FINAL DRAINAGE REPORT
for
"Cordera Filing No. 2A"
&
MASTER DEVELOPMENT DRAINAGE PLAN
for
"Cordera Filings 2A-2D"

Pine Creek Drainage Basin

Prepared for:
City of Colorado Springs, Colorado
Engineering Division

On Behalf of:
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Prepared by:

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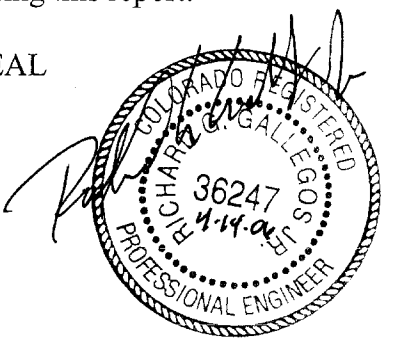
November 2005
Revised, April 2006

04.104.022

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 County 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.

SEAL



Richard G. Gallegos, Jr.
Registered Professional Engineer
State of Colorado
No. 36247

Developer's Statement:

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

LP47, LLC dba La Plata Investments
Business Name

By: _____
Thomas Taylor
Title: Director of Development Services
Address: 2315 Briargate Parkway, Suite 100
Colorado Springs, CO 80920

City of Colorado Springs:

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

_____ _____
City Engineer Date April 17, 2006

Conditions:

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I. INTRODUCTION

A. Background

Cordera Filing No. 2A is a proposed 39.091 acre subdivision encompassing approximately 112 single-family residential lots, open space, and right of way within the larger Cordera Master Plan area. The site is generally located in northeast Colorado Springs. This Final Drainage Report expands upon the work previously completed within the *Final Drainage Report for Cordera Filing No. 1 and Master Development Drainage Plan (MDDP) for Cordera and Briargate Crossing East, Pine Creek and Cottonwood Creek Basins*, prepared by Matrix Design Group, Inc. This report evaluates the site-specific requirements to develop Filing 2A as well as giving overall guidance as an MDDP for all four phases of Filing 2. Filing 2A is the subject of this report. Filing 2B will be single family lots along the northern limits of the development. Filing 2C will comprise the eastern portion of the site. Filing 2D is the proposed school site within the heart of the property.

The proposed development will consist mainly of single-family parcels with lot sizes averaging approximately ¼-acre in size. The first phase of development will consist of five cul-de-sac bulbs and is the subject of this Final Drainage Report. Additional phases of development will occur to the north and east comprising single-family lots and a future school site.

B. Project Location

Cordera Filing No. 2A is located in northeastern Colorado Springs, east of Powers Boulevard. The surrounding area is largely undeveloped and was formally utilized for agricultural purposes. Large single-family parcels have been developed to the north, however due to the large lot sizes, the majority of this area continues to follow historic drainage patterns. Wolf Ranch exists to the east, however this development or planning area will not impact Filing 2A.

More specifically, Cordera Filing No. 2A is located as follows.

1. General Location. West ½ of Section 25 and east ½ of Section 26, Township 12 South, Range 66 West of the 6th P.M. in the City of Colorado Springs, County of El Paso, State of Colorado.
2. Surrounding Streets. Grand Cordera Parkway will be constructed adjacent to the site to the west, Briargate Parkway is being constructed to the south, Old Ranch Road exists to the north, and Grand Lawn Circle is proposed to the east. Union Boulevard will be constructed adjacent to Filing 2A to the north to extend infrastructure to the area.
3. Drainageway. The site formally drained to Pine Creek. To prepare the area for development, a storm sewer system has been extended to the site. This storm sewer pipe outfalls to an existing detention pond constructed at the intersection of Briargate Parkway and Powers Boulevard. The entire filing limits are located within the Pine Creek Drainage Fee Basin.
4. Surrounding Developments. The area surrounding Cordera Filing No. 2A is largely undeveloped at this time. Developments surrounding the filing are being planned as

infrastructure is extended to the area. The following general land uses adjacent to the property are as follows.

North: Unplatted land exists to the north of the site. Portions of the land are currently vacant or are single-family residential lots. The area located adjacent to Filing 2A will be developed as a future Cordera Filing. An existing gas line and easement are the northern limits of Filing 2A.

East: Unplatted vacant land that will be a future school site. An existing pump station and reservoir for Colorado Springs Utilities has been previously platted as *Briargate Subdivision Filing No. 53.* The *Wolf Ranch* development is being planned at this time to the east of the overall Cordera Master Planning Area.

West: Unplatted vacant land exists adjacent to Filing 2A. This area will be developed as Briargate Crossing East consisting of commercial parcels.

South: Cordera Filing No. 1 is being constructed south of Filing 2A. The development consists of single-family lots.

C. Property Description

The site is undeveloped and unplatted. *Briargate Subdivision Filing No.* 53 is located to the east and has been developed by Colorado Springs Utilities as a water reservoir/pump station. Cordera Filing No. 1 is under construction at this time to the south. Roadway and utility infrastructure is being extended up to the site as part of the work being completed with Powers Boulevard, Union Boulevard, and Briargate Parkway.

1. Drainage Area. Cordera Filing No. 2A consists of approximately 39.091 acres of land to be platted as right-of-way, single-family lots, and open space. As described earlier, the tributary lies entirely within the Pine Creek Drainage Basin. The area is diverted to either the North or South Forks.

   This area has been previously planned for within the MDDP for the overall Cordera and Briargate Crossing Master Plan Area.

2. Ground Cover. This site is covered with sparse vegetation including natural grasses and some trees and shrubs.

3. General Topography. The site drains to the southwest with an average grade of approximately 6%.

4. General Soil Conditions. The *Soil Conservation Service of El Paso County Area, Colorado*, published by the United States Department of Agriculture, dated November 1991, has been utilized to investigate the existing general soil types within and tributary to the area impacting Cordera Filing No. 2A. Six different soil types can be found in and around the study reach:

Table 1.1
SCS Soil Survey Summary

Soil ID No.	***Soil***	***Hydrologic Classification***	***Permeability***	***Erosion Hazard***
12	Bresser sandy loam	B	Moderate	Slight to Moderate
68	Peyton-Pring complex (3%-8% slope)	B	Rapid	Moderate to High
69	Peyton-Pring complex (8%-15% slope)	B	Rapid	Moderate to High
71	Pring coarse sandy loam	B	Rapid	Moderate
83	Stapleton sandy loam	B	Rapid	Moderate
85	Stapleton-Bernal sandy loams			
	Stapleton part	B	Rapid	Moderate
	Bernal part	D	Moderate	Moderate

Soils can be classified in four different hydrologic groups, A, B, C, or D to help predict stormwater runoff rates. Hydrologic group "A" is characterized by deep, well-drained coarse-grained soils with a rapid infiltration rate when thoroughly wet and having a low runoff potential. Group "D" typically has a clay layer at or near to the surface, or a very shallow depth to impervious bedrock and has a very slow infiltration rate and a high runoff potential. For the purposes of this Final Drainage Report, it has been assumed that hydrologic group "B" characteristics exists across the study area due to the fact the soil type dominates the area. Only a minor area of the Stapleton-Bernal sandy loam (partially hydrologic group "D") exists in the area project area at the downstream portions of the site.

5. Major Drainageways. No major drainageways exist with the limits of Filing 2A. Historically, runoff sheet flows to Pine Creek. A storm sewer exists under Briargate Parkway and outfalls to a newly constructed detention pond. The site will drain entirely to this pond when the area is fully developed.

6. Irrigation Facilities. No known functioning irrigation facilities on or around the site that could be influenced by local drainage. The site was formally used as pasture and grazing land for livestock, however there is no current agricultural use of the land. A livestock watering pond is located within the limits of the filing, however this will be removed when the site is developed.

7. Utilities and other Encumbrances. Currently, there are two main utility facilities that will impact the design of the proposed subdivision. The first consists of an existing water pump station, which has been constructed by Colorado Springs Utilities. Three separate water lines have been constructed to provide and distribute water from the reservoir. The areas have been overlot graded with some improvements completed. The water line designs are based upon the overlot grades, and will be protected in place as part of the development.

   The second utility within the area is a natural gas pipeline and easement owned and maintained by Colorado Springs Utilities that crosses the site in an east-west alignment. To minimize the impacts to the existing gas line, the area around the line is planned as open space, and existing grades will be matched in this area. The future storm sewer system will cross the gas line. The final design of the sewer will be coordinated with Colorado Springs Utilities.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

Cordera Filing No. 2A is located within the Pine Creek Drainage Fee Basin. The Drainage Basin Planning Studies and Master Development Drainage Plans completed that include site are as follows.

Cottonwood Creek Drainage Basin Planning Study, URS Consultants, June 9, 1994

Cottonwood Creek Drainage Basin Planning Study, Ayres and Associates, June 2000.

Pine Creek Drainage Basin Planning Study, Obering, Wurth & Associates Consulting Civil Engineers, revised October 1988.

Amendment No. 1 to the Pine Creek Drainage Basin Planning Study as Approved by City Council 12/18/88 & as Approved by El Paso County Commissioner 8/25/88, Obering, Wurth & Associates Consulting Civil Engineers, revised July 29, 1992.

Amendment No. 2 to the Pine Creek Drainage Basin Planning Study and Master Development Drainage Plan for Pine Creek Subdivision (Portion Contributing to Pine Creek), by JR Engineering, October 1998.

Amendment No. 3 to Pine Creek Drainage Basin Planning Study and Master Development Plan for the Pine Creek and Cordera Neighborhoods (Portions Contributing to Pine Creek), by JR Engineering, February 2003.

Master Development Drainage Plan for Union Boulevard/Briargate Parkway and Preliminary/Final Drainage Report for Portions of Union Boulevard, Briargate Parkway, Family Place and Austin Bluffs Parkway, JR Engineering, July 2001.

Final Drainage Report for Cordera Filing No. 1 and Master Development Drainage Plan for Cordera and Briargate Crossing East, Pine Creek and Cottonwood Creek Basins, DRAFT, by Matrix Design Group, Inc., January 2004.

Several subdivision preliminary and final drainage reports have also been completed for areas surrounding the site. A complete list of drainage reports used in the preparation of this report can be found in the References section of this report.

Runoff from the site will be detained to reduce flows to acceptable levels to protect downstream facilities. The MDDP for the Cordera and Briargate East areas have required the construction of a regional detention pond for the area. The pond also provides an opportunity to treat the stormwater flows for water quality. The City of Colorado Springs has recently implemented Phase II of the water quality requirements that are being imposed by the Environmental Protection Agency. The water quality requirements for the proposed development will be

incorporated into the detention pond being planned with Filing 1 as the Water Quality Capture Volume (WQCV). The WQCV has been designed based upon the requirements of Volume II of the Colorado Springs Drainage Criteria Volume and is additional volume to the detention requirements. An Extended Detention Basin has been designed for a 40-hour drain time of the WQCV. The WQCV has been increased by 20% to provide considerations for sedimentation. The detention and water quality ponds will not be located within the limits of Filing 2A and has considered this area within the newly constructed pond located at Briargate Parkway and Powers Boulevard.

Cordera Filing No. 2A is generally located within the upstream limits of the Pine Creek drainage basin. Previous drainage studies downstream of Filing 2A have been completed and have established permissible discharge rates allowed from the overall Cordera development.

The Pine Creek Drainage Basin is approximately 5.0 square miles in size located in the northern portion of the City of Colorado Springs. The basin is located north of Cottonwood Creek and south of Kettle Creek Drainage Basin. The general drainage patterns of the basin decline to the southwest and ultimately feed into Monument Creek. The tributary areas that drain through the Cordera and Briargate East developments are largely undeveloped, or consist of primarily unplatted single-family parcels that range from approximately 1 acre to about 10 acres in size.

Pine Creek South Fork is located immediately south of Briargate Parkway and west of Powers Boulevard within an open space/community park area. As part of the Briargate Parkway construction, a reinforced concrete box and large diameter storm sewer pipe has been extended from an existing detention pond (listed as DF "C" in the Drainage Basin Planning Study) located northwest of the intersection of Briargate Parkway and Union Boulevard to a point just north of the Powers Boulevard alignment. The storm sewer under construction will serve as an outfall point for the detention ponds accepting flows from portions of Cordera Filing No. 1 and 2A.

B. Floodplain Statement

Review of the ***Flood Insurance Rate Map (FIRM) 530 (08041CO530 F)***, effective date March 17, 1997, published by the Federal Emergency Management Agency (FEMA) reveals that no portion of the ***Cordera Filing No. 2A*** lies within any designated 100-year floodplain. See Floodplain Map, Appendix.

C. Sub-Basin Description

Historically, the drainage basins have had runoff sheet flow to Pine Creek. No drainage improvements have been required at the site as the area was formally utilized as pasture and grazing land for livestock. The land is currently vacant and no longer used for agricultural purposes. The development of the site will require the construction of curb and gutter and a storm sewer system to convey the increased flows to the proposed detention ponds.

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria

This report has been prepared in accordance to the criteria set forth in the ***City of Colorado Springs & El Paso County Drainage Criteria Manual, Volumes I and II***, dated November 1991 and including subsequent updates. In addition to the City Criteria Manual, the ***Urban Storm Drainage Criteria Manuals, Volumes 1-3***, published by the Urban Drainage and Flood Control District, latest update 2003, has also been used to supplement the City Criteria Manual.

Several subdivision drainage reports have been found within the files of the City Subdivision Engineering Review Unit that have been completed for specific developments adjacent to and within the study area. The reports have been listed as references within this report. Each has been reviewed to ensure compliance with the recommendations and drainage facilities proposed.

B. Hydrologic Criteria

Due to the relatively small areas evaluated within the limits of Filing 2 the Rational Method has been used to size inlets and pipe laterals and the sub-trunk storm system. The Rational Method has been used to evaluate drainage areas less than 100-acres in size:

$$Q=C*I*A$$

Where:

Q = Maximum runoff rate in cubic feet per second
C = Runoff coefficient
I = Average rainfall intensity in inches per hour
A = Area of drainage sub-basin in acres

The Subdivision Engineering Review Unit issued an update to the rainfall intensity frequency curves for the City of Colorado Springs on January 7, 2003. The updated information has been utilized in this study. The revised storm rainfall time intensity-frequency curves have been used for the Rational Method analysis.

The design storm events are:

- Initial Storm = 5-Year Storm
- Major Storm = 100-Year Storm

Runoff coefficients are based upon field observations of the area, and preliminary master planning documents of future development. Type "B" hydrologic soil characteristics have been assumed throughout the area. Weighted runoff coefficients and the ground percent impervious has been calculated based upon the following land uses as outlined in *Table 5-1, Recommended Average Runoff Coefficients and Percent Imperviou*s as given within the City Drainage Criteria Manual.

Table 3.1
Runoff Coefficients

Land Use	% Imp.	C(5)	C(100)
School	80	0.70	0.80
Residential (1/2 Acre or less)	25	0.35	0.45
Residential (1/4 Acre)	40	0.50	0.60
Parks	7	0.30	0.55
Undeveloped Open Space	2	0.15	0.20

The Rational Method provides a valid hydrologic analysis for total drainage basins of 100-acres or less. Cordera Filing 2A and surrounding areas total greater than 100-acres when combined together. To evaluate the entire drainage area, the *Hydraulic Engineering Center's Hydrologic Modeling System (HEC-HMS)*, version 2.2.2 software, produced by the Unites States Army Corps of Engineers, released May 2003, has been used to develop hydrograph data of each basin. The same program also routes basin flows to design points and provides information to determine preliminary trunk storm sewer sizes for the major and minor storm event. HEC-HMS updates the original HEC-1 program by modernizing algorithms and analysis techniques. The program is scheduled to replace HEC-1 by the Army Corps of Engineers in the near future. Per City Criteria, the SCS hydrograph procedure is required for large drainage basins greater than 100 acres, but less than 10 square miles. Two storm distributions are provided within the City Criteria – the two-hour storm and the 24-hour time distribution for SCS Type IIa. For the purposes of this analysis, the 24-hour distribution has been selected because of the detention pond requirements, which will calculate a greater volume of runoff to be detained. Lag times for the modeling have been calculated as:

$$T(l) = 0.6*T(c)$$

Where

T(l) = Lag Time
T(c) = Time of Concentration.

Weighted Curve Numbers and associated percent imperiousness have been calculated based upon Tables 5-4 through 5-7 within the Drainage Criteria Manual.

The HEC-HMS model completed for this analysis evaluated the runoff from the storm sewer to be constructed with Filing 2A only. The MDDP and FDR for Filing 1 provides an evaluation of the detention requirements and outfall data.

C. Hydraulic Criteria

A detailed hydraulic analysis of the roadways, storm sewers, swales, and inlets has been completed as part of this study to place drainage facilities. Per City of Colorado Springs Criteria, roadway capacities for the 5-year and 100-year storm events has been updated and adopted by the City Council for Colorado Springs on October 11, 1994. Each roadway within Filing 2A was evaluated to determine additional constraints that may not allow the full allowable

depth of flow to be utilized. In general, the roadway capacities for the major storm are limited to the flow to the top of curb and gutter. Flow is restricted to one side of the roadway during the minor storm event. Where roadway capacities are exceeded in the development, inlets have been placed to reduce flows back to acceptable levels. The roadway stormwater capacity criteria are as follows:

Table 3.2
Roadway Capacity Criteria

Street Type	**Initial Storm Criteria**	**Major Storm Criteria**
Residential Street (6" ramp curb)	Flow spread to crown; Maximum 20 cfs per side	12" maximum depth at flowline; No adjacent flooding
Residential Street (8" vertical curb)	6" allowable depth at flow line; Maximum 34 cfs per side	12" maximum depth at flowline; No adjacent flooding
Collector Street (8" vertical curb)	8" allowable depth at flow line; Maximum 34 cfs per side; No overtopping crown of road	12" maximum depth at flowline; No adjacent flooding
Arterial Street (8" vertical curb)	8" allowable depth at flowline; Maximum 34 cfs per side; No overtopping crown of road	12" maximum depth at flowline; -or- 4" depth at crown (whichever is more restrictive)

IV. DRAINAGE FACILITY DESIGN

A. Existing Conditions (Pre Development Conditions)

Filing 2A is currently undeveloped and was previously utilized to raise livestock. The site is no longer used for agricultural purposes. The site is currently undeveloped and covered with native grassed, shrubs and some trees.

The site is located within Pine Creek Drainage Basin. The existing site conditions have been previously analyzed within two different reports. *Amendment #3 to the Pine Creek Drainage Basin Planning Study*, prepared by JR Engineering, dated October 2002 has completed a hydrologic study, which includes the area of Filing 2A. In addition, the *Final Drainage Report for Cordera Filing No. 1 and Master Development Drainage Plan for Cordera and Briargate Crossing East, Draft*, prepared by Matrix Design Group, Inc., dated January 2004 has evaluated the historic drainage basins utilizing updated hydrologic data provided by the City Stormwater Review Unit.

The majority of the flows that once traveled to Pine Creek now enter a storm sewer system recently constructed as part of the Briargate Parkway roadway improvements that have been completed west of Briargate Parkway. The storm sewer system is being extended to the east of Powers Boulevard.

The historic hydrology impacting the Cordera and Briargate Crossing East area has been previously analyzed within the MDDP. The area was originally undeveloped with the exception of an existing Colorado Springs Utility water pump station and reservoir and large single-family parcels located to the north of the site. Per the MDDP, the following is a summary of the areas, and flow generated from each historic sub-basins that Filing 2A is located within, or impacted by.

Table 4.1
Hydrologic Flow Rate Summary

Basin ID	Area (ac)	Q(5) (cfs)	Q(100) (cfs)
PE-1	32.97	4.3	30.5
PE-2	110.91	13.8	98.5
PE-3	99.00	9.0	63.4
PE-4	139.46	14.4	102.5
PE-5	111.99	15.8	110.7
PE-6	123.76	24.1	151.0
PE-7	134.33	14.5	103.4
PE-8	73.16	8.6	61.3

The historic drainage basins include all of Filing 2A, off-site tributary areas flowing through and areas downstream of the site. Portions of the site drain to the intersection of Powers Boulevard and Briargate Parkway at design point P1. This area is considered the South Fork of Pine Creek

and includes sub-basins PE-1, PE-2, and PE-5. At design point P2, the total routed flows have been calculated as Q(5)=34.9 cfs and Q(100)=291.0 cfs.

Sub-basins PE-3, PE-4, PE-6, PE-7, and PE-8 all flow to the North Fork of Pine Creek. Routed flows directly entering the North Fork channel and routed together to Powers Boulevard have been calculated as Q(5)=45.7 cfs and Q(100)=304.2 cfs at design point P5. The existing conditions have sub-basin PE-3 being routed to the North Fork of Pine Creek through a Colorado Department of Transportation storm sewer at Union Boulevard and Powers Boulevard. Flows from this area will be routed through existing detention pond DF-3, located on the west side of Powers Boulevard and ultimately flowing to the North Fork of Pine Creek.

Additional flows on the included drainage map include areas impacting the Cordera Master Plan area, however these flows do not impact Cordera Filing 2A.

B. Fully Developed Conditions

The fully developed conditions have been used to determine the sizing of the storm sewer infrastructure for Cordera Filing 2A. An analysis has been completed to ensure that roadway capacities are adequate and to provide inlet and pipe lateral sizing. The Rational Method has been used to evaluate each sub-basin with in the limits of Filing 2A. City standard D10R inlets have been sized based upon reasonable hydraulic head depths at each location and utilizes proper clogging factors. A detailed description of each basin and drainage facility is listed below.

The fully developed conditions assume that future development within the Cordera area and Bradley Ranch Area has been achieved. Only minor areas from the Bradley Ranch area have been assumed to flow to the site as the requirements per the DBPS. When future development within the Cordera Master Plan area is completed, interim conditions will be evaluated to ensure that flows are safely transported to downstream facilities. This will be completed on future filing by filing basis and will be discussed in detail in future Final Drainage Reports.

Attention to the lot-to-lot drainage patterns have been evaluated in this report. Specifically, three different lot-to-lot drainage patterns have been developed – Type "A", Type "B" and "Walkout/Garden Level" lots have been designated on the drainage plan with drainage flow arrows shown on the drainage maps. A Type "A" lot will have runoff flow from the back of the lot to the front side of the lot. These lots typically will accept flows from a portion of the adjacent lots located behind the residence. A Type "B" lot will have a high point located approximately in the middle of the site. Approximately half of the lot will drain to the front side toward the roadways, and the back half will drain to the back property line. A "Walkout/Garden Level" lot will have approximately 1/3 of the front portion of the lot draining to the roadway and the back 2/3 of the lot draining to the rear property line. Additional details of the drainage patterns for each lot type have been included on the drainage maps. See Appendix.

For the immediate development, interim conditions will be addressed later in this report.

Sub-basin PF1-A is located south and west of Grand Lawn Circle and will be a cul-de-sac in the future Cordera development located north of the existing gas easement. It is 2.00 acres in size and has peak runoff rates of 2.2 cfs and 5.1 cfs for the minor and major storm, respectively. A 5' D10R sump inlet is anticipated to drain the sub-basin. Flows will be directed southerly under Grand Lawn Circle.

Sub-basin PF1-B is 6.87 acres and is located to the northeast of Grand Lawn Circle. The future single-family lots will generate a peak runoff of Q(5)= 7.1 cfs and Q(100)=16.2 cfs that will drain south to a future 10' D10R sump inlet at the intersection of the cul-de-sac and Grand Lawn Circle. Flows from this area will be conveyed southerly under Grand Lawn Circle via a storm sewer.

Sub-basin PF1-C consists of 6.44 acres of future residential development to the east of Grand Lawn Circle. The peak runoff rates are calculated to be Q(5)=7.2 cfs and Q(100)=16.5 cfs. The cul-de-sac will be drained by a future 10' D10R sump inlet to a storm sewer system that will drain southerly via a proposed 50' wide public drainage and utility easement. The easement will

terminate at Fraser Valley Lane. A 36" RCP has been proposed under Fraser Valley Lane within the limits of Filing 2.

Sub-basin PF1-D is 4.08 acres in area comprising future single-family lots north of the existing gas easement. Runoff rates of Q(5)=4.5 cfs and Q(100)=10.3 cfs will be collected by a future 5' D10R sump inlet and conveyed southerly within a future public drainage and utility easement.

Sub-basin PF1-E will be comprised of future residential lots and open space area. The 2.81 acre sub-basin will generate peak runoff rates of Q(5)=3.2 cfs and Q(100)=7.3 cfs. Runoff from this area will be directed to Grand Lawn Circle via a diversion swale when the area north of the gas easement is developed. Runoff from this area will be directed to Grand Lawn Circle to one of two proposed 5' D10R sump inlets. When this sub-basin is developed, the peak runoff rates at the two proposed 5' inlets will be Q(5)=11.0 and Q(100)=24.0 cfs.

The residential housing on the north side of Fraser Valley Lane between the loop of Grand Lawn Circle is 5.93 acres and is designated as sub-basin PF2-A. Flow from the sub-basin has been calculate as Q(5)=8.7 cfs and Q(100)=18.6 cfs. Runoff will be collected by a proposed 10' D10R sump inlet at the intersection of Fraser Valley Lane and Grand Lawn Circle. Stormwater from this area will be conveyed to a proposed 48" RCP under Fraser Valley Lane.

Sub-basin PF2-B encompasses 5.97 acres of residential development within Filing 2 along Cherry Creek Park Court and Gem Lake Court. Peak runoff rates for this area have been calculated as Q(5)=9.1 cfs and Q(100)=19.5 cfs. Stormwater will be collected by a proposed 10' D10R sump inlet and conveyed to the storm sewer within the Fraser Valley Lane right of way. A proposed 30' public drainage easement has been proposed from the end of Cherry Creek Park Court to Fraser Valley Lane.

Sub-basin PF2-C is 5.40 acres of residential development within Filing 2. The area will generate Q(5)=8.8 cfs and Q(100)=18.9 cfs of storm water flows. Runoff will be collected by one of two proposed 5' D10R sump inlets. Flows from the future development north of the gas easement will also be accepted at this inlet from sub-basin PF1E as described earlier.

Sub-basin PF2-D is 1.64 acres in size comprising future Cordera development north of the existing gas easement. This area will generate peak flows of Q(5)=2.0 cfs and Q(100)= 4.6 cfs. Runoff will be directed to future Grand Lawn Circle and to 10' inlet within sub-basin PF2B. Peak runoff rates at the inlet from both sub-basins will be Q(5)=10.9 cfs and Q(100)=23.5 cfs.

Sub-basin PF3-A is 28.84-acre site proposed for a school. The basin drains to the southwest where a proposed swale will direct the runoff to a 36" FES and to the storm sewer system under Briargate Parkway. The 36" FES and associated storm sewer has been designed and will be constructed as part of the improvements for Cordera Filing 1. The peak runoff for the undeveloped site has been determined to be 21.2 cfs and 52.8 cfs for the minor and major storms, respectively. The flow is then routed through the Briargate Parkway trunk system. When the site is developed with a proposed school site with playground areas, the peak runoff rates will be 38.2 cfs and 81.8 cfs for the minor and major storm events. The 36" storm sewer has been sized to accommodate the historic flows as well as the future conditions.

Sub-basin PF3-B is 4.84 acres in size consisting of existing Colorado Springs Utilities reservoirs and pump station. This area has been previously platted as Briargate Subdivision Filing 53. The calculated peak runoff for this basin is Q(5)=8.1 cfs and Q(100)=17.3 cfs. A 24" RCP storm sewer has been extended up to the site as part of the roadway work for Briargate Parkway. The facilities were designed and approved as part of Cordera Filing 1.

Sub-basin PF3-C is almost entirely roadway along Grand Lawn Circle. The basin is 1.77 acres and drains south along the street's curb and gutter with peak runoff rates of Q(5)=4.0 cfs and Q(100)=8.2 cfs. A 5' sump D10R inlet directs the flow through an 18" RCP. The runoff is flows downstream via a 18" RCP along Briargate Parkway.

Sub-basin PF3D consists of the proposed roadways adjacent to the future school site on the north, west, and south sides. The 6.42 acre basin will have peak flow rates of Q(5)=8.0 cfs and Q(100)=17.2 cfs. Runoff will flow to a 10' D10R sump inlet located at the intersection of Grand Lawn Circle and Briargate Parkway.

Sub-basin PF4-A is 19.47 acres and located adjacent to Union Boulevard, Grand Cordera Parkway, and Briargate Parkway. Specifically, it is comprised of park space, single family lots draining to Union Boulevard and Grand Cordera Parkway, a portion of Grand Cordera Parkway, and a portion of Union Boulevard. The minor and major storm events of Q(5)=16.8 cfs and Q(100)=38.0 cfs will be collected at the intersection of Grand Cordera Parkway and Briargate Parkway by a city standard 20' sump D10R inlet. The runoff joins upstream flows from the Union / Grand Cordera trunk system and the Briargate trunk system in a 72" RCP.

Sub-basin PF4-B is the area draining to the pedestrian trail that runs under Briargate Parkway. The basin is 1.35 acres in size and peak runoff was determined to be Q(5)=2.5 cfs and Q(100)=5.4 cfs. One of two grated area inlets will collect the runoff under the bridge in Briargate Parkway and drain to the proposed 42" RCP under Briargate Parkway. These inlets have been previously designed as part of Cordera Filing 1.

Sub-basin PF4-C is 2.64 acres in size comprising the west half of Grand Cordera Parkway. Peak runoff rates of Q(5)=6.6 cfs and Q(100)=13.5 cfs will flow to a proposed 10' D10R sump inlet at the northwest corner of Briargate Parkway and Grand Cordera Parkway. The inlets will drain to the proposed 72" RCP storm sewer under Grand Cordera Parkway.

Sub-basin PF6-A is 5.71 acres of future single-family lots located north of Grand Lawn Circle. Peak runoff rates of Q(5)=6.8 cfs and Q(100)=15.5 cfs will be drained by a future 10' D10R sump inlet along Grand Lawn Circle. This area will not be constructed at this time and will be apart of a future filing.

Sub-basin PF6-B is 4.91 acres of future residential housing north of Grand Lawn Circle. Peak runoff rates for this area have been calculated at Q(5)=5.8 cfs and Q(100)=13.4 cfs. The future inlet sizing to drain this area has been estimated as a 10' D10R sump inlet.

Sub-basin PF6-C consists of 10.65 acres of future residential development located north of Grand Lawn Circle. The runoff rates have been determined to be Q(5)=10.9 cfs and Q(100)=24.8 cfs. It is estimated that this basin will be drained by a future 15' D10R inlet and be conveyed westerly via a storm sewer.

Sub-basin PF7-A is located between Rainbow Gulch Court and Bonny Lake Park Court, east of Grand Lawn Circle. It is 5.44 acres in size and will be single-family housing with a portion of the park system located within Filing 2. The basin drains to one of two 5' sump D10R inlet, and then on to a 24" RCP that connects to a 48" RCP running down Grand Lawn Circle to the Union Boulevard trunk system. The peak flows have been determined to be Q(5)=8.6 cfs and Q(100)=18.3 cfs.

A significant portion of the 8.11 acres that is designated as sub-basin PF7-B is park and trial. The remaining fraction of the basin is residential development to be developed as part of a future Cordera filing. The basin runoff is calculated to be Q(5)=9.6 cfs and Q(100)=22.0 cfs. A diversion swale will be constructed to isolate the flows from the proposed future residential lots to be located north of the existing gas easement. An 18" FES will be installed as part of the future development to accept runoff into the storm sewer system.

Sub-basin PF7-C is 3.15 acres in size and located east of Grand Lawn Circle at a future proposed cul-de-sac. A diversion swale has been proposed to limit the flows allowed to enter the residential lots from the open space area located to the east. Peak runoff rates from the sub-basin have been calculated as Q(5)=3.5 cfs and Q(100)=8.1 cfs requiring a future 5' D10R inlet to drain the basin.

Sub-basin PF7-D is 3.87 acres of development located within Filing 2. Peak runoff rates of Q(5)=6.6 cfs and Q(100)=14.1 cfs will be collected within one of two 5' D10R sump inlets located at the intersection of Grand Lawn Circle and Bonny Lake Park Court. Flows will be conveyed to the proposed 36" RCP storm sewer under Grand Lawn Circle.

Sub-basin PF8-A is 10.10 acres of residential development in the northwestern portion of the site. It is located adjacent to Union Boulevard and reaches from the northern limits of the Filing 2A to Fraser Valley Lane, a collector roadway. Flow from the sub-basin has been calculated to be Q(5)=14.8 cfs and Q(100)=31.5 cfs. Runoff will flow to Union Boulevard and travel south to a 15' city standard D10R sump inlet located along Fraser Valley Lane. Additionally, stormwater that drains to the southern portion of Rainbow Gulch Court will flow to the inlet via Grand Lawn Circle to Fraser Valley Lane. After the runoff enters the inlet, it is conveyed along a 48" RCP storm sewer where it combines with flows from upstream sub-basins. Next, it connects with a 60" RCP storm sewer that flows southwest along Union Boulevard and then south along Grand Cordera Parkway.

Sub-basin PF8-B consists of the southern portion of Bonny Lake Park Court and the northern portion of Rainbow Gulch Court. It is 3.55 acres in size and planned for residential housing. The runoff rates were determined to be Q(5)=5.8 cfs and Q(100)=12.4 cfs which drain to one of two 5' D10R sump inlets at the intersection of Rainbow Gulch Court and Grand Lawn Circle. Runoff will be drained by a 48" RCP storm sewer that combines with runoff from northern sub-

basins and flows from Grand Lawn Circle to Fraser Valley Lane to the Union Boulevard trunk system.

Sub-basin PF8-C encompasses 1.48 acres of residential development along the western most limits of Bonny Lake Park Court. Calculated peak runoff rates are 2.5 cfs and 5.4 cfs for the major and minor storm, respectively will be drained by a 5' D10R sump inlet and flow to a proposed 24" RCP under Union Boulevard. In the event the inlet should become clogged, stormwater will have an overflow route through an open space corridor/50' wide public drainage and utility easement.

The northeastern portion of future residential lots north of Grand Lawn Circle has been designated sub-basin PF8-D. This area will be part of a future filing and has been included within the analysis to help size the future infrastructure. Stormwater facilities in this area will not be constructed at this time. The sub-basin is 7.40 acres of single-family residential lots. Runoff was determined to be Q(5)=8.0 cfs and Q(100)=18.4 cfs. It is anticipated that a 15' city standard D10R sump inlet will be required to drain this area.

Sub-basin PF8-E consists of 1.37 acres of residential development within Filing 2 along Bonny Lake Park Court. Peak runoff rates from this area have been calculated as Q(5)=1.7 cfs and 3.8 cfs. These flow rates can be handled by a 5' D10R sump inlet located at the intersection of Bonny Lake Park Court and Grand Lawn Circle. When the future development north of the existing gas easement occurs, additional flow will travel to this inlet from sub-basin PF8-G. When this occurs, the combined flows will equal Q(5)=3.3 cfs and Q(100)=7.5 cfs. The same 5' D10R sump inlet will be able to accommodate the flows.

Sub-basin PF8-F will be comprised of open space area and the back portion of future single-family lots. The 3.56 acres area will generate peak flow rates of Q(5)=4.2 cfs and Q(100)=9.6 cfs. A proposed 18" RCP with a flared end section will be extended to this area from Union Boulevard.

Sub-basin PF8-G comprised 1.62 acres of future single-family residential development located north of the existing 50' gas easement. This sub-basin will generate peak stormwater flow rates of Q(5)=1.8 cfs and Q(100)=4.2 cfs. This area will flow to the proposed 5' D10R sump inlet within sub-basin PF8-E as described above.

Sub-basin PF9-A is 4.31 acres of residential development along Steamboat Lake Court. The calculated minor and major storms were determined to be 6.9 cfs and 14.7 cfs, respectively. Runoff drains to the end of the cul-de-sac where it is directed to a 10' sump D10R inlet. An 18" RCP sewer drains the inlet and connects to the 72" RCP Union Boulevard/Grand Cordera Parkway trunk sewer system.

Similarly, sub-basin PF9-B is 5.10 acres of residential development along Turquoise Lake Court, which drains to the Union Boulevard/Grand Cordera Parkway trunk sewer system. The runoff is calculated to be Q(5)=8.2 cfs and Q(100)=17.4 cfs, which enters the storm sewer system via a city standard D10R 10' sump inlet. An 18" RCP lateral connects the inlet to the 72" RCP trunk system under Grand Cordera Parkway.

Sub-basin PF9-C is 11.81 acres and consists of single-family lots along Trinidad Lake Court, Cub Lake Terrace, and Paonia Park Court and San Luis Peak Court. The peak runoff is Q(5)=12.5 cfs and Q(100)=27.8 cfs which drains to the western end of Trinidad Lake Court. A 15' sump D10R inlet conveys the flow to an 18" RCP. The 18" RCP connects to the proposed 60" RCP Union Boulevard/Grand Cordera Parkway trunk system.

The Rational Method has been used to size individual inlets as well as the corresponding lateral sizes. Because the overall drainage area is greater than 100-acres, the SCS method has been utilized to size the trunk infrastructure. The basin delineation completed for this analysis combines the areas used in the Rational Method at critical design points. The design points are summarized as follows.

Table 4.2
Hydrologic Design Point Summary

Design Point ID	Sub-basins	Q(5) (cfs)	Q(100) (cfs)
P1	PF1A, PF1B	4.6	18.1
P2	PF1C, PF1D	5.1	21.0
P3	P1, P2, PF1E, PF2C	15.9	62.5
P4	P3, PF2A, PF2B, P8, PF7A, PF8B	54.9	211.2
P5	PF6C, PF6B	6.9	29.1
P6	P5, PF6A	9.6	40.6
P7	P6, PF7C, PF8D	14.7	61.9
P8	P7, PF7B, PF7D, PF8E, PF8G	24.7	101.2
P10	P4, P8, PF8A, PF8C, PF8F	64.2	243.8
P11	P10, PF9C	71.4	269.8
P12	P11, PF9A, PF9B	77.7	291.3
P13	PF3A, PF3B, PF3C, PF3D	50.4	133.2
P14	P12, P13, PF4A, PF4B, PF4C	128.8	448.1

C. Interim Conditions

This Final Drainage Report has also considered the interim conditions of the site to evaluate the impacts of the upstream historic drainage basins during the time from when Cordera Filing 2A is developed to the time when a future phase of development is completed north of the existing gas line. Drainage Map DP04, Interim Drainage Map, see Appendix, has been completed to show the upstream areas north and east of Filing 2A.

The upstream, undeveloped basins tributary to the site are greater than 100 acres in size. To evaluate these basins, an interim HEC-HMS model has been created to verify that flows traveling to the proposed storm sewer system are less than that of the fully developed conditions.

Sub-basin PINT1 is 119.08 acres in size of largely undeveloped land. The area currently drains to a local unimproved tributary channel. The interim conditions at the site will accept flows in a 48" RCP storm sewer. The peak runoff rates from this basin have been calculated as Q(5)=8.5 cfs and Q(100)=86.4 cfs. These peak runoff rates are less than the fully developed conditions. The storm sewer system has been designed for the fully developed conditions. The fully developed conditions at design point 4 have been calculated as Q(5)=54.9 cfs and Q(100)=211.2 cfs.

Sub-basin PINT 2 is 127.12 acres in size consisting of undeveloped land. Peak runoff rates for the interim conditions have been calculated as Q(5)=8.3 cfs and Q(100)=80.6 cfs. Runoff will be directed to a 36" FES at the intersection of Grand Lawn Circle and Briargate Parkway. The flared end section is being constructed as part of the improvements for Filing 1. The future developed flows at this point have been calculated as Q(5)=50.4 cfs and Q(100)=133.2 cfs. The storm sewer system has been designed to accommodate the fully developed conditions.

The interim conditions for the site will generate less flow than the fully developed conditions. The storm sewer system has been previously sized for the future conditions. The storm sewer will be able to accommodate off site flows during the interim conditions.

D. Water Quality

The City of Colorado Springs is working with the Environmental Protection Agency to implement Phase II of the water quality standards for new developments. The development of this site will consider the impacts of stormwater quality of runoff exiting the site during construction and upon completion of the improvements.

During the construction phase, temporary Best Management Practices, as specified within Volume II of the Colorado Springs Drainage Criteria Manual will be implemented to prevent sediment transport. These temporary measures may include, and not be limited to, silt fence, straw bale check dams, vehicle tracking control devices, mulching, reseeding, soil roughening, temporary sedimentation ponds, and inlet protection. A detailed erosion control plan will be completed as part of the construction documents. In addition, a Construction Activities Stormwater Management Plan (SWMP) has been prepared, submitted, and approved by the Colorado Department of Public Health and Environment.

Long-term water quality will be achieved for Filing 2A within an existing regional water quality/detention pond located southeast of the intersection of Powers Boulevard and Briargate Parkway. The detention pond has been previously planned and sized within the MDDP prepared by Matrix Design Group, Inc. to accommodate the development of Filing 2A. Per the approved MDDP, the total Water Quality Capture Volume (WQCV) for the area tributary to the pond is 5.0 ac-ft of storage. The WQCV has been designed as an Extended Detention Basin that will be "dry", requiring a 40-hour drain time to treat the "initial flush" of stormwater. The WQCV has been increased 20% to allow for sediment deposition and maintenance considerations. This volume is independent of the volume required for detention at the site.

E. Cost Estimate

All proposed drainage facilities within Filing 2A will be constructed by the developer and publicly owned and maintained by the City of Colorado Springs. An engineer's estimate for construction costs of the stormwater facilities is provided for all proposed improvements associated with the development of Filing 2A. All of Filing 2A is located within the Pine Creek Drainage Basin.

The ***Pine Creek Drainage Basin*** is a closed fee basin. No drainage fees are required, however all public improvements constructed by the developer are not eligible for reimbursement.

Table 4.3
Engineer's Estimate of Probable Construction Costs
Cordera Filing 2A - Pine Creek Drainage Basin
Non-Reimbursable Public Improvements

Item	Unit	Quantity	Unit Cost	Extension
Storm Manhole	EA	9	$3,000.00	$27,000.00
18" RCP	LF	300	$30.00	$9,000.00
24" RCP	LF	200	$35.00	$7,000.00
36" RCP	LF	50	$55.00	$2,750.00
48" RCP	LF	800	$80.00	$64,000.00
60" RCP	LF	1500	$135.00	$202,500.00
72" RCP	LF	750	$170.00	$127,500.00
10' D10R Inlet	EA	3	$3,600.00	$10,800.00
15' D10R Inlet	EA	2	$4,500.00	$9,000.00
20' D10R Inlet	EA	1	$5,500.00	$5,500.00
24" Flared End Section	EA	1	$500.00	$500.00
36" Flared End Section	EA	1	$750.00	$750.00
48" Flared End Section	EA	1	$1,200.00	$1,200.00
			Sub-Total	$467,500.00
			15% Contingencies & Engineering	$46,750.00
			Grand Total	***$514,250.00***

Since the engineer has no control over the cost of labor, materials, equipment or services furnished by others, or over the contactor's method of determining prices, or over the competitive bidding or market conditions, the opinion of probable construction costs provided herein are made on the basis of the engineer's experience and qualifications and represents the best judgment as an experienced and qualified professional familiar with the construction industry. The engineer cannot, and does not guarantee that proposals, bid or actual construction costs will not vary from the opinion of probable costs.

F. Drainage and Bridge Fees

Cordera Filing No. 2A has not been previously platted and is located entirely within the Pine Creek Drainage Basin. The Pine Creek Drainage Basin is a closed basin, meaning that ***no drainage, bridge, or pond fees are assessed to property to be platted***, however all public stormwater improvements constructed by the owner/developer within the basin are not reimbursable. Filing 2A has historically had 39.091 acres of land tributary to the Pine Creek Drainage Basin. As shown in Section D, Cost Estimate, the Engineer's Opinion of Probable Construction Costs are ***$514,250.00***. This cost includes the entire stormwater infrastructure within the limits of Filing 2A. The construction cost estimate for the storm sewer within Briargate Parkway as well as the proposed detention pond has been previously included within the Final Drainage Report for Cordera Filing 1.

V. REFERENCES

1. ***Amendment No. 1 to Pine Creek Drainage Planning Study as Approved by City Council 12/18/88 & as Approved by El Paso County Commissioner 8/25/88***, Obering Wurth & Associates, Revised July 29, 1992.

2. ***Amendment No. 2 to Pine Creek Drainage Basin Planning Study and Master Development Drainage Plan for Pine Creek Subdivision (Portion Contributing to Pine Creek)***, JR Engineering, October 1998.

3. ***Amendment No. 3 to Pine Creek Drainage Basin Planning Study***, JR Engineering, March 2003.

4. ***City of Colorado Springs & El Paso County Drainage Criteria Manual***, City of Colorado Springs, latest edition.

5. ***City of Colorado Springs Drainage Criteria Manual, Volume 2,*** City of Colorado Springs, November 1, 2002.

6. ***Colorado Department of Transportation, Powers Boulevard Design Plans***, URS Consultants, September 2002.

7. ***Cottonwood Creek Drainage Basin Planning Study, City of Colorado Springs and El Paso County***, URS Consultants, June 9, 1994.

8. ***Cottonwood Creek Drainage Basin Planning Study, Ayres and Associates***, June 2000.

9. ***Final Drainage Report for Cordera Filing No. 1 and Master Development Drainage Plan for Cordera and Briargate Crossing East, Pine Creek and Cottonwood Creek Basins, DRAFT***, Matrix Design Group, Inc., January 2004.

10. ***Final Drainage Report for Union Boulevard (Briargate Parkway to Powers Boulevard),*** JR Engineering, July 2003.

11. ***Flood Insurance Rate Map for El Paso County, Colorado and Incorporated Areas, Panel 528 of 1300***, Federal Emergency Management Agency, Effective Date March 17, 1997.

12. ***Flood Insurance Rate Map for El Paso County, Colorado and Incorporated Areas, Panel 530 of 1300***, Federal Emergency Management Agency, Effective Date March 17, 1997.

13. ***Master Development Drainage Plan and Final Drainage Report for "Briargate Crossing West Filing No. 1"***, Matrix Design Group, Inc., April 2003.

14. ***Master Development Drainage Plan for Union Boulevard/Briargate Parkway and Preliminary/Final Drainage Report for Portions of Union Boulevard, Briargate Parkway, Family Place, and Austin Bluffs Parkway***, JR Engineering, July 2001.

15. ***Pine Creek Drainage Basin, Drainage Basin Planning Study***, Obering Wurth & Associates, Revised October 1988.

16. ***Preliminary & Final Drainage Report & Plan, Briargate Subdivision Filing No. 53 (Briargate Pumping Station & Reservoir)***, Obering, Wurth & Associates, Revised June 1990.

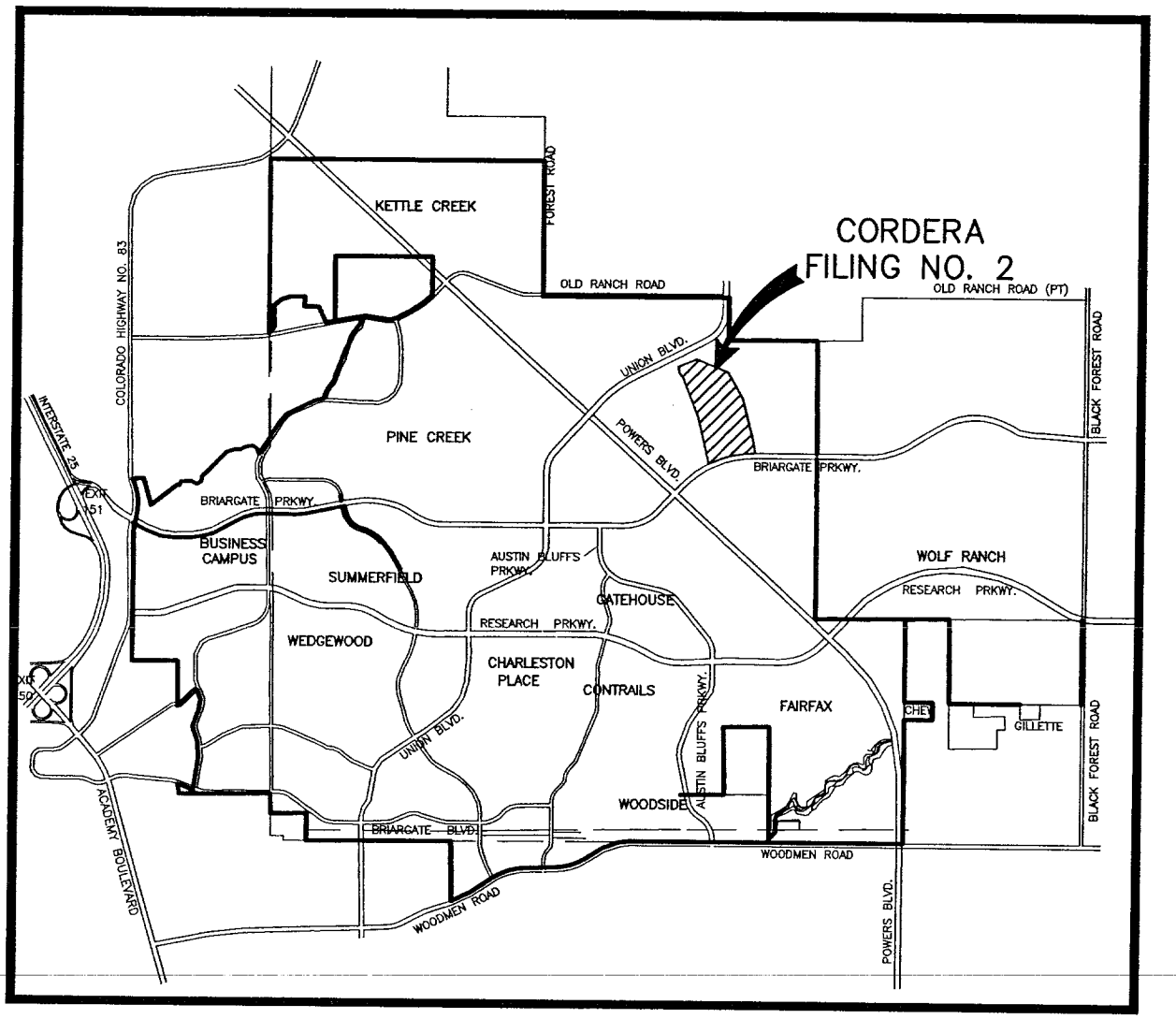
17. ***Soil Survey of El Paso County Area, Colorado***. United States Department of Agriculture Soil Conservation Service, June 1981.

18. ***Letter - Summary of Preliminary Investigation Phase of Fairfax Pond Water Shed Analysis***, JR Engineering, September 16, 2003.

VII. APPENDICIES

APPENDIX A

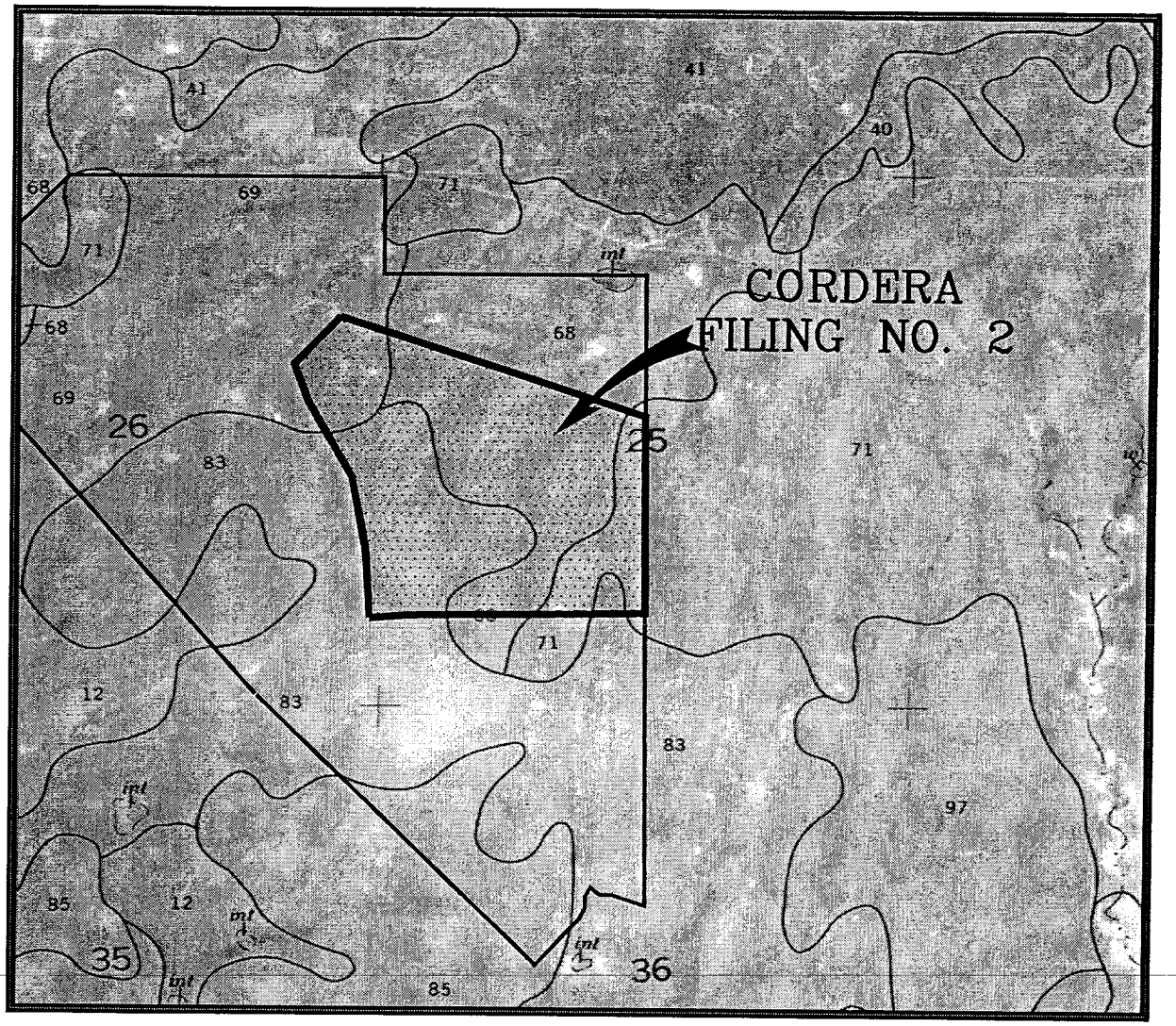
MAPS



VICINITY MAP

NORTH
N.T.S.

Matrix Design Group, Inc.
Integrated Design Solutions
2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208



SOILS MAP

NORTH
N.T.S.

LEGEND

ID	SOIL NAME	HYD. GROUP
12	BRESSER SANDY LOAM	B
68	PEYTON–PRING COMPLEX (3%–8%)	B
69	PEYTON–PRING COMPLEX (8%–15%)	B
71	PRING	B
83	STAPLETON	B
85	STAPLETON–BERNAL COMPLEX	B/D

Matrix Design Group, Inc.
Integrated Design Solutions
2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
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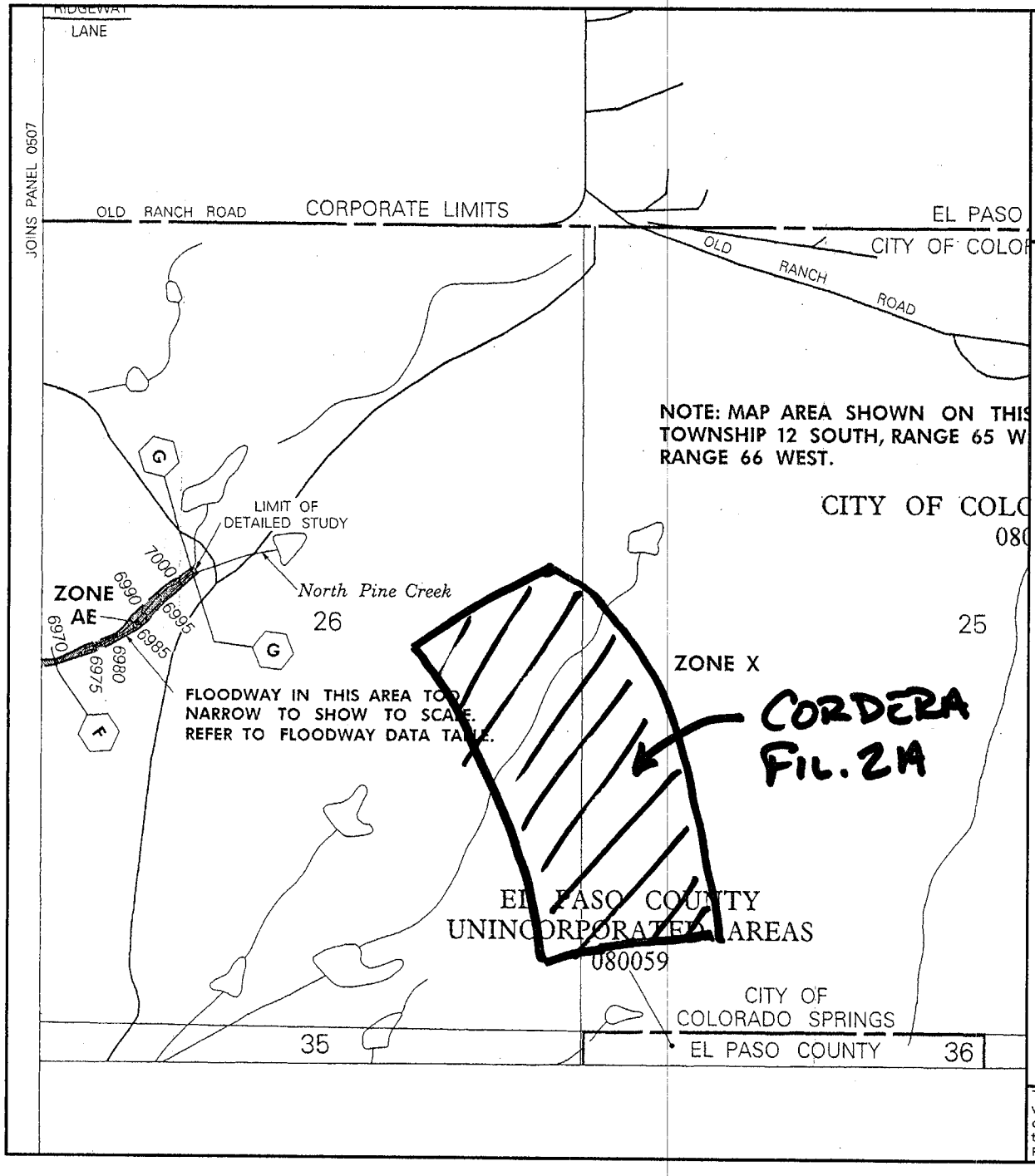


APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 530 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0530	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0530	F

MAP NUMBER
08041C0530 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

APPENDIX B

HYDROLOGIC AND HYDRAULIC CALCULATIONS

Cordera Filing No. 2A Final Drainage Report
Rational Method
Pine Creek Drainage Fee Basin

Sub-Basin Designation	Total Area (ac.)	Weighted Coefficients		CA		Overland Time			Travel Time					Intensity		Peak Runoff			5-Year	100-Year	5-Year	100-Year	
		C(5)	C(100)	CA(5)	CA(100)	Overland Length (ft)	Overland Slope (%)	T(initial) (min.)	Travel Length (ft)	Average Slope (%)	Velocity (fps)	T(travel) (min.)	Final T(c)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)	Inlet Length (ft)	D(max) (ft)	D(max) (ft)	Calculated Depth (ft)	Calculated Depth (ft)	Meets Criteria?
Pine Creek Drainage Basin																							
PF1-A	2.00	0.35	0.45	0.70	0.90	150	2.00%	15.5	475	3.3%	3.5	2.3	17.7	3.20	5.69	2.2	5.1	5	0.67	1.00	0.32	0.55	Yes
PF1-B	6.87	0.35	0.45	2.40	3.09	135	2.00%	14.7	1300	3.2%	3.4	6.4	21.1	2.94	5.22	7.1	16.2	10	0.67	1.00	0.43	0.75	Yes
PF1-C	6.44	0.35	0.45	2.25	2.90	100	2.00%	12.6	850	2.1%	2.8	5.1	17.7	3.20	5.70	7.2	16.5	10	0.67	1.00	0.44	0.76	Yes
PF1-D	4.08	0.35	0.45	1.43	1.84	120	2.00%	13.9	800	3.0%	3.1	4.3	18.2	3.16	5.63	4.5	10.3	5	0.67	1.00	0.51	0.89	Yes
PF1-E	2.81	0.35	0.45	0.98	1.26	125	2.00%	14.1	400	1.5%	2.3	2.9	17.0	3.26	5.81	3.2	7.3	N/A					
Inlet @ PF1-E	(Surface flows combining PF1-E and PF2-C)			3.68	4.50			17.04	600	3.0%	3.1	3.2	20.3	2.99	5.33	11.0	24.0	10	0.67	1.00	0.58	0.98	Yes
PF2-A	5.93	0.50	0.60	2.97	3.56	100	2.00%	12.6	1300	1.7%	2.6	8.3	21.0	2.94	5.24	8.7	18.6	10	0.67	1.00	0.50	0.83	Yes
PF2-B	5.97	0.50	0.60	2.99	3.58	100	2.00%	12.6	1100	2.0%	2.7	6.8	19.4	3.06	5.44	9.1	19.5	N/A					
Inlet @ PF2-B	(Surface flows combining PF2-B and PF2-D)			3.56	4.32			19.4	0				19.4	3.06	5.44	10.9	23.5	10	0.67	1.00	0.58	0.97	Yes
PF2-C	5.40	0.50	0.60	2.70	3.24	100	2.00%	12.6	800	3.0%	3.1	4.3	16.9	3.27	5.82	8.8	18.9	N/A					
PF2-D	1.64	0.35	0.45	0.57	0.74	100	2.00%	12.6	400	3.0%	3.1	2.2	14.8	3.48	6.20	2.0	4.6	N/A					
PF3-A (Hist)	28.84	0.25	0.35	7.21	10.09	100	3.00%	11.1	1850	2.5%	3.1	9.9	21.0	2.94	5.23	21.2	52.8	36" FES					
PF3-A (Dev)	28.84	0.50	0.60	14.42	17.30	150	2.00%	15.5	1850	2.5%	3.1	9.9	25.4	2.66	4.73	38.3	81.8	Future Ext.					
PF3-B	4.84	0.50	0.60	2.42	2.90	105	2.00%	13.0	650	2.5%	3.4	3.2	16.1	3.35	5.96	8.1	17.3	N/A					
PF3-C	1.77	0.70	0.80	1.24	1.42	35	1.00%	9.4	1400	2.2%	3.0	7.8	17.2	3.25	5.78	4.0	8.2	5	0.67	1.00	0.47	0.76	Yes
PF3-D	6.42	0.50	0.60	3.21	3.85	35	2.00%	7.5	3000	1.5%	2.4	20.8	28.3	2.50	4.46	8.0	17.2	10	0.67	1.00	0.47	0.78	Yes
PF4-A	19.47	0.37	0.47	7.20	9.15	175	2.00%	16.7	2200	1.6%	2.4	15.3	32.0	2.33	4.15	16.8	38.0	20	0.67	1.00	0.49	0.84	Yes
PF4-B	1.35	0.50	0.60	0.68	0.81	50	2.00%	8.9	750	3.5%	3.7	3.4	12.3	3.77	6.72	2.5	5.4	Grated Inlets					
PF4-C	2.64	0.70	0.80	1.85	2.11	35	2.00%	7.5	1300	2.5%	3.4	6.4	13.9	3.59	6.39	6.6	13.5	10	0.67	1.00	0.42	0.67	Yes
PF6-A	5.71	0.35	0.45	2.00	2.57	125	3.00%	12.4	800	4.5%	4.1	3.3	15.6	3.40	6.05	6.8	15.5	10	0.67	1.00	0.42	0.73	Yes
PF6-B	4.91	0.35	0.45	1.72	2.21	125	3.00%	12.4	800	4.5%	4.1	3.3	15.6	3.40	6.05	5.8	13.4	10	0.67	1.00	0.38	0.66	Yes
PF6-C	10.65	0.35	0.45	3.73	4.79	150	3.00%	13.5	1600	3.0%	3.4	7.8	21.4	2.91	5.18	10.9	24.8	15	0.67	1.00	0.44	0.76	Yes
PF7-A	5.44	0.50	0.60	2.72	3.26	170	3.00%	14.4	800	3.3%	3.5	3.8	18.2	3.16	5.62	8.6	18.3	10	0.67	1.00	0.49	0.82	Yes
PF7-B	8.11	0.35	0.45	2.84	3.65	100	3.00%	11.1	850	3.0%	3.0	4.7	15.8	3.38	6.02	9.6	22.0	36"/18" FES					
PF7-C	3.15	0.35	0.45	1.10	1.42	150	3.00%	13.5	900	3.5%	3.7	4.1	17.6	3.21	5.72	3.5	8.1	5	0.67	1.00	0.43	0.75	Yes
PF7-D	3.87	0.50	0.60	1.94	2.32	100	2.00%	12.6	600	2.5%	3.4	2.9	15.6	3.40	6.06	6.6	14.1	10	0.67	1.00	0.41	0.68	Yes
PF8-A	10.10	0.50	0.60	5.05	6.06	150	2.75%	13.9	1800	4.0%	4.1	7.3	21.3	2.92	5.20	14.8	31.5	15	0.67	1.00	0.54	0.90	Yes
PF8-B	3.55	0.50	0.60	1.78	2.13	130	2.00%	14.4	350	1.5%	2.3	2.5	17.0	3.27	5.82	5.8	12.4	10	0.67	1.00	0.38	0.63	Yes
PF8-C	1.48	0.50	0.60	0.74	0.89	125	2.00%	14.1	150	1.5%	2.3	1.1	15.2	3.44	6.12	2.5	5.4	5	0.67	1.00	0.35	0.58	Yes
PF8-D	7.40	0.35	0.45	2.59	3.33	150	3.00%	13.5	980	3.1%	3.1	5.3	18.8	3.11	5.53	8.0	18.4	10	0.67	1.00	0.47	0.82	Yes
PF8-E	1.37	0.35	0.45	0.48	0.62	125	2.00%	14.1	125	2.0%	2.8	0.7	14.9	3.47	6.19	1.7	3.8	N/A					
PF8-F	3.56	0.35	0.45	1.25	1.60	125	2.00%	14.1	300	3.0%	3.0	1.7	15.8	3.38	6.02	4.2	9.6	18" FES					
PF8-G	1.62	0.35	0.45	0.57	0.73	125	2.00%	14.1	750	3.0%	3.5	3.6	17.7	3.20	5.70	1.8	4.2	N/A					
Inlet @ PF8-E	(Surface flows combining PF8-E and PF8-G)			1.05	1.35			17.7	200	3.5%	3.7	0.9	18.6	3.12	5.56	3.3	7.5	5	0.67	1.00	0.41	0.71	Yes
PF9-A	4.31	0.50	0.60	2.16	2.59	135	2.00%	14.7	755	4.1%	4.1	3.1	17.8	3.20	5.69	6.9	14.7	10	0.67	1.00	0.43	0.71	Yes
PF9-B	5.10	0.50	0.60	2.55	3.06	135	2.00%	14.7	765	4.2%	4.2	3.0	17.7	3.20	5.70	8.2	17.4	10	0.67	1.00	0.48	0.79	Yes
PF9-C	11.81	0.38	0.48	4.49	5.61	150	2.00%	15.5	1175	2.0%	2.5	7.8	23.3	2.78	4.95	12.5	27.8	15	0.67	1.00	0.47	0.80	Yes

Cordera Filing No. 1 Final Drainage Report
Cordera & Briargate Crossing East Master Development Drainage Plan

HEC-HMS Input parameters - Pine Creek
Historic Conditions
Curve Number Calculations

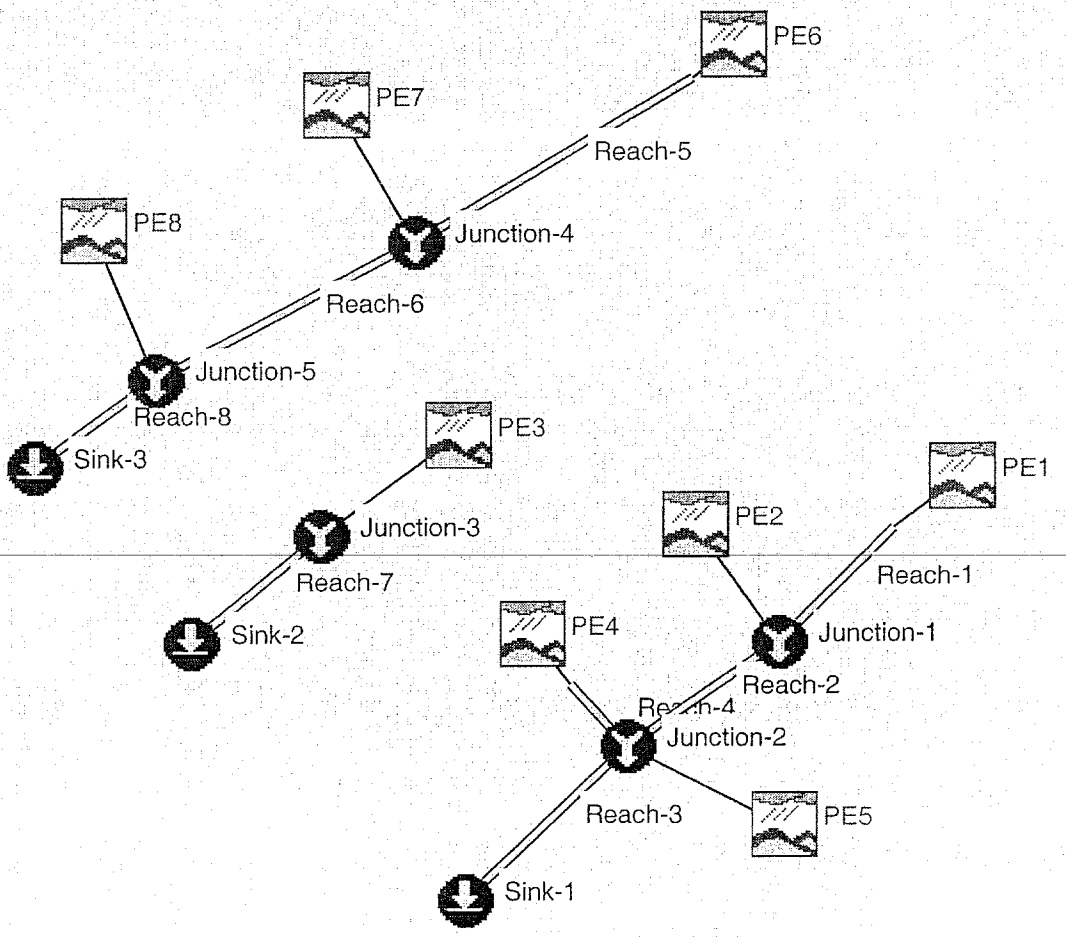
Basin ID	Total Area (ac)	Total Area (sq. mi.)	Residential			Parks/Open Space (ac)	Pavement/ Roof (ac)	Commercial (ac)	Schools (ac)	Weighted CN	Percent Impervious
			1 acre lots (ac)	1/4 acre lots (ac)	1/8 acre lots (ac)						
PE1	32.97	0.052	0.0	0.0	0.0	33.0	0.0	0.0	0.0	61.0	0%
PE2	110.91	0.173	0.0	0.0	0.0	110.0	0.9	0.0	0.0	61.3	1%
PE3	47.41	0.074	0.0	0.0	0.0	47.4	0.0	0.0	0.0	61.0	0%
PE4	139.46	0.218	0.0	0.0	0.0	139.5	0.0	0.0	0.0	61.0	0%
PE5	111.99	0.175	0.0	0.0	0.0	111.0	1.0	0.0	0.0	61.3	1%
PE6	123.76	0.193	30.0	0.0	0.0	93.8	0.0	0.0	0.0	62.7	5%
PE7	121.98	0.191	0.0	0.0	0.0	122.0	0.0	0.0	0.0	61.0	0%
PE8	60.21	0.094	0.0	0.0	0.0	60.2	0.0	0.0	0.0	61.0	0%

Land Use		*CN*	*% Imp.*
Residential	1 acre	68	20%
	1/4 Lots	75	38%
	1/8 Lots	85	65%
Parks/Open Space		61	0%
Pavement/Roofs		98	100%
Commercial		92	85%
School		80	52%

Cordera Filing No. 1 Final Drainage Report
Cordera & Briargate Crossing East Master Development Drainage Plan

HEC-HMS Input parameters - Pine Creek
Historic Conditions
Time of Concentration

Basin ID	Overland Time			Travel Time				Concentrated Flow					
	Length (ft)	Slope (ft/ft)	T(initial) (min)	Length (ft)	Weighted Slope (%)	Velocity (fps)	T(shallow flow) (min)	Length (ft)	Weighted Slope (%)	Velocity (fps)	T(travel) (min)	T(conc.) (min)	Lag Time (min)
PE1	300	4.0%	17.4	3000	6.0%	3.7	13.6	0	0.0%	0.0	0	31.0	18.6
PE2	300	4.0%	17.4	2000	6.0%	3.7	9.0	1800	5.0%	5.0	6.0	32.5	19.5
PE3	300	3.0%	19.2	2700	3.3%	2.6	17.6	0	0.0%	0.0	0	36.7	22.0
PE4	300	5.0%	16.2	3500	4.9%	3.2	18.0	2400	4.0%	5.0	8.0	42.2	25.3
PE5	300	4.0%	17.4	1800	5.5%	3.5	8.6	500	5.0%	5.0	1.7	27.7	16.6
PE6	300	5.0%	16.2	4400	6.0%	3.7	19.9	700	3.0%	5.0	2.3	38.4	23.0
PE7	300	4.0%	17.4	2600	4.6%	3.1	13.8	2500	3.0%	5.0	8.3	39.6	23.8
PE8	300	4.0%	17.4	2400	4.4%	3.0	13.2	1400	2.5%	5.0	4.7	35.3	21.2


PE6
PE7
Reach-5
PE8
Junction-4
Reach-6
Junction-5
Reach-8
Sink-3
PE3
PE1
PE2
Junction-3
Reach-1
Reach-7
Sink-2
PE4
Junction-1
Reach-2
Junction-2
Reach-3
PE5
Sink-1

HMS * Summary of Results

Project : Pine Creek Run Name : Run 5

Start of Run : 01Jan00 0000 Basin Model : PC-Historic
End of Run : 02Jan00 0000 Met. Model : 5-YR
Execution Time : 29Jan04 1207 Control Specs : Control 1

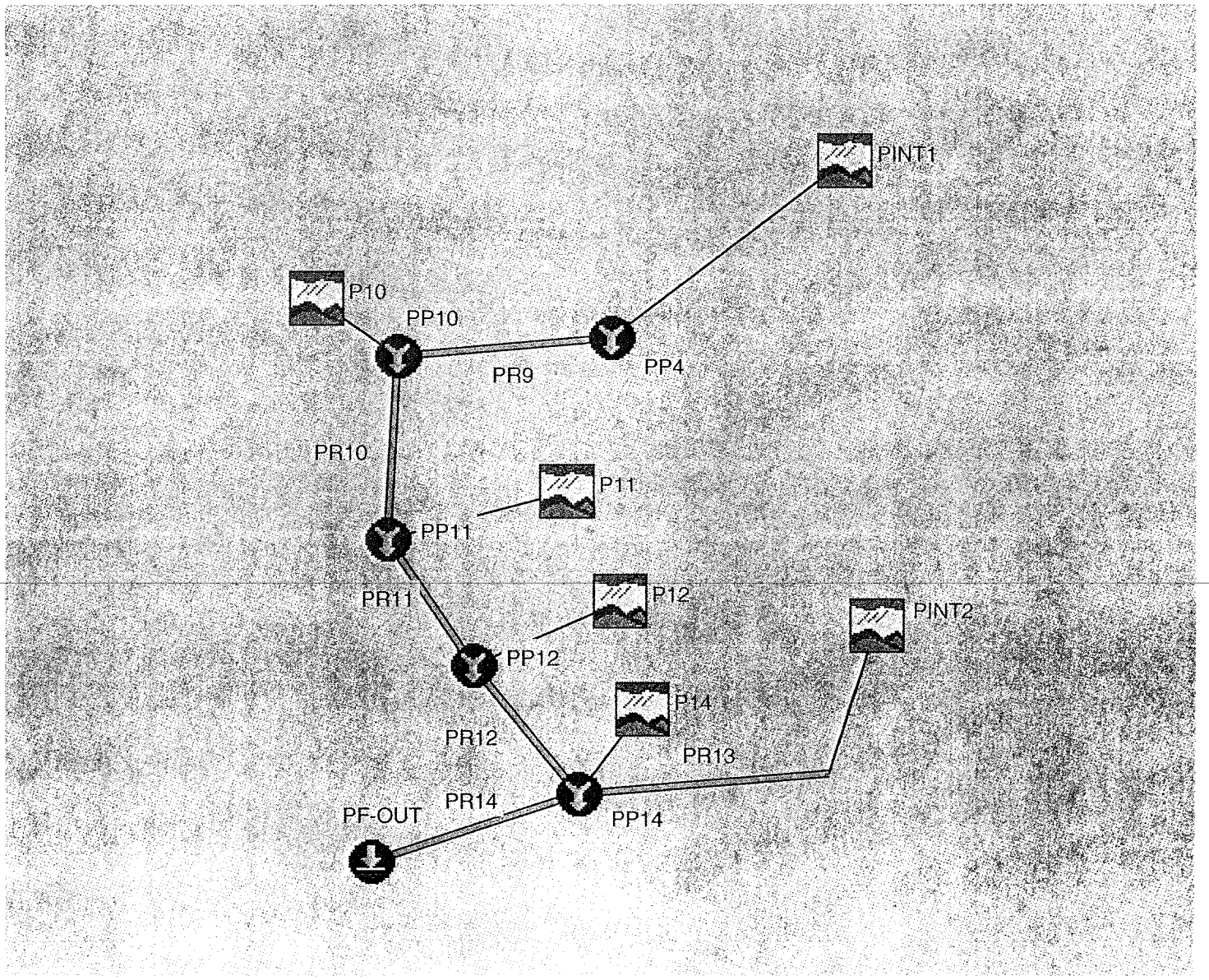
Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PE4	53.046	01 Jan 00 0618	6.0036	0.218
Reach-4	52.915	01 Jan 00 0624	5.9685	0.218
PE1	15.555	01 Jan 00 0612	1.4341	0.052
Reach-1	15.357	01 Jan 00 0626	1.4188	0.052
PE2	50.169	01 Jan 00 0612	4.7703	0.173
Junction-1	56.555	01 Jan 00 0618	6.1891	0.225
Reach-2	56.171	01 Jan 00 0622	6.1673	0.225
PE5	56.042	01 Jan 00 0610	4.8285	0.175
Junction-2	145.11	01 Jan 00 0620	16.964	0.618
Reach-3	145.08	01 Jan 00 0620	16.964	0.618
Sink-1	145.08	01 Jan 00 0620	16.964	0.618
PE6	53.243	01 Jan 00 0616	5.6116	0.193
Reach-5	52.871	01 Jan 00 0620	5.5808	0.193
PE7	48.490	01 Jan 00 0616	5.2617	0.191
Junction-4	100.54	01 Jan 00 0618	10.842	0.384
Reach-6	100.26	01 Jan 00 0622	10.791	0.384
PE8	25.854	01 Jan 00 0614	2.5910	0.094
Junction-5	122.86	01 Jan 00 0620	13.382	0.478
Reach-8	122.57	01 Jan 00 0622	13.379	0.478
Sink-3	122.57	01 Jan 00 0622	13.379	0.478
PE3	19.793	01 Jan 00 0614	2.0394	0.074
Junction-3	19.793	01 Jan 00 0614	2.0394	0.074
Reach-7	19.780	01 Jan 00 0616	2.0394	0.074
Sink-2	19.780	01 Jan 00 0616	2.0394	0.074

HMS * Summary of Results

Project : Pine Creek Run Name : Run 6

Start of Run : 01Jan00 0000 Basin Model : PC-Historic
End of Run : 02Jan00 0000 Met. Model : 100-YR
Execution Time : 29Jan04 1206 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PE4	185.81	01 Jan 00 0616	19.268	0.218
Reach-4	185.55	01 Jan 00 0620	19.211	0.218
PE1	53.663	01 Jan 00 0610	4.6018	0.052
Reach-1	53.350	01 Jan 00 0620	4.5653	0.052
PE2	173.88	01 Jan 00 0612	15.307	0.173
Junction-1	218.73	01 Jan 00 0614	19.873	0.225
Reach-2	217.95	01 Jan 00 0616	19.839	0.225
PE5	191.55	01 Jan 00 0610	15.493	0.175
Junction-2	560.41	01 Jan 00 0614	54.543	0.618
Reach-3	560.16	01 Jan 00 0614	54.542	0.618
Sink-1	560.16	01 Jan 00 0614	54.542	0.618
PE6	183.91	01 Jan 00 0614	17.814	0.193
Reach-5	183.48	01 Jan 00 0618	17.759	0.193
PE7	169.75	01 Jan 00 0616	16.887	0.191
Junction-4	352.36	01 Jan 00 0616	34.646	0.384
Reach-6	352.06	01 Jan 00 0618	34.575	0.384
PE8	89.715	01 Jan 00 0614	8.3147	0.094
Junction-5	436.37	01 Jan 00 0618	42.890	0.478
Reach-8	436.10	01 Jan 00 0618	42.886	0.478
Sink-3	436.10	01 Jan 00 0618	42.886	0.478
PE3	69.177	01 Jan 00 0614	6.5447	0.074
Junction-3	69.177	01 Jan 00 0614	6.5447	0.074
Reach-7	69.158	01 Jan 00 0614	6.5447	0.074
Sink-2	69.158	01 Jan 00 0614	6.5447	0.074


PINT1
P10
PP10
PR9
PP4
PR10
P11
PP11
PR11
P12
PINT2
PP12
P14
PR12
PR13
PR14
PF-OUT
PP14

HMS * Summary of Results

Project : Filing 2A Run Name : Run 3

Start of Run : 01Jan00 0000 Basin Model : Filing 2A Int
End of Run : 02Jan00 0000 Met. Model : 5-YR
Execution Time : 22Nov05 1910 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PINT1	8.5278	01 Jan 00 0626	2.0542	0.199
PP4	8.5278	01 Jan 00 0626	2.0542	0.199
PR9	8.5098	01 Jan 00 0628	2.0534	0.199
P10	9.5845	01 Jan 00 0608	0.75596	0.024
PP10	13.165	01 Jan 00 0614	2.8094	0.222
PR10	13.150	01 Jan 00 0616	2.8081	0.222
P11	9.3834	01 Jan 00 0606	0.64031	0.018
PP11	20.017	01 Jan 00 0608	3.4485	0.241
PR11	19.952	01 Jan 00 0610	3.4478	0.241
P12	7.0699	01 Jan 00 0606	0.50864	0.015
PP12	26.679	01 Jan 00 0608	3.9565	0.256
PR12	26.447	01 Jan 00 0610	3.9556	0.256
PINT2	8.3393	01 Jan 00 0628	1.9922	0.186
PR13	8.3295	01 Jan 00 0628	1.9913	0.186
P14	10.639	01 Jan 00 0610	1.0008	0.037
PP14	40.181	01 Jan 00 0610	6.9477	0.478
PR14	40.171	01 Jan 00 0612	6.9467	0.478
PF-OUT	40.171	01 Jan 00 0612	6.9467	0.478

HMS * Summary of Results

Project : Filing 2A Run Name : Run 4

Start of Run : 01Jan00 0000 Basin Model : Filing 2A Int
End of Run : 02Jan00 0000 Met. Model : 100-YR
Execution Time : 22Nov05 1907 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PINT1	86.441	01 Jan 00 0620	10.777	0.199
PP4	86.441	01 Jan 00 0620	10.777	0.199
PR9	86.125	01 Jan 00 0620	10.775	0.199
P10	33.758	01 Jan 00 0606	2.3713	0.024
PP10	103.02	01 Jan 00 0616	13.147	0.222
PR10	102.98	01 Jan 00 0618	13.143	0.222
P11	30.762	01 Jan 00 0604	1.9425	0.018
PP11	115.37	01 Jan 00 0614	15.086	0.241
PR11	115.19	01 Jan 00 0614	15.085	0.241
P12	23.253	01 Jan 00 0606	1.5431	0.015
PP12	131.41	01 Jan 00 0612	16.628	0.256
PR12	131.38	01 Jan 00 0612	16.626	0.256
PINT2	80.627	01 Jan 00 0622	10.270	0.186
PR13	80.612	01 Jan 00 0622	10.268	0.186
P14	42.447	01 Jan 00 0610	3.3516	0.037
PP14	237.44	01 Jan 00 0614	30.246	0.478
PR14	237.06	01 Jan 00 0616	30.244	0.478
PF-OUT	237.06	01 Jan 00 0616	30.244	0.478

Cordera Filing No. 2 Final Drainage Report

HEC-HMS Input parameters - Pine Creek and Cottonwood Creek
Developed Conditions
Curve Number Calculations

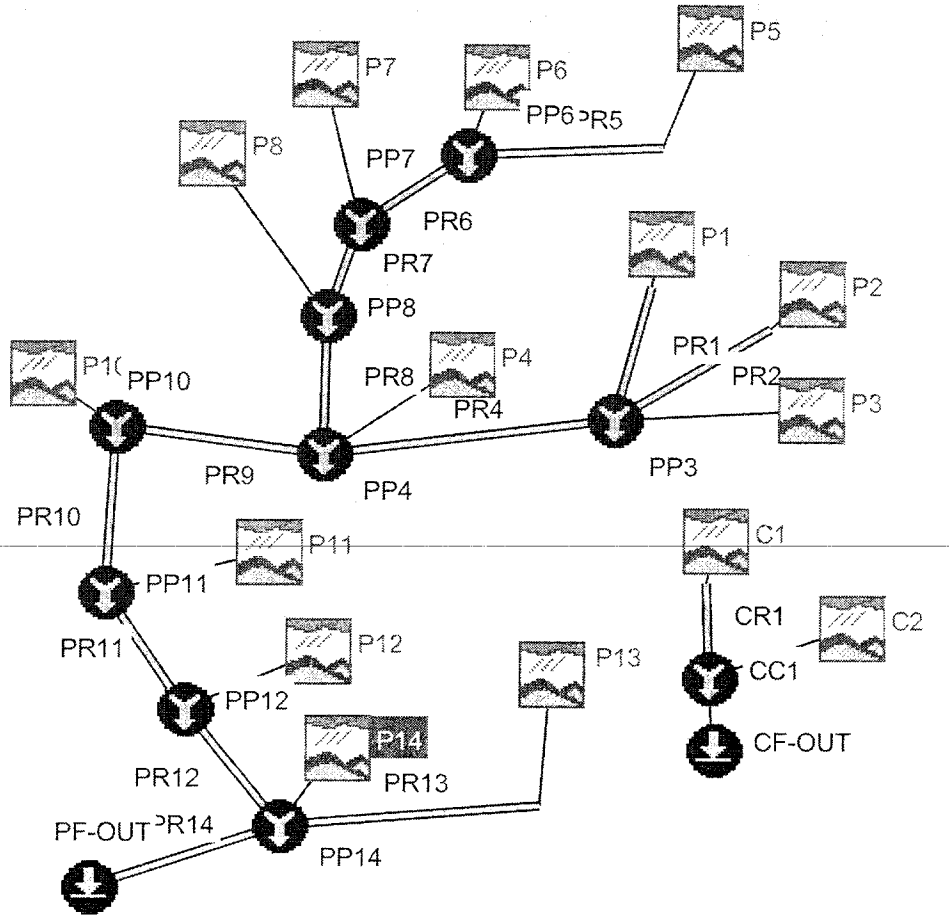
Basin ID	Total Area (ac)	Total Area (sq. mi.)	Residential		Parks (ac)	Commercial (ac)	Schools (ac)	Weighted CN
			1/2 acre lots	1/4 acre lots				
C1	10.91	0.0170		10.91				75.0
C2	19.82	0.0310		19.82				75.0
P1	8.87	0.0139	6.87	2.00				71.1
P2	10.52	0.0164	10.52					70.0
P3	9.85	0.0154	4.45	5.40				72.7
P4	20.89	0.0326		20.89				75.0
P5	15.56	0.0243	15.56					70.0
P6	5.71	0.0089	5.71					70.0
P7	10.55	0.0165	10.55					70.0
P8	18.53	0.0290	13.29	5.24				71.4
P9	N/A							
P10	15.14	0.0237	3.56	11.58				73.8
P11	11.81	0.0185		11.81				75.0
P12	9.41	0.0147		9.41				75.0
P13	41.89	0.0655				6.61	35.28	81.9
P14	23.46	0.0367			20.82	2.64		64.5

Land Use		*CN*	*% Imp.*
Residential	1/2 acre	70	30%
	1/4 acre	75	38%
Parks		61	0%
Open Space		61	0%
Commercial		92	85%
Schools		80	52%

Cordera Filing No. 2 Final Drainage Report

HEC-HMS Input Parameters - Pine Creek and Cottonwood Creek
Developed Conditions
Curve Number Calculations

	Overland Time			Travel Time				Concentrated Flow				
Basin ID	Length (ft)	Slope (%)	T(initial) (min)	Length (ft)	Weighted Slope (%)	Velocity (fps)	T(shallow flow) (min)	Length (ft)	Velocity (fps)	T(travel) (min)	T(conc) (min)	Lag Time (min)
C1	150	2.0%	15.5	1000	2.0%	3.5	4.8	475	5.0	1.6	21.8	13.1
C2	100	2.0%	12.6	1140	1.3%	2.3	8.3	910	5.0	3.0	23.9	14.4
P1	150	3.2%	13.3	1300	3.2%	3.4	6.4	150	5.0	0.5	20.1	12.1
P2	200	4.0%	14.2	780	4.7%	4.5	2.9	380	5.0	1.3	18.4	11.0
P3	50	2.0%	8.9	850	3.9%	4.8	3.0	50	5.0	0.2	12.1	7.2
P4	120	3.5%	11.5	1100	2.0%	3.5	5.2	1550	5.0	5.2	21.9	13.2
P5	150	4.0%	12.3	1600	3.1%	3.4	7.8	350	5.0	1.2	21.3	12.8
P6	125	3.5%	11.8	780	4.6%	4.3	3.0	100	5.0	0.3	15.1	9.1
P7	150	4.5%	11.9	980	3.1%	3.1	5.3	50	5.0	0.2	17.3	10.4
P8	185	4.0%	13.7	1350	3.9%	4.1	5.5	50	5.0	0.2	19.3	11.6
P9	N/A											
P10	200	3.5%	14.9	1750	4.3%	4.3	6.8	50	5.0	0.2	21.8	13.1
P11	55	2.0%	9.4	1180	2.0%	2.7	7.3	100	5.0	0.3	17.0	10.2
P12	135	2.0%	14.7	765	4.2%	4.2	3.0	420	5.0	1.4	19.1	11.5
P13	100	3.0%	11.1	1820	2.5%	3.4	8.9	100	5.0	0.3	20.3	12.2
P14	160	2.0%	16.0	1500	1.6%	2.4	10.4	50	5.0	0.2	26.6	15.9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PP6
R5
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P2
PP8
PR1
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PP10
PR8
PR2
P3
PR4
PR9
PP4
PP3
PR10
C1
P11
PP11
CR1
C2
PR11
P12
P13
CC1
PP12
P14
CF-OUT
PR12
PR13
PF-OUT
PR14
PP14

HMS * Summary of Results

Project : Filing 2 Run Name : Run 1

Start of Run : 01Jan00 0000 Basin Model : Filing 2 Dev
End of Run : 02Jan00 0000 Met. Model : 5-YR
Execution Time : 05Apr05 2022 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
C1	7.6133	01 Jan 00 0608	0.58800	0.017
CR1	7.5386	01 Jan 00 0608	0.58803	0.017
C2	13.104	01 Jan 00 0608	1.0719	0.031
CC1	20.643	01 Jan 00 0608	1.6599	0.048
CF-OUT	20.643	01 Jan 00 0608	1.6599	0.048
P5	6.8953	01 Jan 00 0608	0.58792	0.024
PR5	6.8319	01 Jan 00 0608	0.58791	0.024
P6	3.0397	01 Jan 00 0604	0.21555	0.009
PP6	9.5765	01 Jan 00 0608	0.80346	0.033
PR6	9.5586	01 Jan 00 0608	0.80345	0.033
P7	5.3008	01 Jan 00 0606	0.39947	0.017
PP7	14.651	01 Jan 00 0608	1.2029	0.050
PR7	14.648	01 Jan 00 0608	1.2029	0.050
P8	10.117	01 Jan 00 0606	0.78821	0.029
PP8	24.722	01 Jan 00 0608	1.9911	0.079
PR8	24.672	01 Jan 00 0608	1.9911	0.079
P1	4.5596	01 Jan 00 0608	0.36566	0.014
PR1	4.5348	01 Jan 00 0608	0.36560	0.014
P2	5.0869	01 Jan 00 0606	0.39698	0.016
PR2	5.0496	01 Jan 00 0608	0.39686	0.016
P3	7.4600	01 Jan 00 0604	0.45561	0.015
PP3	15.859	01 Jan 00 0606	1.2181	0.046
PR4	15.773	01 Jan 00 0606	1.2181	0.046
P4	14.544	01 Jan 00 0608	1.1275	0.033
PP4	54.940	01 Jan 00 0608	4.3367	0.157
PR9	54.613	01 Jan 00 0608	4.3361	0.157
P10	9.5845	01 Jan 00 0608	0.75596	0.024
PP10	64.197	01 Jan 00 0608	5.0921	0.181
PR10	63.703	01 Jan 00 0610	5.0913	0.181
P11	9.3834	01 Jan 00 0606	0.64031	0.018
PP11	71.412	01 Jan 00 0610	5.7316	0.199
PR11	71.330	01 Jan 00 0610	5.7315	0.199
P12	7.0699	01 Jan 00 0606	0.50864	0.015
PP12	77.682	01 Jan 00 0610	6.2401	0.214
PR12	77.449	01 Jan 00 0610	6.2397	0.214
P13	50.448	01 Jan 00 0606	3.4610	0.066
PR13	49.905	01 Jan 00 0606	3.4604	0.066
P14	4.3275	01 Jan 00 0612	0.55216	0.037
PP14	128.78	01 Jan 00 0608	10.252	0.316
PR14	128.69	01 Jan 00 0610	10.252	0.316
PF-OUT	128.69	01 Jan 00 0610	10.252	0.316

HMS * Summary of Results

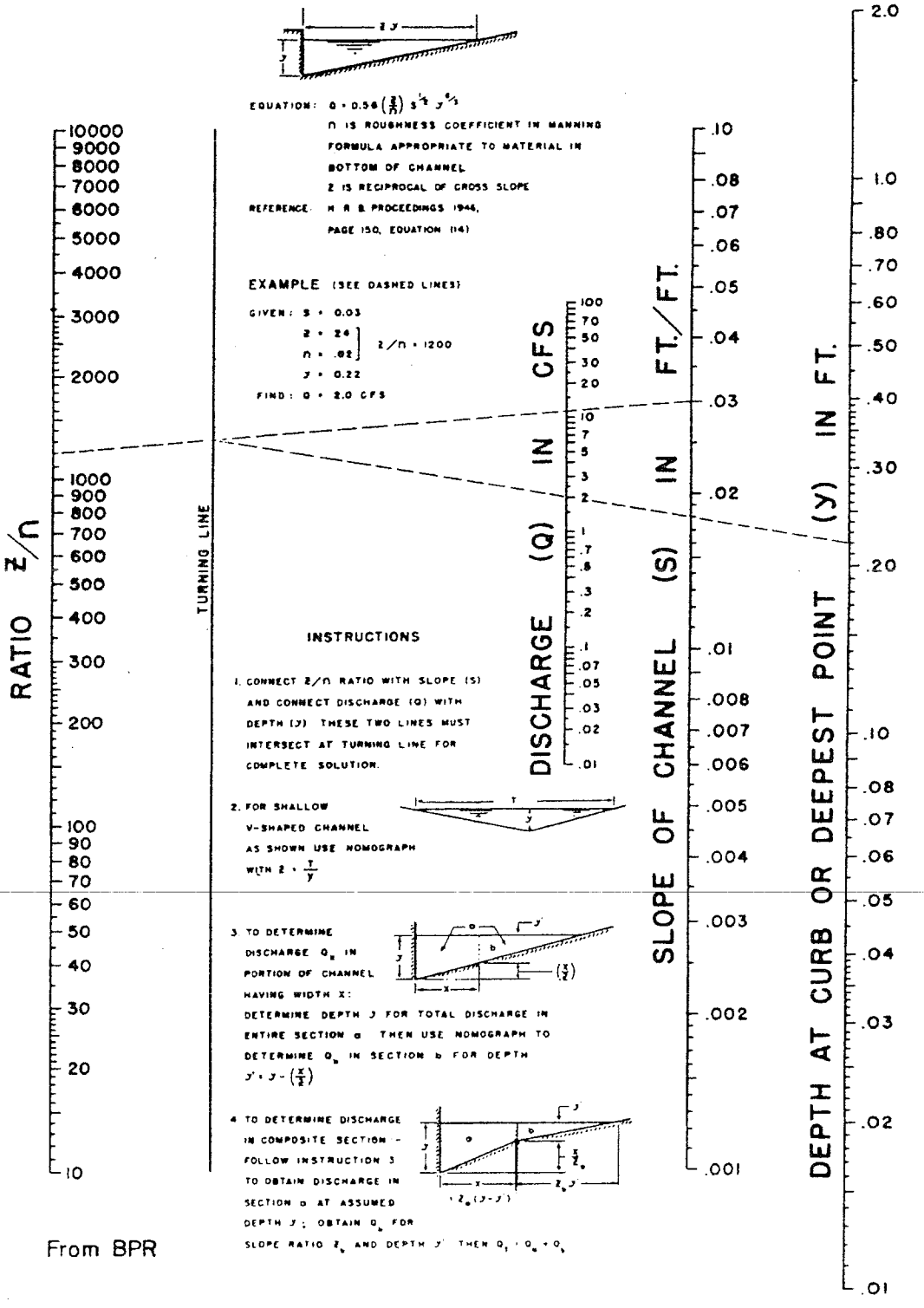
Project : Filing 2 Run Name : Run 2

Start of Run : 01Jan00 0000 Basin Model : Filing 2 Dev
End of Run : 02Jan00 0000 Met. Model : 100-YR
Execution Time : 05Apr05 2020 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
C1	25.569	01 Jan 00 0606	1.7840	0.017
CR1	25.352	01 Jan 00 0608	1.7837	0.017
C2	44.539	01 Jan 00 0608	3.2524	0.031
CC1	69.892	01 Jan 00 0608	5.0361	0.048
CF-OUT	69.892	01 Jan 00 0608	5.0361	0.048
P5	29.090	01 Jan 00 0606	2.0726	0.024
PR5	28.892	01 Jan 00 0606	2.0727	0.024
P6	12.330	01 Jan 00 0604	0.75968	0.009
PP6	40.604	01 Jan 00 0606	2.8324	0.033
PR6	40.503	01 Jan 00 0606	2.8325	0.033
P7	21.628	01 Jan 00 0604	1.4080	0.017
PP7	61.924	01 Jan 00 0606	4.2405	0.050
PR7	61.803	01 Jan 00 0606	4.2407	0.050
P8	39.372	01 Jan 00 0606	2.6556	0.029
PP8	101.17	01 Jan 00 0606	6.8962	0.079
PR8	100.83	01 Jan 00 0606	6.8964	0.079
P1	18.097	01 Jan 00 0606	1.2437	0.014
PR1	17.955	01 Jan 00 0606	1.2436	0.014
P2	20.981	01 Jan 00 0606	1.3993	0.016
PR2	20.931	01 Jan 00 0606	1.3992	0.016
P3	25.799	01 Jan 00 0602	1.4750	0.015
PP3	62.543	01 Jan 00 0604	4.1178	0.046
PR4	61.527	01 Jan 00 0606	4.1175	0.046
P4	48.849	01 Jan 00 0606	3.4210	0.033
PP4	211.21	01 Jan 00 0606	14.435	0.157
PR9	210.02	01 Jan 00 0606	14.435	0.157
P10	33.758	01 Jan 00 0606	2.3713	0.024
PP10	243.78	01 Jan 00 0606	16.806	0.181
PR10	241.75	01 Jan 00 0608	16.802	0.181
P11	30.762	01 Jan 00 0604	1.9425	0.018
PP11	269.78	01 Jan 00 0606	18.744	0.199
PR11	269.18	01 Jan 00 0608	18.745	0.199
P12	23.253	01 Jan 00 0606	1.5431	0.015
PP12	291.25	01 Jan 00 0608	20.288	0.214
PR12	291.09	01 Jan 00 0608	20.288	0.214
P13	133.24	01 Jan 00 0604	8.8623	0.066
PR13	133.04	01 Jan 00 0606	8.8614	0.066
P14	28.439	01 Jan 00 0610	2.4115	0.037
PP14	448.08	01 Jan 00 0608	31.561	0.316
PR14	447.80	01 Jan 00 0608	31.562	0.316
PF-OUT	447.80	01 Jan 00 0608	31.562	0.316

APPENDIX C

STANDARD DESIGN CHARTS AND TABLES



From BPR

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

HDR Infrastructure, Inc.
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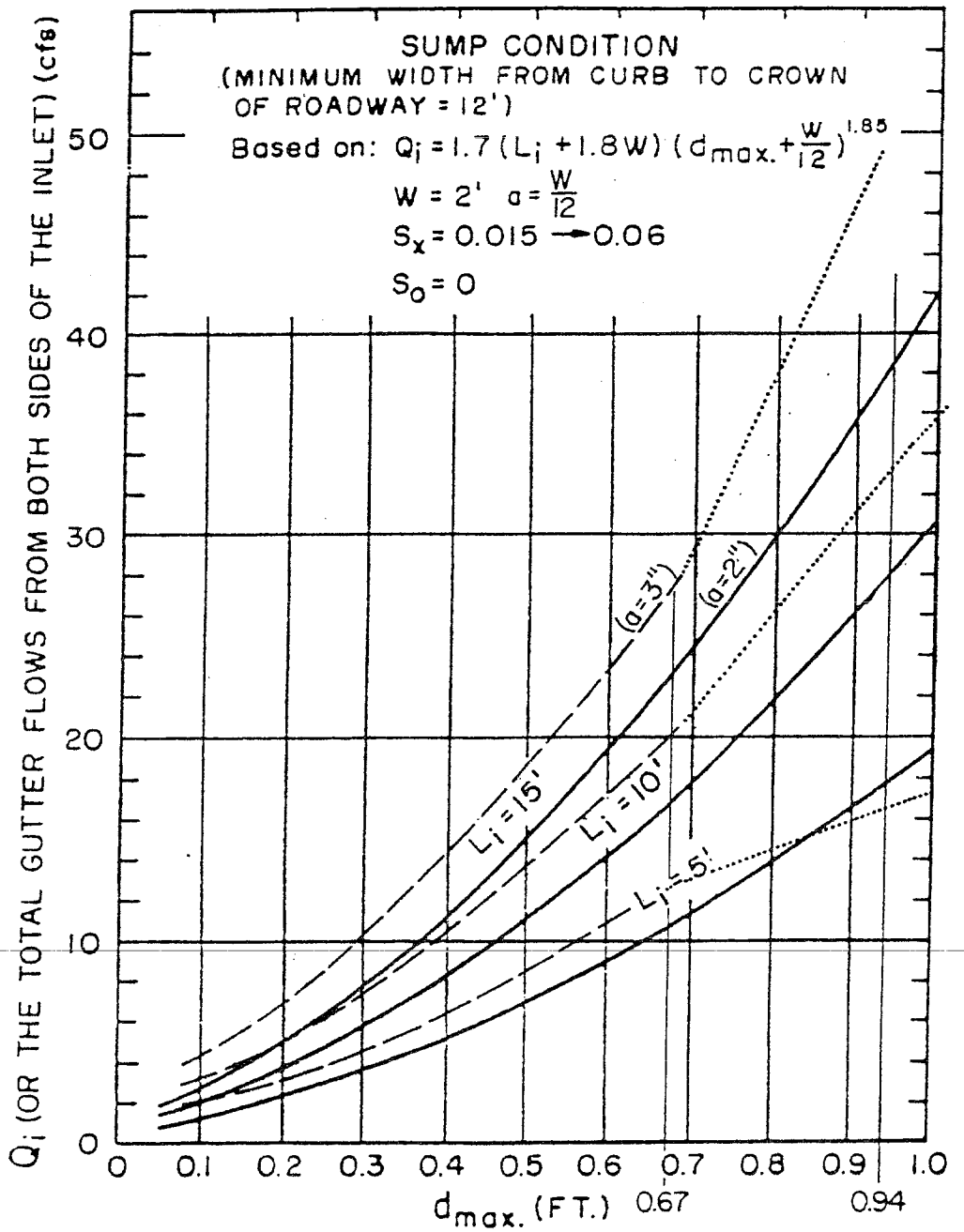
Drainage Criteria Manual

NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

Date: OCT. 1987

Figure: T - 2



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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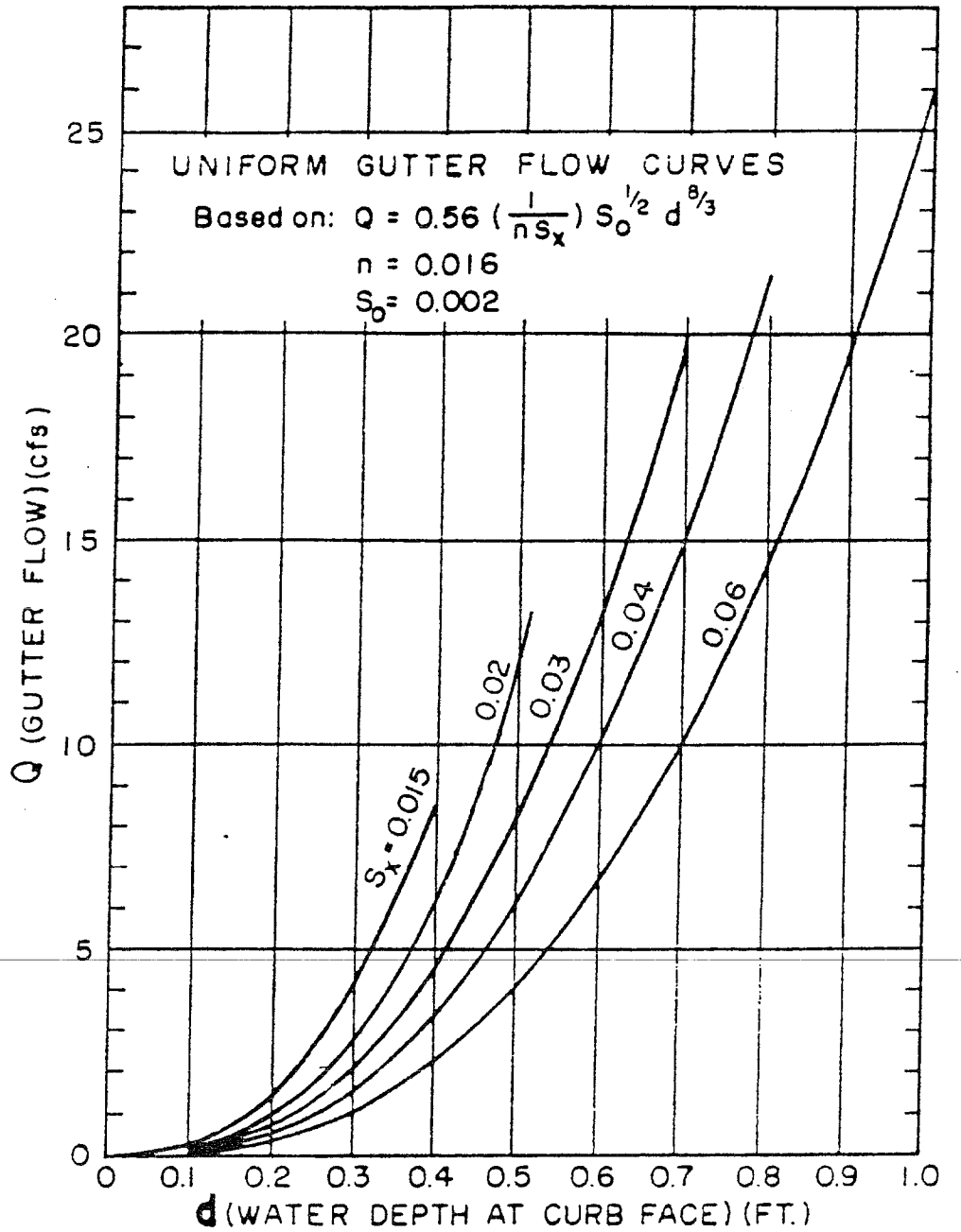
Date: OCT. 1987

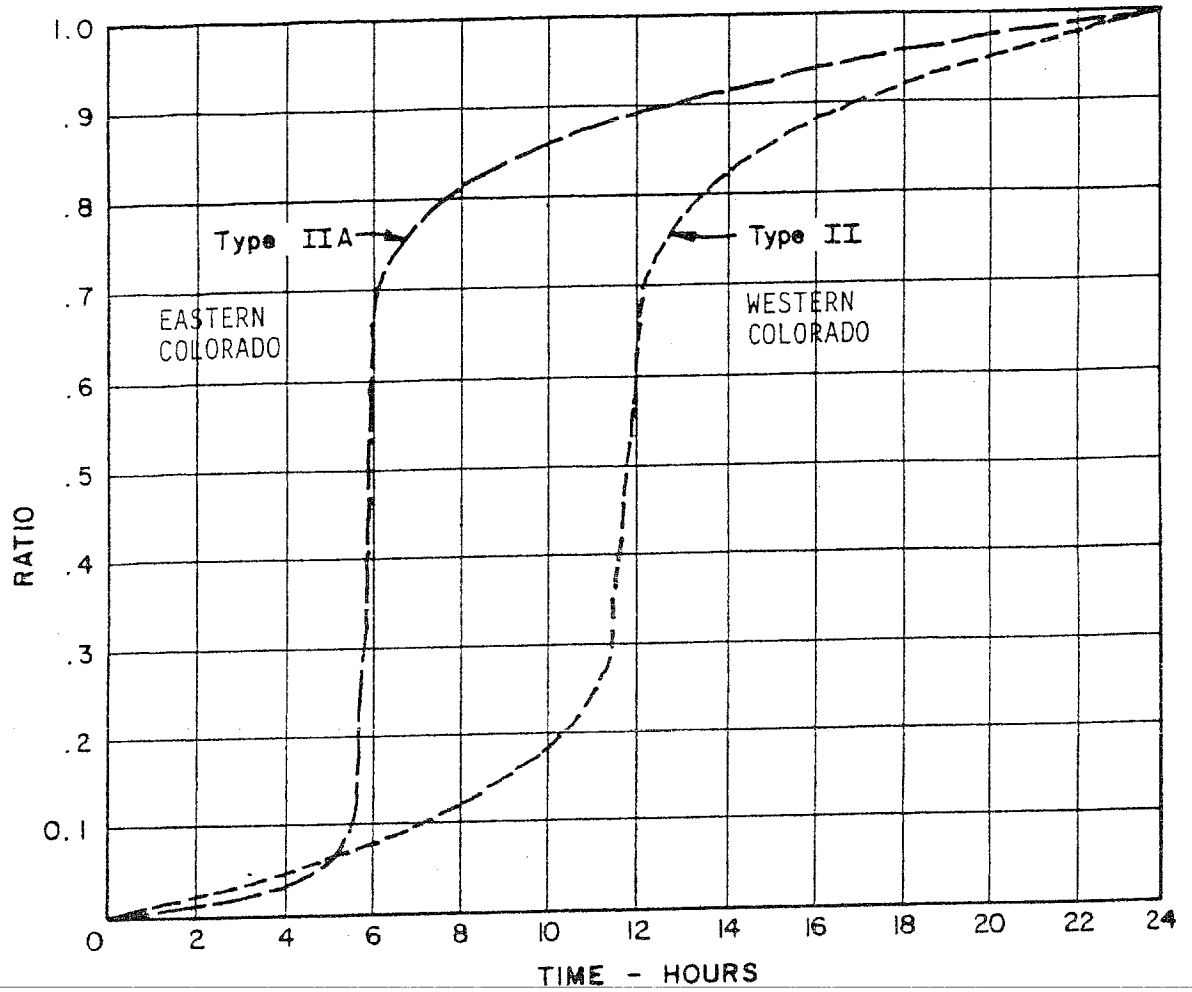
Figure: 7-11

Sump Capacity for Curb-opening Inlets



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

Uniform Gutter Flow Curves



RE: SCS

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Drainage Criteria Manual

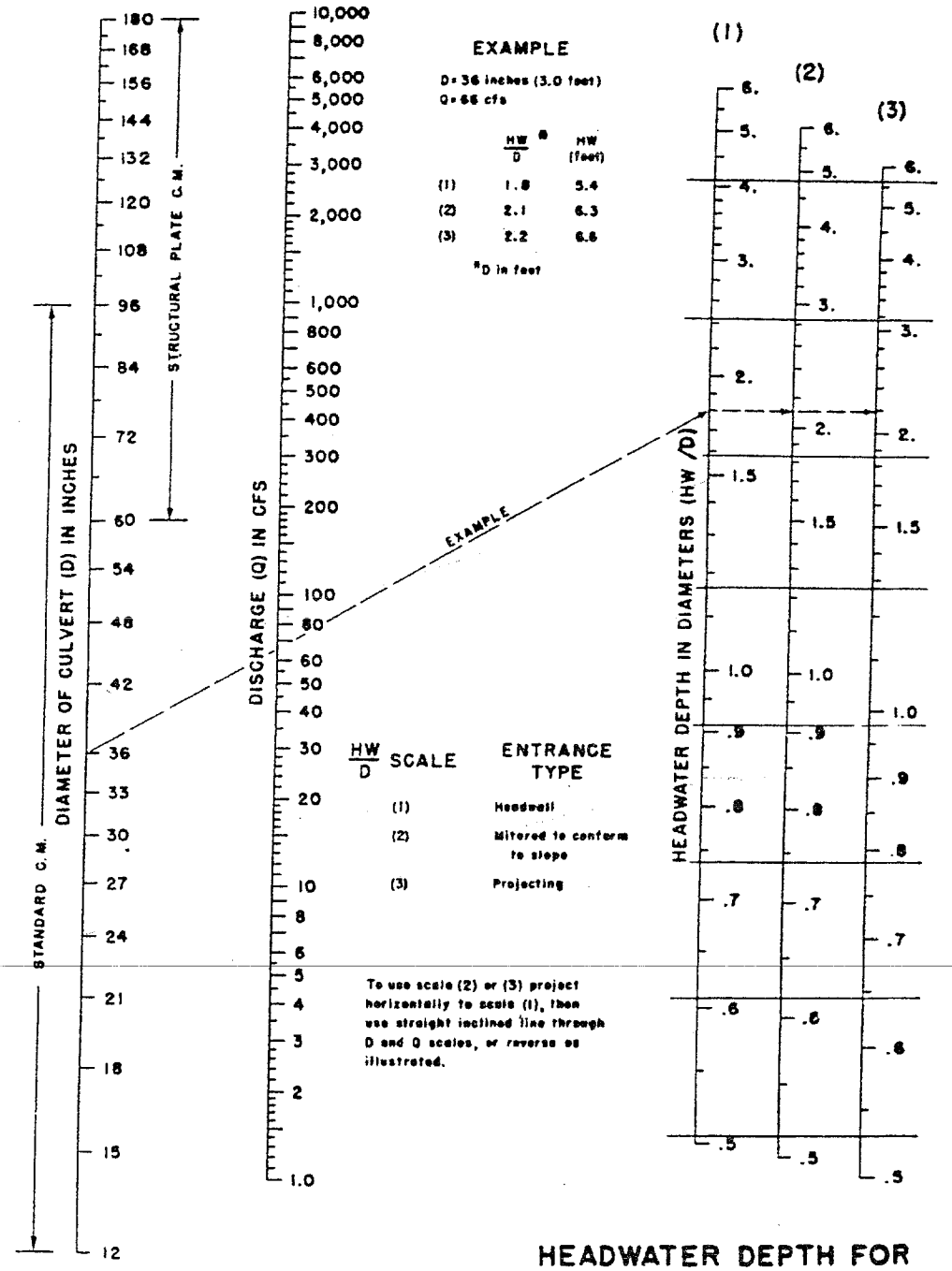
24 HOUR RAINFALL DISTRIBUTIONS

Date
OCT. 1987

Figure
5-5b

TABLE 5-3
STANDARD SCS 24-HOUR
TYPE IIA CUMULATIVE RAINFALL DISTRIBUTION
FOR TR-20 INPUT

Minute Intervals				Hour
15	30	45	60	
0.0005	0.0015	0.0030	0.0045	1
0.0060	0.0080	0.0100	0.0120	2
0.0143	0.0165	0.0188	0.0210	3
0.0233	0.0255	0.0278	0.0320	4
0.0390	0.0460	0.0530	0.0600	5
0.0750	0.1000	0.4000	0.7000	6
0.7250	0.7500	0.7650	0.7800	7
0.7900	0.8000	0.8100	0.8200	8
0.8250	0.8300	0.8350	0.8400	9
0.8450	0.8500	0.8550	0.8600	10
0.8638	0.8675	0.8713	0.8750	11
0.8788	0.8825	0.8863	0.8900	12
0.8938	0.8975	0.9013	0.9050	13
0.9083	0.9115	0.9148	0.9180	14
0.9210	0.9240	0.9270	0.9300	15
0.9325	0.9350	0.9375	0.9400	16
0.9425	0.9450	0.9475	0.9500	17
0.9525	0.9550	0.9575	0.9600	18
0.9625	0.9650	0.9675	0.9700	19
0.9725	0.9750	0.9775	0.9800	20
0.9813	0.9825	0.9838	0.9850	21
0.9863	0.9875	0.9888	0.9900	22
0.9913	0.9925	0.9938	0.9950	23
0.9963	0.9975	0.9988	1.0000	24



BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

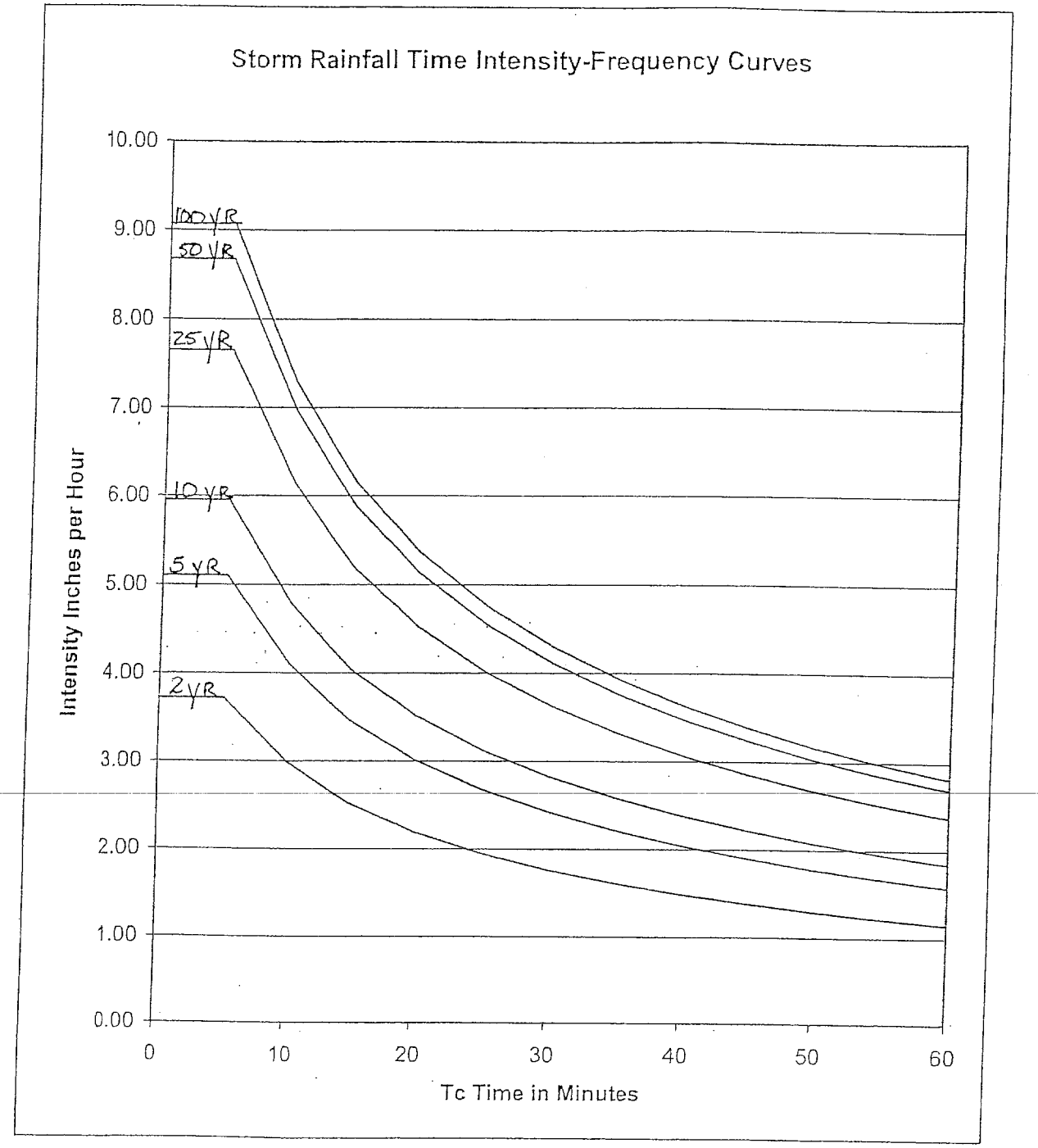
TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

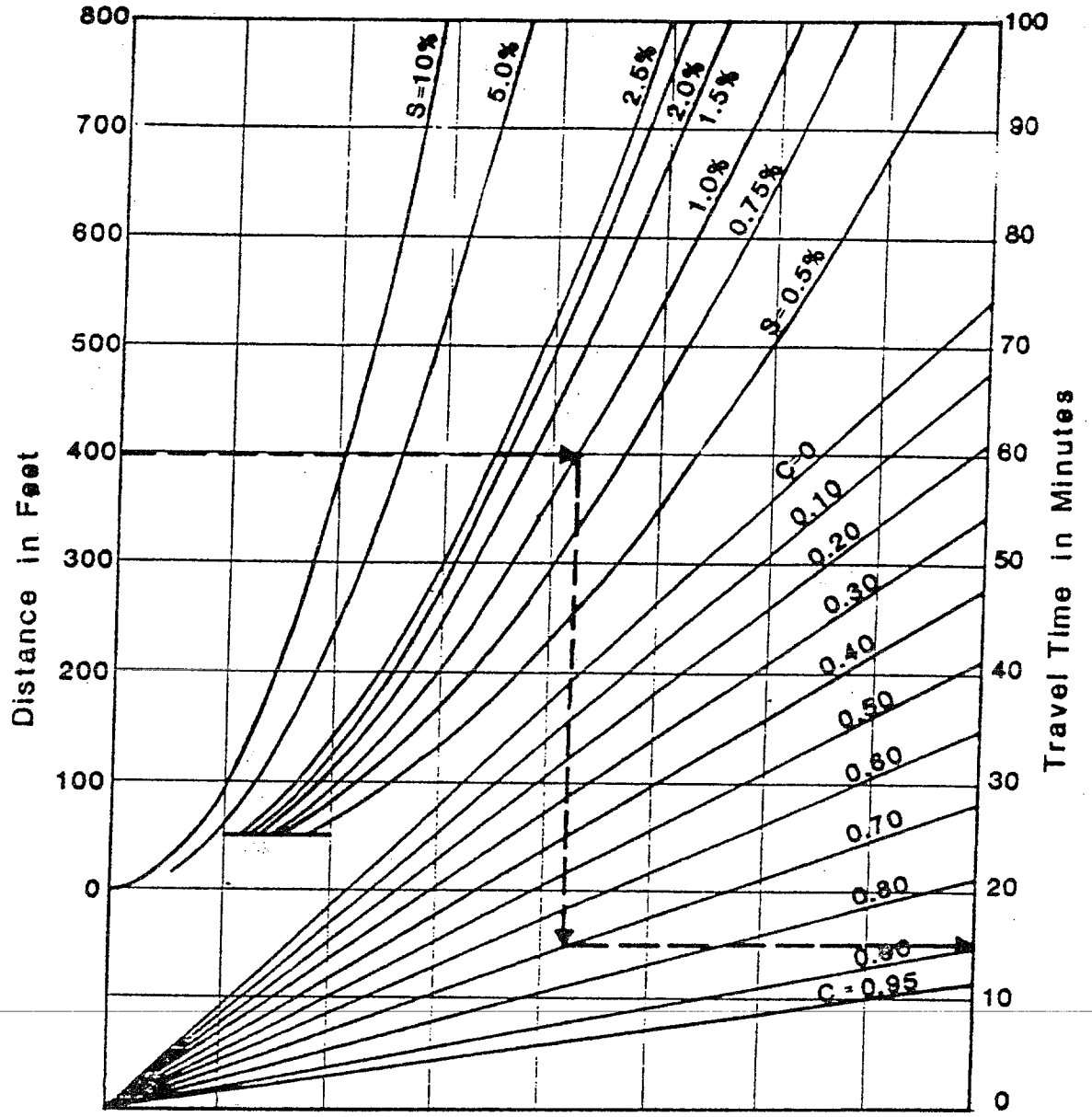
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10 A&B*	10 C&D*	100 A&B*	100 C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	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

9/30/90



Rainfall Depth - Duration - Frequency Table derived from Rainfall Atlas III for Colorado
Resource: Guo, James C.Y., (2001) "Urban Storm Water Modeling", Chapter 5: Runoff Prediction for Small Catchment, published by Auraria Campus Book Company, University of Colorado at Denver, Denver, Colorado.



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

HDR Infrastructure, Inc.
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The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Overland Flow Curves

Date
OCT. 1987

Figure
5-2

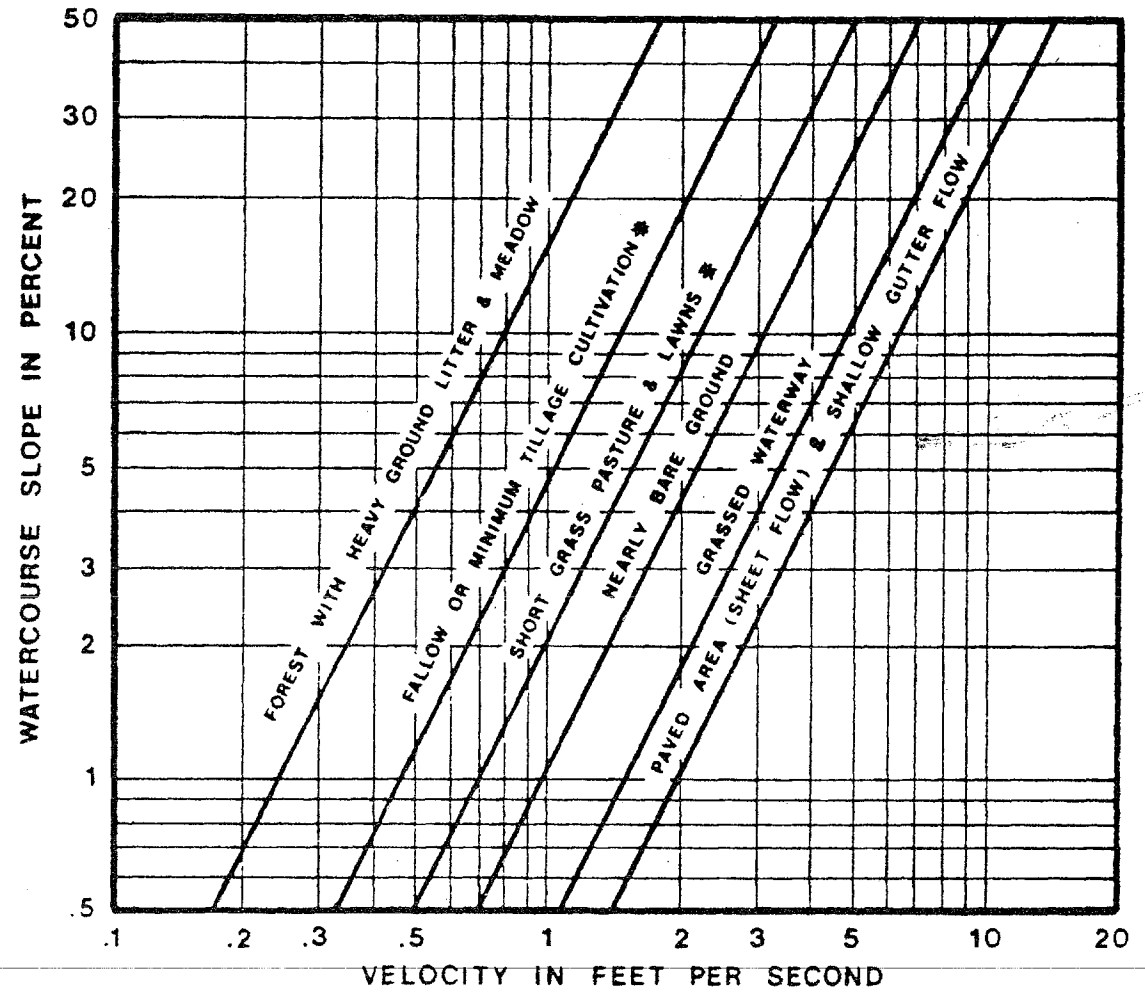
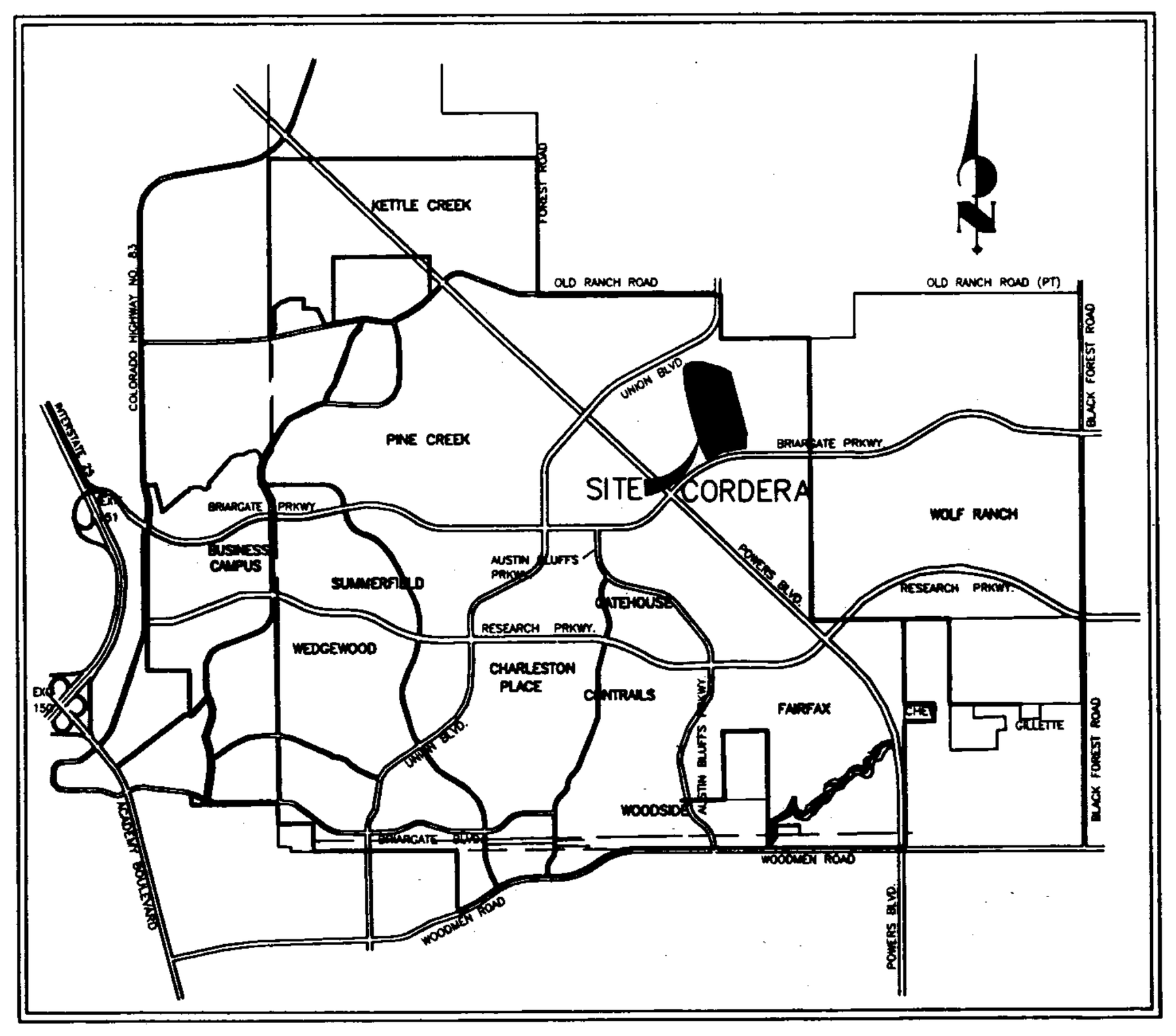


FIGURE RO-1

Estimate of Average Overland Flow Velocity for Use With the Rational Formula



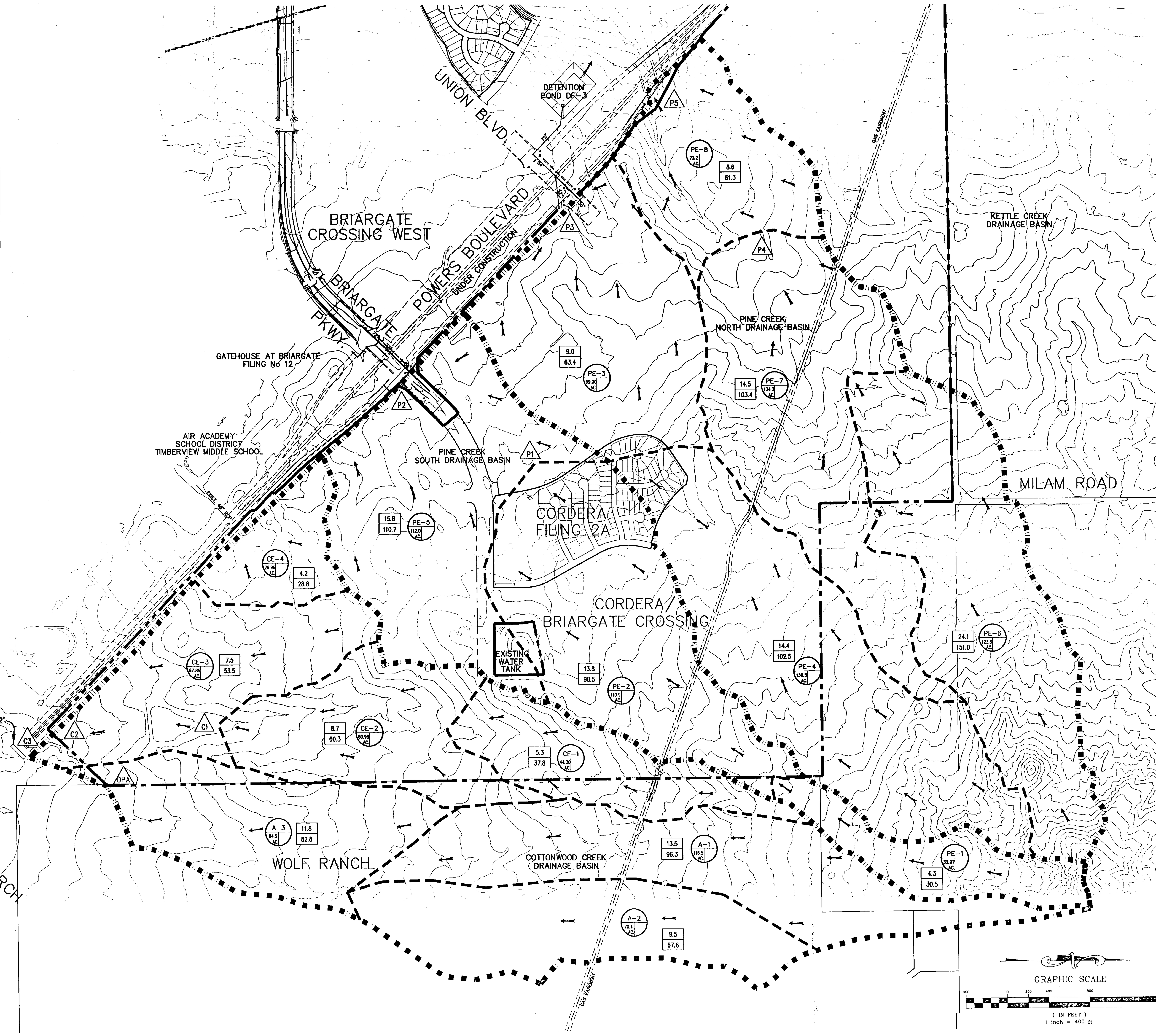
VICINITY MAP:
N.T.S.

SUB-BASIN DATA SUMMARY EXISTING CONDITIONS

BASIN ID	AREA (AC)	PEAK RUNOFF Q(5) (CFS)	Q(100) (CFS)
CE1	44.00	5.3	37.8
CE2	60.99	8.7	60.3
CE3	67.86	7.5	53.5
CE4	26.96	4.2	28.8
A1	116.50	13.5	96.3
A2	70.40	9.5	67.6
A3	84.50	11.8	82.8
PE1	32.97	4.3	30.5
PE2	110.91	13.8	98.5
PE3	99.00	9.0	63.4
PE4	139.46	14.4	102.5
PE5	111.99	15.8	110.7
PE6	123.76	24.1	151.0
PE7	134.33	14.5	103.4
PE8	73.16	8.6	61.3

SUB-BASIN DATA SUMMARY EXISTING CONDITIONS

DESIGN POINT	PEAK RUNOFF Q(5) (CFS)	Q(100) (CFS)
C1	9.8	85.5
C2	16.2	138.0
C3	42.0	362.9
DPA	27.4	225.6
P1	13.9	119.0
P2	34.9	291.0
P3	9.0	63.4
P4	38.0	244.9
P5	45.7	304.2



LEGEND

- FILING LIMITS
- DRAINAGE BASIN BOUNDARY
- 6520 PROPOSED CONTOUR
- 6520 EXISTING CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- DRAINAGE CHANNEL
- PROPOSED TYPE 'R' INLET
- PROPOSED TYPE I OR II MANHOLE
- PROPOSED FLOW DIRECTION ARROW
- DESIGN POINT
- 5-YEAR STORM EVENT PEAK FLOW (CFS)
- 100-YEAR STORM EVENT PEAK FLOW (CFS)
- BASIN DESIGNATION
- "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

2003-07-17stormsewer plan x-powers-fromURS 28715320H wolfcreek x-pinecreek16 x-topo x-base

NAME: S:\04.104.022\dwg\DRAINAGE\DP01ex.dwg
PCP: Matrix.ctb
PLOT DATE: Mar 30, 2006 3:10pm

BENCHMARK DATA(ELEV.) 6975.68
(DATUM) ASSUMED
(DESCRIPTION/LOCATION) THE NW SIDE OF FH #104 AT THE INT. OF BRIARGATE PKWY AND BRAINARD DR

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

Matrix Design Group, Inc.
Integrated Design Solutions 2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208

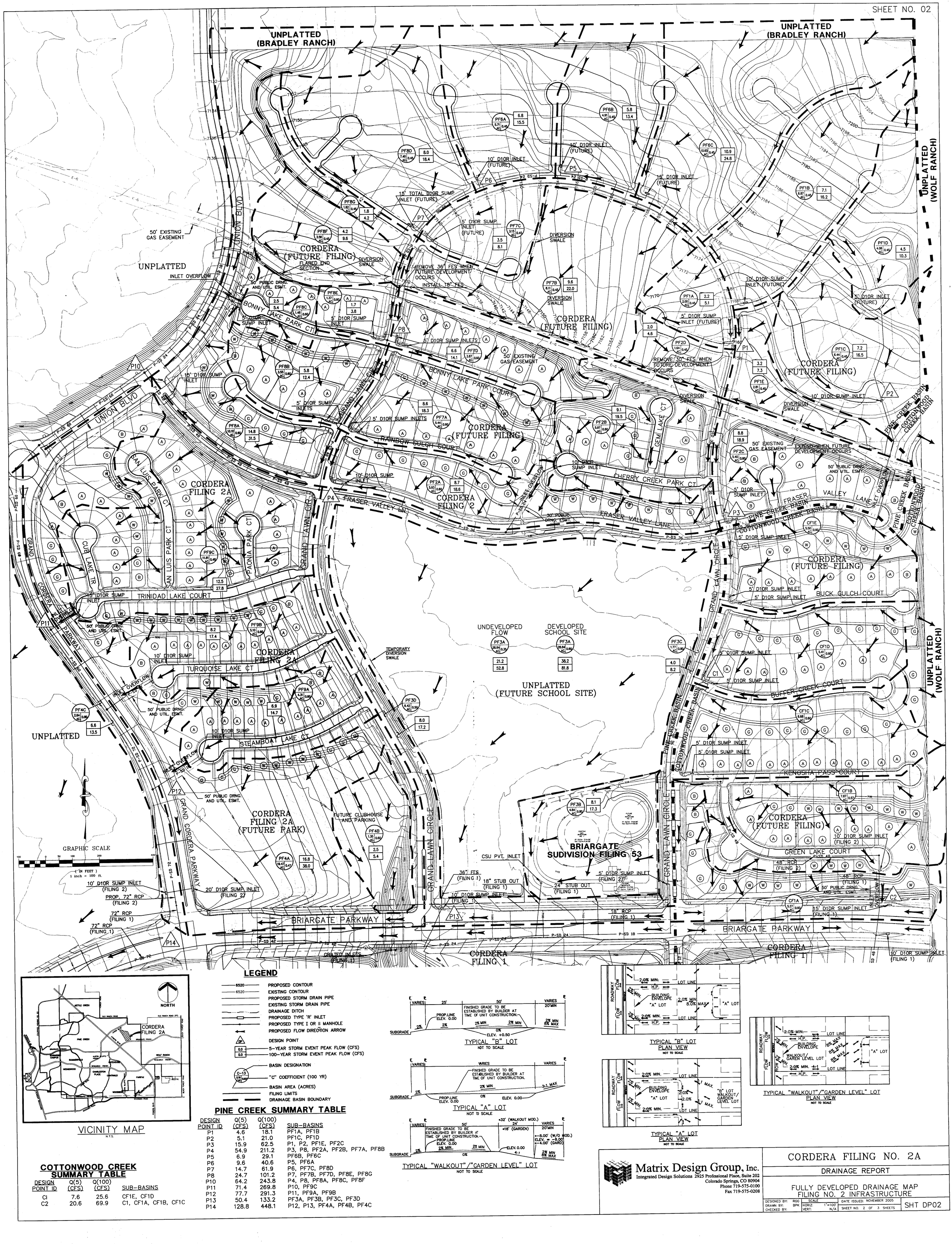
CORDERA FILING NO. 2A

DRAINAGE REPORT

HISTORIC CONDITIONS DRAINAGE MAP

DESIGNED BY: RGG
DRAWN BY: BPK
CHECKED BY:
SCALE HORIZ: 1"=400' VERT: N/A
DATE ISSUED: NOVEMBER 2005
SHEET NO. 1 OF 3 SHEETS

DP01



LEGEND

- 6520 — PROPOSED CONTOUR
- 6520 — EXISTING CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- DRAINAGE DITCH
- PROPOSED TYPE 'R' INLET
- PROPOSED TYPE I OR II MANHOLE
- PROPOSED FLOW DIRECTION ARROW
- DP — DESIGN POINT
- 0.0 — 5-YEAR STORM EVENT PEAK FLOW (CFS)
- 0.0 — 100-YEAR STORM EVENT PEAK FLOW (CFS)
- C-13 0.19 AC 0.82 — BASIN DESIGNATION, "C" COEFFICIENT (100 YR), BASIN AREA (ACRES)
- FILING LIMITS
- DRAINAGE BASIN BOUNDARY

VICINITY MAP
N.T.S.

PINE CREEK SUMMARY TABLE

DESIGN POINT ID	Q(5) (CFS)	Q(100) (CFS)	SUB-BASINS
P1	4.6	18.1	PF1A, PF1B
P2	5.1	21.0	PF1C, PF1D
P3	15.9	62.5	P1, P2, PF1E, PF2C
P4	54.9	211.2	P3, P8, PF2A, PF2B, PF7A, PF8B
P5	6.9	29.1	PF6B, PF6C
P6	9.6	40.6	P5, PF6A
P7	14.7	61.9	P6, PF7C, PF8D
P8	24.7	101.2	P7, PF7B, PF7D, PF8E, PF8G
P10	64.2	243.8	P4, P8, PF8A, PF8C, PF8F
P11	71.4	269.8	P10, PF9C
P12	77.7	291.3	P11, PF9A, PF9B
P13	50.4	133.2	PF3A, PF3B, PF3C, PF3D
P14	128.8	448.1	P12, P13, PF4A, PF4B, PF4C

COTTONWOOD CREEK SUMMARY TABLE

DESIGN POINT ID	Q(5) (CFS)	Q(100) (CFS)	SUB-BASINS
C1	7.6	25.6	CF1E, CF1D
C2	20.6	69.9	C1, CF1A, CF1B, CF1C

Matrix Design Group, Inc.
Integrated Design Solutions 2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208

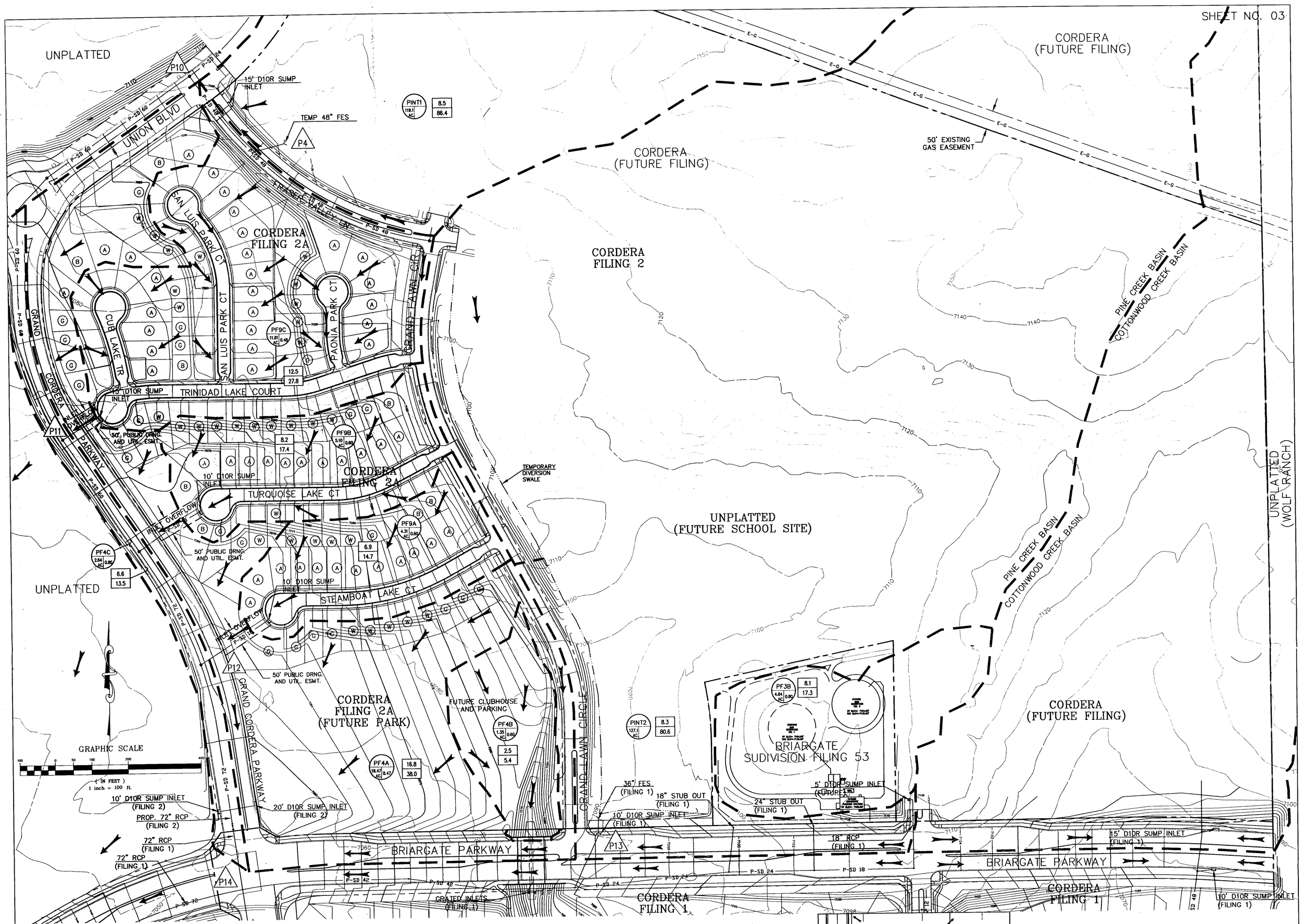
CORDERA FILING NO. 2A

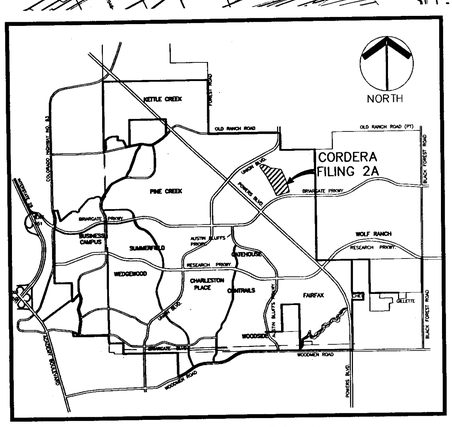
DRAINAGE REPORT

FULLY DEVELOPED DRAINAGE MAP
FILING NO. 2 INFRASTRUCTURE

DESIGNED BY:	RGG	SCALE	DATE ISSUED: NOVEMBER 2005
DRAWN BY:	BPK	HORIZ: 1"=100'	
CHECKED BY:		VERT: N/A	SHEET NO. 2 OF 3 SHEETS

SHT DP02

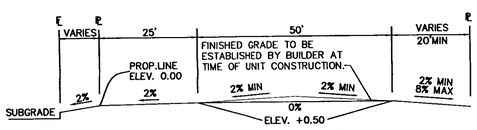




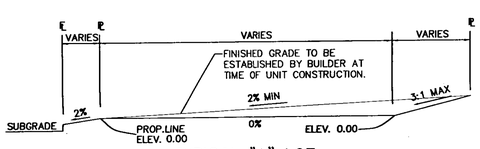
VICINITY MAP
N.T.S.

LEGEND

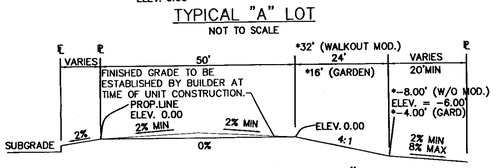
- 6520 — PROPOSED CONTOUR
- 6520 — EXISTING CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- DRAINAGE DITCH
- PROPOSED TYPE 'R' INLET
- PROPOSED TYPE I OR II MANHOLE
- PROPOSED FLOW DIRECTION ARROW
- DP — DESIGN POINT
- 0.0 — 5-YEAR STORM EVENT PEAK FLOW (CFS)
- 0.0 — 100-YEAR STORM EVENT PEAK FLOW (CFS)
- BASIN DESIGNATION
- C-13, 5.18 AC, 0.60 — "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)
- FILING LIMITS
- DRAINAGE BASIN BOUNDARY



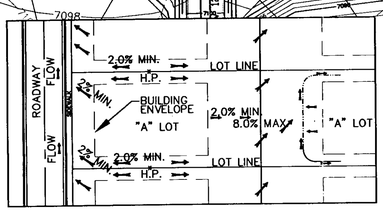
TYPICAL "B" LOT
NOT TO SCALE



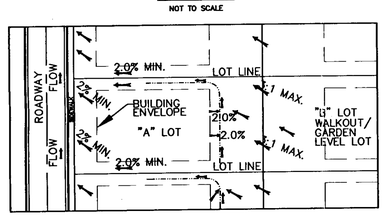
TYPICAL "A" LOT
NOT TO SCALE



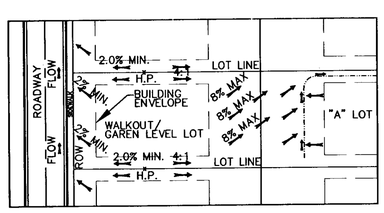
TYPICAL "WALKOUT"/"GARDEN LEVEL" LOT
NOT TO SCALE



TYPICAL "B" LOT
PLAN VIEW
NOT TO SCALE



TYPICAL "A" LOT
PLAN VIEW
NOT TO SCALE



TYPICAL "WALKOUT"/"GARDEN LEVEL" LOT
PLAN VIEW
NOT TO SCALE

PINE CREEK SUMMARY TABLE

DESIGN POINT ID	Q(5) (CFS)	Q(100) (CFS)	SUB-BASINS
P4	8.5	86.4	PINT1
P10	13.1	103.0	P4, PF9C
P11	20.0	115.4	P1, P2, PF1E, PF2C
P12	26.7	131.4	P3, P8, PF2A, PF2B, PF7A, PF8B
P13 (FUT)	50.4	133.2	
P14	40.2	237.4	PINT2, PF3B, PF4A

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CORDERA FILING NO. 2A

DRAINAGE REPORT

INTERIM DRAINAGE MAP
FILING NO. 2A INFRASTRUCTURE

DESIGNED BY: RGG	SCALE	DATE ISSUED: NOVEMBER 2005	SHT DP03
DRAWN BY: BPK	HORIZ. 1"=100'		
CHECKED BY:	VERT: N/A	SHEET NO. 3 OF 3 SHEETS	