

**MASTER DEVELOPMENT DRAINAGE REPORT
For
Cumbre Vista Subdivision**

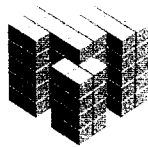
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**PRELIMINARY/FINAL DRAINAGE REPORT
For
Cumbre Vista Filing No. 1**

Prepared for:
**City of Colorado Springs
Subdivision Review Team**
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Colorado Springs, CO 80903

On Behalf of:
Infinity Holding Company, LLC

Prepared by:



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July 2005

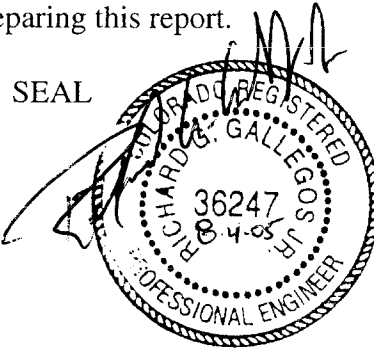
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Engineer's Statement:

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

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.

Infinity Holding Company LLC
Business Name

By: Charlie P. Williams
Mr. ~~Paul Howard~~ Charlie Williams

Title: _____
Address: 1465 North Union Boulevard
Colorado Springs, CO 80909

City of Colorado Springs:

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

Tom Matos
City Engineer

Aug 17, 2005
Date

Conditions:

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I. INTRODUCTION

A. Background

Cumbre Vista subdivision is a proposed single-family residential development located within El Paso County. The overall project will encompass approximately 123 acres with 455 lots and will include an annexation into the City of Colorado Springs.

The site will be developed in four phases, each corresponding to one of four filings. This report will evaluate the existing and proposed drainage patterns at the site and will serve as the Preliminary/Final Drainage Report for Filing 1. Cumbre Vista Subdivision Filing No. 1 is 44.559 acres in size and will comprise the western portion of the overall Cumbre Vista Development. This study will also provide guidance on the development of the three future filings and serve as the Master Development Drainage Plan for future work.

The site is located southwest of the proposed intersection of Tutt Boulevard and Cowpoke Road. See Vicinity Map, Appendix. Tutt Boulevard will be extended from Woodman Road to Cowpoke Road as part of a separate project to help support the development at Cumbre Vista.

B. Project Location

The site is located in El Paso County and will be annexed into the City of Colorado Springs. The site is located at south of Cowpoke Road and east of the proposed extension of Tutt Boulevard. See Vicinity Map, Appendix A. A more detailed location of the site is as follows.

1. General Location. Section 6, Township 13 South, Range 65 West of the 6th Principal Meridian in Colorado Springs, Colorado.
2. Surrounding Streets. Surrounding street locations are as follows.

North: Cowpoke Road is located adjacent to the site to the north. Cowpoke has an east-west alignment and is currently a two lane roadway within a 60 foot right of way.

East: Black Forest Road is located approximately 1/3 mile to the east of the site in a north-south alignment. Cowpoke Road will provide access to the site from Black Forest Road

West: Powers Boulevard is located approximately ¼ mile to the west. Tutt Boulevard will be constructed adjacent to the site and provide additional access from Woodman Road. Tutt Boulevard from Woodman Road to Cowpoke Road will be constructed concurrently with the development.

South: Woodman Road is located approximately 2000 feet due south of the site.

3. Drainageway. The majority of site is located within the Cottonwood Drainage Basin. Cottonwood Creek is located approximately 200 feet northwest of the project. Small tributary drainage fingers currently drain the property and outfall to Cottonwood Creek.

The same general historic drainage patterns will be maintained upon development and will be conveyed to Cottonwood Creek via a storm sewer system.

A small portion of the site has historically drained to the east into the Sand Creek Drainage Basin. A similar drainage basin line will be maintained along the eastern limits of the development.

4. Surrounding Developments. Surrounding land uses around the proposed single-family development are as follows.

North: Vacant unplatted land. This area is anticipated to become part of the future Wolf Ranch development located to the north. Wolf Ranch is comprised primarily of single-family parcels with open space and areas of multi family scattered across the site.

East: Large single family lots with existing homes, and vacant land zoned in the county zoned as RR3 single family parcels.

West: Vacant unplatted land.

South: Vacant and developed large single-family parcels. Some commercial areas do exist south of the single family parcels along Woodman Road.

C. **Property Description**

1. Drainage Area/Drainageways. The majority of the site is located south of Cottonwood Creek. Per the Drainage Basin Planning Study (DBPS) completed for the area, Cottonwood Creek will remain in its natural state with development and other improvements protected from the channel by implementing a prudent line setback. This set back has been based upon calculations and mapping provided within the DBPS. The channel will convey 2,332 cfs of flow during the major storm event when upstream areas are fully developed with regional detention facilities in place. No drainageway improvements are proposed as part of this project. The storm sewer outfall point to the creek will be fortified to prevent undesired erosion of the channel banks. The improvements to adjacent Tutt Boulevard will be stopped short of the channel. A future extension of Tutt Boulevard to the north will require a bridge to span Cottonwood Creek with some channel improvements to protect the structure. The bridge and associated improvements are not part of this project.

A portion of the eastern most limits of the property currently sheet flows to the east and is located within the Sand Creek Drainage Basin. The developed site will reduce the tributary area draining to the east slightly and will maintain the sheet flow patterns from the back half of the lots along the eastern property line. Runoff will continue to follow existing drainage patterns after exiting the development.

2. Ground Cover. The area is covered with native grasses with some trees and bushes. Existing single-family residential developments at the site will be replaced with the proposed subdivision. Within Cottonwood Creek, the area is vegetated with grasses and trees. The channel thalweg is appears to be incised into bedrock.

3. General Topography. General topography of the site declines to the northwest at slopes ranging from 2% to 12%.
4. General Soil Conditions. The *Soil Survey 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 the Tutt Boulevard. See Soils Map, Appendix A. Two different soil types can be found in and around the study reach per Map 9 of the Soil Survey:

Soil ID No.	Soil	Hydrologic Classification	Permeability	Erosion Hazard
8	Blakeland loamy sand (1%-9% slopes)	A	Rapid	Moderate
85	Stapleton Bernal sandy loams (3%-20% slopes)	B (Stapleton Part) D (Bernal Part)	Moderately Rapid	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.

Stapleton Bernal sandy loams dominate the soil types within the study reach. For the purposes of the Final Drainage Report, it has been assumed that hydrologic group "C" characteristics exist in the upstream area.

5. Irrigation Facilities. No existing irrigation facilities can be found on or around the site that would impact drainage patterns.
6. Proposed Land Use. The Master Plan area will be platted in four phases as four separate filings. The plats will include the single-family lots, open space corridors, a park area, and the required right of way for roadway and utility improvements.
7. Existing Utilities. Overhead electric lines and telecommunication lines exist within an easement crossing the property. These utilities will be removed and relocated within the proposed roadways of the subdivision when development will impact the facilities. No water or sanitary sewer mains exist in the area. The existing single family residences are serviced by well and septic systems.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

Cumbre Vista Filing 1 lies within the Cottonwood Creek Drainage Basin per the *Cottonwood Creek Drainage Basin Planning Study* (DBPS) prepared by Ayres and Associates. This DBPS has been adopted as the guiding document by the City of Colorado Springs to plan drainage infrastructure improvements. The upstream basin is largely undeveloped.

The DBPS has identified that the recommended improvements to the main channel shall maintain the channel in its natural state and utilize a prudent line setback for development. The channel is relatively stable and the thalweg appears to be incised into bedrock. The channel sides have native grasses, bushes and some trees that help to stabilize the banks and slow down flow velocities.

A small area of the overall Cumbre Vista development does lie within the Sand Creek Drainage Basin along the eastern limits of the Master Plan area. This area will be reduced in size slightly and continue to follow historic drainage patterns. The exact area and associated drainage fees will be addressed for this area when it is platted in the future within a final drainage report for the filing.

B. Floodplain Statement

Review of the *Flood Insurance Rate Map Panel 529 (08041CO529 F)*, effective date March 17, 1997, published by the Federal Emergency Management Agency (FEMA), reveals that Cumbre Vista Subdivision Filing No. 1 is not located within a regulatory 100-year floodplain or floodway. See Floodplain Map, Appendix A.

C. Sub-Basin Description

The upstream tributary area has been previously developed as large single family lots with some agricultural uses. Localized tributaries in the areas have remained as historic and exhibit impacts of erosion. The localized tributaries will be filled in to accommodate the overlot grading plan for the new subdivision. Runoff that has historically drained to the tributaries will be replaced with a storm sewer system, which will convey flows to Cottonwood Creek. The infrastructure within the roadways will be sized to accommodate the full build out of the area based upon current planning documents. An interim plan will also be developed to adequately drain the historic tributary areas flowing to the proposed roadway.

III. DRAINAGE DESIGN CRITERIA

A. Regulations

This report has been prepared in accordance to the criteria set forth in the *City of Colorado Springs Drainage Criteria Manual*, dated November 1991 and 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, have also been used to supplement the City Criteria Manual. The analysis and proposed improvements have also considered the recommendations as provided within the Cottonwood Creek DBPS. No specific information was provided in the DBPS for the small area located within the Sand Creek. Runoff rates from this area will remain similar, or slightly lower than the historic rates flowing to the east. Runoff will maintain the sheet flow patterns historically seen from this area.

B. Hydrologic Criteria

Hydrologic analyses of the project have been performed using the Rational Method in accordance with the Criteria Manual for Colorado Springs. The Rational Method is used for basin areas that are less than 100 acres in size to help design localized facilities such as inlets and trunk infrastructure required:

$$Q=C*I*A$$

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 design storm events are:

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

Runoff coefficients are based upon field observations of the area for the historic and interim conditions and anticipated development for the future conditions. Type "C" hydrologic soil characteristics have been assumed throughout the area.

C. Hydraulic Criteria

Detailed hydraulic analyses of the proposed roadways were completed as part of this study to determine the capacities of the roadways, and place proposed drainage inlets. The following criteria have been utilized per the City of Colorado Springs Drainage Criteria Manual and based upon the general site constraints.

Roadway Capacity Criteria

Street Type	Initial Storm Criteria	Major Storm Criteria
Residential Street (6" ramp curb)	5" allowable depth at flowline; Maximum 34 cfs per side, No overtopping of crown.	7" maximum depth at flowline; No adjacent flooding.
Collector Street (8" vertical curb)	6" allowable depth at flowline; Maximum 34 cfs per side; No overtopping of crown	12" maximum depth at flowline; No adjacent flooding.
Arterial (8" vertical curb)	6" allowable at flowline; Maximum 34 cfs per side; No overtopping of crown.	12" maximum depth at flowline; -or- 4" depth at crown; (whichever is more restrictive) -and- No adjacent flooding

Tutt Boulevard was evaluated previously within the Final Drainage Report for Tutt Boulevard Filing No. 4, prepared by Matrix Design Group, Inc., dated April 2005. Cowpoke Road, Sorpresa Lane, and the internal residential roadways have been evaluated. Where roadway stormwater capacities are exceeded or at sump locations, inlets have been place to remain in compliance with City criteria. Additional physical constraints of the roadways have also been evaluated to determine areas where the minimum typical City criteria cannot be maintained.

D. Waivers from Criteria

No waivers from the drainage standards are being requested at this time.

IV. DRAINAGE FACILITY DESIGN

A. General Concept

The surrounding area has been analyzed based upon current conditions; interim conditions; and anticipated full build out of the area. The interim conditions assume that only Filing 1 will be constructed at this time.

The proposed storm sewer system will have the ability to convey the 100-year storm event. The flows will be routed through a proposed water quality pond and onto Cottonwood Creek. The water quality pond as well as the infrastructure constructed as part of Filing 1 will be sized for the fully developed conditions. Storm sewers will be stubbed out at the upstream end of each filing as development occurs to provide "just in time" extensions of the infrastructure.

B. Existing Conditions

The existing conditions have been evaluated assuming that Tutt Boulevard has been completed, but not the Cumbre Vista development. It should be noted that if Tutt Boulevard and Cumbre Vista Filing 1 occur concurrently as expected, the provisions made within the Interim Conditions as presented in the Final Drainage Report (FDR) for Tutt Boulevard Filing No. 4 will not have to be completed. The FDR for Tutt Boulevard has provided a 48" FES and 24" FES with riprap pads to accept drainage from Cumbre Vista in its undeveloped state at natural low points. The development of Cumbre Vista will trigger the need to construct Tutt Boulevard to provide adequate access to the parcel.

Drainage sub-basins for the interim conditions have been delineated and the storm sewer within Tutt Boulevard sized to accommodate the anticipated flows. Runoff from the undeveloped Cumbre Vista not flowing to Tutt Boulevard will continue to follow historic drainage patterns to Cottonwood Creek. The development of Cumbre Vista will significantly shrink the historic drainage area flowing to Tutt Boulevard.

During the interim conditions, a swale will be graded into the landscape between the proposed Tutt Boulevard right of way line and the back of sidewalk. See Drainage Plan for location and typical section. This swale will help to intercept flows prior to reaching the roadway to minimize sediment transport to the roadway and help control flows. This swale is no longer needed adjacent to the Cumbre Vista development when it occurs.

Sub-basin E10 is 84.48 acres of undeveloped land or large single-family parcels. Cowpoke road is the northern limits of this sub-basin. Flows travel overland to an existing drainage finger and to Cottonwood Creek. Peak runoff rates for this area have been calculated as $Q(5)=61.5$ cfs and $Q(100)=164.3$ cfs.

Sub-basin E21 is 72.50 acres of undeveloped land, or large single-family residential lots. Peak runoff rates for this area have been calculated as $Q(5)=55.2$ cfs and $Q(100)=147.3$ cfs. Runoff will sheet flow to an existing tributary finger or be diverted to a low point by a proposed swale to

be constructed behind the proposed sidewalk along Tutt Boulevard. Flows will be directed to a 48" FES per the approved Final Drainage Report for Tutt Boulevard Filing 4. The majority of this area will be redirected when Cumbre Vista is developed into single family residential lots. The 48" FES can be plugged and abandoned when this area is developed. If the development of the single family area occurs concurrently with the construction of Tutt Boulevard, the 48" FES and RCP will not be required. Flows will be transported north under Tutt Boulevard via a 54" RCP storm sewer.

Sub-basin E22 is 7.37 acres of undeveloped land with peak runoff rates of $Q(5)=7.3$ cfs and $Q(100)=19.4$ cfs. Flows will be directed to a 24" FES via the existing drainage finger or the proposed swale along the east side of Tutt Boulevard. As with sub-basin E21, if the construction of the single family residential area occurs concurrently with the construction of Tutt Boulevard, this segment of the storm sewer can be eliminated. If the 24" FES is installed, the pipe can be plugged and abandoned when upstream development occurs. Flows will be transported to the trunk 54" RCP storm sewer system under Tutt Boulevard.

Sub-basin E32 comprises the eastern half of Tutt Boulevard from Sorpressa Lane to Cowpoke Road. Flows from the 1.72 acre basin will generate peak runoff rates of $Q(5)=4.3$ cfs and $Q(100)=8.8$ cfs. A proposed 10' City standard D10R sump inlet will capture the flows at the intersection of Tutt Boulevard and Cowpoke Road. Flows will be conveyed to the 54" trunk storm sewer.

Sub-basin E33 is 1.61 acres of the west side of Tutt Boulevard from Sorpressa Lane to Cowpoke Road. Flows from the basin have been calculated as $Q(5)=4.0$ and $Q(100)=8.2$ cfs. Runoff will be intercepted by a proposed 10' City standard D10R sump inlet.

Sub-basin E50 is the only area that is located within the Sand Creek Drainage Basin. This area is 5.63 acres in size and will generate peak runoff rates of $Q(5)=6.2$ cfs and $Q(100)=16.5$ cfs. Runoff sheet flows to the east.

C. Interim Conditions

The interim conditions of the site have been evaluated based upon the drainage requirements for Cumbre Vista Filing 1. Filing 1 will trigger the need for improvements along Cowpoke Road to the north, Tutt Boulevard to the west, and Sorpressa Lane to the south of the site. Roadways internal to the first filing include a portion of Cumbre Vista Way, Mount Hayden Drive, and Hunter Peak Trail. In areas where roadway improvements are to be constructed the storm sewer system will also be completed. As additional roadways are constructed or extended, the storm sewer system shall also be extended per the stormwater facilities as shown on the fully developed drainage plan.

This interim analysis has been completed to determine how to handle runoff that will enter Filing 1 from upstream areas. This analysis will help minimize the impacts from the major storm event.

Sub-basin I50 is the historic drainage area within the limits of the future Cumbre Vista development that lies within the Sand Creek Drainage Basin. This 5.63 acre sub-basin will generate $Q(5)=6.2$ cfs and $Q(100)=16.5$ cfs and continue to sheet flow to the east.

Sub-basin I10 is 2.28 acres in size located at the intersection of Sorpressa Lane and Tutt Boulevard. Flows of $Q(5)=2.9$ cfs and $Q(100)=6.6$ cfs will flow to an 10' D10R inlet proposed as part of the Tutt Boulevard project. Flows will be transported to the proposed 48" storm sewer under Sorpressa Lane and to Tutt Boulevard. At the junction of the 48" RCP storm sewer, upstream flows have been combined at design point 52. Peak flow rates within the sewer have been calculated as $Q(5)=50.1$ cfs and $Q(100)=114.0$ cfs combining flows from sub-basins I10 and design point 51.

Sub-basin I11 is 13.58 acres of large single-family parcels and vacant land. This area generates $Q(5)=16.2$ cfs and $Q(100)=37.2$ cfs. To avoid undesired sediment transport to the proposed section of Sorpressa Lane, a diversion swale will direct runoff to a proposed 24" FES. Runoff will then be directed to a proposed 48" RCP storm sewer under the roadway to design point 51.

At design point 51, flow from design point 50 will combine with flows from sub-basins I11 and I13. The peak routed runoff rates at this point are $Q(5)=49.2$ cfs and $Q(100)=111.9$ cfs and will be conveyed downstream within a 48" RCP storm sewer under Sorpressa Lane.

Sub-basin I12 is 27.63 acres of single-family and vacant meadowland generating peak runoff rates of $Q(5)=26.1$ cfs and $Q(100)=59.8$ cfs of flow. A small amount of runoff will enter a proposed 10' D10R inlet to be installed to capture future flows. The majority of the runoff will be diverted prior to entering Sorpressa Lane to a proposed 30" FES. The FES can be removed when the development to the south is constructed. Flows from this sub-basin will be directed to design point 50.

Design point 50 combines runoff from sub-basins I12 and I14. The peak flow rates of $Q(5)=32.3$ cfs and $Q(100)=73.6$ cfs will be transported westerly via a proposed 48" RCP storm sewer.

Sub-basin I13 is 4.71 acres in size comprised of vacant land and a portion of Hunter Peak Trail and Sorpressa Lane. This area will generate $Q(5)=8.8$ cfs and $Q(100)=19.6$ cfs of runoff. Stormwater will be collected in a proposed 15' D10R sump inlet at the intersection of Hunter Peak Trail and Sorpressa Lane. The inlet has been sized to accommodate the future development of Cumbre Vista. Flow will be directed westerly to design point 51.

Sub-basin I14 is 5.73 acres of single-family lots and vacant land with peak runoff rates of $Q(5)=7.0$ cfs and $Q(100)=15.6$ cfs. A proposed 30" FES has been proposed near a natural low point to accept flows. When Sorpressa Lane is extended in the future, a diversion swale shall intercept flows prior to entering the roadway and be directed to the 30" FES to help minimize sediment transport onto the roadway.

Sub-basin I40 is 60.58 acres of vacant land. Portions of this area are developed with large single-family parcels, however this area will be redeveloped as part of the Cumbre Vista development

and the developments will be vacated and removed. Peak runoff rates from this area have been calculated as $Q(5)=55.9$ cfs and $Q(100)=128.0$ cfs. Flows will enter a proposed 42" FES and be transported downstream to the northwest to design point 53. The 42" RCP storm sewer has been sized to accommodate the flows from the interim condition of development. When the site is fully developed, the flows and area tributary to the 42" storm sewer will be greatly reduced.

Sub-basin I41 is 18.45 acres in size consisting of a portion of Cowpoke Road and vacant meadowland. The area will generate peak runoff rates of $Q(5)=18.7$ cfs and $Q(100)=42.9$ cfs. Flows will be directed to a proposed 20' D10R sump inlet. Flows will travel downstream to design point 54.

Sub-basin I42 is 1.85 acres in size of single-family lots within Filing 1. Runoff will enter Hunter Peak Trail, travel northward, and be directed to design point 53. Peak runoff rates from the sub-basin are $Q(5)=4.5$ cfs and $Q(100)=9.4$ cfs. At design point 53, runoff from sub-basin I40 and I42 will be combined and enter a proposed 42" RCP storm sewer. The routed flows at this point are $Q(5)=57.7$ cfs and $Q(100)=131.4$ cfs.

Sub-basin I43 is 1.98 acres of single-family lots in Filing 1. The minor and major storm event runoff rates are $Q(5)=3.6$ cfs and $Q(100)=7.4$ cfs. Runoff will be directed to a proposed 20' D10R sump inlet. The inlet sizing has been based upon future developed conditions of the area.

Sub-basin I44 is 4.91 acres of development located within Filing 1 generating $Q(5)=10.8$ cfs and $Q(100)=22.3$ cfs of stormwater. Runoff will be directed to a 10' D10R flow by inlet located at the intersection of Mount Hayden Drive and Cumbre Vista Way. Approximately 7.4 cfs and 14.1 cfs will be intercepted during the minor and major storm events, respectively. An additional 3.3 cfs and 8.2 cfs will by pass the inlet and travel to the 20' sump inlet in sub-basin I43.

Sub-basin I45 is 6.27 acres of development within Filing 1. Peak runoff rates have been calculated as $Q(5)=13.5$ cfs and $Q(100)=28.1$ cfs. Runoff will be intercepted by a proposed 20' D10R sump inlet and be directed downstream to design point 54 via a 30" RCP storm sewer.

Sub-basin I46 is 4.34 acres of single-family development along proposed Cumbre Vista Way generating peak flow rates of $Q(5)=8.0$ cfs and $Q(100)=16.6$ cfs. Runoff will be partially intercepted by a proposed 10' inlet at Cowpoke Road. Approximately $Q(5)=4.8$ cfs and $Q(100)=9.2$ cfs will be captured by the inlet and $Q(5)=3.2$ cfs and $Q(100)=7.4$ cfs of flow will bypass the inlet and travel downstream to a proposed 15' D10R inlet to be constructed as part of the Tutt Boulevard improvements.

Sub-basin I47 has been previously planned for within the Tutt Boulevard Filing No. 4 Final Drainage Report. The sub-basin is the same as shown in the report. The 5.38 acre area will generate peak flow rates of $Q(5)=11.6$ cfs and $Q(100)=24.1$ cfs. When this area is developed, a diversion swale, if constructed along Tutt Boulevard, can be filled in and two storm sewer pipes can be plugged and abandoned. If the development of Filing 1 occurs concurrently with the construction of Tutt Boulevard, the diversion swale and storm sewer stub outs can be eliminated entirely from the Tutt Boulevard project. The two stub outs have been proposed to drain natural

low points on the upstream side of Tutt Boulevard. The development of filing 1 will fill in these low points, thus eliminating the need to construct the storm sewer stub outs or allowing for the plugging and abandoning of the facilities.

Sub-basin I48 is 1.53 acres in size consisting of the northern half of proposed Cowpoke Road. Runoff will be directed to a proposed 10' D10R flow by inlet that will also serve as a junction for the proposed 60" RCP storm sewer. The area will generate stormwater flow rates of $Q(5)=4.0$ cfs and $Q(100)=8.0$ cfs. The 10' inlet will capture $Q(5)=3.5$ cfs and $Q(100)=6.2$ cfs. Approximately $Q(5)=0.4$ cfs and $Q(100)=1.8$ cfs will bypass the system and flow to a proposed 5' sump inlet at Tutt Boulevard. The 5' inlet has been previously sized with the Tutt Boulevard design.

At design point 54, flows from design point 53, I41, I43, I44, I45, I46, and I48 will all be combined within a proposed 60" RCP storm sewer. The peak flow rates at this point are $Q(5)=100.7$ cfs and $Q(100)=222.8$ cfs. The 60" RCP storm sewer has been sized based upon the higher flows generated by the full development of the area. From design point 54, flows will be routed through a proposed water quality pond and outfall to Cottonwood Creek. At the outfall point to Cottonwood Creek, riprap protection will be installed to protect the channel banks from erosion.

Sub-basin I49 consists of the northeast portion of the intersection of Cowpoke Road and Tutt Boulevard. This area has been previously analyzed within the Tutt Boulevard Filing 4 Final Drainage Report. A 5' D10R inlet will capture flow rates of $Q(5)=3.5$ cfs and $Q(100)=7.1$ cfs from the 1.27 acre sub-basin. The 5' inlet will be constructed as part of the Tutt Boulevard improvements.

D. Developed Conditions

This study serves not only as a Preliminary/Final Drainage Report for Cumbre Vista Filing 1, but also serves as a Master Development Drainage Plan for the other future three filings of Cumbre Vista. The developed conditions analysis has been completed to ensure that the proposed system to be installed for Filing 1 will have the capacity to handle the future flows from development to occur at a later time.

Sub-basin SC1 consists of the back half of the proposed single-family lots along the eastern property line. Runoff rates of $Q(5)=2.3$ cfs and $Q(100)=6.2$ cfs from this 2.10 acre area will continue to follow historic drainage patterns and sheet flow to the east. The area has been reduced in size from the historic tributary area and will generate lower runoff rates from the existing conditions.

Sub-basin D10 is 10.19 acres in size comprised of area south of Sorpressa Lane. Peak runoff rates from the area have been calculated as $Q(5)=12.0$ cfs and $Q(100)=26.6$ cfs. This analysis assumes the area will remain as low-density residential lots. Runoff from the area will enter a future diversion swale and be directed to a proposed 24" RCP storm sewer under Sorpressa Lane. Flows from this area will combine with runoff from sub-basin D11 at design point 10.

Sub-basin D11 is 3.37 acres in size of single-family lots in the Cumbre Vista Development. The area will generate $Q(5)=6.8$ cfs and $Q(100)=14.0$ cfs of flow. Runoff will be intercepted by a 10' D10R sump inlet at the intersection of Gilpin Peak Drive and Sorpressa Lane. The storm sewer system will combine flows with sub-basin D10 at design point 10.

Design point 10 will have peak stormwater flow rates of $Q(5)=17.9$ cfs and $Q(100)=39.0$ cfs. A 30" RCP storm sewer will be required to transport flows westerly to design point 11.

Sub-basin D12 is 5.01 acres of single-family lots and vacant land to the south of Sorpressa Lane. Peak runoff rates from the sub-basin are $Q(5)=6.1$ cfs and $Q(100)=13.7$ cfs. A diversion swale will intercept flows and direct runoff to a proposed 30" RCP FES. Flows will be directed to design point 11.

Sub-basin D13 is comprised of 2.32 acres of future single-family residential lots. A proposed 5' D10R sump inlet will capture flows of $Q(5)=4.9$ cfs and $Q(100)=10.1$ cfs.

Design point 11 will combine flows from design point 10 and sub-basins D12, D13, and D18. Combined flow rates at this point have been calculated as $Q(5)=61.8$ cfs and $Q(100)=129.3$ cfs. Stormwater from sub-basin D18 will require coordination with property owners south of Sorpressa Lane to establish a drainage corridor that can convey flows from the commercial site to the proposed 48" RCP storm sewer under Sorpressa Lane. The storm sewer has been sized to accommodate flows from the developed commercial site, however a utility corridor has not been established at this time. Establishing the exact corridor is outside of the scope of this project and will be required by the developers of the commercial parcel.

Sub-basin D14 is 3.94 acres of future single-family development south of Sorpressa Lane. The peak runoff rates of $Q(5)=8.3$ cfs and $Q(100)=17.2$ cfs will be collected by a proposed 10' D10R sump inlet and will flow to design point 12.

Sub-basin D15 is 4.35 acres of development along Sorpressa Lane within the Cumbre Vista development. Runoff rates of $Q(5)=7.9$ cfs and $Q(100)=16.4$ cfs will be directed via curb and gutter to a proposed 15' D10R sump inlet. Flows at this point will be combined with upstream flows at design point 12.

Design point 12 will have routed flow rates from the upstream basins of $Q(5)=72.7$ cfs and $Q(100)=151.9$ cfs. A 48" RCP storm sewer will transport flows westerly to design point 13.

Sub-basin D16 is 10.90 acres of single-family development south of Sorpressa Lane. Peak runoff rates from the sub-basin have been calculated as $Q(5)=20.2$ cfs and $Q(100)=42.0$ cfs will be directed to the north. A proposed diversion swale will intercept flows prior to entering Sorpressa Lane and will enter a proposed 24" RCP FES.

Sub-basin D17 is comprised of 5.96 acres of large single family parcels. Peak runoff rates of $Q(5)=7.3$ cfs and $Q(100)=16.2$ cfs will flow a proposed diversion swale south of Sorpressa Lane.

Flows will be directed to a proposed 24" RCP stub-out to minimize the impacts of sediment transport to the roadway. At design point 13, flows from the sub-basin along Sorpressa Lane will be combined. The routed runoff rates have been calculated as $Q(5)=91.4$ cfs and $Q(100)=191.6$ cfs. These flows will enter the trunk system constructed under Tutt Boulevard.

Sub-basin D20 is comprised of 3.37 acres of the proposed Cumbre Vista development along Cumbre Vista Way. The sub-basin will generate peak flow rates of $Q(5)=6.4$ cfs and $Q(100)=13.2$ cfs. A 10' D10R sump inlet will capture the flows.

Sub-basin D21 is 7.76 acres of single-family development with peak runoff rates of $Q(5)=14.4$ cfs and $Q(100)=30.0$ cfs. Runoff will be captured by a 15' D10R sump inlet and be combined with flows from sub-basin D20 at design point 20.

Design point 20 will have routed flow rates of $Q(5)=20.5$ cfs and $Q(100)=42.6$ cfs from sub-basins D20 and D21. Flows will be transported downstream within a proposed 30" RCP storm sewer to design point 21.

Sub-basin D22 is 3.68 acres of the Cumbre Vista development along the eastern property line. This area will generate peak flow rates of $Q(5)=6.5$ cfs and $Q(100)=13.5$ cfs. A 10' D10R flow by inlet will capture $Q(5)=4.0$ cfs and $Q(100)=6.7$ cfs and allow approximately $Q(5)=2.5$ cfs and $Q(100)=6.8$ cfs of flow to travel downstream to sub-basin D31 and design point 23.

Sub-basin D23 is 3.36 acres of single-family development with stormwater flow rates of $Q(5)=5.9$ cfs and $Q(100)=12.3$ cfs. Runoff will be intercepted by a proposed 10' D10R sump inlet and transported downstream to design point 21.

Sub-basin D24 is 7.23 acres in size. Peak runoff rates of $Q(5)=14.1$ cfs and $Q(100)=29.2$ cfs have been calculated. A proposed 15' D10R sump inlet has the capacity to capture the flows. Runoff will be transported downstream to design point 21.

Design point 21 combines flows from design point 20 and sub-basins D22 (flow by stormwater), D23, and D24. Routed peak runoff rates at this point have been calculated as $Q(5)=42.3$ cfs and $Q(100)=86.4$ cfs. A 36" RCP storm sewer will be required to convey flows downstream to design point 22

Sub-basin D25 will generate flows of $Q(5)=6.0$ cfs and $Q(100)=12.5$ cfs from 3.27 acres of development within Cumbre Vista. Runoff will be collected by a proposed 10' D10R sump inlet at the intersection of Mount Heron Trail and Cumbre Vista Way.

Sub-basin D26 is 7.23 acres of single-family development generating flows of $Q(5)=14.2$ cfs and $Q(100)=29.4$ cfs. Runoff will be directed to a proposed 15' D10R sump inlet at the intersection of Mount Heron Trail and Cumbre Vista Way. Runoff will be directed via storm sewer downstream to design point 22.

Sub-basin D27 is 3.35 acres of development. Peak runoff rates of $Q(5)=6.3$ cfs and $Q(100)=13.1$ cfs will be captured by a proposed 10' D10R sump inlet at Mount Hope Drive and Cumbre Vista Way. Stormwater will be conveyed downstream to design point 22.

Sub-basin D28 is 4.58 acres in size. The single-family lots will generate peak runoff rates of $Q(5)=9.0$ cfs and $Q(100)=18.7$ cfs. A 15' D10R sump inlet will capture flows and transport them to design point 22.

At design point 22, peak routed runoff rates have been calculated as $Q(5)=72.4$ cfs and $Q(100)=148.8$ cfs. A proposed 48" RCP storm sewer will convey flows downstream to design point 42.

Sub-basin D29 is 2.70 acres in size comprised of a block of single-family lots. Peak runoff rates of $Q(5)=6.2$ cfs and $Q(100)=13.0$ cfs will be captured by a 5' D10R sump inlet.

Sub-basin D30 is 3.32 acres along Cowpoke Road. This area will generate flows of $Q(5)=7.39$ cfs and $Q(100)=15.3$ cfs. Runoff from this area will be directed to the west to sub-basin D31 and design point 23.

Sub-basin D31 is 6.66 acres of development south of Cowpoke Road. Flows from this area total $Q(5)=13.6$ cfs and $Q(100)=28.3$ cfs. Runoff will combine with flows from upstream sub-basin D30 and runoff that has by passed a 10' inlet within sub-basin D22 at design point 23. Flows at this point are $Q(5)=22.4$ cfs and $Q(100)=48.3$ cfs. A proposed 20' D10R sump inlet will have the capacity to capture these flow rates.

Sub-basin D40 is comprised of 9.31 acres of a proposed elementary school and park area with the development. The park will be maintained by the Metropolitan District recently formed for the area. Stormwater runoff rates of $Q(5)=10.1$ cfs and $Q(100)=22.4$ cfs will be intercepted by a diversion swale and directed to a proposed 24" RCP storm sewer. The diversion swale will minimize the impacts of stormwater to the properties to the north of the park.

Sub-basin D41 is the block of single-family lots surrounded by Mount Hope Drive and Hunter Peak Trail. The 3.83 acres of development will generate $Q(5)=8.5$ cfs and $Q(100)=17.7$ cfs of stormwater. A proposed 10' D10R sump inlet will collect the flows. Runoff will be directed via storm sewer to design point 40.

Sub-basin D42 is 3.78 acres in size. Runoff rates of $Q(5)=7.2$ cfs and $Q(100)=15.0$ cfs will be partially intercepted by a proposed 10' D10R flow by inlet. The inlet will capture approximately 5.5 cfs and 10.5 cfs of the minor and major storm events. $Q(5)=1.7$ cfs and $Q(100)=4.6$ cfs will continue down the roadway to the proposed sump inlet located within sub-basin D43.

Sub-basin D43 is 4.03 acres of single-family development with peak runoff rates of $Q(5)=7.7$ cfs and $Q(100)=16.0$ cfs. The bypass flows from sub-basins D42 and D44 will also combine at a proposed 20' D10R sump inlet. Flows will combine with runoff from upstream areas at design point 42.

Design point 42 combines flows from design points 22, 40, and 41 with runoff from sub-basins D29, D42, D44, and D43. The runoff rates from sub-basins D42 and D44 are the flows which have by-passed the upstream flow by inlets. The peak routed runoff rates at this point are $Q(5)=115.7$ cfs and $Q(100)=241.2$ cfs. Flows are transported downstream within a 60" RCP storm sewer to design point 43.

Sub-basin D44 is 4.91 acres in area that will flow to a proposed 10' D10R flow by inlet at the intersection of Mount Hayden Drive and Cumbre Vista Way. The peak runoff rates from this area are $Q(5)=10.8$ cfs and $Q(100)=22.3$ cfs. Approximately $Q(5)=7.4$ cfs and $Q(100)=14.1$ cfs will be intercepted by the inlet and $Q(5)=3.3$ cfs and $Q(100)=8.2$ cfs will by pass the inlet and flow downstream to the 20' inlet located within sub-basin D43.

Sub-basin D45 is 6.27 acres in size and will drain to a proposed 15' D10R sump inlet. Peak runoff rates from this basin are $Q(5)=13.5$ cfs and $Q(100)=28.1$ cfs. Runoff will be directed via storm sewer to design point 41.

Design point 41 will combine flows from sub-basins D44 and D45 within a proposed 30" storm sewer system. The peak routed runoff rates have been calculated as $Q(5)=24.1$ cfs and $Q(100)=50.1$ cfs.

Sub-basin D46 is comprised of a portion of the single-family lots along the western property line. The 4.34 acre sub-basin will generate peak stormwater flow rates of $Q(5)=8.0$ cfs and $Q(100)=16.6$ cfs. Runoff will be directed to a proposed 10' D10R flow by inlet. The inlet has the ability to intercept $Q(5)=4.8$ cfs and $Q(100)=9.2$ cfs. Approximately $Q(5)=3.2$ cfs and $Q(100)=7.4$ cfs will by pass the inlet and travel to the proposed 15' sump inlet within sub-basin D47.

Sub-basin D47 is the 5.38 acres of the site adjacent to proposed Tutt Boulevard. This area will drain via curb and gutter to a proposed 15' D10R inlet at the intersection of Tutt Boulevard and Cowpoke Road. The sub-basin will generate $Q(5)=11.6$ cfs and $Q(100)=24.1$ cfs of stormwater. Flows will be captured by the inlet and directed to the trunk storm sewer system under Tutt Boulevard. This inlet has been designed and will be constructed as part of the Tutt Boulevard project. Within sub-basin D47, a 48" RCP and 24" RCP FES have been proposed at the natural low points upstream of Tutt Boulevard. These facilities are not required if the development of Filing 1 occurs concurrently with the construction of Tutt Boulevard and can be deleted from the project. If in the event Tutt Boulevard is constructed and Cumbre Vista lags behind significantly, the 48" and 24" FES shall be constructed. Once Cumbre Vista is developed, the low points will be filled in and re-graded. The FES's can be removed and the two storm sewer pipes plugged and abandoned.

Sub-basin D48 is 1.53 acres comprised of the north one-half of Cowpoke Road. This area will produce $Q(5)=4.0$ cfs and $Q(100)=8.0$ cfs of flow. Runoff will be directed to a proposed 10' D10R flow by inlet, which will also serve as a junction for the storm sewer system. The inlet will capture $Q(5)=3.5$ cfs and $Q(100)=6.2$ cfs and allow $Q(5)=0.4$ cfs and $Q(100)=1.8$ cfs to

bypass the system. The bypass flows will travel to the proposed 5' inlet within sub-basin D49. Flows captured by the 10' inlet will be combined with upstream flows within the storm sewer system at design point 43.

Design point 43 routes runoff from design points 23 and 42 and sub-basin D48 together. The combined flow rates have been calculated as $Q(5)=134.9$ cfs and $Q(100)=282.4$ cfs. A 60" RCP storm sewer will convey flows to the proposed water quality pond located to the northwest.

Sub-basin D49 is 1.27 acres in size comprised of a portion of Cowpoke Road and Tutt Boulevard. This area has been previously designed within the Final Drainage Report for Tutt Boulevard Filing 4. A 5' D10R sump inlet will capture the peak runoff rates from the basin of $Q(5)=3.5$ cfs and $Q(100)=7.1$ cfs and convey the flows to the system under Tutt Boulevard.

E. Water Quality

To address the latest requirements dealing with water quality for the site, a proposed extended detention basin has been proposed. The basin will become a public facility and will be owned and maintained by the City of Colorado Springs. The basin will be for water quality measures only and will not provide any detention for the site. Runoff will be routed through the proposed pond, located to the northwest of Filing 1 between the proposed alignment for Cowpoke Road and the existing Cottonwood Creek channel. The total area being developed measures approximately 102 acres in size. The site is approximately 60% impervious when averaged together to include the residential areas as well as the parks and open space within the development. This will require 2.4 acre-feet of storage. This volume includes an additional 20% of volume to account for sediment. Runoff will be held for a 40-hour drain time as required by Volume 2 of the City's Drainage Criteria Manual. See Appendix for calculations.

F. Cottonwood Creek – Prudent Line Setback

The Drainage Basin Planning Study for Cottonwood Creek has proposed using a prudent line setback for the existing channel rather than providing stabilization improvements. The existing channel is relatively stable with vegetated sides and the channel thalweg incised into bedrock through the majority of the area. The Drainage Basin Planning study has established a general prudent line setback for the area. A more detailed evaluation has been completed for the area impacted by the proposed Cumbre Vista development. All private and public improvements have been placed outside of the limits of the setback.

The setback has calculated based upon the methodology provided within the Drainage Basin Planning Study. Three different approaches were used to determine the setback.

- The limits of the 100-year floodplain as determined by FEMA
- The calculated setback based upon the valley width and bank height
- The valley crest plus 50 feet.

The greatest distance of the three methods has been used to establish the prudent line and is shown on the drainage plans included within the appendix of this report.

G. Tutt Boulevard Bridge

A bridge has been proposed to span over Cottonwood Creek and extend the roadway to the north as part of future construction. The Cumbre Vista development has entered into the Annexation Agreement established with the City of Colorado Springs and will help to fund the construction of the bridge. The appropriate fees will be paid to for the development's contribution to constructing the roadway. The bridge will not be constructed at this time. When development occurs to the north or northwest of the site, the need for the bridge will be triggered and the bridge will be built. Final design plans and drainage details for the bridge will be completed at that time. The Final Drainage Report for Tutt Boulevard Filing No. 4 has considered the impacts of the bridge on the proposed facilities to be constructed as part of the Tutt Boulevard construction.

H. Cost Estimate

All proposed drainage facilities will be publicly owned and maintained after the system is constructed by the developer and the improvements are accepted by the City. An engineer's estimate for probable construction costs of the stormwater facilities has been provided for all the improvements to be constructed as part of Filing 1 only.

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

Item	Unit	Quantity	Unit Cost	Extension
Storm Manhole	EA	8	\$3,000.00	\$24,000.00
18" RCP	LF	160	\$30.00	\$4,800.00
24" RCP	LF	100	\$35.00	\$3,500.00
30" RCP	LF	625	\$40.00	\$25,000.00
48" RCP	LF	1300	\$70.00	\$91,000.00
60" RCP	LF	325	\$95.00	\$30,875.00
5' D10R Inlet	EA	2	\$3,000.00	\$6,000.00
10' D10R Inlet	EA	4	\$3,500.00	\$14,000.00
15' D10R Inlet	EA	1	\$4,200.00	\$4,200.00
20' D10R Inlet	EA	3	\$4,700.00	\$14,100.00
Headwall	EA	1	\$2,500.00	\$2,500.00
Storm Sewer Plugs	EA	3	\$250.00	\$750.00
Water Quality Pond	AC-FT	2.4	\$10,000.00	\$24,000.00
Pond Outfall Structure	EA	1	\$5,000.00	\$5,000.00
48" FES	EA	1	\$1,200.00	\$1,200.00
18" Dia. Riprap	CY	410	\$34.00	\$13,940.00
Storm Sewer Plugs	EA	3	\$250.00	\$750.00
			Sub Total	\$265,615.00
			10% Contingencies	\$26,561.50
			Grand Total	\$292,176.50

Since the engineer has no control over the cost of labor, materials, equipment or services furnished by others, or over the contractor'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.

I. Drainage and Bridge Fees

Cumbre Vista Filing 1 has not been previously platted. The 2005 drainage and bridge fees as published by the City of Colorado Springs will be assessed to the site. Filing 1 is located entirely within the Cottonwood Creek Drainage Fee Basin. The fees are based upon the platted acreage and have been calculated as follows.

Cumbre Vista Subdivision Filing No. 1
Final Drainage Report
Drainage and Bridge Fees

	Area (ac.)	Fee/Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Credit
Drainage Fee	44.559	\$8,957.00	\$399,114.96	\$0.00	\$399,114.96	\$0.00
Bridge Fee	44.559	\$731.00	\$32,572.63	\$0.00	\$32,572.63	\$0.00
Total Fee Due at Platting					\$431,687.59	

There are no proposed drainage infrastructure improvements to be completed with this project that have been specified within the DBPS for Cottonwood Creek. Therefore the construction of the drainage infrastructure is not reimbursable against the Drainage Fees. The Drainage and Bridge fees in the amount of **\$431,687.59** will be due at the time of plat recording.

VI. CONCLUSIONS

The proposed Cumbre Vista Filing 1 single-family development will be developed in compliance with the *City of Colorado Springs & El Paso County Drainage Criteria Manual*, dated November 1991 and the current Drainage Basin Planning Study for Cottonwood Creek.

Cottonwood Creek will be the major drainageways receiving runoff from the site. The stormwater infrastructure completed as part of the roadway will accept the developed runoff rates from the area and convey the flows to Cottonwood Creek.

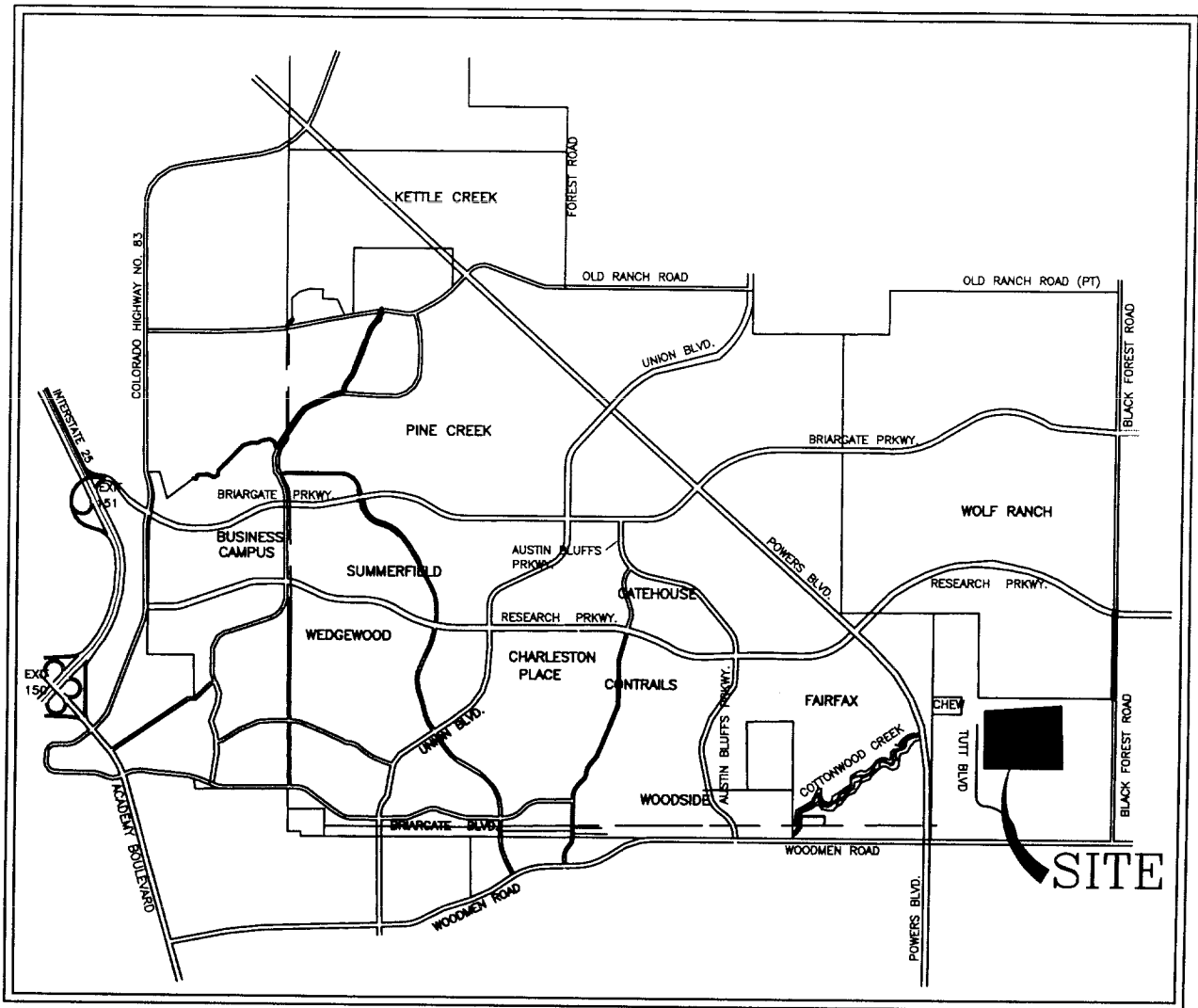
VII. REFERENCES

1. *City of Colorado Springs & El Paso County Drainage Criteria Manual*, dated November 1991.
2. *Cottonwood Creek Drainage Basin Planning Study*, Ayres and Associated, June 2000.
3. *Cottonwood Creek Drainage Basin Planning Study*, URS Consultants, June 9, 1994.
4. *FEMA Flood Insurance Rate Map*, El Paso County Colorado and Incorporated Areas, Panel 529 of 1300. March 17, 1997.
5. *Preliminary/Final Drainage Report for Tutt Boulevard Filing No. 4, Woodman Road to Cowpoke Road*, Matrix Design Group, Inc., April 2005.
6. *Preliminary Construction Drawings for Tutt Boulevard, Woodman Road to Cowpoke Road*, MVE Engineers-Surveyors, February 2005.
7. *Soil Survey of El Paso County Area, Colorado*. United States Department of Agriculture Soil Conservation Service. Issued June 1981.

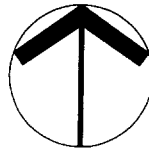
VIII. APPENDICIES

APPENDIX A

MAPS



VICINITY MAP

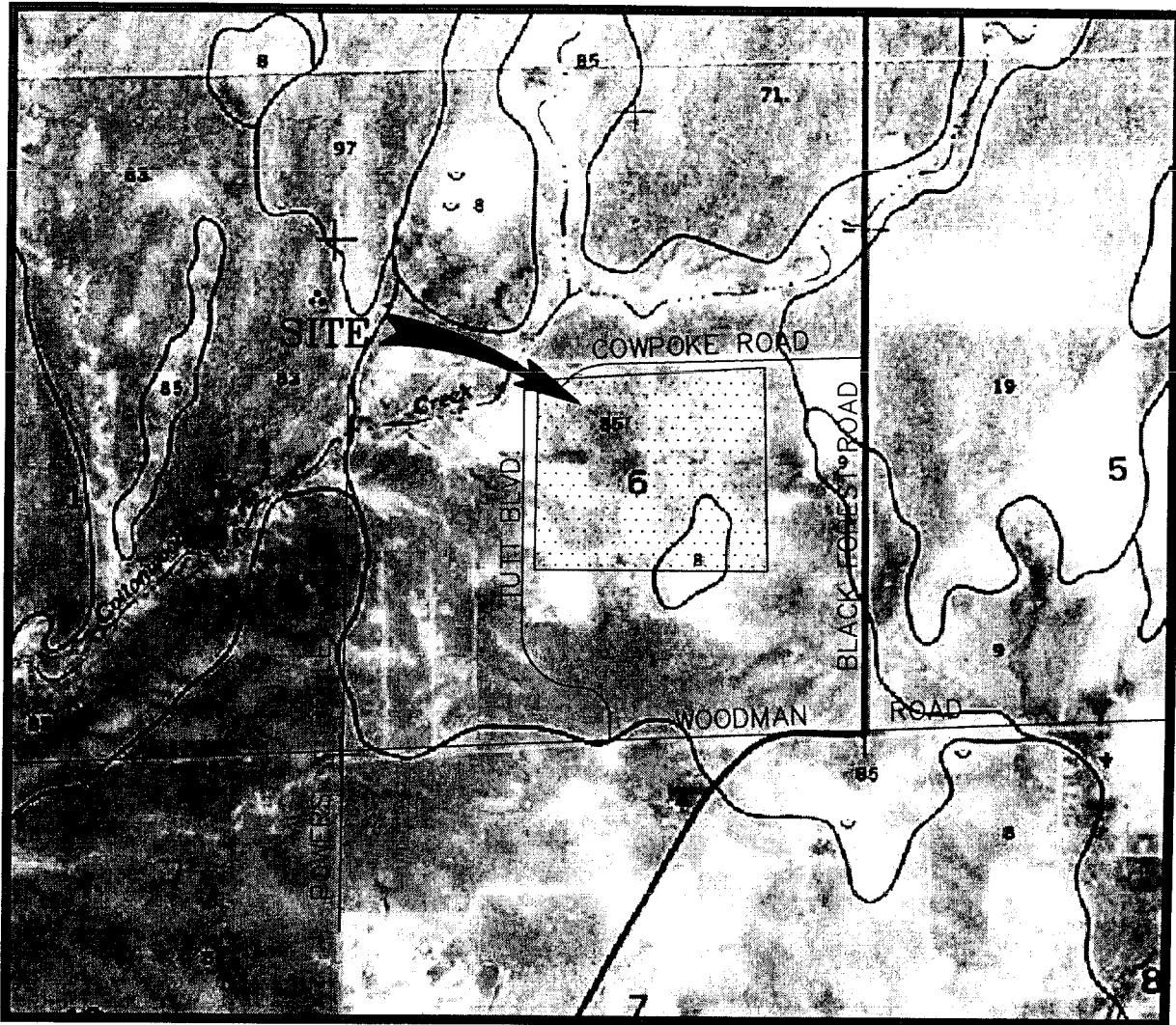


NORTH
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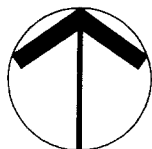
Matrix Design Group, Inc.
Integrated Design Solutions

2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208



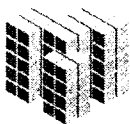
SOILS MAP

LEGEND



NORTH
N.T.S.

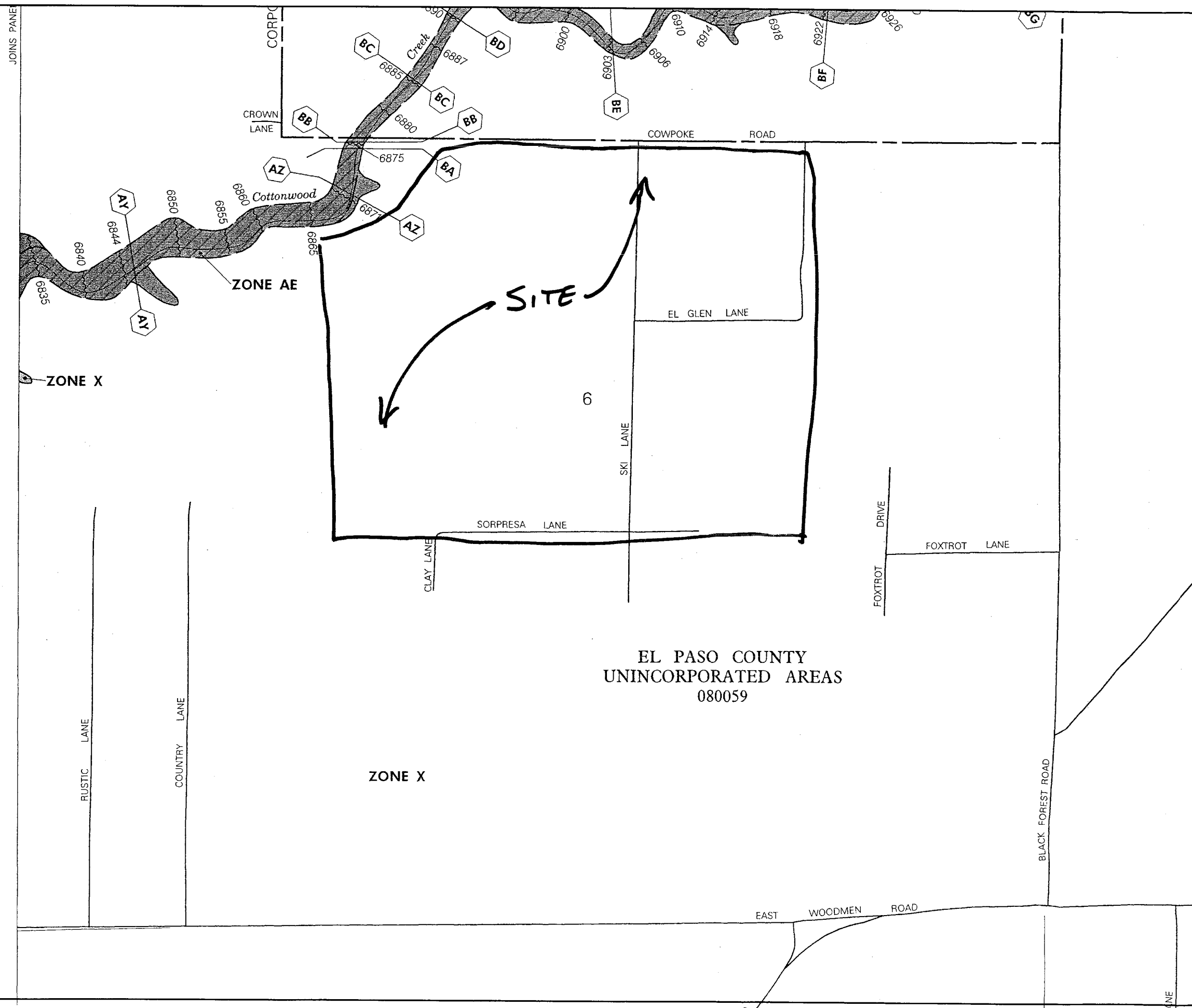
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85	STAPLETON BERNAL SANDY LOAMS	B/D



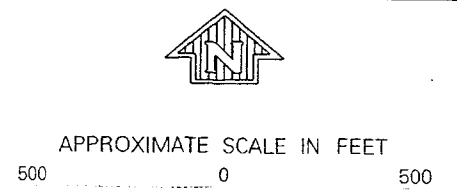
Matrix Design Group, Inc.

Integrated Design Solutions

2925 Professional Place, Suite 202
 Colorado Springs, CO 80904
 Phone 719-575-0100
 Fax 719-575-0208



EL PASO COUNTY
UNINCORPORATED AREAS
080059



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

PANEL 529 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0529	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0529	F

MAP NUMBER
08041C0529 F

EFFECTIVE DATE:
MARCH 17, 1997



Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX B

HYDROLOGIC AND HYDRAULIC CALCULATIONS

Cumbre Vista Filing No. 1

Rational Method Hydrologic Analysis
Existing Conditions

Sub-Basin Designation	Total Area (ac.)	Weighted Coefficients		CA		Overland Time			Travel Time				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)
E10	84.48	0.30	0.45	25.34	38.02	100	2.0%	12.6	3100	4.0%	3.0	17.2	29.9	2.43	4.32	61.5	164.3
															12.37		
E21	72.50	0.30	0.45	21.75	32.63	100	2.0%	12.6	2700	4.0%	3.0	15.0	27.6	2.54	4.52	55.2	147.3
E22	7.37	0.30	0.45	2.21	3.32	100	2.0%	12.6	1000	4.5%	4.0	4.2	16.8	3.28	5.84	7.3	19.4
															12.37		
E32	1.72	0.70	0.80	1.20	1.38	40	2.0%	8.0	1400	3.7%	4.0	5.8	13.8	3.59	6.39	4.3	8.8
E33	1.61	0.70	0.80	1.13	1.29	40	2.0%	8.0	1400	3.7%	4.0	5.8	13.8	3.59	6.39	4.0	8.2
															12.37		
E50	5.63	0.30	0.45	1.69	2.53	100	2.0%	12.6	100	3.0%	3.0	0.6	13.2	3.66	6.52	6.2	16.5

Cumbre Vista Filing 1

Rational Method Hydrologic Analysis
Developed Conditions

Sub-Basin Designation	Design Point	Sewer or Road	Sub-Basins	Total Area (ac.)	Weighted Coefficients		CA		Overland Time			Travel Time			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)
SC1				2.10	0.30	0.45	0.63	0.95	100	2.0%	12.6	100	2.0%	3.0	0.6	13.2	3.66	6.52	2.3	6.2
D10				10.19	0.40	0.50	4.08	5.10	150	2.0%	15.5	1000	3.0%	3.0	5.6	21.0	2.94	5.23	12.0	26.6
D11				3.37	0.60	0.70	2.02	2.36	65	2.0%	10.2	900	2.0%	2.5	6.0	16.2	3.34	5.95	6.8	14.0
D12				5.01	0.40	0.50	2.00	2.51	150	2.0%	15.5	700	3.0%	3.0	3.9	19.4	3.06	5.45	6.1	13.7
D13				2.32	0.60	0.70	1.39	1.62	75	2.0%	11.0	600	2.5%	2.7	3.7	14.7	3.50	6.23	4.9	10.1
D14				3.94	0.60	0.70	2.36	2.76	75	2.0%	11.0	650	3.0%	3.0	3.6	14.6	3.51	6.25	8.3	17.2
D15				4.35	0.60	0.70	2.61	3.05	100	2.0%	12.6	1300	3.0%	3.0	7.2	19.9	3.02	5.38	7.9	16.4
D16				10.90	0.60	0.70	6.54	7.63	75	2.0%	11.0	1300	2.5%	2.7	8.0	19.0	3.09	5.51	20.2	42.0
D17				5.96	0.40	0.50	2.38	2.98	150	2.0%	15.5	700	3.0%	3.0	3.9	19.4	3.06	5.45	7.3	16.2
D18				17.94	0.70	0.80	12.56	14.35	50	2.0%	8.9	2000	3.0%	3.0	11.1	20.1	3.01	5.36	37.8	76.9
D20				3.37	0.60	0.70	2.02	2.36	50	2.0%	8.9	1700	1.8%	3.0	9.4	18.4	3.14	5.60	6.4	13.2
D21				7.76	0.60	0.70	4.66	5.43	50	2.0%	8.9	1500	1.3%	2.6	10.0	18.9	3.10	5.51	14.4	30.0
D22				3.68	0.60	0.70	2.21	2.58	50	2.0%	8.9	2150	1.8%	3.0	11.9	20.9	2.95	5.25	6.5	13.5
D23				3.36	0.60	0.70	2.02	2.35	50	2.0%	8.9	1800	1.3%	2.5	12.0	20.9	2.94	5.24	5.9	12.3
D24				7.23	0.60	0.70	4.34	5.06	50	2.0%	8.9	1500	2.0%	3.0	8.3	17.3	3.24	5.77	14.1	29.2
D25				3.27	0.60	0.70	1.96	2.29	50	2.0%	8.9	1850	2.0%	3.0	10.3	19.2	3.08	5.47	6.0	12.5
D26				7.23	0.60	0.70	4.34	5.06	50	2.0%	8.9	1550	2.5%	3.2	8.1	17.0	3.26	5.81	14.2	29.4
D27				3.35	0.60	0.70	2.01	2.35	50	2.0%	8.9	1800	2.5%	3.2	9.4	18.3	3.15	5.61	6.3	13.1
D28				4.58	0.60	0.70	2.75	3.21	50	2.0%	8.9	1200	1.3%	2.5	8.0	16.9	3.27	5.82	9.0	18.7
D29				2.70	0.60	0.70	1.62	1.89	50	2.0%	8.9	550	2.8%	3.3	2.8	11.7	3.85	6.86	6.2	13.0
D30				3.32	0.60	0.70	1.99	2.32	50	2.0%	8.9	900	3.3%	3.7	4.1	13.0	3.69	6.57	7.3	15.3
D31				6.66	0.60	0.70	4.00	4.66	50	2.0%	8.9	1300	2.8%	3.3	6.6	15.5	3.41	6.07	13.6	28.3
D40				9.31	0.40	0.50	3.72	4.66	200	2.0%	17.9	800	1.2%	2.0	6.7	24.5	2.71	4.82	10.1	22.4
D41				3.83	0.60	0.70	2.30	2.68	50	2.0%	8.9	700	1.9%	3.0	3.9	12.8	3.71	6.60	8.6	17.7
D42				3.78	0.60	0.70	2.27	2.65	50	2.0%	8.9	1600	1.9%	3.0	8.9	17.8	3.19	5.68	7.2	15.0
D43				4.03	0.60	0.70	2.42	2.82	50	2.0%	8.9	1600	1.9%	3.0	8.9	17.8	3.19	5.68	7.7	16.0
D44				4.91	0.60	0.70	2.95	3.44	50	2.0%	8.9	1000	3.5%	3.8	4.4	13.3	3.65	6.50	10.8	22.3
D45				6.27	0.60	0.70	3.76	4.39	50	2.0%	8.9	1100	3.5%	3.8	4.8	13.8	3.60	6.40	13.5	28.1
D46				4.34	0.60	0.70	2.60	3.04	50	2.0%	8.9	2000	2.5%	3.2	10.4	19.4	3.06	5.45	8.0	16.6
D47				5.38	0.60	0.70	3.23	3.77	40	2.0%	8.0	1400	3.7%	4.0	5.8	13.8	3.59	6.39	11.6	24.1
D48				1.59	0.70	0.80	1.07	1.22	40	2.0%	8.0	1200	3.0%	4.0	5.0	13.0	3.69	6.57	4.0	8.0
D49				1.27	0.70	0.80	0.89	1.02	40	2.0%	8.0	800	3.0%	4.0	3.3	11.3	3.91	6.95	3.5	7.1
10	Sewer		D10, D11	13.56			6.10	7.45			21.0	0	2.0%	5.0	0.0	21.0	2.94	5.23	17.9	39.0
11	Sewer		10, D12, D13, D18	38.83			22.05	25.94			21.0	600	2.5%	5.0	2.0	23.0	2.80	4.99	61.8	129.3
12	Sewer		11, D14, D15	47.12			27.03	31.74			23.0	550	2.5%	5.0	1.8	24.9	2.69	4.79	72.7	151.8
13	Sewer		12, D16, D17	63.98			35.95	42.35			24.9	800	3.0%	5.0	2.7	27.5	2.54	4.52	91.4	191.6
20	Sewer		D20, D21	11.13			6.68	7.79			18.9	100	2.0%	5.0	0.3	19.3	3.07	5.47	20.5	42.6
21	Sewer		20, D23, D24, D22	25.40			14.38	16.49			20.9	0	0.0%	5.0	0.0	20.9	2.94	5.24	42.3	86.4
22	Sewer		21, D25, D26, D27, D28	43.83			25.44	29.39			20.9	600	3.0%	7.0	1.4	22.4	2.84	5.06	72.4	148.8
23	Street		D31, D30, D22 (fb)	13.66			6.85	8.28			13.0	1400	2.5%	6.0	3.9	16.9	3.28	5.83	22.4	48.3
40	Sewer		D40, D41, D42	16.92			7.74	9.18			24.5	850	1.8%	7.0	2.0	26.6	2.59	4.62	20.1	42.4
41	Sewer		D44, D45	11.18			6.71	7.83			13.8	0	0.0%	5.0	0.0	13.8	3.60	6.40	24.1	50.1
42	Sewer		22, 40, 41, D29, D42(fb), D44(fb), D43	87.35			45.38	53.17			26.6	500	1.5%	10.0	0.8	27.4	2.55	4.54	115.7	241.2
43	Sewer		23, 42, D48	102.54			53.30	62.67			27.4	200	1.5%	10.0	0.3	27.7	2.53	4.51	134.9	282.4

Cumbre Vista Filing 1
 Flow By Inlets
 Interim/Developed Conditions

Flow By Inlets

Design Point	Storm Event	Q (cfs)	Spread (ft)	Gross Slope (%)	Street Slope (%)	I (in/hr)	Fr	L(1)	L(2)	L(3)	Inlet Size (ft)	Q(in) (cfs)	CA (in)	Q(fb) (cfs)	CA (ft)
D22	5-year	6.5	10.0	2.0%	3.0%	2.95	2.09	16.1	9.7	34.5	10	4.0	1.35	2.5	0.86
	100-year	13.5	12.0	2.0%	3.0%	5.25	2.17	20.0	12.0	42.9	10	6.7	1.29	6.8	1.29
D42	5-year	7.2	10.0	2.0%	1.0%	3.19	1.21	9.3	5.6	19.9	10	5.5	1.72	1.7	0.55
	100-year	15.0	12.0	2.0%	1.0%	5.68	1.25	11.6	6.9	24.8	10	10.5	1.84	4.6	0.81
D44	5-year	10.8	10.0	2.0%	1.6%	3.65	1.53	11.8	7.1	25.2	10	7.4	2.04	3.3	0.91
	100-year	22.3	12.0	2.0%	1.6%	6.50	1.58	14.6	8.8	31.4	10	14.1	2.18	8.2	1.26
D46	5-year	8.0	14.0	1.5%	1.6%	3.06	1.56	15.4	8.7	36.0	10	4.8	1.56	3.2	1.04
	100-year	16.6	16.0	1.5%	1.6%	5.45	1.60	18.0	10.2	42.2	10	9.2	1.68	7.4	1.35
D48	5-year	4.0	6.0	2.0%	1.6%	3.69	1.36	6.3	3.8	13.5	10	3.5	0.95	0.4	0.12
	100-year	8.0	8.0	2.0%	1.6%	6.57	1.45	9.0	5.4	19.2	10	6.2	0.94	1.8	0.28

Cumbre Vista Filing 1
 Sump Inlets

Design Point	Storm Event	Q (cfs)	Inlet Size (ft)	Clogging Factor	Calculated Depth (ft)	D(max) (ft)	Meets Criteria?
D20	5-year	6.4	10	1.25	0.39	0.50	yes
	100-year	13.2	10	1.25	0.63	1.00	yes
D21	5-year	14.4	15	1.25	0.51	0.50	no
	100-year	30.0	15	1.25	0.83	1.00	yes
D23	5-year	5.9	10	1.25	0.37	0.50	yes
	100-year	12.3	10	1.25	0.60	1.00	yes
D24	5-year	14.1	15	1.25	0.50	0.50	no
	100-year	29.2	15	1.25	0.82	1.00	yes
D25	5-year	6.0	10	1.25	0.37	0.50	yes
	100-year	12.5	10	1.25	0.61	1.00	yes
D26	5-year	14.2	15	1.25	0.50	0.50	no
	100-year	29.4	15	1.25	0.82	1.00	yes
D27	5-year	6.3	10	1.25	0.39	0.50	yes
	100-year	13.1	10	1.25	0.63	1.00	yes
D28	5-year	9.0	15	1.25	0.37	0.50	yes
	100-year	18.7	15	1.25	0.61	1.00	yes
D29	5-year	6.2	10	1.25	0.38	0.50	yes
	100-year	13.0	10	1.25	0.62	1.00	yes
Design Point 23	5-year	22.4	20	1.25	0.57	0.67	yes
	100-year	48.3	20	1.25	0.94	1.00	yes
D41	5-year	8.5	10	1.25	0.47	0.50	yes
	100-year	17.7	10	1.25	0.77	1.00	yes
D43	5-year	7.7	20	1.25	0.28	0.50	yes
	100-year	16.0	20	1.25	0.45	1.00	yes
D45	5-year	13.5	15	1.25	0.49	0.50	yes
	100-year	28.1	15	1.25	0.80	1.00	yes
D47	5-year	11.6	15	1.25	0.44	0.50	yes
	100-year	24.1	15	1.25	0.72	1.00	yes
D49	5-year	3.5	5	1.25	0.41	0.50	yes
	100-year	7.1	5	1.25	0.66	1.00	yes

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

Designer: _____
 Company: Matrix Design Group, Inc.
 Date: April 1, 2005
 Project: Cumbre Vista Filing 1
 Location: El Paso County

<p>1. Basin Storage Volume</p> <p>A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)</p> <p>B) Contributing Watershed Area (Area)</p> <p>C) Water Quality Capture Volume (WQCV) ($WQCV = 1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I)$)</p> <p>D) Design Volume: $Vol = (WQCV / 12) * Area * 1.2$</p>	<p>$I_a = \frac{60.00}{0.60} \%$</p> <p>Area = <u>102.00</u> acres</p> <p>WQCV = <u>0.24</u> watershed inches</p> <p>Vol = <u>2.409</u> acre-feet</p>
<p>2. Outlet Works</p> <p>A) Outlet Type (Check One)</p> <p>B) Depth at Outlet Above Lowest Perforation (H)</p> <p>C) Required Maximum Outlet Area per Row, (A_o)</p> <p>D) Perforation Dimensions (enter one only): i) Circular Perforation Diameter OR ii) 2" Height Rectangular Perforation Width</p> <p>E) Number of Columns (nc, See Table 6a-1 For Maximum)</p> <p>F) Actual Design Outlet Area per Row (A_o)</p> <p>G) Number of Rows (nr)</p> <p>H) Total Outlet Area (A_{ot})</p>	<p><input checked="" type="checkbox"/> Orifice Plate</p> <p><input type="checkbox"/> Perforated Riser Pipe</p> <p><input type="checkbox"/> Other: _____</p> <hr/> <p>H = <u>8.00</u> feet</p> <p>$A_o = \frac{641}{24} = 26.71$ square inches</p> <p>D = <u>1.000</u> inches, OR W = _____ inches</p> <p>$nc = \frac{18.85}{26.71} = 0.706$ number</p> <p>$A_o = 26.71$ square inches</p> <p>$nr = \frac{18.85}{26.71} = 0.706$ number</p> <p>$A_{ot} = 18.85$ square inches</p>
<p>3. Trash Rack</p> <p>A) Needed Open Area: $A_t = 0.5 * (\text{Figure 7 Value}) * A_{ot}$</p> <p>B) Type of Outlet Opening (Check One)</p> <p>C) For 2", or Smaller, Round Opening (Ref.: Figure 6a): i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1 ii) Height of Trash Rack Screen (H_{TR})</p>	<p>$A_t = \frac{641}{2} = 320.5$ square inches</p> <p><input checked="" type="checkbox"/> $\leq 2"$ Diameter Round</p> <p><input type="checkbox"/> 2" High Rectangular</p> <p><input type="checkbox"/> Other: _____</p> <hr/> <p>$W_{conc} = 9$ inches</p> <p>$H_{TR} = 126$ inches</p>

APPENDIX C

STANDARD DESIGN CHARTS AND TABLES

TABLE 5-1

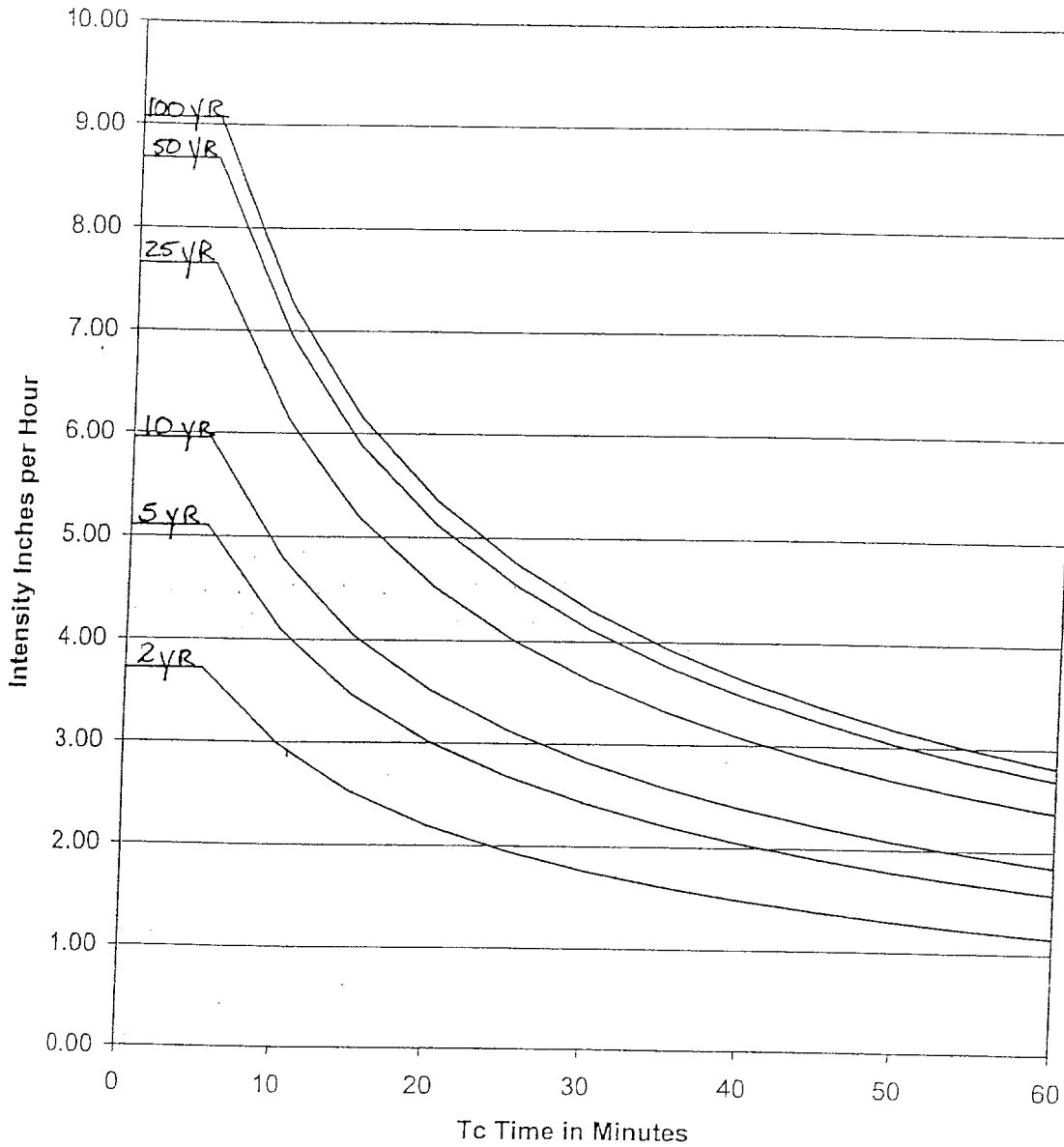
RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY			
		10		100	
		A&B*	C&D*	A&B*	C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries					
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					
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

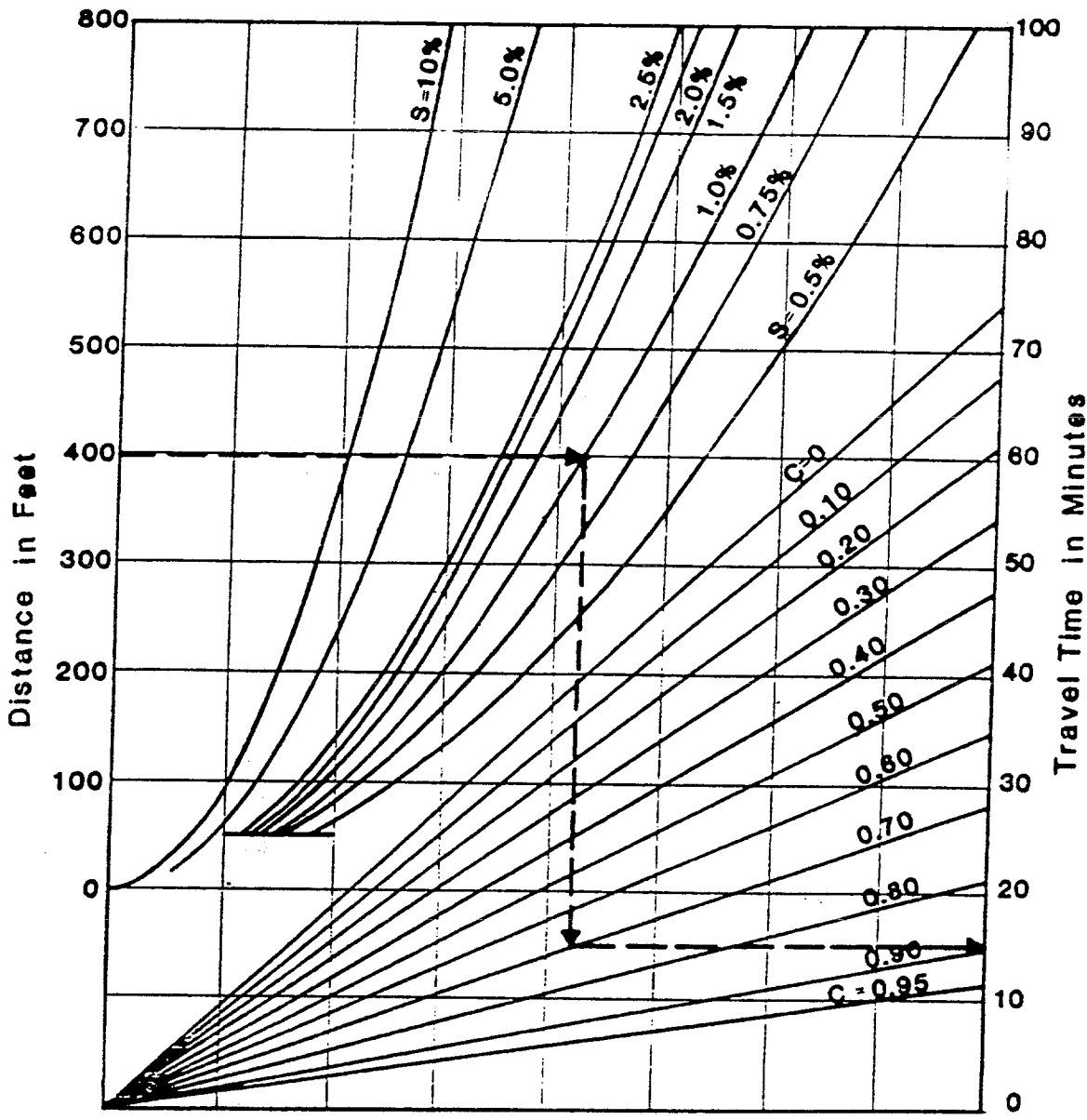
* Hydrologic Soil Group

9/30/90

Storm Rainfall Time Intensity-Frequency Curves



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



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



HDR Infrastructure, Inc.
 A Centerra Company

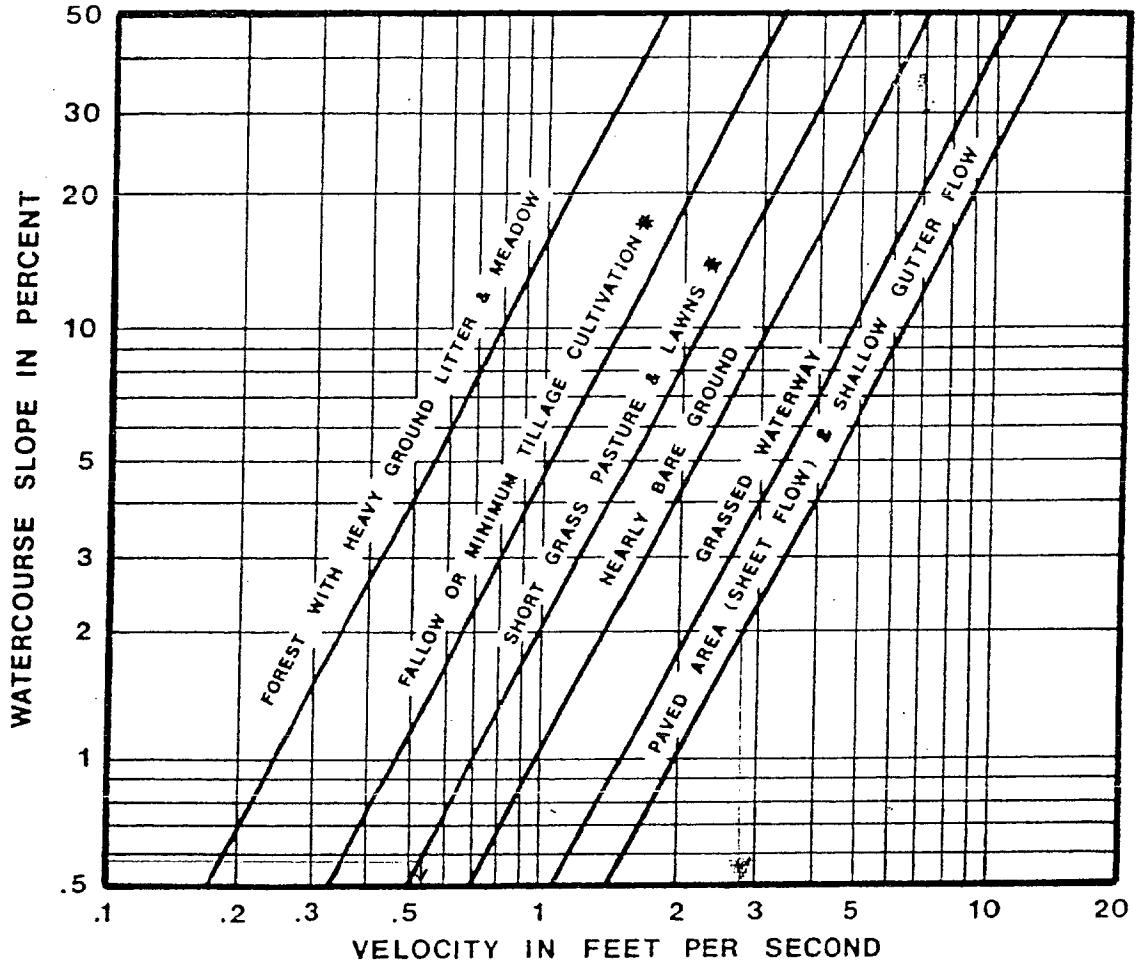
The City of Colorado Springs / El Paso County
 Drainage Criteria Manual

Overland Flow Curves

Date
 OCT. 1987

Figure

5-2



ESTIMATE OF AVERAGE FLOW VELOCITY FOR USE WITH THE RATIONAL FORMULA.

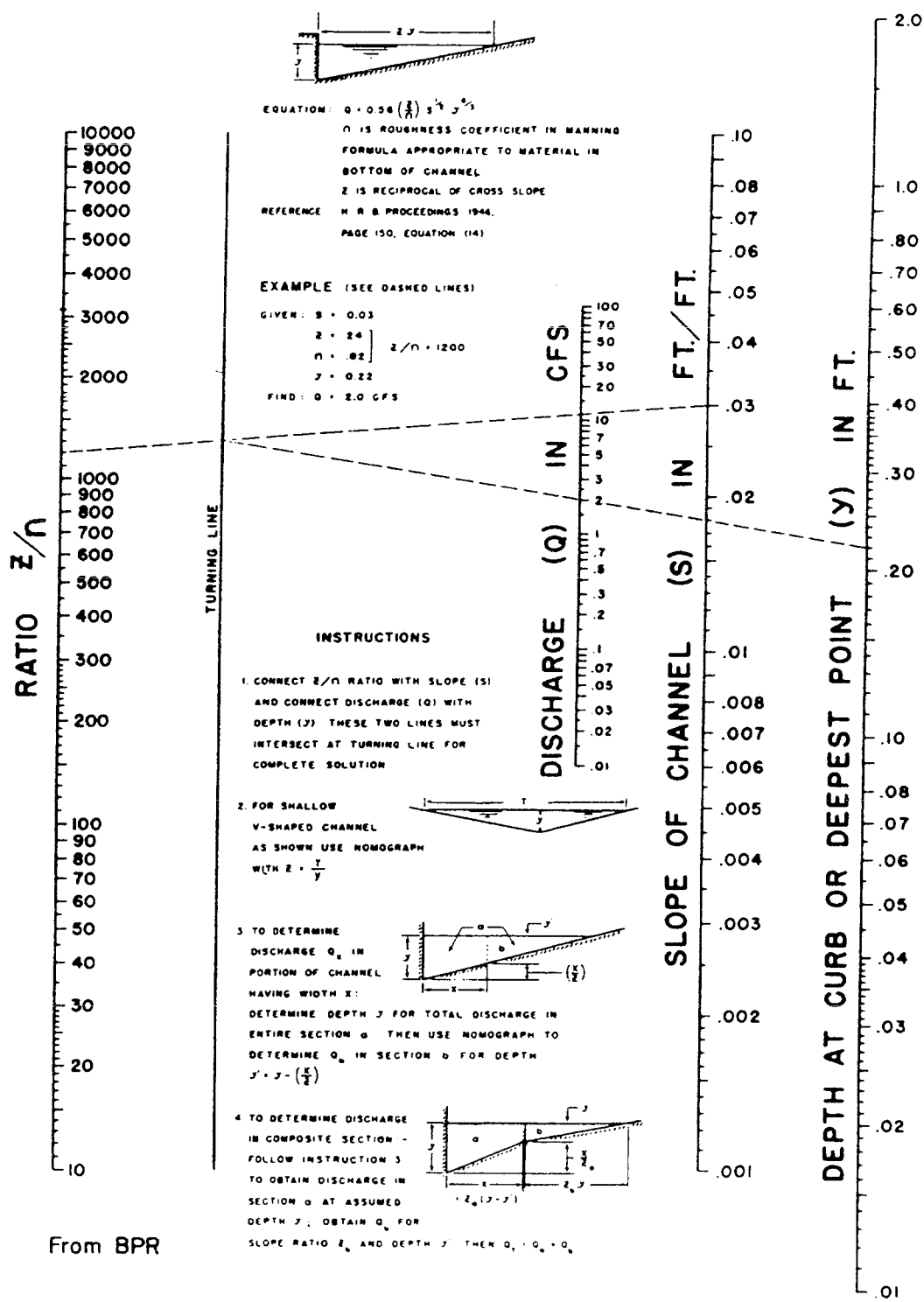
* MOST FREQUENTLY OCCURRING "UNDEVELOPED" LAND SURFACES IN THE DENVER REGION.

REFERENCE: "Urban Hydrology For Small Watersheds" Technical Release No. 55, USDA, SCS Jan. 1975.

FIGURE 2

5-1-84

URBAN DRAINAGE & FLOOD CONTROL DISTRICT



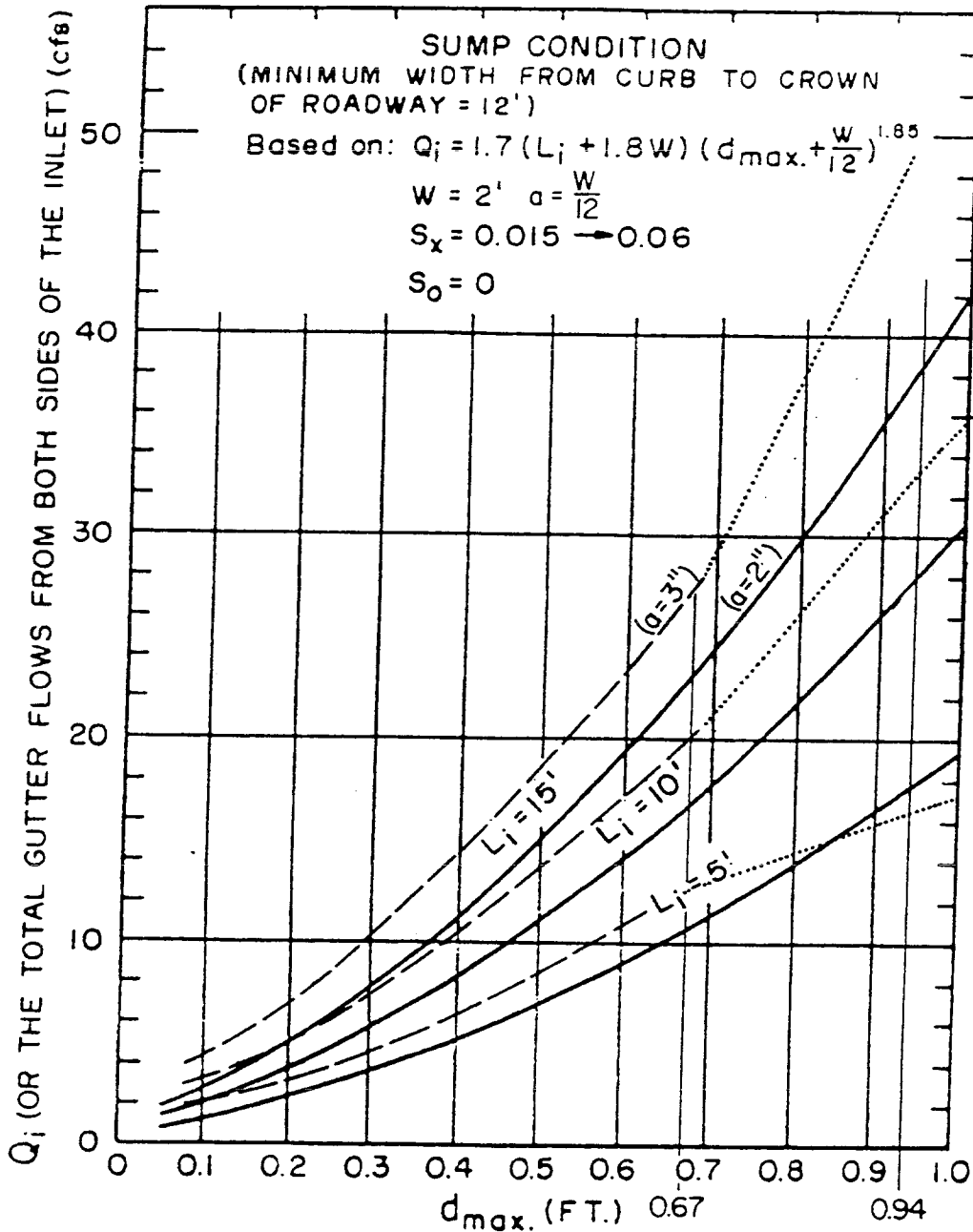
From BPR

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



The City of Colorado Springs / El Paso County
 Drainage Criteria Manual
NONOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

Date
OCT. 1987
 Figure
7 - 2



REFERENCE : Izzard, Carl. I., 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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Drainage Criteria Manual

Sump Capacity for Curb-opening Inlets

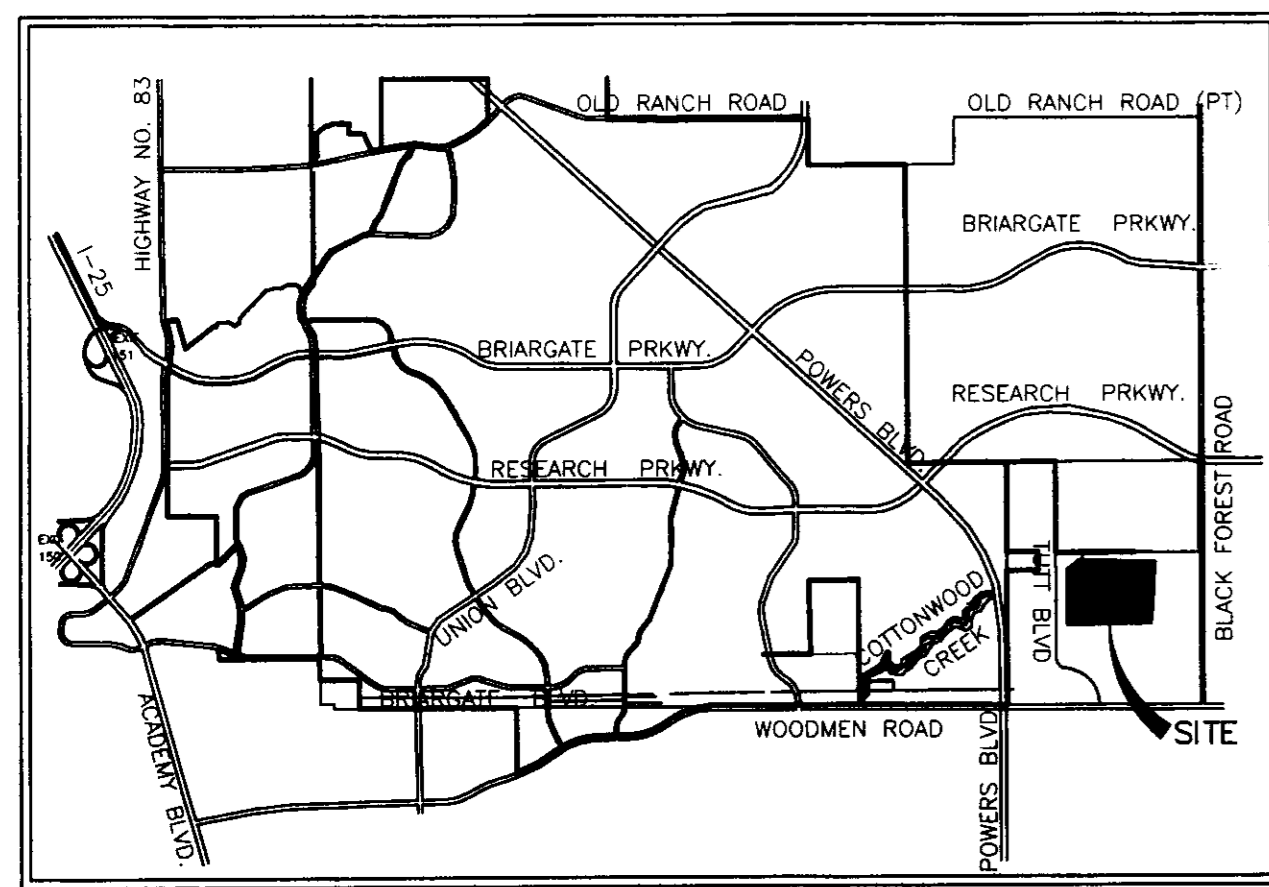
7-38

Date

OCT. 1987

Figure

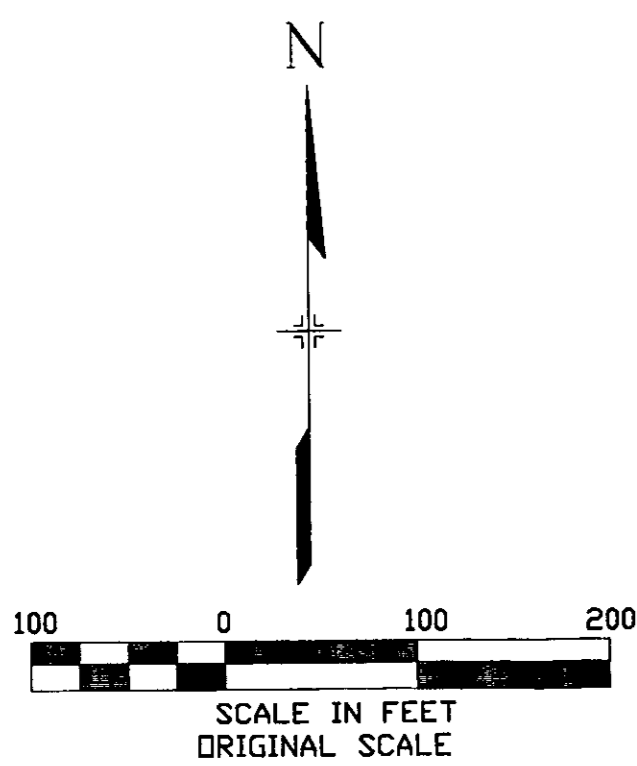
7-11



VICINITY MAP
NORTH
NTS

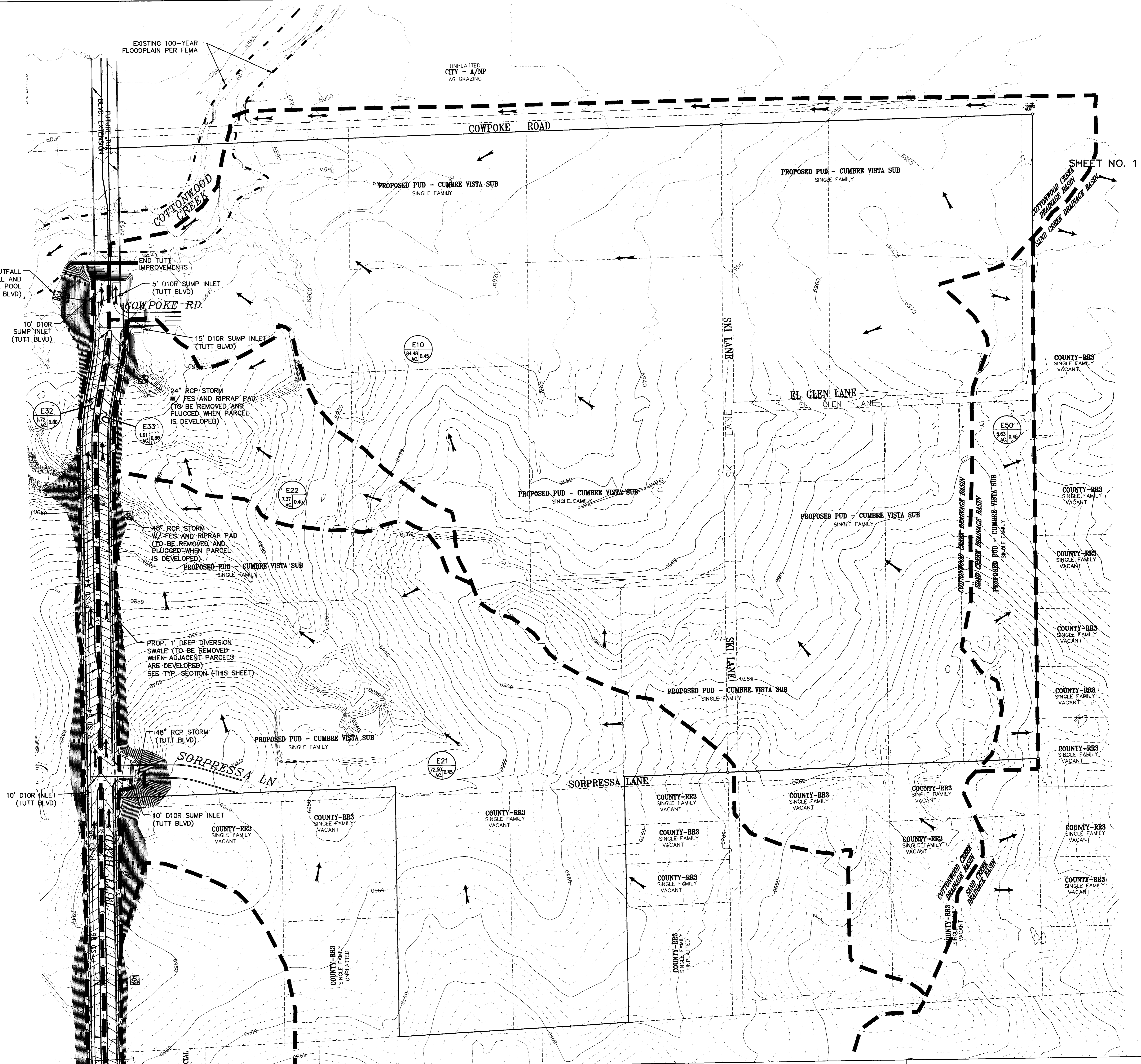
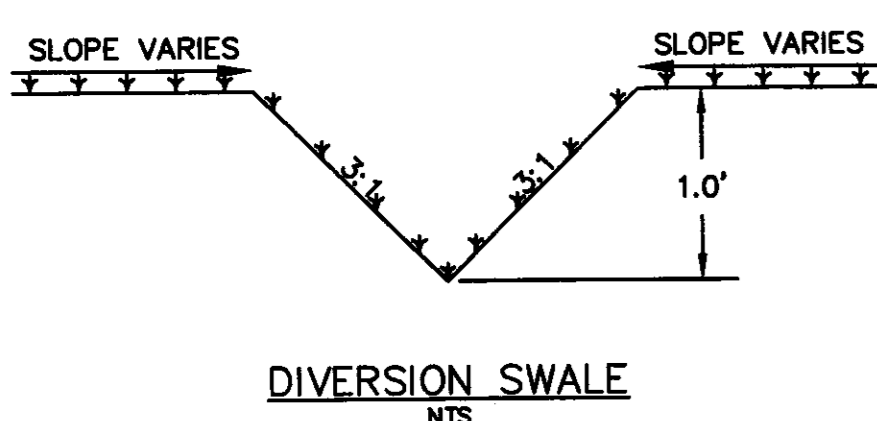
LEGEND

- RIGHT OF WAY
- DRAINAGE BASIN BOUNDARY
- PROPOSED CONTOUR
- EXISTING CONTOUR
- PROPOSED STORM SEWER W/ SIZE OF PIPE
- 100-YEAR FLOODPLAIN
- PROPOSED D10R INLET
- PROPOSED MANHOLE
- PROPOSED FLOW DIRECTION ARROW
- DESIGN POINT
- BASIN DESIGNATION
- "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)



SUB-BASIN DATA SUMMARY

BASIN ID	AREA	Q ₅ (cfs)	Q ₁₀₀ (cfs)
E10	84.48	61.5	164.3
E21	72.50	55.2	147.3
E22	7.37	7.3	19.4
E32	1.72	4.3	8.8
E33	1.61	4.0	8.2
E50	5.63	6.2	16.5



SHEET NO. 1

NO.	DATE	DESCRIPTION	BY
REVISIONS			
BENCHMARK DATA (ELEV.)			
(DATUM)			
(DESCRIPTION/LOCATION)			

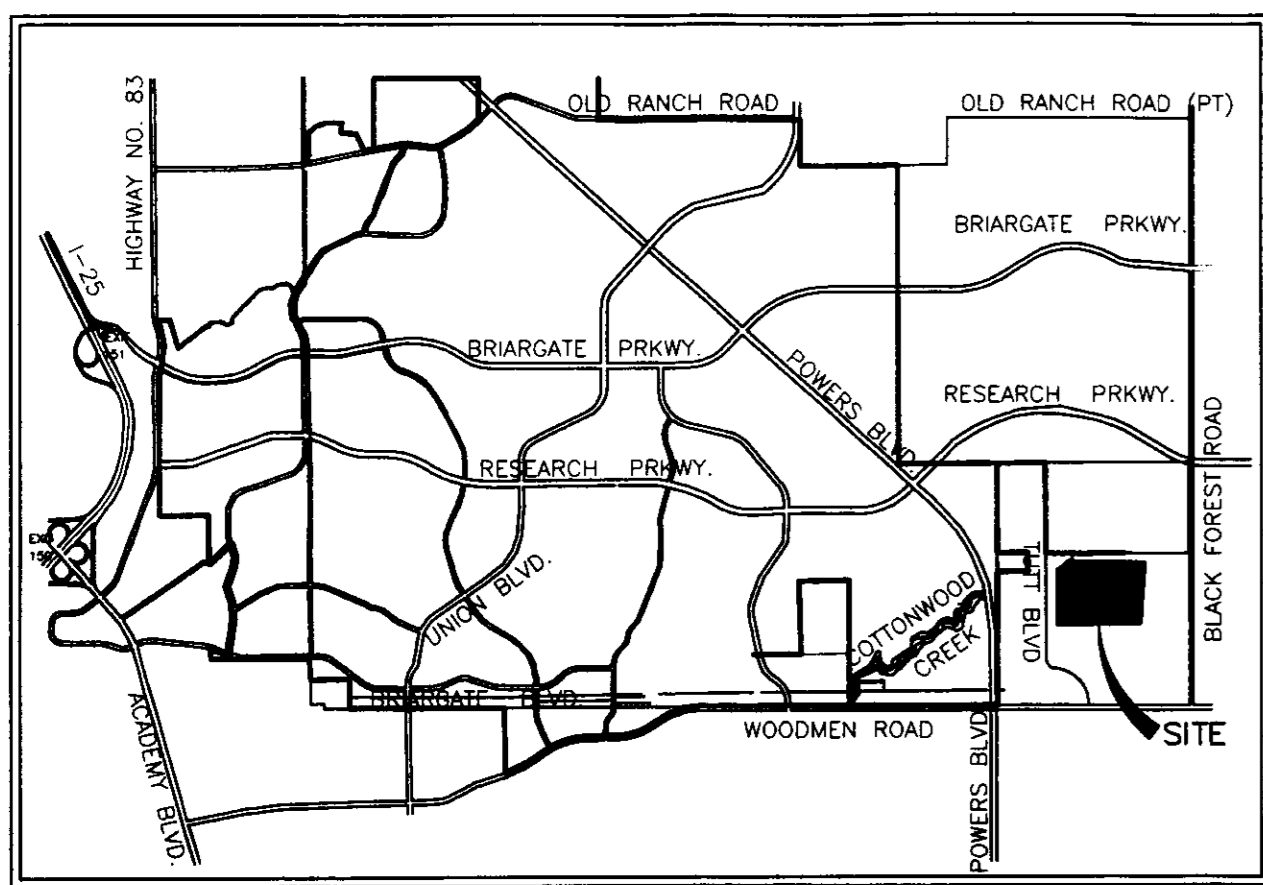
NAME: S:\05185\001(Powerwood)\dwg\Drainage\DR01.dwg	
PCP: Matrix.cib	
PLOT DATE: Jul 21, 2005 11:09am	

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

CUMBRE VISTA FILING NO. 1
PRELIMINARY/FINAL DRAINAGE REPORT
EXISTING CONDITIONS
DRAINAGE MAP

DESIGNED BY: RGC	SCALE: 1"=100'	DATE ISSUED: APRIL 2005	DP01
DRAWN BY: RGC	HORIZ: N/A	SHEET NO. 1 OF 3 SHEETS	
CHECKED BY: RGC	VERT: N/A		

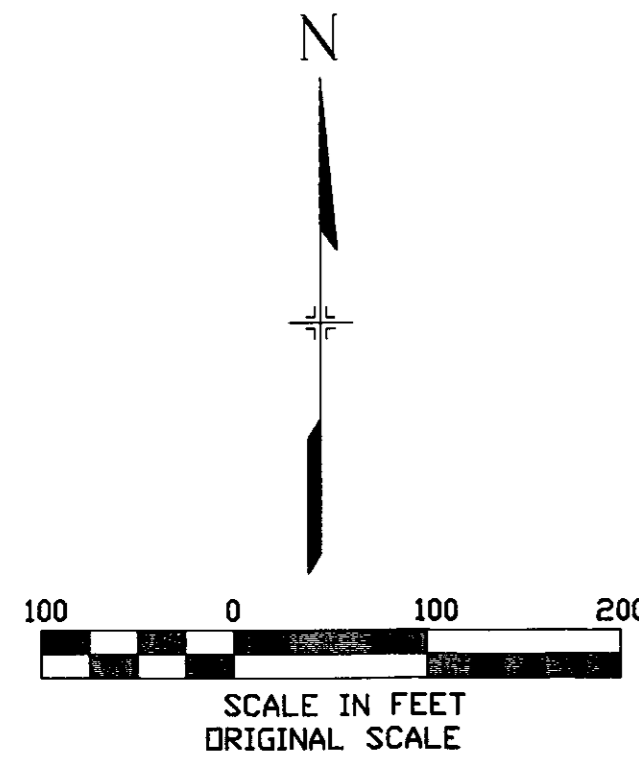
X=STORM
X=PP-GRADING
X=STORM



VICINITY MAP

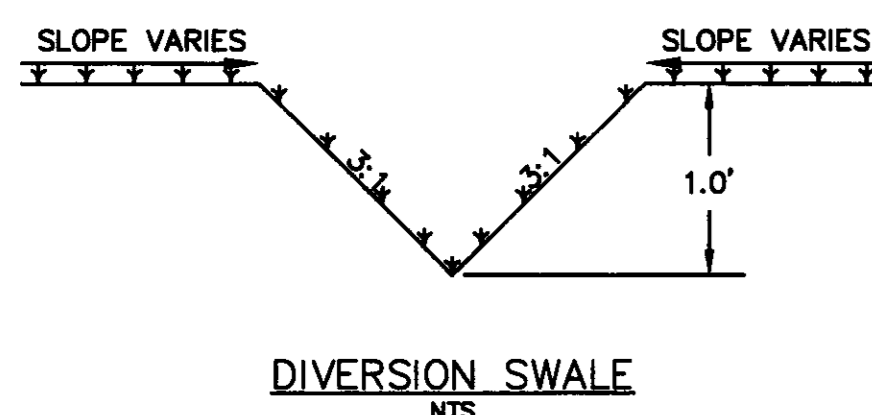
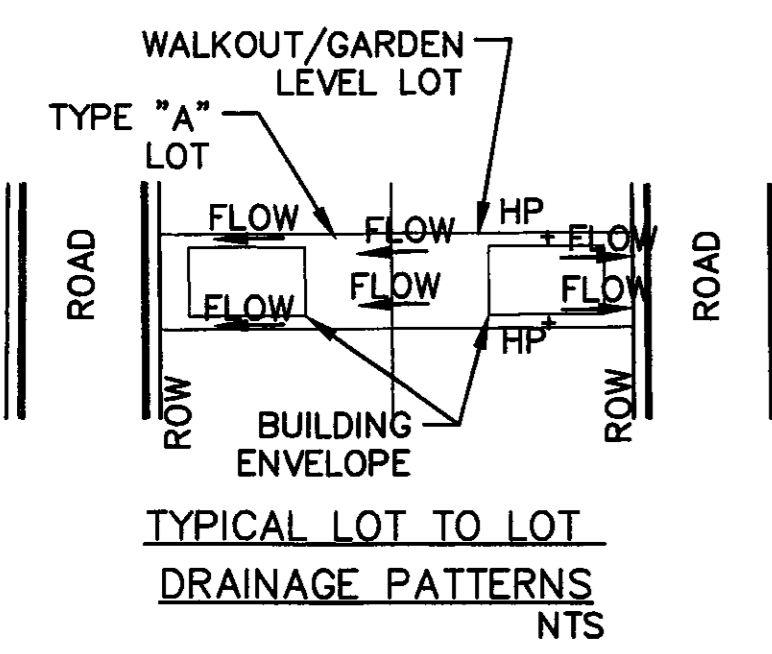
LEGEND

- RIGHT OF WAY
- DRAINAGE BASIN BOUNDARY
- - - PROPOSED CONTOUR
- - - EXISTING CONTOUR
- - - PROPOSED STORM SEWER W/ SIZE OF PIPE
- - - 100-YEAR FLOODPLAIN
- - - PROPOSED D10R INLET
- - - PROPOSED MANHOLE
- - - PROPOSED FLOW DIRECTION ARROW
- ▲ DESIGN POINT
- BASIN DESIGNATION
- "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)



SUR-BASIN DATA SUMMARY

DESIGN POINT	Q ₅ (cfs)	Q ₁₀₀ (cfs)
50	32.3	73.6
51	49.2	111.9
52	50.1	114.0
53	57.7	131.4
54	100.7	222.8



NO.	DATE	DESCRIPTION REVISIONS	BY

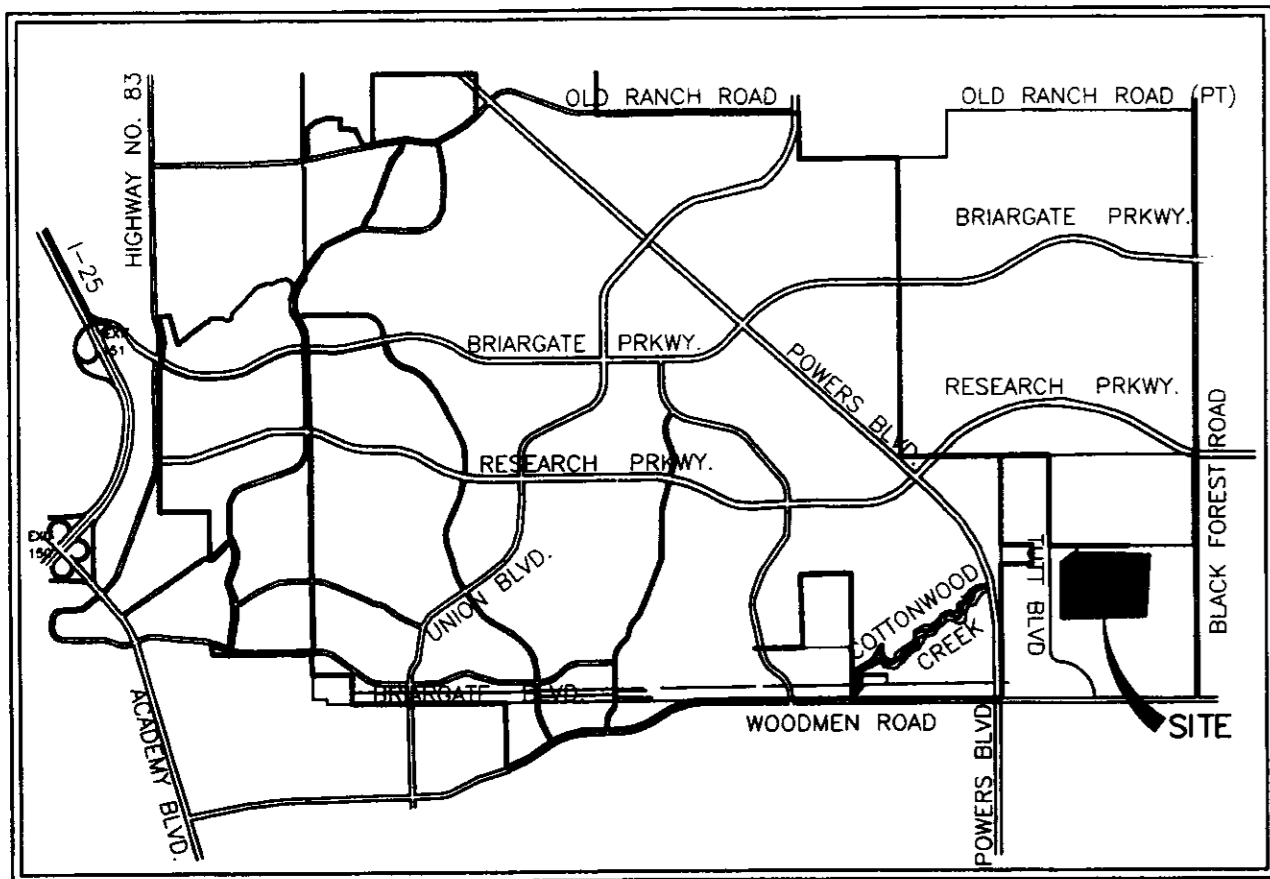
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PCP: Matrix.ctb	(DATUM)
PLOT DATE: Jul 21, 2005 11:29am	(DESCRIPTION/LOCATION)

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

CUMBRE VISTA FILING NO. 1
PRELIMINARY/FINAL DRAINAGE REPORT
INTERIM CONDITIONS
DRAINAGE MAP
CUMBRE VISTA FILING 1

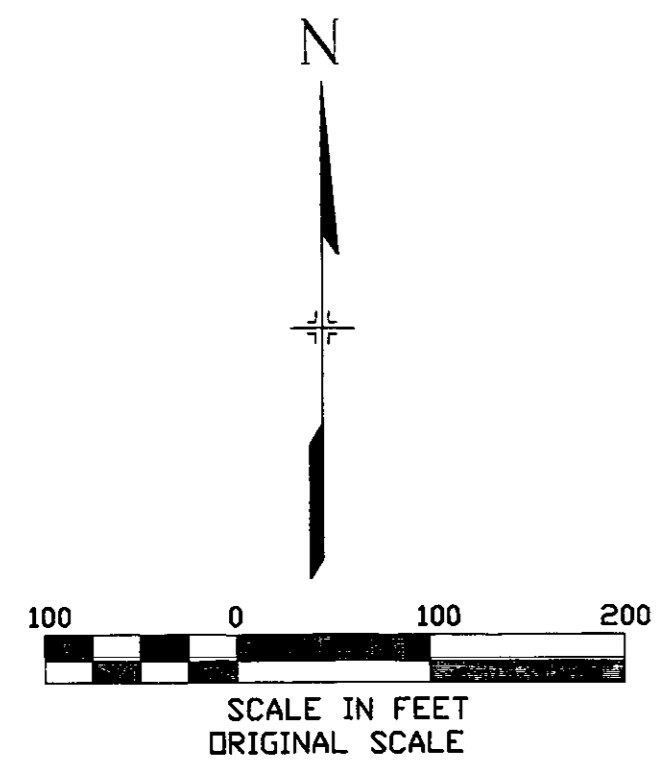
DESIGNED BY: RGG	SCALE: 1"=100'	DATE ISSUED: APRIL 2005
DRAWN BY: RGG	HORIZ: N/A	SHEET NO. 2 OF 3 SHEETS
CHECKED BY: RGG	VERT: N/A	DP02



VICINITY MAP

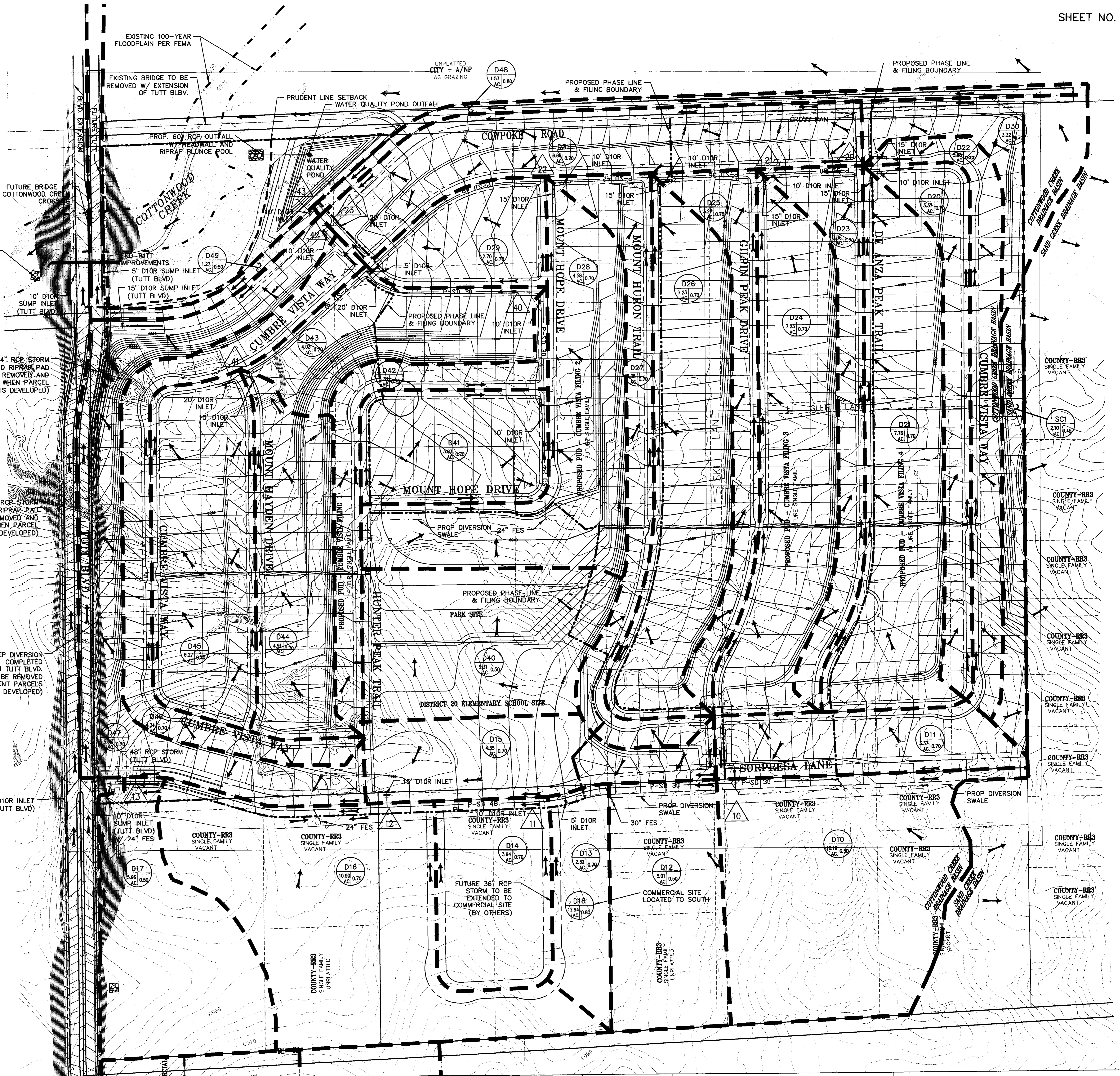
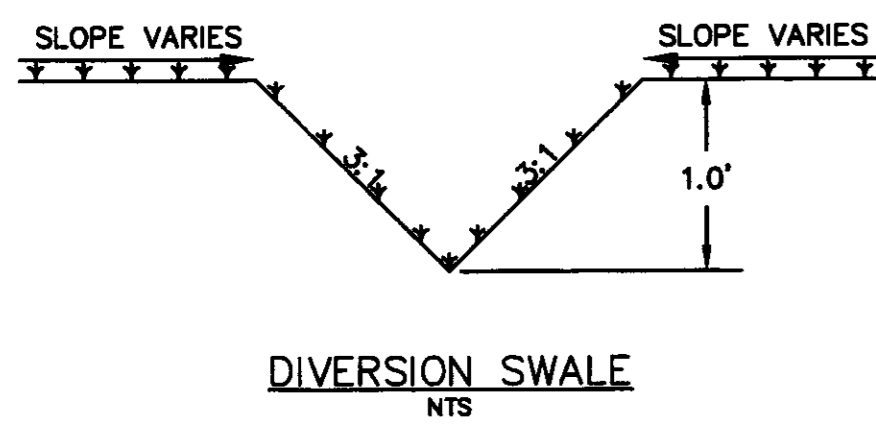
LEGEND

- RIGHT OF WAY
- DRAINAGE BASIN BOUNDARY
- PROPOSED CONTOUR
- EXISTING CONTOUR
- PROPOSED STORM SEWER W/ SIZE OF PIPE
- 100-YEAR FLOODPLAIN
- PROPOSED D10R INLET
- PROPOSED MANHOLE
- PROPOSED FLOW DIRECTION ARROW
- DESIGN POINT
- BASIN DESIGNATION
- "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)



SUB-BASIN DATA SUMMARY

DESIGN POINT	Q ₅ (cfs)	Q ₁₀₀ (cfs)
10	10.0	21.7
11	60.9	127.6
12	73.8	154.3
13	90.6	191.6
20	19.9	41.3
21	41.8	85.3
22	75.9	155.9
23	20.2	44.0
40	14.8	33.0
41	23.4	48.6
42	113.2	237.2
43	130.5	274.6



CUMBRE VISTA FILING NO. 1

PRELIMINARY/FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS DRAINAGE MAP

Matrix Design Group, Inc.
Integrated Design Solutions 2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
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DESIGNED BY: RGD SCALE: 1"=100' DATE ISSUED: APRIL 2005
DRAWN BY: RGD HORIZ: N/A SHEET NO. 3 OF 3 SHEETS
CHECKED BY: RGD VERT: N/A

DP03

NO.	DATE	DESCRIPTION	BY
REVISIONS			
BENCHMARK DATA (ELEV.)			
(DATUM)			
(DESCRIPTION/LOCATION)			

NAME: S:\05.185.001(Powerwood)\dwg\Drainage\DR03.dwg
PCP: Matrix.ctb
PLOT DATE: Jul 21, 2005 11:27am