGN STORM ______

p. l A

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	C4.4	C4.4	1.7	.55	6.2	.94	4.8	4.5													
2	JACKPOT -STREET	ΣC4.4								7.9	1.95	4.4	8.6	4.5	3.4				450	15.1	.5	Qallow =34 CFS Qi = 5.2
3	JACKPOT -STREET	C4.4	->	E1.4						8.4	.78											Qco = 3.4 CAi = 1.17
4																						CA10 = .78
5	JACKPOT	C4.4	C4.5	10.3	.55	6.9	5.67	4.7	26.6													
6	JACKPOT-PIPE		ΣC4.4							7.9	6.84	4.4	30.1			30.1	1.0	30	50	9.1	.1	
7	JACKPOT -PIPE	C4.4	->	C4.1						8.0	6.84											
8																						
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
p. 2

STREET		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	C53	C5.3	4.6	.55	7.5	2.53	4.5	11.4					7.1	4.6				450	19.0	0.4	Q_{ALLOW} = 34 Q_i = 6.8 CFS
2	JACKPOT -STREET	C5.3 → C4.4								7.9	1.01											Q_{co} = 4.6 CFS CA_i = 1.52
3	JACKPOT -PIPE	C5.3 → C5.1								7.5	1.52											CA_{co} = 1.01
4																						
5	JACKPOT -PIPE	ΣC5.1								15.6	18.12	3.4	61.6			61.6	3.0	30	500	16.3	.5	
6	JACKPOT -PIPE	C5.1 → C4.1								16.1	18.12											
7																						
8	JACKPOT	C4.1	C4.1	1.7	.65	5.1	1.11	5.2	5.8													
9	JACKPOT -STREET	ΣC4.1								7.5	2.03	4.5	9.1	.8	3.6				620	6.4	1.6	Q_{ALLOW} = 34 CFS Q_i = 5.5 CFS
10	COMSTOCK -STREET	C4.1 → C4.3								9.1	.81											Q_{co} = 3.6 CFS CA_i = 1.22
11	JACKPOT -PIPE	ΣC4.1								16.1	28.6	3.3	94.2			94.2	1.0	42	620	11.9	.9	CA_{co} = .81

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
P. 3

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	COMSTOCK	C3.1	C3.1	4.4	.75	5.6	3.3	5.1	16.8													
2	COMSTOCK -STREET	ΣC3.1								12.6	5.88	3.3	19.4	3.5	8.7				380	13.3	.5	Q_{ALLOW} = 34 CFS Q_i = 10.7 CFS
3	COMSTOCK -STREET	C3.1	→	C4.3						13.1	2.65											Q_{ro} = 8.7 CFS CA_i = 3.23
4																						CA_{ro} = 2.65
5	COMSTOCK	C3.1	C3.2	21.1	.75	12.7	15.83	3.2	50.7													
6	COMSTOCK -PIPE	ΣC3.1								12.7	19.06	3.2	61.0			61.0	2.5	30	380	15.0	.4	
7	COMSTOCK -PIPE	C3.1	→	C4.3						13.1	19.06											
8																						
9	COMSTOCK	C4.3	C4.3	2.8	.65	6.0	1.82	4.9	8.9													
10	COMSTOCK -STREET	ΣC4.3								13.1	5.28	3.2	16.9									Q_i = 16.9 CFS
11																						

CALCULATED BY Poling
DATE 12/19/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p. 4

STREET			DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	COMSTOCK	C4.3	C4.2	7.6	.65	5.6	4.94	5.0	24.7													
2	COMSTOCK - PIPE	ΣC4.3								17.0	57.8	3.2	185.1			185.1	1.0	54	80	13.7	.1	
3	COMSTOCK - PIPE	C4.3 →	C1.3							17.1	57.8											
4																						
5	COMSTOCK	C1.3	C1.3	7.2	.75	9.9	5.4	4.1	22.1													Q_i = 22.1 CFS
6	COMSTOCK - PIPE	ΣC1.3								17.1	63.2	3.2	202.4									
7	COMSTOCK - PIPE	C1.3 →	CHANNEL							17.1	63.2											
8																						
9																						
10																						
11																						

CALCULATED BY Poling
DATE 12/12/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

P. 5

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	C1.1	C1.1	3.0	.75	9.6	2.25	4.1	9.2													
2	BARNES	- CARRY	OVER		FROM		I - A		.78	12.1	.69											
3	BARNES - STREET	ΣC1.1								12.1	2.94	3.8	11.2	.7	6.7				360	6.0	1.0	Q_{ALLOW} = 17 CFS Q_i = 4.5 CFS
4	BARNES - STREET	C1.1	→	C1.2						13.1	1.76					4.5	1.0	36	360	4.9	1.2	Q_{co} = 6.7 CFS CA_i = 1.18
5	BARNES - PIPE	C1.1	→	C1.2						13.3	1.18											CA_{co} = 1.76
6																						
7	BARNES	C1.2	C1.2	1.0	.75	8.8	.75	4.3	3.2													
8	BARNES - STREET	ΣC1.2								13.1	2.51	3.6	9.0	1.1	4.0				630	7.5	1.4	Q_i = 5.0 CFS Q_{co} = 4.0 CFS
9	BARNES - STREET	C1.2	→	E2.	1					14.5	1.12											CA_i = 1.39 CA_{co} = 1.12
10	BARNES - PIPE	ΣC1.2								13.3	2.57	3.6	9.3									
11	BARNES - PIPE	C1.2	→	6x4	DBL	CBC				13.3	2.57											

CALCULATED BY Poling
DATE 12/13/94
CHECKED BY ____________

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5-YR

p. 6

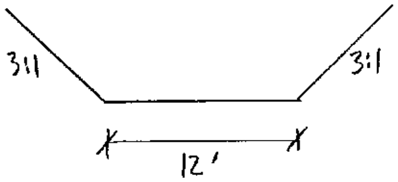
	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	C1.4	C1.4	11.3	.75	13.4	8.48	3.6	30.5													
2	BARNES	C1.4	→		CHANNEL					13.4	30.5											
3																						
4	BARNES	C1.5	C1.5	2.7	.9	5.5	2.43	5.1	12.4													Qi = 12.4 CFS
5	BARNES	C1.5	→	6x4		DBC	CBC			5.5	2.43											
6																						
7																						
8																						
9																						
10																						
11																						

BY Poling DATE 12/22/94 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF 1
CHKD. BY / DATE JOB NO. 212-1127

SIZE CHANNEL FROM COMSTOCK TO EXISTING
DBL 6x4' CBC

SIZE FOR 100-YR STORM

$Q_{100} = 370$ CFS



RIPRAP LINED $n = .03$

$S = .01$

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$d = 2.6'$ $V = 7.4$ FPS $N_F = .8$

$$h_f = 1 + .025 V D^{.33} = 1 + .025 \cdot 7.4 \cdot 2.6^{.33} = 1.3$$

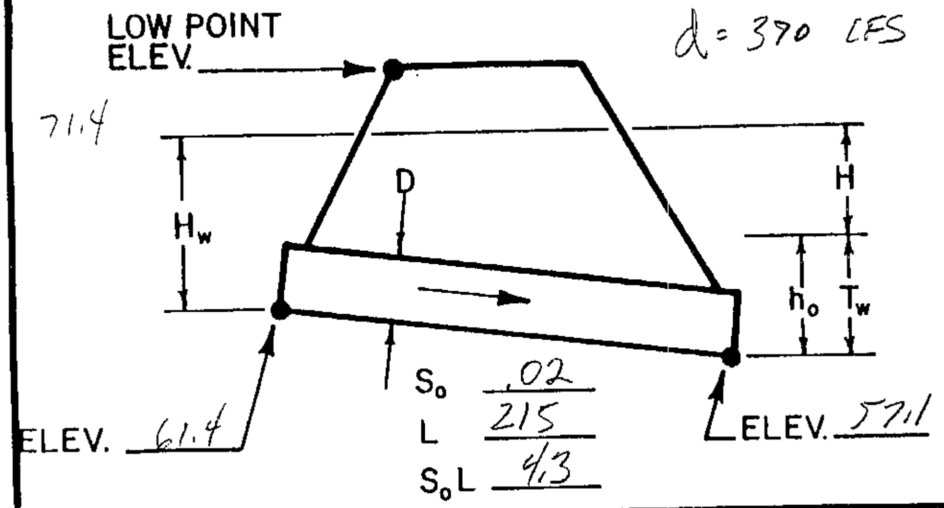
$$d = 2.6 + 1.3 = 3.9 \rightarrow 4.0'$$

STANDARD FORM SF-4
CULVERT RATING

(GREINER 12)

PROJECT: STETSON HILLS MDDP LOCATION: BARNES BTWN TUTT + CHARLOTTE STATION: ______

Q = 390 CFS



S_o .02

L 215

S_oL 4.3

ELEV. 61.4

ELEV. 57.1

CULVERT DATA

TYPE: ______ n: ______

INLET: ______ Q_{FULL}: ______

K_e : ______ V_{FULL}: ______

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D$; $h_o = \frac{d_c + D}{2}$ or T_w (whichever is greater)

$T_w > D$; $h_o = T_w$

(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \leq D$

	INLET CONTROL		OUTLET CONTROL						CONT.	CONTROL	ELEV.
					$T_w < D$		$T_w > D$				
Q	$\frac{H_w}{D}$	H_w	H	T_w	d_c	$\frac{d_c+D}{2} = h_o$	h_o	H_w	H_w		
1	2	3	4	5	6	7	8	9	10	11	12
185	1.3	5.2									

6×4

10' AVAILABLE HEAD, 5.2' REQ'D

DBL 6x4 IS ADEQUATE

STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA

CALCULATED BY Poling

DATE 12/21/94

CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127

PROJECT STETSON HILLS MDDP

DESIGN STORM 100

p. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	COMSTOCK	A1.3	→	C3.1						16.3	4.68											
2	COMSTOCK	C4.1	→	C4.3						17.4	2.86											
3																						
4	COMSTOCK	C3.1	C3.1	4.4	.8	5.6	3.52	8.8	31.0													
5	COMSTOCK	C3.1	C3.2	21.1	.8	12.7	16.88	6.3	106.3													
6	COMSTOCK	Σ	C3.1							16.3	25.08	5.6	140.4	3.5	140.4				380	13.3	.5	Q_{flow} = 351.2 CFS S = 4.2%
7	COMSTOCK	C3.1	→	C4.3						16.8	25.08											
8																						
9	COMSTOCK	C4.2	C4.3	2.8	.75	6.0	2.1	8.5	17.9													
10	COMSTOCK	C4.3	C4.2	7.6	.75	5.6	5.7	8.8	50.2													
11	COMSTOCK	C1.3	C1.3	7.2	.8	9.9	5.76	7.0	40.3													

CALCULATED BY Poling
DATE 12/21/94
CHECKED BY ______

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MODP
DESIGN STORM 100
p. 2

	STREET		DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	COMSTOCK	ΣC1.3/C4.3								17.4	42.5	5.4	229.3									
2																						
3																						
4																						
5	ASSUME Q100 GOES TO CHANNEL W/O EXCEEDING																					
6	12" PONDING DEPTH																					
7	COMSTOCK	C1.3/C4.3 →				CHANNEL				17.4	59.49	5.4	321.2									
8																						
9	COMSTOCK	C1.4	C1.4	11.3	.8	13.4	9.04	6.2	56.0													
10	COMSTOCK	Σ CHANNEL								17.4	68.53	5.4	370.1									
11																						

SUBTRACT QPIPE TO GET QSTREET

QPIPE = 180.5 CFS

ALREADY ACCOUNTED FOR

QSTREET = 229.3 − (202.4 − 94.2) = 121.1

QALLOW = 15.3
S = 0.8%

CA TOTAL = 42.96 + 16.53 = 59.49

CALCULATED BY Poling
DATE 12/21/94
CHECKED BY ______

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 1

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	C6.1	C6.1	2.8	.75	6.4	2.1	8.3	17.4													
2	JACKPOT	C6.1	C6.2	11.8	.76	14.7	8.97	5.9	52.9													
3	JACKPOT	ΣC6.1								14.7	11.07	5.9	65.3	3.3	65.3				700	16.2	.7	Q_{ALLOW} = 223.4 CFS S = 1.7%
4	JACKPOT	C6.1	→	C5.1						15.4	11.07											
5																						
6	JACKPOT	C5.1	C5.1	2.4	.75	5.4	1.8	8.9	16.0													
7	JACKPOT	C5.1	C5.2	9.0	.76	15.2	6.84	5.8	39.7													
8	JACKPOT	C5.1	C5.3	4.6	.65	7.5	2.99	7.8	23.3													
9	JACKPOT	ΣC5.1								15.4	22.7	5.8	131.7	7.1	131.7				500	19.0	.4	Q_{ALLOW} = 476 CFS S = 7.7%
10	JACKPOT	C5.1	→	C4.1						15.8	22.7											
11																						

CALCULATED BY Poling

DATE

CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127

PROJECT STETSON HILLS MDDP

DESIGN STORM 100

p. 1A

	STREET		DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	C4.1	C4.4	1.7	.65	6.2	1.11	8.4	9.3													
2	JACKPOT	C4.1	C4.5	10.3	.65	6.9	6.7	8.1	54.3													
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						

CALCULATED BY Poling
DATE 12/21/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	JACKPOT	C4.1	C4.1	1.7	.75	5.1	1.28	9.0	11.5													
2	JACKPOT	ΣC4.1								15.8	31.79	5.7	181.2									Q ALLOW = 383 CFS S = 5.0%
3																						
4	FLOW OVERTOPS THE CROWN AND IS SPLIT EVENLY ACROSS THE SECTION. ASSUME 1/2 Q IN WEST LANE (Q/4) FLOWS TO COMSTOCK.																					
5																						
6	SUBTRACT Q PIPE TO GET Q STREET Q PIPE = Qs = 94.2 → Q STREET = 87 CFS																					
7	Q TO COMSTOCK = 21.8 CFS (CA = 3.82)													Q TO JACKPOT = 65.2 (CA = 11.44)								
8																						
9	JACKPOT	C4.1	→	E1.4						16.3	11.44			5.9	65.2				500	17.3	.5	
10	COMSTOCK	C4.1	→	C4.3						17.4	3.82			.8	21.8				620	6.4	1.6	
11																						

BASIN D

BY Poling DATE 12/22/94 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF
CHKD. BY | DATE JOB NO. 212-1127

BASIN D

D1) A = 3.5 Ac TYPE A SOIL

SCHOOL ASSUME 50% IMP

$C_5 = .5 \cdot .25 + .5 \cdot .9 = .56$ $C_{100} = \frac{.35 + .95}{2} = .65$

$l_i = 100'$ @ 2.0%

$t_i = 8.0$ MIN

$l_t = 580'$ $S = 1.0\%$ $V = 7.1$ FPS

$t_t = 1.4$

$t_c = 9.4$ MIN

D2) A = 5.4 Ac

1.8 AC RETAIL $C_5 = .75$ $C_{100} = .8$
3.6 AC SCHOOL $C_5 = .56$ $C_{100} = .65$

$C_5 = \frac{1.8 \cdot .75 + 3.6 \cdot .56}{5.4} = .62$

$C_{100} = .7$

$l_i = 100'$ @ 2.0%

$t_i = 7.1$ MIN

$l_t = 1430'$ $S = 3.8\%$ $V = 13.8$ FPS

$t_t = 1.7$ MIN

$t_c = 8.8$ MIN

$Q = 14.4$ CFS $S = 5.0\%$ $Q_{ALLOW} = 34$
$Y = .29'$ $T = 14.5'$
$Q_i/Q = .6$ → USE 20' C.O. INLE

CHECK INLET $Q_{100} = 16.2$ → USE 8' INLET
MAX POND = 0.67'

D3) A = 5.7 Ac

.2 Ac Retail $C_5 = .75$ $C_{100} = .8$
5.5 Ac School $C_5 = .56$ $C_{100} = .65$

$C_5 = \frac{.2 \cdot .75 + 5.5 \cdot .56}{5.7} = .57$ $C_{100} = .66$

$l_i = 300'$ @ 1.0%

$t_i = 17.2$ MIN

$l_t = 800$ @ 3.8% $V = 13.8$ FPS

$t_t = 1.0$ MIN

$t_c = 18.2$ MIN

D4) A = 13.1 Ac $C_5 = .56$ $C_{100} = .65$

$l_i = 300'$ @ 1.0%

$t_i = 17.5$ MIN

$l_t = 950'$ @ 3.2% $V = 12.7$ FPS

$t_t = 1.2$ MIN

$t_c = 18.7$ MIN

MERRICK
ENGINEERS & ARCHITECTS

INFO FROM FIL 10 D.R.

BY Poling DATE 12/22/94 SUBJECT STETSON HILLS MDDP SHEET NO. 3 OF ___
CHKD. BY ___ DATE ___ ___ JOB NO. 212-1127

(D6) ① INLET 44 ^(IN CHARLOTTE) — FIL 10 CONTRIBUTES 1.1 AC
(BACK OF LOT + STREET)
4' C.O.

$C_5 = .9$ $C_{100} = .95$
$t_c = 5.0$ MIN

(D5) ② INLET 43 ^(IN CHARLOTTE) BASIN D

D1 - D12 $Q_5 = 19.2$ CFS
$Q_{100} = 39.0$ CFS } Ⓡ $t_c = 19.9$ MIN @ D12
(FROM MERRICKS REVIEW OF FIL 10 D.R.)

TRAVEL TIME
$V = 71.21S^{1/2}$ $S = .72\%$ $V = 6.0$ FPS
$t_t = \ell/60V = 680/60 \cdot 6 = 1.9$ MIN
$t = 21.8$ MIN

D13 - D18 $A = 10.4$
$C_5 = .63$, $C_{100} = .68$ (FROM MERRICKS REVIEW)
$\ell_i = 50$ @ 2.0%
$t_i = 4.9$ MIN
$\ell_t = 1200'$ $S = 2.75\%$ $V = 71.21S^{1/2} = 11.8$ FPS
$t_t = \ell/60V = 1200/60 \cdot 11.8 = 1.7$ MIN
$t = 6.6$ MIN

USE $t_c = 21.8$ MIN $I_5 = 2.8$ IN/HR $I_{100} = 4.9$ IN/HR
$\Sigma CA_5 = .63 \cdot 10.4 + 19.2/2.8 = 13.4$
$\Sigma CA_{100} = .68 \cdot 10.4 + 39/4.9 = 15.0$
$Q_5 = 13.4 \cdot 2.8 = 37.5$ CFS
$Q_{100} = 15 \cdot 4.9 = 73.5$ CFS

⟶ THIS IS SUBBASIN D5 OF MDDP
$A = 21.7$ AC $C_5 = .62$ $C_{100} = .69$
$t_c = 21.8$ MIN

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 12/22/94 SUBJECT STETSON HILLS MODP SHEET NO. 4 OF
CHKD. BY DATE JOB NO. 212-1127

D5) 14' C.O. INLET IN SUMP $Q = 41.4$
PONDS TO .44' BEFORE OVERTOPPING ANNA LEE CROWN
$Q_i = 16$ CFS $Q_{co} = 25.4$

D6) 4' C.O. INLET IN SUMP $Q = 28.2$ CFS
PONDS TO 0.6' BEFORE OVERTOPPING TO THE SOUTH
$Q_i = 10$ CFS
$Q_{co} = 18.2$ CFS

CALCULATED BY Poling
DATE 12/22/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p. 1

	STREET		DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHANNEL	D1	D1	3.5	.56	9.4	1.96	4.1	8.0													Q_i = 8.0 CFS
2	CHANNEL	D1	→	CHANNEL						9.4	1.96											
3																						
4	CHANNEL	D4	D4	13.1	.56	18.7	7.34	3.1	22.8													
5	CHANNEL	D1	→	CHANNEL						18.7	1.96											
6																						
7	CHARLOTTE	D2	D2	5.4	,62	8.8	3.35	4.3	14.4					5.0	5.8				450	15.9	.5	Q_{ALLOW} = 34 CFS Q_i = 8.6 CFS
8	CHARLOTTE - STREET	D2	→ D	5						9.3	1.34											Q_{CO} = 5.8 CFS CA_i = 2.01
9	CHARLOTTE	D2	D3	5.7	.57	18.2	3.25	3.1	10.1													CA_{CO} = 1.34
10	CHARLOTTE - PIPE	ΣD	2							18.2	5.26	3.1	16.3			16.3	1.0	24"	200	7.8	.4	
11	CHARLOTTE - PIPE	D2	→	CHANNEL		(E. TRIB)				18.6	5.26											

CALCULATED BY Poling
DATE 12/22/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

P. 2

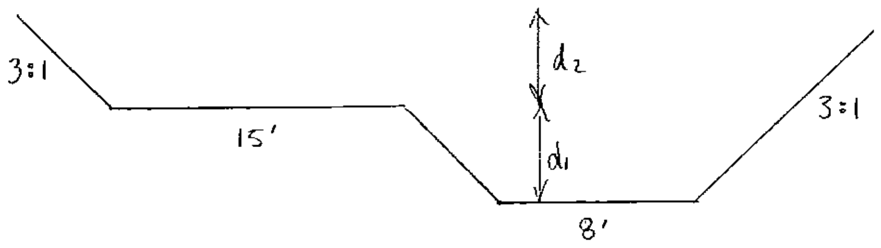
	STREET	DESIGN POINT	DIRECT RUNOFF AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	TOTAL RUNOFF t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	STREET SLOPE (%)	STREET FLOW (CFS)	PIPE DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	TRAVEL TIME LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	REMARKS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHARLOTTE	D5	D5	21.7	.62	21.8	13.45	2.8	37.7													
2	CHARLOTTE - STREET	ΣD5								21.8	14.79	2.8	41.4	1.4	9.07				260	8.3	.5	Q_i = 16 CFS Q_{co} = 25.4 CFS
3	CHARLOTTE - STREET	D5	→ D6							22.3	9.07					16	1.5	24	320	9.2	.6	CA_i = 5.72 CA_{co} = 9.07
4	CHARLOTTE - PIPE	D5	→	B4.3						22.4	5.72											
5																						
6	CHARLOTTE	D6	D6	1.1	.9	5.0	.99	5.2	5.1													
7	CHARLOTTE - STREET	ΣD6								22.3	10.06	2.8	28.2	1.4	18.2				850	8.5	1.7	Q_i = 10 CFS Q_{co} = 18.2 CFS
8	CHARLOTTE - STREET	D6	→	→	B4	5				24.0	6.49					10.0	1.6	18	91	8.2	.2	CA_i = 3.57 CA_{co} = 6.49
9	CHARLOTTE - PIPE	D6	→	B4.	3					22.5	3.57											
10																						
11																						

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 12/28/94 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF 1
CHKD. BY / DATE / / JOB NO. 212-1127

SIZE CHANNEL IN BASIN D FROM STETSON HILLS BLVD TO CHARLOTTE PKWY

Q_{10} = 315 CFS
Q_{100} = 569 CFS



n = .03 (RIPRAP)
S = .01

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

SIZE d_1 FOR 10-YR FLOW

Q = 315 CFS d_1 = 2.8 → 3.0' V = 7.2 FPS N_F = .8

SIZE $d_1 + d_2$ FOR 100-YR FLOW

Q = 569 CFS

$$A = 51 + 41 d_2 + 3 d_2^2$$
$$WP = 6.32 d_2 + 41.96$$

d_2	A	WP	Q
1	95	48.28	743
.5	72.25	45.12	492
.6	76.68	45.75	538
.7	81.17	46.38	587

V = 7.2 FPS N_F = .7

D = 3.7'

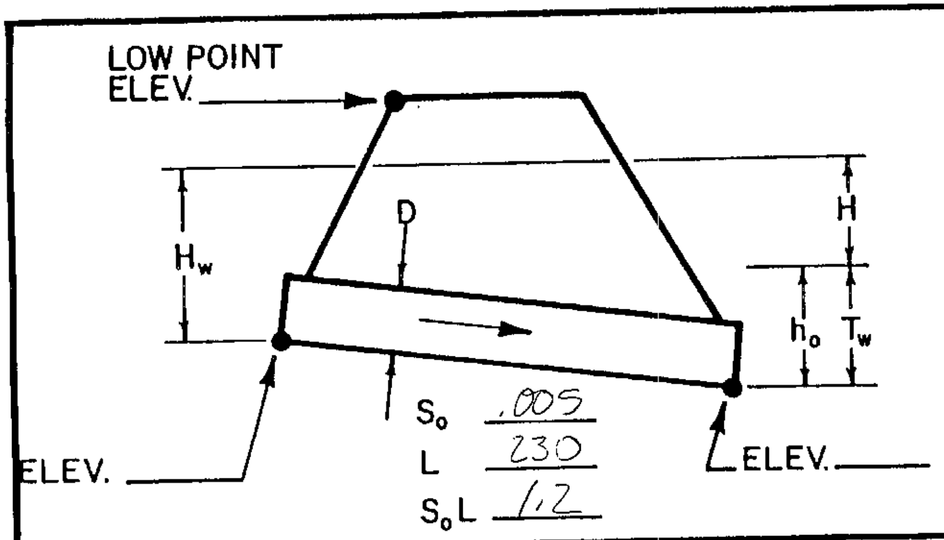
Add FREEBOARD

$h_f = 1 + .025 V D^{.33} = 1.0 + .025 \cdot 7.2 \cdot 3.7^{.33} = 1.3$

D = 3.7 + 1.3 = 5.0'

STANDARD FORM SF-4
CULVERT RATING

PROJECT: STETSON HILLS LOCATION: (GREINER #8) CHARLOTTE BTWN JACKPOT AND ANNA LEE STATION: ______



S_o .005

L 230

S_oL 1.2

CULVERT DATA

TYPE: ______ n: ______

INLET: ______ Q_{FULL}: ______

K_e: ______ V_{FULL}: ______

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D$; $h_o = \frac{d_c+D}{2}$ or T_w (whichever is greater)

$T_w > D$; $h_o = T_w$

(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \leq D$

	Q	INLET CONTROL $\frac{H_w}{D}$	 H_w	OUTLET CONTROL H	 T_w	$T_w < D$ d_c	 $\frac{d_c+D}{2}=h_o$	$T_w > D$ h_o	 H_w	CONT. H_w	CONTROL	ELEV.
	1	2	3	4	5	6	7	8	9	10	11	12
72"	640	4	24		7.5			7.5				
2-72"	320	1.5	9	3.9	7.5			7.5	10.2	10.2	OUTLET	

BASIN E

BY Poling DATE 12/13/94 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF 5
CHKD. BY DATE JOB NO. 212-1127

BASIN E

E1.1) $A = 2.6$ AC $C_5 = .55$

$l_i = 50'$ @ 2.0%

$t_i = 5.8$ MIN

$l_t = 700'$ $S = 1.4\%$ $V = 8.5$ FPS

$t_t = l/60V = 1.4$ MIN

$t_c = 7.2$ MIN

EXISTING 8' C.O. INLET $Q = 6.4$ CFS $S = 1.4\%$ $Q_{ALLOW} = 21$ CFS

$y = .27'$

$T = 13.5'$

$Q_i/Q = .5$

$Q_i = Q_{co} = 3.2$ CFS

E1.2) $A = 21.1$ AC $C_5 = .55$

$t_i = 5.8$ MIN

$l_t = 1400'$ $S = 4.3\%$ $V = 14.7$ FPS

$t_t = l/60V = 1.6$ MIN

$t_c = 7.4$ MIN

E1.4) $A = 1.9$ AC $C_5 = .55$

$t_i = 5.8$ MIN

$l_t = 300'$ $S = 1.6\%$ $V = 9.1$ FPS

$t_t = l/60V = .5$ MIN

$t_c = 6.3$ MIN

MERRICK
ENGINEERS & ARCHITECTS

BY ______ DATE 12/13/94 SUBJECT ______ SHEET NO. 2 OF 5
CHKD. BY ______ DATE ______ JOB NO. ______

BASIN E

E 1.3) $A = 1.1$ Acres $C_5 = 0.55$

$t_i = 5.8$ min

$l_t = 250'$ $S = 3.8$ $v = 14.0$ f/s

$t_t = 0.3$ min

$t_c = 6.1$ min

E 1.5) $A = 3.3$ Ac. $C_5 = 0.55$

$t_i = 5.8$ min.

$l_t = 700'$ $S = 6.3\%$ $V = 17.8$ f/s

$t_t = l/60v = 0.7$ min.

$t_c = 6.5$ min

MERRICK Form 47 Rev 12/81

BY Poling DATE 12/13/94 SUBJECT STETSON HILLS MDDP SHEET NO. 3 OF 5
CHKD. BY ____ DATE ____ JOB NO. 212-1127

E2.1) $A = 2.5$ Ac $C_5 = .75$

$l_i = 150$ @ 1.0%

$t_i = 8.0$ MIN

$l_t = 650'$ $S = 1.1\%$ $V = 7.5$ FPS

$t_t = l/60V = 1.4$ MIN

$t_c = 9.4$ MIN

E2.2) $A = 2.8$ Ac $C_5 = .75$

$t_i = 8.0$ MIN

$l_t = 1000'$ $S = 3.1\%$ $V = 12.5$ FPS

$t_t = l/60V = 1.3$ MIN

$t_c = 9.3$ MIN

E2.3) $A = 4.5$ Ac $C_5 = .75$

$l_i = 300'$ @ 1.0%

$t_i = 11.3$ MIN

$l_t = 300'$ $S = .008$ $V = 6.5$ FPS

$t_t = l/60V = 0.8$ MIN

$t_c = 12.1$ MIN

E2.4) $A = 1.4$ Ac $C_5 = .9$

$t_i = 3.0$ MIN (100' @ 2.0%)

$l_t = 720'$ $S = .013$ $V = 8.1$ FPS

$t_t = 1.5$

$t_c = 5.0$ MIN

E 1.6) $A = 3.3$ AC $C_5 = .9$

$l_i = 100'$ @ 2.0%

$t_i = 3.0$ MIN

$l_i = 1900'$ $S = 2.1\%$ $V = 10.3$ FPS

$t_t = 3.1$ MIN

$t_c = 6.1$ MIN

INLET AT E1.6 12' C.O. INLET IN SUMP

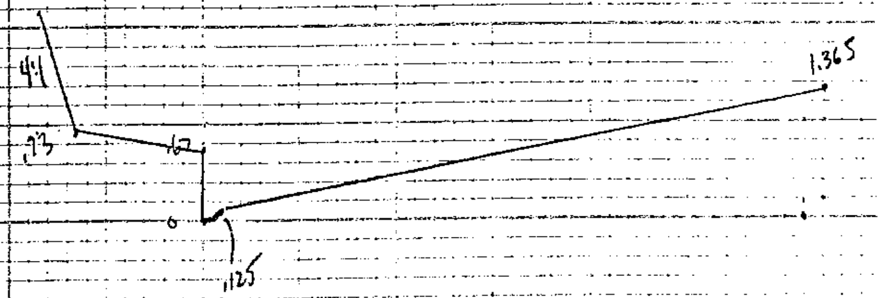
$Q_5 = 98.1$ CFS

FIND PONDING DEPTH

$Q_i = 3.6 L_i (d - .08)^{.5}$

$64.8 = 3.6 \cdot 12 (d - .08)^{.5}$

$d = 2.17'$ → NO



OVERTOPS CURB 1.4' ABOVE FL

$Q_i = 3.6 (12) (1.4 - .08)^{.5} = 49.6$ CFS

CHECK PIPE CAPACITY

21" RCP @ 1.1% → 16.6 CFS

ASSUME 16.6 CFS IS INTERCEPTED

98.1 - 16.6 = 81.5 OVERFLOWS TO THE SOUTH

$CA_I = 4.88$ $CA_{co} = 23.98$

INLET AT E2.4 6' C.O. IN SUMP $Q = 142.8$ CFS

ASSUME 1.0' PONDING THEN WATER OVERTOPS
CURB TO SAND CREEK

$Q_i = 21$ CFS $CA_i = 6.18$

$Q_{co} = 121.01$ CFS $CA_{co} = 35.83$

CALCULATED BY Poling
DATE 12/13/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5-YR
p.1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHARLOTTE	E1.1	E1.1	2.6	.55	7.2	1.43	4.5	6.4													Q_{ALLOW} = 21 CFS $Q_L = Q_{CO}$ = 3.2 CFS
2																						$CA_i = CA_{CO}$ = .72
3	CHARLOTTE	E1.1	E1.2	21.1	.55	7.4	11.61	4.5	52.2													
4	CHARLOTTE - PIPE	ΣE1.1								7.4	12.33	4.5	55.5	EXISTING PIPE IS 24" RCP @ 1.5%								
5	CHARLOTTE - PIPE / STREET		ΣE1.1							7.4	13.04	4.5	58.7	$Q_{PIPE\ MAX}$ = 27.7 CFS → 31.0 IS IN								
6														STREET → @ S = 1.6% Y = .48' OK								
7														CA PIPE = 6.13 CA STREET = 6.91								
8																						
9	CHARLOTTE - STREET	E1.1	→	E1.4						8.1	6.91			1.6	31.0				370	9.1	.7	
10	CHARLOTTE - PIPE	E1.1	→	E1.4						8.1	6.13					27.7	1.5	24	370	8.8	.7	
11																						

CALCULATED BY Poling
DATE 12/12/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5-YR
P. 2

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1																						
2																						
3																						
4																						
5	JACKPOT	E1.4	E1.3	7.1	.55	6.1	6.1	4.8	29													
6																						Q_{ALLOW} = 27 CFS
7	CHARLOTTE	E1.4	E1.4	1.9	.55	6.3	1.05	4.8	5.0													
8	CHARLOTTE	E1.4	E1.5	3.3	.55	6.5	7.82	4.7	8.6													
9	CHARLOTTE	ΣE1.4	(INCLUDES CARRY-OVER FROM BASIN E)							12.2	17.3	3.8	65.7	EXISTING PIPE IS 24" RCP @ 2.4%. $Q_{PIPE\ MAX}$ = 35C → 30.7 IN STREET S = 3.1% Y = .42								
10														DEPTH EXCEEDS CRITERIA BUT DOES NOT OVERTOP CURB								
11			CA_i = 8.33,			CA_{co} = 15.79.								PLACE 6' C.O. INLET IN SUMP CREATED BY CURB RETURN								

CALCULATED BY Poling
DATE 12/13/94
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDF
DESIGN STORM 5
p. 3

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1																						
2	CHARLOTTE -STREET	E1.4	→	E2.1						10.0	8.08			3.1	30.7				750	12.5	1.0	
3	CHARLOTTE - PIPE	E1.4	→	E2.1						10.1	9.22					35	2.4	24	750	11.1	1.1	
4																						
5	BARNES	E2.1	E2.1	2.5	.75	9.4	1.88	4.2	7.9													
6	BARNES	E2.1	E2.2	2.8	.75	9.3	2.1	4.2	8.8													
7	BARNES	E2.1	E2.3	4.5	.75	12.1	3.38	3.8	12.8													
8																						
9	BARNES	ΣE2.1	(INCLUDES Q_{CO} FROM E1.2)							14.5	25.78	3.5	90.2	EXISTING PIPE 15 36" RCP @ .43%								
10														QMAX PIPE = 436 → 46.6 IN STREET COMBINES WITH STREET FLOW FROM FIL-12.								
11			CA_{PIPE} = 12.46				CA_{STREET} = 13.32							STREET FLOW STAYS ON NORTH SIDE OF BARNES MEDIAN.								

CALCULATED BY Poling
DATE 12/13/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

P. 4

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1																						
2	BARNES -PIPE	E2.1 → E2.4								15.5	12.46					43.6	.43	36	360	6.2	1.0	
3	BARNES -STREET	E2.1 → E1.6								15.5	13.32			1.3	96.6				470	8.1	1.0	
4																						
5	BARNES	E1.6	E1.6	3.3	.9	6.1	2.97	5.0	14.9													
6	BARNES -STREET	ΣE1.6 (WEST)								15.5	16.29	3.4	55.4									S = 1.0% QALLOW = 17. CFS
7														EXCEEDS OVERTOP		CRITERIA, MEDIAN		BUT	DOES	NOT		
8	BARNES	E2.4	E2.4	1.4	.9	5.0	1.26	5.2	6.6													
9	BARNES -STREET	ΣE2.4 (WEST)								5.0	1.26											
10																						
11																						

CALCULATED BY Poling
DATE 1/4/95
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p. 5

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	COMBINE WITH FLOW FROM THE WEST																					
2	BARNES	ΣE1.6		(EAST)		(J10)				13.2	5.75											
3	BARNES	ΣE2.4		(EAST)		(J8)				14.5	16.77											
4																						
5	BARNES	ΣE1.6								15.5	19.07	3.4	64.8									Qi = 16.6 CFS Q100 = 81.5 CFS
6	BARNES -	STREET		E1.6 → E2.4						15.5	23.98											CAi = 4.88 CA100 = 23.98
7	BARNES -	PIPE		E1.6 → E2.4						15.7	4.88					16.6	11	21	100	6.9	.2	
8																						
9	BARNES -	STREET		ΣE2.4						15.5	42.01	3.4	142.8									Qi = 21 CFS Q100 = 112.8 CFS
10	BARNES -	STREET		E2.4 → SAND CREEK						15.5	35.83	3.4	121.0									CAi = 6.78 CA100 = 35.83
11	BARNES -	PIPE		ΣE2.4						15.7	25.3	3.3	83.5			83.5	5.0	36	✓			

100-YEAR RUNOFF
BARNES/CHARLOTTE
BASINS A, B, C, D, E

CALCULATED BY Poling
DATE 12/27/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHARLOTTE	B5.4	B5.4	.8	.95	5.0	.76	9.0	6.8					3.6	1.4				1200	13.6	1.5	
2	CHARLOTTE	B5.4	→	B6.2						6.5	.76											
3																						
4	CHARLOTTE	B6.2	B5.5	1.9	.95	5.0	1.81	9.0	16.3													
5	CHARLOTTE	ΣB6.2	(CHARLOTTE)							6.5	2.57	8.2	21.1									
6																						
7	CHARLOTTE	D2	D2	5.4	.7	8.8	3.78	7.3	27.6													
8	CHARLOTTE	D2	D3	5.7	.66	18.2	3.76	5.4	20.3													
9	CHARLOTTE	ΣD2								18.2	7.54	5.4	40.7	ASSUME		Q5	IN	PIPE.		Q5=	16.3	Qmax = 140 CFS S = 5.0%
10														Q =	40.7-	16.3 =		24.4		CA=	4.52	
11														5.0	24.4				450	15.9	.5	

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DATE 12/27/94
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHARLOTTE	D2 → D5								18.7	4.52											
2																						
3	CHARLOTTE	D5	D5	21.7	.69	21.8	14.97	4.9	73.4													
4	CHARLOTTE	ΣD5								21.8	19.49	4.9	95.5	1.4	95.5				260	8.3	.5	Qallow = 140 CFS S = 5.0
5	CHARLOTTE	D5	→	D6						22.3	19.49											
6																						
7	CHARLOTTE	D6	D6	1.1	.95	5.0	1.05	9.0	9.5													
8	CHARLOTTE	ΣD6								22.3	20.54	4.8	98.6	SUBTRACT PIPE FLOW (@ 5)								Qallow = 70 CFS S = 1.4%
9														Q = 98.6 - 10 - 16 = 72.6 CFS CA = 15.12								
10														WATER PONDS TO .6' BEFORE OVERTOPPING								
11														TO THE SOUTH								

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 3

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW(CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHARLOTTE	ΣD6								22.3	15.12	4.8	72.6	1.4	72.6				850	8.5	1.7	
2	CHARLOTTE	D6 →		B4.5						24.0	15.12											
3																						
4	CHARLOTTE	B4.5	B4.5	1.2	.95	5.0	1.14	9.0	10.3													
5	CHARLOTTE	ΣB4.5								24.0	16.26	4.6	74.8	DRAINS TO CHANNEL THROUGH CURB CUTS								
6	CHARLOTTE	B4.5 →			CHANNEL					24.0	16.26											Q_{ALLOW} = 80 CFS S = 1.5%
7																						
8	CHARLOTTE	B4.3	B4.3	1.1	.95	5.0	1.05	9.0	9.5					ASSUME Q_S = 5.1 CFS IS INTERCEPTED Q_{STREET} = 4.4 CFS CA = .49								
9														1.4	4.4				850	8.5	1.7	
10	CHARLOTTE	B4.3 →		B4.4						6.7	.49											
11																						

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DATE 12/27/94
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 4

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHARLOTTE	B4.4	B4.4	1.2	.95	5.0	1.14	9.0	10.3													
2	CHARLOTTE	ΣB4.4								6.7	1.63	8.2	13.4									
3	CHARLOTTE	B4.4	→ CHANNEL							6.7	1.63			DRAINS TO CHANNEL THROUGH CURB CUTS								
4																						
5	CHARLOTTE	E1.1	E1.1	2.6	.65	7.2	1.69	7.9	13.4													
6	CHARLOTTE	E1.1	E1.2	21.1	.65	7.4	13.72	7.8	107.0													
7	CHARLOTTE	ΣE1.1								7.4	15.41	7.8	120.2									
8														SUBTRACT PIPE FLOW: Q=27.7								QALLOW = 70 S=1.4%
9														QSTREET = 120.2 - 27.7 = 92.5 CFS								CA = [illegible]
10														CRITERIA IS EXCEEDED, BUT FLOW DOES								
11														NOT OVERTOP MEDIAN, Y = .75'								
														1.6	92.5				370	9.1	.7	

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

p. 5

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	CHARLOTTE	E1.1 →		E1.4						8.1	11.86											
2	CHARLOTTE	E1.4	E1.3	1.1	0.65	6.1	0.72	8.5	6.1													
3	CHARLOTTE	E1.4	E1.4	1.9	.65	6.3	1.24	8.3	10.3													
4	CHARLOTTE	E1.4	E1.5	3.3	.65	6.5	2.15	8.2	17.6													
5	CHARLOTTE	Σ E1.4		(INCLUDES JACKPOT)						16.3	15.55	5.7	88.6	3.1	122.1				750	12.5	1.0	QALLOW = 120 CFS S=3.6%
6	CHARLOTTE	E1.4 →		E 2.1						17.3	15.55											
7																						
8	CHARLOTTE	E2.1	E2.2	2.8	.8	9.3	2.24	7.2	16.1													
9	CHARLOTTE	E2.1	E2.3	4.5	.8	12.1	3.6	6.5	23.4													
10	CHARLOTTE	Σ E2.1		(NORTH)						17.3	21.39	5.4	115.5									QALLOW = 14.0 S= 4.5%
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDF
DESIGN STORM 100

p. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	A2.1	A2.1	2.2	.8	9.0	1.76	7.2	12.7					2.5	12.7				650	11.3	1.0	Qallow = 110 CFS S=.033
2	BARNES	A2.1	→ A2.2							10.0	1.76											
3																						
4	BARNES	A2.2	A2.2	2.5	.8	8.9	2.0	7.2	14.4													
5																						
6	BARNES	ΣA2.2+		A1.5	A1.7					15.7	41.97	5.7	239.2	WATER WILL POND TO .26' AT I-A2.1B								
7														THEN FLOW EAST. ASSUME 5-YR								
8	I - 2.2 WATER PONDS to (82.17 - (81.77 - 0.67)) = 1.1'													FLOW IS IN THE PIPES + 40.8 cfs								
9	16' INLET Qi (5YR) = 17.4							Qi = 3.6 Li (d - 0.08)$^{1/2}$						Qs @ I-A1.7 = 181.3 + 40.3 = 222.1								
10	SUBTRACT OFF ADDITIONAL							Qi = 58.2 cfs 58.2 - 17.4 = 40.8 cfs as						QSTREET = 239.2 - (222.1 - 96.9) = 114.0 CFS								
11	pipe flow. Check Pipe Capacity 54" @ 1.6% QCAP = 249 cfs													CA = 20.0					↳ ALREADY ACCOUNTED FOR			

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p.2

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	ΣA	1.7	B						15.7	20.0	5.7	114.0	.5	114.0				400	5.0	1.3	S = .5% QALLOW = 40 CFS
2	BARNES	A1.7B → C1.1								17.0	20.0			EXCEEDS CRITERIA BUT DOES NOT OVERTOP MEDIAN. LEAVES 15' CLEAR LANE WEST OF TRANSITION SECTION.								
3																						
4	BARNES	A2.3	A2.3	2.0	.95	5.0	1.9	9.0	17.1													QALLOW = 60 CFS S = 1.0%
5		FLOWS OFF-SITE																				
6																						
7	BARNES	A2.5	A2.5	.7	.95	5.0	.67	9.0	6.0					ASSUME 3.3 CFS COLLECTED BY INLET → 2.7 CFS OVERFLOWS TO THE EAST								QALLOW = 60 CFS S = 1.0%
8																						
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 3

STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
STREET	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1 BARNES	C1.1	C1.1	3.0	.8	9.6	2.4	7.1	17.0													
2 BARNES	ΣC1.1								17.0	22.4	5.5	123.2	.7	123.2				360	6.0	1.0	
3 BARNES	C1.1	→	C1.2						18.0	22.4											
4																					
5 BARNES	C1.2	C1.2	1.0	.8	8.8	.8	7.3	5.8													
6 BARNES	ΣC1.2								18.0	23.2	5.4	125.3									Q OVERTOPS MEDIAN – 16 CFS STAYS
7																					ON NORTH SIDE (CA = 2.96)
8 BARNES	C1.2	→	C1.5						18.0	45.4											16 CFS STAYS ON NORTH SIDE. ASSUME Q5
9																					IS IN PIPE → Q = 4.5 CFS. WATER WILL POND TO 0.19' AND INTERCEPT 5.0 CFS
10																					→ 16 - 4.5 - 5 = 6.5 CFS IS CARRIED OVER CA = 1.2
11													1.1	6.5				630	7.5	1.4	

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127

PROJECT STETSON HILLS MDDP

DESIGN STORM 100

p. 4

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	C1.2	→	E2.1						19.4	1.2											
2																						
3	BARNES	C1.5	C1.5	2.7	.95	5.5	2.57	8.7	22.4													
4	BARNES	ΣC1.5								18.0	47.97	5.4	259.0									
5														WATER		OVERTOPS			CURB		AND	FLOWS
6														OFF-SITE			INTO	CHANNEL				
7	BARNES	E2.4	E2.4	1.4	.95	5.0	1.33	9.0	12.0													
8																						
9	BARNES	E2.1	E2.1	2.5	.8	9.4	2.0	7.2	14.4													
10	BARNES	ΣE2.1		(INCLUDES		CHARLOTTE)				19.4	23.39	5.2	121.6	SUBTRACT			PIPE	FLOW		Q=	43.6	Qallow = 60.0 S = 1.0%
11														121.6		- 43.6	=	78		CFS		CA = 15.00

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 5

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1														CRITERIA IS EXCEEDED BY 0.5' BUT CREST IS								
2														NOT OVERTOPPED								
3														1.3	78.0				470	8.1	1.0	
4	BARNES	E2.1	→	E1.6						20.4	15.0											
5																						
6	BARNES	E1.6	E1.6	3.3	.95	6.1	3.14	8.5	26.7													
7	BARNES	Σ E1.6	(WEST)							20.4	18.14	5.1	92.5									
8																						
9	ADD FLOW FROM EAST																					
10	BARNES	ΣE1.6 (EAST)		(J 10)						13.2	7.57											
11	BARNES	ΣE2.4	(EAST)		(J 8)					14.3	22.9											

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MODP
DESIGN STORM 100

p. 6

STREET			DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	ΣE	1.6							20.4	25.71	5.1	131.1	→ OVERTOPS TO E2.4								
2	BARNES	E1.6 →		E2.4						20.4	25.71											
3																						
4	BARNES	ΣE	2.4							20.4	49.94	5.1	254.7	→ OVERTOPS CURB AND FLOWS TO SAND CREEK								
5																						
6																						
7																						
8																						
9																						
10																						
11																						

BASIN G

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 1/6/95 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF
CHKD. BY DATE JOB NO. 212-1127

G1) A = 5.3 AC C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 1400' S = 3.4 % V = 13.1 FPS

t_t = 1.8 MIN

t_c = 7.6 MIN

G4/ G2) A = 1.5 AC C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 480' S = 2.1% V = 10.3 FPS

t_t = .8 MIN

t_c = 6.6 MIN

G3) A = 13.9 Ac C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 1400' S = 3.5% V = 13.3 FPS

t_t = 1.8 MIN

t_c = 7.6 MIN

G5) 2.5 Ac TYPE B SOIL

0.7 Ac. SFD C_5 = 0.55 C_{100} = 0.65

1.4 Ac STREET C_5 = 0.9 C_{100} = 0.95

C_5 = 0.66 C_{100} = 0.71

l_i = 100' @ 2.0% t_i = 6.5

l_t = 900' @ 2.0% V = 10.1 f/s

t_t = 1.5 t_c = 8.0 min

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 1/6/95 SUBJECT STETSON HILLS MDDP SHEET NO. 2 OF
CHKD. BY DATE JOB NO. 212-1127

INLET I-G1

$Q = 13.4$ CFS $S = 1.0\%$ $Q_{ALLOW} = 17$ CFS

$y = .39'$

$T = 19.5'$

$Q_i/Q = 0.6$ USE 13' C.O. INLET

$Q_i = 8.0$ CFS

$Q_{co} = 5.4$ CFS

INLET G5 $Q_{100} = 73.6$ cfs

MAX POND $= 0.67'$

$\longrightarrow$ USE 47' OF INLET

I-G4

$Q = 12.7$ cfs $S = 1.0\%$ $Q_{ALLOW} = 17$ cfs

$y = 0.34$ $T = 17$

$Q_i/Q = 0.6 \rightarrow$ USE 11' INLET $Q_1 = 7.6$

$Q_{co} = 5.1$

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDOP
DESIGN STORM 5
p.1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	STETSON HILLS	G1	G1	5.3	.55	7.6	2.92	4.6	13.4													S = 1.0% Qmow = 17 CFS
2																						Qi = 4.0 CFS Qco = 9.4 CFS
3																						CAi = .88 CAco = 2.04
4																						
5	J.S.	G1	G2	1.5	.55	6.6	.83	4.7	3.9													
6	STETSON HILLS - STREET	ΣG1								7.6	2.00	4.6	9.2	1.0	9.2				100	7.1	.2	S = 1.0% Qmow = 17 CFS
7	STETSON HILLS - STREET			G1·		→	G4			7.8	2.0											
8																						
9	STETSON HILLS	G1	G3	13.9	.55	7.6	7.65	4.6	35.2													
10	STETSON HILLS - PIPE		ΣG1							7.6	9.4	4.6	43.2			43.2	1.0	36	100	10.0	.2	
11	STETSON HILLS - PIPE	G1	→	G4						7.8	9.4											

CALCULATED BY Poling
DATE 1/5/95
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS [illegible]
DESIGN STORM
P1A

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	J.S.	64	64	1.5	0.55	6.6	0.83	4.7	3.9													
2	Σ64-STREET									7.8	7.83	4.5	12.7	1.0	5.1				300	7.1	0.7	C= 1.0 QALLOW = 17 cfs
3	STREET	64 → 65								8.5	1.13											Qi = 7.6 Qco = 5.1
4	PIPE	Σ	64							7.8	11.1	4.5	50.0			50	1.0	36"	300	10.3	0.5	CAi = 1.7 CAco = 1.13
5	PIPE	64→65								8.3	11.1											
6																						
7																						
8																						
9																						
10																						
11																						

CALCULATED BY Poling
DATE 1/6/95
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p. 2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	STETSON HILLS	G5	G5	2.5	.66	8.0	1.65	4.3	7.1													
2	STETSON HILLS - STREET		ΣG5							8.5	2.78	4.3	11.6									Qi = 11.6
3	STETSON HILLS - PIPE			Σ G4						8.5	13.88	4.3	59.7			59.7	1.0	36	50	10.6	.1	
4	STETSON HILLS		C4 → CHANNEL (PIPE)							8.6	13.88											
5																						
6																						
7																						
8																						
9																						
10																						
11																						

CALCULATED BY Poling
DATE 1/6/95
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	S.H.	G1	G1	5.3	.65	7.6	3.45	7.8	26.9													
2	S.H.	G1	G2	1.5	.65	6.6	.98	8.2	8.0													
3	S.H.	G1	G3	13.9	.65	7.6	9.04	7.8	70.5													
4	S.H.	ΣG1								7.6	13.47	7.8	105.1	SUBTRACT PIPE FLOW					Q5 = 43.2			CFS
5														105.1 - 43.2 = 61.9 CFS								S = 1.0% QALLOW = 60 ± OK ✓
6														1.0	61.9				100	7.1	0.2	
7	S.H.	G1 → G4								8.4	8.45											
8																						Already Accounted FOR
9	SH.	G4	G4	1.5	.65	6.6	0.98	8.2	8.0					SUBTRACT PIPE FLOW Q = 50 - 43.2 = 6.8								
10	S.H.	ΣG4								7.8	8.91	7.7	68.6	68.6 - 6.8 = 61.8								S = 1.0% QALLOW = 60 ± ✓
11																						

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DATE 1/5/95
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS [illegible]
DESIGN STORM 100

P2

STREET		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1														1.0	61.8				300	7.1	0.7	
2	SH	G4→G5								8.5	8.03											
3																						
4	SH	G5	G5	2.5	0.71	8.0	1.78	7.6	13.8													
5										8.5	9.81	7.5	73.6									
6																						
7																						
8																						
9																						
10																						
11																						

BASIN H

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 1/3/95 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF 4
CHKD. BY DATE JOB NO. 212-1127

~~FIL 13 → BARNES/PETERSON (INCLUDES BARNES ROW)~~

~~Ⓙ1 D.P. 4 — EXISTING 14' SUMP C.O. INLET~~

OK

~~(PIPE FLOW) Q_5 = 13.5 CFS @ 24.5 MIN (CA = 4.67)~~

~~Q_{100} = 27.1 CFS @ 20.0 MIN (CA = 5.31)~~

Ⓗ1 FIL 9 → BARNES

BASIN E Q_5 = 1.2 CFS @ 13.2 MIN (CA = .33)

Q_{100} = 2.4 CFS @ 13.2 MIN (CA = .39)

Ⓗ2 FIL 15 → BARNES (INCLUDE BARNES ROW FROM PETERSON TO H.P.)

ASSUME 100' N OF ROW

$A = (160 \cdot 500 + 870 \cdot 60)/43560 = 3.0$ AC

SFD → .7 $C_5 = .55$; $C_{100} = .65$ (TYPE B SOIL)
STREET → 2.3 $C_5 = .9$ $C_{100} = .95$

$C_5 = .82$ $C_{100} = .88$

l_i = 100' @ 2.0% t_i = 4.2 MIN

l_t = 1350' @ 4.0% V = 14.2 t_t = 1.7

t_c = 5.9 MIN

~~Ⓙ2 FIL 5 → BARNES~~

~~BASIN A A = 3.5 CFS $C_5 = .55$ $C_{100} = .65$ TYPE B SOIL~~

~~t_c = 10.2 MIN I_5 = 4.0 IN/HR I_{100} = 7.0 IN/HR~~

~~$Q_5 = .55 \cdot 4 \cdot 3.5 = 7.7$ CFS~~

~~$Q_{100} = .65 \cdot 7 \cdot 3.5 = 15.9$ CFS~~

~~ASSUME 1/2 Q DRAINS TO BARNES AND 1/2 Q DRAINS TO PRING RANCH~~

~~ASSUME 3.5 AC INCLUDES BARNES AND PRING RANCH ROW~~

Ⓙ3 BARNES ROW E. OF FIL 5

$A = 60 \cdot 600/43560 = .8$ AC $C_5 = .9$ $C_{100} = .95$

l_t = 100' @ 2.0% t_i = 3.0

l_t = 500' @ 2.4% V = 11.0 FPS t_t = .8

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ENGINEERS & ARCHITECTS

BY Poling DATE 1/4/95 SUBJECT STETSON HILLS MDDP SHEET NO. 2 OF 4
CHKD. BY DATE JOB NO. 212-1127

H3) A = 1.8 AC C_5 = .55 TYPE B SOIL

l_i = 50' @ 2.0%

t_i = 5.8 MIN

l_t = 480' S = 2.3% V = 10.8 FPS

t_t = .7 MIN

t_c = 6.5 MIN

H4)
H11) A = 1.3 AC C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 360' S = 3.4% V = 13.2 FPS

t_t = .5 MIN

t_c = 6.3 MIN

H5) A = 4.6 AC C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 700' @ 5.0% V = 15.9 FPS

t_t = .7 MIN

t_c = 6.5 MIN

INLET I-H3 EXISTING 14' C.O. INLET IN SUMP
BRAHMA X-SLOPE DOES NOT ALLOW PONDING AT SUMP.
ASSUME IT ACTS AS A CONT. GRADE INLET

Q = 31.1 CFS S = 2.3%

y = .5 ±
T = 24

Q_i/Q = .34

Q_i = 10.6 CFS Q_{10} = 20.5

INLET I-H11 Q = 41.2 CFS S = 3.2%

y = .46 T = 23

Q_i/Q = .6 → USE 30' INLET → NO - 20' IS MAX

USE 20' C.O. INLET Q_i/Q = .42

Q_i = 17.3 CFS Q_{10} = 23.9

H10) A = 2.1 Ac C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 320' S = 2.1 % V = 10.2 FPS

t_t = .5 MIN

t_c = 6.3 MIN

H12) A = 3.6 Ac C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 1000' S = 4.2% V = 14.6 FPS

t_t = 1.1 MIN

t_c = 6.9 MIN

INLET I-H10

Q_{100} = 115.0

SUMP CONDITION - MAX POND = .67'

USE 65' OF INLET

H13) A = 10.6 Ac C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 550' @ 6.3% V = 12.8 FPS

t_t = .5 MIN

t_c = 6.3 MIN

H14) A = 5.1 Ac C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 940' S = 1.2% V = 7.7 FPS

t_t = 2.0 MIN

t_c = 7.8 MIN

INLET I-H14/7 Q_{100} = 32.0 CFS C.O. INLET IN SUMP

MAX POND 12" → USE 10' INLET Q_i = 32.0 CFS

BY Poling DATE 1/5/95 SUBJECT STETSON HILLS MDDP SHEET NO. 4 OF 4
CHKD. BY ___ DATE ___ JOB NO. 212-1127

H7) A = 5.7 C_5 = .55 TYPE B SOIL

t_c = 7.8 MIN

H8) A = 10.4 C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 1100' S = 1.8 % V = 9.6 MIN

t_t = 1.9 MIN

t_c = 7.7 MIN

H9) A = 3.9 AC C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 980' S = 3.0% V = 12.3 FPS

t_t = 1.3 MIN

t_c = 7.1 MIN

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p.1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	- HIGH POINT ON EAST SIDE OF STETSON HILLS																				
2	FIL 9	H1	H1							13.2	.33	3.6	1.2	4.0	1.2				1100	14.2	1.3	S=4.0% QALLOW = 34 CFS
3	BARNES	H1 → H2								14.5	.33											
4																						
5	FIL 15	H2	H2	3.0	.82	5.9	2.46	5.0	12.3													
6	BARNES	ΣH2								14.5	2.79	3.5	9.8	→		USE 12.3						S=2.0% QALLOW = 24 CFS
7														2.3	12.3				580	10.8	.9	
8	PETERSON	H2 → H3								15.4	2.79											
9																						
10	PETERSON	H3	H3	1.8	.55	6.5	.99	4.7	4.7													
11	BRAHMA / RIVA		FROM		FIL	9	(H6)			15.2	12.79	3.4	43.5	WATER OVERTOPS CROWN AT 25.3 CFS → ASSUME 43.5-25.3 = 18.2								S=3.33 QALLOW = 37 CFS

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DATE 1/4/95
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
p. 2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BRAHMA	ΣH6.1	(SOUTH)							15.2	7.44	3.4	25.3	3.4	25.3				420	13.3	.5	
2	BRAHMA	H6.1 → H3								15.7	7.44											
3																						
4	BRAHMA	H3	H4	1.3	.55	6.3	.72	4.7	3.4													
5	PETERSON	ΣH3	-	STREET						15.7	9.15	3.4	31.1									Qi = 10.6 CFS Qco = 20.5 CFS
6	PETERSON	H3	+ BRAHMA OVERFLOW (FIG 9)							15.7	11.39	3.4	38.7	S = 3.2 %		Qallow = 31 CFS						CAi = 3.11 CAco = 6.04
7														EXCEEDS CRITERIA BUT DOES NOT OVERTOP CURB								
8																						
9	BRAHMA	H11	H11	1.3	.55	6.3	.72	4.7	3.4													
10	PETERSON	ΣH11								15.7	12.11	3.4	41.2	2.1	23.9				350	10.2	.6	Qi = 17.3 CFS Qco = 23.9 CFS
11	PETERSON	- STREET			H11 → H10					16.3	7.02											CAi = 5.09 CAco = 7.02

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p. 3

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	PETERSON -PIPE	FROM		FIC	13	(J1)				24.5	4.67	2.9	13.5			13.5	2.5	30	800	10.3	1.3	
2	PETERSON -PIPE	J1 → H3								25.8	4.67											
3	PETERSON -PIPE	H3	H5	4.6	,55	6.5	2.53	4.7	11.9													
4	PETERSON -PIPE	ΣH3								25.8	10.31	2.6	26.8			26.8	3.4	36	70	13.6	.1	
5	PETERSON -PIPE	H3 →		H11						25.9	10.31											
6																						
7	PETERSON -PIPE	ΣH	11							25.9	15.41	2.6	40.0			40.0	3.4	36	360	15.5	.4	
8	PETERSON -PIPE	H11	→	H10						26.3	15.4											
9																						
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON MILLS MDDP
DESIGN STORM 5
p. 4

			DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
	STREET	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	REMARKS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	PETERSON	H10	H10	2.1	.55	6.3	1.16	4.8	5.6													
2																						
3	PETERSON	H12	H12	3.6	.55	6.9	1.93	4.7	9.1													
4	PETERSON	H12 → H10								7.4	1.93			1.0	9.1				200	7.1	.5	S = 3.0% Qallow = 29 CFS
5																						
6	PETERSON STREET	ΣH10								16.3	10.11	3.3	33.4									Qi = 33.4
7	PETERSON PIPE	ΣH10								26.3	25.51	2.6	66.3									
8	PETERSON PIPE	H10 → K4								26.4	25.51					66.3	1.2	48	110	11.9	.2	
9																						
10		H13	H13	10.6	.55	6.3	5.83	4.8	28.0	→ CHANNEL												
11	BRAHMA	H14	H14	5.1	.55	7.8	281	4.4	124													Qi = 124 CFS

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

P. 5

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW(CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	PETERSON	H9	H9	3.9	.55	5.8	2.15	4.9	10.5					4.6	10.5				830	15.2	.9	S = 4.3% Qallow = 34 CFS
2	BRAHMA	H9 →	H7							6.7	2.15											
3																						
4	FROM FIG 9 BASIN G		)	BRAHMA (H6.2)						18.8	1.05			1.2					800	7.7	1.7	
5	BRAHMA	H6.	2 →	H7						10.5	1.05											
6																						
7	BRAHMA	H7	H7	5.7	.55	7.8	3.14	4.4	13.8													
8	BRAHMA	ΣH7								20.5	6.34	2.9	18.4									Qi = 18.4 CFS
9																						
10																						
11	BRAHMA	H7	H8	10.4	.55	7.7	5.72	4.5	25.7													

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

P. 6

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BRAHMA-	PIPE	Σ	(H7	+H14)					20.5	14.87	2.9	43.1			43.1	2.0	36	50	13.3	.1	
2	BRAHMA	-PIPE		Σ(H7+H14)		→		CHANNEL		20.6	14.87											
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	–	HIGH	POINT		ON	EAST	SIDE		OF	STETSON		HILLS									
2	FIL 9	H1	H1							13.2	.39	6.2	2.4	4.0	2.4				1100	14.2	1.3	S = 4.0% Qflow = 130 CFS
3	BARNES	H1 → H2								14.5	.39											
4																						
5	FIL 15	H2	H2	3.0	.88	5.9	2.64	8.6	22.7													
6	BARNES	ΣH2								14.5	3.03	6.0	18.2	→	USE		22.7					S = 2.0% Qflow = 85 CFS
7																						
8	PETERSON	H2 → H3								15.4	2.79			2.3	22.7				580	10.8	.9	
9																						
10	PETERSON	H3	H3	1.8	.65	6.5	1.17	8.2	9.6													
11	BRAHMA /	RIVA	FROM		FIL	9	(H6.1)			15.1	15.08	5.8	87.5									S = 3.33% Qflow = 110 CFS

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 2

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1																						
														3.4	87.5				420	13.3	.5	
2	BRAHMA	H6	→	H3						15.6	15.08											
3																						
4	BRAHMA	H3	H11	1.3	.65	6.3	.85	8.2	7.0													
5	BRAHMA	H3	H4	1.3	.65	6.3	.85	8.2	7.0													
6	PETERSON	H3	H5	4.6	.65	6.5	2.99	8.2	24.5													
7	PETERSON	ΣH3								15.6	23.73	5.8	137.6									
														SUBTRACT PIPE FLOW 137.6-40 = 97.6 OK ✓						QS=	40	S=3.2%. Q_{allow} = 110 CFS
8																						
														2.1	110				350	10.2	.6	CA_{street} = 16.83
9	PETERSON	H3 → H10								16.2	16.83											
10																						
11	PETERSON	H12	H12	3.6	.65	6.9	2.34	8.1	19.0													
														1.0	19.0				200	7.1	.5	

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 3

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	PETERSON	H10	H10	2.1	.65	6.3	1.37	8.3	11.4													
2																						
3	PETERSON	Σ H	10							16.2	20.54	5.6	115.0									Qi = 115 CFS
4	PETERSON	Σ PIPE			@	H10					27.44		155			155	1.2	48	110	12.3	.1	
5	PETERSON	- PIPE		H10 →		K4				16.3	27.44											
6																						
7		H13	H13	10.6	.65	6.3	6.89	8.3	57.2	→ CHANNEL												
8																						
9	BRAHMA	H14	H14	5.1	.65	7.8	3.32	7.8	25.9													
10																						
11																						

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 4

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	PETERSON	H9	H9	3.9	,65	5,8	2,54	8.6	21,8					4,6	21,8				830	15,2	,9	S = 4.3% Qallow = 130 CFS
2	BRAHMA	H9	→	H7						6,7	2,54											
3																						
4	FROM FIL9 BASIN G		(H6,2)		→ BRAHMA					18,8	1,24			1,2					800	7,7	1,7	
5	BRAHMA	H6,2	→	H7						20.5	1,24											
6																						
7	BRAHMA	H7	H7	5,7	.65	7,8	3,71	7.8	28.9													
8	BRAHMA	H7	H8	10,4	,65	7.7	6,76	7,9	53,4													
9	BRAHMA	ΣH7								20.5	14,25	5,1	72,7	SUBTRACT PIPE FLOW Q5 = 25.7 CFS QSTREET = 72.7 - 25.7 = 47 CFS								
10														CA STREET = 9.2T → OVERTOPS CROWN								
11														ASSUME ΣH14 +H7 IS SPLIT EVENLY								

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 5

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BRAHMA-STREET	ΣH14+H17								20.5	12.53	5.1	63.9	→ 32 CFS PER SIDE								Qi = 32 CFS / SIDE
2																						
3	BRAHMA-PIPE	ΣH14+H17								20.5	17.57	5.1	89.6			89.6	2.0	36	50	12.7	.1	
4	BRAHMA-PIPE		Σ(H14+H17) → CHANNEL							20.6	17.57											
5																						
6																						
7																						
8																						
9																						
10																						
11																						

BASIN J

BY Poling DATE 1/3/95 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF
CHKD. BY DATE JOB NO. 212-1127

FIL 13 → BARNES/PETERSON (INCLUDES BARNES ROW)

(J1) D.P. 4 – EXISTING 14' SUMP C.O. INLET

(PIPE FLOW) $Q_5 = 13.5$ CFS @ 24.5 MIN ($CA = 4.67$)

$Q_{100} = 27.1$ CFS @ 20.0 MIN ($CA = 5.31$)

(H1) FIL 9 → BARNES

BASIN E $Q_5 = 1.2$ CFS @ 13.2 MIN ($CA = .33$)

$Q_{100} = 2.4$ CFS @ 13.2 MIN ($CA = .39$)

(H2) FIL 15 → BARNES (INCLUDE BARNES ROW FROM PETERSON TO H.P.)

ASSUME 100' N OF ROW

$A = (160 \cdot 500 + 870 \cdot 60)/43560 = 3.0$ AC

SFD → .7 $C_5 = .55$, $C_{100} = .65$ (TYPE B SOIL)

STREET → 2.3 $C_5 = .9$ $C_{100} = .95$

$C_5 = .82$ $C_{100} = .88$

$l_i = 100'$ @ 2.0% $t_i = 4.2$ MIN

$l_t = 1350'$ @ 4.0% $V = 14.2$ $t_t = 1.7$

$t_c = 5.9$ MIN

(J2) FIL 5 → BARNES

BASIN A $A = 3.5$ CFS $C_5 = .55$ $C_{100} = .65$ TYPE B SOIL

$t_c = 10.2$ MIN $I_5 = 4.0$ IN/HR $I_{100} = 7.0$ IN/HR

$Q_5 = .55 \cdot 4 \cdot 3.5 = 7.7$ CFS

$Q_{100} = .65 \cdot 7 \cdot 3.5 = 15.9$ CFS

ASSUME 1/2 Q DRAINS TO BARNES AND 1/2 Q DRAINS TO PRING RANCH

ASSUME 3.5 AC INCLUDES BARNES AND PRING RANCH ROW

(J3) BARNES ROW E. OF FIL 5

$A = 60 \cdot 600/43560 = .8$ AC $C_5 = .9$ $C_{100} = .95$

$l_i = 100'$ @ 2.0% $t_i = 3.0$

$l_t = 500'$ @ 2.4% $V = 11.0$ FPS $t_t = .8$

$t_c = 5.0$ MIN

BY Poling DATE 1/3/95 SUBJECT STETSON HILLS MDDP SHEET NO. 2 OF
CHKD. BY / DATE / / JOB NO. 212-1127

I-12B 4' CO. INLET #1 (BARNES) S = 2.5% ASSUME CONT. GRADE →
SLOPE ON BARNES DOES NOT ALLOW WATER TO POND

$Q = 5.6$ CFS / WATER PONDS TO LIP OF GUTTER ~ .125'

$Q_i = 2.0$ CFS

$Q_{co} = 3.6$ CFS

I-12A 4' C.O. INLET (PRING RANCH) CONT. GRADE S = 2.8 CFS

$Q = 3.8$ CFS $y = .2'$ $T = 10.0'$

$Q_i/Q = .26$

$Q_i = 1.0$ CFS $Q_{co} = 2.8$ CFS

⑭ FIL 16 → BARNES – ASSUME 100' NEXT TO ROW DRAINS TO ROW

$A = 3.2$ AC

SFD $C_5 = .55$ $C_{100} = .65$ TYPE B SOIL

$l_i = 50'$ @ 2.0%

$t_i = 5.8$ MIN

$l_t = 800'$ @ 2.9% $V = 12.1$ FPS

$t_t = 1.1$

$t_c = 6.9$ MIN

⑮ FIL 4 → BARNES

BASIN E $Q_5 = 10.1$ CFS @ 10.2 MIN ($CA = 2.53$)

$Q_{100} = 20.9$ CFS @ 10.2 MIN ($CA = 2.99$)

14' CO INLET IN SUMP – ACTS AS CONTINUOUS GRADE INLET DUE TO STREET GRADES

$y = .36$ $T = 18'$ $Q/Q = .44$

$Q_i = 7.6$ CFS $Q_{co} = 9.6$ CFS

⑯ FIL 16 → PRING RANCH

$A = 9.5$ AC

SFD TYPE B SOIL $C_5 = .55$ $C_{100} = .65$

$l_i = 50'$ @ 2.0% $t_i = 5.8$ MIN

$l_t = 800'$ @ 3.5% $V = 13.3$ FPS

$t_t = 1.0$ MIN

$t_t = 6.8$ MIN

MERRICK
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BY Poling DATE 1/3/95 SUBJECT STETSON HILLS MDDP SHEET NO. 3 OF
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(J7) PRING RANCH (PETERSON = BARNES, S. SIDE)

A = 1.1 AC TYPE B SOIL

$C_5 = .9$, $C_{100} = .95$

$l_i = 100'$ @ 20% $t_i = 3.0$ MIN

$l_t = 1300'$ @ 3.2% V = 12.7 FPS

$t_t = 1.7$

$t_c = 5.0$ MIN

(J8) FIL 3 → BARNES

BASINS E + F $Q_5 = 17.8$ CFS @ 10.5 MIN (CA = 4.46)

$Q_{100} = 36.4$ CFS @ 10.5 MIN (CA = 5.27)

FIL 8 → BARNES $Q_5 = 1.1$ CFS @ 10.2 MIN (CA = .28)

$Q_{100} = 2.3$ CFS @ 10.2 MIN (CA = .33)

COMBINE FIL 8 + 3

$Q_5 = (4.46 + .28) \cdot 4 = 4.74 \cdot 4 = 19.0$ CFS

$Q_{100} = (5.27 + .33) \cdot 6.9 = 5.6 \cdot 6.9 = 38.6$ CFS

(J9) FIL 6 → BARNES

$Q_5 = 12.6$ CFS @ 10.4 MIN (CA = 3.15)

$Q_{100} = 25.7$ CFS @ 10.4 MIN (CA = 3.72)

(J10) BARNES ROW E. OF LOW PT

$A = 800 \cdot 60 / 43560 = 1.1$ AC

$C_5 = .9$ $C_{100} = .95$

$t_c = 5.0$ MIN

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BY Poling DATE 1/3/95 SUBJECT STETSON HILLS MDDP SHEET NO. 4 OF

CHKD. BY DATE JOB NO. 212-1127

ANALYSIS : 5-YR) CRITERIA IS EXCEEDED ON THE SOUTH SIDE OF THE STREET BTWN PRING RANCH AND SAND CREEK, BUT THE CURB AND MEDIAN ARE NOT OVERTOPPED

100-YR) EXCEEDS CRITERIA ON THE SOUTH SIDE OF THE STREET NEAR THE LOW POINT, BUT THE CURB AND MEDIAN ARE NOT OVERTOPPED.

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
p. 1.

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES-NORTH	J3	J3	.8	.55	5.0	.44	5.2	2.3					4.5	2.3				900	15.1	1.0	S = 4.5% Qallow = 34 CFS
2	BARNES	J3	→	J2						6.0	.44											
3																						
4	BARNES	J2								10.2	.96	4.0	3.8									
5	BARNES	ΣJ2								10.2	1.4	4.0	5.6									S = 2.5% Qallow = 27 CFS
6																						Qi = 2.0 CFS Q10 = 3.6 CFS
7																						CAi = .5 CA10 = .9
8	PRING RANCH									10.2	.96	4.0	3.8									Qi = 1.0 CFS Q10 = 2.6 CFS
9	PRING RANCH/ BARNES	ΣJ2—PIPE								10.2	.75	4.0	3.0									CAi = .25 CA10 = .71
10	PRING RANCH/ BARNES		ΣJ2 - STREET							10.2	1.61	4.0	6.4	2.5	6.4				1200	11.3	1.8	
11	BARNES	J2	→	J9						12.0	1.61											

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STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
P. 2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW(CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	J4	J4	3.2	.55	6.9	1.76	4.6	8.1					4.2	8.1				1000	14.6	1.1	S= 5.0% Q_{ALLOW} = 34 CFS
2	BARNES	J4 → J5								8.0	1.76											
3																						
4	FROM FIL 4	J5	J5							10.2	2.53	4.0	10.2									
5	BARNES	ΣJ5								10.2	4.29	4.0	17.2									S= 2.5% Q_{ALLOW} = 27 CFS
6																						Q_i = 7.6 CFS Q_{10} = 9.6 CFS
7	BARNES/ PRING RANCH	ΣJ5 -		PIPE		(ALL 4 INLETS)				11.7	6.66	3.8	25.3			25.3	1.3	30	2000	8.6	3.9	CA_i = 1.89 CA_{10} = 2.4
8	BARNES/ PRING RANCH	J5 →		J8						15.6	6.66											
9	BARNES/ PRING RANCE	ΣJ5 - STREET								11.3	12.03	3.9	46.9	EXCEED CRITERIA BUT DOES NOT OVERTOP								
10														CROWN OR CURB								
11														15	41.9				2000	11.3	2.9	

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DESIGN STORM 5

p. 3

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	J5 → LOW PT								14.2	12.03											
2																						
3	FROM FIL 3+8	J8	J8							10.2	4.74	4.0	19.0									
4	BARNES	ΣJ8 (EAST)								14.5	16.77	3.5	58.7	EXCEEDS CRITERIA BUT DOES								S=2.5 Qallow=27 CFS
5														NOT OVERTOP CURB OR CROWN								Y=.55'
6																						
7	FROM FIL 6	J9	J9							10.4	3.15	4.0	12.6									
8	BARNES	ΣJ9								12.0	4.76	3.8	18.1	2.5	18.1				800	11.3	1.2	S=2.5% Qallow=27 CFS
9	BARNES	J9 → LOW PT								13.2	4.76											
10																						
11	BARNES	J10	J10	1.1	.9	5.0	.99	5.2	5.1													

CALCULATED BY Poling
DATE 1/3/95
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5

p. 4

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	Σ J10 (EAST)								13.2	5.75	3.7	21.3									S = 2.5% Q_{allow} = 27 CFS
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						

CALCULATED BY Poling
DATE 1/3/95
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

P. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	BARNES	J3	J3	.8	.65	5.0	.52	9.0	4.7					4.5	4.7				900	15.1	1.0	
2	BARNES	J3	→	J2						6.0	.52											
3																						
4	BARNES/ PRING RANCH	J2								10.2	2.28	7.0	15.9									
5	BARNES/ PRING RANCH	ΣJ2								10.2	2.8	7.0	19.6	2.5	19.6				1200	11.3	1.8	S=2.5% Qrun = 95 CFS
6	BARNES	J2	→	J9						12.0	2.8											
7																						
8																						
9	BARNES	J4	J4	3.2	.65	6.9	2.08	8.1	16.8					4.2	16.8				1000	14.6	1.1	
10	BARNES	J4	→	J5						8.0	2.08											
11																						

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 2

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	FROM FIL 4	J5	J5							10.2	2.99	7.0	20.9									
2	BARNES	ΣJ5								10.2	5.07	7.0	35.5									S=2.5% Qallow = 95 CFS
3	BARNES	ΣJ5	(+PRING RANCH)							11.3	21.08	6.7	141.2									S=2.5 Qallow = 95 CFS
4																						
5														SUBTRACT PIPE FLOW QS = 25.3								
6														Q = 141.2 - 25.3 = 115.9 >95 CRITERIA IS VIOLATED BUT CROWN IS NOT OVERTOPPED								Y=0.7'
7	BARNES	J5	→ LOW PT							14.3	17.3			2.5	115.9				2000	11.3	2.9	
8																						
9	FROM FIL 3+8	J8	J8							10.2	5.6	6.9	38.6									
10	BARNES	ΣJ8	(EAST)							14.3	22.9	6.0	137.9	EXCEEDS CRITERIA BY OVERTOPPING CURB,								
11														NOT [illegible]					Y = .75'			S=2.5%

CALCULATED BY Poling
DATE 1/3/95
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 3

	STREET		DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	FROM FIL 6	J9	J9							10.4	3.72	6.9	25.7									
2	BARNES	ΣJ9								12.0	6.52	6.5	42.4	2.5	42.4				800	11.3	1.2	S=2.5% Qallow = 95 CFS
3	BARNES	J9 → J10								13.2	6.52											
4																						
5	BARNES	J10	J10	1.1	.95	5.0	1.05	9.0	9.5													
6	BARNES	ΣJ10 (EAST)								13.2	7.57	6.2	46.9									S=2.5% Qallow = 95 CFS
7																						
8																						
9																						
10																						
11																						

BASIN K

MERRICK

ENGINEERS & ARCHITECTS

BY Poling DATE 1/5/95 SUBJECT STETSON MILLS MDDP SHEET NO. 1 OF

CHKD. BY DATE JOB NO. 212-1127

K4) A = 7.5 C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 2370' S = 2.9% V = 12.1 MIN

t_t = 3.3 MIN

t_t = 9.1 MIN

INLET I-K4 C.O. INLET IN SUMP

Q_{100} = 35.1 CFS MAX PONDING = .67'

$Q_i = (1.7L_i + 6.12)(d_m + .25)^{1.85}$

L_i = 20.5

USE 20' INLET, POND WILL BE SLIGHTLY HIGHER THEN 0.67'

K5) A = 15.4 AC C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 850' S = 3.4% V = 13.1 FPS

t_t = 1.1

t_c = 6.9 MIN

K6, K7) A = 2.4 AC C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 700' S = 2.4% V = 11.1 FPS

t_t = 1.1

t_i = 6.9 MIN

I-K7/I-K6 S = 2.4% Q_{ALLOW} = 27 CFS

Q = 6.2 CFS

Y = .25

T = 12.5'

Q_i/Q = .6 → USE 12' C.O. INLET

Q_i = 3.7 CFS

Q_{co} = 2.5 CFS

K2) A = 2.7 AC C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 870' S = 3.3% V = 13.0 FPS

t_t = 1.1 MIN

t_t = 6.9 MIN

K8) A = 3.0 Ac C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 910' S = 3.3 % V = 13.0 FPS

t_t = 1.2 MIN

t_c = 7.0 MIN

K5) A = 16.4 AC C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 1550' S = 3.0% V = 12.3 FPS

t_t = 2.1 MIN

t_c = 7.9 MIN

INLET I-K2) Q = 8.9 CFS S = 3.6% V = 13.5 FPS

y = .26'

T = 13.0'

Q_i/Q = .6 → USE 15' C.O. INLET

Q_i = 5.3 CFS Q_{co} = 3.6 CFS

K1) A = 2.2 Ac C_5 = .55 TYPE B SOIL

t_i = 5.8 MIN

l_t = 620' S = 2.6 % V = 11.4 FPS

t_t = .9

t_c = 6.7 MIN

EXISTING 6' C.O. INLET IN SUMP Q = 8.7 CFS

CAN POND TO .53' BEFORE OVERTOPPING CURB

Q_i = 8.7 CFS

BY Poling DATE 1/5/95 SUBJECT STETSON HILLS MDDP SHEET NO. 3 OF
CHKD. BY DATE JOB NO. 212-1127

I-K8) $Q = 9.6$ CFS $S = 3.6\%$

$y = .27'$
$T = 13.5$

$Q_i/Q = .6 \rightarrow$ USE 16' C.O. INLET

$Q_i = 5.8$ CFS $Q_{co} = 3.8$ CFS

CALCULATED BY Poling
DATE 1/5/95
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MODP
DESIGN STORM 5

p.1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	PETERSON	K4	K4	7.5	.55	9.1	4.13	4.2	17.3													Q_i = 17.3 CFS
2																						
3	PETERSON -PIPE FROM	BASIN H	(H10)							26.4	25.51											
4	PETERSON -PIPE	ΣK4								26.4	29.64	2.6	77.1			77.1	2.0	48	100	15.2	.1	
5	PETERSON -PIPE	K4 →	CHANNEL							26.5	29.64											
6																						
7		K3	K3	15.4	.55	6.9	8.47	4.7	39.8	→ CHANNEL												
8																						
9	J.S.	K6	K6	2.4	.55	6.9	1.32	4.7	6.2					3.3	2.5				900	13.0	1.2	S = 2.4% Q_{ALLOW} = 27 CFS
10	J.S. -STREET	K6 → K2								8.1	.53											Q_i = 3.7 CFS Q_{10} = 2.5 CFS
11	J.S. -PIPE	K6	K5	16.4	.55	7.9	9.02	4.4	39.7													CA_i = .79 CA_{10} = .53

CALCULATED BY Poling
DATE 1/5/95
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
p.2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	$\Sigma(C \cdot A)$ (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	J.S.	K7	K7	2.4	.55	6.9	1.32	4.7	6.2					3.3	2.5				960	13.0	1.2	S=2.4% QAllow = 27 CFS
2	J.S. -STREET	K7	→	K8						8.1	.53											Qi = 3.7 CFS Qco = 2.5 CFS
3	J.S. PIPE	Σ(K6+K7)								6.9	10.6	4.7	49.8			49.8	3.0	30	930	15.6	1.0	CAi = .79 CAco = .53
4	J.S. PIPE	(K6+K7) →			(K8+K2)					7.9	10.6											
5																						
6	J.S.	K2	K2	2.7	.55	6.9	1.49	4.7	7.0													
7	J.S. -STREET	ΣK2								8.1	2.02	4.4	8.9	1.9	3.6				160	9.8	.3	S= 3.6% QAllow = 32 CFS
8	J.S. STREET	K2	→	K1						8.4	.81											Qi = 5.3 CFS Qco = 3.6 CFS
9																						CAi = 1.21 CAco = .81
10	J.S. -STREET	K1	K1	2.2	.55	6.7	1.21	4.7	5.7													
11	J.S. -STREET	ΣK1								8.4	2.02	4.3	8.7			8.7	9.3	18	85	15.6	.1	Qi = 8.7 CFS

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DATE 1/5/95
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 5
p. 3

	STREET		DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	J.S. -PIPE	K1	→	INLET	68					8.5	2.02											
2																						
3	J.S. STREET	K8	K8	3.0	.55	7.0	1.65	4.6	7.6													
4	J.S. STREET	ΣK8								8.1	2.18	4.4	9.6	2.1	3.8				420	10.4	.7	S = 3.6% Qallow = 32 CFS
5	J.S. STREET	KB	→	INLET		68				8.8	.87											Q_i = 5,8 CFS Q_{co} = 3.8 CFS
6																						CAi = 1,31 CAco = .87
7	J.S. -PIPE	Σ(K8 + K2)								8.1	13.12	4.4	57.7			57.7	2.0	30	50	11.8	.1	
8	J.S. -PIPE	Σ(	K8+	K2)	→	CHANNEL				8.2	13.12											
9																						
10																						
11																						

CALCULATED BY Poling
DATE 1/5/95
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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100
p. 1

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	PETERSON	K4	K4	7.5	.65	9.1	4.88	7.2	35.1													Qi = 35.1
2																						
3	PETERSON -PIPE FRom		BASIN H	(H10)						16.3	27.44											
4	PETERSON -PIPE	ΣK4								16.3	32.32	5.6	181.0			181	2.0	48	100	18.3	.1	
5	PETERSON -PIPE	K4	→	CHANNEL						16.4	32.32											
6																						
7		K3	K3	15.4	.65	6.9	10.01	8.1	81.1	→		CHANNEL										
8																						
9	J.S.	K6	K6	2.4	.65	6.9	1.56	8.1	12.6													
10	J.S.	K6	K5	16.4	.65	7.9	10.66	7.7	82.1													
11	J.S.	K6	K7	2.4	.65	6.9	1.56	8.1	12.6													

CALCULATED BY Poling
DATE 1/5/95
CHECKED BY ______

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO. 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

p. 2

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	J.S.	ΣK6								7.9	13.78	7.7	106.1	3.3	106.1				960	13.0	1.2	S=2.4% Q_{allow} = 266 CFS
2	J.S.	K6	→	K2						9.1	13.78											
3																						
4	J.S.	K2	K8	3.0	.65	7.0	1.95	8.1	15.8													
5	J.S.	K2	K2	2.7	.65	6.9	1.76	8.1	14.3													
6	J.S.	ΣK2								9.1	17.49	7.2	125.9	ASSUME 1/2 Q GOES TO K1,								S=3.6% Q_{allow} = 325 CFS
7														1/2 Q GOES TO INLET 68								
8														SUBTRACT PIPE FLOW Q_5= 57.7 CFS Q= 125.9 − 57.7 = 68.2 CFS								68.2/2= 34.1
9														CA_{STREET} = 9.47					$CA_{STREET}/2$ = 4.74			
10														1.9	34.1				160	9.8	.3	
11	J.S.	K8	→	K1						9.4	4.74			2.1	34.1				420	10.4	.7	

CALCULATED BY Poling

DATE 1/5/95

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STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127

PROJECT STETSON HILLS MDDP

DESIGN STORM 100

p. 3

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	J.S.	K8 →	INLET 68							9.8	4.74											
2																						
3	J.S.	K1	K1	2.2	.65	6.7	1.43	8.2	11.7													
4	J.S.	ΣK1								9.4	6.17	7.1	43.8									
5														SUBSTRACT PIPE FLOW TO DETERMINE STREET FLOW Q5=8.7 QSTREET = 43.8-8.7 =35.1								
6														35.1 CFS OVERTOPS CROWN, HOWEVER, FIL 14 FLOW CAUSES STREET TO BE FULL →								
7														ASSUME 35.1 OVETOPS CURB AND FLOWS TO CHANNEL								
8	J.S.	K1 → CHANNEL								9.4	4.94											
9																						
10																						
11																						

BASIN L

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 1/6/95 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF
CHKD. BY DATE JOB NO. 212-1127

L4) A = 47.0 AC C_5 = .55 TYPE SOIL

t_i = 5.8 MIN

l_t = 900' S = 3.3% V = 12.9 MIN

t_t = 1.2 MIN

t_c = 7.0 MIN

I_5 = 4.6 IN/HR I_{100} = 8.0 IN/HR

Q_5 = .55 · 4.6 · 47 = 118.9 CFS

Q_{100} = .65 · 8 · 47 = 244.4

→ SAND CREEK

BASIN M

BY Poling DATE 1/6/94 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF
CHKD. BY DATE JOB NO. 212-1127

M1) $A = 2.6$ Ac $C_5 = .55$ TYPE B SOIL

$t_i = 5.8$ MIN

$l_t = 550'$ $S = 1.0\%$ $V = 7.1$ FPS

$t_t = 1.3$ MIN

$t_c = 7.1$ MIN

Assume M1 extends to edge of 06

$A = 5.2$

M2) $A = 24.5$ Ac $C_5 = .55$ TYPE B SOIL

$t_i = 5.8$ MIN

$l_t = 1050'$ $S = 5.2\%$ $V = 16.3$ FPS

$t_t = 1.1$ MIN

$t_c = 6.9$ MIN

I = M1 SUMP CONDITION

$Q_5 = 13.2 \rightarrow$ MAX POND $= .5 \rightarrow 10'$ C.O. INLET

$Q_{100} = 27 \rightarrow$ MAX POND $= .67 \rightarrow 15'$ C.O. INLET

USE 15' INLET

CALCULATED BY Poling
DATE 1/7/95
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON MILLS
DESIGN STORM 5

	STREET		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1		m1	M1	5.2	.55	7.1	2.86	4.6	13.2													Qi=13.2 CFS
2		ASSUME Q FROM 09 + 05 ARE COLLECTED																				
3		BY m1 PIPE																				
4																						
5		m1	05							10.0	6.0	4.1	24.6									
6		m1	09							10.6	7.81	4.0	31.2									
7	PIPE	Σm1								10.6	16.67	4.0	66.9			66.9	1.0	48				
8																						
9																						
10		m2	m2	24.5	.55	6.9	13.48	4.6	62.1													
11																						

CALCULATED BY Poling
DATE 1/7/95
CHECKED BY

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 212-1127
PROJECT STETSON HILLS MDDP
DESIGN STORM 100

	STREET	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1		M1	M1	5.2	.65	7.1	3.38	8.0	27.0													Q_1 = 27.0
2		M1	05							10.0	7.09	7	49.6									
3		M1	09							10.6	9.23	6.9	63.7									
4	PIPE	ΣM1								10.6	19.7	6.9	135.9			135.9	1.0	48				
5																						
6																						
7		M2	M2	24.5	.65	6.9	15.93	8.1	129.0													
8																						
9																						
10																						
11																						

OFF-SITE BASINS

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 10/24/94 SUBJECT STETSON HILLS SHEET NO. 1 OF 1
CHKD. BY ____ DATE ____ MASTER DRAINAGE PLAN JOB NO. 212-1127

BASIN 03

(FROM GREINER REPORT)
A = 53.8 AC → USE RATIONAL METHOD

11.9 AC OFFICE (22.1 %) C_{10} = .75 C_{100} = .8
41.9 AC MFR (<1/8 AC) (77.9%) C_{10} = .6 C_{100} = .7

C_{10} = .221 · .75 + .779 · .6 = .63

C_{100} = .221 · .8 + .779 · .7 = .72

ASSUME

l_i = 100' @ 2.0%

t_i = 7.0 MIN

l_t = 300' @ 3% (STREET FLOW)

$V = 71.21\, S^{1/2}$ = 12.3 FPS

$t_t = l/60V$ = .4 MIN

l_t = 1900' S = 60/1900 = 3.2%

ASSUME CHANNEL SECTION B-B

D_{min} = 2.5

⟹ R = 1.4' n = .02

$V = \frac{1.49}{n} R^{2/3} S^{1/2}$ = 16.7 FPS

$t_t = l/60V = 1900/60 \cdot 16.7$ = 1.9 MIN

t_c = 7 + .4 + 1.9 = 9.3 MIN

I_{100} = 7.2 IN/HR I_{10} = 4.7 IN/HR

Q = CIA

Q_{10} = .63 · 4.7 · 53.8 = 159 CFS

Q_{100} = .72 · 7.2 · 53.8 = 279 CFS

BY Poling DATE 10/28/94 SUBJECT STETSON HILLS SHEET NO. 1 OF
CHKD. BY DATE MASTER DRAINAGE PLAN JOB NO. 212-1127

$\boxed{05}$ $A = 10.9$ AC ASSUME SFR $C_{10} = .55$ $C_{100} = .65$

ASSUME $l_i = 100$ @ 2.0%

$t_i = 8.2$ MIN

$l_t = 1300'$ ASSUME $S = 3.0\%$

$V = 71.21\,S^{1/2} = 12.3$ FPS

$t_t = l/60V = 1.8$ MIN

$t_c = 10$ MIN (MATCHES GREINER)

$I_{10} = 4.6$ IN/HR, $Q_{100} = 7$ IN/HR

$Q = CIA$

$Q_{10} = .55 \cdot 4.6 \cdot 10.9 = 28$ CFS

$Q_{100} = .65 \cdot 7 \cdot 10.9 = 50$ CFS

$I_5 = 4.1$ IN/HR $Q_5 = 24.6$ CFS

$\boxed{08}$ INFO TAKEN FROM GREINER (041)
DEVELOPED CONDITIONS, TYPE B SOIL

$A = .26$ SM

$CN = 84.5$ (CORRESPONDS TO RESIDENTIAL ~ 1/8 AC OR LESS)

$t_c = .26$ MIN

$\boxed{09}$ $A = 14.2$ AC ASSUME SFR $C_5 = .55$ $C_{100} = .65$

ASSUME $l_i = 100'$ @ 2.0% = 8.2 MIN

$l_t = 1100'$ $S = 13/1100 = 1.18\%$

$V = 71.21\,S^{1/2} = 7.7$ FPS

$t_t = l/60V = 2.4$

$t_c = 10.6$ MIN

$I_{100} = 6.9$ IN/HR

$Q_{100} = .65 \cdot 6.9 \cdot 14.2 = 64\pm$ CFS

$I_5 = 4.0$ $Q_5 = 31.2$ CFS

$\boxed{06}$ $A = 11.0$ Ac ASSUME SFR $C_{10} = .55$, $C_{100} = .65$

ASSUME $l_i = 100'$ @ 2.0%

$t_i = 8.2$ MIN

$l_t = 1300'$ $S = 3.0\%$

$V = 71.2 S^{1/2} = 12.3$ FPS

$t_t = l / 60v = 1.8$ MIN

$t_c = 8.2 + 1.8 = 10.0$ MIN (MATCHES GREINER)

$I_{10} = 4.6$ IN/HR, $I_{100} = 7$ IN/HR

$Q = CIA$

$Q_{10} = .55 \cdot 4.6 \cdot 11 = 28$ CFS

$Q_{100} = .65 \cdot 7 \cdot 11 = 50$ CFS

$\boxed{07}$ $A = 44.6$ Ac ASSUME SFR $C_{10} = .55$, $C_{100} = .65$

$t_i = 8.2$ MIN

$l_t = 1900'$ ASSUME $S = 3.0\%$

$V = 12.3$ FPS

$t_t = 1900 / 60 \cdot 12.3 = 2.6$

$t_c = 8.2 + 2.6 = 10.8$ MIN

$I_{10} = 4.6$ IN/HR $I_{100} = 6.9$ IN/HR

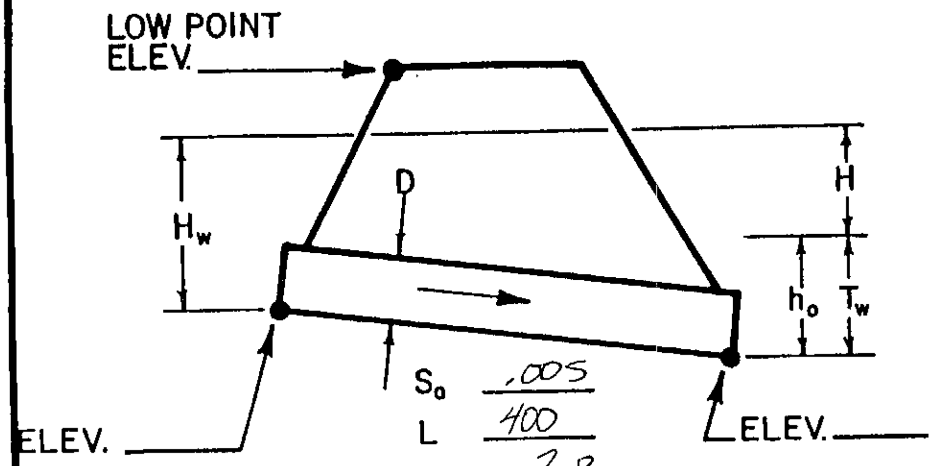
$Q_{10} = .55 \cdot 4.6 \cdot 44.6 = 113$ CFS

$Q_{100} = .65 \cdot 6.9 \cdot 44.6 = 200$ CFS

STANDARD FORM SF-4
CULVERT RATING

(GREINER #11)

PROJECT: STETSON HILLS MDDP LOCATION: STETSON HILLS / CHARLOTTE STATION: ______



S_o .005

L 400

S_oL 2.0

CULVERT DATA

TYPE: ______ n: ______

INLET: ______ Q_{FULL}: ______

K_e: .7 V_{FULL}: ______

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D$; $h_o = \frac{d_c + D}{2}$ or T_w (whichever is greater)

$T_w > D$; $h_o = T_w$

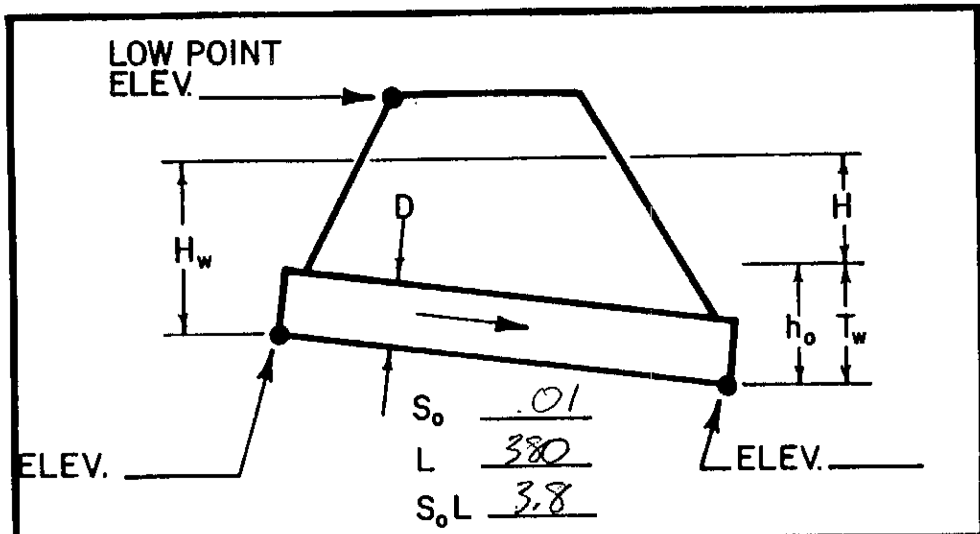
(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \le D$

10'x8'

Q	INLET CONTROL		OUTLET CONTROL						CONT.	CONTROL	ELEV.
	$\frac{H_w}{D}$	H_w	H	T_w	$T_w < D$		$T_w > D$	H_w	H_w		
					d_c	$\frac{d_c+D}{2} = h_o$	h_o				
1	2	3	4	5	6	7	8	9	10	11	12
720	1.1	8.8	2.9	6	5.3	6.7		7.6	8.8	INLET	

STANDARD FORM SF- 4
CULVERT RATING

PROJECT: STETSON HILLS MDDP 2/21/87 LOCATION: (GREINER #10) STETSON HILLS / TUTT STATION: ______



S_o .01

L 380

S_oL 3.8

CULVERT DATA

TYPE: ______ n: ______

INLET: ______ Q_{FULL}: ______

K_e : ______ V_{FULL}: ______

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D$; $h_o = \frac{d_c + D}{2}$ or T_w (whichever is greater)

$T_w > D$; $h_o = T_w$

(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \leq D$

84"

Q	INLET CONTROL		OUTLET CONTROL						CONT. H_w	CONTROL	ELEV.
					$T_w < D$		$T_w > D$				
	$\frac{H_w}{D}$	H_w	H	T_w	d_c	$\frac{d_c+D}{2} = h_o$	h_o	H_w			
1	2	3	4	5	6	7	8	9	10	11	12
272	1.3	9.1	1.6	5	4.4	5.7		3.5	9.1	INLET	
USE	84" RCP OR		HERCP EQUIV		→	PER	GREINER				

STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA

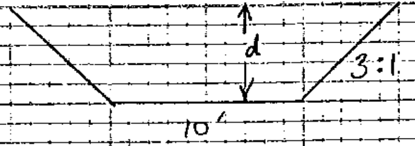
WEST TRIBUTARY CHANNEL

MERRICK

ENGINEERS & ARCHITECTS

BY Poling DATE 11/21/84 SUBJECT STETSON HILLS MASTER SHEET NO. 1 OF 2
CHKD. BY ______ DATE ______ DRAINAGE STUDY JOB NO. 2121127

SIZE WEST TRIBUTARY CHANNEL



RIPRAP LINED $n = .03$
$S = .01$

LOW FLOW (10-YR) CHANNEL

Q_{10} (T1-T2) = 460 V= 7.9 FPS $N_F = .8$

d = 3.1 → 3.5

Q_{10} (T2 → T3) = 800 V= 9.1 FPS $N_F = .8$

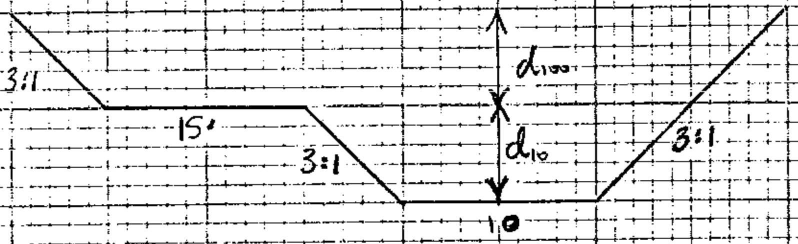
d = 4.0

Q_{10} (T3 → T4.1) = 1160 V= 10.1 FPS $N_F = .8$

d = 4.8 → 5.0

Q_{10} (T4.1 → T5) = 1760 V= 11.2 FPS $N_F = .8$

d = 5.8 → 6.0'



$$Q = \frac{1.49}{n} A R^{4/3} S^{1/2}$$

$$A = 10d_{10} + 3d_{10}^2 + 6d_{10}d_{100} + 25d_{100} + 3d_{100}^2$$

$$WP = 6.32d_{10} + 6.32d_{100} + 25$$

T1 → T2 Q = 700 CFS $d_{10} = 3.5$

d_{100}	A	WP	Q
2	169.75	56.76	1756
1	117.75	50.44	1032
.5	95.5	50.28	729

V= 7.3 FPS $N_F = .6$

d = 4' < 5' → OK

$$H_f = 1 + .025 V D^{.33} = 1 + (.025)\left(\frac{700}{95.5}\right) 4^{.33} = 1.3$$

D = 5.3' → 5.5'

BY Poling DATE 11/29/94 SUBJECT STETSON HILLS MASTER DRAINAGE STUDY SHEET NO. 2 OF 2
CHKD. BY ____ DATE / / JOB NO. 212-1127

$T2 \rightarrow T3$ $Q = 1225$ $d_{10} = 4$

d_{10}	A	WP	Q
1.0	140	56.6	1275

$V = 9.1$ FPS $N_F = .7$

$d = 4+1 = 5.0$

$h_f = 1+.025 \cdot 9.1 \cdot 5^{.33} = 1.2$

$d = 5+1.2 = 6.2 \rightarrow 6.5$

$T3 \rightarrow T4.1$ $Q = 1860$ $d_{10} = 5.0$

d_{100}	A	WP	Q
.5	151.75	56.76	1457
1.0	180	59.92	1868

$V = 10.4$ FPS $N_F = .7$

$d = 6'$

$h_f = 1+.025 V D^{.33} = 1.5$

$d = 6+1.5 = 7.5'$

$T4.1 \rightarrow T5$ $Q = 2873$ $d_{10} = 6.0$

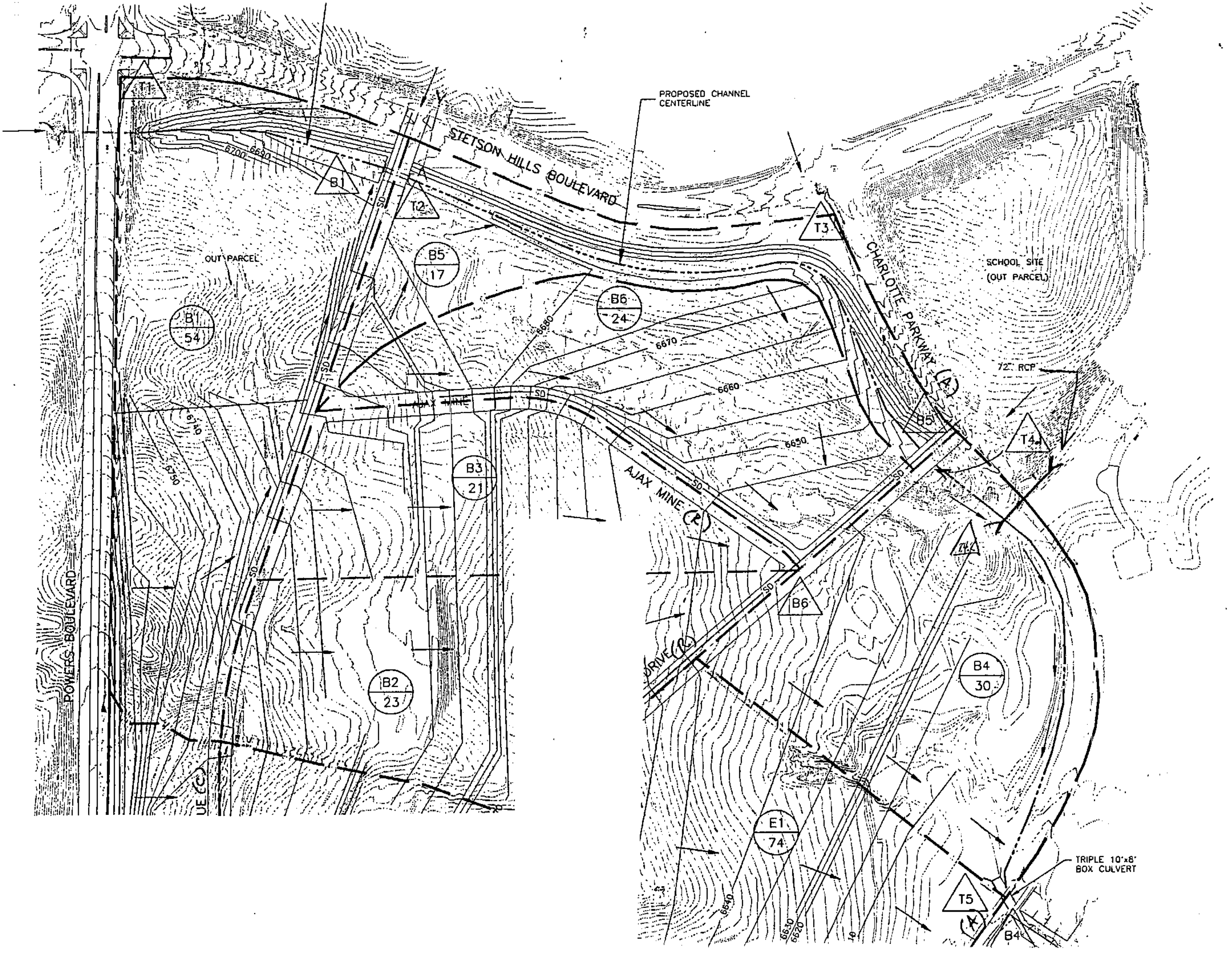
d_{100}	A	WP	Q
1.0	229	66.24	2611
1.5	261.75	69.4	3164
1.3	248.47	68.14	2936

$V = 11.8$ FPS $N_F = .8$

$d = 6+1.5 = 7.5$

$h_f = 1+.025 V D^{.33} = 1.6$

$d = 7.5+1.6 = 9.1 \rightarrow 9.5'$

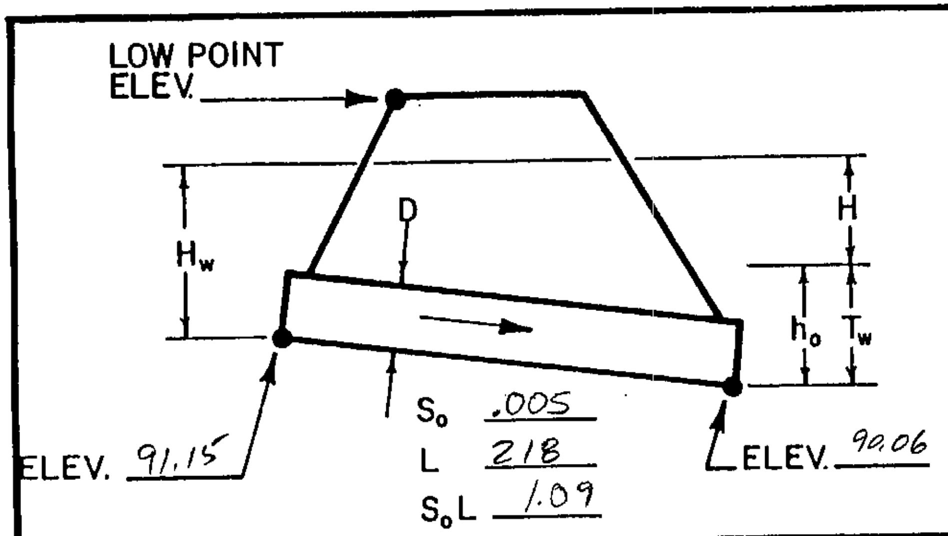

PROPOSED CHANNEL CENTERLINE
STETSON HILLS BOULEVARD
CHARLOTTE PARKWAY (A)
SCHOOL SITE
(OUT PARCEL)
72" RCP
OUT PARCEL
POWERS BOULEVARD
AJAX MINE
AJAX MINE (R)
DRIVE (R)
UE (C)
TRIPLE 10'x8'
BOX CULVERT
T1
T2
T3
T4
T5
B1
B5
B6
B4
B1
54
B5
17
B6
24
B3
21
B2
23
B4
30
E1
74
6700
6690
6680
6670
6660
6650
6740
6750
6640
6630
6620
SD
(A)

STANDARD FORM SF-4
CULVERT RATING

PROJECT: STETSON HILLS

LOCATION: (GREINER # 1) CHARLOTTE BTWN JACKPOT AND JACKPOT

STATION:



ELEV. 91.15

S_o .005

L 218

S_oL 1.09

ELEV. 90.06

CULVERT DATA

TYPE:

n:

INLET:

Q_{FULL}:

K_e: .7

V_{FULL}:

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D$; $h_o = \frac{d_c + D}{2}$ or T_w (whichever is greater)

$T_w > D$; $h_o = T_w$

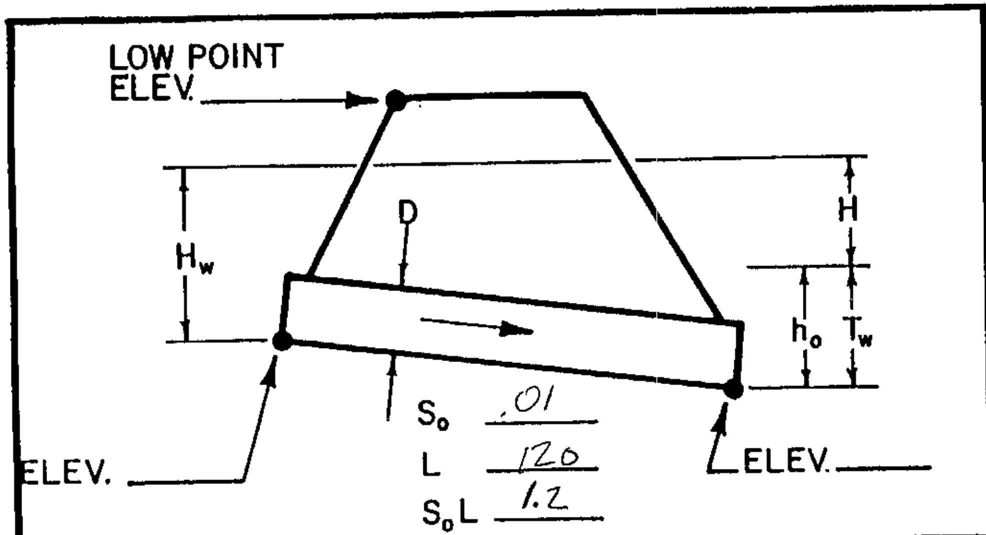
(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \leq D$

3-10X8

Q	INLET CONTROL		OUTLET CONTROL						CONT.	CONTROL	ELEV.
					$T_w < D$		$T_w > D$				
	$\frac{H_w}{D}$	H_w	H	T_w	d_c	$\frac{d_c+D}{2}=h_o$	h_o	H_w	H_w		
1	2	3	4	5	6	7	8	9	10	11	12
2872											
957	1.4	11.2		4.3	6.5	5.4	8.5	8.7	11.2		OK ✓
15	11.2' OF	HW AVAILABLE				TOC = 6605.88			INV. IN = 6591.15		
						HW =	14.7	✓ OK			

STANDARD FORM SF-4
CULVERT RATING

PROJECT: STETSON HILLS MDDP LOCATION: (GREINER #3) TUTT STATION:



S_o .01

L 120

S_oL 1.2

CULVERT DATA

TYPE:

INLET:

K_e: .7

n:

Q_{FULL}:

V_{FULL}:

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D$; $h_o = \frac{d_c + D}{2}$ or T_w (whichever is greater)

$T_w > D$; $h_o = T_w$

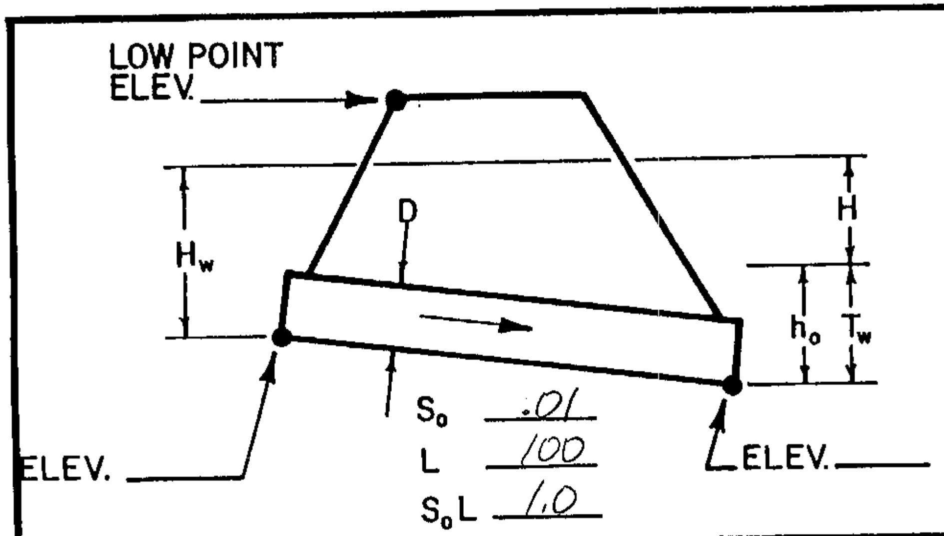
(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \leq D$

10'×6'

Q	INLET CONTROL		OUTLET CONTROL						CONT. H_w	CONTROL	ELEV.
					$T_w < D$		$T_w > D$				
	$\frac{H_w}{D}$	H_w	H	T_w	d_c	$\frac{d_c+D}{2} = h_o$	h_o	H_w			
1	2	3	4	5	6	7	8	9	10	11	12
700	1.5	9	1.9	5	5.2	5.6	5.6	6.3	9	INLET	

STANDARD FORM SF-4
CULVERT RATING

PROJECT: STETSON HILLS MDDP LOCATION: (GREINER #2) JACKPOT DR STATION: ______



S_o .01
L 100
S_oL 1.0

CULVERT DATA

TYPE: ______ n: ______
INLET: ______ Q_{FULL}: ______
K_e: .7 V_{FULL}: ______

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D$; $h_o = \frac{d_c + D}{2}$ or T_w (whichever is greater)

$T_w > D$; $h_o = T_w$

(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \leq D$

Q	INLET CONTROL		OUTLET CONTROL						CONT. H_w	CONTROL	ELEV.
	$\frac{H_w}{D}$	H_w	H	T_w	$T_w < D$ d_c	$\frac{d_c+D}{2} = h_o$	$T_w > D$ h_o	H_w			
1	2	3	4	5	6	7	8	9	10	11	12
1860											
2-10x10 930	1.0	10	2.6	7.5	6.3	8.2		9.8	10	INLET	

STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA

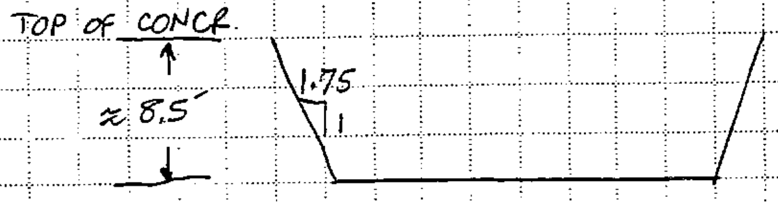
MERRICK
Engineers & Architects

Engineering Calculation Sheet

Date 12-30-94 Sheet of
Contract
By RWL Chk'd

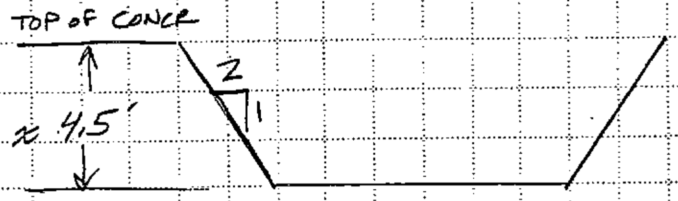
Revision	Date	By

Subject: STETSON HILLS FILING 12
SAND CREEK SIDE CHANNEL
EXISTING CHANNEL GEOMETRY



b = 25'
$S_0 \approx 0.65\%$

SECTION A-A (AT TRIPLE 8'x10' CBC's)



b = 20'
$S_0 \approx 1.20\%$

SECTION B-B (BELOW FIRST 5' DROP)

CHANNEL IS CONCRETE

EXISTING CONDITIONS FLOW = 1875 cfs = Q_{100}
(FROM ORIG. STETSON HILLS MASTER DRAINAGE REPORT)
PROPOSED CONDITIONS FLOW = 2872 cfs = Q_{100}
(REVISED STETSON HILLS MASTER DRAINAGE REPORT)

```
          Trapezoidal Channel Analysis & Design
              Open Channel - Uniform flow


Worksheet Name: Existing Channel

Comment: Existing Side Channel Capacity 100-YR

Solve For Depth

Given Input Data:

        Bottom Width.....    25.00 ft
        Left Side Slope..     1.75:1 (H:V)
        Right Side Slope.     1.75:1 (H:V)
        Manning's n......     0.013
        Channel Slope....     0.0065 ft/ft
        Discharge........  1875.00 cfs

Computed Results:

        Depth............     3.39 ft
        Velocity.........    17.91 fps
        Flow Area........   104.70 sf
        Flow Top Width...    36.85 ft
        Wetted Perimeter.    38.65 ft
        Critical Depth...     4.95 ft
        Critical Slope...     0.0017 ft/ft
        Froude Number....     1.87 (flow is Supercritical)




  Open Channel Flow Module, Version 3.12 (c) 1990
  Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708
```

SECTION A-A

EXISTING FLOWS

```
          Trapezoidal Channel Analysis & Design
              Open Channel - Uniform flow


Worksheet Name: Existing Channel

Comment: Existing Side Channel Capacity 100-YR

Solve For Depth

Given Input Data:

        Bottom Width.....    25.00 ft
        Left Side Slope..     1.75:1 (H:V)
        Right Side Slope.     1.75:1 (H:V)
        Manning's n......     0.013
        Channel Slope....     0.0065 ft/ft
        Discharge........  2872.00 cfs

Computed Results:

        Depth............     4.31 ft
        Velocity.........    20.47 fps
        Flow Area........   140.30 sf
        Flow Top Width...    40.09 ft
        Wetted Perimeter.    42.38 ft
        Critical Depth...     6.36 ft
        Critical Slope...     0.0016 ft/ft
        Froude Number....     1.93 (flow is Supercritical)
```

SECTION A-A

PROPOSED FLOWS

```
  Open Channel Flow Module, Version 3.12 (c) 1990
  Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708
```

```
          Trapezoidal Channel Analysis & Design
              Open Channel - Uniform flow


Worksheet Name: Existing Channel

Comment: Existing Side Channel Capacity 100-YR

Solve For Depth

Given Input Data:

        Bottom Width.....    25.00 ft
        Left Side Slope..     2.00:1 (H:V)
        Right Side Slope.     2.00:1 (H:V)
        Manning's n......     0.013
        Channel Slope....     0.0120 ft/ft
        Discharge........  1875.00 cfs

Computed Results:

        Depth............     2.81 ft
        Velocity.........    21.77 fps
        Flow Area........    86.13 sf
        Flow Top Width...    36.25 ft
        Wetted Perimeter.    37.58 ft
        Critical Depth...     4.87 ft
        Critical Slope...     0.0017 ft/ft
        Froude Number....     2.49 (flow is Supercritical)




  Open Channel Flow Module, Version 3.12 (c) 1990
  Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708
```

SECTION B-B

EXISTING FLOWS

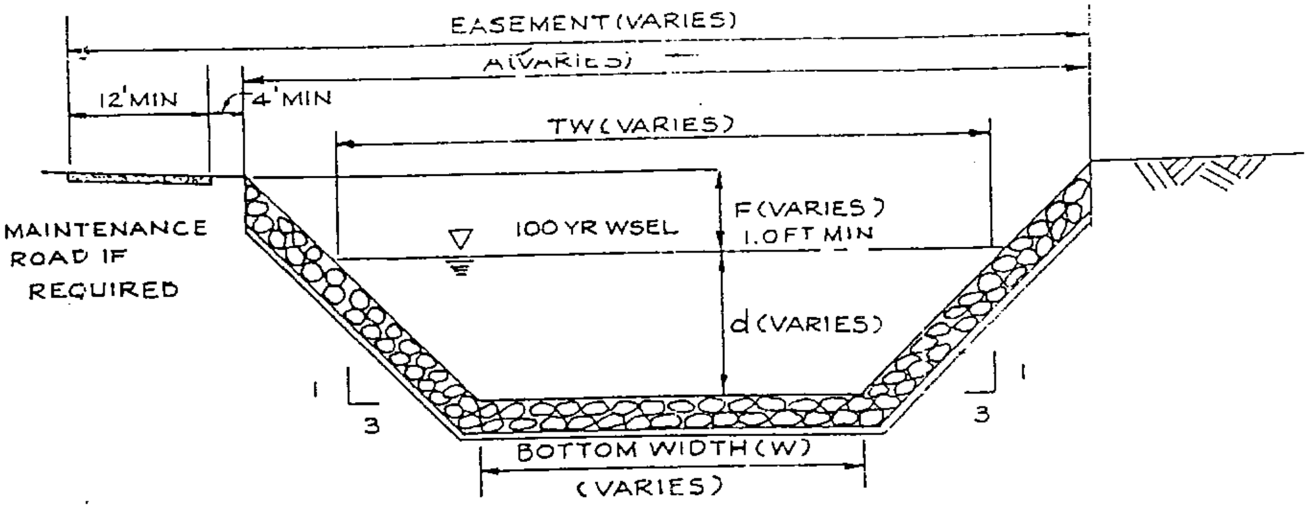
```
          Trapezoidal Channel Analysis & Design
              Open Channel - Uniform flow


Worksheet Name: Existing Channel

Comment: Existing Side Channel Capacity 100-YR

Solve For Depth

Given Input Data:

        Bottom Width.....    25.00 ft
        Left Side Slope..     2.00:1 (H:V)
        Right Side Slope.     2.00:1 (H:V)
        Manning's n......     0.013
        Channel Slope....     0.0120 ft/ft
        Discharge........  2872.00 cfs

Computed Results:

        Depth............     3.58 ft
        Velocity.........    24.93 fps
        Flow Area........   115.21 sf
        Flow Top Width...    39.33 ft
        Wetted Perimeter.    41.02 ft
        Critical Depth...     6.24 ft
        Critical Slope...     0.0016 ft/ft
        Froude Number....     2.57 (flow is Supercritical)
```

SECTION B-B

PROPOSED FLOWS

Freeboard = 4.5' - 3.6' = 0.9'

```
Open Channel Flow Module, Version 3.12 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708
```



RIP RAP CHANNELS

(OTHER THAN SAND CREEK)
FINAL CONSTRUCTION

SECTION	CHANNEL VARIABLE	MAX (Ft)	MIN (Ft)
A-A	EASEMENT	84.7	73.7
	A	68.7	57.7
	TW	56.9	48.1
	F	2.0	1.6
	d	7.8	6.4
	W	10.0	10.0
B-B	EASEMENT	43.6	40.0
	A	27.6	24.0
	TW	21.8	17.9
	F	1.0	1.0
	d	3.1	2.5
	W	3.0	3.0

NOTE: Top widths may vary due to Grading Constraints.
FINAL CONST. NOT PART OF FILING NO. 1 & 2.

Grein

Design GK
Drawn
Check
Scale
NOV

STETSON HILLS SUBDIVISION

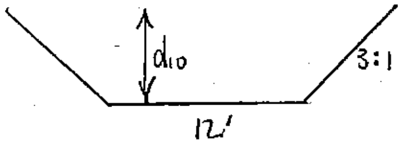
Date
Job No
Sheet 2

EAST TRIBUTARY CHANNEL

MERRICK
ENGINEERS & ARCHITECTS

BY Poling DATE 12/15/94 SUBJECT STETSON HILLS MDDP SHEET NO. 1 OF 3
CHKD. BY / DATE / JOB NO. 212-1127

SIZE EAST TRIBUTARY CHANNEL



RIPRAP LINED $n = .03$
$S = .01$

LOW FLOW (10-YEAR) CHANNEL

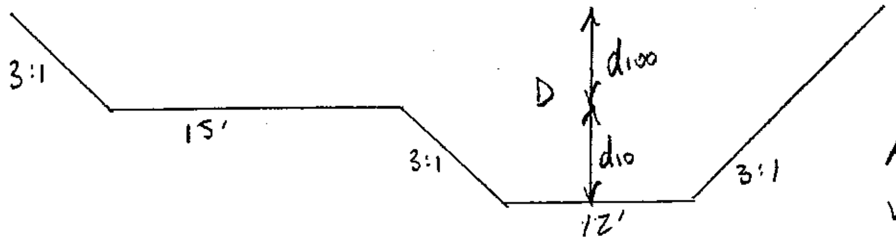
Q_{10} (T10 – T11) = 364 CFS V = 7.4 FPS $N_F = .8$
$d_{10} = 2.6 \rightarrow 3.0'$

Q_{10} (T11 – T12) = 619 CFS V = 8.5 FPS $N_F = .8$
$d_{10} = 3.4' \rightarrow 3.5'$

d_{10} (T12 – T13) = 787 CFS V = 9.1 FPS $N_F = .8$
$d_{10} = 3.8 \rightarrow 4.0'$

Q_{10} (T13 – T14) = 862 CFS V = 9.3 FPS $N_F = .8$
$d_{10} = 4.0'$

Q (T14 → SAND CREEK) = 906 CFS V = 9.5 FPS $N_F = .8$
$d_{10} = 4.1 \rightarrow 4.5'$



$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$$A = 12d_{10} + 3d_{10}^2 + 6d_{10}d_{100} + 27d_{101} + 3d_{100}^2$$

$$WP = 6.32d_{10} + 6.32d_{100} + 27$$

T10 – T11 $Q = 613$ CFS $d_{10} = 3.0'$

d_{100}	A	WP	Q
.5	86.25	49.12	624

V = 7.2 FPS $N_F = .7$

$h_f = 1 + .025 V D^{.33} = 1 + .025 \cdot 7.2 \cdot 3.5^{.33} = 1.3$

$D = 3.5 < 5'$ OK

$D = 3.5 + 1.3 = 4.8 \rightarrow 5.0'$

T11-T12 $Q = 1072$ CFS $d_{10} = 3.5$

d_{100}	A	WP	Q		
1.0	129.75	55.44	1139	V= 8.8 FPS	$N_F = .7$
1.9	124.38	54.81	1069.7		

$d_{100} = 1.0$ $D = 4.5 < 5'$ OK

$h_f = 1 + .025 \cdot 8.8 \cdot 4.5^{.33} = 1.4'$

$D = 4.5 + 1.4 = 5.9 \rightarrow 6.0'$

T12 - T13 $Q = 1377$ CFS $d_{10} = 4.0'$

d_{100}	A	WP	Q		
1.0	150	58.6	1398	V = 9.3 FPS	$N_F = .7$

d_{100} 1.0'

$D = 1.0 + 4.0 = 5.0$ OK

$H_f = 1 + .025 \cdot 9.3 \cdot 5^{.33} = 1.4'$

$D = 5 + 1.4 = 6.4 \rightarrow 6.5'$

T13- T14 $Q = 1523$ CFS $d_{10} = 4.0$

d_{100}	A	WP	Q		
1.5	179.25	61.76	1818		
1.2	161.52	59.83	1560	V= 9.7 FPS	$N_F = .7$

$d_{100} = 1.2$ $D = 5.2'$

$h_f = 1 + .025 \cdot 9.7 \cdot 5.2^{.33} = 1.4$

$D = 5.2 + 1.4 = 6.6 \rightarrow 7.0''$

TH-T15 $Q = 1612$ CFS $d_{10} = 4.5'$

d_{100}	A	WP	Q		
1.0	171.75	61.76	1692.7	V= 9.9 FPS	N_F =.7
.9	165.78	61.13	1607		

$d_{100} = 1.0$ D = 5.5'

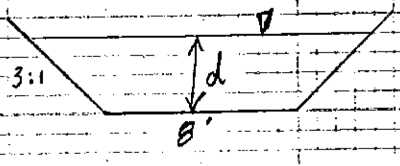
$$h_f = 1 + .025 \cdot 9.9 \cdot 5.5^{.33} = 1.4$$

$$D = 5.5 + 1.4 = 6.9 \rightarrow 7.0'$$

CHANNEL THROUGH ET1 TO T11

$Q_{10} = 110$

$Q_{100} = 193$ CFS



RIPRAP LINED n=.03

S= 1.0%

d= 2.1' FOR Q_{100} V= 6.3 FPS N_F = .7

$$h_f = 1 + .025 V D^{.33} = 1 + .025 \cdot 6.5 \cdot 2.5^{.33}$$

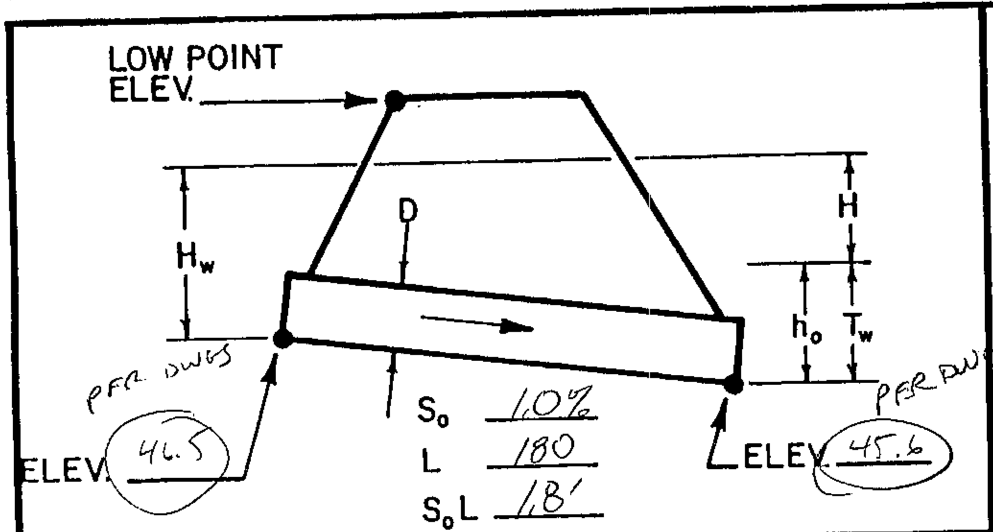
$$h_f = 1.2$$

$$d = 2.1 + 1.2 = 3.4' \longrightarrow 3.5'$$

STANDARD FORM SF-4
CULVERT RATING

(GREINER #6)

PROJECT: STETSON HILLS MDDP LOCATION: BRAHMA TRAIL STATION: ______



PER DWGS

ELEV. 46.5

S_o 1.0%

L 180

S_oL 1.8'

PER DWGS

ELEV. 45.6

CULVERT DATA

TYPE: ______ n: ______

INLET: ______ Q_{FULL}: ______

K_e: .7 V_{FULL}: ______

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D$; $h_o = \frac{d_c + D}{2}$ or T_w (whichever is greater)

$T_w > D$; $h_o = T_w$

(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \le D$

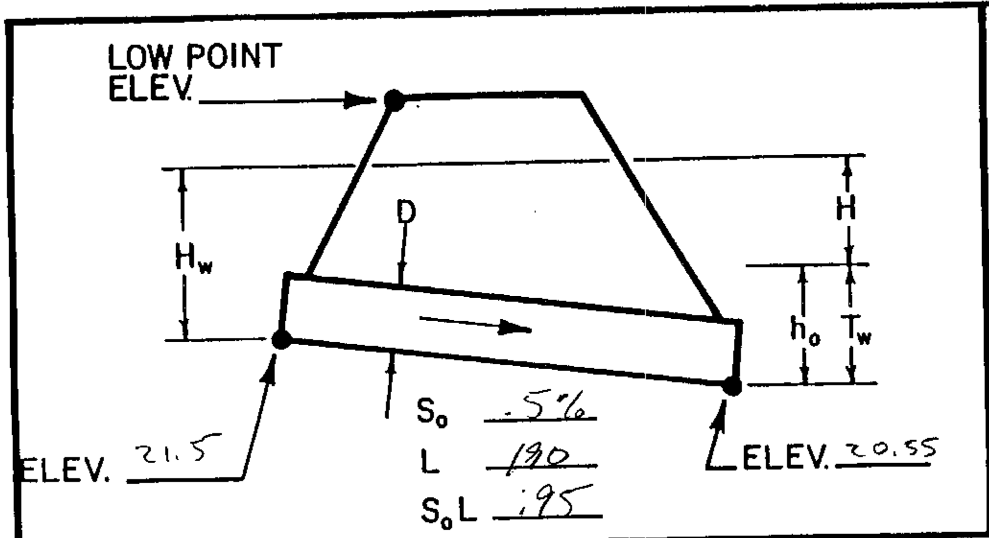
12x8

Q	INLET CONTROL		OUTLET CONTROL						CONT. H_w	CONTROL	ELEV.
					$T_w < D$		$T_w > D$				
	$\frac{H_w}{D}$	H_w	H	T_w	d_c	$\frac{d_c+D}{2}=h_o$	h_o	H_w			
1	2	3	4	5	6	7	8	9	10	11	12
1072	1.3	10.4	3.7	5	6.2	7.1		9	10.4	INLET	

STANDARD FORM SF-4
CULVERT RATING

(GREINER # 4)

PROJECT: STETSON HILLS MDDP LOCATION: JEDEDIAH SMITH RD STATION: ______



ELEV. 21.5

S_o .5%

L 190

S_oL .95

ELEV. 20.55

CULVERT DATA

TYPE: ______ n: ______

INLET: ______ Q_{FULL}: ______

K_e: ______ V_{FULL}: ______

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D$; $h_o = \frac{d_c + D}{2}$ or T_w (whichever is greater)

$T_w > D$; $h_o = T_w$

(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \le D$

Q	INLET CONTROL		OUTLET CONTROL						CONT.	CONTROL	ELEV.
					$T_w < D$		$T_w > D$				
	$\frac{H_w}{D}$	H_w	H	T_w	d_c	$\frac{d_c+D}{2}=h_o$	h_o	H_w	H_w		
1	2	3	4	5	6	7	8	9	10	11	12
1523	1.14	9.12	3.0	5.5	5.5	6.75		8.8	9.12	INLET	

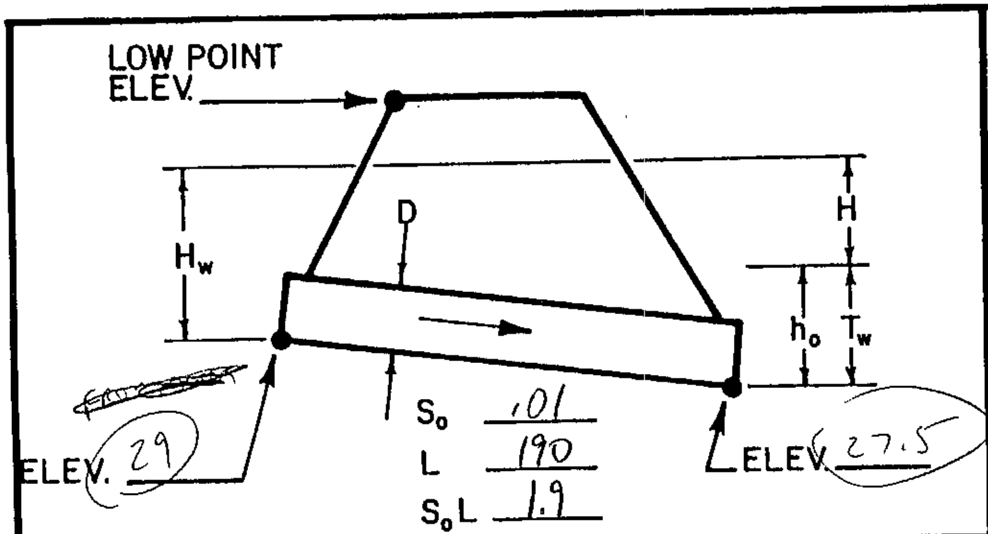
210x8 (existing)

OK

STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA

STANDARD FORM SF-4
CULVERT RATING

PROJECT: STETSON HILLS MDDP   LOCATION: (GREINER #5) PETERSON   STATION: ______



ELEV. 29

S_o .01

L 190

S_oL 1.9

ELEV. 27.5

CULVERT DATA

TYPE: ______   n: ______

INLET: ______ Q_{FULL}: ______

K_e: .2 V_{FULL}: ______

OUTLET CONTROL EQUATIONS

(1) $H_w = H + h_o - LS_o$

(2) For $T_w < D_i$; $h_o = \frac{d_c + D}{2}$ or T_w (whichever is greater)

$T_w > D_i$; $h_o = T_w$

(3) For Box Culvert: $d_c = 0.315(Q/B)^{2/3} \leq D$

	Q	INLET CONTROL		OUTLET CONTROL						CONT. H_w	CONTROL	ELEV.
		$\frac{H_w}{D}$	H_w	H	T_w	$T_w < D$		$T_w > D$	H_w			
						d_c	$\frac{d_c+D}{2} = h_o$	h_o				
	1	2	3	4	5	6	7	8	9	10	11	12
12x10	1377	1.2	12	4.0	5.2	7.4	8.7		10.8	12	INLET	
2 8x8	1377	1.24	9.92	3.6	5.2	6.0	7.0		8.7	9.92	INLET	

STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA