FINAL DRAINAGE REPORT
for
"Cordera Filing No. 1"

&

MASTER DEVELOPMENT DRAINAGE PLAN
for
Cordera and Briargate Crossing East
Pine Creek and Cottonwood Creek Basins

Prepared for:
City of Colorado Springs, Colorado
Engineering Division

On Behalf of:
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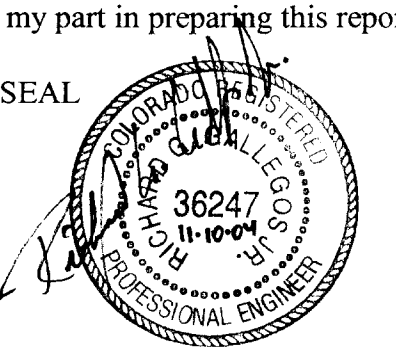
Revised November 2004

03.104.015

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 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

_____ Nov 20, 2004
City Engineer Date

Conditions:

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I. INTRODUCTION

A. Background

Matrix Design Group, Inc. has been retained by La Plata Investments to prepare this ***Final Drainage Report for Cordera Filing No. 1*** and ***Master Development Drainage Plan for Cordera and Briargate Crossing East – Pine Creek and Cottonwood Creek Drainage Basins*** to evaluate the existing drainage conditions and design a stormwater collection system for Cordera Filing No. 1 within the Pine Creek and Cottonwood Creek Drainage Basins. Filing No. 1 will be platted into a 150-acre single-family development with lots ranging from 1/8 acre to 1/2 acre in size located in northeast Colorado Springs. The development will consider the impacts to the property from the construction of adjacent Powers Boulevard located to the southwest of the development.

In addition to the area being platted as Filing No. 1, this study will also analyze the fully developed conditions in the Cordera and Briargate Crossing areas. Future development will consist of commercial, single family lots, multi-family lots, school sites, and open space/trail corridors. The global evaluation of the site is required to properly size and plan three proposed detention ponds located within the study area. As future developments are proposed, site-specific drainage reports will be required for each area to refine the analysis completed for this study.

Two of the three ponds will be constructed concurrently with the infrastructure of Filing No. 1. Land for the ponds will be dedicated by easement at this time and will be incorporated into future plats of the surrounding area. The exact timing of each plat is dependent on market conditions. Detention pond DF-2, located at Powers Boulevard and Briargate Parkway, will be platted with the development of the commercial area adjacent to Filing No. 1. The platting of detention pond DF-1 will be triggered by the development of the adjacent commercial development to the northwest or by the Wolf Creek Ranch development to the east and southeast. Pond DF-1 will be a combined effort between property owners of the Wolf Creek Ranch and Cordera developments.

A hydrologic analysis has been completed to evaluate the existing, interim, and fully developed conditions to ensure compliance with City Drainage Criteria. Two detention ponds will be placed within the Pine Creek Drainage Basin, and one within the Cottonwood Creek Drainage Basin. The Cottonwood Creek Drainage Basin, detention pond DF-1, will be constructed as a joint effort with the Wolf Ranch development, located immediately east of Cordera to maximize the land used for detention and to reduce the number of detention ponds the City of Colorado Springs will have to eventually maintain as public facilities.

B. Project Location

This site is located within the Corporate Limits of the City of Colorado Springs east of the intersection of Powers Boulevard and Briargate Parkway. See Vicinity Map. The site encompasses an area of land formally part of El Paso County, but has since been annexed into the City of Colorado Springs. Surrounding areas consist mainly of vacant undeveloped land and residential developments. More specifically the 150 acres comprising Cordera Filing No. 1 is located as follows:

1. General Location. Southwest ¼ of Section 25, southeast ¼ of Section 26, northeast ¼ of Section 35, and the northwest ¼ of Section 36, 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. The site is bounded on the southwest by Powers Boulevard, which is currently under construction. Briargate Parkway will be extended to the east as part of this development and will be the northern boundary of the project.
3. Drainageway. Drainage from the site is split between two major basins by a natural ridge in the subdivision running in a northeasterly direction:
   - The southeastern half of the site is located within the ***Cottonwood Creek Drainage Basin***. The basin extends off-site to the east of Cordera Filing No. 1.
   - The northwestern half of the site is located with the ***Pine Creek Drainage Basin***. The North Fork of Pine Creek is located to the north of the development approximately ½ mile in a natural state. The South Fork of Pine Creek, located southwest of the property has been modified by previous development and construction of Briargate Parkway. Improvements to the South Fork have been designed to extend to the site as a 72" RCP storm sewer under Briargate Parkway. The storm sewer is currently under construction. The sewer will be constructed under Powers Boulevard. Powers Boulevard is also under construction by the Colorado Department of Transportation.
4. Surrounding Developments. Cordera Filing No. 1 is located within a sparsely developed area of Colorado Springs. In general, the following land uses are located around the study area:

   North: *Briargate Subdivision Filing No. 53*, an existing potable water system pumping station and reservoir exists immediately to the north of Filing No. 1. A gravel road has been constructed to the station. Additional undeveloped, unplatted land is also located immediately north of Filing No. 1. Per master planning documents, the area will be developed into mainly single-family residential lots developed in a similar manner as Cordera Filing No. 1.

   East: *Harris Subdivision,* and vacant unplatted land currently planned as the Wolf Creek development, consisting of mainly single-family residential parcels.

   Southwest: *Gatehouse Village at Briargate Filing No. 12*, a single-family and multi-family residential development. *Briargate Crossing West Filing No. 1*, a commercial development currently in the planning process. Powers Boulevard extension, roadway improvements being completed by the Colorado Department of Transportation.

C. Property Description

Cordera Filing No. 1 as well as the entire Cordera Master Plan area is undeveloped with few adjacent improvements. Roadway and utility infrastructure is currently being extended to the site as part of other adjacent projects including the construction of Powers Boulevard and the development of *Briargate Crossing West Filing No. 1.*

1. Drainage Area. Cordera Filing No. 1 consists of approximately 150.35 acres of land to be platted as right-of-way, single-family lots, and open space. The area is split between the Cottonwood Creek Drainage Basin and the Pine Creek Drainage Basin. Filing No. 1 has approximately 51.5 acres that is historic to Pine Creek and 98.9 acres that is historic to Cottonwood Creek. The design of the roadways, lot layouts, and overlot grading has maintained a drainage basin boundary between the two basins that is similar to the historic patterns. The proposed grading within Filing No. 1 will have approximately 48.4 acres of land tributary to the Pine Creek Basin and 102.0 acres draining to the Cottonwood Creek Basin. The overall drainage plan for Cordera and Briargate Crossing East when fully developed will have an approximate net change of an additional 3.1 acres flowing to the Cottonwood Creek Basin.

   A preliminary layout for the entire Cordera development has been completed. This includes preliminary grading within the Pine Creek and Cottonwood Creek drainage basins. As with Filing 1, the proposed grading throughout the site will maintain a similar drainage basin boundary as the historic basins. The overall grading scheme will result in a negligible net area of 0.1 acre being transferred from the Pine Creek Basin to the Cottonwood Creek Basin. This net area includes the area planned for Filing 1.

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

3. General Topography. The portion within the Cottonwood Creek Drainage Basin flows to the southwest at a natural grade of about 4%. The part of the site that is in the Pine Creek Drainage Basin flows to the south at a 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. 1. Six different soil types can be found in and around the study reach:

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 exists in the area project area at the downstream portions of the site.

5. Major Drainageways. There are no existing major drainageways through the Cordera Filing No. 1. A stormwater collection system has been developed for Filing No. 1 and the master plan area outfalling to either the storm sewer system under construction in the Briargate Parkway right-of-way, the North Fork of Pine Creek or to Cottonwood Creek.

6. Irrigation Facilities. No know irrigation facilities exist 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.

7. Utilities and other Encumbrances. Existing service utilities have been extended up to the existing Briargate pumping station and reservoir. The existing utilities will be incorporated into the final design of the subdivision. In addition to the water pumping station, utilities are being constructed as part of the Powers Boulevard extension within the right-of-way or utility easements. Utilities include high voltage overhead electric lines, and a trunk water line. A high-pressure cross-country gas main does exist approximately 1/3 mile north of the Filing No. 1 boundary.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

Cordera Filing No.1 is located within two Drainage Basins per the current Drainage Basin Planning Studies completed for Pine Creek and Cottonwood Creek. 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.

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.

Cottonwood Creek Drainage Basin

The Cottonwood Creek Drainage Basin consists of approximately 11,900 acres (18.6 square miles) of land in the northern portion of the City of Colorado Springs. The basin drains a west-facing slope in the larger Monument Creek Basin, which is rapidly developing. The main channel and tributaries of Cottonwood Creek do not flow across the site.

Two Drainage Basin Planning Studies have been recently completed for Cottonwood Creek. URS Consultants completed one study in 1994 to evaluate hydrology of the basin and proposed improvements/new construction of trunk stormwater infrastructure, including placement of

detention ponds. Ayres and Associates completed a subsequent study, June 2000, to re-evaluate the hydrology of the entire basin, reducing peak stormwater rates and eliminating the need for certain detention ponds and trunk infrastructure improvements. The study also incorporates a Prudent Line approach to development, where development is set back a certain distance from the existing channel thalweg to allow for natural reshaping of the channel that will protect the adjacent development.

The Cordera development is located on the upstream most portion of the Cottonwood Creek Drainage Basin. Due to the location of the development, the tributary area in the historic condition from the site does not generate sufficient concentrated flows to create a major drainage way through the property. A natural channel has formed downstream from the future Powers Boulevard alignment to Research Parkway. South of Research Parkway is the Fairfax Development, which consists primarily of single-family homes. The drainageway through the Fairfax development is an improved channel and linear park. The Fairfax Detention Pond has been constructed between Woodman Road and Research Parkway.

Adjacent to the site, Powers Boulevard is currently under construction. The construction includes a box culvert under the roadway to provide an outfall point for the site. Down stream facilities including detention ponds, bridges/culverts, and channels have been evaluated for sufficient capacity to release undetained flows from the site. Recent changes to the rainfall depths used by the City of Colorado Springs and the implementation of Phase II of the water quality requirements for the City require, as well as larger tributary drainage areas found in this study than those used in the Drainage Basin Planning Study require larger detention/water quality volumes than originally planned. To meet the new City criteria, a new detention pond is proposed for the Cordera Development.

Pine Creek Drainage Basin

The Pine Creek Drainage Basin in the northern portion of the City of Colorado Springs drains to the southwest and feeds into Monument Creek. The basin is located north of the Cottonwood Creek Drainage Basin and south of the Kettle Creek Drainage Basin. The watershed consists of approximately 3,200 acres (5.0 square miles) of land with sloping plains and rolling hills and has both defined and undefined channels. The North Fork and South Fork of Pine Creek do not flow across the limits of Filing No. 1.

Pine Creek North Fork is located in the northern portion of the master planned area just north of proposed Union Boulevard and Powers Boulevard. The channel will remain mostly undisturbed and preserved as open space to prevent the loss of habitat for the Preble's Meadow Jumping Mouse (PMJM). Permitting to allow construction around the channel has been completed as part of the Powers Boulevard construction and by the developer in anticipation of this project. The channel has previously had retaining walls constructed for the Powers Boulevard extension to minimize the impacts to the PMJM habitat. The retaining walls will act as abutments for a proposed bridge across the channel. Proposed drainage patterns for the development tributary to this channel will be mostly detained with water quality considerations provided.

Pine Creek South Fork is located immediately south of Briargate Parkway within an open space/community park area. Briargate Parkway is currently under construction from Pine

Manor Drive to Powers Boulevard located to the east. 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 portions of Cordera Filing No. 1 as well as the proposed future single family development to the north of Briargate Parkway and East of Grand Cordera Road. A detention and water quality pond will be constructed immediately east of the intersection of Briargate Parkway and Powers Boulevard.

B. Floodplain Statement

Review of the ***Flood Insurance Rate Map Panels 528 (08041CO528 F)*** and ***530 (08041CO530 F)***, effective date March 17, 1997, reveal that no portion of ***Cordera Filing No. 1*** is within any designated 100-year floodplain boundary. The same FIRM maps show that a small portion the North Fork of Pine Creek channel within the Master Planned area has been designated as part of a 100-year floodplain/floodway. The floodplain will be left in its historic state when the surrounding property is developed. See Floodplain Maps.

C. Sub-Basin Description

Cordera and Briargate Crossing East have historically had flows split between the Cottonwood Creek and Pine Creek Drainage Basins. Within the Cottonwood Drainage Basin, runoff has been directed to a natural channel that drains to the Fairfax Channel, located south of Research Drive. As part of the preparation for the construction of Powers Boulevard, an 8'x12' concrete box culvert is under construction and will accept the historic flows. The box culvert is located immediately south of the proposed development. Offsite tributary areas impacting the development will be minor from the east, as a natural ridgeline exists along the eastern property line. Based upon master planning documents for the undeveloped area to the east, only minor areas will drain to Cordera when the offsite land is developed.

The Pine Creek Drainage Basin will split flows between the North and South Forks of Pine Creek. The North Fork is in its natural condition and will remain that way upon development of the site due to the environmental constraints. The upper reaches of the South Fork that extend to the property have been replaced with a storm sewer system down stream of Cordera Filing 1 to allow for the construction of Briargate Parkway. The runoff that enters the storm sewer is eventually routed to Detention Pond DF 'C' located at the northwest intersection of Briargate Parkway and Union Boulevard and about one mile due east from the site.

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

Hydrologic analyses for the site have been completed utilizing a combination of methods. To evaluate larger drainage areas that range in size between 100-acres and 5-square miles, 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 and the required detention pond volumes 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 City of Colorado Springs Subdivision Engineering Review Unit has issued revised rainfall data, effective January 1st, 2003 and summarized within a letter issued January 7th, 2003. The information provides 24-hour rainfall depths for the 5-year and 100-year storm events. Addendum #3 to the Pine Creek Drainage Basin Planning Study, completed by JR Engineering,

uses depths of 2.6 inches for the 5-year and 4.4 inches for the 100-year storm events. The most current Cottonwood Creek Drainage Basin Planning Study uses a 100-year storm event depth of 4.136 inches and only evaluates the major storm event.

In addition to the computer modeling for a global look at the area, smaller drainage basins were also closely evaluated to size inlets and sub-trunk systems to be constructed as part of Filing No. 1. 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 of the City Drainage Criteria Manual:

Land Use	**% Imp.**	**C(5)**	**C(100)**
Commercial (Business Areas)	95	0.90	0.90
Residential (1/8 Acre or less)	65	0.60	0.70
Residential (1/3 Acre)	40	0.50	0.60
Industrial (Light Areas)	80	0.70	0.80
Office (Business Areas)	95	0.90	0.90
Parks	7	0.30	0.55
Undeveloped Open Space	2	0.15	0.20

Regional detention ponds will be provided as part of the development of this site. See Drainage Basin Maps, Appendix for exact locations.

Additional consideration has been given to the new criteria of the Phase II Water Quality Requirements for the City of Colorado Springs. To assist developers in meeting new requirements, the City has recently published ***Volume II*** of the ***Drainage Criteria Manual***. The water quality capture volume, outfall structure, and sedimentation volumes have been designed for the ponds, and are described in detail in the proposed drainage facility section of this report.

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 the Cordera Filing No. 1 area 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 is as follows:

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" max. depth at flowline; No adjacent flooding
Residential Street (8" vertical curb)	6" allowable depth at flow line; Maximum 34 cfs per side	12" max. depth at flowline; No adjacent flooding
Collector Street (8" vertical curb)	6" allowable depth at flow line; Maximum 34 cfs per side; No overtopping crown of road	12" max. depth at flowline; No adjacent flooding
Arterial Street (8" vertical curb)	6" allowable depth at flowline; Maximum 34 cfs per side; No overtopping crown of road	12" max. depth at flowline; -or- 4" depth at crown (Whichever is more restrictive)

Regional detention ponds will be required as part of the development of Cordera Filing No. 1. The ponds have been designed to City criteria, with supplemental information taken from the Urban Storm Drainage Criteria Manual, Volume II. The ponds include additional capacity for water quality treatment. A 40-hour release time has been used for the water quality outlet structure and an additional 20% of the water quality treatment volume has been provided for sediment accumulation. Calculations for each pond have been included in Appendix B of this report.

IV. DRAINAGE FACILITY DESIGN

A. Existing Conditions

Cordera and Briargate Crossing East are currently undeveloped with the exception of an existing water tank/pumping station and dirt access road. Briargate Parkway, Union Boulevard, and Powers Boulevard area currently under construction and will be completed prior to or concurrently with the development. Current vegetation includes natural grasses, shrubs, and some trees. The site drains to two basins, the Pine Creek Drainage Basin in the northwest and the Cottonwood Creek Drainage Basin in the southeast. The existing hydrology for the Filing No. 1 and the rest of the master planning area has been analyzed in each of the Drainage Basin Planning Studies, as well as within this study. Runoff rates and drainage sub-basins are shown on the drainage map DP01 – Existing Conditions. See Appendix A, Maps.

Pine Creek Drainage Basin

The Pine Creek Drainage Basin Planning Study, Amendment #3 has evaluated the Cordera/Briargate Crossing East development in its natural state. The plan does assume that Powers Boulevard has been constructed and the storm water infrastructure has been extended to the east side of the roadway. The design plans for the adjacent roadways and storm sewers have been approved by either the City of Colorado Springs or the Colorado Department of Transportation and are currently under construction. The area has been divided between two main tributary areas – the North Fork of Pine Creek and the South Fork of Pine Creek.

North Fork Pine Creek

Addendum #3 to the Pine Creek DBPS has divided the historic area drainage to two outfall points for the Cordera/Briargate Crossing East areas. The main outfall point is the North Fork of Pine Creek currently in its natural state. Existing condition runoff will be a combination of overland and channel flows following historic patterns. No drainage infrastructure improvements have been completed upstream of Powers Boulevard.

Drainage sub-basin PE6 consists of 123.8 acres of upstream offsite tributary area comprised of one acre single family lots and undeveloped land. Peak calculated runoff rates for the sub-basin are Q(5)=24.0 cfs and Q(100)=151.0 cfs. The runoff is routed into sub-basin PE7 via the North Creek channel.

Drainage sub-basin PE7 covers 134.3 acres of land draining to the existing East Fork of Pine Creek. Abutments for a future bridge have been constructed along the proposed Powers Boulevard roadway to help minimize the environmental impacts to existing wildlife living within the channel. Peak calculated runoff rates for the basin are Q(5)=14.5 cfs and Q(100)=103.4 cfs. The total routed runoff from sub-basins PE6 and PE7 (Design Point P4) are Q(5)=38.0 cfs and Q(100)=244.9 cfs within the existing channel. Storm water then travels to sub-basin PE8

Sub-basin PE8 consists of 73.2 acres of land immediately upstream of Powers Boulevard. The minor and major storm event peak runoff rates have been calculated as Q(5)=8.6 cfs and

Q(100)=61.3 cfs. The total upstream historic drainage tributary area to the North Fork of Pine Creek has been calculated as Q(5)=45.7 cfs and Q(100)=304.2 cfs at a design point P5, located immediately upstream of Powers Boulevard.

One other historic tributary area does drain to the North Fork of Pine Creek, however, the sub-basin flows to the existing storm sewer system at Powers Boulevard and Union Boulevard, into a newly constructed detention basin, and into Pine Creek. Sub-basin PE3 consists of 99.0 acres of undeveloped land generating peak runoff rates of Q(5)=9.0 cfs and Q(100)=63.4cfs

South Fork Pine Creek

A significant portion of the development will flow to the proposed storm sewer system at the intersection of Briargate Parkway and Powers Boulevard and be transported to the existing detention pond located at Union Boulevard and Briargate Parkway. A summary of the hydrology for the tributary area is as follows.

Sub-basin PE1 is 33.0 acres of tributary area at the upper most limit of the drainage basin consisting of offsite undeveloped flow. Calculated peak runoff rates for the sub-basin are 4.3 cfs for the 5-year storm event and 30.5 cfs for the 100-year storm event. Flows are routed to sub-basin PE2.

Sub-basin PE2 is comprised of 110.9 acres of mostly undeveloped land. An existing water tank and pump station can be found at the southern portion of the sub-basin. Peak runoff rates have been calculated as Q(5)=13.8 cfs and Q(100)=98.5 cfs. The routed peak runoff rates at design point P1 are Q(5)=13.9 cfs and Q(100)=119.0 cfs. Storm water travels downstream to sub-basins PE4 and PE5.

Sub-basin PE4 is 139.5 acres in size of undeveloped land. Peak calculated runoff rates are Q(5)=14.4 cfs and Q(100)=102.5 cfs.

Sub-basin PE5 consists of 112.0 acres with runoff rates of 15.8 cfs and 110.7 cfs for the minor and major storms, respectively. Flow is directed to the existing storm sewer system constructed at Powers Boulevard and Briargate Parkway. The total routed flows at the intersection are Q(5)=34.8 cfs and Q(100)=291.0 cfs at design point P2. A portion of the existing water tank and pump station is located at the upstream end of the basin.

Cottonwood Creek Drainage Basin

The site has been previously studied within the Cottonwood Creek Drainage Basin Planning Study, and the Fairfax Master Development Drainage Plan. The area has historically drained overland and by natural channels. Three distinct existing drainage basins now exist in the areas planned for development consisting of Cordera, the subject of this study, and the adjacent future development of Wolf Creek Ranch.

Sub-basin CE4 is an area that has historically drained to an existing residential area. A 48" RCP storm pipe has been extended to the Powers Boulevard right-of-way and will be extended to Cordera to drain a portion of the future commercial development, and portions of the proposed

residential areas. The historic basin is 27.0 acres in size with peak runoff rates of Q(5)=4.2 cfs and Q(100)=28.8 cfs. The pipe has been sized to accommodate the developed flows from this area.

Sub-basin CE1 is 44.0 acres in size consisting of mainly on-site flows and generating runoff rates of Q(5)=5.3 cfs and Q(100)=37.8 cfs. Storm water from this basin is routed to Design Point C1 within the Cottonwood Creek Basin.

Sub-basin CE2 covers 61.0 acres of undeveloped land within the Cordera area. Peak runoff rates are 8.7 cfs and 60.6 cfs for the 5-year and 100-year storm events respectively. Routed peak rates combining sub-basins CE1 and CE2 are 9.8 cfs and 85.5 cfs at Design Point C1 for the minor and major storms. Runoff flows downstream to sub-basin CE3.

Sub-basin CE3 is an area covering 67.9 acres of undeveloped land. Runoff rates are Q(5)=7.5 cfs and Q(100)=53.5 cfs. Runoff from the upstream basins CE1 and CE2 combine with off-site basins CE5 and CE6 located to the east on the future Wolf Creek Ranch development. Total flow at Design Point C2 point are Q(5)=16.2 cfs and Q(100)=138.0 cfs. The Colorado Department of Transportation, in anticipation of the construction of a new portion of Powers Boulevard, has recently realigned a segment of Cottonwood Creek and constructed a 8'x12' concrete box culvert (CBC) originally called for within the DBPS. Flows at this culvert were predicted to be approximately 901 cfs during the major storm event when the upstream basin is fully developed with no detention facilities. The DBPS also assumed a lower density of development for the area and utilized lower rainfall depths. Updated studies for the Fairfax development, located downstream of the site and immediately south of Research Parkway have assumed a peak runoff rate equal to, or less than the historic flows from the site. The historic peak runoff rate from the historic drainage basin has been used as the maximum allowable release rate from the proposed detention pond DF-1 to help prevent negative impacts to the existing downstream facilities.

Kiowa Engineering has completed a hydrologic analysis for the Wolf Ranch property, located immediately east of the Cordera Development. The same data input for the HEC-1 model completed by Kiowa Engineering has been included within the HEC-HMS model completed for this study. The following sub-basin analysis, with the same sub-basin designations used in the Wolf Ranch study are summarized as follows.

Sub-basin A-1 is 116.5 acres in area of undeveloped land. The peak runoff rates for this area are Q(5)=13.5 cfs and Q(100)=96.2 cfs. Runoff is combined with the flows from sub-basin A-2 at design point 1A.

Sub-basin A-2 comprises 70.4 acres of pasture land with peak runoff rates of Q(5)=9.5 cfs and Q(100)=67.6 cfs. Flows from sub-basin A-1 and A-2 are combined at design point 1A for a total flow of 22.6 cfs and 161.2 cfs for the minor and major storms, respectively. Runoff from the design point then enters a stock pond. Flows entering the stock pond will overtop a low point in along the manmade dam, and flow to design point DPA. The pond will have minimal impacts to the overall hydrology of the area, reducing the peak runoff rates by only 1 cfs for both the minor and major storm events.

Sub-basin A-3 is 84.5 acres of undeveloped land. The area generates peak runoff rates of Q(5)=11.8 cfs and Q(100)=82.8 cfs. Flows are combined with the upstream basins at design point DPA. Peak undeveloped flow rates from the Wolf Ranch area are Q(5)=27.4 cfs and Q(100)=225.6 cfs. The total flows are combined from design point C2 and DPA have been calculated as Q(5)=42.0 cfs and Q(100)=362.9 cfs and will flow to the recently completed 12'x8' concrete box culvert under Powers Boulevard.

B. Interim Conditions

Construction and development at the Cordera site will be phased. This interim condition analysis focuses on the development of the 150 acres of Cordera Filing No. 1 to be platted immediately. To determine the storm water system requirements, this analysis has been used to size trunk storm infrastructure and the associated detention requirements. As part of the development of Cordera Filing No. 1, two detention ponds will be constructed – one within the Cottonwood Creek Drainage Basin, Detention Pond DF-1, and one within the Pine Creek Drainage Basin, Detention Pond DF-2. Each pond will be encompassed within easements granted to the City and will not be platted with Filing 1 at this time. The land will be platted when the commercial areas to the southwest are developed. The proposed detention ponds will be public facilities maintained by the City of Colorado Springs. See Drainage Map DP02 – Interim Conditions, Appendix A, Maps, for a summary of runoff rates, drainage system layouts, and drainage basin designations. The ponds will be accepted and maintained by the City after the land for the pond is platted. The developer will maintain the ponds during the interim.

Pine Creek Drainage Basin

The Pine Creek Drainage Basin Planning Study, Amendment #3 has evaluated the Cordera/Briargate Crossing East development in its fully developed state. The study provides recommendations for the site and provides an outline of the storm water system requirements. This drainage plan will utilize the drainage infrastructure outlined within Addendum #3, and also referencing the drainage facility design completed for the Powers Boulevard extension, designed for CDOT.

North Fork Pine Creek

The interim conditions at the site have divided the master planning area into three segments. The northern most area draining to the North Fork of Pine Creek will largely remain in its historic state. The area has been analyzed using three drainage sub-basins – PI7, PI8, and PI10.

Sub-basin PI7 is 123.8 acres of undeveloped and single family (one acre lots) parcels. Peak runoff rates for this basin are Q(5)=24.1 cfs and Q(100)=151.1 cfs draining downstream to sub-basin PI8.

Drainage sub-basin PI8 comprises 134.3 acres of undeveloped land generating storm water runoff rates of 14.5 cfs for the 5-year event and 103.4 cfs for the 100-year event. When storm water from this and the upstream basin are combined at Design Point P4, peak rates are Q(5)=38.0 cfs and Q(100)=244.9 cfs. Flow then travels down to sub-basin PI10.

Sub-basin PI10 is 73.2 acres in size with runoff rates of Q(5)=8.6 cfs and Q(100)=61.3 cfs. The total peak runoff rates from the three drainage basins at the Powers Boulevard Bridge, designated as Design Point P5, are Q(5)=45.7 cfs and Q(100)=304.2 cfs.

Sub-basin PI9 will also drain to the North Fork of Pine Creek, however the runoff from this basin will be intercepted by the storm pipes at the intersection of Union and Powers Boulevard. Runoff will be routed through a detention pond constructed as part of the Powers Boulevard improvements prior to being released into the existing channel downstream of the site. The sub-

basin is 88.2 acres in size with peak runoff rates of Q(5)=8.0 cfs and Q(100)=56.5 cfs. Proposed Grand Cordera Road will define the northeastern boundary of the sub-basin.

No detention ponds are planned for the interim development of Cordera in the North Fork Pine Creek basin.

South Fork Pine Creek

At the eastern corner of the intersection of Powers Boulevard and Briargate Parkway, a detention pond has been proposed. Peak release rates for the detention pond and any undetained tributary area have been previously defined within Addendum #3 to the DBPS. The proposed pond will provide water quality capture volume, as required by the recent Phase II permitting by the City of Colorado Springs, as well as the required detention volume for the proposed development. Since the majority of the sub-basin development has been planned in the Cordera area, and any future upstream developments will required peak runoff rates be reduced to historic levels, it is proposed with this development to construct the detention pond to its ultimate capacity. This will allow the pond to be constructed as an amenity to the development and eliminate the need to retrofit the pond in future phases of construction. The required easements and land dedication for the detention pond facility will be provided to the City of Colorado Springs by separate documents from the plat for Cordera Filing No. 1.

Drainage sub-basin PI1 is 33.0 acres of undeveloped land. The basin limits are the same as shown in the historic analysis. Peak runoff rates have been calculated at Q(5)=4.3 cfs and Q(100)=30.5 cfs. Flows travel downstream to sub-basin PI2.

Sub-basin PI2 covers 65.9 acres of undeveloped land and a portion of the existing water pump station. Runoff generated from the area is Q(5)=9.4 cfs and Q(100)=63.2 cfs. The combined rates from sub-basins PI1 and PI2 at Design Point P1 are Q(5)=9.4 cfs and Q(100)=74.2 cfs. Runoff travels downstream to sub-basin PI4.

Sub-basin PI3 is 18.7 acres of natural open space with runoff rates of Q(5)=2.9 cfs and Q(100)=20.1 cfs. Flow travels to sub-basin PI4.

Sub-basin PI4 covers 59.4 acres of land. Calculated peak storm water runoff rates are 45.8 cfs and 141.2 cfs for the 5-year and 100-year storm events, respectively. This sub-basin considers the proposed construction of Briargate Parkway, Grand Cordera Road, portions of the single-family lots for Cordera Filing No. 1, and the future proposed commercial sites. Runoff from upstream basins PI1, PI2, PI3, and PI6 have been combined at Design Point P2 with minor and major storm event flows of 60.8 cfs and 288.8 cfs. Runoff is then routed to sub-basin PI5 and to the proposed detention pond that will be located east of the intersection of Briargate Parkway and Powers Boulevard.

Sub-basin PI5 consists of 63.23 acres of single-family lots on Cordera Filing No. 1 and future commercial development. The storm water flows to the proposed detention pond. Runoff rates from the sub-basin are Q(5)=71.5 cfs and Q(100)=186.3 cfs. When the flows are combined at the detention pond DF-2 with the upstream tributary area, the peak rate entering the detention pond are Q(5)=127.9 cfs and Q(100)=455.9 cfs. The release rates in the interim condition are

Q(5)=43.4 cfs and Q(100)=212.9. The peak release rate from the basin, when combined with the direct runoff from sub-basin PI9A must be less than Q(5)=182 cfs and Q(100)=419 cfs. These peak release rates have been given in Addendum #3 to the DBPS. Flow from the detention pond will enter a 72" RCP storm sewer being constructed as part of the Briargate Parkway extension to Powers Boulevard.

Sub-basin PI6 is 131.7 acres of undeveloped land that is routed to sub-basin PI4. Flows calculated are Q(5)=14.3 cfs and Q(100)=102.5 cfs.

Sub-basin PI9A will be a future commercial development. The natural topography at the site creates a basin that is 32.4 acres in size. The site has been analyzed as pasture land for this model with peak runoff rates of Q(5)=9.1 cfs and Q(100)=42.8 cfs. As mentioned earlier, the runoff from this basin will discharge to the new storm sewer system at the intersection of Briargate Parkway and Powers Boulevard. This flow, when combined with the discharge from the proposed detention pond DF-2 will generate storm water rates of Q(5)=52.4 cfs and Q(100)=240.5 cfs at design point P3. These rates are well below the maximum peak rate described within Addendum #3 of the DBPS. The detention volumes required for the interim conditions are 3.4 acre-feet and 12.1 acre-feet for the minor and major storm event.

Cottonwood Creek Drainage Basin

Within the Cottonwood Creek Drainage Basin Planning Study, improvements to an existing channel within the Cordera Development have been proposed to serve as the primary storm drainage infrastructure. Approximately 3,300 linear feet of the channel is to be improved with erosion control matting, establishment of grasses, and grade control structures. To better suit the type of development, a trunk storm sewer system under the roadway system has been proposed in lieu of the open channel.

In addition to the channel improvements, the DBPS references the Master Development Drainage Plan for the Fairfax at Briargate within the area studies in this report. The MDDP proposes the construction of a detention pond to the north of the intersection of Research Boulevard and Powers Boulevard. This pond will be a combined effort of the Cordera and Wolf Creek developments.

The interim conditions within the Cottonwood Creek Drainage Basin will create drainage basins that will discharge to the same points designated within the Existing Conditions section of this report. Flow will be divided between three discharge points.

The first discharge point will be to an existing 48" RCP storm sewer that discharges to the existing residential development, located to the west of the proposed Powers Boulevard alignment. Sub-basin CI9 covers 22.65 acres of residential development and undeveloped commercial area. The sub-basin will generate 13.4 cfs during the 5-year storm event and 46.7 cfs during the 100-year storm event. The peak runoff rates from the commercial and residential areas have been planned for in the *Final Drainage Report for Gatehouse Village at Briargate Filing No. 12*, prepared by JR Engineering, dated January 2000.

The second discharge point will ultimately drain to the existing 8'x12' CBC constructed under the future Powers Boulevard roadway alignment. Flow from Cordera and Wolf Creek Ranch will flow to a proposed detention pond located immediately upstream of the CBC. The detention pond will be a joint effort between the two developers to allow for a more efficient land use, and to eliminate a detention pond the City of Colorado Springs will have to maintain. A summary of the tributary drainage sub-basins is as follows.

Sub-basin CI1 is 48.6 acres in size. Peak calculated runoff rates are 5.8 cfs for the minor storm event ant 41.6 cfs for the major storm event. Flows then travel into sub-basin CI2.

Sub-basin CI2 covers 32.3 acres in area with peak runoff rates of Q(5)=25.7 cfs and Q(100)=77.8 cfs. The flow rates at design point C1, when combined with sub-basin CI1 are 26.0 cfs and 97.3 cfs for the minor and major storm events.

Sub-basin CI3 is combined with flow from sub-basins CI1 and CI2 at design point C2 for peak runoff rates of Q(5)=38.7 cfs and Q(100)=130.8 cfs. Runoff from sub-basin CI3 only is 13.2 cfs for the 5-year storm event and 39.0 cfs for the 100-year storm event. The area will cover a total of 14.6 acres of single-family lots that are approximately ¼ acres each in size.

Sub-basin CI4 is 12.2 acres of single-family lots and open space. Runoff rates for the basin are Q(5)=4.6 cfs and Q(100)=19.8 cfs. Routed runoff rates from the upstream tributary area, design point C2 and sub-basin CI4, have been calculated as Q(5)=42.8 cfs and Q(100)=150.1 cfs at design point C3.

Sub-basin CI5 covers 11.1 acres of single-family residents. The 5-year and 100-year storm events will generate 9.6 cfs and 28.6 cfs respectively. Routed runoff rates at design point C4 are Q(5)=51.8 cfs and Q(100)=176.4 cfs.

Sub-basin CI6 generates 29.2 cfs during the 5-year storm event and 64.0 cfs during the 100-year storm event. The basin consists of 16.0 acres of single-family residential lots. Total flows are Q(5)=74.9 cfs and Q(100)=227.2 cfs at design point C5.

Sub-basin CI7 is 24.0 acres in size. Peak runoff rates are Q(5)=33.3 cfs and Q(100)=80.2 cfs. Routed peak runoff rates at design point C6 are Q(5)=107.2 cfs and Q(100)=303.4 cfs.

Sub-basin CI8 covers 30.3 acres of land. Peak calculated runoff rates for the minor and major storm events are 54.4 cfs and 119.7 cfs. Flows from the Cordera and Wolf Ranch developments are combined at design point C8 with runoff rates of Q(5)=162.7 cfs and Q(100)=507.3 cfs. These flow rates assume that no development has occurred in the Wolf Ranch area.

The same basins used in the historic analysis for the Wolf Ranch development have been used in this analysis. The Wolf Ranch parcel will not be developed immediately. Sub-basin A-1 is 116.5 acres in area of undeveloped land. The peak runoff rates for this area are Q(5)=13.5 cfs and Q(100)=96.2 cfs. Runoff is combined with the flows from sub-basin A-2 at design point 1A.

Sub-basin A-2 comprises 70.4 acres of pasture land with peak runoff rates of Q(5)=9.5 cfs and Q(100)=67.6 cfs. Flows from sub-basin A-1 and A-2 are combined at design point 1A for a total flow of 22.6 cfs and 161.2 cfs for the minor and major storms, respectively. Runoff from the design point then enters a stock pond. Flows entering the stock pond will overtop a low point in along the manmade dam, and flow to design point DPA. The pond will have minimal impacts to the overall hydrology of the area, reducing the peak runoff rates by only 1 cfs for both the minor and major storm events.

Sub-basin A-3 is 84.5 acres of undeveloped land. The area generates peak runoff rates of Q(5)=11.8 cfs and Q(100)=82.8 cfs. Flows are combined with the upstream basins at design point DPA. Peak undeveloped flow rates from the Wolf Ranch area are Q(5)=27.4 cfs and Q(100)=225.6 cfs.

The preliminary sizing of the proposed detention pond for the Cottonwood Creek basin will have a peak inflow rate of 162.7 cfs for the 5-year storm and 507.3 cfs for the 100-year storm, designated as Design Point C8. The pond will require a storage volume of approximately 9.5 acre-feet for the 5-year storm event and 24.1 acre-feet for the 100-year event.

C. Interim Conditions – Cordera Filing No. 1

The Interim Conditions Analysis described above has been used to provide preliminary sizing of the required storm sewer infrastructure that will be completed with the first phase of construction for Cordera Filing No. 1. The preliminary storm sewer layout has been shown on the Interim Drainage Map for Filing No. 1, included within the appendix of this report. 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 within the Filing 1 limits. Each roadway has been evaluated to determine proper inlet spacing. City standard D-10-R inlets have been sized based upon reasonable hydraulic head depths at each location and utilizes proper clogging factors. Roadway and inlet calculations have been included for in the Appendix B, *Cordera Filing No. 1 Hydrology and Hydraulics*, of this report. The trunk infrastructure through the site has been sized utilizing the results from the HEC-HMS. The residential roadways in Filing No. 1 will have proposed "bump outs", where the roadway narrows to 24' at the intersections of other roadways. The proposed inlet sizing given within the appendix of this report are the total minimum length of the City standard D-10-R inlet required. At some points within the development, due to grading constraints within the roadways, two inlets have been place within the same sub-basin. Utilizing two inlets will intercept the required flows from the sub-basins, while avoiding excessive cross slopes through the residential bump outs to maintain sump inlet conditions.

Drainage patterns through each lot have also been evaluated to determine how flows should be conveyed on a lot-to-lot basis. Three different lot types have been shown on the drainage plan to show how flows should be conveyed to the proposed curb and gutter within each right of way. A typical "A" lot will accept upstream flows and convey stormwater along the property lines. The construction of the homes will create side lot swales along the property line to convey flows to the right of way.

A typical "B" lot will have a highpoint at approximately the midpoint of the proposed home. Runoff from the front portion of the parcel will flow to the proposed roadway. Stormwater flowing to the back property line will pass through the downstream lot to the roadway curb and gutter.

In areas where significant vertical differences must be addressed, a "garden level" or "walk out" lot has been designated. These lots will have a highpoint at approximately the midpoint of the proposed structure. The front of the lot will drain to the roadway and the rear will drain to the back of the lot. A 4:1 slope will be graded in the heart of the parcel to provide an elevation difference of 4' for a garden level home, and 8' for a walk out home. Runoff draining to the rear of the parcel will flow through the downstream lot and flow to the proposed roadway.

Pine Creek Drainage Basin

Cordera Filing No. 1 will drain to a proposed detention pond at the intersection of Briargate Parkway and Powers Boulevard. This pond has been designated as DF2 within the HEC-HMS analysis. The detention facility will be constructed now to accommodate the full development of the area that will ultimately drain to the proposed pond. The pond will outfall to the storm sewer system that is being constructed as part of the Powers Boulevard construction. The pond will

outfall to the Powers 54" RCP storm sewer. The storm sewer system constructed for Powers Boulevard is based upon Amendment #3 of the Pine Creek DBPS.

A detailed analysis has been completed for the detention pond as part of this study. The ultimate condition will require 4.96 acre-feet of water quality capture volume (WQCV) to be included within the design. This volume has not been considered within the storage volume available for detention. The 5-year storm will require 4.64 acre-feet of storage. When combined with the WQCV, the pond will reach a depth of 6.7' and have an maximum discharge rate of 70.3 cfs. The outfall will be a 10' wide weir for both the 5-year and 100-year storms. During the interim conditions, only 3.43 acre-feet will be required with a discharge rate of 43.4 cfs during the 5-year storm.

The 100-year storm will require 14.58 acre-feet of storage for the fully developed conditions. The proposed weir outlet will allow 267.3 cfs to discharge to the existing storm sewer system. When the detention volume is combined with the WQCV, the pond will reach a maximum depth of 9.2'. During the interim conditions, the pond will only store 12.06 acre-feet of runoff and discharge 212.9 cfs.

The pond will also have an overflow structure, to be constructed adjacent to Briargate Parkway. If in the event the pond outfall should completely fail, the overflow structure will have the capacity to pass the undetained 100-year storm event flow. The overflow weir will be constructed 9.5' above the pond bottom and will be 75' in length armored with riprap.

Sub-basin P1 is 3.41 acres of residential development along Mushroom Rock Court. Flow from the sub-basin has been calculated at Q(5)=7.7 cfs and Q(100)=16.0 cfs. Runoff from the cul-de-sac will flow to the east and enter a proposed 5' City standard D10R sump inlet. Flow will combine with runoff from sub-basin P11 at design point 11 with runoff rates of Q(5)=15.6 cfs and Q(100)=32.5 cfs and be transported downstream via a 24" RCP storm sewer to sub-basin P2.

Sub-basin P2 has been divided into four sections along Happy Meadows Trail a collector roadway. P2a is 3.85 acres in size with runoff rates of Q(5)=8.1 cfs and Q(100)=16.8 cfs drained by a 10' D10R inlet. P2b is 1.65 acres with runoff rates of Q(5)=3.7 cfs and Q(100)=7.8 cfs. A 5' sump D10R inlet will collect runoff. P2c covers 0.37 acres of roadway drainage with peak runoff rates calculated at Q(5)=1.4 cfs and Q(100)=2.5 cfs collected by a 5' sump inlet. P2d is 0.78 acres of roadway area generating 2.7 cfs and 4.8 cfs of runoff for the minor and major storm events, respectively. A 5' sump D10R inlet will accept flow. Each inlet will be connected to a 42" RCP at the intersection of Grand Cordera and Happy Meadows Trail. The storm pipe will daylight onto the undeveloped commercial parcel and flow via swale to Detention Pond DF-2 at the corner of Briargate Parkway and Powers Boulevard. The private swale will be constructed in a temporary easement. The swale will constructed due to the fact there is no layout for the commercial parcel at this time. When the commercial parcel is developed, the storm sewer shall be extended to the detention pond with adequate public easements provided. At the 42" RCP, the calculated runoff rate is Q(5)=58.8 cfs and Q(100)=122.1 cfs. The owner of the property shall maintain the private swale until the future storm sewer system is constructed.

Sub-basin P3 encompasses 3.78 acres of residential development along Preachers Hollow Trail. Calculated peak runoff rates are 8.6 cfs and 17.8 cfs for the minor and major storm, respectively. The cul-de-sac will be drained by a sump 5' City standard D10R inlet and drain to the intersection of Grand Cordera and Happy Meadows Trail. Runoff will be drained by an 18" RCP storm sewer and combined with runoff from upstream sub-basin P4 at design point 12. Combined runoff rates at this point are Q(5)=13.5 cfs and Q(100)=28.1 cfs.

Sub-basin P4 is 2.43 acres in size consisting of single-family residential parcels along cul-de-sac Young Gulch Way and a portion of the trail system. Calculated peak runoff rates are Q(5)=5.5 cfs and Q(100)=11.4 cfs. Runoff will be drained to by a sump 5' D10R inlet and be transported via 24" RCP storm sewer to design point 12 and on to the intersection of Grand Cordera and Happy Meadows Trail.

The northern most portion of Lizard Rock Trail has been designated as sub-basin P5. The area is a cul-de-sac with single-family residential lots covering 4.90 acres in area. Peak runoff rates for this area are 9.3 cfs for the minor storm and 19.9 cfs for the major storm. The cul-de-sac will be drained by a sump 10' D10R inlet and drained by 24" RCP to the trunk 72" RCP at the intersection of Grand Cordera and Briargate Parkway.

Sub-basin P6 is 3.72 acres comprised of single-family lots and the proposed trail system with Pancake Rocks Trail to the east, Lizard Rock Trail to the west, and Happy Meadows Trail to the south. Peak runoff rates have been calculated as Q(5)=6.8 cfs and Q(100)=14.5 cfs. The residential streets will have proposed "bump outs" at each intersection where the curb roadway width is approximately 24 feet from flow line for a short segment then transitions to a 34 foot width. To accommodate the "bump outs" and help facilitate drainage as well as avoid extreme grade changes, the sub-basin will be drained by one of two sump 5' D10R inlets. The inlets will be drained by 18" RCP and combine with flow from sub-basin P7 at design point 13. Peak combined flows are Q(5)=16.0 cfs and Q(100)=34.3 cfs.

Sub-basin P7 comprises 5.58 acres of single-family lots along the northern side of the development draining primarily to Pancake Rocks Trail. The peak runoff rates of Q(5)=10.1 cfs and Q(100)=21.5 cfs will be drained by two sump 5' D10R inlets at the intersection of Happy Meadows Trail and Pancake Rocks Trail and transported to the west along Happy Meadows Trail in a 24" RCP to design point 13 and sub-basin P6.

Sub-basin P8 consists of 6.04 acres at the intersection of Briargate Parkway and Grand Cordera as well as open space and a portion of the adjacent single-family residential lots. Peak runoff rates for this area have been calculated at Q(5)=11.6 cfs and Q(100)=24.1 cfs. Runoff from this sub-basin will be collected by sump 10' D10R inlet and transported to the trunk 72" line under Briargate Parkway via an 18" RCP storm sewer.

Sub-basin P10 consists of 5.41 acres of the north half of Briargate Parkway. Runoff from this basin has been calculated at Q(5)=17.6 cfs and Q(100)=31.3 cfs and will be drained by a sump 20' D10R inlet and a 30" RCP. Runoff from the north of Briargate Crossing will be diverted

around the proposed roadway until infrastructure can be extended to provide additional inlets in future development.

Sub-basin P11 is 4.68 acres in size consisting of single-family residential lots along Rabbit Mountain Loop. Runoff has been calculated at 10.0 cfs and 20.8 cfs for the minor and major storm, respectively. Stormwater will enter a sump 10' D10R inlet at the end of the cul-de-sac bulb and be transported downstream in a 24" RCP storm sewer and combine with flow from sub-basin P1 at design point 11.

Cottonwood Creek Drainage Basin

Sub-basin OF1 comprises the area to be developed north of Briargate Parkway. The basin delineations and characteristics have been evaluated in the historic and proposed states. The basin in its undeveloped, historic state covers 48.56 acres of land consisting of pasture with native grasses. Peak runoff rates for this basin are Q(5)=30.2 cfs and Q(100)=75.3 cfs. The stormwater will flow to the proposed 48" RCP trunk system that extends just north of Briargate Parkway. The pipe, with a 48" flared end section, will be able to accept runoff from the major storm event. When developed, the sub-basin will be reduced to 30.73 acres of residential development. The storm sewer will be extended when the development occurs and runoff will enter the system via a series of inlets. The calculated runoff rates for the minor and major storm events are Q(5)=50.7 cfs and Q(100)=105.3 cfs. The 48" RCP storm sewer will be able to accommodate the major storm event entirely within the pipe.

Sub-basin C2 is 7.71 acres in area on the northern limits of Filing 1. The area consists of a portion of Briargate Parkway, open space, future Grand Lawn Circle and the future single-family residential area to the north of Filing 1. Peak runoff rates from this sub-basin have been calculated at Q(5)=12.0 cfs and Q(100)=25.6 cfs. Runoff will flow to a sump condition on the north side of Briargate Parkway and enter a sump 15' D10R inlet. The inlet will connect to the upstream most end of the 48" RCP trunk system.

Sub-basin C3 comprises 1.96 acres of Briargate Parkway right-of-way immediately south of sub-basin C2. Runoff rates from this area are 7.3 cfs and 13.0 cfs respectively for the minor and major storm events. A 10' D10R sump inlet draining to the 48" RCP trunk storm sewer will collect stormwater.

Sub-basin C4 covers 4.60 acres of land along Roxborough Park Court on the north side of Filing 1. The minor and major storm event of Q(5)=9.2 cfs and Q(100)=19.7 cfs will be collected at the intersection of Grand Lawn Circle and Happy Meadows Trail in a 15' D10R sump inlet. An 18" RCP storm sewer will transport flow downstream to the 48" RCP trunk system.

A cul-de-sac, Monarch Crest Way, is covered by sub-basin C5. The 5.69 acres of land will drain to the intersection of Happy Meadows Trail and Monarch Crest Way to a 10' or 5' D10R sump inlet. Each inlet will connect to the 48" trunk system in Monarch Crest Way. Peak runoff rates for the sub-basin are Q(5)=10.2 cfs and Q(100)=21.7 cfs.

Sub-basin C6 is 4.05 acres in size draining to Imogene Pass Place with peak runoff rates of Q(5)=7.2 cfs and Q(100)=15.3 cfs. Runoff will drain to one of two proposed 5' D10R sump

inlets at the intersection of Imogene Pass Place and Monarch Crest Way and connect to the 48" trunk system in Monarch Crest Way.

Sub-basin C7 covers 5.5 acres in size of the single-family lots draining to Chimney Gulch Way. The runoff rates for this sub-basin are Q(5)=9.1 cfs and Q(100)=19.5 cfs and will drain to one of two proposed 5' D10R sump inlets. Stormwater will be directed to the trunk 48" RCP system in Happy Meadows Trail right-of-way. Flow from sub-basins OF1, C2 through C7, and C18 will be combined at design point C1.

Sub-basin C8 is 4.33 acres in size with runoff rates of Q(5)=7.8 cfs and Q(100)=16.8 cfs. Flow will be collected by one of two 5' D10R sump inlets and connect to the trunk system in Happy Meadows Trail

Sub-basin C9 drains to the intersection of Pancake Rocks Trail and Happy Meadows Trail. The 5.45 acres of single-family lots will generate peak runoff rates of Q(5)=9.5 cfs and Q(100)=20.3 cfs flowing to one of two 5' D10R sump inlets. Flow from this sub-basin and sub-basin C16 will combine with flow from design point C1 at design point C2 in the trunk 48" RCP storm sewer under Happy Meadows Trail.

Sub-basin C10 is 3.83 acres in size draining Q(5)=6.3 cfs and Q(100)=13.4 cfs of flow to the intersection of Soda Creek Court and Dome Rock Place. A sump 5' D10R inlet will collect runoff from the sub-basin. Flow will combine with runoff at design point C4. Design point C4 combines upstream runoff from design point C3 and sub-basins C10 through C11.

Sub-basin C11 is 3.91 acres of single-family development. Calculated runoff rates for the minor and major storm events are Q(5)=7.0 cfs and Q(100)=15.0 cfs and will drain to a 5' D10R sump inlet at the intersection of Soda Creek Court and Dome Rock Place draining to design point C4.

Sub-basin C12 covers 3.39 acres of single-family lots and open space along Dome Rock Place. The minor and major storm runoff rates of Q(5)=6.2 cfs and Q(100)=13.3 cfs will drain to a 5' D10R sump inlet on the south side of the roadway. Runoff will combine with flows at design point C4, described earlier.

Sub-basin C13 is 3.90 acres in size along Lizard Rock Trail. Runoff of Q(5)=6.0 cfs and Q(100)=12.8 cfs will flow to a 10' inlet at the intersection of Happy Meadows Trail and Dome Rock Place. Flow at this point will be transported to the proposed 60" RCP trunk system at design point C3. Design point C3 combines flows from design point C2 with sub-basins C13, C14, and C15.

Sub-basin C14 primarily consists of open space/park area covering 7.49 acres in size. Calculated runoff rates for the minor and major storm events are Q(5)=7.7 cfs and Q(100)=18.2 cfs. Flow will be directed to a 24" flared end section that will extend from the proposed inlet draining sub-basin C13.

Sub-basin C15 is 0.78 acres in size along Pancake Rocks Trail. The area generates Q(5)=1.5 cfs and Q(100)=3.2 cfs of runoff and drains to design point C3. Sub-basin C15 has been

established to verify the capacity of the roadway along Pancake Rocks Trail and Happy Meadows Trail.

Sub-basin C16 covers 3.47 acres of residential development on the north side of Pancake Rocks Trail. The runoff generated from the sub-basin is 6.6 cfs and 14.1 cfs for the minor and major storm events and will drain to one of two 5' D10R sump inlets at the intersection of Pancake Rocks Trail and Happy Meadows Trail.

Sub-basin C17 is 1.35 acres in size draining the front portions of the residential lots along the Roxborough Park Court. A 5' D10R sump inlet will transport the peak runoff rates of Q(5)=2.7 cfs and Q(100)=5.8 cfs to a proposed 18" RCP storm sewer to design point C2.

Sub-basin C18 is 2.77 acres of residential development directing flow to the intersection of Chimney Gulch Way and Happy Meadows Trail at design point C1. Peak runoff rates for the sub-basin are Q(5)=5.7 cfs and Q(100)=12.2 cfs. Flow will be intercepted by one of two 5' D10R sump inlets at the intersection and transported to the proposed 48" RCP trunk line.

Sub-basin C20 is 4.60 acres of the single-family lots along Rabbit Mountain Loop. Runoff rates for the minor and major storm events are Q(5)=9.9 cfs and Q(100)=20.6 cfs. Runoff will be directed via curb and gutter to a proposed 10" D10R sump inlet on the down stream end of the cul-de-sac. Flow will be directed via an 18" RCP storm sewer to the trunk system in Grand Cordera.

Sub-basin C21 encompasses 4.76 acres of land along Petrified Forest Trail. The minor and major storm events will generate Q(5)=10.4 cfs and Q(100)=21.5 cfs. Curb and gutter will direct stormwater to a proposed 10' D10R sump inlet at the southwestern end of the cul-de-sac. Flow will be directed via a 24" RCP storm sewer to the trunk system in Grand Cordera.

Sub-basin C22 is 3.35 acres of primarily roadway and open space along Grand Cordera. Runoff will flow to the intersection of Grand Cordera and Happy Meadows Trail to a 10' D10R sump inlet. This inlet will connect into the trunk system in Grand Cordera. The 5-year and 100-year storm events for this basin are Q(5)=7.3 cfs and Q(100)=15.2 cfs.

Sub-basin C23 is 3.60 acres around Galloping Goose Way. Calculated peak runoff rates for the sub-basin are Q(5)=7.7 cfs and Q(100)=16.0 cfs flowing via curb and gutter to a 10' D10R sump inlet.

Sub-basin C24 is 4.35 acres of Lizard Rock Trail. Stormwater rates of Q(5)=9.3 cfs and Q(100)=19.4 cfs will flow to a 10' D10R sump inlet. A portion of the trunk storm sewer system, a 60" RCP, crosses through this sub basin. Runoff from the proposed inlet will feed directly into the trunk line. Flow at the proposed inlet has been designated as design point C5 in the interim condition combining runoff from design point C4 and sub-basin C24.

Sub-basin C25 consists of 22.40 acres of the future multi-family development that is not part of the Filing 1 plat. Flow from the sub-basin will be directed into one of two flared end sections draining to the trunk 66" RCP storm sewer system in Grand Cordera. Peak runoff rates have

been calculated at Q(5)=48.8 cfs and Q(100)=99.3 cfs for the developed state. The future development of the multi-family site will have the storm sewer system extended accordingly from the flared end section proposed in this report. A final site-specific drainage report for the development will be required upon development.

Sub-basin C26 is 3.15 acres of the Grand Cordera roadway. Flow will be transported to the southern limits of the project to a 10' D10R sump inlet. Peak runoff rates from the sub-basin are Q(5)=7.1 cfs and Q(100)=13.6 cfs.

Sub-basin C27 consists of 3.14 acres of the southern half of the Grand Cordera roadway. Flow will travel via curb and gutter to the southern limits of the project, and into a 10' D10R sump inlet. Peak runoff rates have been calculated at Q(5)=6.8 cfs and Q(100)=12.2 cfs. Flow at this point has been combined and designated as design point C6 per the HEC-HMS model. The design point includes flow from the future commercial site as well as the upstream flow from Filing 1.

D. Fully Developed Conditions

The fully developed analysis completed has focused upon the impacts to the development area to the southeast of the existing North Fork of Pine Creek. Recommendations within Addendum #3 of the DBPS will be used when a more in-depth study is completed for the development of the surrounding area. This analysis is being used primarily to help determine the infrastructure requirements impacting Cordera Filing No. 1 and the future residential area located to the north of Filing No. 1.

Pine Creek Drainage Basin

The development criteria set forth in Addendum #3 of the DBPS has been used to evaluate the future development of the site. Within the Pine Creek Drainage Basin, at least two additional detention ponds will be constructed in addition to the facility located east of Briargate Parkway and Powers Boulevard and completed with Filing No. 1. One basin, detention pond DF-4 will be constructed to the southeast of Powers Boulevard and the North Fork of Pine Creek. The second detention pond DF-5, will detain storm water upstream of the development from the off-site tributary area.

North Fork Pine Creek

The upstream off-site drainage basins, sub-basins PF11 and PF12 are currently comprised of undeveloped land and one acre single-family lots. It is unknown at this time what kind of development will occur on the vacant land and if the larger single family lots may be re-developed. Detention will be required for development with runoff from the combined basins limited to approximately 130 cfs for the 5-year storm and 230 cfs for the 100-year storm. These runoff rates have been designated within Addendum #3 of the DBPS. The exact size and water quality requirements for the future ponds will be determined when the area is developed. For the purposes of this analysis, flows were reduced to the peak allowable and routed through a detention pond. Drainage from these sub-basins will not be allowed to be directed the adjacent sub-basin PF6. If sub-basin PF12 is developed prior to the future Cordera development sub-basin PF6, runoff shall be redirected to proposed detention pond DF-5. If drainage basin PF6 is developed prior to the upstream development, care shall be taken to isolate the flows. This item will be addressed in the final drainage report for the development of the area.

Sub-basins PF16, PF17, and PF18 will be developed as commercial and residential sites. Flow from each of these sub-basins will be reduced to historic levels in future detention pond DF-4 and released into the North Fork of Pine Creek Channel. The total tributary area to the detention pond is 110.7 acres of land. Peak storm water runoff rates entering the pond have been calculated at Q(5)=197.0 cfs and Q(100)=431.0 cfs. Maximum release rates for each storm event are Q(5)=22.1 cfs and Q(100)=151.1 cfs requiring detention storage volumes of 6.0 and 12.3 acre-feet.

Sub-basins PF13, PF14, and PF15 have all been modeled with direct discharge to the North Fork of Pine Creek. Per Addendum #3, this may not be permissible due to the environmental impacts associated with the existing wild life living within the creek limits. When this area is developed, a more in-depth evaluation of the maximum permissible flows will have to be completed. A

parallel storm sewer system may be required along the channel to prevent excessive runoff from entering the existing channel and reducing the potentially harmful impacts to the existing wild life in the area. The parallel system will also reduce the erosion potential in the creek. The combined tributary area at a point in the North Fork of Pine Creek and Powers Boulevard is 472 acres. The peak routed runoff rates with the two detention ponds as described above are Q(5)=148.0 cfs and Q(100)=556.5 cfs at design point P6.

A small area of commercial development will discharge to the existing storm sewer system constructed as part of the Powers Boulevard extension at Union Boulevard. Per the design plans produced by CDOT, a peak runoff rate of 78 cfs for the 100-year storm event can enter the system. Drainage sub-basin 17 has been sized to take full advantage of this outfall. Peak runoff rates from the 16.9 acre commercial development are Q(5)=39.3 cfs and Q(100)=75.9 cfs. BMP's for this area to address water quality issues shall be evaluated when the parcel is developed in a site-specific final drainage report.

South Fork Pine Creek

The proposed detention pond east of the intersection of Briargate Parkway and Powers Boulevard will have an ultimate outfall point of a proposed 72" RCP in Briargate Parkway that ultimately flows to an existing detention pond, designated as DF-C within Addendum #3 of the DBPS. Detention pond DF-C is located approximately one mile west of Cordera Filing 1 on the northwest corner of the intersection of Briargate Parkway and Union Boulevard. Flows from sub-basins PF1 through PF9 will be routed into the proposed detention pond on the Cordera Development, DF-2. Approximately 263 acres will drain to detention pond DF-2. This area may vary depending on the final layout of the adjacent Wolf Creek Ranch. The detention pond will have a total inflow, designated as design point P7, of 212.6 cfs for the 5-year storm and 634.0 cfs for the 100-year storm event. For the minor storm, 4.6 acre-feet of storage volume will allow a peak outflow rate of 22.1 cfs. The major storm outflow rate will be reduced to 267.3 cfs and will require 14.6 acre-feet of storage.

Runoff from sub-basin PF10 will enter the Briargate Parkway storm sewer system undetained to the proposed 72" RCP. The flow from the sub-basin will combine with the outflow from the detention pond. The differing times to each peak rate will produce a maxim flow of 152.6 cfs and 386.4 cfs for the minor and major storm events, as delineated within Addendum #3 of the DBPS. The site-specific final drainage report for the development shall provide BMP's for the site to address water quality issues for sub-basin PF10.

Cottonwood Creek Drainage Basin

The tributary area for Cordera and Wolf Creek Ranch will drain to a proposed detention pond and then to an existing 8'x12' CBC under the future Powers Boulevard alignment. Upon full development of the basin, an area that has historically drained to Research Boulevard will be rerouted to the proposed detention pond. This will be completed in the future as part of the Wolf Creek Ranch Development. It is the intent of the developers of each master planning area to create a combined detention pond to reduce the land area requirements and eliminate an additional facility for the City of Colorado Springs to maintain. The sizing within this report will have to be verified upon the development of the Wolf Creek Ranch area. There is no defined land plan for Wolf Creek, which may result in different densities, zonings, or areas from

what may be planned now. The final size and water quality capture volume must be verified upon future development.

A small drainage basin consisting of some residential and commercial development will follow historic drainage patterns and drain to an existing 48" RCP storm sewer that has been extended to the site as part of the residential development located to the west of Powers Boulevard. Sub-basin CF9 is 22.65 acres in size and will generate peak runoff rates of Q(5)=45.1 cfs and Q(100)=92.6 cfs. Per the *Final Drainage Report for Gatehouse Village at Briargate Filing No. 12*, the 48" RCP storm sewer can accept a maximum peak runoff rate of 125 cfs when this area is developed.

Sub-basins CF1 through CF7 consist of the fully developed Cordera master plan area totaling 140 acres in size. Peak runoff rates are Q(5)=153.4 cfs and Q(100)=444.2 cfs upstream of the proposed detention basin.

Sub-basins A-1 through A-10 consist of the predicted fully developed area for Wolf Creek Ranch totaling approximately 363 acres in size. The area will generate peak runoff rates of Q(5)=259.9 cfs and Q(100)=774.2 cfs at design point DPA. As with the historic conditions, coordination has occurred to determine the tributary area to design point DPA. Data for sub-basins A-1 through A-10 have been obtained from the analysis completed for the Wolf Ranch development.

The runoff from sub-basins CF1 through CF8 and A-1 through A-10 will be combined at design point C8 and enter proposed detention pond DF-1. Peak runoff rates into the pond at this point are Q(5)=385.5 cfs and Q(100)=1183.5 cfs. The peak release rates of the detention pond have been based upon the calculated historic runoff rates for the sub-basin so as not to overwhelm the existing down stream improvements. The peak release rates are Q(5)=48.1 cfs and Q(100)=362.7 cfs. Within the Cottonwood DBPS, a maximum of 901 cfs is allowed. The historic runoff rates have been maintained due to capacity issues at the next downstream detention pond in the Fairfax development and also because of the existing condition of the downstream channel. The channel from Powers Boulevard to Research Boulevard is currently in its historic state and suffering from erosion problems. By installing the proposed detention pond with the water quality capture volume, the downstream flow rates and flow frequency will be reduced helping to stabilize the downstream channel in its natural state.

E. Water Quality Capture Volume

The City of Colorado Springs has moved into the Phase II of providing water quality for new developments. The water quality capture volume required for this project will be combined with the proposed detention ponds. It should be noted that the previously listed required detention volumes do not include water quality volumes. The water quality capture volumes have included a 20% increase in the volume to account for sediment that will be trapped in the detention pond. The water quality portion of a detention pond will be the first portion of the pond to fill up (the lowest volume in the pond).

Extended Detention Basin (EDB) and Sedimentation Facility criteria will be used. The detention ponds will be "dry", requiring a 40-hour drain time for the water quality capture volumes. As part of this report, the required additional volumes have been calculated. The final outlet facility will be designed as part of the final construction drawings for the site.

For the Cottonwood Creek Drainage Basin, two conditions were evaluated – the fully developed conditions and interim conditions. See appendix. Upon full build out of the upstream tributary area, it is estimated that 11.2 acre-feet of volume will be required. The final volume will have to be verified once a firm site plan for the adjacent Wolf Creek Ranch is completed. The interim conditions for the development of Cordera Filing No. 1 will require 4.0 acre-feet of water quality capture volume.

For the Pine Creek Drainage Basin, the fully developed conditions will have two detention ponds constructed. The first pond will be located east of the intersection of Briargate Parkway and Powers Boulevard. This pond will ultimately require 5.0 acre-feet of storage. The second pond to be located east of the North Fork of Pine Creek and Powers Boulevard will require 2.4 acre-feet of storage. A third detention pond has been shown off-site of the Cordera development and will be sized by the future developer of the upstream area.

The interim conditions for Pine Creek will only require the one detention pond at Briargate Parkway and Powers Boulevard be constructed. The interim volume required will be 3.3 acre-feet of storage.

F. Cost Estimate

All proposed drainage facilities will be 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 Cordera Filing No. 1. Stormwater facilities that have been master planned within this document, but will not be constructed within Filing 1, have been excluded from this estimate. The construction cost estimate is based upon the drainage basin each improvement will be located within.

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 reimbursable.

Engineer's Estimate of Probable Construction Costs
Pine Creek Drainage Basin
Non-Reimbursable Public Improvements

Item	Unit	Quantity	Unit Cost	Extension
Storm Manhole	EA	0	$3,500.00	$0.00
18" RCP	LF	1405	$36.00	$50,580.00
24" RCP	LF	1865	$48.00	$89,520.00
30" RCP	LF	807	$60.00	$48,420.00
36" RCP	LF	1060	$76.00	$80,560.00
48" RCP	LF	0	$95.00	$0.00
54" RCP	LF	0	$130.00	$0.00
60" RCP	LF	0	$150.00	$0.00
66" RCP	LF	0	$180.00	$0.00
72" RCP	LF	829	$225.00	$186,525.00
5' D10R Inlet	EA	6	$3,725.00	$22,350.00
10' D10R Inlet	EA	5	$4,600.00	$23,000.00
15' D10R Inlet	EA	2	$6,000.00	$12,000.00
20' D10R Inlet	EA	2	$7,000.00	$14,000.00
10' D9 Grated Inlet	EA	1	$3,750.00	$3,750.00
48" Flared End Section	EA	0	$2,400.00	$0.00
36" Flared End Section	EA	2	$2,000.00	$4,000.00
24" Flared End Section	EA	0	$1,800.00	$0.00
Storm Sewer Plug	EA	1	$500.00	$500.00
Concrete Headwall	EA	1	$5,000.00	$5,000.00
Detention Outlet Structure	EA	1	$8,000.00	$8,000.00
Detention Pond	ac-ft	23.5	$10,000.00	$235,000.00
			Sub-Total	$783,205.00
			10% Contingencies	$78,320.50
			Grand Total	***$861,525.50***

Within the Cottonwood Creek Drainage Basin, the trunk storm sewer system has been identified as public improvements proposed in the DBPS, and therefore reimbursable items. All storm sewer laterals, associated manholes, and inlets are non-reimbursable. A summary of each cost is as follows.

Engineer's Estimate of Probable Construction Costs
Cottonwood Creek Drainage Basin
Reimbursable Public Improvements

Item	Unit	Quantity	Unit Cost	Extension
Storm Manhole	EA	18	$3,500.00	$63,000.00
48" RCP	LF	1925	$95.00	$182,875.00
54" RCP	LF	280	$130.00	$36,400.00
60" RCP	LF	2140	$150.00	$321,000.00
66" RCP	LF	1050	$180.00	$189,000.00
48" Flared End Section	EA	1	$2,400.00	$2,400.00
Concrete Headwall	EA	1	$5,000.00	$5,000.00
			Sub-Total	$799,675.00
			10% Contingencies	$79,967.50
			Grand Total	***$879,642.50***

Per the Ayres and Associates DBPS, dated June 2000, the proposed public reimbursable public improvements for Design Points E2 to 11C, located within the Cordera Development, has a total construction cost of $481,400.00 to improve the existing drainage ways by providing erosion and grade control measures. The difference between the estimated construction costs proposed in this report and the costs given in the Ayres DBPS is ***$398,242.50***.

Engineer's Estimate of Probable Construction Costs
Cottonwood Creek Drainage Basin
Non-Reimbursable Public Improvements

Item	Unit	Quantity	Unit Cost	Extension
Storm Manhole	EA	10	$3,500.00	$35,000.00
18" RCP	LF	1650	$36.00	$59,400.00
24" RCP	LF	780	$48.00	$37,440.00
30" RCP	LF	525	$60.00	$31,500.00
36" RCP	LF	665	$76.00	$50,540.00
5' D10R Inlet	EA	2	$3,725.00	$7,450.00
10' D10R Inlet	EA	15	$4,600.00	$69,000.00
15' D10R Inlet	EA	5	$6,000.00	$30,000.00
20' D10R Inlet	EA	1	$7,000.00	$7,000.00
36" Flared End Section	EA	1	$2,000.00	$2,000.00
24" Flared End Section	EA	2	$1,800.00	$3,600.00
Detention Pond Outlet	EA	1	$8,000.00	$8,000.00
Detention Pond	ac-ft	50.5	$10,000.00	$505,000.00
			Sub-Total	$845,930.00
			10% Contingencies	$84,593.00
			Grand Total	***$930,523.00***

The difference between the original system proposed within the DBPS and the entire public system proposed within this project is ***$1,328,765.50***. An adjustment to the Cottonwood Creek Drainage Basin Fee is being requested to include the construction costs of the public systems associated with the development. The proposed improvements, including the detention pond will help to minimize the downstream impacts to segments of unimproved channel.

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.

G. Drainage and Bridge Fees

Cordera Filing No. 1 has not been previously platted. The 2004 Drainage, Bridge, and Pond fees as published by the City of Colorado Springs Stormwater Division will be assessed to the site. The site is split between the Pine Creek and Cottonwood Creek Drainage Basins.

The Pine Creek Drainage Basin is a closed basin. Filing 1 has 51.1 acres of tributary area to the basin. No drainage, bridge, or pond fees will be assessed to the developer for the area being platted that contribute to Pine Creek. All public stormwater improvements constructed by the developer within the basin are not reimbursable. All of the facilities listed within the Cost Estimate section of this report will be constructed during the interim condition.

Pine Creek Drainage Basin

	Area (ac)	Fee/Acre	Total
Drainage Fee	51.1	$0.00	$0.00
Bridge Fee	51.1	$0.00	$0.00
Pond Fee	51.1	$0.00	$0.00
		Grand Total Due at Platting	***$0.00***

Approximately 98.9 acres of Cordera Filing No. 1 are located within the Cottonwood Creek Basin. The entire system as listed within the Cost Estimate section of this report will be constructed for the interim condition. Within the Cottonwood Creek Drainage Basin, only drainage and bridge fees are assessed as follows.

Cottonwood Creek Drainage Basin

	Area (ac)	Fee/Acre	Total
Drainage Fee	98.9	$8,341.00	$824,924.90
Bridge Fee	98.9	$696.00	$68,834.40
Pond Fee	98.9	$0.00	$0.00
		Grand Total Due at Platting	***$893,759.30***
		Current Reimbursable Construction Cost (Per DBPS)	$481,400.00
		Fees Due at Platting	$412,359.30
		Proposed Construction Costs to be added to Drainage Fees	$1,328,765.50
		Total Eligible for Reimbursement	***$916,406.20***

The Cottonwood Creek Drainage Basin Planning Study proposes a trunk system be extended through the site consisting of an improved channel. In place of the channel, this development has proposed a trunk storm sewer system. A portion of the trunk system from Briargate Parkway to the proposed detention pond is reimbursable.

The construction costs presented in the DBPS for the proposed public stormwater facilities are reimbursable from the drainage fees. We are proposing to include the additional construction cost to the basin drainage fee. Due to the fact the Engineer's Estimate of Probable Construction

Costs exceeds that of the drainage fees required for the site, no drainage fees will be due at the time of platting, and the owner will be eligible for reimbursement for the difference between the drainage fees and the actual construction costs. Bridge fees will be due at the time of platting. Financial assurances for the construction of the public drainage facilities will be required prior to issuance of a building permit.

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 Union Boulevard (Briargate Parkway to Powers Boulevard),*** JR Engineering, July 2003.

10. ***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.

11. ***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.

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

13. ***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.

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

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

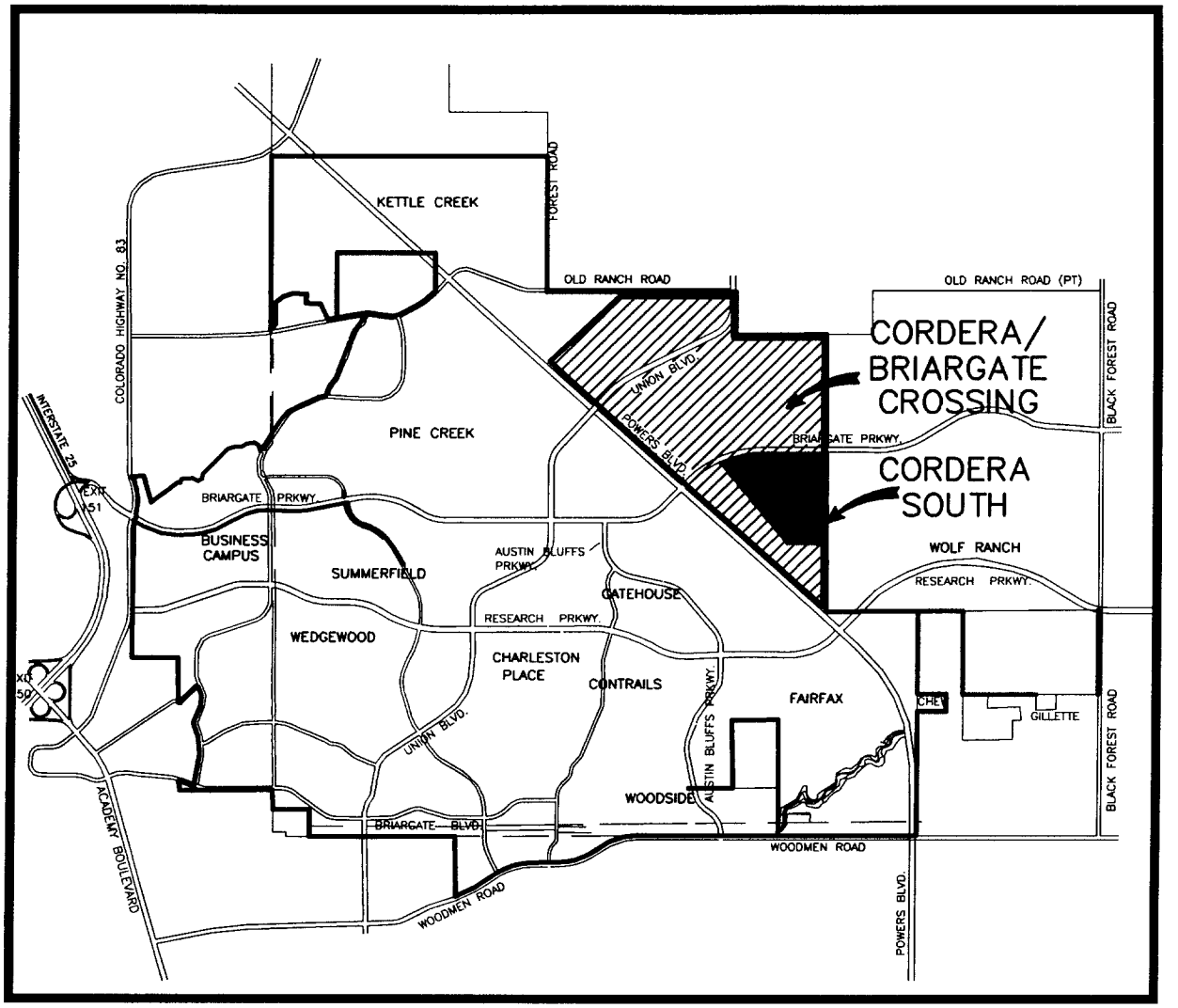
16. ***Soil Survey of El Paso County Area, Colorado***. United States Department of Agriculture Soil Conservation Service, June 1981.

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

VII. APPENDICIES

APPENDIX A

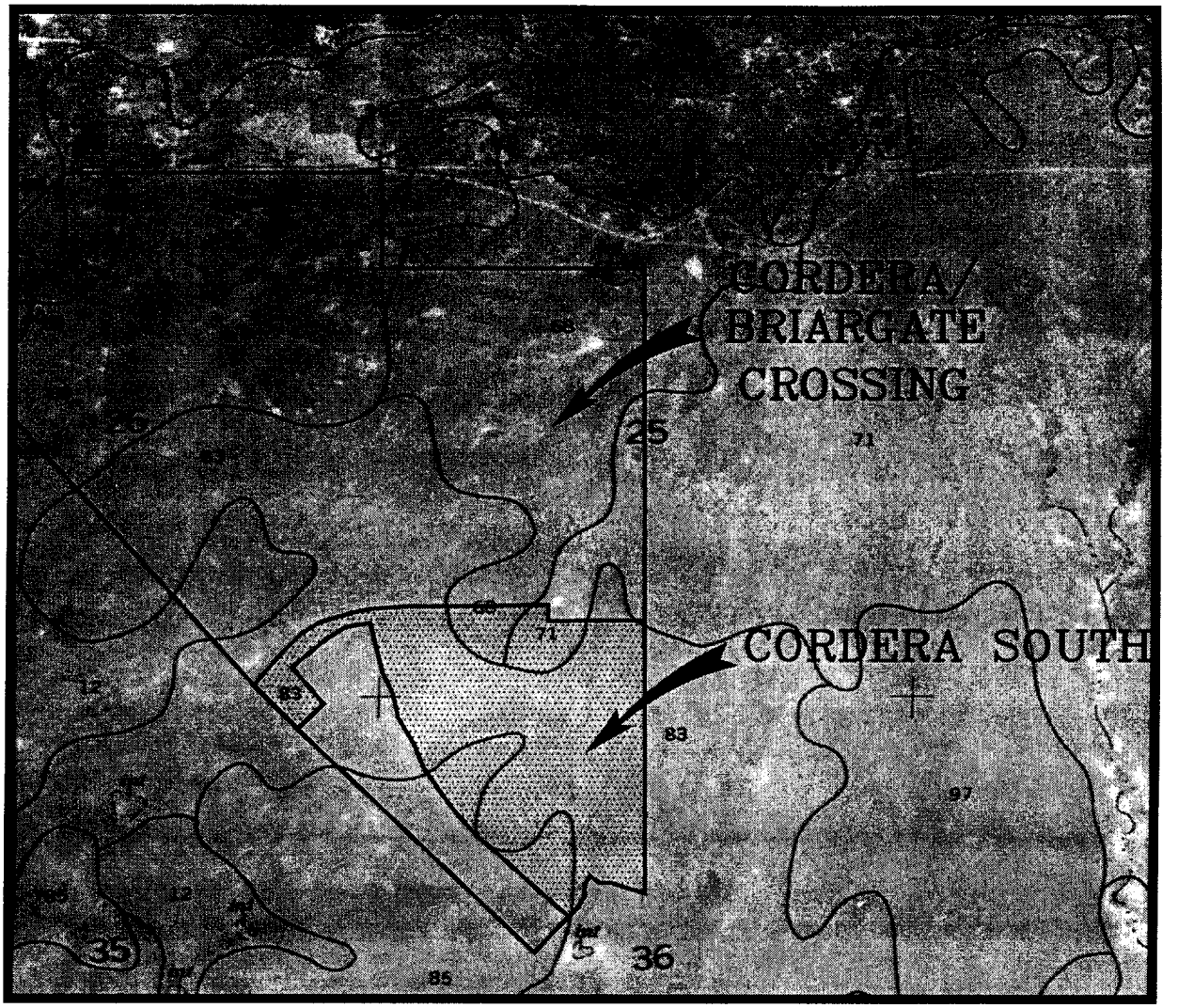
MAPS



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

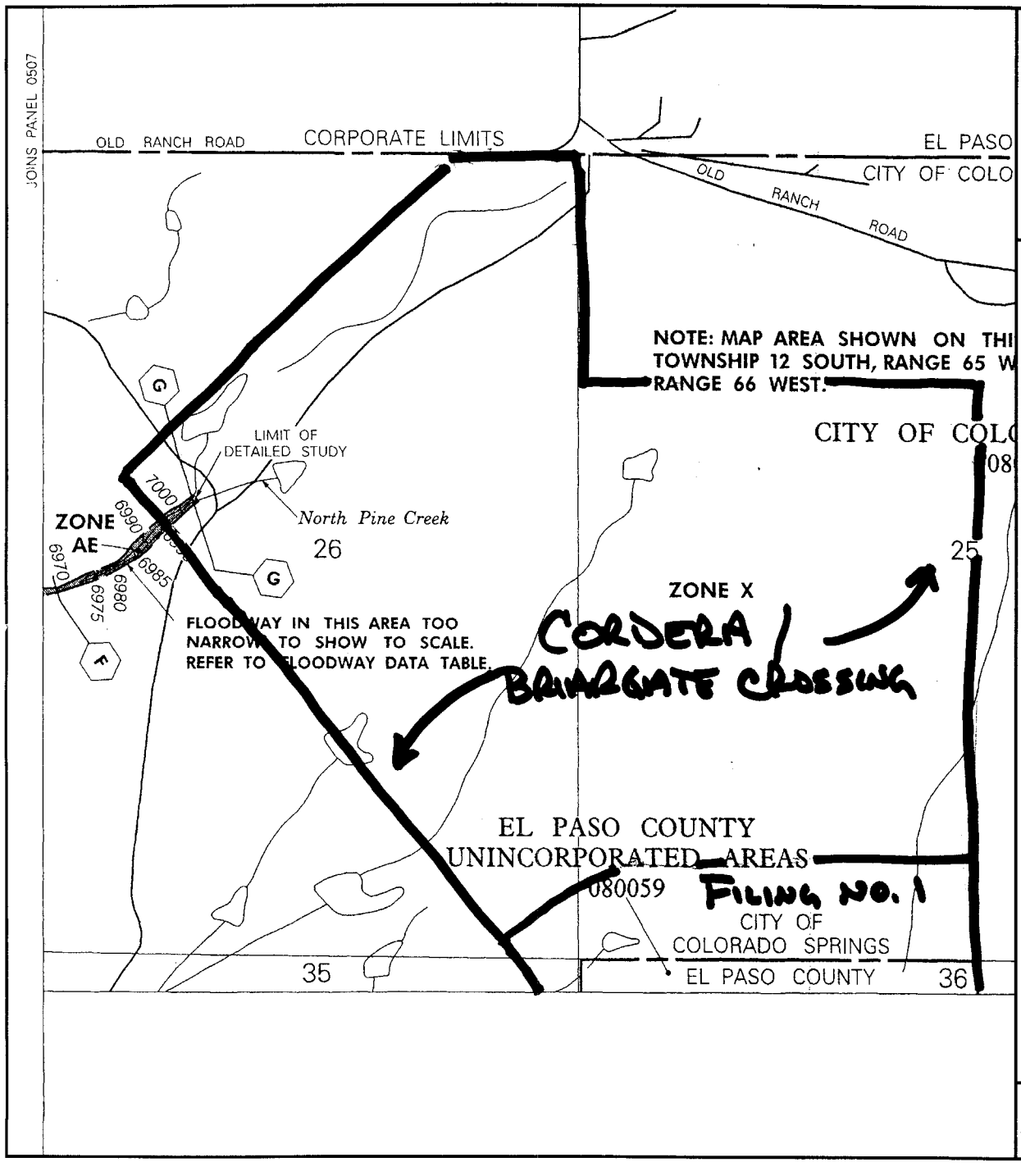
NORTH
N.T.S.

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
Fax 719-575-0208

FIG. 3



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)

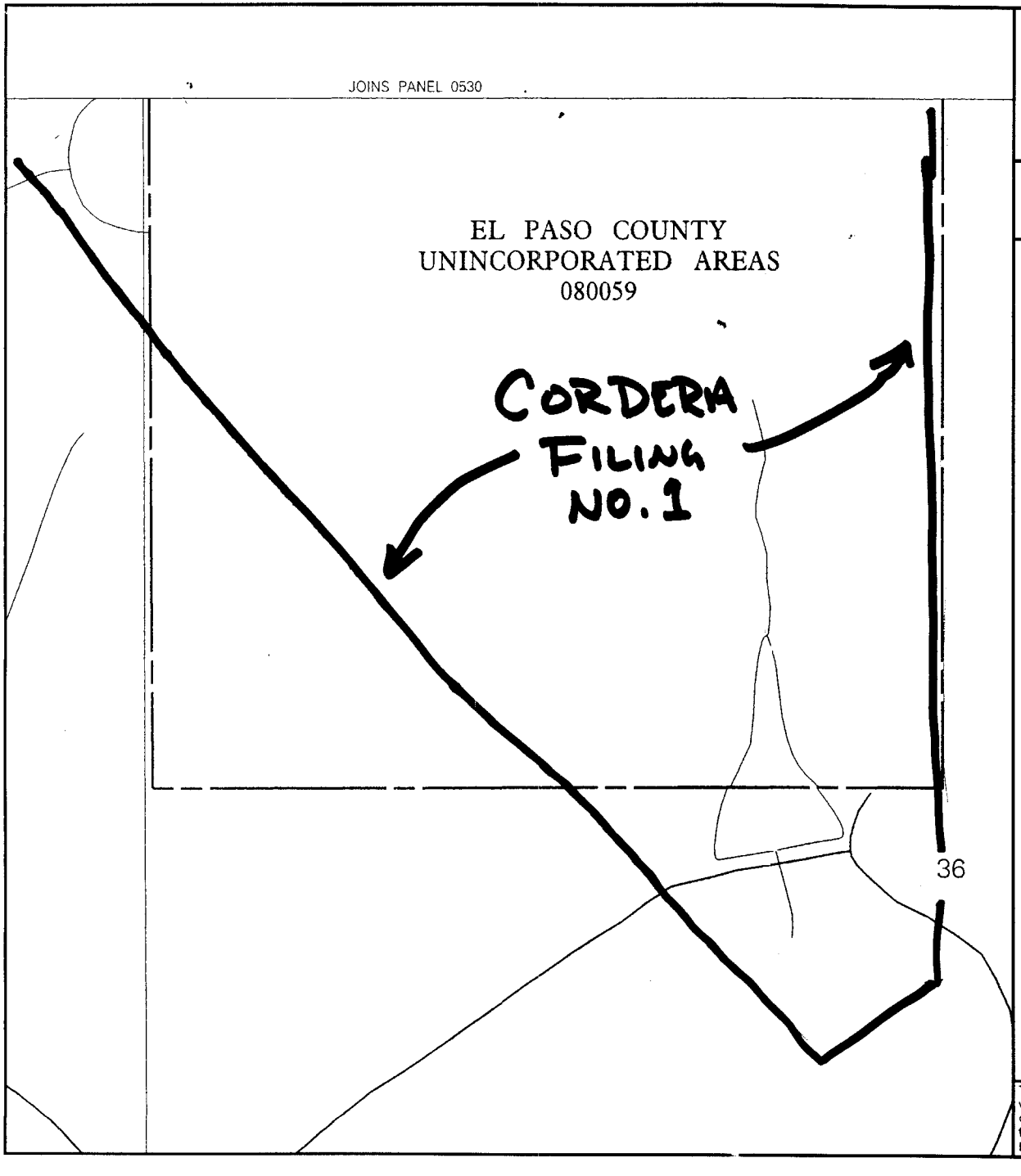
CONTAINS:

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



APPROXIMATE SCALE IN FEET

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 528 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

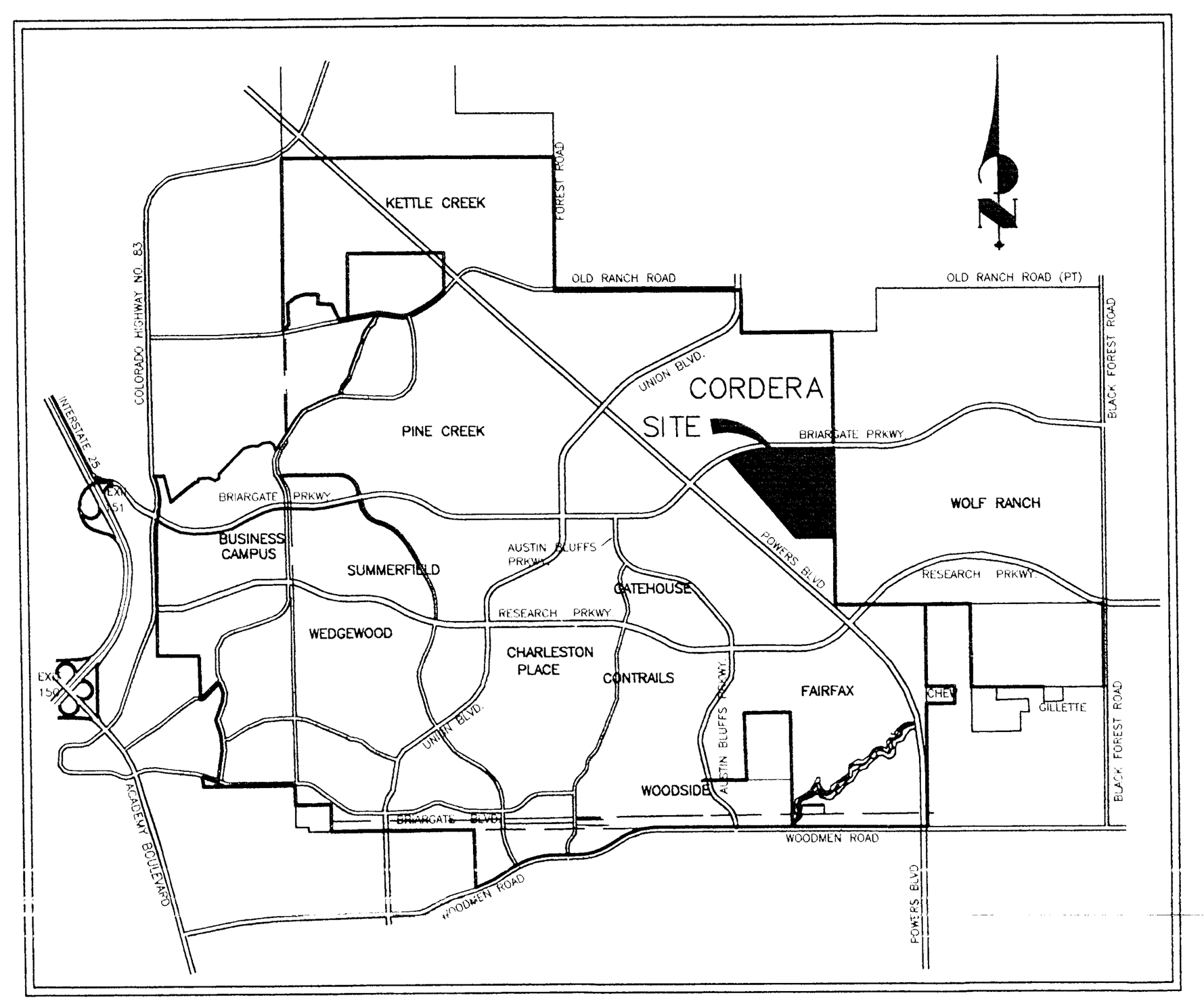
COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0528	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0528	F

MAP NUMBER
08041C0528 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

SHEET NO. 1



VICINITY MAP:
N.T.S.

SUB-BASIN DATA SUMMARY
DEVELOPED CONDITIONS

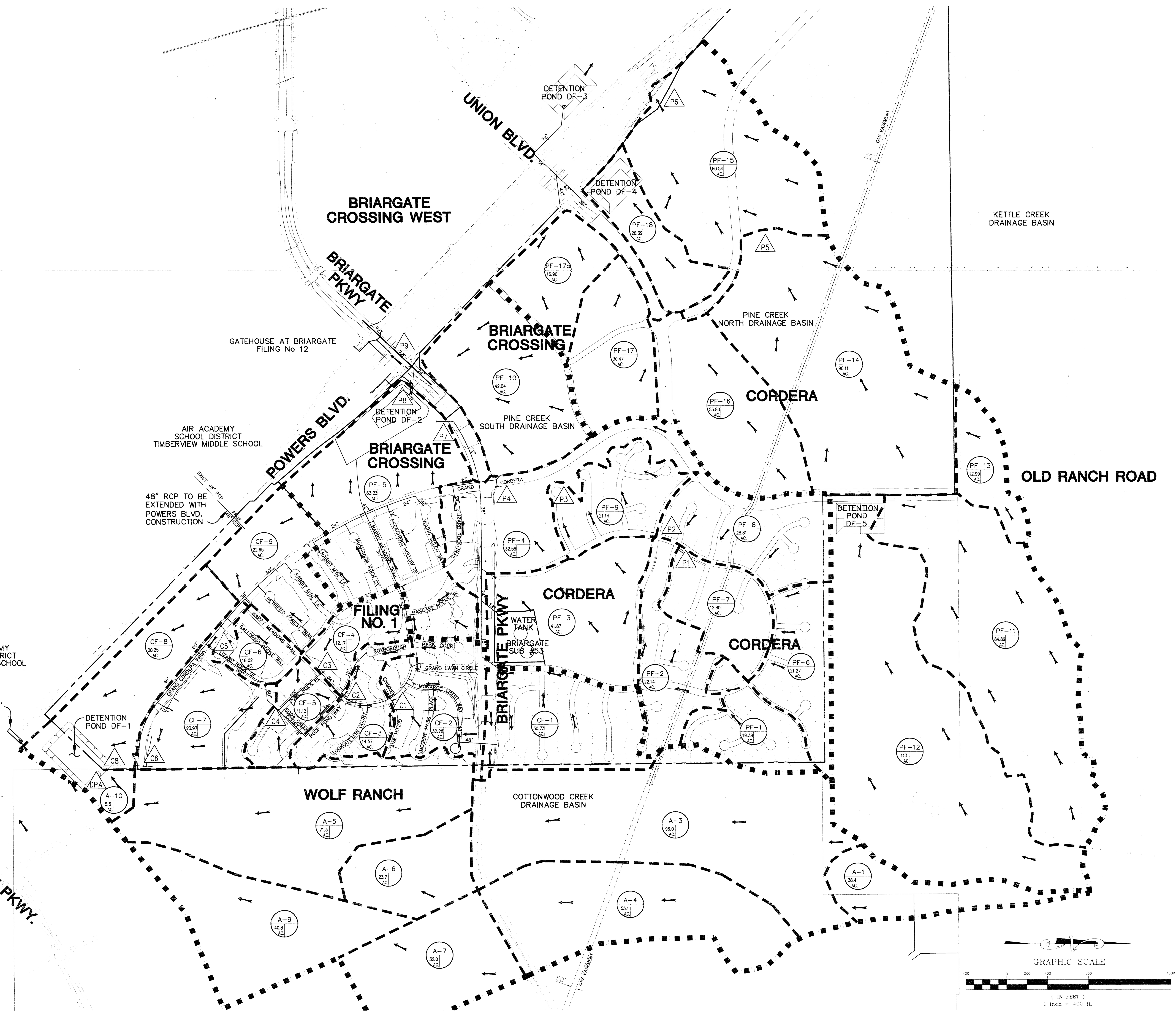
BASIN ID	AREA (AC)	PEAK RUNOFF Q(5) (CFS)	PEAK RUNOFF Q(100) (CFS)
CF1	30.73	26.3	78.3
CF2	32.28	25.7	77.8
CF3	14.57	13.2	39.0
CF4	12.17	4.8	19.8
CF5	11.13	9.6	28.6
CF6	16.02	29.2	64.0
CF7	23.97	39.7	88.7
CF8	30.25	54.4	119.7
CF9	22.65	45.1	92.6
A1	38.40	5.2	36.8
A3	96.00	79.6	234.4
A4	55.10	58.2	155.4
A5	71.30	68.9	191.3
A6	23.68	26.4	68.9
A7	32.00	34.9	94.1
A9	40.77	21.9	76.0
A10	5.50	1.0	5.7
PF1	19.39	11.0	39.3
PF2	22.14	9.6	38.3
PF3	41.87	52.6	129.6
PF4	32.58	22.9	74.7
PF5	63.23	75.8	192.9
PF5a	4.14	3.4	9.9
PF5b	10.48	27.2	50.3
PF6	21.27	11.4	42.0
PF7	12.80	5.8	23.6
PF8	28.81	14.5	53.9
PF9	21.14	18.3	54.5
PF10	42.04	103.3	197.1
PF11	84.89	83.4	230.1
PF12	112.65	108.2	299.8
PF13	12.99	2.0	14.9
PF14	90.11	61.1	201.9
PF15	60.54	45.0	144.2
PF16	53.80	77.4	187.7
PF17	30.47	71.5	138.4
PF17a	16.90	39.3	75.9
PF18	26.39	50.2	107.6

SUB-BASIN DATA SUMMARY
DEVELOPED CONDITIONS

DESIGN POINT	PEAK RUNOFF Q(5) (CFS)	PEAK RUNOFF Q(100) (CFS)
C1	51.6	155.8
C2	63.9	192.6
C3	68.1	212.1
C4	76.8	238.9
C5	98.7	290.9
C6	135.7	374.2
C8	385.5	1183.5
DPA	259.9	774.2
P1	17.0	65.1
P2	51.7	195.6
P3	67.5	245.3
P4	140.6	445.7
P5	117.4	316.7
P6	148.0	556.5
P7	212.7	634.4
P8	74.1	277.0
P9	152.6	386.4

LEGEND

- FILING LIMITS
- DRAINAGE BASIN BOUNDARY
- 6520 PROPOSED CONTOUR
- 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
- DP DESIGN POINT
- C-13 BASIN DESIGNATION
- 5.19 AC. BASIN AREA (ACRES)



GRAPHIC SCALE
400 0 200 400 800 1600
(IN FEET)
1 inch = 400 ft.

2003-07-17stormsewer plan
x-powers-fromURS
2871532DH
wolfcreek
x-pinecreek16
x-topo
x-base

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: S:\03.104.015\dwg\Prelim\STRM-DRAIN\DP01.dwg
PCP: Matrix.ctb
PLOT DATE: Nov 09, 2004 4:02pm

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.

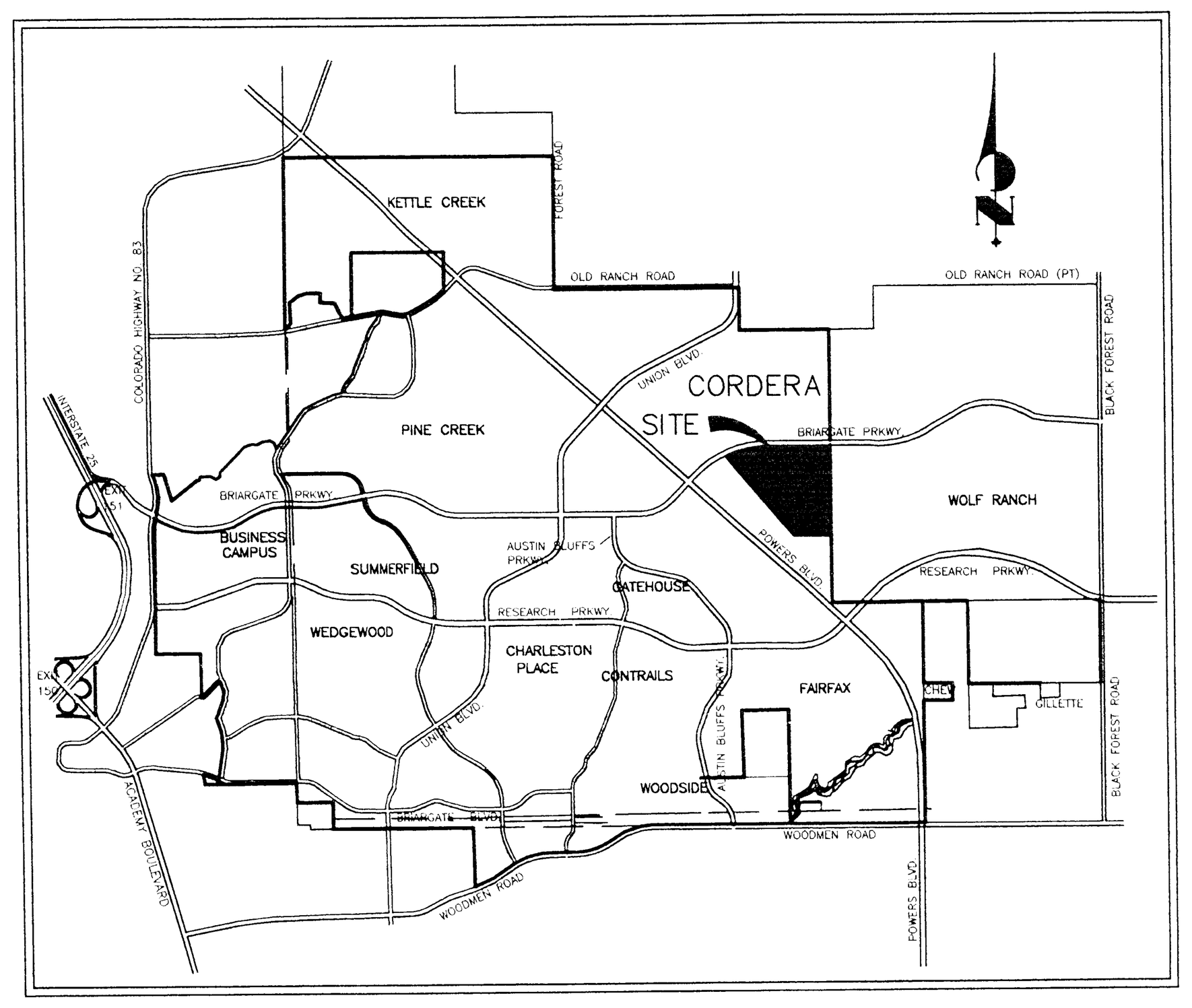
Matrix Design Group, Inc.
Integrated Design Solutions 2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208

CORDERA FILING NO. 1

DRAINAGE REPORT

FULLY DEVELOPED DRAINAGE MAP

DESIGNED BY: RGG
DRAWN BY: BPK
CHECKED BY:
SCALE HORIZ: 1"=400' VERT: N/A
DATE ISSUED: NOV 2003
SHEET NO. 1 OF 4 SHEETS
DP01



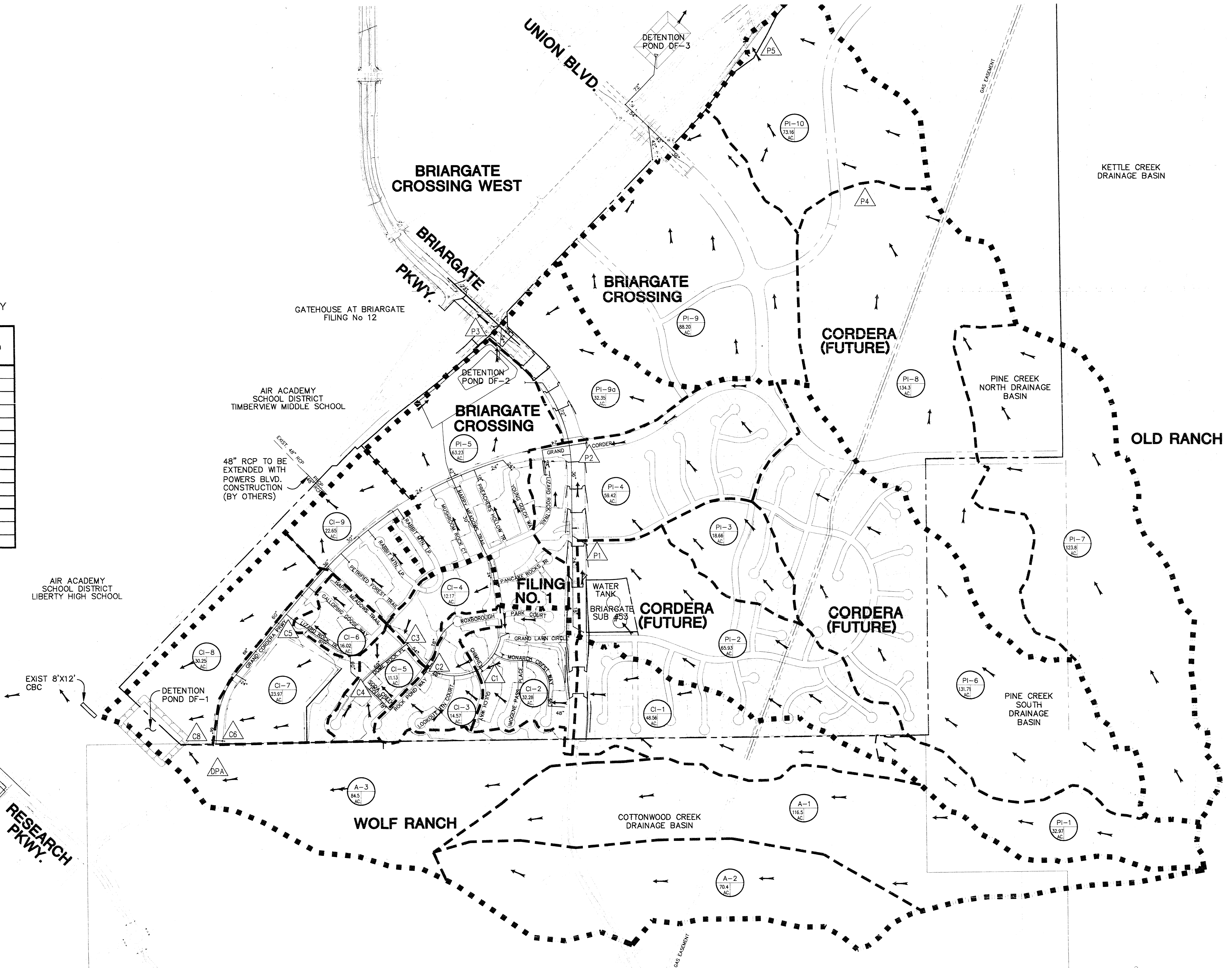
VICINITY MAP:
N.T.S.

SUB-BASIN DATA SUMMARY
INTERIM CONDITIONS

BASIN ID	AREA (AC)	PEAK RUNOFF Q(5) (CFS)	Q(100) (CFS)
CI1	48.56	5.8	41.6
CI2	32.28	25.7	77.8
CI3	14.57	13.2	39.0
CI4	12.17	4.6	19.8
CI5	11.13	9.6	28.6
CI6	16.02	29.2	64.0
CI7	23.97	33.3	80.2
CI8	30.25	54.4	119.7
CI9	22.65	13.4	46.7
A1	116.48	13.5	96.2
A2	70.40	9.5	67.6
A3	84.48	11.8	82.8
PI1	32.97	4.3	30.5
PI2	65.93	9.4	63.2
PI3	18.66	2.9	20.1
PI4	59.42	45.8	141.2
PI5	63.23	71.5	186.3
PI6	131.71	14.3	102.5
PI7	123.76	24.1	151.0
PI8	134.33	14.5	103.4
PI9	88.2	8.0	56.5
PI9a	32.35	9.1	42.8
PI10	73.16	8.6	61.3

SUB-BASIN DATA SUMMARY
INTERIM CONDITIONS

DESIGN POINT	PEAK RUNOFF Q(5) (CFS)	Q(100) (CFS)
C1	26.0	97.3
C2	38.7	130.8
C3	42.8	150.1
C4	51.8	176.4
C5	74.9	227.2
C6	107.2	303.4
C8	162.7	507.3
DPA	27.4	225.6
P1	9.4	74.2
P2	60.8	288.8
P3	52.4	240.5
P4	38.0	244.9
P5	45.7	304.2



LEGEND

- FILING LIMITS
- DRAINAGE BASIN BOUNDARY
- 6520 PROPOSED CONTOUR
- 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
- DP DESIGN POINT
- TAC DESIGN SEGMENT
- C-13 BASIN DESIGNATION
- "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

NAME: S:\03.104.015\dwg\Prelim\STRM-DRAIN\DP02.dwg
PCP: Matrix.ctb
PLOT DATE: Nov 09, 2004 4:03pm

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.

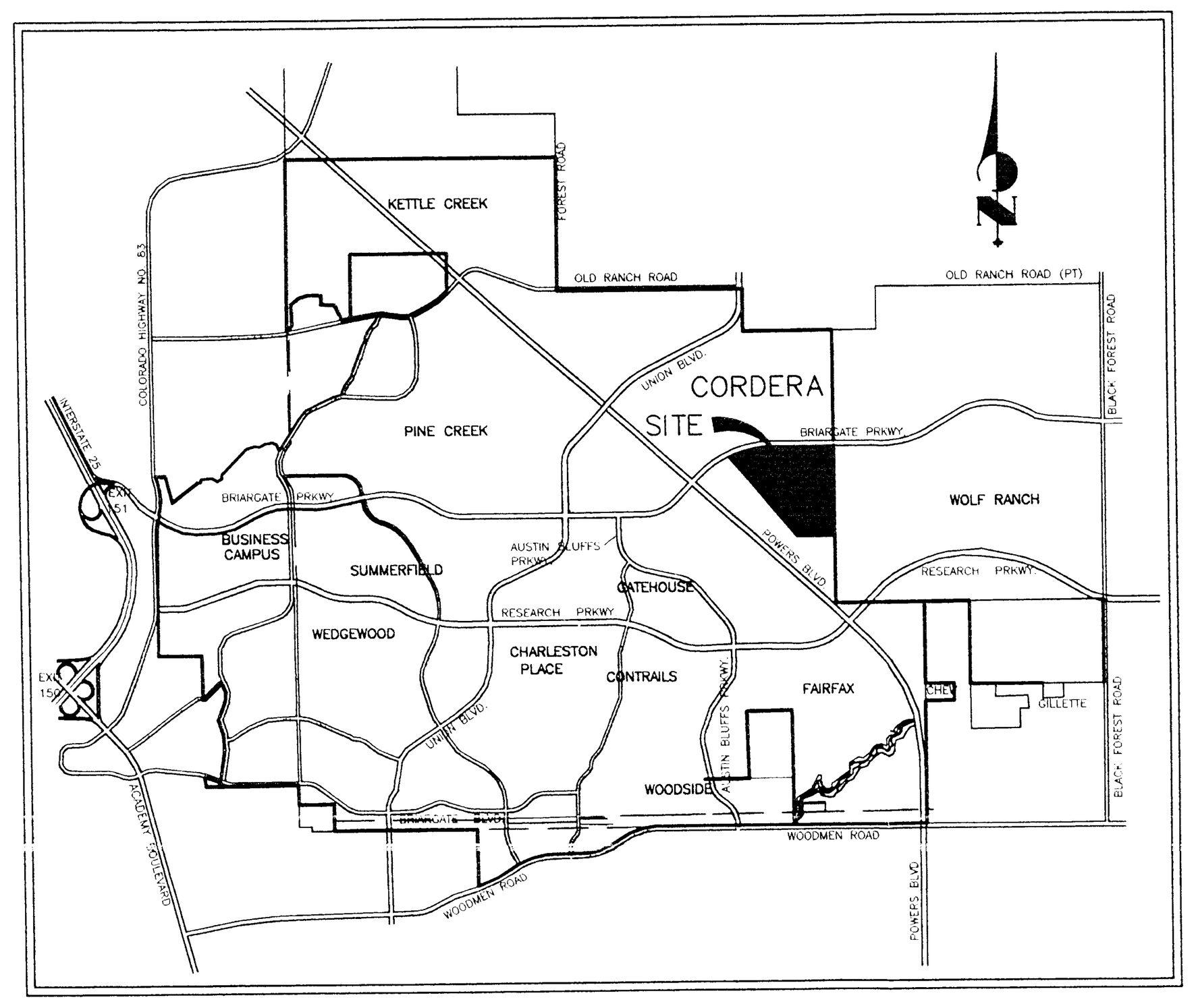
Matrix Design Group, Inc.
Integrated Design Solutions 2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208

CORDERA FILING NO. 1

DRAINAGE REPORT

INTERIM DRAINAGE MAP

DESIGNED BY: RGO	SCALE	DATE ISSUED: NOV 2003	DP02
DRAWN BY: BPK	HORIZ: 1"=400'	SHEET NO. 2 OF 4 SHEETS	
CHECKED BY:	VERT: N/A		



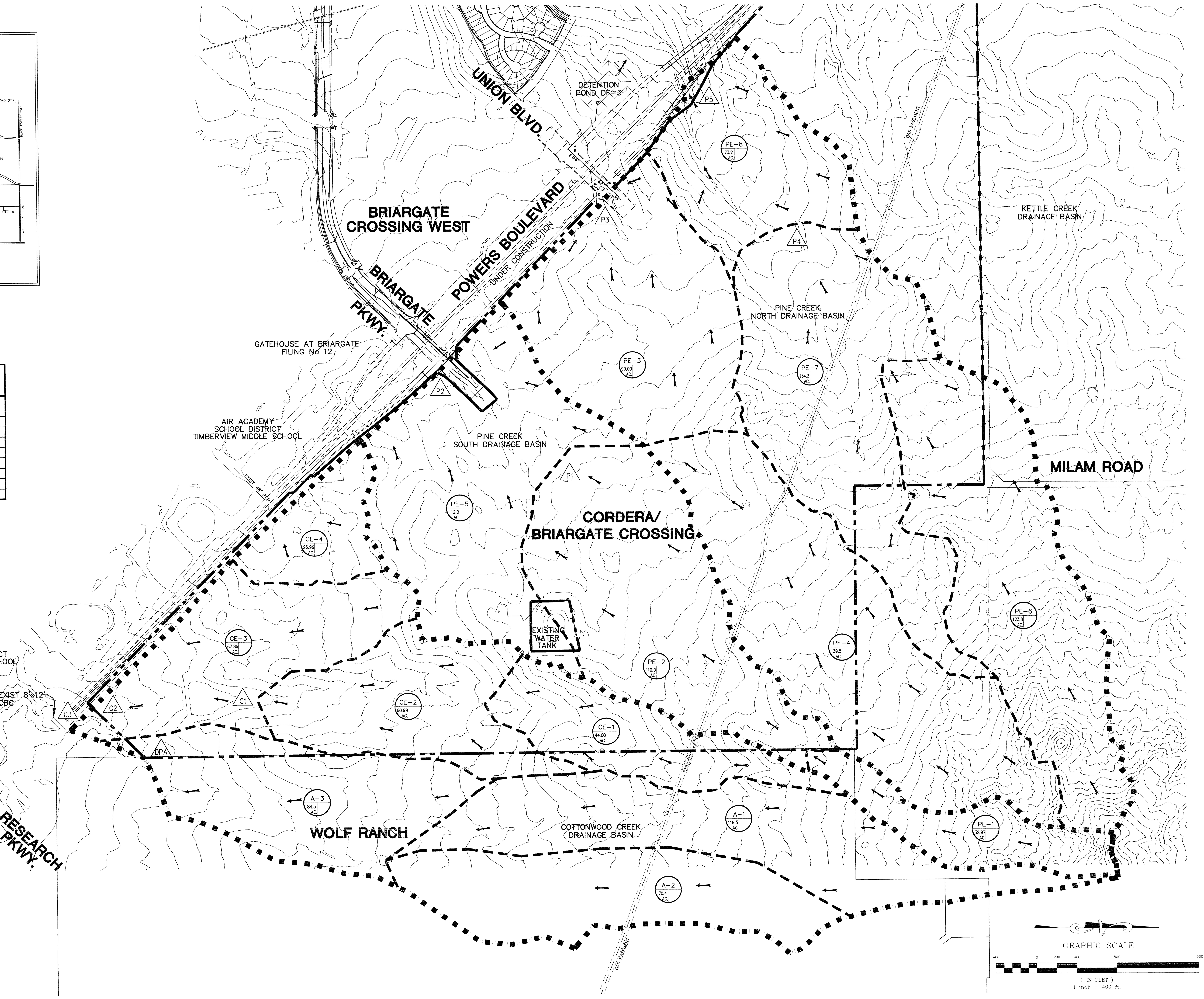
VICINITY MAP:
N.T.S.

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
- DP — DESIGN POINT
- TAG — DESIGN SEGMENT
- C-13 — BASIN DESIGNATION
- 0.62 — "C" COEFFICIENT (100 YR)
- 5.19 AC. — BASIN AREA (ACRES)

2003-07-17stormsewer plan
x-powers-fromURS
2871532DH
wolfcreek
x-pinecreek16
x-topo
x-base

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: S:\03.104.015\dwg\Prelim\STRM-DRAIN\DP03.dwg
PCP: Matrix.ctb
PLOT DATE: Nov 09, 2004 3:53pm

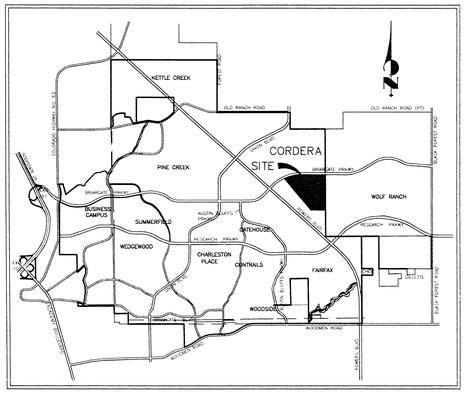
BENCHMARK DATA(ELEV.) 6975.68
(DATUM) ASSUMED
(DESCRIPTION/LOCATION) THE NW SIDE OF FH #104 AT THE INT. OF BRIARGATE PKWY AND BRAINARD DR

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. 1
DRAINAGE REPORT
EXISTING DRAINAGE MAP

DESIGNED BY: RGG	SCALE	DATE ISSUED: NOV. 2003	DP03
DRAWN BY: BPK	HORIZ: 1"=400'		
CHECKED BY:	VERT: N/A	SHEET NO. 3 OF 4 SHEETS	



VICINITY MAP:

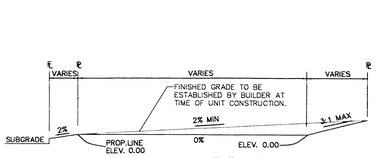
N.T.S.

SUB-BASIN DATA SUMMARY
INTERIM CONDITIONS

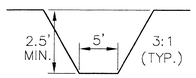
BASIN ID	AREA (AC)	PEAK RUNOFF Q(5) (CFS)	PEAK RUNOFF Q(100) (CFS)
CI1	48.56	5.8	41.8
CI2	32.28	25.7	77.8
CI3	14.57	13.2	39.0
CI4	12.17	4.6	19.8
CI5	11.13	9.6	28.6
CI6	16.02	29.2	64.0
CI7	23.97	33.3	80.2
CI8	30.25	54.4	119.7
CI9	22.85	13.4	46.7
A1	116.48	13.5	96.2
A2	70.40	9.5	67.6
A3	84.48	11.8	82.8
PI1	32.97	4.3	30.5
PI2	65.93	9.4	63.2
PI3	18.86	2.9	20.1
PI4	59.42	45.8	141.2
PI5	63.23	71.5	186.3
PI6	131.71	14.3	102.5
PI7	123.76	24.1	151.0
PI8	134.33	14.5	103.4
PI9	88.2	8.0	56.5
PI9a	32.35	9.1	42.8
PI10	73.16	8.8	61.3

SUB-BASIN DATA SUMMARY
INTERIM CONDITIONS

DESIGN POINT	PEAK RUNOFF Q(5) (CFS)	PEAK RUNOFF Q(100) (CFS)
C1	28.0	97.3
C2	38.7	130.8
C3	42.8	150.1
C4	51.8	176.4
C5	74.9	227.2
C6	107.2	303.4
C8	162.7	507.3
DPA	27.4	225.6
P1	9.4	74.2
P2	80.8	288.8
P3	52.4	240.5
P4	38.0	244.9
P5	45.7	304.2

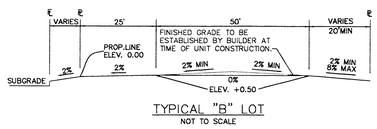


TYPICAL "A" LOT
NOT TO SCALE

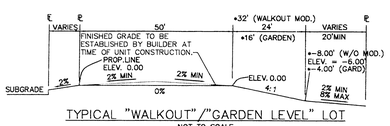


SECTION A – A

N.T.S.



TYPICAL "B" LOT
NOT TO SCALE



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

LEGEND

- 6520 — PROPOSED CONTOUR
- EXISTING CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- DRAINAGE CHANNEL
- PROPOSED D-10-R INLET
- PROPOSED TYPE I OR II MANHOLE
- PROPOSED FLOW DIRECTION ARROW
- DP — DESIGN POINT
- TAG — DESIGN SEGMENT
- C-1.3 / 3.18 / 0.62 AC — BASIN DESIGNATION
- "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)
- FILING LIMITS
- DRAINAGE SUB-BASIN BOUNDARY
- MAJOR DRAINAGE BASIN BOUNDARY
- (A) "A" LOT GRADING, SEE DETAIL
- (B) "B" LOT GRADING, SEE DETAIL
- (W) "W" LOT GRADING, SEE DETAIL
- (G) "G" LOT GRADING, SEE DETAIL

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

NAME: S:\03.104.015\dwg\Prelim\STRM-DRAIN\DP04.dwg
PCP: Matrix.ctb
PLOT DATE: Nov. 09, 2004 3:42pm

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. 1

DRAINAGE REPORT

INTERIM DRAINAGE MAP
FILING NO. 1 INFRASTRUCTURE

DESIGNED BY: RGG	SCALE	DATE ISSUED: NOV. 2003	
DRAWN BY: BPK	HORIZ: 1"=200'	SHEET NO. 4 OF 4 SHEETS	DP04
CHECKED BY:	VERT: N/A		

2003-07-17atomsweer plan
x-powers-fromURS
xoffrees
xgatecreek16
x-topo
x-base

APPENDIX B

HYDROLOGIC AND HYDRAULIC CALCULATIONS

CORDERA FILING NO. 1
HYDROLOGY AND HYDRAULICS

Cordera Filing No. 1 Final Drainage Report
Rational Method
Cottonwood Creek Drainage Fee Basin

Sub-Basin Designation	Design Point	Sub-Basins	Total Area (ac.)	Weighted Coefficients		CA		Overland Time			Travel Time					T(c) Check L/180+10	Final T(c)	Intensity		Peak Runoff	
				C(5)	C(100)	CA(5)	CA(100)	Overland Length (ft)	Overland Slope (%)	T(initial) (min.)	Travel Length (ft)	Weighted Slope (%)	Velocity (fps)	T(travel) (min.)	Final T(c)			I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
C2			7.71	0.50	0.60	3.86	4.63	50	2.00%	8.9	1900	2.4%	3.2	9.9	18.8	20.8	18.8	3.11	5.53	12.0	25.6
-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C3			1.96	0.90	0.90	1.76	1.76	25	2.00%	6.3	675	2.7%	3.2	3.5	9.8	13.9	9.8	4.13	7.35	7.3	13.0
C4			4.60	0.50	0.60	2.30	2.76	60	3.00%	8.6	500	4.0%	4.0	2.1	10.7	13.1	10.7	4.00	7.13	9.2	19.7
C5			5.69	0.50	0.60	2.85	3.41	60	2.00%	9.8	650	2.3%	2.2	4.9	14.7	13.9	13.9	3.58	6.37	10.2	21.7
C5a			3.10	0.50	0.60	1.55	1.86	60	2.00%	9.8	600	2.5%	2.2	4.5	14.3	13.7	13.7	3.61	6.42	5.6	12.0
C5b			2.59	0.50	0.60	1.30	1.55	60	2.00%	9.8	600	1.5%	2.2	4.5	14.3	13.7	13.7	3.61	6.42	4.7	10.0
C6			4.05	0.50	0.60	2.03	2.43	50	2.00%	8.9	730	1.5%	2.2	5.5	14.5	14.3	14.3	3.53	6.29	7.2	15.3
C6a			1.35	0.50	0.60	0.68	0.81	50	2.00%	8.9	730	1.5%	2.2	5.5	14.5	14.3	14.3	3.53	6.29	2.4	5.1
C6b			2.70	0.50	0.60	1.35	1.62	50	2.00%	8.9	650	1.1%	2.2	4.9	13.9	13.9	13.9	3.59	6.38	4.8	10.3
C7			5.50	0.50	0.60	2.75	3.30	50	2.00%	8.9	1125	1.8%	2.5	7.5	16.4	16.5	16.4	3.32	5.91	9.1	19.5
C8			4.33	0.50	0.60	2.17	2.60	50	2.00%	8.9	590	1.2%	2.0	4.9	13.9	13.6	13.6	3.62	6.45	7.8	16.8
C9			5.45	0.50	0.60	2.73	3.27	75	2.00%	11.0	775	1.2%	2.0	6.5	17.4	14.7	14.7	3.49	6.22	9.5	20.3
C10			3.83	0.50	0.60	1.92	2.30	50	2.00%	8.9	1175	1.3%	2.0	9.8	18.7	16.8	16.8	3.28	5.84	6.3	13.4
C11			3.91	0.50	0.60	1.96	2.35	50	2.00%	8.9	650	1.2%	2.0	5.4	14.4	13.9	13.9	3.58	6.38	7.0	15.0
C12			3.39	0.50	0.60	1.70	2.03	50	2.00%	8.9	525	1.0%	2.0	4.4	13.3	13.2	13.2	3.67	6.52	6.2	13.3
C13			3.90	0.50	0.60	1.95	2.34	75	3.50%	9.1	1600	2.1%	2.5	10.7	19.8	19.3	19.3	3.07	5.46	6.0	12.8
C14			7.49	0.30	0.40	2.25	3.00	100	2.50%	11.7	900	3.6%	3.8	3.9	15.7	15.6	15.6	3.40	6.06	7.7	18.2
C15			0.78	0.50	0.60	0.39	0.47	50	2.00%	8.9	530	2.8%	3.2	2.8	11.7	13.2	11.7	3.86	6.86	1.5	3.2
C16			3.47	0.50	0.60	1.74	2.08	50	2.00%	8.9	610	3.1%	3.2	3.2	12.1	13.7	12.1	3.80	6.76	6.6	14.1
C17			1.35	0.50	0.60	0.68	0.81	50	2.00%	8.9	375	3.7%	3.8	1.6	10.6	12.4	10.6	4.01	7.14	2.7	5.8
C18			2.77	0.50	0.60	1.39	1.66	50	2.00%	8.9	180	3.3%	3.3	0.9	9.9	11.3	9.9	4.13	7.34	5.7	12.2
C19		Not used																			
C19a		Not used																			
C19b		Not used																			
C20			4.60	0.60	0.70	2.76	3.22	50	2.00%	8.9	650	1.5%	2.2	4.9	13.9	13.9	13.9	3.59	6.38	9.9	20.6
C20a			3.50	0.60	0.70	2.10	2.45	50	2.00%	8.9	650	1.5%	2.2	4.9	13.9	13.9	13.9	3.59	6.38	7.5	15.6
C20b			1.10	0.60	0.70	0.66	0.77	35	2.00%	7.5	625	1.5%	2.2	4.7	12.2	13.7	12.2	3.79	6.74	2.5	5.2
C21			4.76	0.60	0.70	2.86	3.33	50	2.00%	8.9	600	1.5%	2.2	4.5	13.5	13.6	13.5	3.63	6.46	10.4	21.5
C21a			3.75	0.60	0.70	2.25	2.63	50	2.00%	8.9	600	1.5%	2.2	4.5	13.5	13.6	13.5	3.63	6.46	8.2	17.0
C21b			1.01	0.60	0.70	0.61	0.71	35	2.00%	7.5	575	1.5%	2.2	4.4	11.8	13.4	11.8	3.84	6.83	2.3	4.8
C22			3.35	0.60	0.70	2.01	2.35	50	2.00%	8.9	675	2.0%	2.5	4.5	13.4	14.0	13.4	3.64	6.47	7.3	15.2
C23			3.60	0.60	0.70	2.16	2.52	85	2.80%	10.4	650	2.0%	2.5	4.3	14.8	14.1	14.1	3.56	6.34	7.7	16.0
C24			4.35	0.60	0.70	2.61	3.05	90	2.80%	10.7	625	2.5%	3.1	3.4	14.1	14.0	14.0	3.57	6.36	9.3	19.4
C25			22.40	0.70	0.80	15.68	17.92	75	2.30%	10.5	1500	2.4%	3.0	8.3	18.8	18.8	18.8	3.11	5.54	48.8	99.3
C26			3.15	0.75	0.80	2.36	2.52	50	2.00%	8.9	2100	3.0%	3.2	10.9	19.9	21.9	19.9	3.02	5.38	7.1	13.6
C27			3.14	0.90	0.90	2.83	2.83	25	2.00%	6.3	3600	2.0%	2.5	24.0	30.3	30.1	30.1	2.42	4.30	6.8	12.2
OF1 (hist)			48.56	0.25	0.35	12.14	17.00	100	4.50%	9.7	3400	4.2%	3.0	18.9	28.6	29.4	28.6	2.49	4.43	30.2	75.3
OF1 (dev)			30.73	0.60	0.70	18.44	21.51	100	4.50%	9.7	3401	4.2%	4.0	14.2	23.8	29.5	23.8	2.75	4.90	50.7	105.3

Cordera Filing No. 1 Final Drainage Report
Rational Method
Pine Creek Drainage Fee Basin

Sub-Basin Designation	Design Point	Sub-Basins	Total Area (ac.)	Weighted Coefficients		CA		Overland Time			Travel Time					T(c) Check L/180+10	Final T(c)	Intensity		Peak Runoff	
				C(5)	C(100)	CA(5)	CA(100)	Overland Length (ft)	Overland Slope (%)	T(initial) (min.)	Travel Length (ft)	Weighted Slope (%)	Velocity (fps)	T(travel) (min.)	Final T(c)			I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
P1			3.41	0.60	0.70	2.05	2.39	50	2.00%	8.9	600	2.7%	2.9	3.4	12.4	13.6	12.4	3.76	6.70	7.7	16.0
P2a			3.85	0.60	0.70	2.31	2.70	55	2.00%	9.4	775	2.3%	2.4	5.4	14.8	14.6	14.6	3.50	6.24	8.1	16.8
P2b			1.65	0.60	0.70	0.99	1.16	50	2.00%	8.9	450	1.3%	2.2	3.4	12.4	12.8	12.4	3.77	6.71	3.7	7.8
P2c			0.37	0.90	0.90	0.33	0.33	25	2.00%	6.3	450	1.5%	2.2	3.4	9.7	12.6	9.7	4.14	7.38	1.4	2.5
P2d			0.78	0.90	0.90	0.70	0.70	25	2.00%	6.3	775	2.4%	2.4	5.4	11.7	14.4	11.7	3.85	6.86	2.7	4.8
P3			3.78	0.60	0.70	2.27	2.65	50	2.00%	8.9	600	3.0%	3.0	3.3	12.3	13.6	12.3	3.78	6.73	8.6	17.8
P4			2.43	0.60	0.70	1.46	1.70	50	2.00%	8.9	600	3.0%	3.0	3.3	12.3	13.6	12.3	3.78	6.73	5.5	11.4
P5			4.90	0.50	0.60	2.45	2.94	50	2.00%	8.9	575	2.8%	3.0	3.2	12.1	13.5	12.1	3.80	6.76	9.3	19.9
P6			3.72	0.50	0.60	1.86	2.23	50	2.00%	8.9	800	3.0%	3.0	4.4	13.4	14.7	13.4	3.64	6.48	6.8	14.5
P7			5.58	0.50	0.60	2.79	3.35	75	2.00%	11.0	575	3.5%	3.2	3.0	13.9	13.6	13.6	3.62	6.44	10.1	21.5
P8			6.04	0.60	0.70	3.62	4.23	50	2.00%	8.9	1575	3.0%	3.0	8.8	17.7	19.0	17.7	3.20	5.70	11.6	24.1
P10			5.41	0.90	0.90	4.87	4.87	100	3.00%	11.1	550	5.0%	3.5	2.6	13.7	13.6	13.6	3.62	6.44	17.6	31.3
P11			4.68	0.60	0.70	2.81	3.28	75	2.00%	11.0	665	1.5%	2.2	5.0	16.0	14.1	14.1	3.56	6.33	10.0	20.8
	11	P11, P1	8.09			4.85	5.66			16.0	450		5.0	1.5	17.5		17.5	3.22	5.73	15.6	32.5
	12	P3, P4	6.21			3.73	4.35			12.3	350		5.0	1.2	13.4		13.4	3.64	6.47	13.5	28.1
	13	P6, P7	9.30			4.65	5.58			13.9	350		5.0	1.2	15.1		15.1	3.45	6.14	16.0	34.3
	14	11, 12, 13, P2	30.25			17.57	20.48			15.1	300		5.0	1.0	16.1		16.1	3.35	5.96	58.8	122.1

Street Capacities

Street	Drainage Basins	Roadway Width (ft)	Roadway Classification	Curb and Gutter Type	Storm Event	Maximum Flow Depth Criteria	Max. Depth (ft)	Max. Flow Area (sq. ft.)	Wetted Perimeter (ft)	Minimum Slope (%)	Q(cap) (cfs)	Q(allowed) (cfs)	Max. Q(runoff) (cfs)	Meets Criteria?
Briargate Parkway	C2	39	Arterial	Vertical	5-year	6" depth	0.50	4.9	20.0	1.8%	23.8	23.8	12.0	yes
(north half)		(west bnd)			100-year	12" depth	0.86	11.9	20.4		104.2	104.2	25.6	yes
Briargate Parkway	C3	39	Arterial	Vertical	5-year	6" depth	0.50	4.9	20.0	1.8%	23.8	23.8	7.3	yes
(south half)		(east bnd)			100-year	12" depth	0.86	11.9	20.4		103.9	103.9	13.0	yes
Briargate Parkway	P10	39	Arterial	Vertical	5-year	6" depth	1.22	11.9	20.7	1.8%	102.7	34.0	17.6	yes
(north half)		(west bnd)			100-year	12" depth	1.58	18.9	21.1		219.9	219.9	31.3	yes
Grand Cordera	C22	27	Collector	Vertical	5-year	6" depth	0.34	2.3	13.8	2.5%	10.2	10.2	7.3	yes
(south E)		(1/2 road)			100-year	12" depth	0.86	9.3	14.4		102.8	102.8	15.2	yes
Grand Cordera	C26	27	Collector	Vertical	5-year	6" depth	0.34	2.3	13.8	1.3%	7.4	7.4	7.1	yes
(E south)		(1/2 road)			100-year	12" depth	0.86	9.3	14.4		74.1	74.1	13.6	yes
Grand Cordera	C27	27	Collector	Vertical	5-year	6" depth	0.34	2.3	13.8	1.3%	7.4	7.4	6.8	yes
(south half)		(1/2 road)			100-year	12" depth	0.86	9.3	14.4		74.1	74.1	12.2	yes
Grand Cordera	P2a	27	Collector	Vertical	5-year	6" depth	0.34	2.3	13.8	1.6%	8.3	8.3	8.1	yes
(north of E, east half)		(1/2 road)			100-year	12" depth	0.86	9.3	14.4		83.2	83.2	16.8	yes
Grand Cordera	P2b	27	Collector	Vertical	5-year	6" depth	0.34	2.3	13.8	1.5%	7.9	7.9	3.7	yes
(south of E, east half)		(1/2 road)			100-year	12" depth	0.86	9.3	14.4		79.6	79.6	7.8	yes
Grand Cordera	P2c	27	Collector	Vertical	5-year	6" depth	0.34	2.3	13.8	1.5%	7.9	7.9	1.4	yes
(south of E, west half)		(1/2 road)			100-year	12" depth	0.86	9.3	14.4		79.6	79.6	2.5	yes
Grand Cordera	P2d	27	Collector	Vertical	5-year	6" depth	0.34	2.3	13.8	1.6%	8.3	8.3	2.7	yes
(north of E, west half)		(1/2 road)			100-year	12" depth	0.86	9.3	14.4		83.2	83.2	4.8	yes
Grand Cordera	P8	27	Collector	Vertical	5-year	6" depth	0.50	3.4	14.0	1.0%	12.2	12.2	11.6	yes
(at Briargate Pkwy)					100-year	12" depth	0.86	8.2	14.4		52.9	52.9	24.1	yes
Calloping Grouse Way	C23	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	2.0%	11.5	11.5	7.7	yes
					100-year	Top of Curb	0.50	5.6	17.5		34.6	34.6	16.0	yes
Petrified Forest Trail	C21a	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	1.7%	10.6	10.6	8.2	yes
North Half					100-year	Top of Curb	0.50	5.6	17.5		31.9	31.9	17.0	yes
Petrified Forest Trail	C21b	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	1.7%	10.6	10.6	2.3	yes
South Half					100-year	Top of Curb	0.50	5.6	17.5		31.9	31.9	4.8	yes
Rabbit Mountain Loop	C20a	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	1.2%	8.9	8.9	7.5	yes
North Half					100-year	Top of Curb	0.50	5.6	17.5		26.8	26.8	15.6	yes
Rabbit Mountain Loop	C20b	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	1.2%	8.9	8.9	2.5	yes
South Half					100-year	Top of Curb	0.50	5.6	17.5		26.8	26.8	5.2	yes
Grand Lawn Circle	C4	40	Collector	Vertical	5-year	Crown of road	0.40	4.0	20.4	5.0%	28.1	20.0	9.2	yes
					100-year	Top of Curb	0.67	9.4	20.7		115.8	115.8	19.7	yes
Happy Meadows Trail	P2a	40	Collector	Vertical	5-year	Crown of road	0.40	4.0	20.4	2.7%	20.7	20.0	8.1	yes
Grand Cordera to F (north)					100-year	Top of Curb	0.67	9.4	20.7		85.1	85.1	16.8	yes
Happy Meadows Trail	P2b	40	Collector	Vertical	5-year	Crown of road	0.40	4.0	20.4	2.7%	20.7	20.0	3.7	yes
Grand Cordera to F (south)					100-year	Top of Curb	0.67	9.4	20.7		85.1	85.1	7.8	yes
Happy Meadows Trail	P6	40	Collector	Vertical	5-year	Crown of road	0.40	4.0	20.4	1.8%	16.9	16.9	6.8	yes
F to K					100-year	Top of Curb	0.67	9.4	20.7		69.5	69.5	14.5	yes
Happy Meadows Trail	C4	40	Collector	Vertical	5-year	Crown of road	0.40	4.0	20.4	2.5%	19.9	19.9	9.2	yes
M to D					100-year	Top of Curb	0.67	9.4	20.7		81.9	81.9	19.7	yes
Happy Meadows Trail	C13	40	Collector	Vertical	5-year	Crown of road	0.40	4.0	20.4	1.8%	16.9	16.9	6.0	yes
(sump at s)					100-year	Top of Curb	0.67	9.4	20.7		69.5	69.5	12.8	yes
Lizard Rock Trail	P6	40	Collector	Vertical	5-year	Crown of road	0.40	4.0	20.4	2.0%	17.8	17.8	6.8	yes
J to E					100-year	Top of Curb	0.67	9.4	20.7		73.2	73.2	14.5	yes
Lizard Rock Trail	P5	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	2.8%	13.5	13.5	9.3	yes
North cul-de-sac					100-year	Top of Curb	0.50	5.6	17.5		40.6	40.6	19.9	yes
Lizard Rock Trail	C24	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	2.5%	12.9	12.9	9.3	yes
South cul-de-sac					100-year	Top of Curb	0.50	5.6	17.5		38.7	38.7	19.4	yes
Rabbit Mountain Loop	P11	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	1.0%	16.3	16.3	10.0	yes
(both sides)					100-year	Top of Curb	0.50	5.6	17.5		24.5	24.5	20.8	yes
Mushroom Rock Court	P1	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	1.6%	10.3	10.3	7.7	yes
					100-year	Top of Curb	0.50	5.6	17.5		31.0	31.0	16.0	yes
Preachers Hollow Trail	P3	34	Residential	Ramp	5-year	Crown of road	0.34	2.9	17.3	2.8%	13.5	13.5	8.6	yes
					100-year	Top of Curb	0.50	5.6	17.5		40.6	40.6	17.8	yes

Sump Inlet

Inlet Length (ft)	Clogging Factor	D(max) (ft)	Max. Q(runoff) (cfs)	Calculated Depth (ft)	Meets Criteria?
15	1.25	0.50	12.0	0.39	Yes
		0.86	25.6	0.71	Yes
10	1.25	0.50	7.3	0.32	Yes
		0.86	13.0	0.52	Yes
20	1.25	0.50	17.6	0.44	Yes
		0.86	31.3	0.70	Yes
10	1.25	0.34	7.3	0.32	Yes
		0.67	15.2	0.59	Yes
10	1.25	0.34	7.1	0.31	Yes
		0.86	13.6	0.54	Yes
10	1.25	0.34	6.8	0.30	Yes
		0.86	12.2	0.50	Yes
10	1.25	0.35	8.1	0.35	Yes
		0.86	16.8	0.64	Yes
5	1.25	0.34	3.7	0.24	Yes
		0.86	7.8	0.47	Yes
5	1.25	0.34	1.4	0.03	Yes
		0.86	2.5	0.14	Yes
5	1.25	0.34	2.7	0.16	Yes
		0.86	4.8	0.31	Yes
10	1.25	0.50	11.6	0.48	Yes
		0.86	24.1	0.83	Yes
10	1.25	0.50	7.7	0.33	Yes
		0.78	16.0	0.61	Yes
10	1.25	0.50	10.4	0.36	Yes
		0.78	21.5	0.65	Yes
-	-	-	-	-	-
		-	-	-	-
10	1.25	0.50	9.9	0.34	Yes
		0.78	20.6	0.63	Yes
-	-	-	-	-	-
		-	-	-	-
15	1.25	0.40	9.2	0.24	Yes
		0.50	19.7	0.49	Yes
-	-	-	-	-	-
		-	-	-	-
-	-	-	-	-	-
		-	-	-	-
10	1.25	0.34	6.8	0.23	Yes
		0.60	14.5	0.48	Yes
15	1.25	0.40	9.2	0.24	Yes
		0.50	19.7	0.49	Yes
10	1.25	0.40	7.2	0.25	Yes
		0.50	15.3	0.50	Yes
-	-	-	-	-	-
		-	-	-	-
10	1.25	0.65	9.3	0.32	Yes
		0.78	19.9	0.61	Yes
10	1.25	0.50	9.3	0.32	Yes
		0.78	19.4	0.60	Yes
10	1.25	0.50	10.0	0.34	Yes
		0.78	20.8	0.63	Yes
5	1.25	0.50	7.7	0.39	Yes
		0.78	16.0	0.70	Yes
5	1.25	0.50	8.6	0.43	Yes
		0.78	17.8	0.75	Yes

Street	Drainage Basins	Roadway Width (ft)	D(max) (ft)	Max. Q(runoff) (cfs)	Calculated Depth (ft)	Meets Criteria?
Young Gulch Way	P4	34	0.50	5.5	0.28	Yes
			0.78	11.4	0.54	Yes
Pancake Rocks Trail (east side)	P7	34	0.50	10.1	0.35	Yes
			0.67	21.5	0.65	Yes
Roxborough Park Court (North of E)	C4	34	-	-	-	-
			-	-	-	-
Roxborough Park Court (South of E)	C17	34	0.50	2.7	0.11	Yes
			0.78	5.8	0.30	Yes
Monarch Crest Way (west side)	C5	34	0.34	10.2	0.27	Yes
			0.60	21.7	0.53	Yes
Monarch Crest Way (east side)	C6a	34	-	-	-	-
			-	-	-	-
Imogene Pass Place	C6b	34	0.34	7.2	0.25	Yes
			0.60	15.3	0.50	Yes
Chimney Gulch Way (east)	C7	34	0.34	9.1	0.32	Yes
			0.60	19.5	0.60	Yes
Chimney Gulch Way (west)	C18	34	0.34	5.7	0.29	Yes
			0.60	12.2	0.57	Yes
Lookout Mountain Court	C8	34	0.34	7.8	0.27	Yes
			0.60	16.8	0.54	Yes
Rock Pond Way (east)	C9	34	0.34	9.5	0.33	Yes
			0.65	20.3	0.62	Yes
Rock Pond Way (west)	C16	34	0.34	6.6	0.22	Yes
			0.60	14.1	0.47	Yes
Dome Rock Place	C12	34	0.34	6.2	0.32	Yes
			0.67	13.3	0.61	Yes
Dome Rock Place (east)	C11	34	0.50	7.0	0.36	Yes
			0.67	15.0	0.66	Yes
Dome Rock Place (west)	C10	34	0.50	6.3	0.32	Yes
			0.67	13.4	0.61	Yes

Pond DF-2 Cordera (South Alternative)
WQCV Volume Check and Elevation Calculation

Area =	276.00	acres	***Contributing Area to Pond***
Imp. =	40%		***APPROX***

WQ Storage =	0.18	inches	***Average***	
V_{WQ} =	4.137	acre-feet	180,193 cf	
V_{WQ}+20% =	***4.964***	**acre-feet**	216,232 cf	
$V_{5\text{-YR}}$ =	**4.64**	**acre-feet**	Total $V_{5\text{-YR}}$ =	**9.60**
$V_{100\text{-YR}}$ =	**14.58**	**acre-feet**	Total $V_{100\text{-YR}}$ =	**19.55**

Detention Pond

Contour (feet)	Area (sq. ft.)	Avg Area (sq. ft.)	Volume (cu. ft.)	Cum. Vol. (cu. ft.)	Cum. Vol. (ac-ft)	
7002	0					
		8,096	16,193	16,193	0.37	@ Elevation = 7004
7004	24,289				-	
		50,193	100,387	116,580	2.68	@ Elevation = 7006
7006	81,735				***4.96***	***7006.96***
		103,833	207,666	324,245	7.44	@ Elevation = 7008
7008	127,628				***10.00***	***7008.733***
		151,868	303,736	627,981	14.42	@ Elevation = 7010
7010	177,474				***19.55***	***7011.204***
		185,793	371,587	999,568	22.95	@ Elevation = 7012
7012	194,239				-	
		202,786	405,572	1,405,140	32.26	@ Elevation = 7014
7014	211,455					

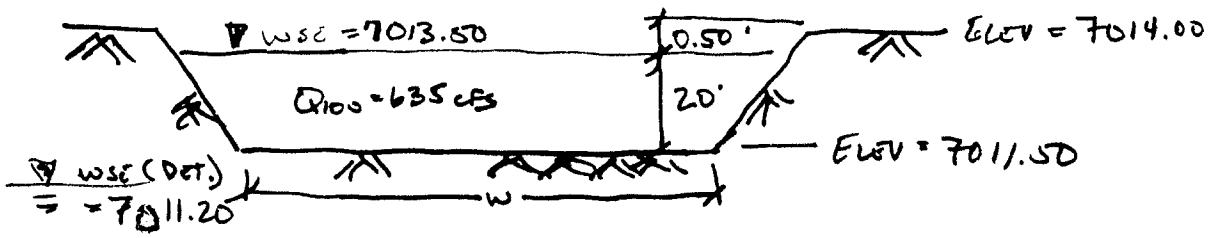
Matrix Design Group, Inc.
Integrated Design Solutions
Infrastructure Engineering
Community Development
Program Management

Job. No. D3.104.015
Date SEPT / 20 / 2004
Sheet _____ of _____
By _____

ject CORDERA FIL #1
oject DF2 POND

DF2 OVERFLOW

Q_{100} = 635 CFS (UNDETAINED RUNOFF RATE INTO POND)



$Q = 3.1(w)(h^{1.5})$

$635\ CFS = 3.1(w)(2.0)^{1.5}$

$w = 72.4'$

∴ USE 75' WIDE OVERFLOW SPILLWAY
20' DEEP W/ 0.5' FREE BOARD IF

POND OUTFALL IS COMPLETELY PLUGGED.

PINE CREEK

CORDERA/BRIARGATE CROSSING
HISTORIC 5-YEAR STORM EVENT

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

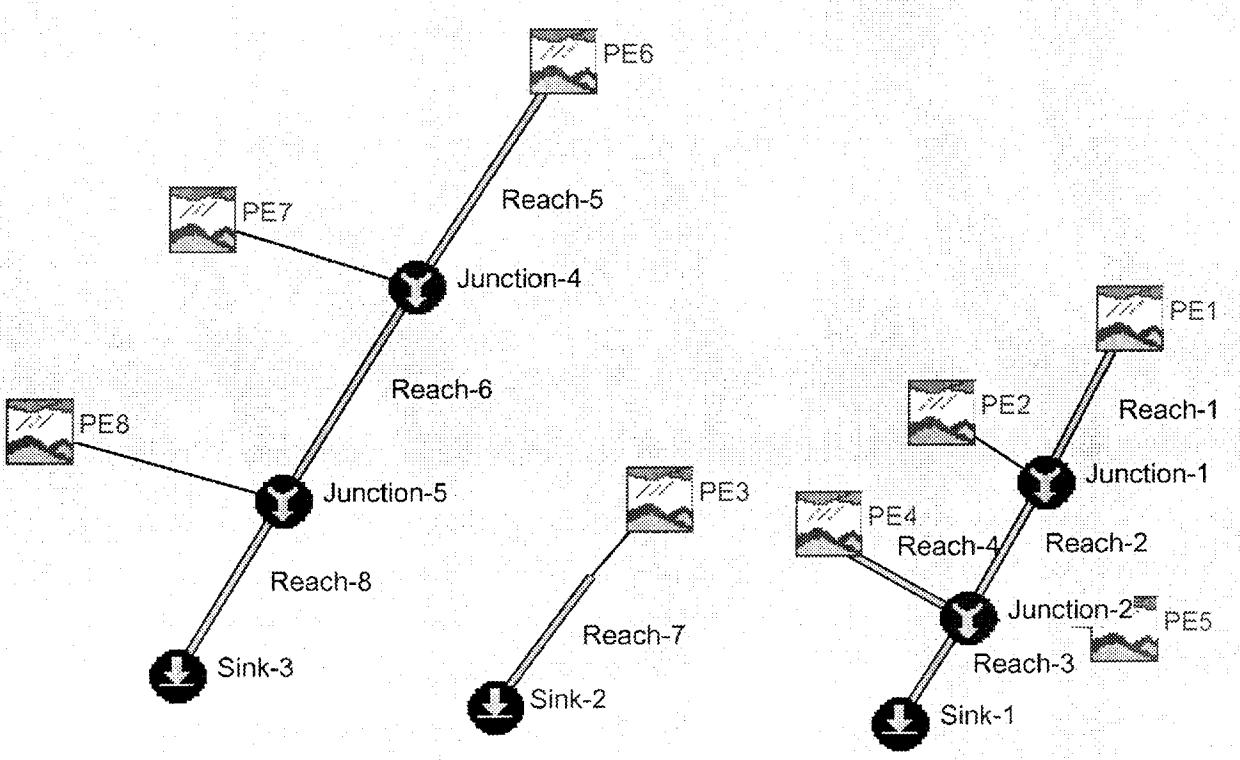
Basin ID	Total Area (ac)	Total Area (sq. mi.)	Residential			Parks/Open Space (ac)	Pavement/ Roof (ac)	Commercial (ac)	Schools (ac)	Weighted CN	Percent Impervious
			1 acre lots	1/4 acre lots	1/8 acre lots						
PE1	32.97	0.052	0.0	0.0	0.0	33.0	0.0	0.0	0.0	61.0	0%
PE2	110.91	0.173	0.0	0.0	0.0	110.0	0.9	0.0	0.0	61.3	1%
PE3	99.00	0.155	0.0	0.0	0.0	99.0	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	134.33	0.210	0.0	0.0	0.0	134.3	0.0	0.0	0.0	61.0	0%
PE8	73.16	0.114	0.0	0.0	0.0	73.2	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
Junction-4
Reach-6
PE8
Junction-5
PE3
Reach-8
Reach-7
Sink-3
Sink-2
PE1
PE2
Reach-1
Junction-1
PE4
Reach-4
Reach-2
Junction-2
PE5
Reach-3
Sink-1

HMS * Summary of Results

Project : Pine Creek 9-14-04 Run Name : Run 6

Start of Run : 01Jan04 0000 Basin Model : Pine Creek - Hist
End of Run : 02Jan04 0000 Met. Model : 5-yr - Type IIa
Execution Time : 21Sep04 1055 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PE3	8.9897	01 Jan 04 0632	2.0576	0.155
Reach-7	8.9862	01 Jan 04 0632	2.0572	0.155
Sink-2	8.9862	01 Jan 04 0632	2.0572	0.155
PE6	24.083	01 Jan 04 0610	2.7695	0.193
Reach-5	23.758	01 Jan 04 0620	2.7618	0.193
PE7	14.460	01 Jan 04 0622	2.7947	0.210
Junction-4	38.009	01 Jan 04 0620	5.5564	0.403
Reach-6	37.840	01 Jan 04 0626	5.5423	0.403
PE8	8.5962	01 Jan 04 0620	1.5187	0.114
Junction-5	45.673	01 Jan 04 0626	7.0610	0.517
Reach-8	45.367	01 Jan 04 0626	7.0578	0.517
Sink-3	45.367	01 Jan 04 0626	7.0578	0.517
PE4	14.365	01 Jan 04 0624	2.8995	0.218
Reach-4	14.334	01 Jan 04 0638	2.8859	0.218
PE1	4.3083	01 Jan 04 0616	0.69337	0.052
Reach-1	4.2928	01 Jan 04 0638	0.68889	0.052
PE2	13.833	01 Jan 04 0618	2.3060	0.173
Junction-1	13.910	01 Jan 04 0618	2.9949	0.225
Reach-2	13.853	01 Jan 04 0626	2.9856	0.225
PE5	15.807	01 Jan 04 0614	2.3352	0.175
Junction-2	34.861	01 Jan 04 0630	8.2068	0.618
Reach-3	34.834	01 Jan 04 0630	8.2065	0.618
Sink-1	34.834	01 Jan 04 0630	8.2065	0.618

HMS * Summary of Results for Junction-2

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Hi
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1458	Control Specs	: Control

Computed Results

Peak Outflow : 34.861 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0630

Total Outflow : 0.25 (in)

HMS * Summary of Results for Sink-2

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Hi:
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I:
Execution Time	: 21Sep04 1055	Control Specs	: Control

Computed Results

Peak Discharge : 8.9862 (cfs) Date/Time of Peak Discharge : 01 Jan 04 0632

Total Discharge : 0.25 (in)

HMS * Summary of Results for Junction-5

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Hi
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1458	Control Specs	: Control

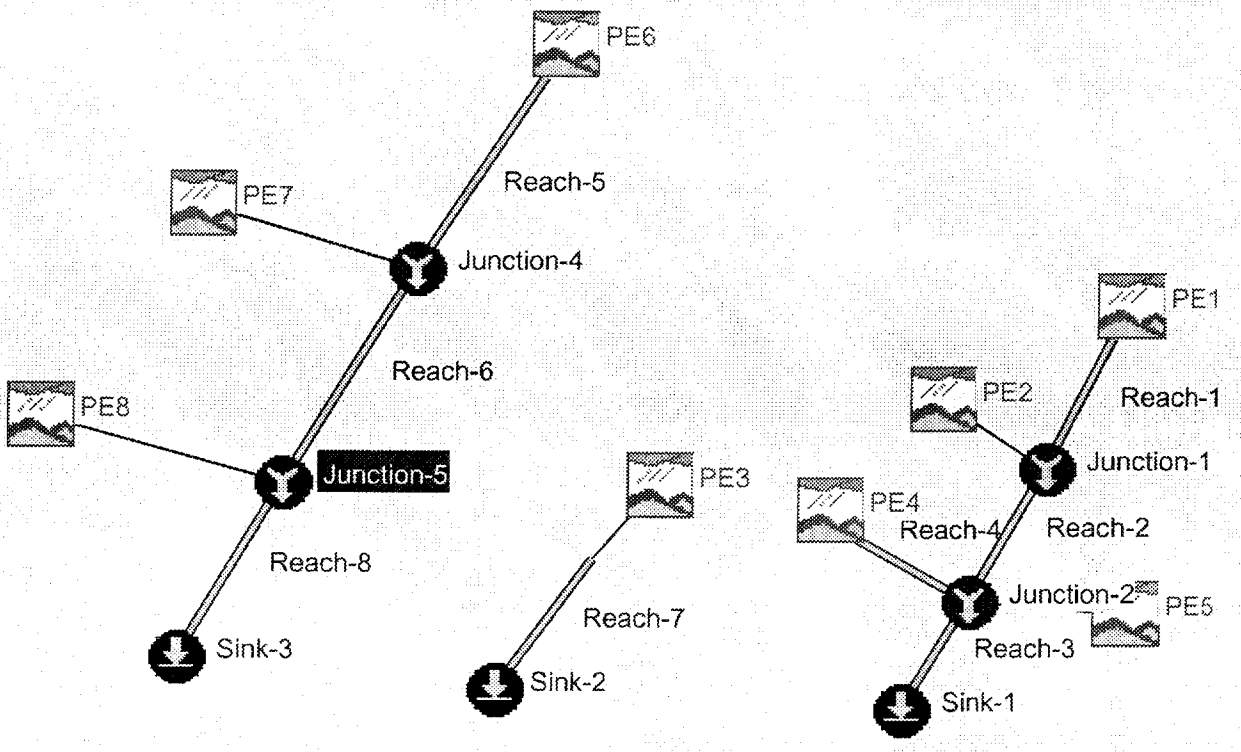
Computed Results

Peak Outflow : 45.673 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0626

Total Outflow : 0.26 (in)

PINE CREEK

CORDERA/BRIARGATE CROSSING
HISTORIC 100-YEAR STORM EVENT


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

HMS * Summary of Results

Project : Pine Creek 9-14-04 Run Name : Run 5

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Hist
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type IIa
Execution Time	: 21Sep04 1054	Control Specs	: Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PE3	63.420	01 Jan 04 0626	8.8865	0.155
Reach-7	63.384	01 Jan 04 0626	8.8858	0.155
Sink-2	63.384	01 Jan 04 0626	8.8858	0.155
PE6	150.97	01 Jan 04 0608	11.547	0.193
Reach-5	150.23	01 Jan 04 0612	11.536	0.193
PE7	103.42	01 Jan 04 0618	12.059	0.210
Junction-4	244.94	01 Jan 04 0614	23.595	0.403
Reach-6	242.84	01 Jan 04 0616	23.572	0.403
PE8	61.326	01 Jan 04 0616	6.5509	0.114
Junction-5	304.17	01 Jan 04 0616	30.123	0.517
Reach-8	303.21	01 Jan 04 0618	30.122	0.517
Sink-3	303.21	01 Jan 04 0618	30.122	0.517
PE4	102.50	01 Jan 04 0620	12.514	0.218
Reach-4	102.20	01 Jan 04 0626	12.493	0.218
PE1	30.495	01 Jan 04 0612	2.9900	0.052
Reach-1	30.424	01 Jan 04 0624	2.9861	0.052
PE2	98.462	01 Jan 04 0614	9.9452	0.173
Junction-1	119.01	01 Jan 04 0618	12.931	0.225
Reach-2	118.61	01 Jan 04 0622	12.918	0.225
PE5	110.66	01 Jan 04 0610	10.068	0.175
Junction-2	291.00	01 Jan 04 0620	35.478	0.618
Reach-3	290.86	01 Jan 04 0620	35.478	0.618
Sink-1	290.86	01 Jan 04 0620	35.478	0.618

HMS * Summary of Results for Junction-2

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Hi:
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I:
Execution Time	: 20Sep04 1003	Control Specs	: Control

Computed Results

Peak Outflow : 291.00 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0620

Total Outflow : 1.08 (in)

HMS * Summary of Results for Sink-2

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Hi
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 21Sep04 1054	Control Specs	: Control

Computed Results

Peak Discharge : 63.384 (cfs) **Date/Time of Peak Discharge** : 01 Jan 04 0626

Total Discharge : 1.07 (in)

HMS * Summary of Results for Junction-5

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Hi:
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I:
Execution Time	: 20Sep04 1003	Control Specs	: Control

Computed Results

Peak Outflow : 304.17 (cfs) **Date/Time of Peak Outflow** : 01 Jan 04 0616

Total Outflow : 1.09 (in)

PINE CREEK

CORDERA/BRIARGATE CROSSING
INTERIM 5-YEAR STORM EVENT

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

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

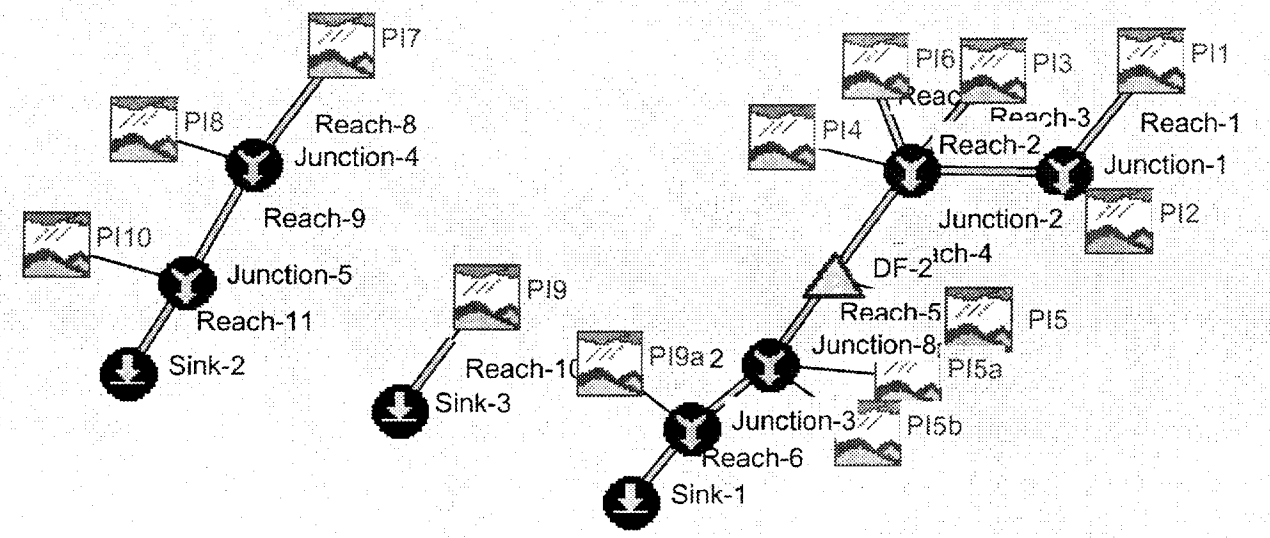
Basin ID	Total Area (ac)	Total Area (sq. mi.)	Residential			Parks/Open Space (ac)	Pavement/ Roof (ac)	Commercial (ac)	Schools (ac)	Weighted CN	Percent Impervious
			1 acre lots	1/4 acre lots	1/8 acre lots						
PI1	32.97	0.052	0.0	0.0	0.0	33.0	0.0	0.0	0.0	61.0	0%
PI2	65.93	0.103	0.0	0.0	0.0	65.0	0.9	0.0	0.0	61.5	1%
PI3	18.66	0.029	0.0	0.0	0.0	18.7	0.0	0.0	0.0	61.0	0%
PI4	59.42	0.093	0.0	36.1	12.4	10.9	0.0	0.0	0.0	74.5	37%
PI5	63.23	0.099	0.0	34.5	28.7	0.0	0.0	0.0	0.0	79.5	50%
PI6	131.71	0.206	0.0	0.0	0.0	131.7	0.0	0.0	0.0	61.0	0%
PI7	123.76	0.193	30.0	0.0	0.0	93.8	0.0	0.0	0.0	62.7	5%
PI8	134.33	0.210	0.0	0.0	0.0	134.3	0.0	0.0	0.0	61.0	0%
PI9	88.2	0.138	0.0	0.0	0.0	88.2	0.0	0.0	0.0	61.0	0%
PI9a	32.35	0.051	0.0	0.0	0.0	27.5	4.9	0.0	0.0	66.6	15%
PI10	73.16	0.114	0.0	0.0	0.0	73.2	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
Interim 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)
PI1	300	4.0%	17.4	3000	6.0%	3.7	13.6	0	0.0%	0.0	0.0	31.0	18.6
PI2	300	4.0%	17.4	2000	6.0%	3.7	9.0	1500	5.0%	6.0	4.2	30.6	18.4
PI3	300	3.5%	18.2	1150	5.0%	3.3	5.8	0	0.0%	0.0	0	24.0	14.4
PI4	200	3.3%	15.2	450	3.3%	2.5	2.9	1300	3.5%	10.0	2.2	20.3	12.2
PI5	150	2.6%	14.2	200	2.6%	2.2	1.5	2400	2.6%	10.0	4.0	19.7	11.8
PI6	300	5.0%	16.2	3500	4.9%	3.2	18.0	1500	4.0%	5.0	5.0	39.2	23.5
PI7	100	2.0%	12.6	500	3.0%	2.4	3.5	3000	3.0%	10.0	5.0	21.1	12.7
PI8	300	4.0%	17.4	2600	4.6%	3.1	13.9	2500	3.0%	5.0	8.3	39.6	23.8
PI9	300	4.0%	17.4	1500	3.0%	2.4	10.4	1200	3.0%	8.0	2.5	30.3	18.2
PI9a	300	3.0%	19.2	1500	3.5%	2.6	9.5	0	0.0%	0.0	0	28.6	17.2
PI10	300	4.0%	17.4	2400	4.4%	3.0	13.2	1400	2.5%	5.0	4.7	35.2	21.1


PI7
PI8
Reach-8
Junction-4
Reach-9
PI10
Junction-5
Reach-11
Sink-2
PI9
Reach-10
Sink-3
PI6
PI3
PI1
PI4
Reach-2
Reach-3
Reach-1
Junction-1
Junction-2
PI2
DF-2
Reach-5
PI5
Junction-8
PI5a
PI9a
2
Junction-3
PI5b
Reach-6
Sink-1

HMS * Summary of Results

Project : Pine Creek 9-14-04 Run Name : Run 4

Start of Run : 01Jan04 0000 Basin Model : Pine Creek - Interim
End of Run : 02Jan04 0000 Met. Model : 5-yr - Type IIa
Execution Time : 20Sep04 1500 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PI6	14.330	01 Jan 04 0622	2.7417	0.206
Reach-7	14.315	01 Jan 04 0622	2.7416	0.206
PI3	2.9139	01 Jan 04 0612	0.38729	0.029
Reach-3	2.8906	01 Jan 04 0614	0.38704	0.029
PI1	4.3083	01 Jan 04 0616	0.69337	0.052
Reach-1	4.3378	01 Jan 04 0646	0.68791	0.052
PI2	9.4334	01 Jan 04 0616	1.4457	0.103
Junction-1	9.4342	01 Jan 04 0616	2.1336	0.155
Reach-2	9.3790	01 Jan 04 0618	2.1333	0.155
PI4	45.751	01 Jan 04 0606	3.3995	0.093
Junction-2	60.829	01 Jan 04 0610	8.6614	0.483
Reach-4	60.512	01 Jan 04 0610	8.6598	0.483
PI5	71.545	01 Jan 04 0606	4.9076	0.099
DF-2	43.408	01 Jan 04 0632	13.098	0.582
Reach-5	43.404	01 Jan 04 0632	13.098	0.582
PI5b	27.171	01 Jan 04 0600	1.6281	0.016
PI5a	3.3655	01 Jan 04 0606	0.23093	0.006
Junction-8	46.569	01 Jan 04 0630	14.957	0.604
Reach-12	46.564	01 Jan 04 0630	14.957	0.604
PI9a	9.0973	01 Jan 04 0614	1.0438	0.051
Junction-3	52.408	01 Jan 04 0620	16.000	0.655
Reach-6	52.403	01 Jan 04 0620	16.000	0.655
Sink-1	52.403	01 Jan 04 0620	16.000	0.655
PI9	8.0038	01 Jan 04 0632	1.8319	0.138
Reach-10	8.0006	01 Jan 04 0632	1.8315	0.138
Sink-3	8.0006	01 Jan 04 0632	1.8315	0.138
PI7	24.083	01 Jan 04 0610	2.7695	0.193
Reach-8	23.758	01 Jan 04 0620	2.7618	0.193
PI8	14.460	01 Jan 04 0622	2.7947	0.210
Junction-4	38.009	01 Jan 04 0620	5.5564	0.403
Reach-9	37.840	01 Jan 04 0626	5.5423	0.403
PI10	8.5962	01 Jan 04 0620	1.5187	0.114
Junction-5	45.673	01 Jan 04 0626	7.0610	0.517
Reach-11	45.367	01 Jan 04 0626	7.0578	0.517
Sink-2	45.367	01 Jan 04 0626	7.0578	0.517

HMS * Summary of Results for DF-2

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Inter:
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I:
Execution Time	: 20Sep04 1500	Control Specs	: Control

Computed Results

Peak Inflow	: 127.91 (cfs)	Date/Time of Peak Inflow	: 01 Jan 04 0608
Peak Outflow	: 43.408 (cfs)	Date/Time of Peak Outflow	: 01 Jan 04 0632
Total Inflow	: 0.44 (in)	Peak Storage	: 3.4324(ac-ft)
Total Outflow	: 0.42 (in)	Peak Elevation	: 7008.2(ft)

HMS * Summary of Results for Junction-2

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Inter
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1500	Control Specs	: Control

Computed Results

Peak Outflow : 60.829 (cfs) **Date/Time of Peak Outflow** : 01 Jan 04 0610

Total Outflow : 0.34 (in)

HMS * Summary of Results for Junction-3

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Inter
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1500	Control Specs	: Control

Computed Results

Peak Outflow : 52.408 (cfs) **Date/Time of Peak Outflow** : 01 Jan 04 0620

Total Outflow : 0.46 (in)

HMS * Summary of Results for Sink-3

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Inter
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1500	Control Specs	: Control

Computed Results

Peak Discharge : 8.0006 (cfs) Date/Time of Peak Discharge : 01 Jan 04 0632

Total Discharge : 0.25 (in)

HMS * Summary of Results for Junction-5

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Inter
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1500	Control Specs	: Control

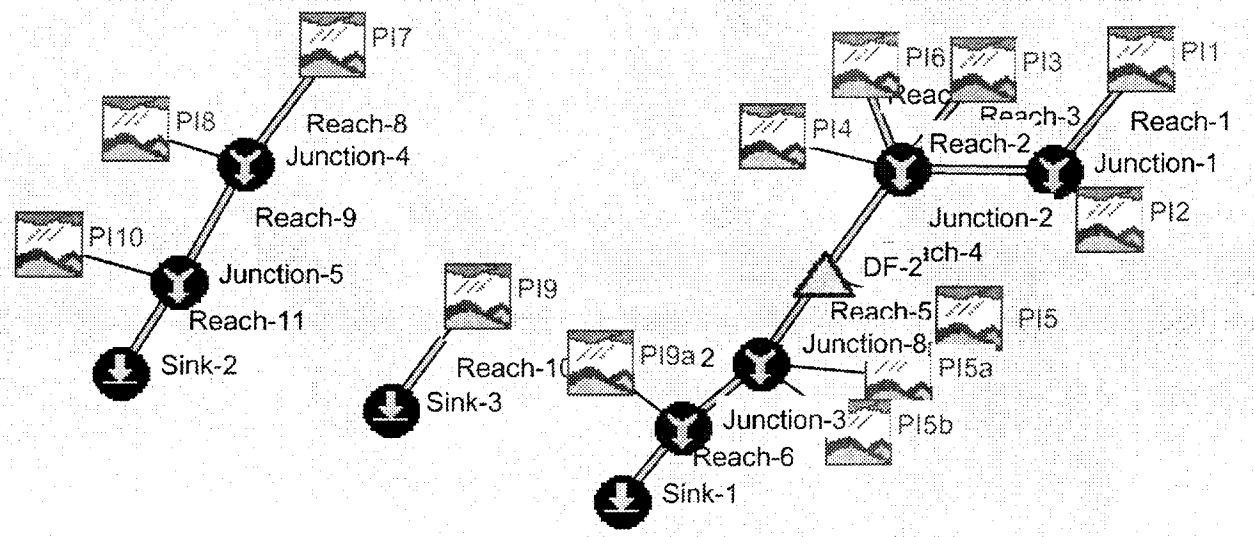
Computed Results

Peak Outflow : 45.673 (cfs) **Date/Time of Peak Outflow** : 01 Jan 04 0626

Total Outflow : 0.26 (in)

PINE CREEK

CORDERA/BRIARGATE CROSSING
INTERIM 100-YEAR STORM EVENT


PI7
PI8
Reach-8
Junction-4
Reach-9
PI10
Junction-5
Reach-11
Sink-2
PI9
Reach-10
Sink-3
PI6
PI3
PI1
PI4
Reach-2
Reach-3
Reach-1
Junction-1
Junction-2
PI2
DF-2
Reach-5
PI5
Junction-8
PI5a
PI9a 2
Junction-3
PI5b
Reach-6
Sink-1

HMS * Summary of Results

Project : Pine Creek 9-14-04 Run Name : Run 3

Start of Run : 01Jan04 0000 Basin Model : Pine Creek - Interim
End of Run : 02Jan04 0000 Met. Model : 100-yr - Type IIa
Execution Time : 20Sep04 1058 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PI6	102.45	01 Jan 04 0618	11.830	0.206
Reach-7	102.38	01 Jan 04 0618	11.830	0.206
PI3	20.053	01 Jan 04 0608	1.6693	0.029
Reach-3	19.949	01 Jan 04 0610	1.6688	0.029
PI1	30.495	01 Jan 04 0612	2.9900	0.052
Reach-1	30.361	01 Jan 04 0628	2.9841	0.052
PI2	63.203	01 Jan 04 0612	6.0873	0.103
Junction-1	74.175	01 Jan 04 0622	9.0714	0.155
Reach-2	73.640	01 Jan 04 0622	9.0695	0.155
PI4	141.17	01 Jan 04 0606	9.5707	0.093
Junction-2	288.77	01 Jan 04 0610	32.139	0.483
Reach-4	287.43	01 Jan 04 0610	32.137	0.483
PI5	186.27	01 Jan 04 0604	12.302	0.099
DF-2	212.90	01 Jan 04 0630	43.599	0.582
Reach-5	212.88	01 Jan 04 0630	43.599	0.582
PI5b	50.346	01 Jan 04 0600	3.1142	0.016
PI5a	9.9149	01 Jan 04 0604	0.63737	0.006
Junction-8	219.19	01 Jan 04 0630	47.350	0.604
Reach-12	219.18	01 Jan 04 0630	47.350	0.604
PI9a	42.786	01 Jan 04 0610	3.7173	0.051
Junction-3	240.49	01 Jan 04 0624	51.067	0.655
Reach-6	240.49	01 Jan 04 0624	51.066	0.655
Sink-1	240.49	01 Jan 04 0624	51.066	0.655
PI9	56.465	01 Jan 04 0626	7.9118	0.138
Reach-10	56.432	01 Jan 04 0626	7.9112	0.138
Sink-3	56.432	01 Jan 04 0626	7.9112	0.138
PI7	150.97	01 Jan 04 0608	11.547	0.193
Reach-8	150.23	01 Jan 04 0612	11.536	0.193
PI8	103.42	01 Jan 04 0618	12.059	0.210
Junction-4	244.94	01 Jan 04 0614	23.595	0.403
Reach-9	242.84	01 Jan 04 0616	23.572	0.403
PI10	61.326	01 Jan 04 0616	6.5509	0.114
Junction-5	304.17	01 Jan 04 0616	30.123	0.517
Reach-11	303.21	01 Jan 04 0618	30.122	0.517
Sink-2	303.21	01 Jan 04 0618	30.122	0.517

HMS * Summary of Results for DF-2

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Inter
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 20Sep04 1058	Control Specs	: Control

Computed Results

Peak Inflow	: 455.89 (cfs)	Date/Time of Peak Inflow	: 01 Jan 04 0608
Peak Outflow	: 212.90 (cfs)	Date/Time of Peak Outflow	: 01 Jan 04 0630
Total Inflow	: 1.43 (in)	Peak Storage	: 12.060(ac-ft)
Total Outflow	: 1.40 (in)	Peak Elevation	: 7010.5(ft)

HMS * Summary of Results for Junction-3

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Inter
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 20Sep04 1058	Control Specs	: Control

Computed Results

Peak Outflow : 240.49 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0624

Total Outflow : 1.46 (in)

HMS * Summary of Results for Sink-3

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Inter
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 20Sep04 1058	Control Specs	: Control

Computed Results

Peak Discharge : 56.432 (cfs) Date/Time of Peak Discharge : 01 Jan 04 0626

Total Discharge : 1.07 (in)

HMS * Summary of Results for Junction-5

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - Inter
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 20Sep04 1058	Control Specs	: Control

Computed Results

Peak Outflow : 304.17 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0616

Total Outflow : 1.09 (in)

PINE CREEK

CORDERA/BRIARGATE CROSSING
DEVELOPED 5-YEAR STORM EVENT

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

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

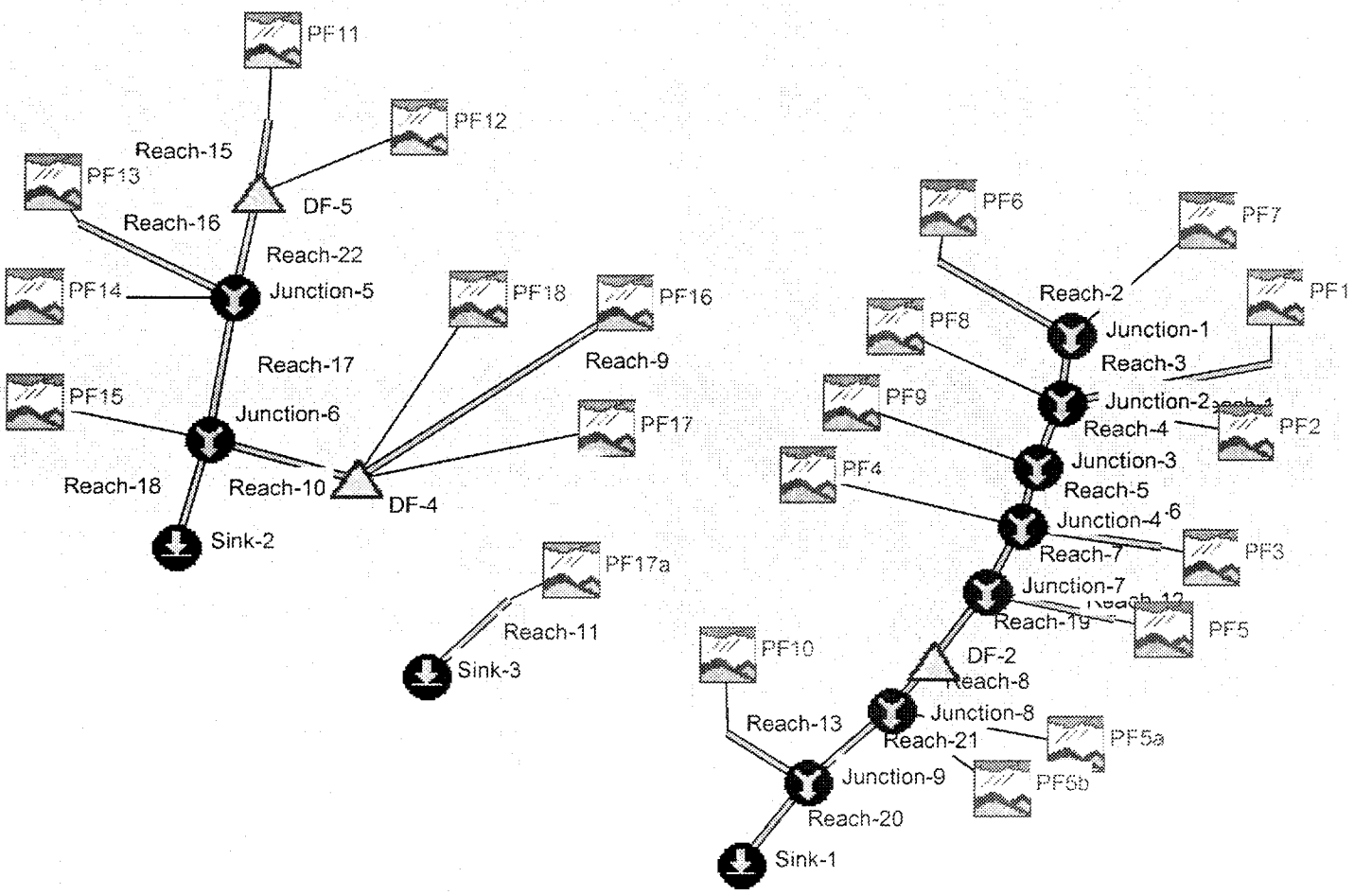
Basin ID	Total Area (ac)	Total Area (sq. mi.)	Residential				Parks/Open Space (ac)	Pavement/Roof (ac)	Commercial (ac)	Schools (ac)	Weighted CN	Percent Impervious
			1 acre lots	1/2 acre lots	1/4 acre lots	1/8 acre lots						
PF1	19.39	0.030	0.0	16.6	2.0	0.0	0.8	0.0	0.0	0.0	70.2	25%
PF2	22.14	0.035	0.0	19.4	0.0	0.0	2.8	0.0	0.0	0.0	68.9	22%
PF3	41.87	0.065	0.0	0.0	0.0	0.0	0.0	1.8	4.8	35.3	82.1	58%
PF4	32.58	0.051	0.0	0.0	8.2	10.7	13.7	0.0	0.0	0.0	72.4	31%
PF5	63.23	0.099	0.0	0.0	34.5	0.0	4.7	0.0	24.0	0.0	80.4	53%
PF5a	4.14	0.006	0.0	0.0	0.0	0.0	2.5	1.6	0.0	0.0	75.3	39%
PF5b	10.48	0.016	0.0	0.0	0.0	0.0	1.3	9.2	0.0	0.0	93.4	88%
PF6	21.27	0.033	0.0	21.3	0.0	0.0	0.0	0.0	0.0	0.0	70.0	25%
PF7	12.8	0.020	0.0	9.5	0.0	0.0	3.3	0.0	0.0	0.0	67.7	19%
PF8	28.81	0.045	0.0	7.4	13.7	0.0	7.7	0.0	0.0	0.0	70.0	25%
PF9	21.14	0.033	0.0	0.0	21.1	0.0	0.0	0.0	0.0	0.0	75.0	38%
PF10	42.04	0.066	0.0	0.0	0.0	0.0	0.0	0.0	42.0	0.0	92.0	85%
PF11	84.89	0.133	30.0	0.0	0.0	0.0	54.9	0.0	0.0	0.0	63.5	7%
PF12	112.65	0.176	0.0	0.0	0.0	0.0	112.7	0.0	0.0	0.0	61.0	0%
PF13	12.99	0.020	0.0	0.0	0.0	0.0	13.0	0.0	0.0	0.0	61.0	0%
PF14	90.11	0.141	0.0	0.0	70.5	0.5	19.2	0.0	0.0	0.0	72.1	30%
PF15	60.54	0.095	0.0	0.0	7.6	13.9	30.0	0.0	9.1	0.0	72.9	32%
PF16	53.8	0.084	0.0	0.0	21.0	13.0	3.8	0.0	16.1	0.0	81.5	56%
PF17	30.47	0.048	0.0	0.0	0.0	0.0	0.0	0.0	30.5	0.0	92.0	85%
PF17a	16.9	0.026	0.0	0.0	0.0	0.0	0.0	0.0	16.9	0.0	0.0	85%
PF18	26.39	0.041	0.0	0.0	0.0	0.0	5.0	0.0	21.4	0.0	86.1	69%

Land Use		***CN***	***% Imp.***
Residential	1 acre	68	20%
	1/2 acre	70	25%
	1/4 acre	75	38%
	1/8 acre	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
Fully Developed 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)
PF1	100	1.6%	13.6	600	4.2%	2.9	3.4	450	3.8%	12.0	0.6	17.6	10.6
PF2	150	1.5%	17.0	350	2.9%	2.3	2.5	2000	1.9%	10.0	3.3	22.9	13.7
PF3	125	3.0%	12.4	1400	3.0%	2.4	9.7	0	0.0%	0.0	0	22.1	13.2
PF4	100	2.0%	12.6	375	1.3%	1.6	4.0	500	1.2%	10.0	0.8	17.5	10.5
PF5	150	2.6%	14.2	200	2.6%	2.2	1.5	2400	2.6%	10.0	4.0	19.7	11.8
PF5a	50	2.0%	8.9	500	1.2%	1.6	5.2	1100	1.2%	5.0	3.7	17.8	10.7
PF5b	50	2.0%	8.9	250	4.0%	2.9	1.4	1000	3.5%	10.0	1.7	12.0	7.2
PF6	150	2.0%	15.5	200	4.0%	2.9	1.2	1500	3.3%	12.0	2.1	18.7	11.2
PF7	100	3.0%	11.1	800	4.0%	2.9	4.7	750	3.2%	12.0	1.0	16.8	10.1
PF8	150	1.5%	17.0	200	2.5%	2.2	1.5	1650	2.6%	10.0	2.8	21.3	12.8
PF9	150	3.3%	13.1	450	3.3%	2.5	2.9	850	3.5%	12.0	1.2	17.3	10.4
PF10	50	2.0%	8.9	500	3.0%	2.4	3.5	1250	2.8%	10.0	2.1	14.5	8.7
PF11	100	2.0%	12.6	500	3.0%	2.4	3.5	3000	3.0%	10.0	5.0	21.1	12.7
PF12	100	2.0%	12.6	500	3.0%	2.4	3.5	3500	3.0%	10.0	5.8	21.9	13.2
PF13	100	2.0%	12.6	500	3.0%	2.4	3.5	1600	3.0%	10.0	2.7	18.8	11.3
PF14	100	3.0%	11.1	500	4.0%	2.9	2.9	2800	3.5%	12.0	3.9	17.9	10.7
PF15	75	2.0%	11.0	500	3.0%	2.4	3.5	1500	3.0%	10.0	2.5	16.9	10.2
PF16	75	2.0%	11.0	300	3.0%	2.4	2.1	700	3.0%	10.0	1.2	14.2	8.5
PF17	75	2.0%	11.0	400	3.0%	2.4	2.8	1500	3.0%	8.0	3.1	16.9	10.1
PF17a	75	2.0%	11.0	500	3.0%	2.4	3.5	1650	3.0%	8.0	3.4	17.9	10.7
PF18	50	2.0%	8.9	400	3.0%	2.4	2.8	600	3.0%	10.0	1.0	12.7	7.6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PF12
Reach-15
PF13
DF-5
Reach-16
Reach-22
PF14
Junction-5
PF18
PF16
Reach-9
Reach-17
PF15
Junction-6
PF17
Reach-18
Reach-10
DF-4
Sink-2
PF17a
Reach-11
Sink-3
PF6
PF7
Reach-2
PF1
PF8
Junction-1
Reach-3
PF9
Junction-2
Reach-4
PF2
PF4
Junction-3
Reach-5
Junction-4
Reach-7
PF3
Junction-7
Reach-19
PF5
PF10
DF-2
Reach-8
Junction-8
Reach-13
Reach-21
PF5a
Junction-9
PF5b
Reach-20
Sink-1

HMS * Summary of Results

Project : Pine Creek 9-14-04 Run Name : Run 2

Start of Run : 01Jan04 0000 Basin Model : Pine Creek - Dev
End of Run : 02Jan04 0000 Met. Model : 5-yr - Type IIa
Execution Time : 21Sep04 1351 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PF10	103.27	01 Jan 04 0602	6.2790	0.066
Reach-13	103.20	01 Jan 04 0602	6.2792	0.066
PF6	11.446	01 Jan 04 0606	0.88420	0.033
Reach-2	11.405	01 Jan 04 0608	0.88392	0.033
PF7	5.8071	01 Jan 04 0606	0.44897	0.020
Junction-1	16.966	01 Jan 04 0608	1.3329	0.053
Reach-3	16.933	01 Jan 04 0608	1.3329	0.053
PF1	10.985	01 Jan 04 0606	0.81590	0.030
Reach-1	10.814	01 Jan 04 0608	0.81549	0.030
PF8	14.466	01 Jan 04 0608	1.2052	0.045
PF2	9.5626	01 Jan 04 0610	0.86253	0.035
Junction-2	51.742	01 Jan 04 0608	4.2162	0.163
Reach-4	51.156	01 Jan 04 0610	4.2155	0.163
PF9	18.292	01 Jan 04 0606	1.2462	0.033
Junction-3	67.546	01 Jan 04 0608	5.4617	0.196
Reach-5	66.713	01 Jan 04 0610	5.4613	0.196
PF3	52.603	01 Jan 04 0606	3.7276	0.065
Reach-6	52.298	01 Jan 04 0608	3.7273	0.065
PF4	22.899	01 Jan 04 0606	1.6215	0.051
Junction-4	140.55	01 Jan 04 0608	10.810	0.312
Reach-7	139.47	01 Jan 04 0608	10.810	0.312
PF5	75.847	01 Jan 04 0606	5.1663	0.099
Reach-12	75.759	01 Jan 04 0606	5.1663	0.099
Junction-7	212.72	01 Jan 04 0608	15.976	0.411
Reach-19	212.62	01 Jan 04 0608	15.976	0.411
DF-2	70.302	01 Jan 04 0626	15.518	0.411
Reach-8	70.299	01 Jan 04 0626	15.517	0.411
PF5b	27.171	01 Jan 04 0600	1.6281	0.016
PF5a	3.3655	01 Jan 04 0606	0.23093	0.006
Junction-8	74.106	01 Jan 04 0624	17.376	0.433
Reach-21	74.096	01 Jan 04 0624	17.376	0.433
Junction-9	152.56	01 Jan 04 0604	23.655	0.499
Reach-20	152.45	01 Jan 04 0604	23.655	0.499
Sink-1	152.45	01 Jan 04 0604	23.655	0.499
PF17a	39.318	01 Jan 04 0602	2.4731	0.026
Reach-11	39.277	01 Jan 04 0602	2.4732	0.026
Sink-3	39.277	01 Jan 04 0602	2.4732	0.026
PF13	1.9589	01 Jan 04 0608	0.24039	0.020
Reach-16	1.9600	01 Jan 04 0656	0.23672	0.020
PF11	83.402	01 Jan 04 0606	6.0382	0.133
Reach-15	82.928	01 Jan 04 0608	6.0384	0.133

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PF12	108.15	01 Jan 04 0608	7.9895	0.176
DF-5	102.30	01 Jan 04 0618	12.350	0.309
Reach-22	102.15	01 Jan 04 0626	12.330	0.309
PF14	61.143	01 Jan 04 0606	4.3911	0.141
Junction-5	117.36	01 Jan 04 0624	16.958	0.470
Reach-17	117.17	01 Jan 04 0630	16.931	0.470
PF16	77.402	01 Jan 04 0604	4.6647	0.084
Reach-9	77.033	01 Jan 04 0604	4.6648	0.084
PF18	50.193	01 Jan 04 0602	2.9100	0.041
PF17	71.492	01 Jan 04 0604	4.5653	0.048
DF-4	22.147	01 Jan 04 0636	11.719	0.173
Reach-10	22.146	01 Jan 04 0636	11.719	0.173
PF15	45.003	01 Jan 04 0606	3.1254	0.095
Junction-6	148.00	01 Jan 04 0628	31.775	0.738
Reach-18	147.85	01 Jan 04 0628	31.773	0.738
Sink-2	147.85	01 Jan 04 0628	31.773	0.738

HMS * Summary of Results for Junction-7

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1502	Control Specs	: Control

Computed Results

Peak Outflow : 212.72 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0608

Total Outflow : 0.73 (in)

HMS * Summary of Results for DF-2

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1502	Control Specs	: Control

Computed Results

Peak Inflow	: 212.62 (cfs)	Date/Time of Peak Inflow	: 01 Jan 04 0608
Peak Outflow	: 70.302 (cfs)	Date/Time of Peak Outflow	: 01 Jan 04 0626
Total Inflow	: 0.73 (in)	Peak Storage	: 5.0858(ac-ft)
Total Outflow	: 0.71 (in)	Peak Elevation	: 7008.6(ft)

HMS * Summary of Results for Junction-9

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1502	Control Specs	: Control

Computed Results

Peak Outflow : 152.56 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0604

Total Outflow : 0.89 (in)

HMS * Summary of Results for Sink-3

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 20Sep04 1502	Control Specs	: Control

Computed Results

Peak Discharge : 110.21 (cfs) **Date/Time of Peak Discharge** : 01 Jan 04 0604

Total Discharge : 1.78 (in)

HMS * Summary of Results for DF-4

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 21Sep04 1351	Control Specs	: Control

Computed Results

Peak Inflow	: 196.98 (cfs)	Date/Time of Peak Inflow	: 01 Jan 04 0604
Peak Outflow	: 22.147 (cfs)	Date/Time of Peak Outflow	: 01 Jan 04 0636
Total Inflow	: 1.32 (in)	Peak Storage	: 6.0168(ac-ft)
Total Outflow	: 1.27 (in)	Peak Elevation	: 4.5948(ft)

HMS * Summary of Results for Junction-6

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 5-yr - Type I
Execution Time	: 21Sep04 1351	Control Specs	: Control

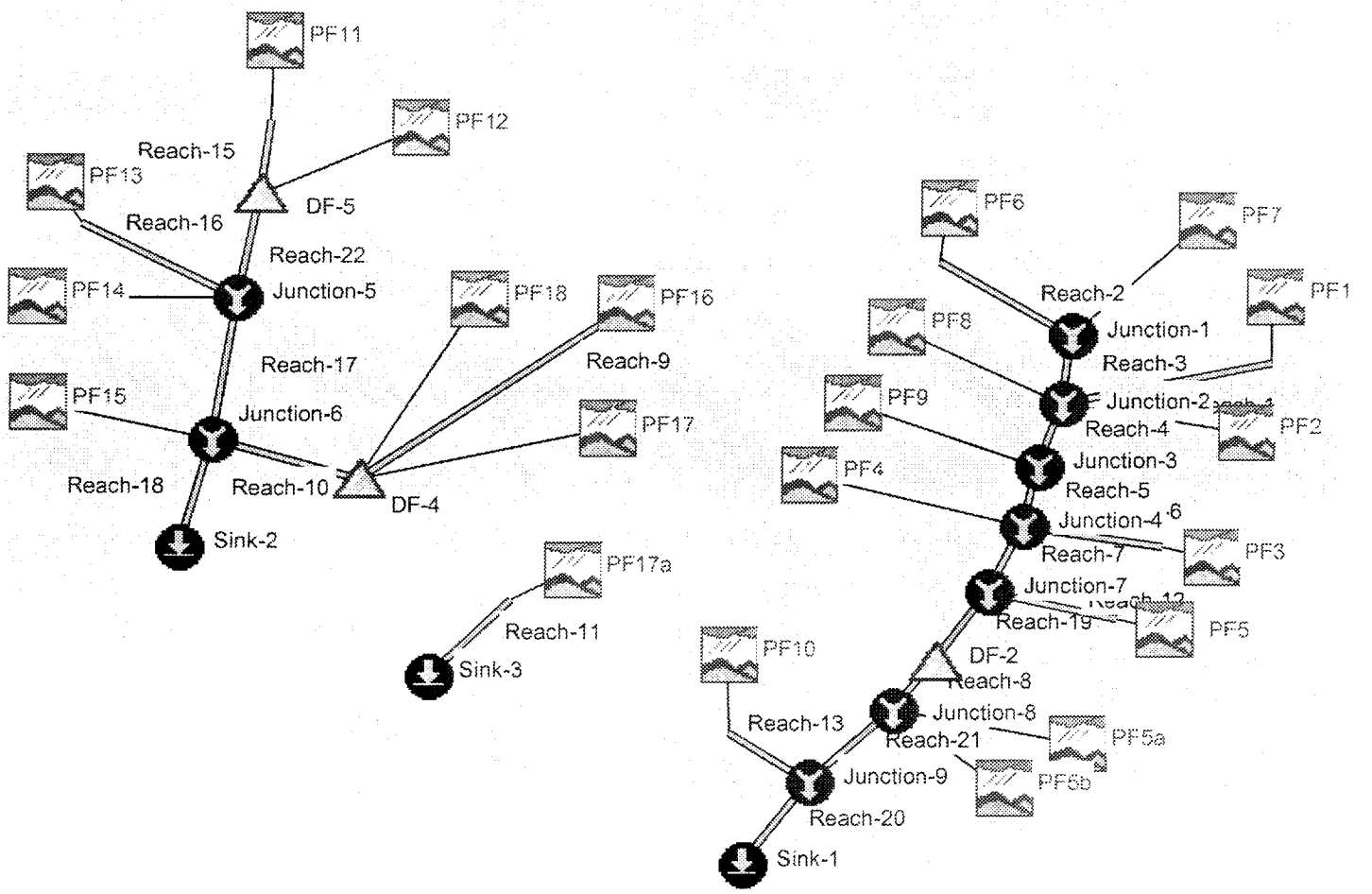
Computed Results

Peak Outflow : 148.00 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0628

Total Outflow : 0.81 (in)

PINE CREEK

CORDERA/BRIARGATE CROSSING
DEVELOPED 100-YEAR STORM EVENT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PF12
Reach-15
PF13
DF-5
Reach-16
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PF14
Junction-5
PF18
PF16
Reach-9
Reach-17
PF15
Junction-6
PF17
Reach-18
Reach-10
DF-4
Sink-2
PF17a
Reach-11
Sink-3
PF6
PF7
Reach-2
PF1
PF8
Junction-1
Reach-3
PF9
Junction-2
Reach-4
PF2
PF4
Junction-3
Reach-5
Junction-4
Reach-7
PF3
Junction-7
Reach-19
PF5
PF10
DF-2
Reach-8
Junction-8
Reach-13
Reach-21
PF5a
Junction-9
PF5b
Reach-20
Sink-1

HMS * Summary of Results

Project : Pine Creek 9-14-04 Run Name : Run 1

Start of Run : 01Jan04 0000 Basin Model : Pine Creek - Dev
End of Run : 02Jan04 0000 Met. Model : 100-yr - Type IIa
Execution Time : 21Sep04 1353 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PF10	197.12	01 Jan 04 0602	12.324	0.066
Reach-13	197.09	01 Jan 04 0602	12.324	0.066
PF6	41.963	01 Jan 04 0606	2.8156	0.033
Reach-2	41.725	01 Jan 04 0606	2.8147	0.033
PF7	23.599	01 Jan 04 0604	1.5381	0.020
Junction-1	65.050	01 Jan 04 0606	4.3528	0.053
Reach-3	64.909	01 Jan 04 0606	4.3530	0.053
PF1	39.343	01 Jan 04 0604	2.5825	0.030
Reach-1	39.039	01 Jan 04 0606	2.5821	0.030
PF8	53.870	01 Jan 04 0606	3.8382	0.045
PF2	38.250	01 Jan 04 0608	2.8419	0.035
Junction-2	195.63	01 Jan 04 0606	13.615	0.163
Reach-4	194.34	01 Jan 04 0608	13.612	0.163
PF9	54.470	01 Jan 04 0604	3.4648	0.033
Junction-3	245.26	01 Jan 04 0606	17.077	0.196
Reach-5	243.73	01 Jan 04 0608	17.077	0.196
PF3	129.64	01 Jan 04 0606	8.8471	0.065
Reach-6	129.18	01 Jan 04 0606	8.8468	0.065
PF4	74.719	01 Jan 04 0604	4.8216	0.051
Junction-4	445.71	01 Jan 04 0606	30.745	0.312
Reach-7	442.52	01 Jan 04 0606	30.746	0.312
PF5	192.88	01 Jan 04 0604	12.703	0.099
Reach-12	192.59	01 Jan 04 0604	12.703	0.099
Junction-7	634.38	01 Jan 04 0606	43.449	0.411
Reach-19	633.97	01 Jan 04 0606	43.450	0.411
DF-2	267.25	01 Jan 04 0620	42.697	0.411
Reach-8	267.18	01 Jan 04 0620	42.697	0.411
PF5b	50.346	01 Jan 04 0600	3.1142	0.016
PF5a	9.9149	01 Jan 04 0604	0.63737	0.006
Junction-8	277.03	01 Jan 04 0620	46.449	0.433
Reach-21	277.00	01 Jan 04 0620	46.448	0.433
Junction-9	386.41	01 Jan 04 0606	58.772	0.499
Reach-20	386.23	01 Jan 04 0606	58.772	0.499
Sink-1	386.23	01 Jan 04 0606	58.772	0.499
PF17a	75.922	01 Jan 04 0602	4.8540	0.026
Reach-11	75.887	01 Jan 04 0602	4.8542	0.026
Sink-3	75.887	01 Jan 04 0602	4.8542	0.026
PF13	14.852	01 Jan 04 0606	1.0892	0.020
Reach-16	14.687	01 Jan 04 0626	1.0899	0.020
PF11	230.09	01 Jan 04 0606	15.646	0.133
Reach-15	229.56	01 Jan 04 0606	15.647	0.133

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
PF12	299.77	01 Jan 04 0606	20.703	0.176
DF-5	228.15	01 Jan 04 0620	34.670	0.309
Reach-22	227.89	01 Jan 04 0626	34.648	0.309
PF14	201.88	01 Jan 04 0604	13.164	0.141
Junction-5	316.70	01 Jan 04 0608	48.902	0.470
Reach-17	314.84	01 Jan 04 0612	48.865	0.470
PF16	187.66	01 Jan 04 0602	11.208	0.084
Reach-9	185.98	01 Jan 04 0604	11.205	0.084
PF18	107.64	01 Jan 04 0602	6.3796	0.041
PF17	138.43	01 Jan 04 0602	8.9605	0.048
DF-4	151.07	01 Jan 04 0616	26.108	0.173
Reach-10	150.92	01 Jan 04 0616	26.108	0.173
PF15	144.18	01 Jan 04 0604	9.1692	0.095
Junction-6	556.48	01 Jan 04 0610	84.142	0.738
Reach-18	554.57	01 Jan 04 0610	84.141	0.738
Sink-2	554.57	01 Jan 04 0610	84.141	0.738

HMS * Summary of Results for DF-2

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 20Sep04 1104	Control Specs	: Control

Computed Results

Peak Inflow	: 633.97 (cfs)	Date/Time of Peak Inflow	: 01 Jan 04 0606
Peak Outflow	: 267.25 (cfs)	Date/Time of Peak Outflow	: 01 Jan 04 0620
Total Inflow	: 1.98 (in)	Peak Storage	: 14.581(ac-ft)
Total Outflow	: 1.95 (in)	Peak Elevation	: 7011.1(ft)

HMS * Summary of Results for Junction-9

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 20Sep04 1104	Control Specs	: Control

Computed Results

Peak Outflow : 386.41 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0606

Total Outflow : 2.21 (in)

HMS * Summary of Results for Sink-3

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 20Sep04 1104	Control Specs	: Control

Computed Results

Peak Discharge : 213.30 (cfs) Date/Time of Peak Discharge : 01 Jan 04 0602

Total Discharge : 3.50 (in)

HMS * Summary of Results for DF-4

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 21Sep04 1353	Control Specs	: Control

Computed Results

Peak Inflow	: 430.96 (cfs)	Date/Time of Peak Inflow	: 01 Jan 04 0602
Peak Outflow	: 151.07 (cfs)	Date/Time of Peak Outflow	: 01 Jan 04 0616
Total Inflow	: 2.88 (in)	Peak Storage	: 12.340(ac-ft)
Total Outflow	: 2.83 (in)	Peak Elevation	: 7.4893(ft)

HMS * Summary of Results for Junction-6

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 21Sep04 1353	Control Specs	: Control

Computed Results

Peak Outflow : 556.48 (cfs) Date/Time of Peak Outflow : 01 Jan 04 0610

Total Outflow : 2.14 (in)

HMS * Summary of Results for DF-5

Project : Pine Creek 9-14-04 Run Name : Run

Start of Run	: 01Jan04 0000	Basin Model	: Pine Creek - D
End of Run	: 02Jan04 0000	Met. Model	: 100-yr - Type I
Execution Time	: 20Sep04 1104	Control Specs	: Control

Computed Results

Peak Inflow	: 529.33 (cfs)	Date/Time of Peak Inflow	: 01 Jan 04 0606
Peak Outflow	: 228.15 (cfs)	Date/Time of Peak Outflow	: 01 Jan 04 0620
Total Inflow	: 2.21 (in)	Peak Storage	: 11.673(ac-ft)
Total Outflow	: 2.10 (in)	Peak Elevation	: 6.2450(ft)

COTTONWOOD CREEK

CORDERA/BRIARGATE CROSSING
HISTORIC 5-YEAR STORM EVENT

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

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

Basin ID	Total Area (ac)	Total Area (sq. mi.)	Residential			Parks (ac)	Open Space (ac)	Commercial (ac)	Schools (ac)	Weighted CN	Percent Impervious
			1 acre lots	1/4 acre lots	1/8 acre lots						
CE1	44.00	0.069	0.0	0.0	0.0	0.0	44.0	0.0	0.0	61.0	0%
CE2	60.99	0.095	0.0	0.0	0.0	0.0	61.0	0.0	0.0	61.0	0%
CE3	67.86	0.106	0.0	0.0	0.0	0.0	67.9	0.0	0.0	61.0	0%
CE4	26.96	0.042	0.0	0.0	0.0	0.0	27.0	0.0	0.0	61.0	0%
A1	116.48	0.182	0.0	0.0	0.0	0.0	116.5	0.0	0.0	61.0	0%
A2	70.40	0.110	0.0	0.0	0.0	0.0	70.4	0.0	0.0	61.0	0%
A3	84.48	0.132	0.0	0.0	0.0	0.0	84.5	0.0	0.0	61.0	0%

**Basins A1, A2, and A3 are per the Wolf Ranch MDDP, prepated by Kiowa Engineering, 2004

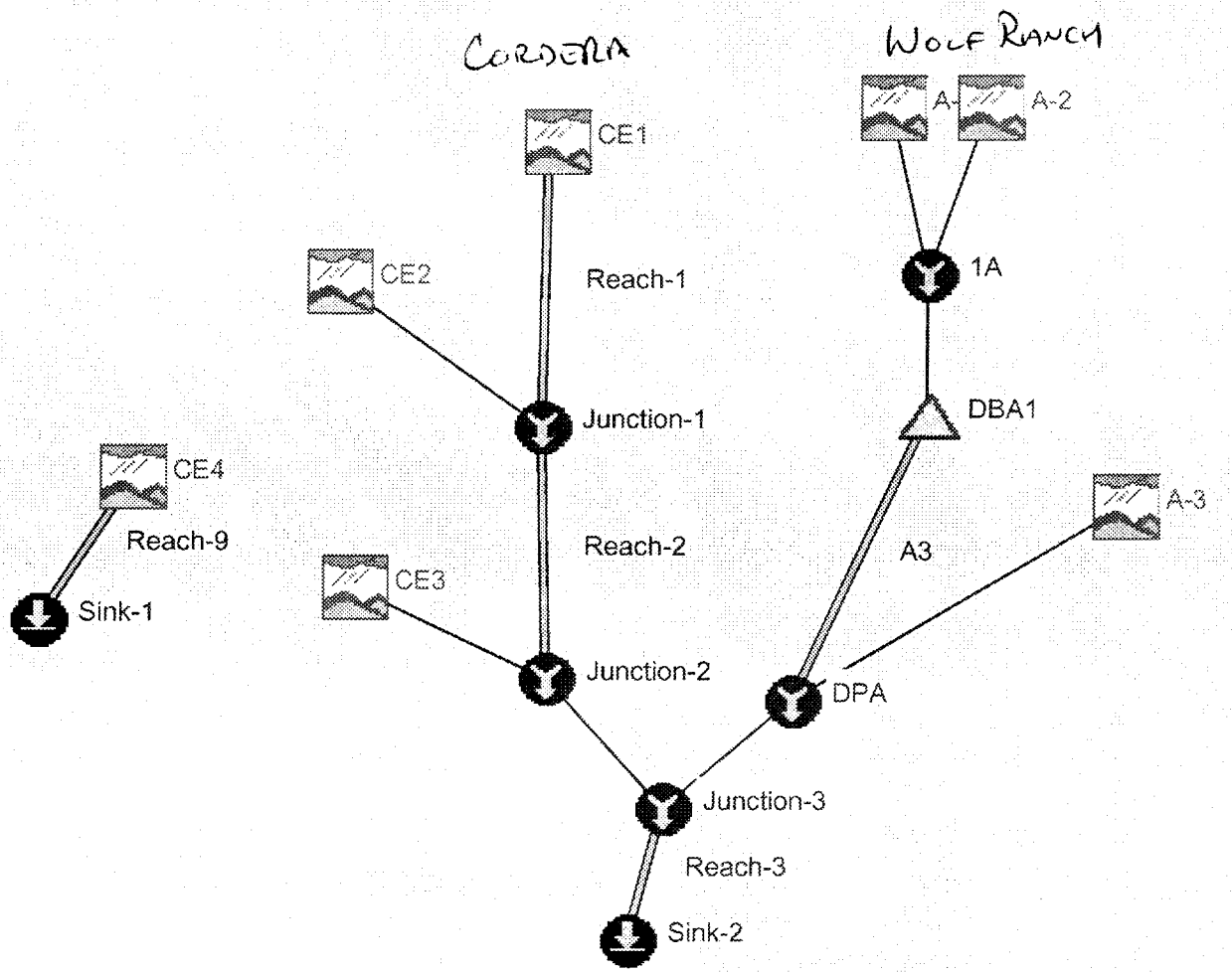
Land Use		***CN***	***% Imp.***
Residential	1 acre	68	20%
	1/4 Lots	75	38%
	1/8 Lots	85	65%
Parks		61	0%
Open Space		61	0%
Commercial		92	85%
Schools		80	52%

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

HEC-HMS Input parameters - Cottonwood 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)
CE1	300	4.0%	17.4	3000	4.1%	3.0	16.7	0	0.0%	0.0	0	34.1	20.5
CE2	300	4.0%	17.4	1100	3.5%	2.5	7.3	1500	2.4%	10.0	2.5	27.3	16.4
CE3	300	4.0%	17.4	3000	3.1%	2.4	20.8	0	0.0%	0.0	0	38.3	23.0
CE4	300	4.0%	17.4	1000	3.1%	2.4	6.9	0	0.0%	0.0	0	24.4	14.6
A1													21.6
A2													17.4
A3													16.8

**Basins A1, A2, and A3 are per the Wolf Ranch MDDP, prepared by Kiowa Engineering, 2004


CORDERA
WOLF RANCH
CE1
A-1
A-2
CE2
Reach-1
1A
Junction-1
DBA1
CE4
Reach-9
A-3
Reach-2
A3
CE3
Sink-1
Junction-2
DPA
Junction-3
Reach-3
Sink-2

HMS * Summary of Results

Project : Cottonwood 9-20-04 Run Name : Run 2

Start of Run : 01Jan00 0000 Basin Model : Cottonwood-Historic
End of Run : 02Jan00 0000 Met. Model : 5-yr Type IIa
Execution Time : 20Sep04 1505 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
CE1	5.3090	01 Jan 00 0618	0.91939	0.069
Reach-1	5.3030	01 Jan 00 0634	0.91581	0.069
CE2	8.6531	01 Jan 00 0614	1.2678	0.095
Junction-1	9.8238	01 Jan 00 0630	2.1836	0.164
Reach-2	9.7965	01 Jan 00 0638	2.1774	0.164
CE3	7.5009	01 Jan 00 0622	1.4111	0.106
Junction-2	16.241	01 Jan 00 0624	3.5885	0.270
A-1	13.468	01 Jan 00 0620	2.4227	0.182
A-2	9.5490	01 Jan 00 0616	1.4647	0.110
1A	22.632	01 Jan 00 0618	3.8875	0.292
DBA1	21.066	01 Jan 00 0624	3.6310	0.292
A3	21.053	01 Jan 00 0632	3.6225	0.292
A-3	11.799	01 Jan 00 0614	1.7586	0.132
DPA	27.397	01 Jan 00 0630	5.3811	0.423
Junction-3	42.028	01 Jan 00 0630	8.9696	0.694
Reach-3	41.941	01 Jan 00 0630	8.9693	0.694
Sink-2	41.941	01 Jan 00 0630	8.9693	0.694
CE4	4.1790	01 Jan 00 0612	0.56086	0.042
Reach-9	4.1711	01 Jan 00 0612	0.56085	0.042
Sink-1	4.1711	01 Jan 00 0612	0.56085	0.042

HMS * Summary of Results for DPA

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Histor
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I
Execution Time	: 20Sep04 1505	Control Specs	: Control

Computed Results

Peak Outflow : 27.397 (cfs) **Date/Time of Peak Outflow** : 01 Jan 00 0630

Total Outflow : 0.24 (in)

HMS * Summary of Results for Junction-2

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Histor
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I
Execution Time	: 20Sep04 1505	Control Specs	: Control

Computed Results

Peak Outflow : 16.241 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0624

Total Outflow : 0.25 (in)

HMS * Summary of Results for Junction-3

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Histor
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I
Execution Time	: 20Sep04 1505	Control Specs	: Control

Computed Results

Peak Outflow : 42.028 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0630

Total Outflow : 0.24 (in)

HMS * Summary of Results for Sink-1

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Histor
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I
Execution Time	: 20Sep04 1505	Control Specs	: Control

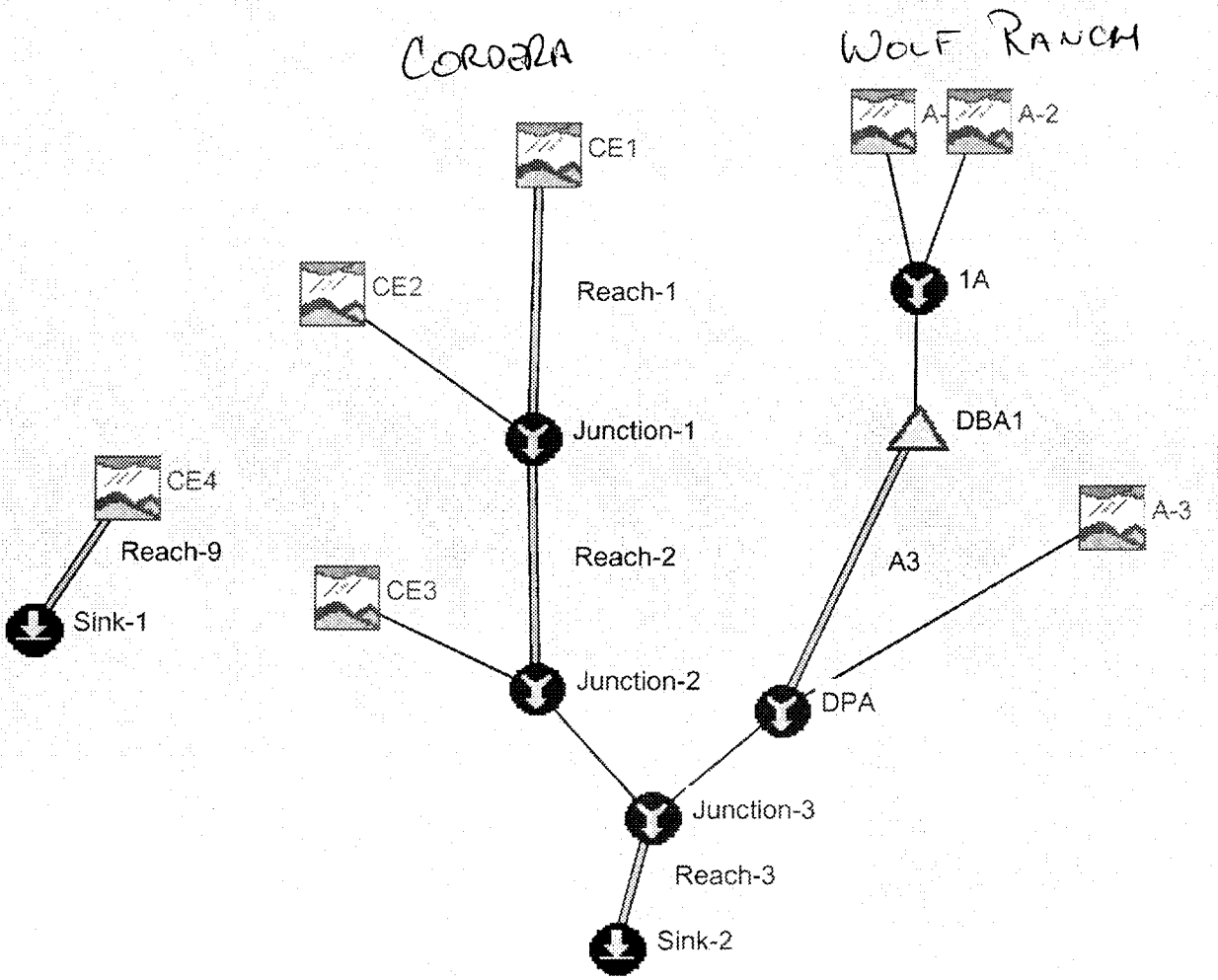
Computed Results

Peak Discharge : 4.1711 (cfs) Date/Time of Peak Discharge : 01 Jan 00 0612

Total Discharge : 0.25 (in)

COTTONWOOD CREEK

CORDERA/BRIARGATE CROSSING
HISTORIC 100-YEAR STORM EVENT


CORDERA
WOLF RANCH
CE1
A-1
A-2
CE2
Reach-1
1A
Junction-1
DBA1
CE4
Reach-9
A-3
Reach-2
A3
CE3
Sink-1
Junction-2
DPA
Junction-3
Reach-3
Sink-2

HMS * Summary of Results

Project : Cottonwood 9-20-04 Run Name : Run 1

Start of Run : 01Jan00 0000 Basin Model : Cottonwood-Historic
End of Run : 02Jan00 0000 Met. Model : 100-yr Type IIa
Execution Time : 21Sep04 0955 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
CE1	37.795	01 Jan 00 0614	3.9656	0.069
Reach-1	37.714	01 Jan 00 0622	3.9602	0.069
CE2	60.635	01 Jan 00 0610	5.4655	0.095
Junction-1	85.542	01 Jan 00 0616	9.4257	0.164
Reach-2	85.245	01 Jan 00 0620	9.4160	0.164
CE3	53.512	01 Jan 00 0618	6.0883	0.106
Junction-2	137.96	01 Jan 00 0620	15.504	0.270
A-1	96.218	01 Jan 00 0616	10.451	0.182
A-2	67.566	01 Jan 00 0612	6.3154	0.110
1A	161.24	01 Jan 00 0614	16.767	0.292
DBA1	160.17	01 Jan 00 0616	16.498	0.292
A3	159.59	01 Jan 00 0620	16.485	0.292
A-3	82.828	01 Jan 00 0612	7.5819	0.132
DPA	225.64	01 Jan 00 0618	24.067	0.423
Junction-3	362.94	01 Jan 00 0618	39.571	0.694
Reach-3	362.69	01 Jan 00 0618	39.571	0.694
Sink-2	362.69	01 Jan 00 0618	39.571	0.694
CE4	28.818	01 Jan 00 0610	2.4174	0.042
Reach-9	28.814	01 Jan 00 0610	2.4175	0.042
Sink-1	28.814	01 Jan 00 0610	2.4175	0.042

HMS * Summary of Results for Junction-2

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Histor
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I
Execution Time	: 21Sep04 0955	Control Specs	: Control

Computed Results

Peak Outflow : 137.96 (cfs) **Date/Time of Peak Outflow** : 01 Jan 00 0620

Total Outflow : 1.08 (in)

HMS * Summary of Results for DPA

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Histor
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I
Execution Time	: 21Sep04 0955	Control Specs	: Control

Computed Results

Peak Outflow : 225.64 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0618

Total Outflow : 1.07 (in)

HMS * Summary of Results for Junction-3

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Histor
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I
Execution Time	: 21Sep04 0955	Control Specs	: Control

Computed Results

Peak Outflow : 362.94 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0618

Total Outflow : 1.07 (in)

HMS * Summary of Results for Sink-1

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Histor
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I
Execution Time	: 21Sep04 0955	Control Specs	: Control

Computed Results

Peak Discharge : 28.814 (cfs) Date/Time of Peak Discharge : 01 Jan 00 0610

Total Discharge : 1.08 (in)

COTTONWOOD CREEK

CORDERA/BRIARGATE CROSSING
INTERIM 5-YEAR STORM EVENT

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

HEC-HMS Input parameters - Cottonwood Creek
Interim Conditions
Curve Number Calculations

Basin ID	Total Area (ac)	Total Area (sq. mi.)	Residential			Parks (ac)	Open Space (ac)	Commercial (ac)	Schools (ac)	Weighted CN	Percent Impervious
			1 acre lots	1/4 acre lots	1/8 acre lots						
CI1	48.56	0.076	0.0	0.0	0.0	0.0	48.6	0.0	0.0	61.0	0%
CI2	32.28	0.050	0.0	32.3	0.0	0.0	0.0	0.0	0.0	75.0	38%
CI3	14.57	0.023	0.0	14.6	0.0	0.0	0.0	0.0	0.0	75.0	38%
CI4	12.17	0.019	0.0	5.9	0.0	6.3	0.0	0.0	0.0	67.7	18%
CI5	11.13	0.017	0.0	11.1	0.0	0.0	0.0	0.0	0.0	75.0	38%
CI6	16.02	0.025	0.0	0.0	16.0	0.0	0.0	0.0	0.0	85.0	65%
CI7	23.97	0.037	0.0	0.0	20.9	3.1	0.0	0.0	0.0	81.9	57%
CI8	30.25	0.047	0.0	0.0	30.3	0.0	0.0	0.0	0.0	85.0	65%
CI9	22.65	0.035	0.0	0.0	9.4	0.0	13.3	0.0	0.0	70.9	27%
A1	116.48	0.182	0.0	0.0	0.0	0.0	116.5	0.0	0.0	61.0	0%
A2	70.40	0.110	0.0	0.0	0.0	0.0	70.4	0.0	0.0	61.0	0%
A3	84.48	0.132	0.0	0.0	0.0	0.0	84.5	0.0	0.0	61.0	0%

**Basins A1, A2, and A3 are per the Wolf Ranch MDDP, prepated by Kiowa Engineering, 2004

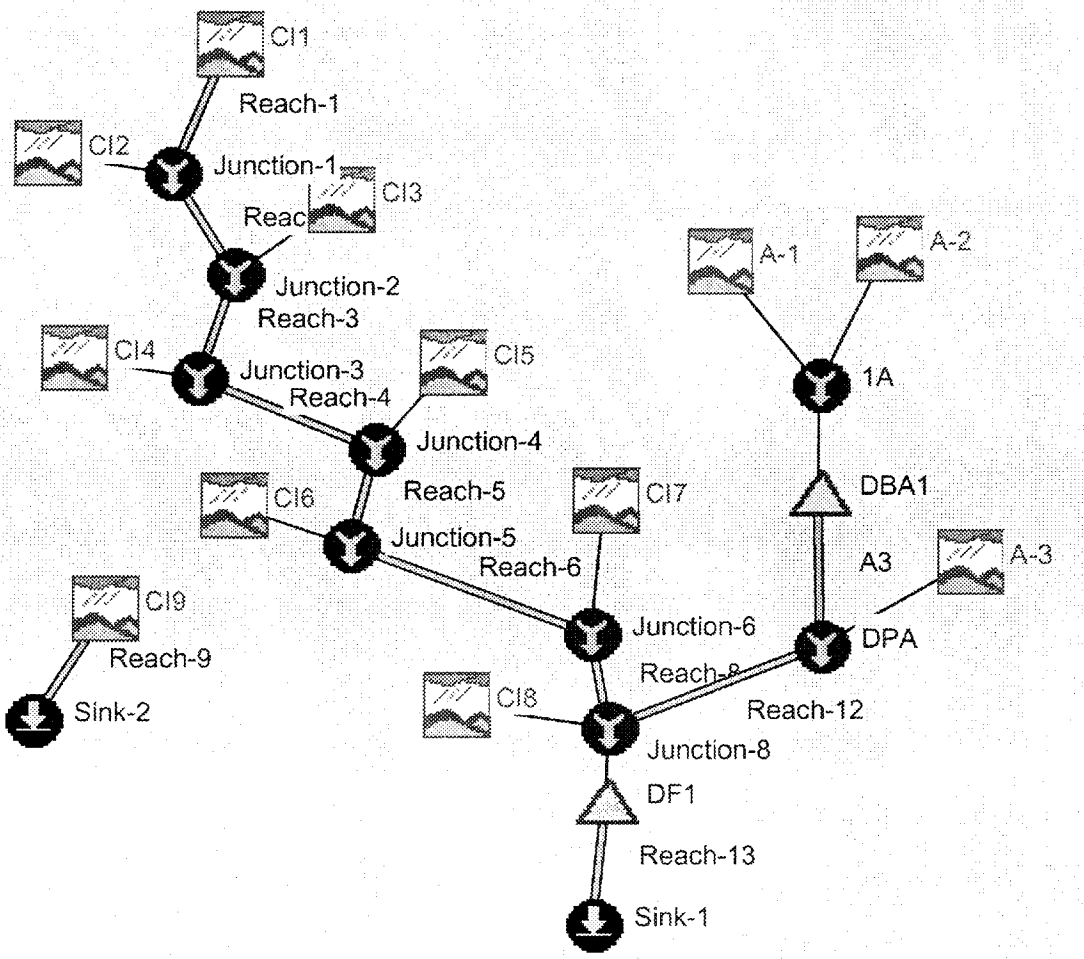
Land Use		***CN***	***% Imp.***
Residential	1 acre	68	20%
	1/4 Lots	75	38%
	1/8 Lots	85	65%
Parks		61	0%
Open Space		61	0%
Commercial		92	85%
Schools		80	52%

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

HEC-HMS Input parameters - Cottonwood Creek
Interim 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)
CI1	300	4.0%	17.4	3000	4.1%	3.0	16.7	0	0.0%	0.0	0	34.1	20.5
CI2	100	2.0%	12.6	950	1.4%	2.2	7.2	275	4.7%	15.0	0.3	20.1	12.1
CI3	100	2.0%	12.6	400	1.3%	2.2	3.0	275	2.2%	13.0	0.4	16.0	9.6
CI4	200	2.0%	17.9	800	4.0%	3.2	4.2	0	0.0%	0.0	0	22.0	13.2
CI5	100	2.0%	12.6	500	1.4%	2.2	3.8	0	0.0%	0.0	0	16.4	9.9
CI6	50	3.0%	7.8	600	1.7%	2.5	4.0	300	3.0%	15.0	0.3	12.2	7.3
CI7	100	2.0%	12.6	500	3.6%	3.2	2.6	1000	2.0%	12.0	1.4	16.6	10.0
CI8	50	2.0%	8.9	500	3.3%	3.1	2.7	1000	3.0%	15.0	1.1	12.7	7.6
CI9	75	2.0%	11.0	665	1.5%	2.2	5.0	2085	3.0%	15.0	2.3	18.3	11.0
A1													21.6
A2													17.4
A3													16.8

**Basins A1, A2, and A3 are per the Wolf Ranch MDDP, prepared by Kiowa Engineering, 2004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Reach-1
Cl2
Junction-1
Cl3
Reac
Junction-2
Reach-3
Cl4
Junction-3
Cl5
Reach-4
Junction-4
Cl6
Reach-5
Cl7
Junction-5
Reach-6
Cl9
Reach-9
Junction-6
Sink-2
Cl8
Junction-8
DF1
Reach-13
Sink-1
A-1
A-2
1A
DBA1
A3
A-3
DPA
Reach-12

HMS * Summary of Results

Project : Cottonwood 9-20-04 Run Name : Run 4

Start of Run : 01Jan00 0000 Basin Model : Cottonwood-Interim
End of Run : 02Jan00 0000 Met. Model : 5-yr Type IIa
Execution Time : 21Sep04 0957 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
CI1	5.8475	01 Jan 00 0618	1.0127	0.076
Reach-1	5.8286	01 Jan 00 0626	1.0105	0.076
CI2	25.748	01 Jan 00 0606	1.8874	0.050
Junction-1	25.997	01 Jan 00 0606	2.8979	0.126
Reach-2	25.855	01 Jan 00 0608	2.8977	0.126
CI3	13.234	01 Jan 00 0604	0.86870	0.023
Junction-2	38.659	01 Jan 00 0606	3.7664	0.149
Reach-3	38.455	01 Jan 00 0606	3.7663	0.149
CI4	4.6481	01 Jan 00 0608	0.42615	0.019
Junction-3	42.816	01 Jan 00 0606	4.1925	0.168
Reach-4	42.578	01 Jan 00 0608	4.1922	0.168
CI5	9.6183	01 Jan 00 0604	0.64204	0.017
Junction-4	51.757	01 Jan 00 0606	4.8342	0.185
Reach-5	51.531	01 Jan 00 0608	4.8334	0.185
CI6	29.213	01 Jan 00 0602	1.6761	0.025
Junction-5	74.874	01 Jan 00 0606	6.5095	0.210
Reach-6	74.862	01 Jan 00 0606	6.5071	0.210
CI7	33.268	01 Jan 00 0604	2.1000	0.037
Junction-6	107.22	01 Jan 00 0606	8.6071	0.247
Reach-8	107.05	01 Jan 00 0606	8.6072	0.247
A-1	13.468	01 Jan 00 0620	2.4227	0.182
A-2	9.5490	01 Jan 00 0616	1.4647	0.110
1A	22.632	01 Jan 00 0618	3.8875	0.292
DBA1	21.066	01 Jan 00 0624	3.6310	0.292
A3	21.053	01 Jan 00 0632	3.6225	0.292
A-3	11.799	01 Jan 00 0614	1.7586	0.132
DPA	27.397	01 Jan 00 0630	5.3811	0.423
Reach-12	27.350	01 Jan 00 0632	5.3810	0.423
CI8	54.411	01 Jan 00 0602	3.1508	0.047
Junction-8	162.66	01 Jan 00 0604	17.139	0.718
DF1	11.851	01 Jan 00 0826	8.0516	0.718
Reach-13	11.850	01 Jan 00 0826	8.0482	0.718
Sink-1	11.850	01 Jan 00 0826	8.0482	0.718
CI9	13.408	01 Jan 00 0606	1.0015	0.035
Reach-9	13.368	01 Jan 00 0606	1.0015	0.035
Sink-2	13.368	01 Jan 00 0606	1.0015	0.035

HMS * Summary of Results for Junction-6

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Inter:
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I:
Execution Time	: 21Sep04 0957	Control Specs	: Control

Computed Results

Peak Outflow : 107.22 (cfs) **Date/Time of Peak Outflow** : 01 Jan 00 0606

Total Outflow : 0.65 (in)

HMS * Summary of Results for DPA

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Inter:
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I:
Execution Time	: 21Sep04 0957	Control Specs	: Control

Computed Results

Peak Outflow : 27.397 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0630

Total Outflow : 0.24 (in)

HMS * Summary of Results for DF1

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Inter:
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I:
Execution Time	: 21Sep04 0957	Control Specs	: Control

Computed Results

Peak Inflow	: 162.66 (cfs)	Date/Time of Peak Inflow	: 01 Jan 00 0604
Peak Outflow	: 11.851 (cfs)	Date/Time of Peak Outflow	: 01 Jan 00 0826
Total Inflow	: 0.45 (in)	Peak Storage	: 9.4511(ac-ft)
Total Outflow	: 0.21 (in)	Peak Elevation	: 5.9677(ft)

HMS * Summary of Results for Sink-2

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Inter:
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I:
Execution Time	: 21Sep04 0957	Control Specs	: Control

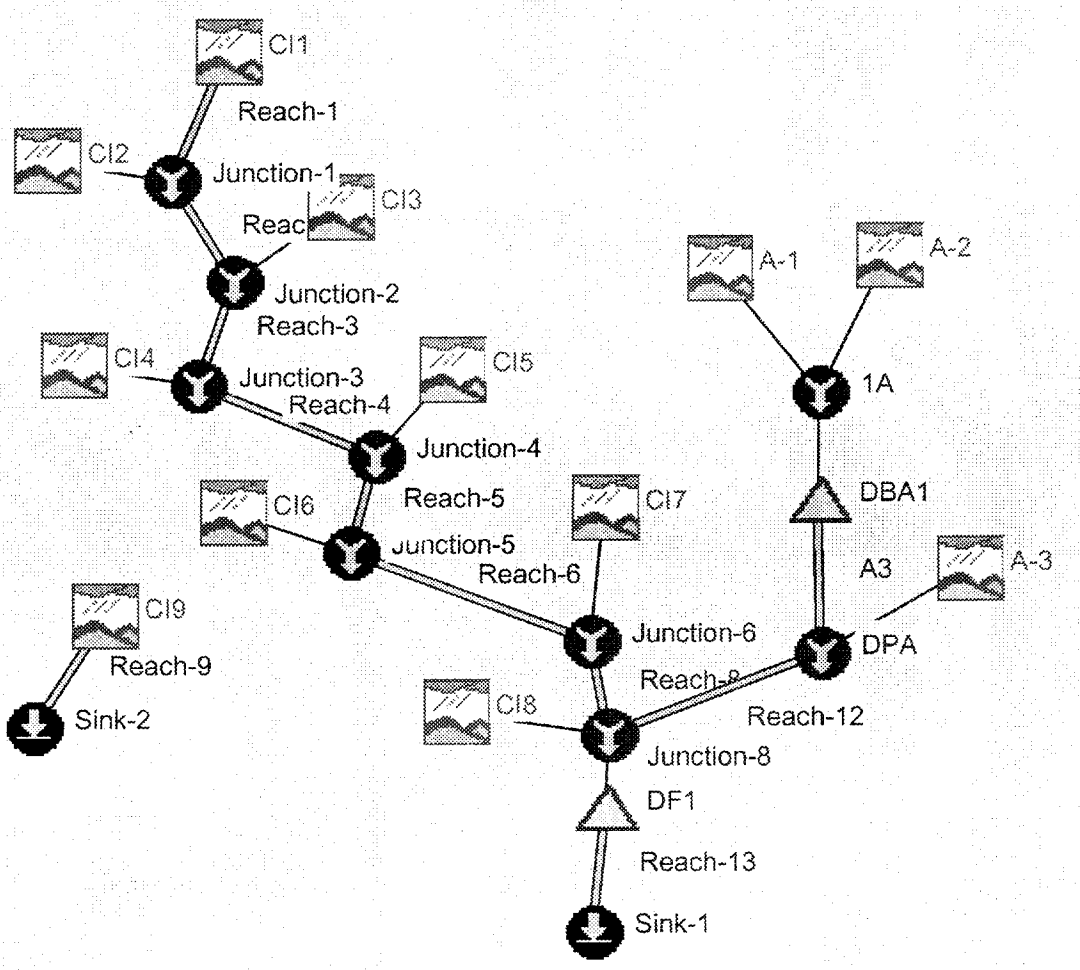
Computed Results

Peak Discharge : 13.368 (cfs) **Date/Time of Peak Discharge** : 01 Jan 00 0606

Total Discharge : 0.54 (in)

COTTONWOOD CREEK

CORDERA/BRIARGATE CROSSING
INTERIM 100-YEAR STORM EVENT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Cl2
Junction-1
Cl3
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Junction-2
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Cl4
Junction-3
Cl5
Reach-4
Junction-4
Cl6
Reach-5
Cl7
Junction-5
Reach-6
Cl9
Reach-9
Sink-2
Junction-6
Cl8
Reach-8
Reach-12
Junction-8
DF1
Reach-13
Sink-1
A-1
A-2
1A
DBA1
A3
A-3
DPA

HMS * Summary of Results

Project : Cottonwood 9-20-04 Run Name : Run 3

Start of Run : 01Jan00 0000 Basin Model : Cottonwood-Interim
End of Run : 02Jan00 0000 Met. Model : 100-yr Type IIa
Execution Time : 21Sep04 1000 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
CI1	41.630	01 Jan 00 0614	4.3679	0.076
Reach-1	41.536	01 Jan 00 0620	4.3641	0.076
CI2	77.792	01 Jan 00 0606	5.2481	0.050
Junction-1	97.333	01 Jan 00 0608	9.6122	0.126
Reach-2	96.890	01 Jan 00 0610	9.6119	0.126
CI3	39.029	01 Jan 00 0604	2.4152	0.023
Junction-2	130.84	01 Jan 00 0606	12.027	0.149
Reach-3	130.38	01 Jan 00 0606	12.027	0.149
CI4	19.769	01 Jan 00 0608	1.4602	0.019
Junction-3	150.06	01 Jan 00 0606	13.487	0.168
Reach-4	149.99	01 Jan 00 0608	13.487	0.168
CI5	28.569	01 Jan 00 0604	1.7851	0.017
Junction-4	176.40	01 Jan 00 0606	15.272	0.185
Reach-5	175.35	01 Jan 00 0608	15.271	0.185
CI6	63.981	01 Jan 00 0602	3.7536	0.025
Junction-5	227.23	01 Jan 00 0604	19.025	0.210
Reach-6	226.76	01 Jan 00 0606	19.021	0.210
CI7	80.238	01 Jan 00 0604	5.0041	0.037
Junction-6	303.38	01 Jan 00 0606	24.025	0.247
Reach-8	303.34	01 Jan 00 0606	24.026	0.247
A-1	96.218	01 Jan 00 0616	10.451	0.182
A-2	67.566	01 Jan 00 0612	6.3154	0.110
1A	161.24	01 Jan 00 0614	16.767	0.292
DBA1	160.17	01 Jan 00 0616	16.498	0.292
A3	159.59	01 Jan 00 0620	16.485	0.292
A-3	82.828	01 Jan 00 0612	7.5819	0.132
DPA	225.64	01 Jan 00 0618	24.067	0.423
Reach-12	225.46	01 Jan 00 0618	24.067	0.423
CI8	119.66	01 Jan 00 0602	7.0565	0.047
Junction-8	507.27	01 Jan 00 0608	55.149	0.718
DF1	113.89	01 Jan 00 0652	45.963	0.718
Reach-13	113.86	01 Jan 00 0652	45.959	0.718
Sink-1	113.86	01 Jan 00 0652	45.959	0.718
CI9	46.746	01 Jan 00 0606	3.1055	0.035
Reach-9	46.738	01 Jan 00 0606	3.1056	0.035
Sink-2	46.738	01 Jan 00 0606	3.1056	0.035

HMS * Summary of Results for DPA

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Inter:
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I:
Execution Time	: 21Sep04 1000	Control Specs	: Control

Computed Results

Peak Outflow : 225.64 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0618

Total Outflow : 1.07 (in)

HMS * Summary of Results for Junction-6

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Inter:
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I:
Execution Time	: 21Sep04 1000	Control Specs	: Control

Computed Results

Peak Outflow : 303.38 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0606

Total Outflow : 1.82 (in)

HMS * Summary of Results for DF1

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Inter:
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I:
Execution Time	: 21Sep04 1000	Control Specs	: Control

Computed Results

Peak Inflow	: 507.27 (cfs)	Date/Time of Peak Inflow	: 01 Jan 00 0608
Peak Outflow	: 113.89 (cfs)	Date/Time of Peak Outflow	: 01 Jan 00 0652
Total Inflow	: 1.44 (in)	Peak Storage	: 24.136(ac-ft)
Total Outflow	: 1.20 (in)	Peak Elevation	: 8.0314(ft)

HMS * Summary of Results for Sink-2

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Inter:
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I:
Execution Time	: 21Sep04 1000	Control Specs	: Control

Computed Results

Peak Discharge : 46.738 (cfs) Date/Time of Peak Discharge : 01 Jan 00 0606

Total Discharge : 1.66 (in)

COTTONWOOD CREEK

CORDERA/BRIARGATE CROSSING
DEVELOPED 5-YEAR STORM EVENT

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

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

Basin ID	Total Area (ac)	Total Area (sq. mi.)	Residential			Parks (ac)	Open Space (ac)	Commercial (ac)	Schools (ac)	Weighted CN	Percent Impervious
			1 acre lots	1/4 acre lots	1/8 acre lots						
CF1	30.73	0.048	0.0	30.7	0.0	0.0	0.0	0.0	0.0	75.0	38%
CF2	32.28	0.050	0.0	32.3	0.0	0.0	0.0	0.0	0.0	75.0	38%
CF3	14.57	0.023	0.0	14.6	0.0	0.0	0.0	0.0	0.0	75.0	38%
CF4	12.17	0.019	0.0	5.9	0.0	6.3	0.0	0.0	0.0	67.7	18%
CF5	11.13	0.017	0.0	11.1	0.0	0.0	0.0	0.0	0.0	75.0	38%
CF6	16.02	0.025	0.0	0.0	16.0	0.0	0.0	0.0	0.0	85.0	65%
CF7	23.97	0.037	0.0	0.0	24.0	0.0	0.0	0.0	0.0	85.0	65%
CF8	30.25	0.047	0.0	0.0	30.3	0.0	0.0	0.0	0.0	85.0	65%
CF9	22.65	0.035	0.0	0.0	9.4	0.0	0.0	13.3	0.0	89.1	77%
A1	38.40	0.060								61.0	
A3	96.00	0.150								76.0	
A4	55.10	0.086								79.0	
A5	71.30	0.111								77.7	
A6	23.68	0.037								79.8	
A7	32.00	0.050								78.2	
A9	40.77	0.064								72.1	
A10	5.50	0.009								61.0	

**Basin A is per the Wolf Ranch MDDP, prepared by Kiowa Engineering, 2004

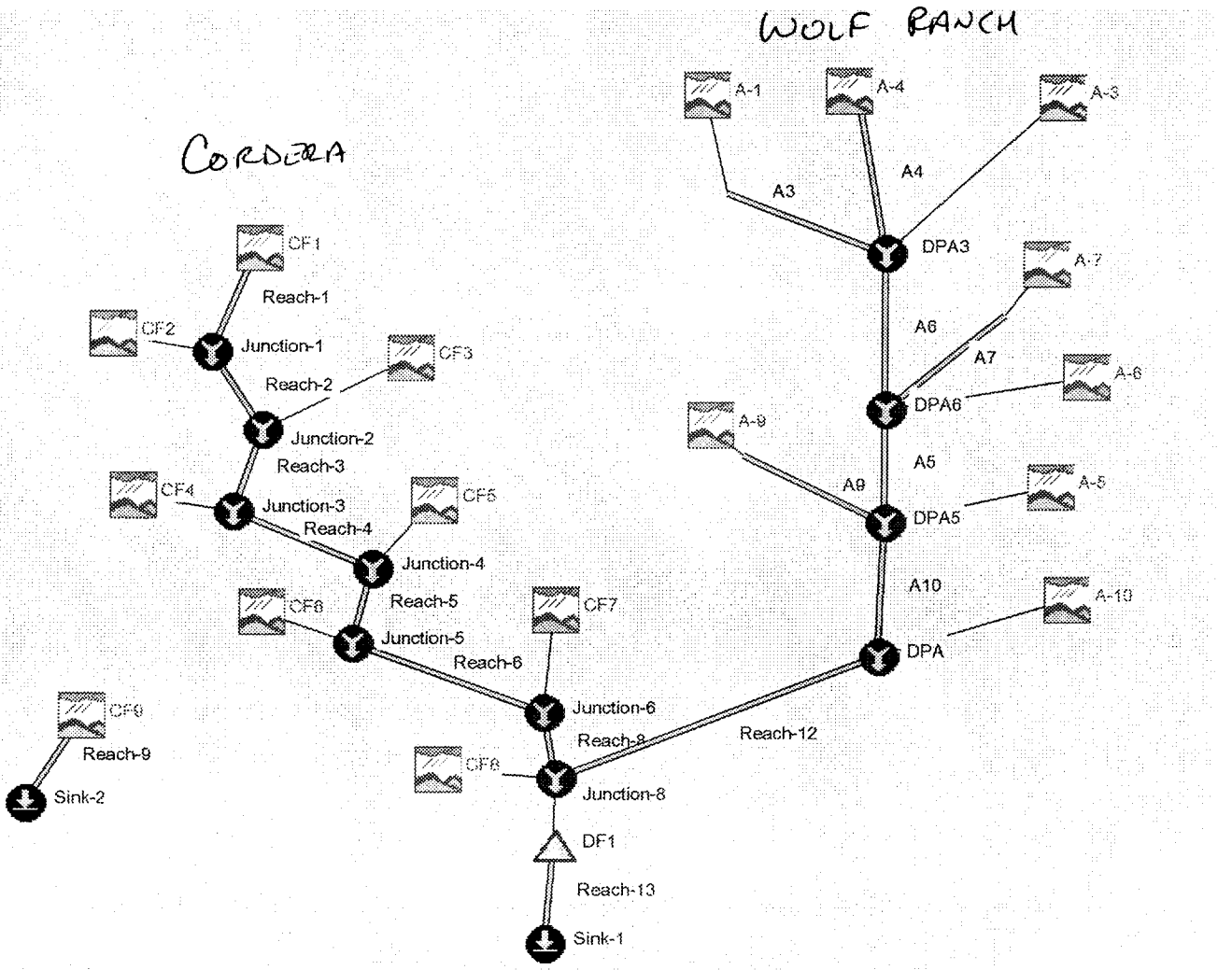
Land Use		*CN*	*% Imp.*
Residential	1 acre	68	20%
	1/4 Lots	75	38%
	1/8 Lots	85	65%
Parks		61	0%
Open Space		61	0%
Commercial		92	85%
Schools		80	52%

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

HEC-HMS Input parameters - Cottonwood Creek
Fully Developed 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)
CF1	50	2.0%	8.9	900	1.4%	2.2	6.8	1530	2.0%	12.0	2.1	17.9	10.7
CF2	100	2.0%	12.6	950	1.4%	2.2	7.2	275	4.7%	15.0	0.3	20.1	12.1
CF3	100	2.0%	12.6	400	1.3%	2.2	3.0	275	2.2%	13.0	0.4	16.0	9.6
CF4	200	2.0%	17.9	800	4.0%	3.2	4.2	0	0.0%	0.0	0	22.0	13.2
CF5	100	2.0%	12.6	500	1.4%	2.2	3.8	0	0.0%	0.0	0	16.4	9.9
CF6	50	3.0%	7.8	600	1.7%	2.5	4.0	300	3.0%	15.0	0.3	12.2	7.3
CF7	100	2.0%	12.6	500	3.6%	3.2	2.6	1000	2.0%	12.0	1.4	16.6	10.0
CF8	50	2.0%	8.9	500	3.3%	3.1	2.7	1000	3.0%	15.0	1.1	12.7	7.6
CF9	75	2.0%	11.0	665	1.5%	2.2	5.0	2085	3.0%	15.0	2.3	18.3	11.0
A1												29.2	17.5
A3												22.1	13.3
A4												21.0	12.6
A5												20.9	12.5
A6												21.0	12.6
A7												17.2	10.3
A9												26.3	15.8
A10												23.1	13.9

**Basin A is per the Wolf Ranch MDDP, prepared by Kiowa Engineering, 2004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A-1
A-4
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DPA6
A-9
A9
A5
A-5
DPA5
A10
A-10
DPA
CF1
Reach-1
CF2
Junction-1
CF3
Reach-2
Junction-2
Reach-3
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CF8
CF7
Junction-5
Reach-6
Junction-6
Reach-8
Reach-12
CF9
Reach-9
Sink-2
CF6
Junction-8
DF1
Reach-13
Sink-1

HMS * Summary of Results

Project : Cottonwood 9-20-04 Run Name : Run 6

Start of Run : 01Jan00 0000 Basin Model : Cottonwood-Developed
End of Run : 02Jan00 0000 Met. Model : 5-yr Type IIa
Execution Time : 21Sep04 1004 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
CF1	26.324	01 Jan 00 0606	1.8125	0.048
Reach-1	26.014	01 Jan 00 0608	1.8116	0.048
CF2	25.748	01 Jan 00 0606	1.8874	0.050
Junction-1	51.568	01 Jan 00 0606	3.6990	0.098
Reach-2	51.504	01 Jan 00 0608	3.6991	0.098
CF3	13.234	01 Jan 00 0604	0.86870	0.023
Junction-2	63.895	01 Jan 00 0606	4.5678	0.121
Reach-3	63.469	01 Jan 00 0606	4.5680	0.121
CF4	4.6481	01 Jan 00 0608	0.42615	0.019
Junction-3	68.075	01 Jan 00 0608	4.9942	0.140
Reach-4	68.013	01 Jan 00 0608	4.9942	0.140
CF5	9.6183	01 Jan 00 0604	0.64204	0.017
Junction-4	76.827	01 Jan 00 0608	5.6362	0.157
Reach-5	76.649	01 Jan 00 0608	5.6357	0.157
CF6	29.213	01 Jan 00 0602	1.6761	0.025
Junction-5	98.735	01 Jan 00 0606	7.3117	0.182
Reach-6	97.452	01 Jan 00 0608	7.3098	0.182
CF7	39.697	01 Jan 00 0604	2.4794	0.037
Junction-6	135.65	01 Jan 00 0606	9.7892	0.219
Reach-8	135.28	01 Jan 00 0606	9.7895	0.219
A-9	21.924	01 Jan 00 0610	1.9812	0.064
A9	21.746	01 Jan 00 0612	1.9812	0.064
A-1	5.1944	01 Jan 00 0616	0.80037	0.060
A3	5.1647	01 Jan 00 0632	0.79657	0.060
A-4	58.212	01 Jan 00 0606	4.1458	0.086
A4	57.798	01 Jan 00 0606	4.1459	0.086
A-3	79.588	01 Jan 00 0608	6.0292	0.150
DPA3	137.20	01 Jan 00 0608	10.972	0.296
A6	135.78	01 Jan 00 0610	10.963	0.296
A-7	34.931	01 Jan 00 0604	2.2982	0.050
A7	34.805	01 Jan 00 0606	2.2980	0.050
A-6	26.417	01 Jan 00 0606	1.8657	0.037
DPA6	190.02	01 Jan 00 0610	15.127	0.383
A5	187.46	01 Jan 00 0614	15.104	0.383
A-5	68.890	01 Jan 00 0606	4.9680	0.111
DPA5	259.10	01 Jan 00 0614	22.053	0.558
A10	259.16	01 Jan 00 0614	22.045	0.558
A-10	0.72857	01 Jan 00 0612	0.10327	0.009
DPA	259.86	01 Jan 00 0614	22.148	0.567
Reach-12	259.50	01 Jan 00 0614	22.148	0.567
CF8	54.411	01 Jan 00 0602	3.1508	0.047

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Junction-8	385.45	01 Jan 00 0610	35.089	0.833
DF1	48.105	01 Jan 00 0708	26.553	0.833
Reach-13	48.104	01 Jan 00 0708	26.550	0.833
Sink-1	48.104	01 Jan 00 0708	26.550	0.833
CF9	45.149	01 Jan 00 0604	2.8888	0.035
Reach-9	45.114	01 Jan 00 0604	2.8890	0.035
Sink-2	45.114	01 Jan 00 0604	2.8890	0.035

HMS * Summary of Results for DPA

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I
Execution Time	: 21Sep04 1004	Control Specs	: Control

Computed Results

Peak Outflow : 259.86 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0614

Total Outflow : 0.73 (in)

HMS * Summary of Results for Junction-6

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I
Execution Time	: 21Sep04 1004	Control Specs	: Control

Computed Results

Peak Outflow : 135.65 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0606

Total Outflow : 0.84 (in)

HMS * Summary of Results for Junction-8

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I
Execution Time	: 21Sep04 1004	Control Specs	: Control

Computed Results

Peak Outflow : 385.45 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0610

Total Outflow : 0.79 (in)

HMS * Summary of Results for DF1

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I
Execution Time	: 21Sep04 1004	Control Specs	: Control

Computed Results

Peak Inflow	: 385.45 (cfs)	Date/Time of Peak Inflow	: 01 Jan 00 0610
Peak Outflow	: 48.105 (cfs)	Date/Time of Peak Outflow	: 01 Jan 00 0708
Total Inflow	: 0.79 (in)	Peak Storage	: 16.873(ac-ft)
Total Outflow	: 0.60 (in)	Peak Elevation	: 7.0147(ft)

HMS * Summary of Results for Sink-2

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 5-yr Type I
Execution Time	: 21Sep04 1004	Control Specs	: Control

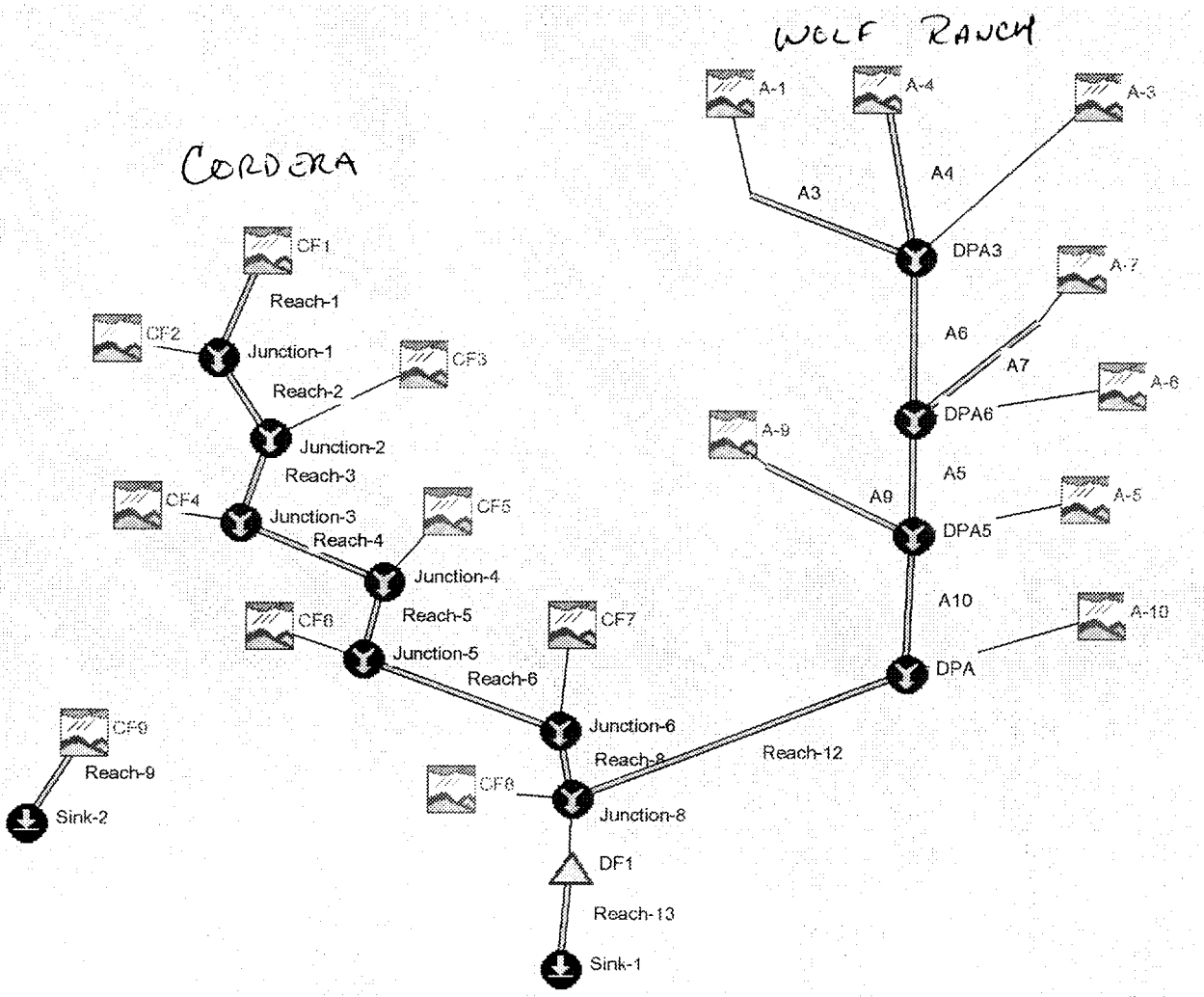
Computed Results

Peak Discharge : 45.114 (cfs) **Date/Time of Peak Discharge** : 01 Jan 00 0604

Total Discharge : 1.55 (in)

COTTONWOOD CREEK

CORDERA/BRIARGATE CROSSING
DEVELOPED 100-YEAR STORM EVENT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CORDERA
A-1
A-4
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A3
A4
DPA3
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A6
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A-6
DPA6
A-9
A5
A9
A-5
DPA5
A10
A-10
DPA
CF1
Reach-1
CF2
Junction-1
CF3
Reach-2
Junction-2
Reach-3
CF4
Junction-3
CF5
Reach-4
Junction-4
CF6
Reach-5
CF7
Junction-5
Reach-6
Junction-6
CF9
Reach-9
Sink-2
Reach-8
Reach-12
CF8
Junction-8
DF1
Reach-13
Sink-1

HMS * Summary of Results

Project : Cottonwood 9-20-04 Run Name : Run 5

Start of Run : 01Jan00 0000 Basin Model : Cottonwood-Developed
End of Run : 02Jan00 0000 Met. Model : 100-yr Type IIa
Execution Time : 21Sep04 1005 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
CF1	78.309	01 Jan 00 0604	5.0395	0.048
Reach-1	77.980	01 Jan 00 0606	5.0385	0.048
CF2	77.792	01 Jan 00 0606	5.2481	0.050
Junction-1	155.77	01 Jan 00 0606	10.287	0.098
Reach-2	155.31	01 Jan 00 0606	10.287	0.098
CF3	39.029	01 Jan 00 0604	2.4152	0.023
Junction-2	192.63	01 Jan 00 0606	12.702	0.121
Reach-3	192.43	01 Jan 00 0606	12.703	0.121
CF4	19.769	01 Jan 00 0608	1.4602	0.019
Junction-3	212.11	01 Jan 00 0606	14.163	0.140
Reach-4	211.36	01 Jan 00 0606	14.164	0.140
CF5	28.569	01 Jan 00 0604	1.7851	0.017
Junction-4	238.93	01 Jan 00 0606	15.949	0.157
Reach-5	237.67	01 Jan 00 0606	15.949	0.157
CF6	63.981	01 Jan 00 0602	3.7536	0.025
Junction-5	290.93	01 Jan 00 0604	19.702	0.182
Reach-6	290.07	01 Jan 00 0606	19.699	0.182
CF7	88.687	01 Jan 00 0602	5.5531	0.037
Junction-6	374.20	01 Jan 00 0606	25.252	0.219
Reach-8	374.19	01 Jan 00 0606	25.253	0.219
A-9	75.960	01 Jan 00 0608	5.9412	0.064
A9	75.777	01 Jan 00 0610	5.9412	0.064
A-1	36.754	01 Jan 00 0612	3.4509	0.060
A3	36.518	01 Jan 00 0622	3.4457	0.060
A-4	155.39	01 Jan 00 0606	10.506	0.086
A4	155.15	01 Jan 00 0606	10.507	0.086
A-3	234.36	01 Jan 00 0606	16.364	0.150
DPA3	394.57	01 Jan 00 0606	30.317	0.296
A6	391.36	01 Jan 00 0610	30.301	0.296
A-7	94.132	01 Jan 00 0604	5.9280	0.050
A7	93.500	01 Jan 00 0604	5.9278	0.050
A-6	68.854	01 Jan 00 0606	4.6468	0.037
DPA6	541.68	01 Jan 00 0608	40.876	0.383
A5	536.82	01 Jan 00 0612	40.836	0.383
A-5	191.34	01 Jan 00 0606	12.961	0.111
DPA5	774.97	01 Jan 00 0610	59.738	0.558
A10	768.87	01 Jan 00 0612	59.722	0.558
A-10	5.6781	01 Jan 00 0608	0.46805	0.009
DPA	774.18	01 Jan 00 0612	60.190	0.567
Reach-12	774.14	01 Jan 00 0612	60.191	0.567
CF8	119.66	01 Jan 00 0602	7.0565	0.047

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Junction-8	1183.5	01 Jan 00 0608	92.500	0.833
DF1	362.67	01 Jan 00 0632	83.775	0.833
Reach-13	362.56	01 Jan 00 0632	83.773	0.833
Sink-1	362.56	01 Jan 00 0632	83.773	0.833
CF9	92.636	01 Jan 00 0604	5.9836	0.035
Reach-9	92.630	01 Jan 00 0604	5.9838	0.035
Sink-2	92.630	01 Jan 00 0604	5.9838	0.035

HMS * Summary of Results for DPA

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I
Execution Time	: 21Sep04 1005	Control Specs	: Control

Computed Results

Peak Outflow : 774.18 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0612

Total Outflow : 1.99 (in)

HMS * Summary of Results for Junction-6

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I
Execution Time	: 21Sep04 1005	Control Specs	: Control

Computed Results

Peak Outflow : 374.20 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0606

Total Outflow : 2.16 (in)

HMS * Summary of Results for Junction-8

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I
Execution Time	: 21Sep04 1005	Control Specs	: Control

Computed Results

Peak Outflow : 1183.5 (cfs) Date/Time of Peak Outflow : 01 Jan 00 0608

Total Outflow : 2.08 (in)

HMS * Summary of Results for DF1

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I
Execution Time	: 21Sep04 1005	Control Specs	: Control

Computed Results

Peak Inflow	: 1183.5 (cfs)	Date/Time of Peak Inflow	: 01 Jan 00 0608
Peak Outflow	: 362.67 (cfs)	Date/Time of Peak Outflow	: 01 Jan 00 0632
Total Inflow	: 2.08 (in)	Peak Storage	: 39.280(ac-ft)
Total Outflow	: 1.89 (in)	Peak Elevation	: 10.069(ft)

HMS * Summary of Results for Sink-2

Project : Cottonwood 9-20-04 Run Name : Run

Start of Run	: 01Jan00 0000	Basin Model	: Cottonwood-Develop
End of Run	: 02Jan00 0000	Met. Model	: 100-yr Type I
Execution Time	: 21Sep04 1005	Control Specs	: Control

Computed Results

Peak Discharge : 92.630 (cfs) Date/Time of Peak Discharge : 01 Jan 00 0604

Total Discharge : 3.21 (in)

WATER QUALITY

WATER QUALITY CAPTURE VOLUME CALCULATIONS

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: RGG
Company: Matrix Design Group, Inc.
Date: January 1, 2004
Project: Cordera Filing No. 1
Location: Cottonwood Creek - DF1 (Fully Developed)

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = 52.00 % i = 0.52
B) Contributing Watershed Area (Area)	Area = 529.00 acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))	WQCV = 0.21 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = 11.203 acre-feet
2. Outlet Works	
A) Outlet Type (Check One)	x Orifice Plate ___ Perforated Riser Pipe ___ Other:
B) Depth at Outlet Above Lowest Perforation (H)	H = 2.00 feet
C) Required Maximum Outlet Area per Row, (A_o)	A_o = 23.82 square inches
D) Perforation Dimensions **(enter one only)**: i) Circular Perforation Diameter **OR** ii) 2" Height Rectangular Perforation Width	D = 2.0000 inches, **OR** W = ___ inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc = 7 number
F) Actual Design Outlet Area per Row (A_o)	A_o = 21.99 square inches
G) Number of Rows (nr)	nr = 6 number
H) Total Outlet Area (A_{ot})	A_{ot} = 131.95 square inches
3. Trash Rack	
A) Needed Open Area A_t = 0.5 * (Figure 7 Value) * A_{ot}	A_t = 3.964 square inches
B) Type of Outlet Opening (Check One)	X ≤ 2" Diameter **Round** ___ 2" High **Rectangular** ___ Other:
C) For 2", or Smaller, **Round Opening** (Ref.: Figure 6a):	
i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	W_{conc} = 147 inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} = 48 inches

Interim Water Quality Capture Volume

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = 15.00 % i = 0.15
B) Contributing Watershed Area (Area)	Area = 428.00 acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))	WQCV = 0.09 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = 3.993 acre-feet

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: RGG
Company: Matrix Design Group, Inc.
Date: January 1, 2004
Project: Cordera Filing No. 1
Location: Pine Creek - DF2 (Fully Developed)

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio (i = I_a / 100)	I_a = 40.00 % i = 0.40
B) Contributing Watershed Area (Area)	Area = 276.00 acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))	WQCV = 0.18 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = 4.964 acre-feet
2. Outlet Works	
A) Outlet Type (Check One)	x Orifice Plate _____ Perforated Riser Pipe _____ Other: _____
B) Depth at Outlet Above Lowest Perforation (H)	H = 2.00 feet
C) Required Maximum Outlet Area per Row, (A_o)	A_o = 10.55 square inches
D) Perforation Dimensions(enter one only): i) Circular Perforation DiameterOR ii) 2" Height Rectangular Perforation Width	 D = 2.0000 inches, OR W = _____ inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc = 3 number
F) Actual Design Outlet Area per Row (A_o)	A_o = 9.42 square inches
G) Number of Rows (nr)	nr = 6 number
H) Total Outlet Area (A_{ot})	A_{ot} = 56.55 square inches
3. Trash Rack	
A) Needed Open Area A_t = 0.5 * (Figure 7 Value) * A_{ot}	A_t = 1,699 square inches
B) Type of Outlet Opening (Check One)	X ≤ 2" Diameter Round _____ 2" High Rectangular _____ Other: _____
C) For 2", or Smaller, Round Opening (Ref.: Figure 6a): i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	 W_{conc} = 63 inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} = 48 inches

Interim Water Quality Capture Volume

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio (i = I_a / 100)	I_a = 14.00 % i = 0.14
B) Contributing Watershed Area (Area)	Area = 372.00 acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))	WQCV = 0.09 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = 3.287 acre-feet

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer:	RGG
Company:	Matrix Design Group, Inc.
Date:	January 1, 2004
Project:	Cordera Filing No. 1
Location:	Pine Creek - DF4 (Fully Developed)

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio (i = I_a / 100)	I_a = 52.20 % i = 0.52
B) Contributing Watershed Area (Area)	Area = 111.00 acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))	WQCV = 0.21 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = 2.357 acre-feet
2. Outlet Works	
A) Outlet Type (Check One)	x Orifice Plate _____ Perforated Riser Pipe _____ Other: _____
B) Depth at Outlet Above Lowest Perforation (H)	H = 1.00 feet
C) Required Maximum Outlet Area per Row, (A_o)	A_o = 14.77 square inches
D) Perforation Dimensions **(enter one only)**: i) Circular Perforation Diameter **OR** ii) 2" Height Rectangular Perforation Width	 D = 2.0000 inches, **OR** W = _____ inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc = 4 number
F) Actual Design Outlet Area per Row (A_o)	A_o = 12.57 square inches
G) Number of Rows (nr)	nr = 3 number
H) Total Outlet Area (A_{ot})	A_{ot} = 37.70 square inches
3. Trash Rack	
A) Needed Open Area: A_t = 0.5 * (Figure 7 Value) * A_{ot}	A_t = 1.133 square inches
B) Type of Outlet Opening (Check One)	X ≤ 2" Diameter **Round** _____ 2" High **Rectangular** _____ Other: _____
C) For 2", or Smaller, **Round Opening** (Ref.: Figure 6a):	
i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	W_{conc} = 60 inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} = 36 inches

APPENDIX C

STANDARD DESIGN CHARTS AND TABLES

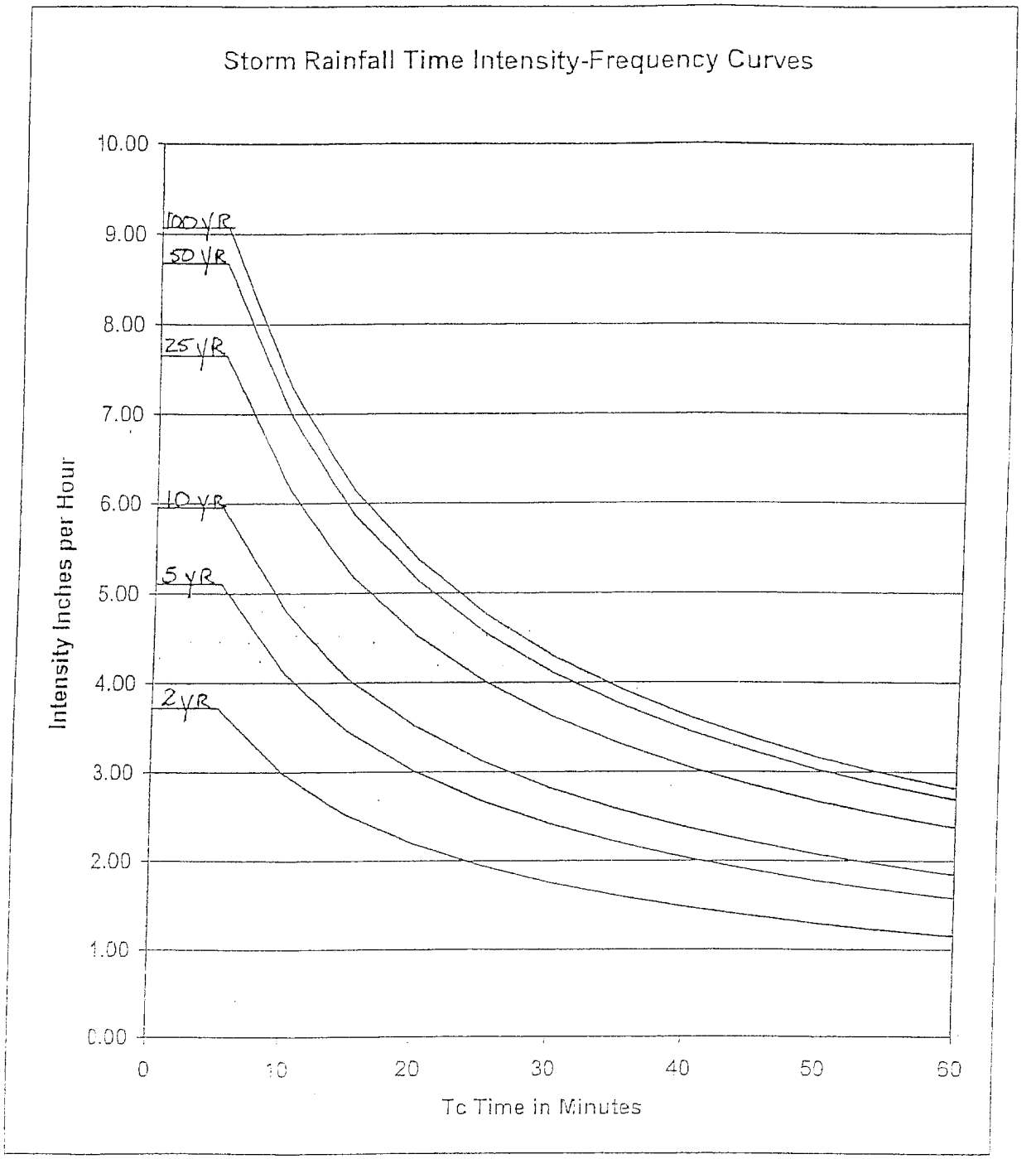
TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

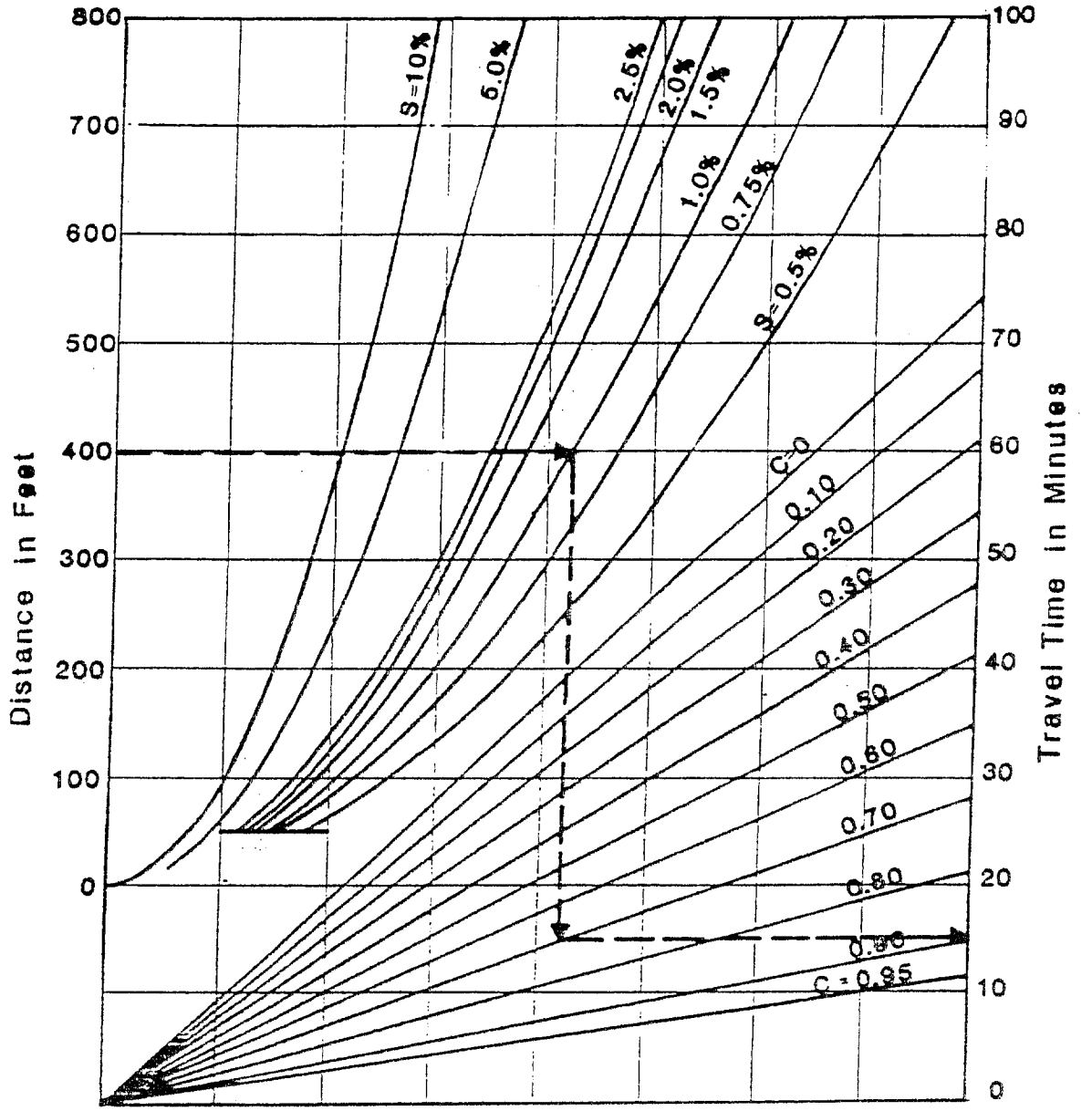
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10 A&B*	10 C&D*	100 A&B*	100 C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40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

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Overland Flow Curves

Date: OCT. 1967

Figure: 5-2

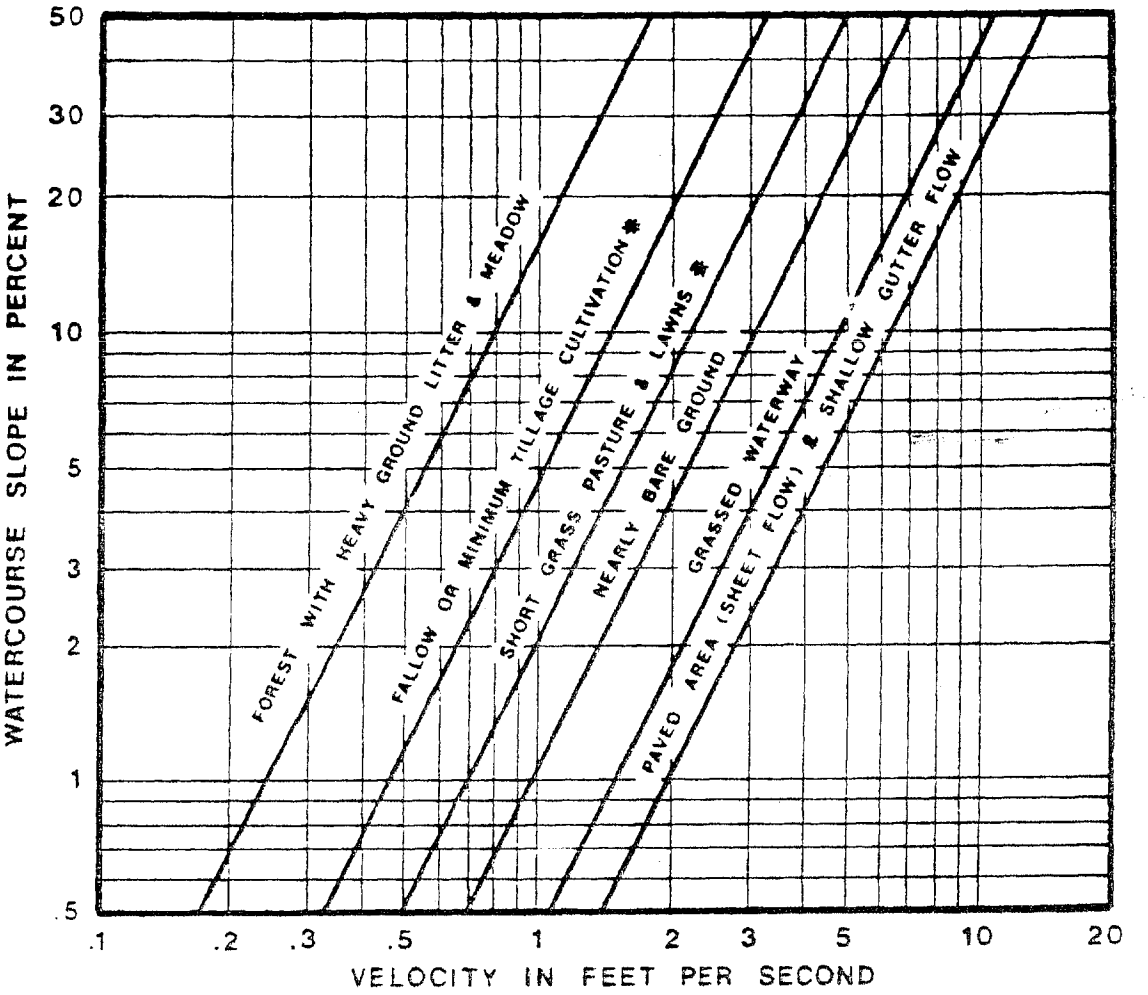
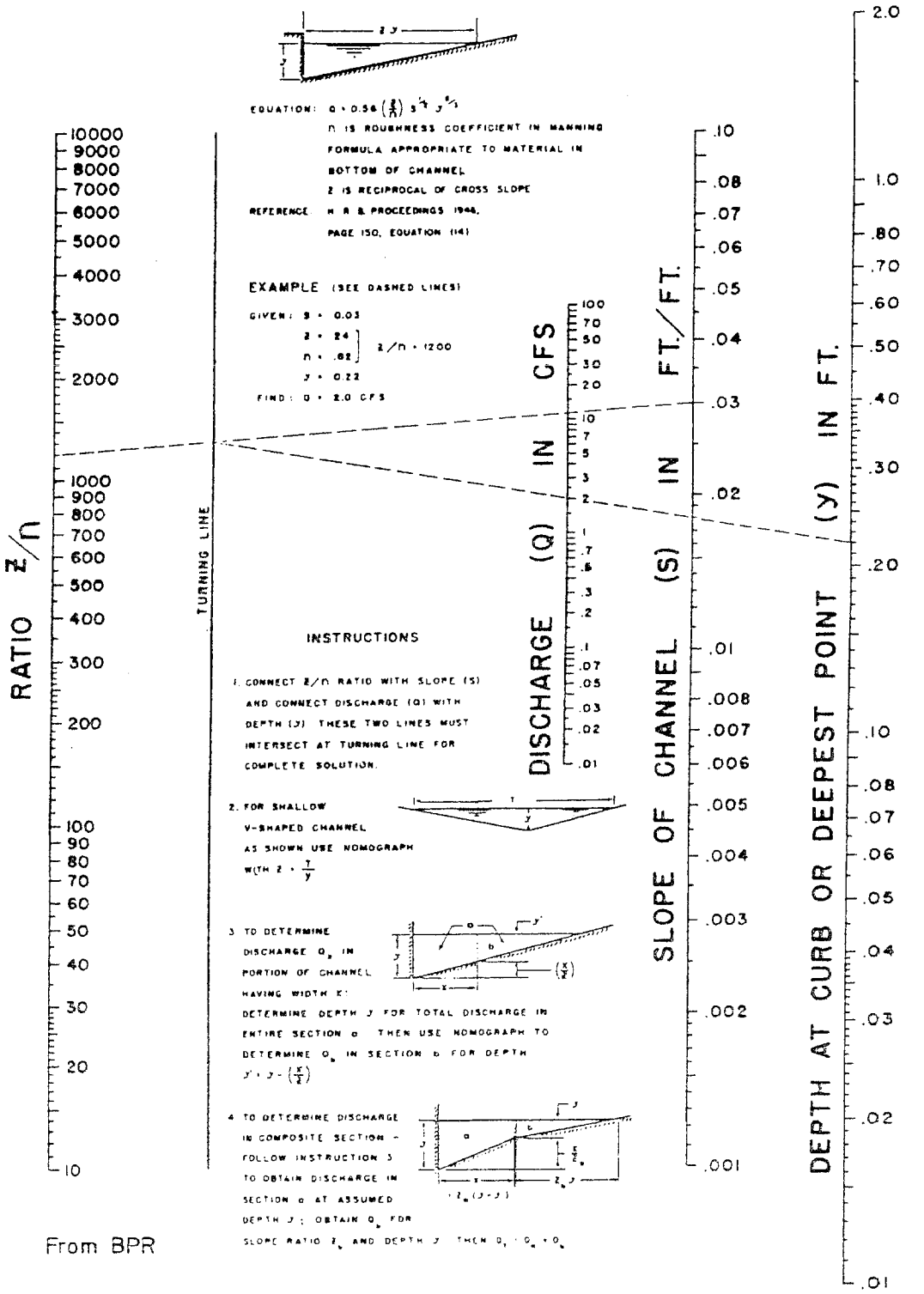


FIGURE RO-1

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



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

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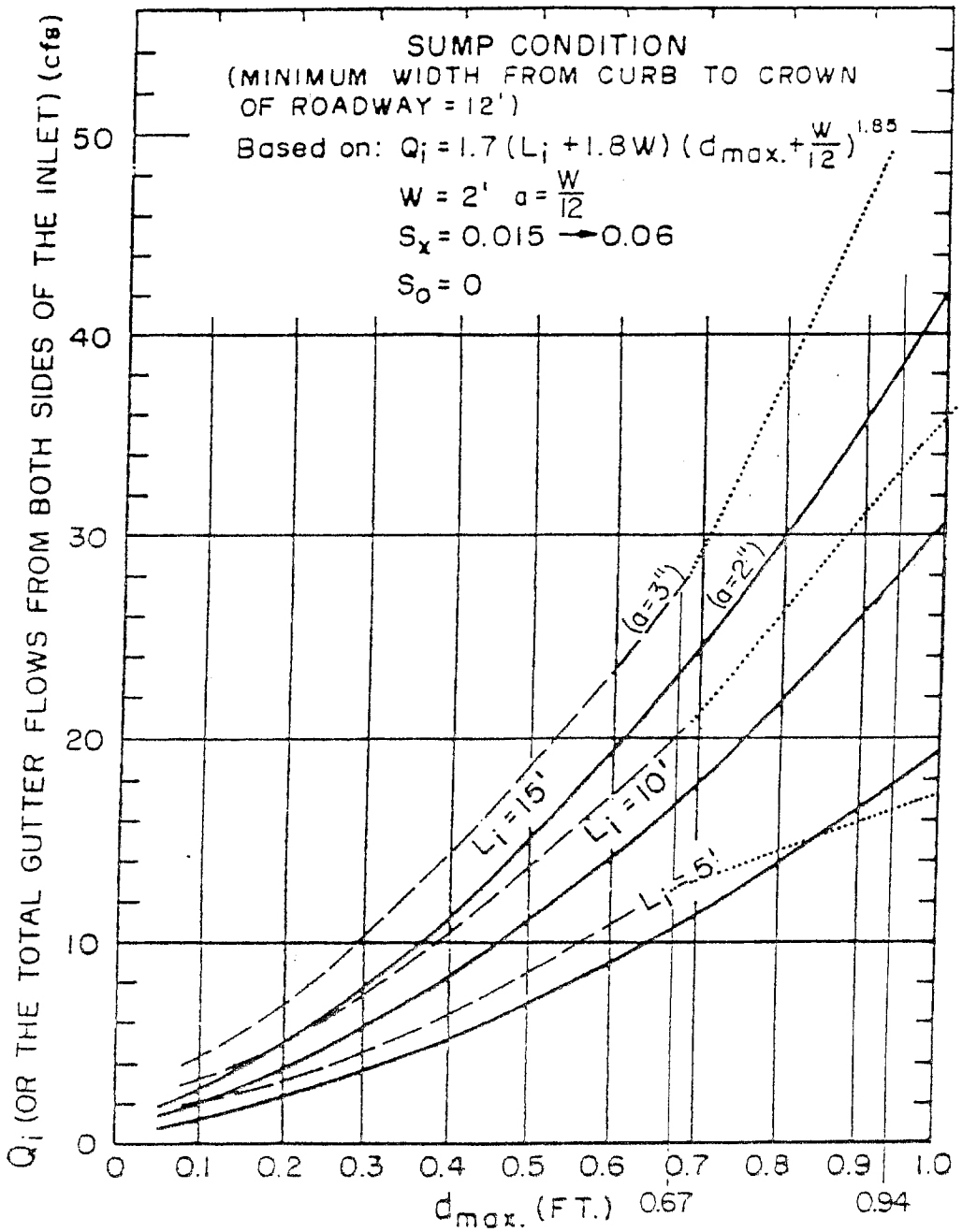
NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

Date
OCT. 1967

Figure
7 - 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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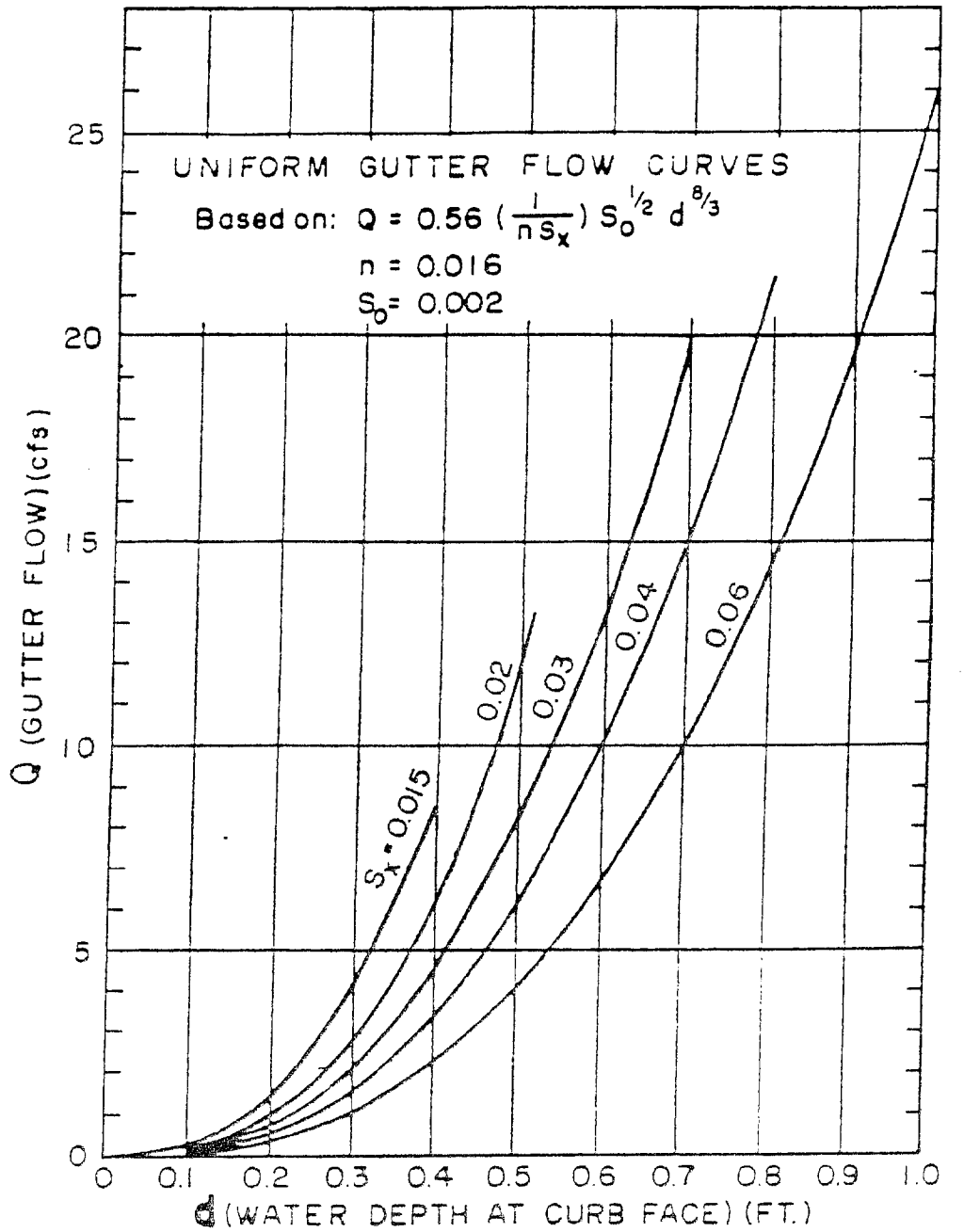
Figure
7-11

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

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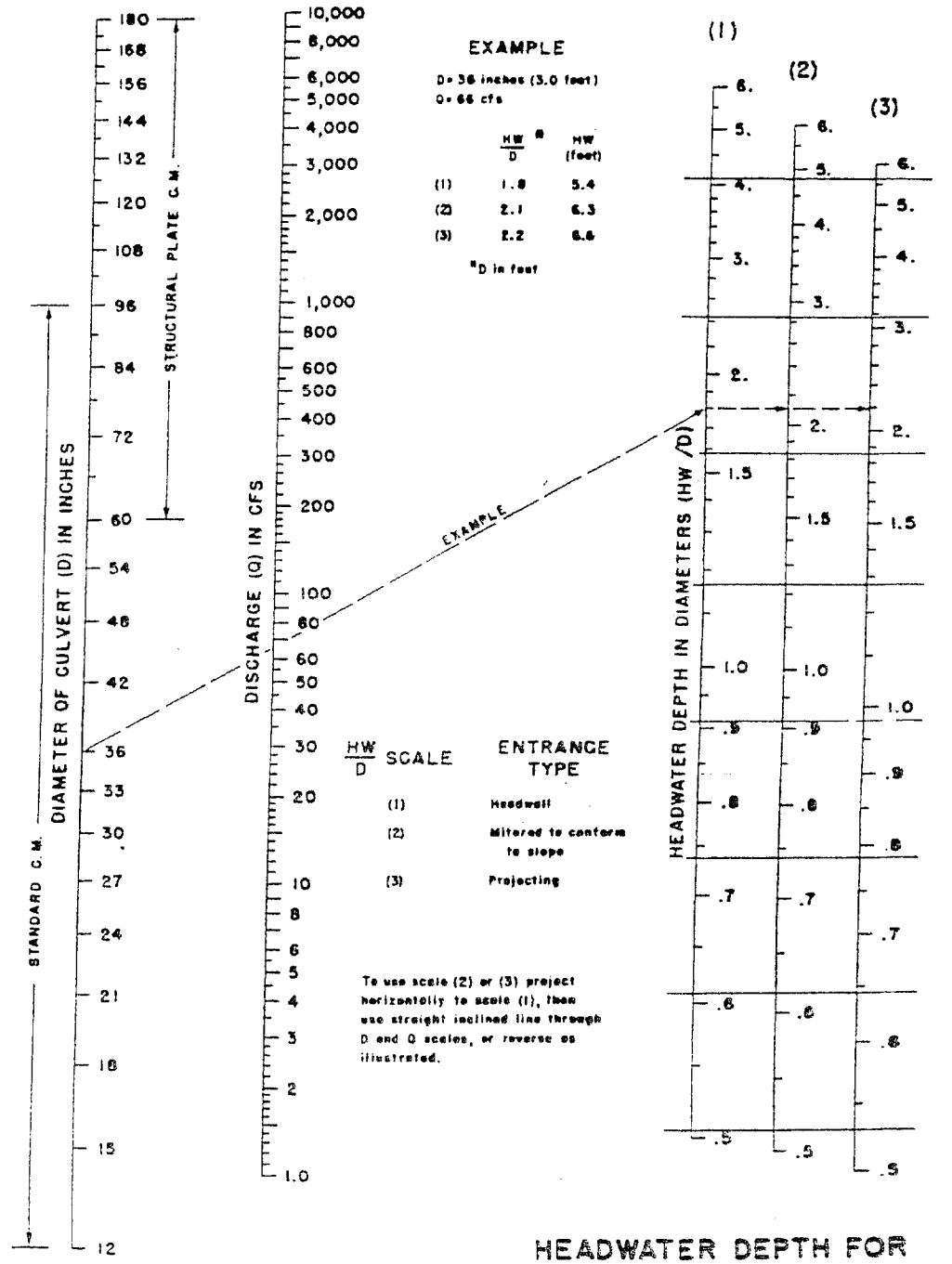
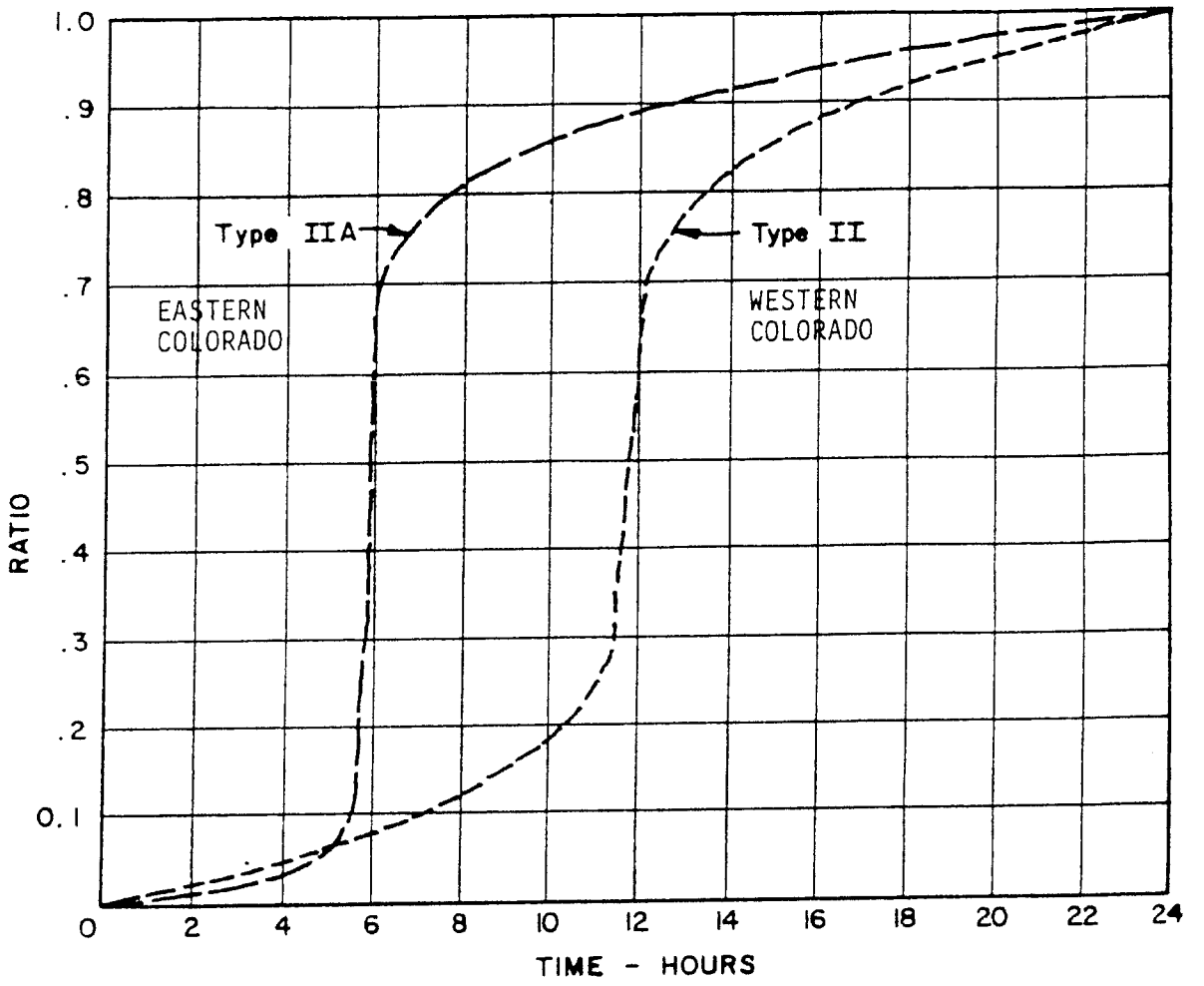
Figure
7 - 12



BUREAU OF PUBLIC ROADS JAN. 1963

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



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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