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FINAL DRAINAGE REPORT FOR INDEPENDENCE PLACE AT CHEYENNE MOUNTAIN FILING NO. 1

Prepared for:
Peoples National Bank
5175 N. Academy Blvd.
Colorado Springs, CO 80918

ATTN: Mr. Terry Hillman

Job no. 2320.00

CLASSIC CONSULTING ENGINEERS & SURVEYORS

6385 Corporate Drive, Ste. #101 Colorado Springs, CO 80919 (719) 785-0790 www.ClassicConsulting.net

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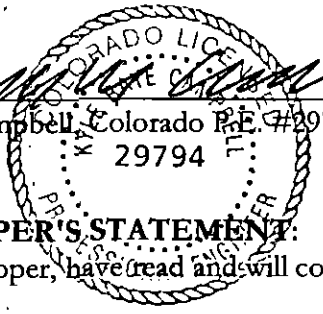
DRAINAGE REPORT STATEMENT

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 El Paso 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.



Kyle R. Campbell, Colorado P.E. #29794 — Date: 3.1.12

DEVELOPER'S STATEMENT:

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

Business Name: Peoples National Bank

By:

Title: V.P.

Address: 5175 N. Academy Blvd.

Colorado Springs, CO 80918

EL PASO COUNTY:

Filed in accordance with Section 51.1 of the El Paso County Land Development Code, 1980, as amended.

County Engineer — Date: 5-16-12

Conditions:

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FINAL DRAINAGE REPORT FOR INDEPENDENCE PLACE AT CHEYENNE MOUNTAIN

PURPOSE

This document is the Final Drainage Report for Independence Place at Cheyenne Mountain Filing No. 1. The purpose of this report is to identify onsite and offsite drainage patterns, storm sewer, inlet locations, and areas tributary to the site, and to safely route developed storm water runoff to adequate outfall facilities.

GENERAL DESCRIPTION

The Independence Place at Cheyenne Mountain Filing No. 1 site is a 15.46 acre site located in the south-west corner of Section 33, Township 14 South, and Range 66 West and in the north-west corner of Section 4, Township 15 South, and Ranch 66 West of the Sixth Principal Meridian in the County of El Paso, and State of Colorado. The site is bound to the south and west by the existing Stratmoor Hills Subdivisions and the Stratmoor Hills United Methodist Church (un-platted), to the north and east by Venetucci Blvd. and the Colorado Springs World Arena and adjacent developments. Westmark Ave. is located to the south of the proposed site. The Independence Place at Cheyenne Mountain Filing No. 1 site will contain multiple 3-story apartment buildings with a community center and outdoor swimming pool.

The average soil condition reflects Hydrologic Group "C". Per the Soil Map, the existing subdivisions tributary to the proposed site is of Group "B" (Fort Collins loam), with the portions of the existing tributary area and all on-site soils being Group "C" (Schamber-Razor complex and Nunn clay loam). The soils types are determined by the "Soil Survey of El Paso County Area," prepared by the Soil Conservation Service (see map in Appendix). For the purpose of this analysis Type 'C' soils were used in the development area.

EXISTING DRAINAGE CONDITIONS

The site is located within the Stratton Drainage Basin. This site was originally studied as a part of the "Master Drainage Plan Harrison Street – I-25 Vicinity Cheyenne Mountain Ranch," by Hartzell – Pfeiffenberger and Associates, Inc. dated November 15, 1973. Since then the site was included in additional basin analysis reports; "Stratton and Fischer's Canyon Drainage Basin Planning Study, Draft Hydraulic Analysis," by Muller Engineering Co. dated May 31, 1990; the "Master Drainage Report for Cheyenne Mountain Center and Final Drainage Report for Cheyenne Mountain Center Filing No. 1 and Cheyenne Meadows Road," by Drexel Barrell, dated October 1985; the "Hydrology Report Stratton Drainage Basin Outfall Study," by Drexel Barrell, dated June 1994; and the "Preliminary and Final Drainage Report and

Plan for World Arena Subdivision No. 1," by Obering, Wurth & Associates, August 1994 revised March 1995.

The most recent master study drainage report for this area that included the proposed site was the "Hydrology Report Stratton Drainage Basin Outfall Study El Paso County, Colorado," by Drexel Barrell, dated June 9, 1994. This Hydrology Report by Drexel Barrell conforms to current El Paso County criteria and was performed based on minor modifications and revisions to TR-20 data prepared in the 1990 study by Muller Engineering Co. This Hydrology Report also updated the hydrologic modeling completed in the 1985 study by Drexel Barrell with the correct 2 hour and 24 hour storms that are utilized in the current criteria. This report provides the basis for the proposed site's allowable release rate since it sized and described the 90"/102" RCP storm outfall system (Sinton Outfall). This system runs parallel with the eastern site boundary, along the opposite site of Venetucci Blvd. A Drainage Map from the Drexel Barrell Hydrology Study is included in the appendix of this report for reference.

The proposed 15.46 acre site is included within Basin 009 of this previous study. At the time of the Drexel Barrell Hydrology Study, existing box culverts conveyed the runoff from Basin 009 under Venetucci Blvd. /Old Hwy 85-87 to the existing 14' x 11.7' box culvert crossing under Interstate 25 and to the east into Fountain Creek. The development of Cheyenne Mountain Center constructed the 'Sinton Outfall' RCP storm sewer system that accepts the allowable release rates of the upstream parcels and conveys them along the historic drainage pattern of under I-25 and into the Sinton Channel, which connects to Fountain Creek. This large storm system consists of 102" RCP and 90" RCP storm main, with appropriate sized storm laterals to account for the flows quantified within the Drexel Barrell Hydrology Report. Basin 009 of this previous report consists of 0.147 square miles (94.08 acres) and was modeled using a CN value of 81 (SCS Method since entire study area was over 100 acres). Per the Drainage Criteria Manual Vol. 1 Table 5-5 a CN of 81 is equivalent to 1/3 acre home lots with all Group C soils, or about 1/6 acre home lots with all Group B soils. The existing Stratmoor Hills subdivision is also located within this Basin 009, with homes slightly over 2 lots per acre; and since these homes are within Group B soils, a more accurate CN value for the existing development would be around 71. Therefore, the remaining area of Basin 009 (the proposed Independence Place at Cheyenne Mountain Filing No. 1 site) is allowed to be substantially higher density than the calculated CN of 81. Also, runoff from Basin 008 of the previous report overflows the existing curb storm inlets and a portion drains onto the Venetucci Blvd. right-of-way within the Basin 009 area.

Thus the actual total release from the developed site can be higher than the assumed Basin 009 flows (Q_{100} = 270 cfs, 24 hour duration storm event).

When the World Arena was constructed to the immediate north of the proposed site, street improvements were made to Venetucci Blvd. that expanded the existing storm sewer facilities constructed with the Sinton Outfall main (Drexel Barrell Report). Many curb inlets were placed along the improved roadways at the Cheyenne Meadows Road intersection and Bob Johnson Drive intersection. Using the "Preliminary and Final Drainage Report and Plan for World Arena Subdivision No. 1," by Obering, Wurth & Associates, August 1994 revised March 1995 and the "Roadway Improvement Package and Storm Sewer Package for US Highway 85/87 (Venetucci Boulevard)," by Drexel Barrell including the as-built revisions; these storm modifications have been incorporated into this report and construction drawings for the proposed development. The following will describe the existing runoff quantities and existing facilities in more detail at each of the existing design points.

Design Point 1 (Q_5 = 25.0 cfs, Q_{100}= 61.1 cfs) consists of flows from Basins EX-1, EX-2, and EX-3 all of which are within the existing Stratmoor Hills subdivision to the south-west of the proposed site. Basin EX-1 is 6.13 acres of existing home lots that drains to the east, overtops Stratmoor Drive and into Basin EX-2. The combined flows from EX-1 & EX-2 continue on the surface to the east and overtop Westcott Ave. drain into Basin EX-3. Roadside ditches along Chamberlin Ave. route all of the runoff from the three basins to DP-1, where an existing concrete storm pipe collects the water and routes it under Chamberlin Ave. and into the ravine to the east, within Basin EX-4. Although the density of the existing Stratmoor Hills subdivision is closer to 2 DU/Ac., C values corresponding with 3 DU/Ac. are used to conservatively estimate the runoff from the upstream basins (C_5 = 0.40, C_{100} = 0.55, Group B soils).

Design Point 2 (Q_5 = 38.2 cfs, Q_{100}= 92.1 cfs) consists of flows from DP-1 and Basins EX-4, EX-5, and EX-6. Basin EX-4 is 4.57 acres (B soils) of existing home lots that drains to the south into the outfall ravine from DP-1. Basin EX-5 is 4.93 acres (C soils) of existing roadway and home lots that drains into one of two ravines that meet at DP-2. Basin EX-6 is 3.96 acres (C soils) of existing home lots that drains to the north-east to DP-2. C soils were used throughout EX-5 & EX-6 to calculate the storm runoff higher and therefore more conservatively. See soils map in Appendix for separation of B and C soil groups. All of the

runoff from these basins combine at this confluence point and continue north-east onto the proposed site and toward DP-3.

Design Point 3 (Q_5 = 45.2 cfs, Q_{100}= 107.9 cfs) consists of flows from DP-2 and Basins EX-7 and EX-8. Slightly upstream and west of DP-3, man made berms were constructed at some point in the past that prevents the runoff from DP-2 from continuing north to the existing culverts under Venetucci Blvd (as the Stratton Basin Hydrology Study anticipated). This man made berm instead routes the entire flow from DP-2 onto Westmark Ave. (DP-3) where the flow combines with the runoff from Basins EX-7 & EX-8. This runoff continues north-east as surface flow on Westmark Ave. to DP-4. Documentation of why and when this berm, along with others located on the actual proposed site, does not exist as a drainage report for this existing Stratmoor Hills subdivision is not on file with El Paso County and there is no mention of diverting the flows with the Hydrology Report or any of the World Arena Subdivision drainage reports.

Design Point 4 (Q_5 = 49.6 cfs, Q_{100}= 118.3 cfs) consists of flows from DP-3 and Basins EX-9 and EX-10. Basin EX-9 is 3.54 acres (C soils) of existing home lots and Westmark Ave. that drains down Westmark via curb and gutter and surface flow to the intersection of Venetucci Blvd. and Westmark Ave. (DP-4). Basin EX-10 is 1.11 acres (C soils) of on-site, undeveloped land that drains to this intersection and onto the roadway prior to the small culvert at DP-5. This combined runoff from DP-4 flows onto Venetucci Blvd. and the adjacent roadside swale to Design Point 8.

Design Point 5 (Q_5 = 7.1 cfs, Q_{100}= 16.7 cfs) consists of runoff from Basin EX-11, 3.83 acres (C soils) of mostly on-site, undeveloped land with a small portion of existing Stratmoor Hills homes and a portion of the western half of existing Venetucci Blvd. This runoff sheet flows to an existing 12" CMP storm pipe culvert that routes the runoff under Venetucci Blvd. and continues in the existing drainage pattern towards Interstate 25. This runoff combines with that from DP-8 and continues around the future World Arena Subd. Lot 2, Fil. 5 site to the existing 48" RCP I-25 crossing. The final drainage report for this World Arena parcel does not acknowledge or quantify the off-site tributary flows.

Design Point 6 (Q_5 = 10.4 cfs, Q_{100}= 25.3 cfs) consists of runoff from Basin EX-12, 7.01 acres (C soils) of mostly on-site, undeveloped land with a small portion of existing Stratmoor Hills homes and a portion of the western half of existing Venetucci Blvd. This runoff sheet flows to this existing low point at DP-6.

Previous reports drainage documents show an existing box culvert at this location that routes any runoff at this point under Venetucci Blvd. and directly toward the I-25 box culvert (Sinton Outfall). However, this box culvert has since been covered, or filled, with soil and is no longer functioning. Documentation on why this was done can not be found on file with El Paso County. The Sinton Outfall storm system shown on the Drainage Map does provide a 48" RCP stub off the junction box that points directly to the DP-6 and this filled in box culvert. It is our understanding that this 48" stub was to connect to this low-point at DP-6 with the Sinton storm system construction, but was never completed. This would then leave the existing box culvert not needed, and filing it to abandon in place would be permitted. A field inspection of the manhole does indeed show only a capped 48" lateral toward DP-6, and it appears this runoff simply infiltrates into the ground at this location.

Design Point 7 (Q_5 = 30.5 cfs, Q_{100}= 83.9 cfs) consists of runoff from Basins EX-13 & EX-14 and the flow by from DP-11. Basin EX-13 is 8.63 acres (C soils) of mostly on-site, undeveloped land, a portion of the western half of Venetucci Blvd. and a small portion of existing Stratmoor Hills homes. Basin EX-14 is 13.75 acres that consists of mostly undeveloped land and a small portion of the existing homes as well as a portion of the adjacent Stratmoor Hills United Methodist Church and the western half of Venetucci Blvd. A substantial amount of runoff at this point (Q_5 = 3.1 cfs, Q_{100}= 21.2 cfs) comes from the water not intercepted by the inlets at Design Points 9 -- 11. The existing curb along the west side of Venetucci Blvd. from the Cheyenne Meadows Rd. intersection ends just after the inlet at DP-11, thus the flow by drains into the roadside ditch to DP-7. The combined runoff is intercepted by an existing CDOT Type D storm inlet (3.5' x 8.5' inlet dimensions). This inlet was installed with the construction of the Sinton Outfall Storm System and an existing 48" RCP storm pipe conveys the intercepted runoff across Venetucci Blvd. and connects to the 90" main.

Design Point 8 (Q_5 = 52.1 cfs, Q_{100}= 124.2 cfs) consists of flows from DP-4 and Basin EX-15. Basin EX-15 is 2.64 acres (C soils) of off-site, undeveloped land, including a portion of existing Venetucci Blvd. An existing elliptical CMP culvert conveys this runoff under Venetucci Blvd. to the north and into the existing drainage pattern. This culvert is very under-sized for 120+ cfs and it can be assumed that significant ponding takes place at this location prior to flowing to the downstream facilities. The parcel to the north of DP-8 (across Venetucci Blvd.) is planned to be a hotel with surrounding parking. The development of the site will maintain the historic drainage pattern around the future development, but does change the overall

outfall of the existing runoff. This World Arena Lot 2, Filing No. 5 (hotel site) construction was stopped after overlot grading and utility infrastructure was completed. Per the "Final Drainage Report for World Arena Subdivision Filing No. 5, Lot #2," by Matrix Design Group, Inc. (April 2008) the construction of Detention Pond #1 was to be outside of the existing drainage path to the existing 48" RCP under I-25. However, a site visit confirmed that the outlet pipe for this Pond 1 has been connected to the existing 48" interstate crossing and the existing low point (entry into the 48") has been filled in. Now, the existing drainage ponds approximately 2.0' and overtops into Pond #1, where a D-9 grate inlet within the pond intercepts the flows and passes them into the existing culvert.

Design Point 9a (Q_5 = 22.3 cfs, Q_{100}= 47.6 cfs) consists of runoff from Basin EX-20, 14.70 acres of existing single family subdivision and Cheyenne Meadows Road. An existing 8' D-10R at-grade curb inlet (4.5% street slope) intercepts a portion of this runoff (Q_5 = 5.7 cfs, Q_{100}= 5.9 cfs), while the rest continues down Cheyenne Meadows Rd. to the intersection with Venetucci Blvd.

Design Point 9b (Q_5 = 47.8 cfs, Q_{100}= 102.0 cfs) consists of runoff from Basin EX-16, 31.48 acres of existing single family subdivision and Cheyenne Meadows Road. An existing 8' D-10R at-grade curb inlet (4.5% street slope) intercepts a portion of this runoff (Q_5 = 5.9 cfs, Q_{100}= 12.7 cfs), while the rest continues down Cheyenne Meadows Rd. to the intersection with Venetucci Blvd. The combined intercepted runoff from DP-9a & DP-9b is routed in an existing 36" RCP storm pipe to the north to an existing channel, away from the Venetucci Blvd. and Cheyenne Meadows Rd. intersection. The large amount of flow-by (Q_5 = 41.9 cfs, Q_{100}= 89.3 cfs) continues to the submerged inlets at DP-9c.

Design Point 9c (Q_5 = 85.3 cfs, Q_{100}= 186.7 cfs) consists of runoff from Basins EX-21 and EX-22, as well as the flow by from DP-9a & DP-9b. Basin EX-21 is 14.83 acres of the existing single family Huckleberry Knoll Subdivision and Cheyenne Meadows Rd. Basin EX-22 is 4.46 acres of existing Stratmoor Hills Subdivision, existing Stratmoor Hills United Methodist Church, and existing Cheyenne Meadows Rd. Two existing D10-R curb inlets (20' & 30') exist on Cheyenne Meadows, west of Venetucci Blvd. The storm water at this point overtops the crown of the Cheyenne Meadows and completely submerges the inlets, thus changing the calculation used in quantifying the intercepted flow (See Calculations in Appendix). The total area of opening of the two combined inlets is 33.5 square feet (50.0' x 0'67), and based upon field as-builts of the curb return, the inlets only have 0.35' of depth before overtopping south down Venetucci Blvd. This

results in both inlets only intercepting 57 cfs of both 5 and 100 year flows. The flow by from these inlets next hits the inlet at DP-10.

Design Point 10 (Q_5 = 28.3 cfs, Q_{100}= 129.7 cfs) has a 20' at-grade D10-R curb inlet that intercepts a large portion of the flow-by from DP-9c. Venetucci Blvd. has a slope of 1.3% at this inlet based upon field as-builts of the constructed curb. This 20' inlet intercepts Q_5 = 16.3 cfs and Q_{100}= 75.6, while the remainder continues to the next existing inlet at DP-11.

Design Point 11 (Q_5 = 12.0 cfs, Q_{100}= 54.1 cfs) has a 20' at-grade CDOT Type R curb inlet that intercepts a portion of the remaining flow-by from DP-9c & DP-10. Venetucci Blvd. has a slope of 2.8% at this inlet based upon field as-builts of the constructed curb. This 20' inlet intercepts Q_5 = 8.9 cfs and Q_{100}= 32.9, while the remainder continues south down Venetucci Blvd. The existing curb and gutter along Venetucci ends just downstream of DP-11, therefore the flow-by (Q_5 = 3.1 cfs, Q_{100}= 21.2 cfs) runs off the edge of asphalt and enters the roadside ditch, which drains to the grated inlet at DP-7.

Design Point 12 (Q_5 = 3.1 cfs, Q_{100}= 6.0 cfs) consists of runoff from Basin EX-17, 0.80 acres of existing Venetucci Blvd. and adjacent landscape area that drains to an existing 5' at-grade CDOT Type R curb inlet. Based upon field as-builts Venetucci Blvd. has a slope of 3.0% at this inlet, resulting in intercepting Q_5 = 1.9 cfs and Q_{100}= 2.3, while the remainder continues within the curb to DP-13.

Design Point 13 (Q_5 = 3.4 cfs, Q_{100}= 8.2 cfs) consists of runoff from the flow-by of DP-12 and Basin EX-18, 0.68 acres of existing Venetucci Blvd. and adjacent landscape area that drains to an existing 5' at-grade CDOT Type R curb inlet. Based upon field as-builts Venetucci Blvd. has a slope of 0.7% at this inlet, resulting in intercepting Q_5 = 2.2 cfs and Q_{100}= 3.5 cfs. The non-intercepted runoff (Q_5 = 1.2 cfs, Q_{100}= 4.7 cfs) continues within the curb and gutter onto Bob Johnson Drive and west toward the overall basin outfall corridor.

Design Point 14 (Q_5 = 1.4 cfs, Q_{100}= 3.2 cfs) consists of runoff from Basin EX-19, 0.58 acres of existing Venetucci Blvd. and adjacent undeveloped right of way area. An existing modified Type D grated inlet drains this area and conveys the runoff into the 90" RCP Sinton Outfall system via a 48" RCP storm lateral. As mentioned previously, the existing alignments and storm facilities have been established through the

"Roadway Improvement Package and Storm Sewer Package for US Highway 85/87 (Venetucci Boulevard)," by Drexel Barrell including the as-built revisions and field survey data.

Summary of Existing Conditions

The existing Sinton Outfall Storm system was planned to intercept all of the Stratton Basin runoff at rates specified within the "Hydrology Report Stratton Drainage Basin Outfall Study El Paso County, Colorado," by Drexel Barrell, dated June 9, 1994. The construction of the large storm main system appears to have been completed in two separate phases, per the "M.D.D.P. for Cheyenne Mountain Center." The second phase included extending storm sewer laterals off of the main alignment to our proposed site location in order to convey the existing runoff as well as a future allowable runoff rate per the Hydrology Study. This extension of a 48" storm lateral was completed at the northernmost existing roadway crossing (Design Point 7). However, at Design Point 6, no such storm sewer extension off the main line was completed and it appears that the existing roadway culvert was filled in and does not pass historic runoff under Venetucci Blvd./Old Hwy 85/87. The construction plans for the 102"-90" RCP storm main show a 48" RCP stub pointed toward the filled in box culvert, but capped 8.0' outside of the manhole. It is our assumption that this 48" stub is meant to convey the runoff at this DP-6 location. Therefore, our proposed conditions will discuss extending this lateral under Venetucci Blvd. and into our proposed site. Drainage reports completed for the immediate downstream World Arena Subdivisions do not discuss any off-site flows from the tributary area, including our site and the upstream Stratmoor Hills Subdivision, or mention extending this 48" stub to the edge of the Venetucci Blvd. right-of-way. The Hydrology Report specifies a developable 100-year flow rate from the proposed site and upstream Stratmoor Hills Subdivision as 270 cfs. The calculated combined 100-year existing flow rate at design points 6, 7, and 8 is 198 cfs. Therefore, substantial more development can be constructed with this Basin 009 before storm water detention is required.

Also, the construction of the diversion berms on the proposed site that re-route the upstream tributary area (Stratmoor Hills) runoff directly to the Westmark Ave. and Venetucci Blvd. intersection are un-documented and seem to have been completed to eliminate the historic runoff to the 'filled in' culvert at DP-6. The existing CMP culverts at DP-5 and DP-8 are not adequately sized to convey all of the existing storm runoff that they currently receive. However, since it appears this drainage path is not natural and not per the previous drainage studies, we are proposing intercepting the upstream, existing runoff and conveying it through the proposed site's public storm system and directly to the 90"/102" RCP Sinton Outfall system.

PROPOSED DRAINAGE CONDITIONS

Developed runoff from the Independence Place at Cheyenne Mountain Filing No. 1 site will be conveyed into proposed storm water quality facilities and storm sewer systems as shown on the Drainage Map, and will outfall into the provided locations of the existing Sinton Outfall storm system. A detailed description of the developed flows is as follows:

Design Point 1 (Q_5 = 25.0 cfs, Q_{100}= 61.1 cfs) is the tributary flows from the existing Stratmoor Hills Subdivision as described in the Existing Conditions portion of this report, Design Point 1.

Design Point 2 (Q_5 = 38.2 cfs, Q_{100}= 92.1 cfs) is the confluence point of the tributary flows from the existing Stratmoor Hills Subdivision as described in the Existing Conditions portion of this report, Design Point 2. This location is within the site boundary, however nothing is to be graded or constructed in this remote area of the site. These flows continue northeast to the collection area at DP-3.

Design Point 3 (Q_5 = 40.9 cfs, Q_{100}= 98.2 cfs) consists of runoff from Basins OS-7, OS-26, and Basin A, as well as the flows from DP-2. A depressed area with a top of berm width of 8.0' is proposed at this location with a Private 42" RCP FES to intercept the entire off-site flow tributary to the proposed site. This depressed area is 7.7' deep at the emergency spillway (48' width, elevation 6881). A headwater depth calculation of 7.3' above the flowline of the 42" outlet pipe (Pipe 9) is included in the Appendix of this report. In the unlikely event that the Private 42" pipe is non-operable, the runoff will flow over the emergency spillway and down a wide, flat corridor around the adjacent apartment building and into the parking lot, so as not to cause flooding of the building. However, the likely hood of runoff overtopping this depressed area is very remote. The intercepted runoff within the 42" RCP continues north to the ultimate connection to the Sinton Outfall system. As mentioned in the Existing Conditions portion of this report, this existing runoff has been diverted with on-site man-made berms to outfall at DP-25, south of Westmark Ave. Per the previous reports, this runoff was to be conveyed directly to the 90"/102" RCP Sinton Outfall main toward the north, which is what we are proposing with the current development.

Design Point 4 (Q_5 = 1.8 cfs, Q_{100}= 3.9 cfs) consists of runoff from Basin B and Basin OS-19. Basin OS-19 is 0.72 acres of existing Stratmoor Hills single family subdivision that drains onto the proposed site. Basin B consists of half a building unit's roof top and the surrounding landscape area. This runoff is collected at two low points within the perimeter swales by an 18" circular area drain and a CDOT Type D grated inlet. A Private 18" RCP main (Pipe 1) conveys the intercepted flow to the south-east, behind the buildings to DP-5.

Design Point 5 (Q_5 = 5.5 cfs, Q_{100}= 11.6 cfs) consists of runoff from Basin C and Basins OS-23 & OS-24. Basins OS-23 & OS-24 are 0.61 acres and 0.78 acres respectively of existing Stratmoor Hills single family subdivision that drains onto the proposed site. Basin C consists of building roof top and surrounding landscape area. This runoff is collected at four low points within the perimeter swales by (3) 18" circular area drains and (1) CDOT Type D grated inlet. A Private 24" RCP main (Pipe 2) conveys the intercepted flow to the south-east, behind the buildings toward DP-6.

Design Point 6 (Q_5 = 3.2 cfs, Q_{100}= 6.8 cfs) consists of runoff from Basin D and Basin OS-25. Basin OS-25 is 0.56 acres of existing Stratmoor Hills single family subdivision that drains onto the proposed site. Basin D consists of building roof top and surrounding landscape area. This runoff is collected at four low points within the perimeter swales by (2) 18" circular area drain and (2) CDOT Type D grated inlets. A Private 24" RCP main (Pipe 3) conveys the combined flow from DP-4, DP-5, & DP-6 to the east, bypassing the Private 42" RCP (Pipe 9) and draining into the sump inlet at DP-7.

Design Point 7 (Q_5 = 4.8 cfs, Q_{100}= 9.9 cfs) consists of runoff from Basin E and Basin OS-10. Basin OS-10 is 0.49 acres of existing Stratmoor Hills single family subdivision that drains onto the proposed site. Basin E is 1.05 acres of proposed parking lot, drive aisle, and surrounding landscape area. This runoff is collected at a low point within the curb by a 6.0' CDOT Type R curb inlet. A Private 30" RCP main (Pipe 4) conveys the combined flow (Q_5 = 13.6 cfs, Q_{100}= 28.5 cfs) into the proposed Sand Filter Basin Storm Water Quality Facility #1 (DP-8).

Design Point 8 (Q_5 = 13.8 cfs, Q_{100}= 29.0 cfs) is the runoff contained in the Private Sand Filter Basin SWQ Facility #1. It consists of runoff from Pipe 4 and Basin F, 0.15 acres of on-site undeveloped area and existing single-family area directly tributary to the facility. This proposed facility is completely contained

within four retaining walls and sits below the adjacent street level. A 4" underdrain system will collect the runoff as it infiltrates through the required soil layers per the Drainage Criteria Manual Vol. 2, Figure SFB-1 and convey the water into the outlet box. Based upon the Urban Drainage BMP Design-Aid Workbook and the collected area impervious calculations, a water quality volume of 0.0542 acre-feet is required (2.69 acres @ 61.7% impervious). The top of the 6.0' wide outlet box of this facility will be placed 2.5' above the bottom to provide 0.0602 acre-feet of treatment volume. The lowest wall elevation of the facility provides 1.67' of depth over the top of the outlet box, providing more than adequate depth for interception of all of the runoff into the storm system. Any unlikely overtopping of the facility will drain directly into the adjacent existing Westmark Avenue and not cause any damage to any proposed or existing structure.

A Private 30" RCP (Pipe 5) will convey the treated water to the proposed 48" RCP main (Pipe 9b) coming from DP-3. This 48" main connects to the large Sinton Outfall main on the east side of Venetucci Blvd.

Design Points 9a, 9b, 9c, 10, 11, & 12 all correspond directly with the Design Points within the Existing Conditions Portion of this report. These design points all represent existing curb inlets along Cheyenne Meadows Road and Venetucci Blvd. and are modeled within this report to determine the runoff not intercepted by the existing inlets. The flow-by calculated is the runoff tributary to Design Point 18.

Design Point 13 (Q_5 = 3.3 cfs, Q_{100}= 8.0 cfs) consists of runoff from Basin V-1 and the flow-by from DP-12. Basin V-1 is 0.65 acres of existing Venetucci Blvd. and surrounding landscape area. The flow-by from DP-12 is Q_5 = 1.2 cfs and Q_{100}= 3.7 cfs. This design point corresponds directly with DP-13 in the existing conditions. The existing 5' at-grade type R inlet intercepts a portion of this stormwater, while the remaining water (Q_5 = 1.1 cfs, Q_{100}= 4.4 cfs) flows west down Bob Johnson Dr. as in the existing conditions. The existing storm pipe from this inlet will remain in place, however the existing inlet/manhole at DP-14 is to be removed and the entire outfall system is proposed to be re-aligned. Therefore a small portion of 24" RCP (Pipe 12) is required to connect the existing main to the newly aligned 48" outfall.

Design Point 14 (Q_5 = 1.4 cfs, Q_{100}= 3.1 cfs) consists of runoff from Basin V-5, 0.59 acres of existing Venetucci Blvd. and surrounding undeveloped right-of-way. This design point and tributary Basin corresponds directly with DP-14 in the existing conditions. The existing modified Type D area inlet that currently intercepts this runoff is planned to be removed and replaced with a new Type D grated inlet due

to the re-alignment of the overall storm system. All of this runoff is intercepted by the new inlet at this sump location within the existing vegetated area. An 18" RCP will convey this intercepted runoff to the overall northerly 48" storm outfall (Pipe 22). Pipe 22 combines just north of this location with the existing 90" Sinton Outfall main. **The total combined flow within the 48" Pipe 22 oufall is Q_5 = 38.0 cfs and Q_{100}= 96.3 cfs.**

Design Point 17 (Q_5 = 8.8 cfs, Q_{100}= 18.2 cfs) consists of runoff from Basin V-6 (1.05 acres of Venetucci Blvd. and adjacent landscaped area), Basin H (1.51 acres of the main entrance drive, parking, and landscaped area), and Basin OS-29 (0.31 acres of off-site slope area). A city standard 6' concrete cross pan is proposed at the main entrance to convey the runoff on existing Venetucci Blvd. to the proposed sump inlet. A 12' CDOT Type R sump inlet is required to intercept the entirety of this runoff at the proposed low point just south of the entrance on Venetucci Blvd. A Public 18" pipe (Pipe 15) conveys the runoff to 48" outfall main (Pipe 21, Q_5 = 35.9 cfs, Q_{100}= 92.5 cfs).

Design Point 18 (Q_5 = 18.8 cfs, Q_{100}= 56.8 cfs) consists of runoff from the off-site Basin OS-14 (12.01 acres of existing Stratmoor Hills single-family development and a portion of the Existing Stratmoor Hills United Methodist Church site), Basin V-2 (0.54 acres of existing Venetucci Blvd. and adjacent roadside ditch, and the flow-by from the existing 20' inlet at DP-11. With the development of the proposed site, curb and gutter, along with a 6' detached walk, is to be installed along the west side of existing Venetucci Blvd. to the northerly extents of the proposed site. North of the limits of the proposed curb and gutter, existing Venetucci Blvd. has no curb and the storm runoff sheet flows off the roadway and into the existing roadside ditch. This includes the flows from Basin V-2 and the existing flow-by from the existing inlet at DP-11. This roadside ditch will continue behind the proposed detached walk and curb and gutter and flow south to the (3) proposed CDOT Type D grated inlets at DP-18. A 5.0' wide bottom swale at 2.0% minimum slope will convey this runoff to these area inlets.

The runoff from Basin OS-14 will continue to drain east toward Venetucci, and is intercepted by an existing roadside swale and will drain to the inlets at DP-18. In the existing conditions, all of the stomwater at this design point drained to an existing Type D grated inlet located just south of the proposed southerly curb return into the site. A Public 36" RCP storm sewer (Pipe 14) will convey the intercepted runoff to a proposed manhole that combines with the main northerly outfall system. Pipe 20 (48" RCP, Q_5 = 31.0 cfs

and Q_{100}= 82.2 cfs) represents the storm pipe and flows after combining with the runoff from Pipe 19. This 48" storm main continues north-east to the existing 90" Sinton Outfall main.

Design Point 19 (Q_5 = 3.2 cfs, Q_{100}= 6.7 cfs) consists of runoff from Basin J and Basin OS-12. Basin OS-12 is 0.89 acres existing Stratmoor Hills single family subdivision that drains onto the proposed site. Basin J consists of building roof top and surrounding landscape area. This runoff is collected at two low points within the perimeter swales by (1) 18" circular area drains and (1) CDOT Type D grated inlet. A Private 18" RCP main (Pipe 6) conveys the intercepted flow to the north-east, toward DP-21 (Sand Filter Basin SWQ Facility #2).

Design Point 20 (Q_5 = 2.8 cfs, Q_{100}= 5.9 cfs) consists of runoff from Basin K and Basin OS-27. Basin OS-27 is 0.87 acres existing Stratmoor Hills single family subdivision that drains onto the proposed site. Basin K is 0.28 acres of building roof top and surrounding landscape area. This runoff is collected at two low points within the perimeter swales by (1) 18" circular area drains and (1) CDOT Type D grated inlet. A Private 18" RCP main (Pipe 7) conveys the intercepted flow to the Private 18" from DP-19 (Pipe 8). Pipe 8 conveys the combined runoff (Q_5 = 5.8 cfs, Q_{100}= 12.3 cfs) into the storm water quality facility at DP-21.

Design Point 21 (Q_5 = 11.4 cfs, Q_{100}= 23.1 cfs) is the runoff contained in the Private Sand Filter Basin SWQ Facility #2. It consists of runoff from Pipe 8 and Basin L, 1.59 acres of proposed parking, drive aisle, building roof tops, pool deck, and surrounding landscape area. Basin L sheet flows across the parking lot and drains directly into the Sand Filter facility. This proposed facility has a bottom elevation of 5875.80, 4:1 side slopes and the top of the 6.0' outlet box at elevation 5877.50. A 4" underdrain system will collect the runoff as it infiltrates through the required soil layers per the Drainage Criteria Manual Vol. 2, Figure SFB-1 and convey the water into the outlet box. Based upon the Urban Drainage BMP Design-Aid Workbook and the collected area impervious calculations, a water quality volume of 0.0544 acre-feet is required (2.23 acres @ 73.7% impervious). With the top of the 6.0' wide outlet box placed 1.7' above the bottom, a volume of 0.0676 acre-feet is provided. A portion of the adjacent retaining wall adjacent to the facility is to be constructed at an elevation of 5878.50, providing an overflow path that is lower than the adjacent buildings and swimming pool deck. This also provides a full 1.0' of depth over the top of the outlet box before overtopping of the facility. Any unlikely overtopping of the facility will drain directly into the adjacent Venetucci Blvd. right-of-way and not cause any damage to any proposed or existing structure. A

Private 24" RCP outfall pipe (Pipe 18) will convey the runoff toward the proposed main entrance, where it will combine with the flows from DP-23.

Design Point 22 (Q_5 = 17.6 cfs, Q_{100}= 34.5 cfs) is the runoff contained in the proposed Private Sand Filter Basin SWQ Facility #3. The stormwater is from Basins M, N, OS-18 and OS-28. Basins OS-18 and OS-28 are 0.72 acres and 0.38 acres of existing Stratmoor Hills single family subdivision that drains onto the proposed site. Basin M is 1.47 acres of proposed drive aisle, parking lot and surrounding landscape area. The runoff from this basin drains via surface flow along the parking lot curb and gutter and into the facility via multiple curb cuts. Basin N is 2.15 acres of parking, drive aisle, buildings, and surrounding landscaping. The runoff from Basin N also drains into the facility via surface flow and through multiple curb cuts. A portion of the basin drains to an 18" circular area drain and into the facility via an 8" storm pipe.
This proposed facility has a bottom elevation of 5870.86, 4:1 side slopes, a partial retaining wall against the adjacent building, and the top of the 8.0' outlet box at elevation 5872.10. A 4" underdrain system will collect the runoff as it infiltrates through the required soil layers per the Drainage Criteria Manual Vol. 2, Figure SFB-1 and convey the water into the outlet box. Based upon the Urban Drainage BMP Design-Aid Workbook and the collected area impervious calculations, a water quality volume of 0.1087 acre-feet is required (3.62 acres @ 84.75% impervious). With the top of the 8.0' wide outlet box placed 1.24' above the bottom, a volume of 0.1135 acre-feet is provided. A 3.0' wide bench along the adjacent outside retaining wall is at elevation 5873.00, providing an overflow path that is lower than the adjacent building. This also provides a 0.75' of depth over the top of the outlet box before overtopping of the facility. Any unlikely overtopping of the facility will drain directly into the adjacent Venetucci Blvd. right-of-way and not cause any damage to any proposed or existing structure. A Private 24" RCP outfall pipe (Pipe 10a) will convey the runoff to the proposed Private 48" storm main containing the off-site bypass flows from DP-3.

Design Point 23 (Q_5 = 8.3 cfs, Q_{100}= 18.1 cfs) consists of runoff from the off-site Basin OS-13, 3.13 acres of existing Stratmoor Hills single-family development and Basin I, 0.48 acres of on-site landscaped slope area. Rather than let this significant amount of historic flow drain over the top of the outside rear retaining wall and onto the proposed site, a low point is proposed at the top of the wall. A Public CDOT Type D grated inlet will collect this historic off-site flow and convey it in a Public 18" RCP (Pipe 17) storm pipe straight north, toward the proposed main site entrance. Prior to Venetucci Blvd., this pipe combines with Pipe 18 from SFB #2 and continues towards Venetucci Blvd. in Pipe 19 (30" RCP, Q_5 = 19.2 cfs and Q_{100}=

40.2 cfs). A storm manhole located behind the Venetucci proposed curb combines the storm water from DP-18 with that from Pipe 19 and a Public 48" RCP (Pipe 20/21/22) outlet pipe connects to the existing 90" RCP Sinton Outfall system.

Design Point 24 (Q_5 = 16.0 cfs, Q_{100}= 34.9 cfs) consists of runoff from the off-site Basins OS-8, OS-9, & OS-11, as well as Basin G. Basin OS-8, OS-9 & OS-10 represent the existing Stratmoor Hills single family subdivision areas that drain down Westmark Ave. Basin G is 1.48 acres of Venetucci Blvd., Westmark Ave., and proposed on-site landscaped slope area. This runoff all drains via the proposed curb and gutter to the intersection of Westmark Ave. and Venetucci Blvd. From this intersection, the runoff enters the roadside ditch, along the west side of Venetucci, south of the proposed site (DP-25). DP-24 corresponds directly in location to that of Existing DP-4. The historic runoff at this point, due to the existing man-made diversion berms, is Q_5 = 49.6 cfs and Q_{100}= 118.3 cfs. Therefore, the proposed development reduces the storm water at this location substantially and reduces the burden on the existing facilities downstream of this point.

Design Point 25 (Q_5 = 20.1 cfs, Q_{100}= 45.0 cfs) consists of runoff from DP-24 and off-site Basins OS-15, 2.64 acres of undeveloped existing land. As with DP-24, the storm water at this point is substantially reduced from historic rates and the proposed development reduces the burden on this existing storm crossing.

Design Point 26 (Q_5 = 2.3 cfs, Q_{100}= 4.6 cfs) consists of runoff from Basin P, 0.68 acres of proposed building roof top and surrounding landscaped area. A total of (9) area drains are proposed within this basin at low points within the surrounding landscaped swales. All of these area drains will be 18" circular drains with Private 8"/12" PVC storm outlet pipes. Due to the shallow depth of the nearby SWQ SFB #3, this area drain system cannot drain into the facility. Rather this system (Pipe 10b) will connect directly into the Private 48" RCP outfall system for the site (Pipe 11). Pipe 11 is the extension of the 48" stub that was constructed with the Sinton Outfall system but never extended to the site. Based upon the previous reports and capacity of this pipe and the existing 48" at Pipe 21, the development of the site and release of un-detained flows into the Sinton Outfall system is permissible. **Pipe 11 contains runoff of Q_5 = 58.6 cfs and Q_{100}= 134.0 cfs.**

The overall allowable release rate based upon the Drexel Barrell Hydrology Study for the Sinton Outfall (SCS Method) is 270 cfs in the 100-year condition. Comparing flow rates found using the SCS Method to rates using the Rational Method does not provide an exact comparison point, since Rational Method is more conservative, thus resulting in higher flow rates. However, even with the more conservative (higher) flow rate calculation, the overall total combined flows are less than 270 cfs. This is the combined release rate of Pipe 11, Pipe 22, and Design Point 25 (Q_5 = 103.0 cfs, Q_{100}= 243.1 cfs). Therefore, the development of the proposed site (with no detention) does not hinder the existing storm system and is within acceptable release rates.

EROSION CONTROL PLAN

The El Paso County Drainage Criteria Manual specifies an Erosion Control Plan and associated cost estimate be submitted with the Final Drainage Report. We respectfully request that the Erosion Control Plan and cost estimate be submitted in conjunction with the Grading Plan and construction assurances posted prior to obtaining a grading permit.

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994. Stormwater quality analysis and calculations were performed in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual, Volume 2. The Rational Method was used to estimate stormwater runoff anticipated from design storms for the 5 year and 100 year recurrence interval.

FLOODPLAIN STATEMENT

No portion of this site is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C 0741F effective date, March 17, 1997 (See Appendix).

DRAINAGE AND BRIDGE FEES

This area lies within the Stratton Drainage Basin. El Paso County Drainage Basin Fees are based upon the impervious area of the proposed development (7.056 acres of the 15.46 acre site). The year 2011 drainage and bridge fees are as follows:

Drainage Fees:	
$6,508/acre x 7.056 acres	$ 45,920.45
Bridge Fees:	
$291/acre x 7.056 acres	$ 2,053.30
TOTALS:	**$ 47,973.75**

Fees are due prior to plat recordation. Prior to issuance of building permits a plat will need to be submitted and appropriate drainage facility and erosion control assurances will need to be posted.

CONSTRUCTION COST OPINION

Public & Private Drainage Facilities (Non-Reimbursable)

See Surety Estimate completed and on file with El Paso County for a complete storm sewer construction cost opinion. Per El Paso County criteria, storm sewer facilities are only considered reimbursable if they are specifically called for within the Drainage Basin Planning Study for the site's major basin. There is no Drainage Basin Planning Study for this basin, but coordination with El Paso County Development Services has concluded that none of the proposed storm sewer facilities are considered reimbursable.

SUMMARY

The proposed Independence Place at Cheyenne Mountain Filing No. 1 development is intercepting the off-site flows from the Stratmoor Hills single family subdivision and routing the existing and un-detained developed runoff into the provided storm sewer laterals from the 90"/102" Sinton Outfall system. The total release rates from the proposed development site and existing development is less than the allowable release rate based upon the "Hydrology Report Stratton Drainage Basin Outfall Study El Paso County, Colorado," by Drexel Barrell, dated June 9, 1994. The storm water runoff from the proposed development is routed to one of three sand filter basin storm water quality facilities prior to release into the outfall storm system. The proposed development reduces the runoff to the undersized existing facilities (DP-25), vastly improves the roadway and drainage within the Venetucci Blvd. right-of-way, and provides a storm infrastructure connection between the existing Stratmoor Hills single family subdivision and the World Arena Filings. Construction of the Independence Place at Cheyenne Mountain Filing No. 1 development will no adversely affect the surrounding developments. All drainage facilities were sized using the current El Paso County Drainage Criteria and will safely discharge storm water runoff to adequate downstream facilities.

PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC

Matthew Larson
Project Engineer

ag/2320.00/Reports/FDR/2320.00 FDR.doc

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual dated October 1991.

2. City of Colorado Springs/County of El Paso Drainage Criteria Manual Vol. 2 dated November 2002.

3. "Master Drainage Plan Harrison Street – I-25 Vicinity Cheyenne Mountain Ranch", by Hartzell – Pfeiffenberger and Associates, Inc. dated November 15, 1973

4. "Stratton and Fischer's Canyon Drainage Basin Planning Study, Drafy Hydraulic Analysis," by Muller Engineering Co. dated May 31, 1990

5. "Master Drainage Report for Cheyenne Mountain Center and Final Drainage Report for Cheyenne Mountain Center Filing No. 1 and Cheyenne Meadows Road," by Drexel Barrell, dated October 1985

6. "Hydrology Report Stratton Drainage Basin Outfall Study," by Drexel Barrell, dated June 1994

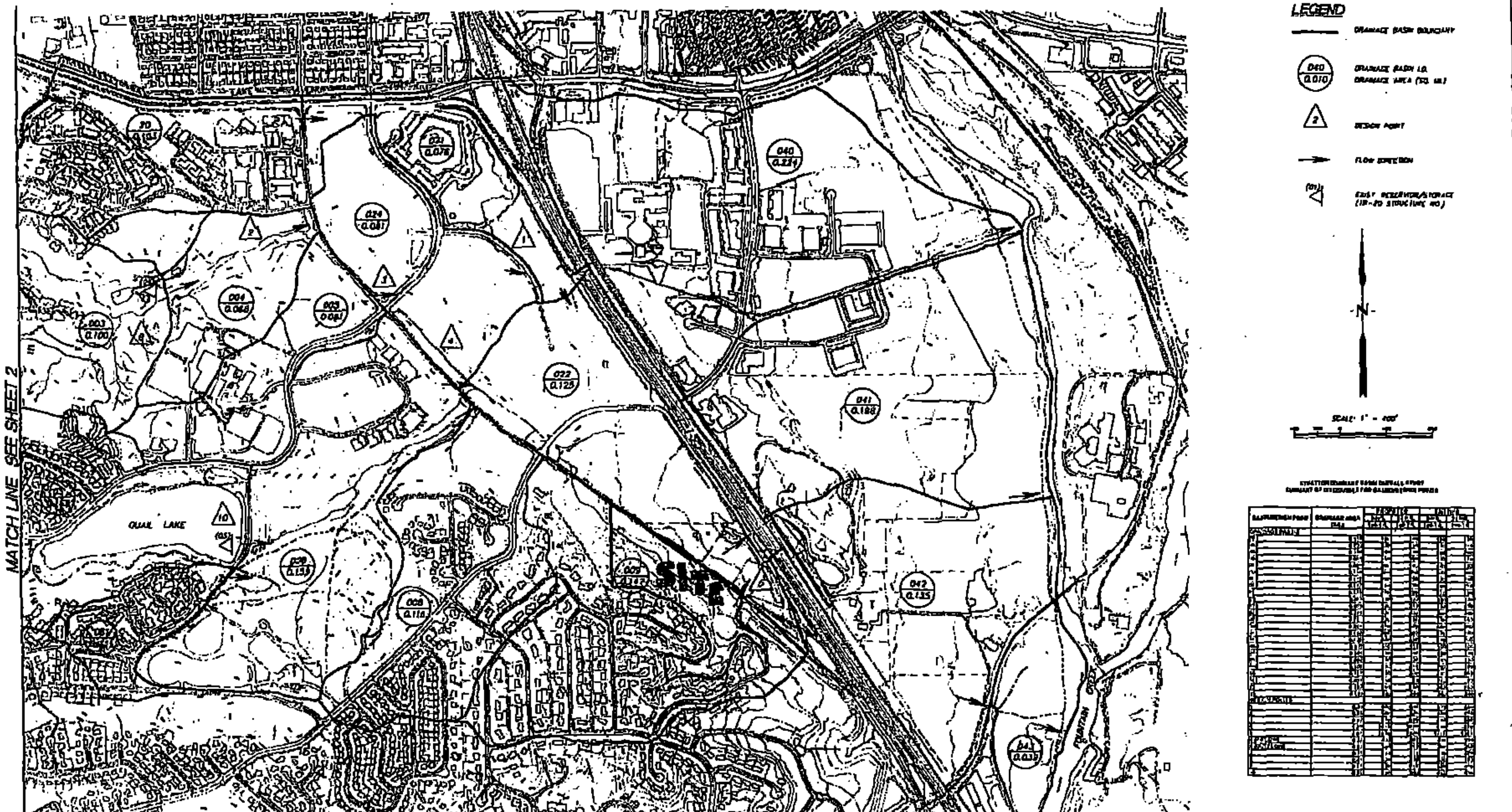
7. "Preliminary and Final Drainage Report and Plan for World Arena Subdivision No. 1," by Obering, Wurth & Associates, August 1994 revised March 1995.

8. "Final Drainage Report for World Arena Subdivision Filing No. 5, Lot #2," by Matrix Design Group, Inc., April 2008

9. "Drainage Report for Huckleberry Knoll Subdivision," by Drexel Barrell & Company, dated June 15, 1983

10. "Roadway Improvement Package and Storm Sewer Package for US Highway 85/87 (Venetucci Boulevard)," by Drexel Barrell including the as-built revisions.

APPENDIX



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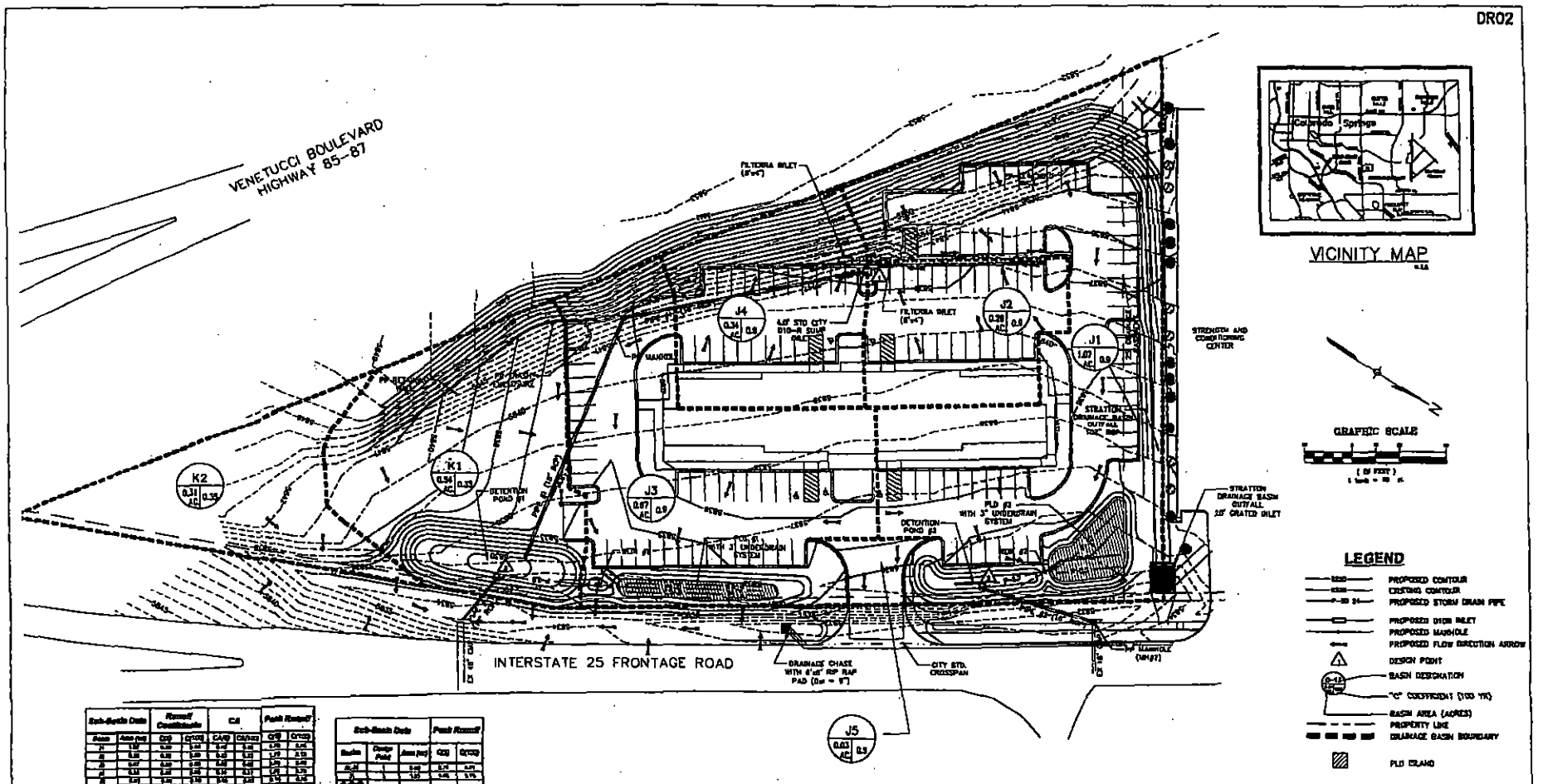
MASTER DRAINAGE PLAN
STRATTON DRAINAGE BASIN
OUTFALL STUDY
EL PASO COUNTY, COLORADO

Drexel Barrell

30 MAY, 1994	12 MAY, 1994	G.B.	CD-7052
6 JUNE, 1994	1" = 400'	L.A. / G.B.	4D-527

SHEET 1 OF 2



VICINITY MAP

Sub-Basin Data		Runoff Coefficients		C.A		Peak Runoff	
Basin	Area (ac)	C(5)	C(100)	CA(5)	CA(100)	Q(5)	Q(100)
J1	1.07	0.90	1.00	0.96	1.07	1.70	2.10
J2	0.39	0.90	1.00	0.35	0.39	0.62	0.77
J3	0.67	0.90	1.00	0.60	0.67	1.06	1.31
J4	0.34	0.90	1.00	0.31	0.34	0.54	0.67
J5	0.63	0.90	1.00	0.57	0.63	1.00	1.24
K1	0.56	0.90	1.00	0.50	0.56	0.89	1.10
K2	0.31	0.90	1.00	0.28	0.31	0.49	0.61

Sub-Basin Data		Peak Runoff	
Basin	Design Point	Q(5)	Q(100)
J1	1	1.70	2.10
J2	1	0.62	0.77
J3	1	1.06	1.31
J4	1	0.54	0.67
J5	1	1.00	1.24
K1	2	0.89	1.10
K2	2	0.49	0.61

REVISIONS					
NO.	DATE	BY	DESCRIPTION	APPROVED BY:	DATE

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

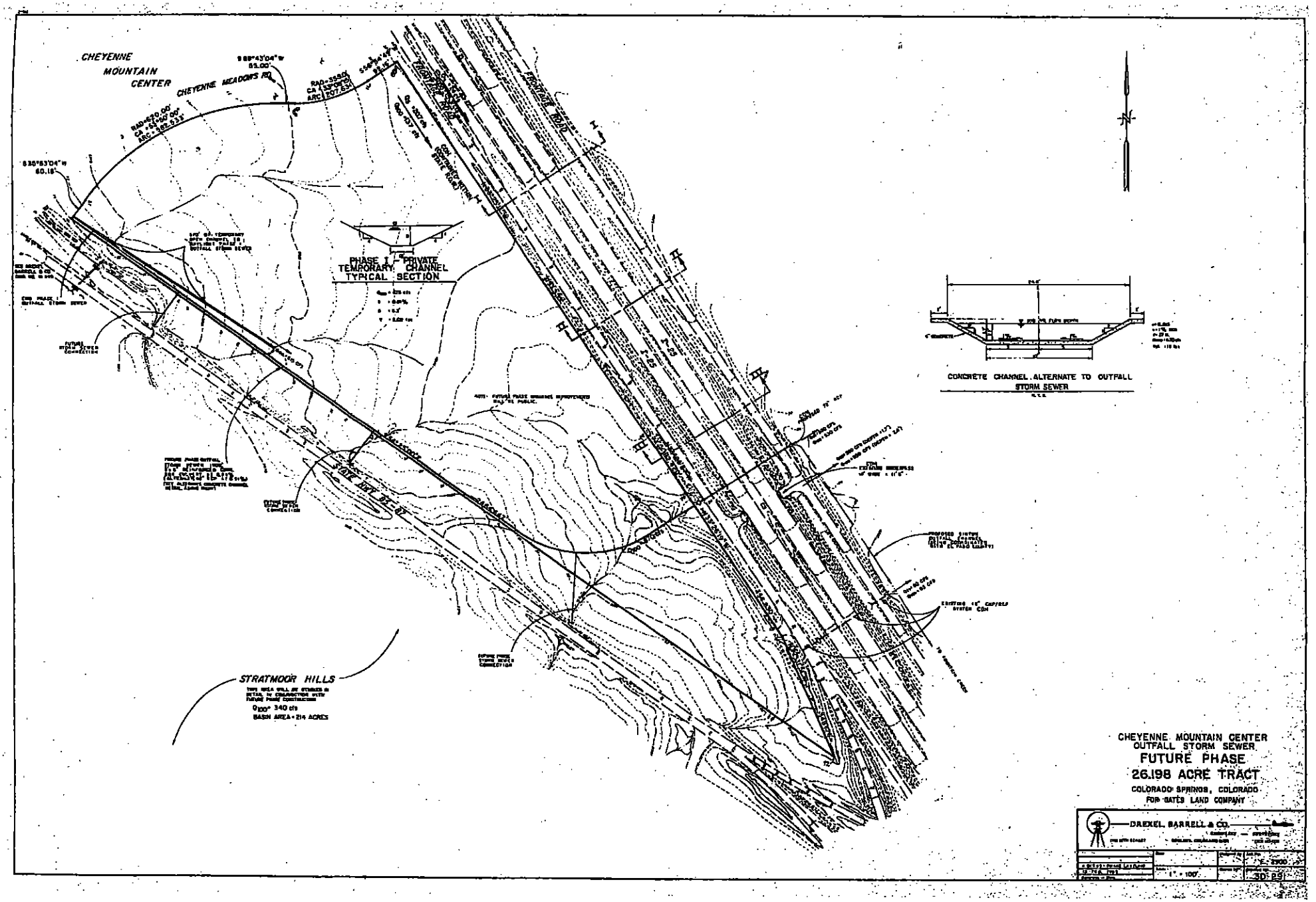
VALUE PLACE HOTEL

FISHERS CANYON DRAINAGE BASIN

DEVELOPED CONDITIONS DRAINAGE MAP

DESIGNED BY: RAE
DRAWN BY: RAE
CHECKED BY: DC
SCALE: 1"=30'
HORIZ: 1:30
VERT: N/A
DATE ESTABLISHED: 2006
MDG PROJECT NO.: 07.139.001

DR02



CHEYENNE MOUNTAIN CENTER
OUTFALL STORM SEWER
FUTURE PHASE
26.198 ACRE TRACT
COLORADO SPRINGS, COLORADO
FOR GATES LAND COMPANY

DREXEL, BARRELL & CO.

1" = 100'

E-2900

30-29

VICINITY MAP

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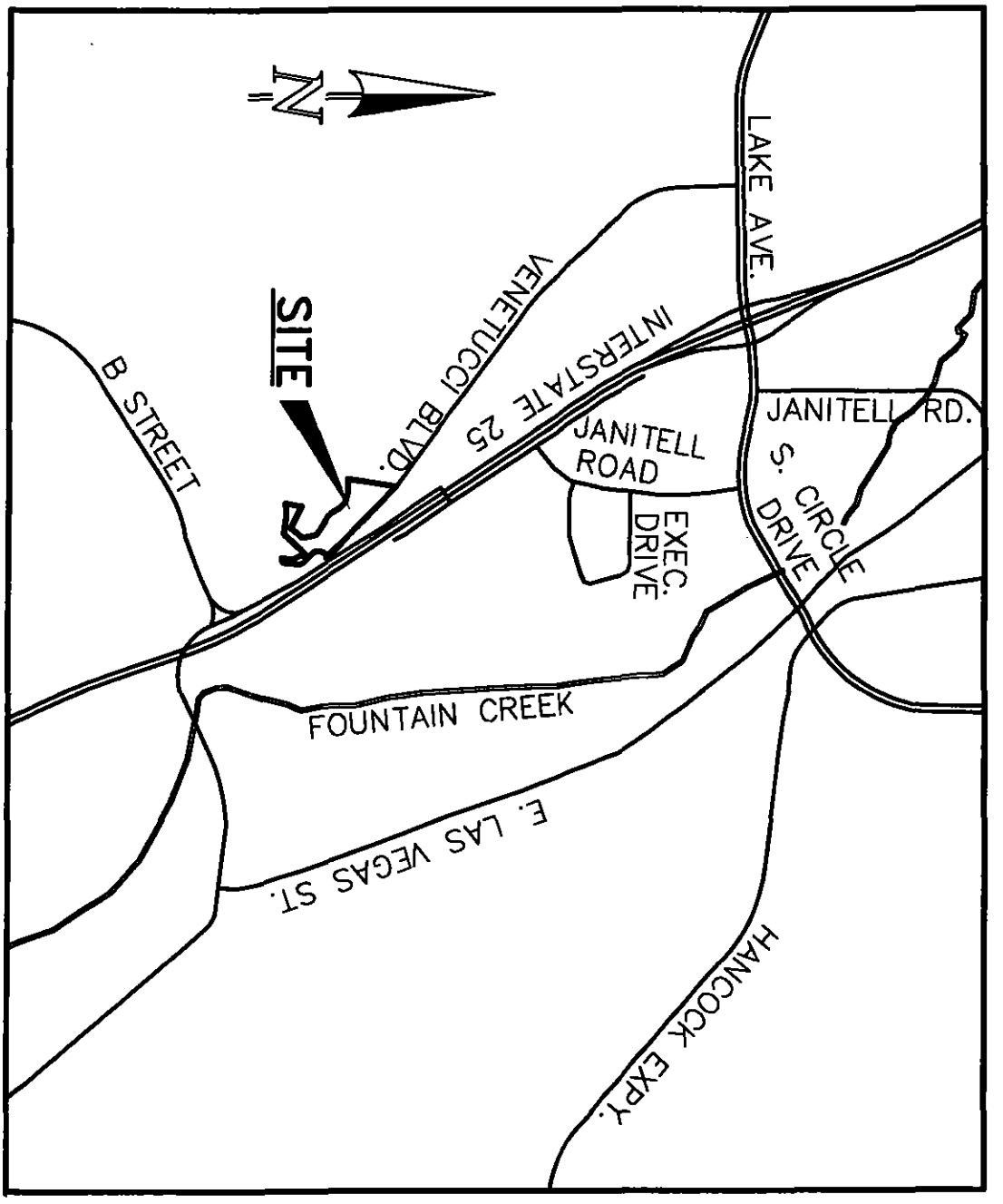

VICINITY MAP
N.T.S.

SOILS MAP (S.C.S SURVEY)

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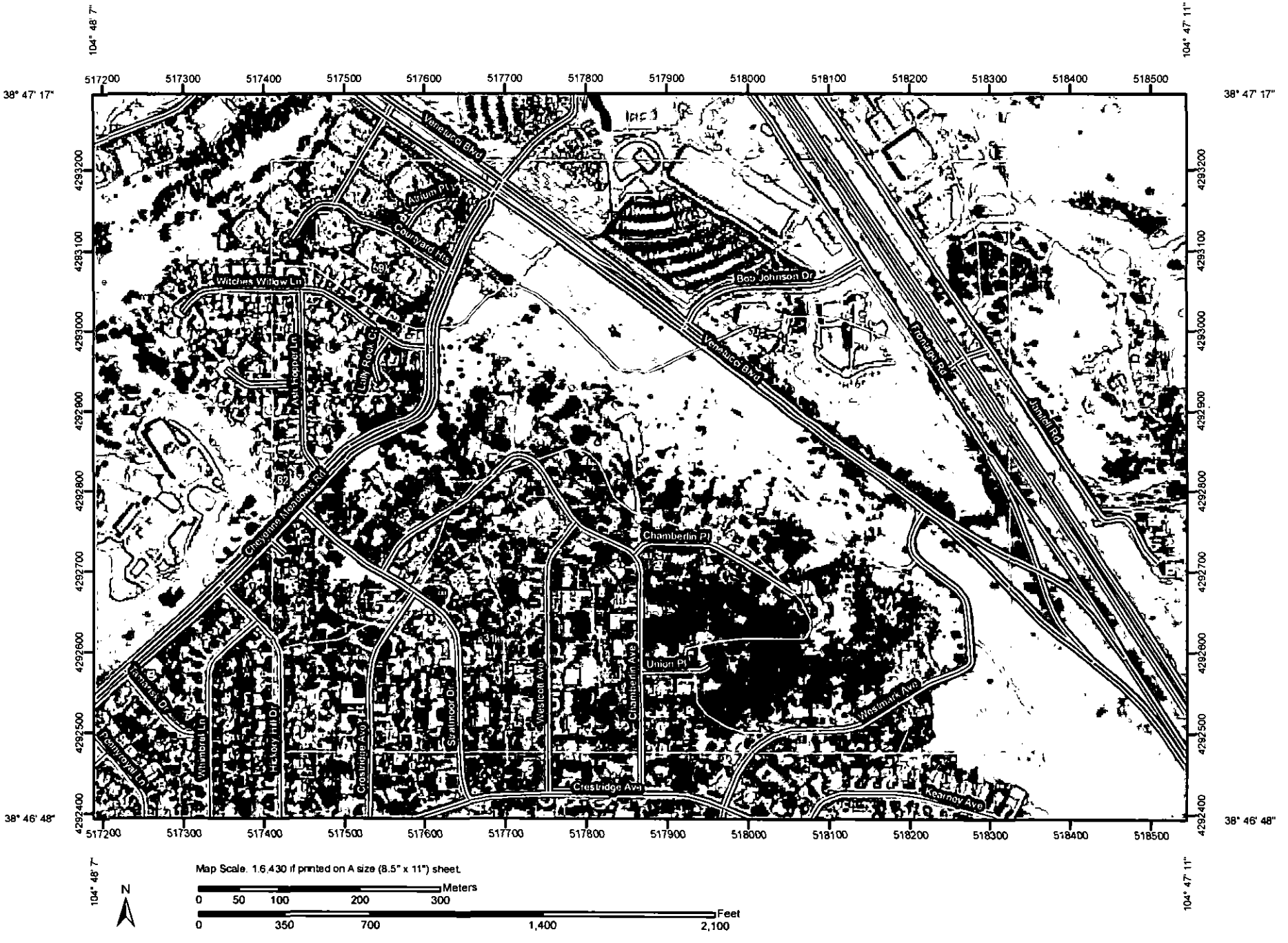
104° 48' 7"
104° 47' 11"
38° 47' 17"
38° 46' 48"
517200
517300
517400
517500
517600
517700
517800
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518000
518100
518200
518300
518400
518500
4293200
4293100
4293000
4292900
4292800
4292700
4292600
4292500
4292400
Vanguard Blvd
Atrium Pl
Courtyard Hts
Witches Willow Ln
Bob Johnson Dr
Ironbarn Rd
Jamel Rd
Cheyenne Meadows Rd
Chamberlin Pl
Union Pl
Westmark Ave
Kearney Ave
Crustridge Ave
Whitebrid Ln
Hickory Hill Dr
Westcott Ave
Chamberlin Ave
Map Scale: 1:6,430 if printed on A size (8.5" x 11") sheet.
N
Meters
0 50 100 200 300
Feet
0 350 700 1,400 2,100

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:6,430 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 13N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 7, May 4, 2009

Date(s) aerial images were photographed: 7/29/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
31	Fort Collins loam, 3 to 8 percent slopes	40.0	24.0%
59	Nunn clay loam, 0 to 3 percent slopes	42.9	25.8%
82	Schamber-Razor complex, 8 to 50 percent slopes	83.5	50.2%
Totals for Area of Interest		**166.4**	**100.0%**

F.E.M.A. MAP

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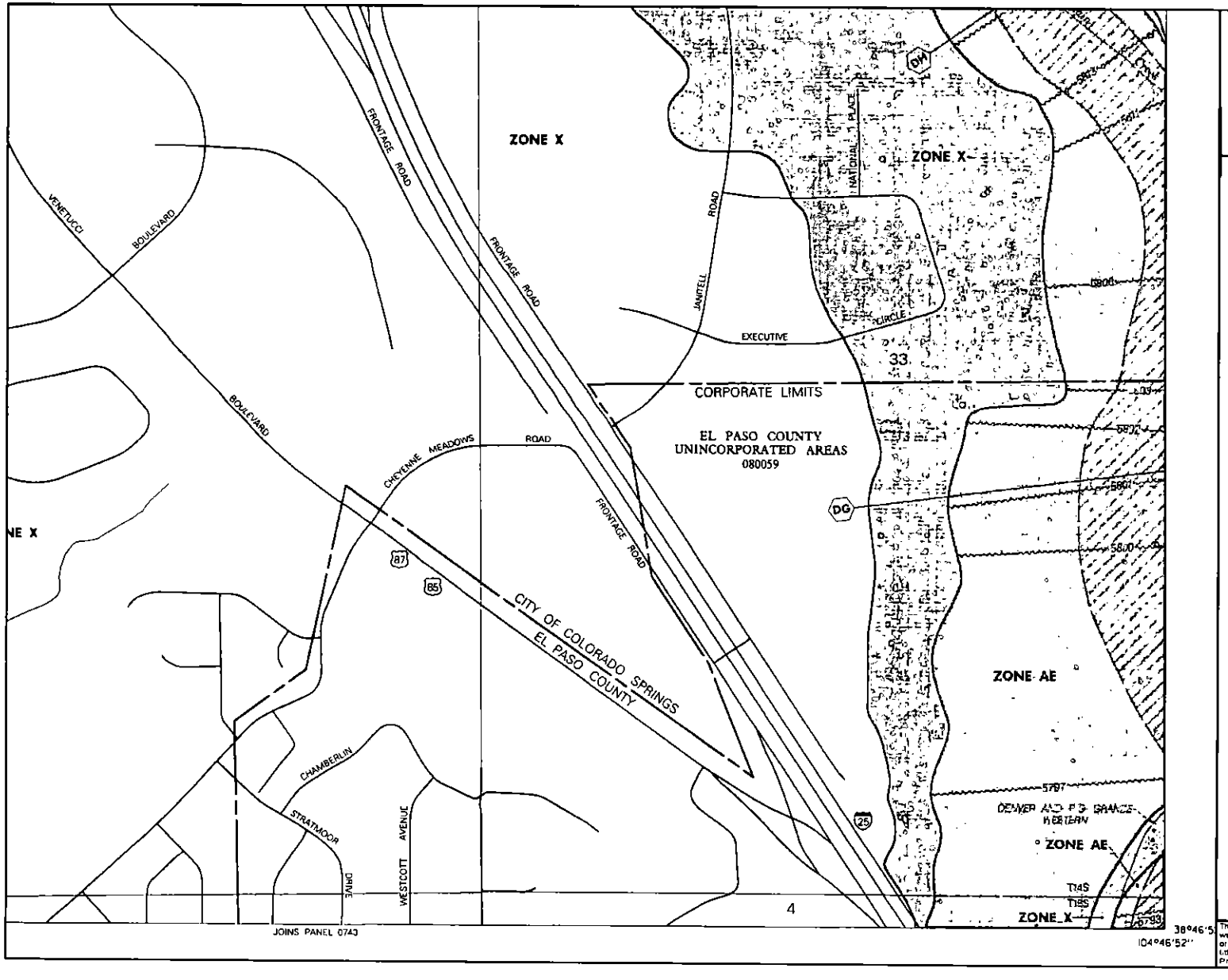

APPROXIMATE SCALE IN FEET
500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 741 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0741	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0741	F

MAP NUMBER
08041C0741 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

HYDROLOGIC CALCULATIONS

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JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *02/07/12*
CALCULATED BY: *MAL*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY (EXISTING CONDITIONS)

BASIN	TOTAL AREA (AC)	EXISTING SINGLE FAMILY AREA			EXISTING VENETUCCI BLVD.			LANDSCAPE/UNDEVELOPED AREAS			WEIGHTED		WEIGHTED CA	
		AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	CA(5)	CA(100)
EX-1	6.13	6.13	0.40	0.55	0.00	0.90	0.95	0.00	0.25	0.35	0.40	0.55	**2.45**	**3.37**
EX-2	9.58	9.58	0.40	0.55	0.00	0.90	0.95	0.00	0.25	0.35	0.40	0.55	**3.83**	**5.27**
EX-3	8.97	8.97	0.40	0.55	0.00	0.90	0.95	0.00	0.25	0.35	0.40	0.55	**3.59**	**4.93**
EX-4	4.57	4.57	0.40	0.55	0.00	0.90	0.95	0.00	0.25	0.35	0.40	0.55	**1.83**	**2.51**
EX-5	4.93	4.23	0.40	0.55	0.00	0.90	0.95	0.70	0.25	0.35	0.38	0.52	**1.87**	**2.57**
EX-6	3.96	3.60	0.50	0.60	0.00	0.90	0.95	0.36	0.30	0.45	0.48	0.59	**1.91**	**2.32**
EX-7	5.17	2.90	0.50	0.60	0.00	0.90	0.95	2.27	0.30	0.45	0.41	0.53	**2.13**	**2.76**
EX-8	1.85	1.85	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	**0.93**	**1.11**
EX-9	3.54	1.85	0.50	0.60	0.00	0.90	0.95	1.69	0.30	0.45	0.40	0.53	**1.43**	**1.87**
EX-10	1.11	0.12	0.50	0.60	0.00	0.90	0.95	0.99	0.30	0.45	0.32	0.47	**0.36**	**0.52**
EX-11	3.83	1.46	0.50	0.60	0.11	0.90	0.95	2.26	0.30	0.45	0.39	0.52	**1.51**	**2.00**
EX-12	7.01	1.83	0.50	0.60	0.19	0.90	0.95	4.99	0.30	0.45	0.37	0.50	**2.58**	**3.52**
EX-13	8.63	4.09	0.50	0.60	0.21	0.90	0.95	4.33	0.30	0.45	0.41	0.53	**3.53**	**4.60**
EX-14	13.75	7.47	0.50	0.60	0.56	0.90	0.95	5.72	0.30	0.45	0.43	0.55	**5.96**	**7.59**
EX-15	2.64	0.00	0.50	0.60	0.36	0.90	0.95	2.28	0.30	0.45	0.38	0.52	**1.01**	**1.37**
EX-16	31.48	31.48	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	**15.74**	**18.89**
EX-17	0.80	0.00	0.50	0.60	0.60	0.90	0.95	0.20	0.30	0.45	0.75	0.83	**0.60**	**0.66**
EX-18	0.68	0.00	0.50	0.60	0.37	0.90	0.95	0.31	0.30	0.45	0.63	0.72	**0.43**	**0.49**
EX-19	0.58	0.00	0.50	0.60	0.18	0.90	0.95	0.40	0.30	0.45	0.49	0.61	**0.28**	**0.35**
EX-20	14.70	14.70	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	**7.35**	**8.82**
EX-21	14.83	13.73	0.50	0.60	1.10	0.90	0.95	0.00	0.30	0.45	0.53	0.63	**7.86**	**9.28**
EX-22	4.46	4.12	0.50	0.60	0.34	0.90	0.95	0.00	0.30	0.45	0.53	0.63	**2.37**	**2.80**

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *02/07/12*
CALC'D BY: *MAL*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY (EXISTING CONDITIONS)

BASIN	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
EX-1	2.45	3.37	0.4	125	4	10.0	160	5.0%	7.8	0.3	10.3	4.05	7.21	9.9	24.3
EX-2	3.83	5.27	0.4	115	4	9.3	500	2.5%	5.5	1.5	10.8	3.98	7.08	15.3	37.3
EX-3	3.59	4.93	0.4	100	10	6.1	250	5.0%	7.8	0.5	6.7	4.71	8.38	16.9	41.3
EX-4	1.83	2.51	0.4	150	31	5.9	475	3.4%	6.5	1.2	7.1	4.62	8.20	8.4	20.6
EX-5	1.87	2.57	0.4	50	2	5.9	750	3.0%	6.1	2.1	7.9	4.46	7.93	8.3	20.4
EX-6	1.91	2.32	0.4	250	24	9.8	500	7.2%	9.4	0.9	10.7	4.00	7.10	7.6	16.5
EX-7	2.13	2.76	0.4	130	38	4.9	260	4.6%	7.5	0.6	5.5	4.98	8.86	10.6	24.5
EX-8	0.93	1.11	0.4	70	4	6.2	1220	6.0%	8.6	2.4	8.5	4.35	7.73	4.0	8.6
EX-9	1.43	1.87	0.4	70	4	6.2	1810	6.0%	8.6	3.5	9.7	4.15	7.38	5.9	13.8
EX-10	0.36	0.52	0.4	150	52	5.0	300	6.7%	9.0	0.6	5.5	4.97	8.84	1.8	4.6
EX-11	1.51	2.00	0.4	100	10	6.1	510	14.5%	13.3	0.6	6.8	4.69	8.34	7.1	16.7
EX-12	2.58	3.52	0.4	185	11	9.9	430	14.5%	13.3	0.5	10.4	4.04	7.18	10.4	25.3
EX-13	3.53	4.60	0.4	200	21	8.5	740	7.8%	9.8	1.3	9.8	4.14	7.35	14.6	33.8
EX-14	5.96	7.59	0.4	150	10	8.6	1000	8.4%	10.1	1.6	10.2	4.07	7.23	24.2	54.9
EX-15	1.01	1.37	0.4	180	36	6.5	500	1.7%	4.6	1.8	8.4	4.38	7.78	4.4	10.6
EX-16	15.74	18.89	0.4	350	13	15.9	1600	4.0%	7.0	3.8	19.7	3.04	5.40	47.8	102.0
EX-17	0.60	0.66	0.4	10	1	1.9	450	2.5%	5.5	1.4	5.0	5.10	9.07	3.1	6.0
EX-18	0.43	0.49	0.4	10	1	1.9	370	3.0%	6.1	1.0	5.0	5.10	9.07	2.2	4.5
EX-19	0.28	0.35	0.4	10	1	1.9	300	1.0%	3.5	1.4	5.0	5.10	9.07	1.4	3.2
EX-20	7.35	8.82	0.4	350	13	15.9	1600	4.0%	7.0	3.8	19.7	3.04	5.40	22.3	47.6
EX-21	7.86	9.28	0.4	50	4	4.7	1150	4.0%	7.0	2.7	7.4	4.56	8.11	35.8	75.3
EX-22	2.37	2.80	0.4	250	44	8.0	850	4.0%	7.0	2.0	10.1	4.09	7.28	9.7	20.3

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *02/07/12*
CALCULATED BY: *MAL*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY (DEVELOPED CONDITIONS)

		EXISTING SINGLE FAMILY AREA			ROADWAYS			LANDSCAPE/UNDEVELOPED AREAS			WEIGHTED		WEIGHTED CA	
BASIN	TOTAL AREA (AC)	AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	CA(5)	CA(100)
OS-1	6.13	6.13	0.40	0.55	0.00	0.90	0.95	0.00	0.25	0.35	0.40	0.55	2.45	3.37
OS-2	9.58	9.58	0.40	0.55	0.00	0.90	0.95	0.00	0.25	0.35	0.40	0.55	3.83	5.27
OS-3	8.97	8.97	0.40	0.55	0.00	0.90	0.95	0.00	0.25	0.35	0.40	0.55	3.59	4.93
OS-4	4.57	4.57	0.40	0.55	0.00	0.90	0.95	0.00	0.25	0.35	0.40	0.55	1.83	2.51
OS-5	4.93	4.23	0.40	0.55	0.00	0.90	0.95	0.70	0.25	0.35	0.38	0.52	1.87	2.57
OS-6	3.96	3.60	0.50	0.60	0.00	0.90	0.95	0.36	0.30	0.45	0.48	0.59	1.91	2.32
OS-7	1.16	1.16	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.58	0.70
OS-8	1.85	1.85	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.93	1.11
OS-9	3.54	1.85	0.50	0.60	0.00	0.90	0.95	1.69	0.30	0.45	0.40	0.53	1.43	1.87
OS-10	0.49	0.49	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.25	0.29
OS-11	1.17	1.03	0.50	0.60	0.14	0.90	0.95	0.00	0.30	0.45	0.55	0.64	0.64	0.75
OS-12	0.89	0.89	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.45	0.53
OS-13	3.13	3.13	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	1.57	1.88
OS-14	12.01	7.47	0.50	0.60	0.00	0.90	0.95	4.54	0.30	0.45	0.42	0.54	5.10	6.53
OS-15	2.64	0.00	0.50	0.60	0.36	0.90	0.95	2.28	0.30	0.45	0.38	0.52	1.01	1.37
OS-16	31.48	31.48	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	15.74	18.89
OS-17	0.80	0.00	0.50	0.60	0.60	0.90	0.95	0.20	0.30	0.45	0.75	0.83	0.60	0.66
OS-18	0.72	0.72	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.36	0.43
OS-19	0.72	0.72	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.36	0.43
OS-20	14.70	14.70	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	7.35	8.82
OS-21	14.83	13.73	0.50	0.60	1.10	0.90	0.95	0.00	0.30	0.45	0.53	0.63	7.86	9.28
OS-22	4.46	4.12	0.50	0.60	0.34	0.90	0.95	0.00	0.30	0.45	0.53	0.63	2.37	2.80
OS-23	0.61	0.61	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.31	0.37
OS-24	0.78	0.78	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.39	0.47
OS-25	0.56	0.56	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.28	0.34
OS-26	0.56	0.56	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.28	0.34
OS-27	0.87	0.87	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.44	0.52
OS-28	0.38	0.38	0.50	0.60	0.00	0.90	0.95	0.00	0.30	0.45	0.50	0.60	0.19	0.23
OS-29	0.31	0.00	0.50	0.60	0.00	0.90	0.95	0.31	0.30	0.45	0.30	0.45	0.09	0.14

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *02/07/12*
CALCULATED BY: *MAL*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY (DEVELOPED CONDITIONS)

BASIN	TOTAL AREA (AC)	EXISTING SINGLE FAMILY AREA			ROADWAYS			LANDSCAPE/UNDEVELOPED AREAS			WEIGHTED		WEIGHTED CA	
		AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	AREA (AC)	C(5)	C(100)	C(5)	C(100)	CA(5)	CA(100)
A	0.79	0.00	0.50	0.60	0.00	0.90	0.95	0.79	0.30	0.45	0.30	0.45	**0.24**	**0.36**
B	0.12	0.00	0.50	0.60	0.06	0.90	0.95	0.06	0.30	0.45	0.60	0.70	**0.07**	**0.08**
C	0.74	0.00	0.50	0.60	0.43	0.90	0.95	0.31	0.30	0.45	0.65	0.74	**0.48**	**0.55**
D	0.63	0.00	0.50	0.60	0.27	0.90	0.95	0.36	0.30	0.45	0.56	0.66	**0.35**	**0.42**
E	1.05	0.00	0.50	0.60	0.65	0.90	0.95	0.40	0.30	0.45	0.67	0.76	**0.71**	**0.80**
F	0.15	0.00	0.50	0.60	0.00	0.90	0.95	0.15	0.30	0.45	0.30	0.45	**0.05**	**0.07**
G	1.49	0.00	0.50	0.60	0.66	0.90	0.95	0.83	0.30	0.45	0.57	0.67	**0.84**	**1.00**
H	1.51	0.00	0.50	0.60	0.76	0.90	0.95	0.75	0.30	0.45	0.60	0.70	**0.91**	**1.06**
I	0.48	0.00	0.50	0.60	0.00	0.90	0.95	0.48	0.30	0.45	0.30	0.45	**0.14**	**0.22**
J	0.40	0.00	0.50	0.60	0.15	0.90	0.95	0.25	0.30	0.45	0.53	0.64	**0.21**	**0.26**
K	0.28	0.00	0.50	0.60	0.16	0.90	0.95	0.12	0.30	0.45	0.64	0.74	**0.18**	**0.21**
L	1.59	0.00	0.50	0.60	1.23	0.90	0.95	0.36	0.30	0.45	0.76	0.84	**1.22**	**1.33**
M	1.47	0.00	0.50	0.60	1.24	0.90	0.95	0.23	0.30	0.45	0.81	0.87	**1.19**	**1.28**
N	2.15	0.00	0.50	0.60	1.85	0.90	0.95	0.30	0.30	0.45	0.82	0.88	**1.76**	**1.89**
P	0.68	0.00	0.50	0.60	0.41	0.90	0.95	0.27	0.30	0.45	0.66	0.75	**0.45**	**0.51**
V-1	0.65	0.00	0.50	0.60	0.35	0.90	0.95	0.30	0.30	0.45	0.62	0.72	**0.41**	**0.47**
V-2	0.54	0.00	0.50	0.60	0.30	0.90	0.95	0.24	0.30	0.45	0.63	0.73	**0.34**	**0.39**
V-3	0.19	0.00	0.50	0.60	0.14	0.90	0.95	0.05	0.30	0.45	0.74	0.82	**0.14**	**0.16**
V-4	0.19	0.00	0.50	0.60	0.19	0.90	0.95	0.00	0.30	0.45	0.90	0.95	**0.17**	**0.18**
V-5	0.59	0.00	0.50	0.60	0.19	0.90	0.95	0.40	0.30	0.45	0.49	0.61	**0.29**	**0.36**
V-6	1.05	0.00	0.50	0.60	0.67	0.90	0.95	0.38	0.30	0.45	0.68	0.77	**0.72**	**0.81**

JOB NAME:	*Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER:	*2320.00*
DATE:	*02/07/12*
CALC'D BY:	*MAL*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY (DEVELOPED CONDITIONS)

	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
BASIN	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
OS-1	2.45	3.37	0.4	125	4	10.0	160	5.0%	7.8	0.3	10.3	4.05	7.21	9.9	24.3
OS-2	3.83	5.27	0.4	115	4	9.3	500	2.5%	5.5	1.5	10.8	3.98	7.08	15.3	37.3
OS-3	3.59	4.93	0.4	100	10	6.1	250	5.0%	7.8	0.5	6.7	4.71	8.38	16.9	41.3
OS-4	1.83	2.51	0.4	150	31	5.9	475	3.4%	6.5	1.2	7.1	4.62	8.20	8.4	20.6
OS-5	1.87	2.57	0.4	50	2	5.9	750	3.0%	6.1	2.1	7.9	4.46	7.93	8.3	20.4
OS-6	1.91	2.32	0.4	250	24	9.8	500	7.2%	9.4	0.9	10.7	4.00	7.10	7.6	18.5
OS-7	0.58	0.70	0.4	50	8	3.7	90	29.0%	18.8	0.1	5.0	5.10	9.07	3.0	6.3
OS-8	0.93	1.11	0.4	70	4	6.2	1220	6.0%	8.6	2.4	8.5	4.35	7.73	4.0	8.6
OS-9	1.43	1.87	0.4	70	4	6.2	1810	6.0%	8.6	3.5	9.7	4.15	7.38	5.9	13.8
OS-10	0.25	0.29	0.4	50	10	3.4	100	30.0%	19.2	0.1	5.0	5.10	9.07	1.3	2.7
OS-11	0.64	0.75	0.4	140	20	6.4	275	5.5%	8.2	0.6	7.0	4.64	8.25	3.0	6.2
OS-12	0.45	0.53	0.4	80	6	6.0	180	16.0%	14.8	0.2	6.2	4.81	8.55	2.1	4.5
OS-13	1.57	1.88	0.4	75	6	5.7	160	11.0%	11.6	0.2	5.9	4.87	8.67	7.6	16.3
OS-14	5.10	8.53	0.4	160	8	9.7	600	12.0%	12.1	0.8	10.6	4.02	7.14	20.5	48.8
OS-15	1.01	1.37	0.4	180	36	6.5	500	1.7%	4.6	1.8	8.4	4.38	7.78	4.4	10.6
OS-16	15.74	18.89	0.4	60	6	4.7	100	33.0%	20.1	0.1	5.0	5.10	9.07	80.3	171.4
OS-17	0.60	0.66	0.4	10	1	1.9	450	2.5%	5.5	1.4	5.0	5.10	9.07	3.1	6.0
OS-18	0.36	0.43	0.4	70	8	4.9	135	28.0%	16.5	0.1	5.0	5.10	9.06	1.8	3.9
OS-19	0.36	0.43	0.4	150	9	8.9	50	33.0%	20.1	0.0	8.9	4.28	7.61	1.5	3.3
OS-20	7.35	8.82	0.4	350	13	15.9	1600	4.0%	7.0	3.8	19.7	3.04	5.40	22.3	47.6
OS-21	7.86	9.28	0.4	50	4	4.7	1150	4.0%	7.0	2.7	7.4	4.56	8.11	35.8	75.3
OS-22	2.37	2.80	0.4	250	44	8.0	850	4.0%	7.0	2.0	10.1	4.09	7.28	9.7	20.3
OS-23	0.31	0.37	0.4	100	8	6.6	85	42.0%	22.7	0.1	6.7	4.71	8.38	1.4	3.1
OS-24	0.39	0.47	0.4	30	2	3.8	225	24.0%	17.1	0.2	5.0	5.10	9.07	2.0	4.2
OS-25	0.28	0.34	0.4	40	8	3.1	120	32.0%	19.8	0.1	5.0	5.10	9.07	1.4	3.0
OS-26	0.28	0.34	0.4	80	6	6.0	100	38.0%	21.6	0.1	6.1	4.84	8.60	1.4	2.9
OS-27	0.44	0.52	0.4	100	6	7.2	100	28.0%	18.5	0.1	7.3	4.57	8.13	2.0	4.2
OS-28	0.19	0.23	0.4	60	6	4.7	100	33.0%	20.1	0.1	5.0	5.10	9.07	1.0	2.1
OS-29	0.09	0.14	0.4	30	4	3.0	120	29.0%	18.8	0.1	5.0	5.10	9.07	0.5	1.3

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FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY (DEVELOPED CONDITIONS)

	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY		TOTAL FLOWS	
BASIN	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
A	0.24	0.36	0.4	40	4	3.9	50	25.0%	17.5	0.0	5.0	5.10	9.07	1.2	3.2
B	0.07	0.08	0.4	20	2.5	2.5	45	2.0%	4.9	0.2	5.0	5.10	9.07	0.4	0.8
C	0.48	0.55	0.4	15	1	2.7	150	2.0%	4.9	0.5	5.0	5.10	9.07	2.5	5.0
D	0.35	0.42	0.4	20	1	3.4	85	2.0%	4.9	0.3	5.0	5.10	9.07	1.8	3.8
E	0.71	0.80	0.4	15	1	2.7	150	2.3%	5.3	0.5	5.0	5.10	9.07	3.6	7.2
F	0.05	0.07	0.4	30	5	2.8	70	33.0%	20.1	0.1	5.0	5.10	9.07	0.2	0.6
G	0.84	1.00	0.4	30	7.5	2.5	775	1.1%	3.7	3.5	6.0	4.86	8.64	4.1	8.6
H	0.91	1.06	0.4	50	18	2.8	380	6.0%	8.6	0.7	5.0	5.10	9.07	4.6	9.6
I	0.14	0.22	0.4	60	10	4.0	60	33.0%	20.1	0.0	5.0	5.10	9.07	0.7	2.0
J	0.21	0.26	0.4	10	1	1.9	160	2.0%	4.9	0.5	5.0	5.10	9.07	1.1	2.3
K	0.18	0.21	0.4	10	1	1.9	150	2.0%	4.9	0.5	5.0	5.10	9.07	0.9	1.9
L	1.22	1.33	0.4	30	1	4.8	230	2.5%	5.5	0.7	5.5	4.98	8.85	6.0	11.8
M	1.19	1.28	0.4	20	1	3.4	450	1.5%	4.3	1.7	5.2	5.06	8.99	6.0	11.5
N	1.76	1.89	0.4	15	1	2.7	650	1.5%	4.3	2.5	5.2	5.04	8.97	8.9	17.0
P	0.45	0.51	0.4	5	0.1	2.3	25	2.0%	4.9	0.1	5.0	5.10	9.07	2.3	4.6
V-1	0.41	0.47	0.4	30	2	3.8	360	3.0%	6.1	1.0	5.0	5.10	9.07	2.1	4.2
V-2	0.34	0.39	0.4	30	5	2.8	345	3.0%	6.1	0.9	5.0	5.10	9.07	1.7	3.6
V-3	0.14	0.16	0.4	30	1	4.8	40	2.0%	4.9	0.1	5.0	5.10	9.07	0.7	1.4
V-4	0.17	0.18	0.4	5	1	1.1	240	1.1%	3.7	1.1	5.0	5.10	9.07	0.9	1.6
V-5	0.29	0.36	0.4	40	2	4.9	250	1.5%	4.3	1.0	5.8	4.90	8.71	1.4	3.1
V-6	0.72	0.81	0.4	30	4	3.0	375	1.0%	3.5	1.8	5.0	5.10	9.07	3.7	7.3

HYDRAULIC CALCULATIONS
INCLUDING STORM WATER QUALITY CALCULATIONS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
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FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY (EXISTING CONDITIONS)

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
1	Basin EX-1 + Basin EX-2 + Basin EX-3	9.87	13.57	27.8	2.53	4.50	25.0	61.1	Culvert under Chamberlin Ave.
2	DP-1 + Basin EX-4 + Basin EX-5 + Basin EX-6	15.48	20.98	29.0	2.47	4.39	38.2	92.1	Confluence Point of ravines
3	DP-2 + Basin EX-7 + Basin EX-8	18.53	24.85	29.6	2.44	4.34	45.2	107.9	Surface flow onto Westmark
4	DP-3 + Basin EX-9 + Basin EX-10	20.32	27.24	29.6	2.44	4.34	49.6	118.3	Surface flow onto Venetucci
5	Basin EX-11	1.51	2.00	6.8	4.69	8.34	7.1	16.7	Existing 12" CMP
6	Basin EX-12	2.58	3.52	10.4	4.04	7.18	10.4	25.3	Existing Filled In Box Culvert
7	Basin EX-13 + Basin EX-14 + FlowBy DP-11	10.57	16.32	21.7	2.89	5.14	30.5	83.9	Existing Grated Inlet
8	DP-4 + Basin EX-15	21.33	28.61	29.6	2.44	4.34	52.1	124.2	Existing Elliptical CMP Culvert
9a	Basin EX-20	7.35	8.82	19.7	3.04	5.40	22.3	47.6	Existing 8' D-10R at-grade inlet
9b	Basin EX-16	15.74	18.89	19.7	3.04	5.40	47.8	102.0	Existing 8' D-10R at-grade inlet
9c	Basin EX-21 + Basin EX-22 + FlowBy DP-9a + FlowBy DP-9b	29.50	36.34	21.7	2.89	5.14	85.3	186.7	Existing 20' & 30' D-10R submerged inlets
10	Flow By from DP-9c	9.79	25.25	21.7	2.89	5.14	28.3	129.7	Existing 20' D-10R At-Grade
11	Flow By from DP-10	4.15	10.53	21.7	2.89	5.14	12.0	54.1	Existing 20' CDOT Type R At-Grade
12	Basin EX-17	0.60	0.66	5.0	5.10	9.07	3.1	6.0	Existing 5' CDOT Type R At-Grade
13	Basin EX-18 + FlowBy DP-12	0.66	0.90	5.0	5.10	9.07	3.4	8.2	Existing 5' CDOT Type R At-Grade
14	Basin EX-19	0.28	0.35	5.0	5.10	9.07	1.4	3.2	Existing Grated Inlet

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FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY (DEVELOPED CONDITIONS)

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
1	EXISTING DP EX-1	9.87	13.57	27.8	2.53	4.50	25.0	61.1	Existing RCP Culvert
2	EXISTING DP EX-2	15.48	20.98	29.0	2.47	4.39	38.2	92.1	Confluence Point of ravines
3	DP-2 + Basin OS-7 + Basin OS-26 + Basin A	16.57	22.37	29.0	2.47	4.39	40.9	98.2	42" FES
4	Basin B + Basin OS-19	0.43	0.52	8.9	4.28	7.61	1.8	3.9	(2) Area Drains ~ (1) 18" circular, (1) Type D Grated Inlet
5	Basin C + Basin OS-23 + Basin OS-24	1.18	1.38	6.7	4.71	8.38	5.5	11.6	(4) Area Drains ~ (3) 18" circular, (1) CDOT Type D Grated Inlet
6	Basin D + Basin OS-25	0.63	0.75	5.0	5.10	9.07	3.2	6.8	(4) Area Drains ~ (2) 18" circular, (2) CDOT Type D Grated Inlet
7	Basin E + Basin OS-10	0.95	1.09	5.0	5.10	9.07	4.8	9.9	10.0' CDOT Type R Sump Inlet
8	PIPE 4 + Basin F	3.23	3.81	8.9	4.28	7.61	13.8	29.0	SAND FILTER BASIN #1 SWQ
9a	EXISTING DP EX-9A	7.35	8.82	19.7	3.04	5.40	22.3	47.6	Existing 8' D-10R at-grade inlet
9b	EXISTING DP EX-9B	15.74	18.89	19.7	3.04	5.40	47.8	102.0	Existing 8' D-10R at-grade inlet
9c	EXISTING DP EX-9C	29.50	36.34	21.7	2.89	5.14	85.3	186.7	Existing 20' & 30' D-10R submerged inlets
10	EXISTING DP EX-10	9.79	25.25	21.7	2.89	5.14	28.3	129.7	Existing 20' D-10R At-Grade
11	EXISTING DP EX-11	4.15	10.53	21.7	2.89	5.14	12.0	54.1	Existing 20' CDOT Type R At-Grade
12	EXISTING DP EX-12	0.60	0.66	5.0	5.10	9.07	3.1	6.0	Existing 5' CDOT Type R At-Grade

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FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY (DEVELOPED CONDITIONS)

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
13	Flow By DP-12 + Basin V-1	0.64	0.88	5.0	5.10	9.07	3.3	8.0	Existing 5' CDOT Type R At-Grade
14	Basin V-5	0.29	0.36	5.8	4.90	8.71	1.4	3.1	(1) CDOT Type D Grated Inlet
17	Basin V-6 + Basin H + Basin OS-29	1.72	2.01	5.0	5.10	9.07	8.8	18.2	12' CDOT Type R Sump Inlet
18	Basin OS-14 + Basin V-2 + Flow By DP-11	6.52	11.05	21.7	2.89	5.14	18.8	56.8	(3) CDOT Type D Grated Inlets
19	Basin J + Basin OS-12	0.66	0.79	6.2	4.81	8.55	3.2	6.7	(2) Area Drains ~ (1) 18" circular, (1) CDOT Type D Grated Inlet
20	Basin K + Basin OS-27	0.62	0.73	7.3	4.57	8.13	2.8	5.9	(2) Area Drains ~ (1) 18" circular, (1) CDOT Type D Grated Inlet
21	Basin L + PIPE 8	2.49	2.85	7.3	4.57	8.13	11.4	23.1	SAND FILTER BASIN #2 SWQ
22	Basin M + Basin N + Basin OS-18 + Basin OS-28	3.49	3.83	5.2	5.06	8.99	17.6	34.5	SAND FILTER BASIN #3 SWQ
23	Basin I + Basin OS-13	1.71	2.09	5.9	4.87	8.67	8.3	18.1	(1) CDOT Type D Grated Inlet
24	Basin G + Basin OS-8 + Basin OS-9 + Basin OS-11	3.84	4.73	9.7	4.15	7.38	16.0	34.9	Surface Flow south down Venetucci
25	DP-24 + Basin OS-15	4.85	6.10	9.7	4.15	7.38	20.1	45.0	Existing Elliptical CMP culvert
26	Basin P	0.45	0.51	5.0	5.10	9.07	2.3	4.6	(9) 18" circular area drains

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* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE. REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
1	DP-4	0.43	0.52	8.9	4.28	7.61	1.8	3.9	18" RCP
2	PIPE 1 + DP-5	1.61	1.90	8.9	4.28	7.61	6.9	14.4	24" RCP
3	PIPE 2 + DP-6	2.24	2.65	8.9	4.28	7.61	9.6	20.2	24" RCP
4	PIPE 3 + DP-7	3.19	3.74	8.9	4.28	7.61	13.6	28.5	30" RCP
5	DP-8 OUT	3.23	3.81	8.9	4.28	7.61	13.8	29.0	30" RCP
6	DP-19	0.66	0.79	6.2	4.81	8.55	3.2	6.7	18" RCP
7	DP-20	0.62	0.73	7.3	4.57	8.13	2.8	5.9	18" RCP
8	PIPE 6 + PIPE 7	1.27	1.52	7.3	4.57	8.13	5.8	12.3	18" RCP
9a	DP-3	16.57	22.37	29.0	2.47	4.39	40.9	98.2	42" RCP
9b	PIPE 9a + PIPE 5	19.81	26.18	29.0	2.47	4.39	48.9	114.9	48" RCP

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FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
10a	DP-22 OUT	3.49	3.83	5.2	5.06	8.99	17.6	34.5	24" RCP
10b	DP-26	0.45	0.51	5.0	5.10	9.07	2.3	4.6	12" PVC
11	PIPE 9B + PIPE 10a + PIPE 10b	23.75	30.53	29.0	2.47	4.39	58.6	134.0	48" RCP
12	DP-13 (INTERCEPTED)	0.42	0.39	5.0	5.10	9.07	2.2	3.6	24" RCP
14	DP-18	6.52	11.05	21.7	2.89	5.14	18.8	56.8	36" RCP
15	DP-17	1.72	2.01	5.0	5.10	9.07	8.8	18.2	24" RCP
17	DP-23	1.71	2.09	5.9	4.87	8.67	8.3	18.1	18" RCP
18	DP-21 OUT	2.49	2.85	7.3	4.57	8.13	11.4	23.1	24" RCP
19	PIPE 17 + PIPE 18	4.19	4.94	7.3	4.57	8.13	19.2	40.2	30" RCP
20	PIPE 14 + PIPE 19	10.71	15.99	21.7	2.89	5.14	31.0	82.2	48" RCP
21	PIPE 20 + PIPE 15	12.43	18.00	21.7	2.89	5.14	35.9	92.5	48" RCP
22	PIPE 21 + PIPE 12 + DP-14	13.15	18.76	21.7	2.89	5.14	38.0	96.3	48" RCP

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DESIGN POINT **EX DP-9a** **100 YEAR FLOW**

Q(100)	47.6	I(100)	5.4		
DEPTH	0.67	Fr	3.09	Inlet size ? L(i) =	8
SPREAD	27.0	L(1)	64.3	If Li < L(2) then Qi =	6
CROSS SLOPE	2.0%	L(2)	38.6	If Li > L(2) then Qi =	15
STREET SLOPE	4.5%	L(3)	137.9	FB =	41.7
				CA(eqv.)=	7.72

5 YEAR FLOW

Q(5)	22.3	I(5)	3.0		
DEPTH	0.42	Fr	2.77	Inlet size ? L(i) =	8
SPREAD	14.8	L(1)	31.4	If Li < L(2) then Qi =	6
CROSS SLOPE	2.0%	L(2)	18.9	If Li > L(2) then Qi =	10
STREET SLOPE	4.5%	L(3)	67.3	FB =	16.6
				CA(eqv.)=	5.48

JOB NAME:	*Independence Place at Cheyenne Mountain Filing No. 1*
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DESIGN POINT	**EX DP-9b**			**100 YEAR FLOW**	
Q(100)	102.0	**I(100)**	5.4		
DEPTH	0.67	**Fr**	3.09	**Inlet size ? L(i) =**	8
SPREAD	27.0	**L(1)**	64.3	**If Li < L(2) then Qi =**	13
CROSS SLOPE	2.0%	**L(2)**	38.6	**If Li > L(2) then Qi =**	33
STREET SLOPE	4.5%	**L(3)**	137.9	**FB =**	89.3
				CA(eqv.)=	16.54

5 YEAR FLOW

Q(5)	47.8	**I(5)**	3.0		
DEPTH	0.67	**Fr**	3.10	**Inlet size ? L(i) =**	8
SPREAD	27.3	**L(1)**	65.0	**If Li < L(2) then Qi =**	6
CROSS SLOPE	2.0%	**L(2)**	39.1	**If Li > L(2) then Qi =**	15
STREET SLOPE	4.5%	**L(3)**	139.4	**FB =**	41.9
				CA(eqv.)=	13.80

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DESIGN POINT **EX DP-9c** Existing 20' & 30' D10-R Inlets

Total Flow: Q_5 = 85.3 cfs I_5 = 2.89

Q_{100} = 186.7 cfs I_{100} = 5.14

Maximum ponding depth at sump: (DCM 7.6.2)

Qi = 0.67A (2g(di-h/2))^0.5

A = area of opening in SF

di = depth of water above inlet lip in FT

h = height of opening in FT

Solving for Qi *(total flow intercepted)*

A = 20 ft * 0.67 ft (1) 20' & (1) 30'

= **33.5** sf

di = **0.35** ft (5 yr)

di = **0.35** ft (100 yr)

h = 0.5 ft

Qi_5 =	**57 cfs**	**for 5yr event**
Qi_{100} =	**57 cfs**	**for 100 yr event**

FLOWBY

Q_5 =	**28 cfs**
Q_{100} =	**130 cfs**
CA_5 =	**9.79**
CA_{100} =	**25.25**

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DESIGN POINT **EX DP-10** **100 YEAR FLOW**

Q(100)	129.7	I(100)	5.1		
DEPTH	0.67	Fr	1.65	Inlet size ? L(i) =	20
SPREAD	27.0	L(1)	34.3	If Li < L(2) then Qi =	76
CROSS SLOPE	2.0%	L(2)	20.6	If Li > L(2) then Qi =	77
STREET SLOPE	1.3%	L(3)	73.5	FB =	54.1
				CA(eqv.)=	10.53

5 YEAR FLOW

Q(5)	28.3	I(5)	2.9		
DEPTH	0.67	Fr	1.65	Inlet size ? L(i) =	20
SPREAD	27.3	L(1)	34.7	If Li < L(2) then Qi =	16
CROSS SLOPE	2.0%	L(2)	20.8	If Li > L(2) then Qi =	17
STREET SLOPE	1.3%	L(3)	74.3	FB =	12.0
				CA(eqv.)=	4.15

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DESIGN POINT **EX DP-11** **100 YEAR FLOW**

Q(100)	54.1	I(100)	5.1		
DEPTH	0.50	Fr	2.28	Inlet size ? L(i) =	20
SPREAD	18.5	L(1)	32.4	If Li < L(2) then Qi =	33
CROSS SLOPE	2.0%	L(2)	19.5	If Li > L(2) then Qi =	33
STREET SLOPE	2.8%	L(3)	69.5	FB =	21.2
				CA(eqv.)=	4.13

5 YEAR FLOW

Q(5)	12.0	I(5)	2.9		
DEPTH	0.37	Fr	2.10	Inlet size ? L(i) =	20
SPREAD	12.3	L(1)	19.8	If Li < L(2) then Qi =	12
CROSS SLOPE	2.0%	L(2)	11.9	If Li > L(2) then Qi =	9
STREET SLOPE	2.8%	L(3)	42.5	FB =	3.1
				CA(eqv.)=	1.08

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DESIGN POINT **EX DP-12** **100 YEAR FLOW**

Q(100)	6.0	I(100)	9.1		
DEPTH	0.30	Fr	2.02	Inlet size ? L(i) =	5
SPREAD	8.5	L(1)	13.2	If Li < L(2) then Qi =	2
CROSS SLOPE	2.0%	L(2)	7.9	If Li > L(2) then Qi =	3
STREET SLOPE	3.0%	L(3)	28.3	FB =	3.7
				CA(eqv.)=	0.41

5 YEAR FLOW

Q(5)	3.1	I(5)	5.1		
DEPTH	0.24	Fr	1.84	Inlet size ? L(i) =	5
SPREAD	5.8	L(1)	8.2	If Li < L(2) then Qi =	2
CROSS SLOPE	2.0%	L(2)	4.9	If Li > L(2) then Qi =	2
STREET SLOPE	3.0%	L(3)	17.5	FB =	1.2
				CA(eqv.)=	0.24

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DESIGN POINT **EX DP-13** **100 YEAR FLOW**

Q(100)	8.2	I(100)	9.1		
DEPTH	0.41	Fr	1.08	Inlet size ? L(i) =	5
SPREAD	14.0	L(1)	11.6	If Li < L(2) then Qi =	4
CROSS SLOPE	2.0%	L(2)	7.0	If Li > L(2) then Qi =	4
STREET SLOPE	0.7%	L(3)	24.9	FB =	4.7
				CA(eqv.)=	0.51

5 YEAR FLOW

Q(5)	3.4	I(5)	5.1		
DEPTH	0.30	Fr	0.98	Inlet size ? L(i) =	5
SPREAD	8.8	L(1)	6.6	If Li < L(2) then Qi =	3
CROSS SLOPE	2.0%	L(2)	4.0	If Li > L(2) then Qi =	2
STREET SLOPE	0.7%	L(3)	14.2	FB =	1.2
				CA(eqv.)=	0.23

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *2/7/2012*
CALCULATED BY: *MAL*

DESIGN POINT 4

Total Flow: Q(5) = 1.8 cfs
Q(100) = 3.9 cfs

Maximum allowable ponding depth at sump:

D(5) = 0.50 (d)
D(100) = 0.67 (dmax)

Qi = [(3.0)(P)(d1.5)]/F (Weir Conditions)

Clogging Factor (F) = 2.0

5-Year Event: 3.5 foot perimeter required

100-Year Event: 4.8 foot perimeter required

INSTALL A TYPICAL CDOT TYPE D INLET TO ACCEPT BOTH 5YR & 100 YR DEVELOPED FLOWS AT THIS DESIGN POINT.

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *2/7/2012*
CALCULATED BY: *MAL*

DESIGN POINT 5

Total Flow: Q(5) = 5.5 cfs
Q(100) = 11.6 cfs

Maximum allowable ponding depth at sump:

D(5) = 0.50 (d)
D(100) = 0.67 (dmax)

Qi = [(3.0)(P)(d1.5)]/F (Weir Conditions)

Clogging Factor (F) = 2.0

5-Year Event: 10.4 foot perimeter required

100-Year Event: 14.1 foot perimeter required

INSTALL A TYPICAL CDOT TYPE D INLET TO ACCEPT BOTH 5YR & 100 YR DEVELOPED FLOWS AT THIS DESIGN POINT.

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *2/7/2012*
CALCULATED BY: *MAL*

DESIGN POINT 6

Total Flow: Q(5) = 3.2 cfs
Q(100) = 6.8 cfs

Maximum allowable ponding depth at sump:

D(5) = 0.50 (d)
D(100) = 0.67 (dmax)

Qi = [(3.0)(P)(d1.5)]/F (Weir Conditions)

Clogging Factor (F) = 2.0

5-Year Event: 6.1 foot perimeter required

100-Year Event: 8.3 foot perimeter required

INSTALL A TYPICAL CDOT TYPE D INLET TO ACCEPT BOTH 5YR & 100 YR DEVELOPED FLOWS AT THIS DESIGN POINT.

JOB NAME:	*Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER:	*2320.00*
DATE:	*02/07/12*
CALCULATED BY:	*MAL*

DESIGN POINT **DP-13** **100 YEAR FLOW**

Q(100)	8.0	I(100)	9.1		
DEPTH	0.40	Fr	1.07	Inlet size ? L(i) =	5
SPREAD	13.5	L(1)	11.1	If Li < L(2) then Qi =	4
CROSS SLOPE	2.0%	L(2)	6.7	If Li > L(2) then Qi =	4
STREET SLOPE	0.7%	L(3)	23.9	FB =	4.4
				CA(eqv.)=	0.48

5 YEAR FLOW

Q(5)	3.3	I(5)	5.1		
DEPTH	0.30	Fr	0.98	Inlet size ? L(i) =	5
SPREAD	8.8	L(1)	6.6	If Li < L(2) then Qi =	2
CROSS SLOPE	2.0%	L(2)	4.0	If Li > L(2) then Qi =	2
STREET SLOPE	0.7%	L(3)	14.2	FB =	1.1
				CA(eqv.)=	0.22

JOB NAME:	*Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER:	*2320.00*
DATE:	*02/07/12*
CALCULATED BY:	*MAL*

DESIGN POINT 7

Total Flow:

Q_5 = **4.8** cfs

Q_{100} = **9.9** cfs

Max. allowable ponding depth:

D_5 = 0.50 ft.

D_{100} = 0.50 ft.

Std. Type R curb inlet detail:

$$Qi = 1.7(Li+1.8(W))(dmax + a)^{1.85}$$

W = 2 ft.

a = 3 in.

Clogging Factor = 1.25

Li (1.[illegible] = Length of inlet opening

Curb inlet sizing:

5-Year Event: **4** foot inlet required

100-Year Event: **8** foot inlet required

(Install 10' Type R sump inlet to accept both 5 yr. & 100 yr. developed flows at this design point.)

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *2/7/2012*
CALCULATED BY: *MAL*

DESIGN POINT 14

Total Flow: Q(5) = 1.4 cfs
Q(100) = 3.1 cfs

Maximum allowable ponding depth at sump:

D(5) = 0.50 (d)
D(100) = 0.67 (dmax)

Qi = [(3.0)(P)(d1.5)]/F (Weir Conditions)

Clogging Factor (F) = 2.0

5-Year Event: 2.7 foot perimeter required

100-Year Event: 3.8 foot perimeter required

INSTALL A TYPICAL CDOT TYPE D INLET TO ACCEPT BOTH 5YR & 100 YR DEVELOPED FLOWS AT THIS DESIGN POINT.

JOB NAME:	*Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER:	*2320.00*
DATE:	*02/07/12*
CALCULATED BY:	*MAL*

DESIGN POINT **17**

Total Flow:

Q_5 = **8.8** cfs

Q_{100} = **18.2** cfs

Max. allowable ponding depth:

D_5 = 0.50 ft.

D_{100} = 0.67 ft.

Std. Type R curb inlet detail:

$$Qi = 1.7(Li+1.8(W))(dmax + a)^{1.85}$$

W = 2 ft.

a = 3 in.

Clogging Factor = 1.25

Li (1.2 = Length of inlet opening

Curb inlet sizing:

5-Year Event: **8** foot inlet required

100-Year Event: **12** foot inlet required

(Install 12' Type R sump inlet to accept both 5 yr. & 100 yr. developed flows at this design point.)

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *2/7/2012*
CALCULATED BY: *MAL*

DESIGN POINT 18

Total Flow: Q(5) = 18.8 cfs
Q(100) = 56.8 cfs

Maximum allowable ponding depth at sump:

D(5) = 0.50 (d)
D(100) = 1.00 (dmax)

Qi = [(3.0)(P)(d1.5)]/F (Weir Conditions)

Clogging Factor (F) = 2.0

5-Year Event: 35.5 foot perimeter required

100-Year Event: 37.9 foot perimeter required

INSTALL (3) TYPICAL CDOT TYPE D INLETS TO ACCEPT BOTH 5YR & 100 YR DEVELOPED FLOWS AT THIS DESIGN POINT.

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *2/7/2012*
CALCULATED BY: *MAL*

DESIGN POINT 19

Total Flow: Q(5) = 3.2 cfs
Q(100) = 6.7 cfs

Maximum allowable ponding depth at sump:

D(5) = 0.50 (d)
D(100) = 1.00 (dmax)

Qi = [(3.0)(P)(d1.5)]/F (Weir Conditions)

Clogging Factor (F) = 2.0

5-Year Event: 5.9 foot perimeter required

100-Year Event: 4.5 foot perimeter required

INSTALL A TYPICAL CDOT TYPE D INLET TO ACCEPT BOTH 5YR & 100 YR DEVELOPED FLOWS AT THIS DESIGN POINT.

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *2/7/2012*
CALCULATED BY: *MAL*

DESIGN POINT 19

Total Flow: Q(5) = 2.8 cfs
Q(100) = 5.9 cfs

Maximum allowable ponding depth at sump:

D(5) = 0.50 (d)
D(100) = 1.00 (dmax)

Qi = [(3.0)(P)(d1.5)]/F (Weir Conditions)

Clogging Factor (F) = 2.0

5-Year Event: 5.3 foot perimeter required

100-Year Event: 3.9 foot perimeter required

INSTALL A TYPICAL CDOT TYPE D INLET TO ACCEPT BOTH 5YR & 100 YR DEVELOPED FLOWS AT THIS DESIGN POINT.

JOB NAME: *Independence Place at Cheyenne Mountain Filing No. 1*
JOB NUMBER: *2320.00*
DATE: *2/7/2012*
CALCULATED BY: *MAL*

DESIGN POINT 23

Total Flow: Q(5) = 8.3 cfs
Q(100) = 18.1 cfs

Maximum allowable ponding depth at sump:

D(5) = 0.50 (d)
D(100) = 1.00 (dmax)

Qi = [(3.0)(P)(d1.5)]/F (Weir Conditions)

Clogging Factor (F) = 2.0

5-Year Event: 15.7 foot perimeter required

100-Year Event: 12.1 foot perimeter required

INSTALL A TYPICAL CDOT TYPE D INLET TO ACCEPT BOTH 5YR & 100 YR DEVELOPED FLOWS AT THIS DESIGN POINT.

Design Procedure Form: Sand Filter Basin (SFB)

Designer:	Matt Larson
Company:	Classic Consulting
Date:	February 7, 2012
Project:	Independence Place at Cheyenne Mountain
Location:	SFB #1

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = 61.70 % i = 0.62
B) Contributing Watershed Area (Area)	Area = 2.6900 acres
C) Water Quality Capture Volume (WQCV) ($WQCV = 1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I)$)	WQCV = 0.24 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area	Vol = 0.0542 acre-feet
2. Minimum Filter Surface Area: A_s = (Vol / 3) * 43,560	A_s = 788 square feet, Minimum
Actual Filter Surface Area Used (Should not be less than minimum):	A_s = 1,049 square feet,
Filter Surface Elevation	_____ feet
Average Side Slope of the Filter Basin (4:1 or flatter, zero for vertical walls)	Z = 0.0 Using Vertical Walls
3. Estimate of Basin Depth (D), based on filter area A_s	D = 2.3 feet
4. Outlet Works	
A) Sand (ASTM C-33) Layer Thickness (18" min.)	18 inches
B) Woven Geotextile Fabric Between Sand & Gravel - meeting ASTM D4751 - AOS U.S. Std. Seive #50 to #70, ASTM D4633 min. trapezoidal tear strength 100 x 60 lbs, min. COE specified open area of 4%.	_____ Woven Geotextile Per USDCM Figure SFB-1 _____ Other: _____
C) Gravel (AASHTO or CDOT Section 703; #4, #57, or #67) Thickness (8" min.)	9 inches, No. _____
D) Overflow Elevation At Top of Design Volume (Filter Surface Elev. + Estimate of Basin Depth (D))	2.30 feet
4. Basin Inlet	
A) Inlet Pipe with Impact Basin; **OR** Inlet Channel with Grouted Sloping Boulder Drop; **OR** Inlet Channel with Concrete Baffle Chute Drop	[X] Inlet Pipe with Impact Basin; **OR** [ ] Inlet Channel with GSB Drop; **OR** [ ] Inlet Channel with Baffle Chute Drop
B) Riprap Outlet Protection For Pipe or Channel Over Non-Woven Geotextile Fabric Wrapped to the Top of the Sand Layer	_____ Riprap Outlet Protection _____ Other: _____
5. Draining of Sand Filter Basin (Check A, **or** B, **or** C, **answer** D) Based on answers to 5A through 5D, check the appropriate method	[X] Infiltration to Subgrade with Permeable Membrane: 5(C) checked **and** 5(D) = no
A) Check box if subgrade is heavy or expansive clay B) Check box if subgrade is silty or clayey sands C) Check box if subgrade is well-draining soils	[ ] [ ] [X]
	[ ] Underdrain with Impermeable Membrane: 5(A) checked **or** 5(D) = yes
	[ ] Underdrain with Woven Geotextile Fabric as in 4(B): 5(B) checked **and** 5(D) = no
D) Does tributary catchment contain land uses that may have petroleum products, greases, or other chemicals present, such as gas station, hardware store, restaurant, etc.?	yes [ ] no [X]
	_____ Other: _____
6. Describe Provisions for Maintenance	_____

Notes: _____

Design Procedure Form: Sand Filter Basin (SFB)

Designer: Matt Larson
Company: Classic Consulting
Date: February 7, 2012
Project: Independence Place at Cheyenne Mountain
Location: SFB #2

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = 73.70 % i = 0.74
B) Contributing Watershed Area (Area)	Area = 2.2300 acres
C) Water Quality Capture Volume (WQCV) ($WQCV = 1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I)$)	WQCV = 0.29 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area	Vol = 0.0544 acre-feet
2. Minimum Filter Surface Area: A_s = (Vol / 3) * 43,560	A_s = 790 square feet, Minimum
Actual Filter Surface Area Used (Should not be less than minimum):	A_s = 1,286 square feet,
Filter Surface Elevation	_____ feet
Average Side Slope of the Filter Basin (4:1 or flatter, zero for vertical walls)	Z = 4.0
3. Estimate of Basin Depth (D), based on filter area A_s	D = 1.5 feet
4. Outlet Works	
A) Sand (ASTM C-33) Layer Thickness (18" min.)	18 inches
B) Woven Geotextile Fabric Between Sand & Gravel - meeting ASTM D4751 - AOS U.S. Std. Seive #50 to #70, ASTM D4633 min. trapezoidal tear strength 100 x 60 lbs, min. COE specified open area of 4%.	_____ Woven Geotextile Per USDCM Figure SFB-1 _____ Other: _____
C) Gravel (AASHTO or CDOT Section 703; #4, #57, or #67) Thickness (8" min.)	9 inches, No. _____
D) Overflow Elevation At Top of Design Volume (Filter Surface Elev. + Estimate of Basin Depth (D))	1.50 feet
4. Basin Inlet	
A) Inlet Pipe with Impact Basin; **OR** Inlet Channel with Grouted Sloping Boulder Drop; **OR** Inlet Channel with Concrete Baffle Chute Drop	[X] Inlet Pipe with Impact Basin; **OR** [ ] Inlet Channel with GSB Drop; **OR** [ ] Inlet Channel with Baffle Chute Drop
B) Riprap Outlet Protection For Pipe or Channel Over Non-Woven Geotextile Fabric Wrapped to the Top of the Sand Layer	_____ Riprap Outlet Protection _____ Other: _____
5. Draining of Sand Filter Basin (Check A, **or** B, **or** C, **answer** D) Based on answers to 5A through 5D, check the appropriate method	[X] Infiltration to Subgrade with Permeable Membrane: 5(C) checked **and** 5(D) = no
A) Check box if subgrade is heavy or expansive clay [ ] B) Check box if subgrade is silty or clayey sands [ ] C) Check box if subgrade is well-draining soils [X]	[ ] Underdrain with Impermeable Membrane: 5(A) checked **or** 5(D) = yes
D) Does tributary catchment contain land uses that may have petroleum products, greases, or other chemicals present, such as gas station, hardware store, restaurant, etc.? yes [ ] no [X]	[ ] Underdrain with Woven Geotextile Fabric as in 4(B): 5(B) checked **and** 5(D) = no _____ Other: _____
6. Describe Provisions for Maintenance	

Notes: _____

Design Procedure Form: Sand Filter Basin (SFB)

Designer:	**Matt Larson**
Company:	**Classic Consulting**
Date:	**February 7, 2012**
Project:	**Independence Place at Cheyenne Mountain**
Location:	**SFB #3**

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio (i = I_a / 100)	I_a = 84.75 % i = 0.85
B) Contributing Watershed Area (Area)	Area = 3.6200 acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i))	WQCV = 0.36 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area	Vol = 0.1087 acre-feet
2. Minimum Filter Surface Area: A_s = (Vol / 3) * 43,560	A_s = 1,578 square feet, Minimum
Actual Filter Surface Area Used (Should not be less than minimum):	A_s = 3,005 square feet,
Filter Surface Elevation	feet
Average Side Slope of the Filter Basin (4:1 or flatter, zero for vertical walls)	Z = 4.0
3. Estimate of Basin Depth (D), based on filter area A_s	D = 1.4 feet
4. Outlet Works	
A) Sand (ASTM C-33) Layer Thickness (18" min.)	18 inches
B) Woven Geotextile Fabric Between Sand & Gravel - meeting ASTM D4751 - AOS U.S. Std. Seive #50 to #70, ASTM D4633 min. trapezoidal tear strength 100 x 60 lbs, min. COE specified open area of 4%.	_____ Woven Geotextile Per USDCM Figure SFB-1 _____ Other: _____
C) Gravel (AASHTO or CDOT Section 703; #4, #57, or #67) Thickness (8" min.)	9 inches, No. _____
D) Overflow Elevation At Top of Design Volume (Filter Surface Elev. + Estimate of Basin Depth (D))	1.40 feet
4. Basin Inlet	
A) Inlet Pipe with Impact Basin; **OR** Inlet Channel with Grouted Sloping Boulder Drop; **OR** Inlet Channel with Concrete Baffle Chute Drop	[X] Inlet Pipe with Impact Basin; **OR** [ ] Inlet Channel with GSB Drop; **OR** [ ] Inlet Channel with Baffle Chute Drop
B) Riprap Outlet Protection For Pipe or Channel Over Non-Woven Geotextile Fabric Wrapped to the Top of the Sand Layer	_____ Riprap Outlet Protection _____ Other: _____
5. Draining of Sand Filter Basin (Check A, **or** B, **or** C, **answer** D) Based on answers to 5A through 5D, check the appropriate method	[X] Infiltration to Subgrade with Permeable Membrane: 5(C) checked **and** 5(D) = no
A) Check box if subgrade is heavy or expansive clay [ ] B) Check box if subgrade is silty or clayey sands [ ] C) Check box if subgrade is well-draining soils [X]	[ ] Underdrain with Impermeable Membrane: 5(A) checked **or** 5(D) = yes
D) Does tributary catchment contain land uses that may have petroleum products, greases, or other chemicals present, such as gas station, hardware store, restaurant, etc.? yes [ ] no [X]	[ ] Underdrain with Woven Geotextile Fabric as in 4(B): 5(B) checked **and** 5(D) = no _____ Other: _____
6. Describe Provisions for Maintenance	

Notes:

JOB NAME: Independence Place at Cheyenne Mountain
JOB NUMBER: 2320.00
DATE: 02/07/12
CALCULATED BY: MAL

SFB #2

POND SIZING WITH PONDPACK EQUATION:
INSERT POND DESIGN SIZE INFO: (RED)

POND ELEVATION : (from lowest to highest)
5875.80
5875.80
5876.80
5877.50

AREA (BTM to TOP):		
	-	acres
1,091	0.03	acres
1,832	0.04	acres
2,550	0.06	acres
	-	acres
	-	acres
	-	acres
	-	acres
	-	acres
	-	acres
	-	acres
	-	acres

PRELIMINARY SIZE:

VOLUME = 1/3{(EL2-EL1)*(A1+A2+((A1*A2)^.5))}

							CUMMULATIVE VOLUME:
-	AC-FT	from	5,876	to	5,876		
0.03	AC-FT	from	5,876	to	5,877		0.03
0.03	AC-FT	from	5,877	to	5,878		0.07
-	AC-FT	from	5,878	to	-		0.07
-	AC-FT	from	-	to	-		0.07
-	AC-FT	from	-	to	-		0.07
-	AC-FT	from	-	to	-		0.07
-	AC-FT	from	-	to	-		0.07
-	AC-FT	from	-	to	-		0.07
-	AC-FT	from	-	to	-		0.07
-	AC-FT	from	-	to	-		0.07

*SIZING IS FOR PRELIMINARY PURPOSES ONLY.

VOLUME = 0.068 AC-FT

APPROXIMATE SURFACE AREA REQUIREMENT

POND DEPTH (FT)	POND VOLUME AC-FT		CF	SURFACE AREA (SF)
4	0.07	=	2,943	736
6	0.07	=	2,943	490
8	0.07	=	2,943	368
10	0.07	=	2,943	294

JOB NAME: Independence Place at Cheyenne Mountain
JOB NUMBER: 2320.00
DATE: 02/07/12
CALCULATED BY: MAL

SFB #3

POND SIZING WITH PONDPACK EQUATION:
INSERT POND DESIGN SIZE INFO: (RED)

POND ELEVATION : (from lowest to highest)
5870.86
5870.86
5871.00
5872.00
5872.10

AREA (BTM to TOP):		
	-	acres
3,005	0.07	acres
3,215	0.07	acres
4,957	0.11	acres
5,160	0.12	acres
	-	acres
	-	acres
	-	acres
	-	acres
	-	acres
	-	acres
	-	acres

PRELIMINARY SIZE:

VOLUME = 1/3{(EL2-EL1)*(A1+A2+((A1*A2)^.5))}

						CUMMULATIVE VOLUME:
-	AC-FT	from	5,871	to	5,871	
0.01	AC-FT	from	5,871	to	5,871	0.01
0.09	AC-FT	from	5,871	to	5,872	0.10
0.01	AC-FT	from	5,872	to	5,872	0.11
-	AC-FT	from	5,872	to	-	0.11
-	AC-FT	from	-	to	-	0.11
-	AC-FT	from	-	to	-	0.11
-	AC-FT	from	-	to	-	0.11
-	AC-FT	from	-	to	-	0.11
-	AC-FT	from	-	to	-	0.11
-	AC-FT	from	-	to	-	0.11

*SIZING IS FOR PRELIMINARY PURPOSES ONLY.

VOLUME = 0.114 AC-FT

APPROXIMATE SURFACE AREA REQUIREMENT

POND DEPTH (FT)	POND VOLUME AC-FT		CF	SURFACE AREA (SF)
4	0.11	=	4,946	1,237
6	0.11	=	4,946	824
8	0.11	=	4,946	618
10	0.11	=	4,946	495

JOB NAME:	Independence Place at Cheyenne Mountain
JOB NUMBER:	2320.00
BY:	MAL
DATE:	2/7/12

LAND USE	SFB #1	% IMPERVIOUS PER DCM	AREA (ENTER ACRES)	IMPERVIOIUS AREA
BUSINESS				
	COMMERCIAL	95	1.41	**1.34**
	NEIGHBORHOOD	70	-	-
			-	-
RESIDENTIAL			-	-
(AC)	1/8	65	-	-
	1/4	40	-	-
	1/3	30	-	-
	1/2	25	-	-
	1	20	-	-
			-	-
INDUSTRIAL			-	-
	LIGHT	80	-	-
	HEAVY	90	-	-
			-	-
PARKS & CEMETARY		7	-	-
PLAYGROUND		13	-	-
RAILROAD YARD		40	-	-
			-	-
UNDEVELOPED			-	-
	HISTORIC FLOW	2	-	-
	PASTURE/MEADOW	0	-	-
	FOREST	0	-	-
	EXPOSED ROCK	100	-	-
	OFFSITE FLOW	45	-	-
			-	-
STREETS			-	-
	PAVED	100	-	-
	GRAVEL	80	-	-
			-	-
DRIVES AND WALKS		100	-	-
LANDSCAPED		25	1.28	**0.32**
ROOFS		90	-	-
LAWNS		0	-	-
			-	-
TOTALS			*2.69*	***1.66***
WEIGHTED AVERAGE (%IMP)				**61.69%**

JOB NAME:	Independence Place at Cheyenne Mountain
JOB NUMBER:	2320.00
BY:	MAL
DATE:	2/7/12

LAND USE	SFB #2	% IMPERVIOUS PER DCM	AREA (ENTER ACRES)	IMPERVIOIUS AREA
BUSINESS				
	COMMERCIAL	95	1.55	**1.47**
	NEIGHBORHOOD	70	-	-
			-	-
RESIDENTIAL			-	-
(AC)	1/8	65	-	-
	1/4	40	-	-
	1/3	30	-	-
	1/2	25	-	-
	1	20	-	-
			-	-
INDUSTRIAL			-	-
	LIGHT	80	-	-
	HEAVY	90	-	-
			-	-
PARKS & CEMETARY		7	-	-
PLAYGROUND		13	-	-
RAILROAD YARD		40	-	-
			-	-
UNDEVELOPED			-	-
	HISTORIC FLOW	2	-	-
	PASTURE/MEADOW	0	-	-
	FOREST	0	-	-
	EXPOSED ROCK	100	-	-
	OFFSITE FLOW	45	-	-
			-	-
STREETS			-	-
	PAVED	100	-	-
	GRAVEL	80	-	-
			-	-
DRIVES AND WALKS		100	-	-
LANDSCAPED		25	0.68	**0.17**
ROOFS		90	-	-
LAWNS		0	-	-
			-	-
TOTALS			*2.23*	***1.64***
WEIGHTED AVERAGE (%IMP)				**73.65%**

JOB NAME:	Independence Place at Cheyenne Mountain
JOB NUMBER:	2320.00
BY:	MAL
DATE:	2/7/12

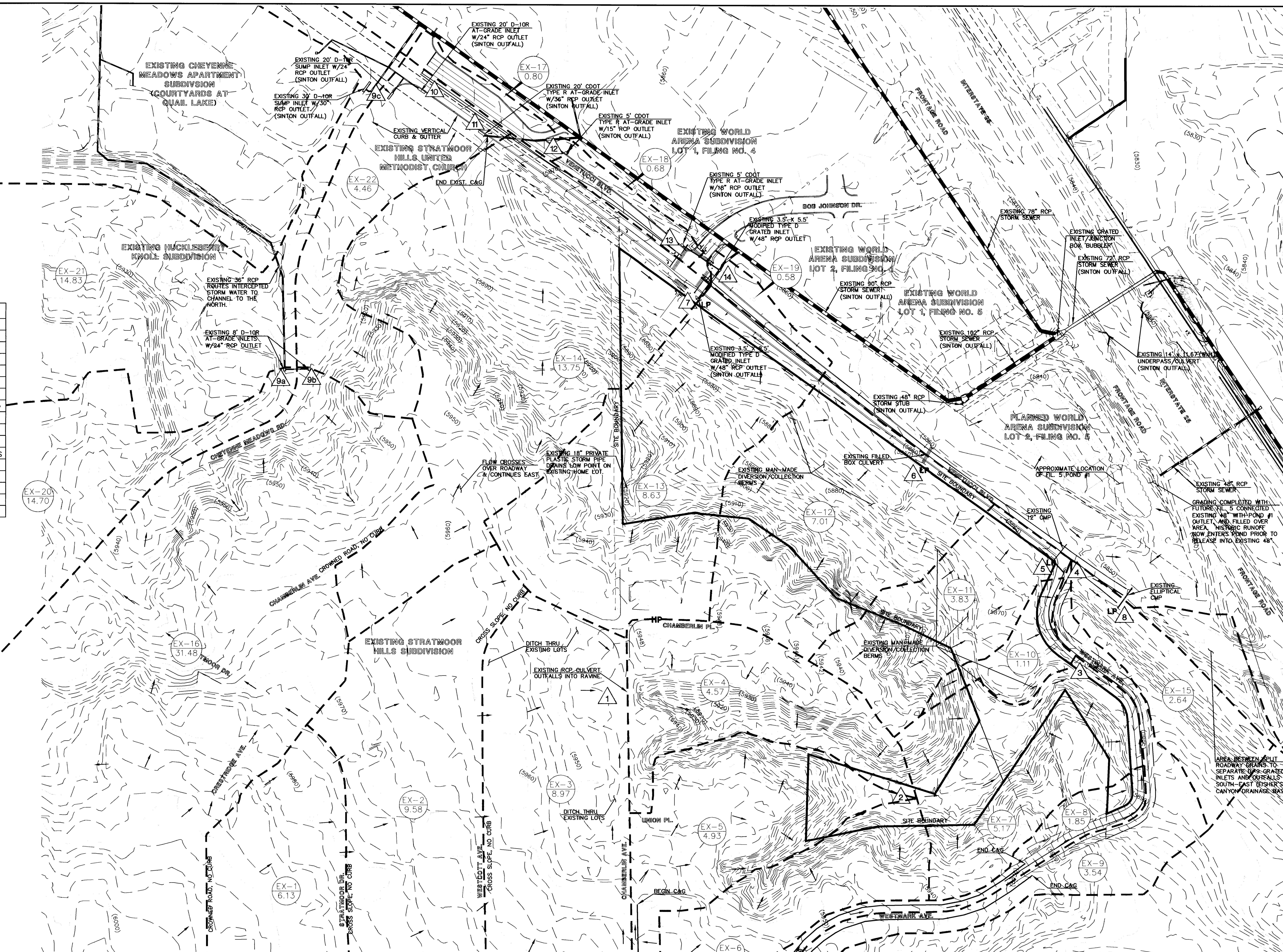
LAND USE	SFB #3	% IMPERVIOUS PER DCM	AREA (ENTER ACRES)	IMPERVIOIUS AREA
BUSINESS				
	COMMERCIAL	95	3.09	**2.94**
	NEIGHBORHOOD	70	-	-
			-	-
RESIDENTIAL			-	-
(AC)	1/8	65	-	-
	1/4	40	-	-
	1/3	30	-	-
	1/2	25	-	-
	1	20	-	-
			-	-
INDUSTRIAL			-	-
	LIGHT	80	-	-
	HEAVY	90	-	-
			-	-
PARKS & CEMETARY		7	-	-
PLAYGROUND		13	-	-
RAILROAD YARD		40	-	-
			-	-
UNDEVELOPED			-	-
	HISTORIC FLOW	2	-	-
	PASTURE/MEADOW	0	-	-
	FOREST	0	-	-
	EXPOSED ROCK	100	-	-
	OFFSITE FLOW	45	-	-
			-	-
STREETS			-	-
	PAVED	100	-	-
	GRAVEL	80	-	-
			-	-
DRIVES AND WALKS		100	-	-
LANDSCAPED		25	0.53	**0.13**
ROOFS		90	-	-
LAWNS		0	-	-
			-	-
TOTALS			*3.62*	*3.07*
WEIGHTED AVERAGE (%IMP)				**84.75%**

BASIN RUNOFF SUMMARY

BASIN	Q5 (CFS)	Q100 (CFS)
EX-1	9.9	24.3
EX-2	15.3	37.3
EX-3	16.9	41.3
EX-4	8.4	20.6
EX-5	8.3	20.4
EX-6	7.6	16.5
EX-7	10.6	24.5
EX-8	4.0	8.6
EX-9	5.9	13.8
EX-10	1.8	4.6
EX-11	7.1	16.7
EX-12	10.4	25.3
EX-13	14.6	33.8
EX-14	24.2	54.9
EX-15	4.4	10.6
EX-16	47.8	102.0
EX-17	3.1	6.0
EX-18	2.2	4.5
EX-19	1.4	3.2
EX-20	22.3	47.6
EX-21	35.8	75.3
EX-22	9.7	20.3

DESIGN POINT SUMMARY

DESIGN POINT	Q5 (CFS)	Q100 (CFS)	INLET SIZE
1	25.0	61.1	RCP CULVERT
2	38.2	92.1	SURFACE
3	45.2	107.9	ONTO WESTMARK
4	49.6	118.3	ONTO VENETUCCI
5	7.1	16.7	12" CMP
6	10.4	25.3	FILLED IN BOX
7	30.5	83.9	GRATED INLET
8	52.1	124.2	ELLIPTICAL CMP
9a	22.3	47.6	8' A.G. INLET
9b	47.8	102.0	8' A.G. INLET
9c	85.3	186.7	20' & 30' SUMPS
10	28.3	129.7	20' A.G. INLET
11	12.0	54.1	20' A.G. INLET
12	3.1	6.0	5' A.G. INLET
13	3.4	8.2	5' A.G. INLET
14	1.4	3.2	GRATED INLET

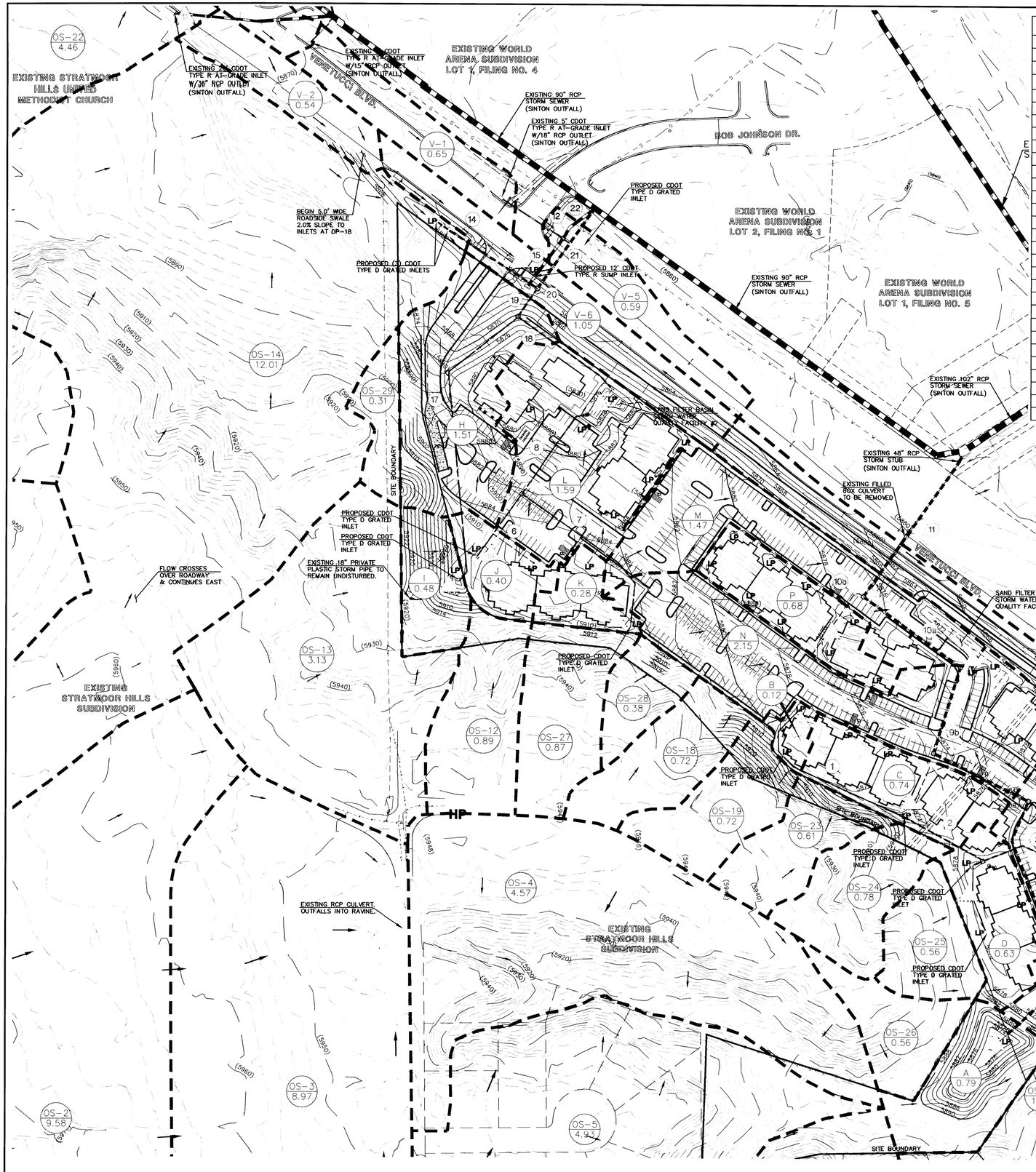


INDEPENDENCE PLACE AT CHEYENNE MOUNTAIN

FINAL DRAINAGE REPORT
EXISTING CONDITIONS

CLASSIC CONSULTING ENGINEERS & SURVEYORS
6385 Corporate Drive, Suite 101 (719)785-0790
Colorado Springs, Colorado 80919 (719)785-0799(Fax)

DESIGNED BY MAL	SCALE	DATE 1-12-11	
DRAWN BY MAL	(H) 1"= 120'	SHEET 1 OF 2	
CHECKED BY	(V) 1"= N/A	JOB NO. 2320.00	



BASIN RUNOFF SUMMARY

BASIN	Q5 (CFS)	Q100 (CFS)	BASIN	Q5 (CFS)	Q100 (CFS)
OS-1	9.9	24.3	A	1.2	3.2
OS-2	15.3	37.3	B	0.4	0.8
OS-3	16.9	41.3	C	2.5	5.0
OS-4	8.4	20.6	D	1.8	3.8
OS-5	8.3	20.4	E	3.6	7.2
OS-6	7.6	16.5	F	0.2	0.6
OS-7	3.0	6.3	G	4.1	8.6
OS-8	4.0	8.6	H	4.6	9.6
OS-9	5.9	13.8	I	0.7	2.0
OS-10	1.3	2.7	J	1.1	2.3
OS-11	3.0	6.2	K	0.9	1.9
OS-12	2.1	4.6	L	6.0	11.8
OS-13	7.6	16.3	M	6.0	11.5
OS-14	20.5	46.6	N	8.9	17.0
OS-15	4.4	10.6	P	2.3	4.6
OS-16	80.3	171.4	V-1	2.1	4.2
OS-17	3.1	6.0	V-2	1.7	3.6
OS-18	1.8	3.9	V-3	0.7	1.4
OS-19	1.5	3.3	V-4	0.9	1.6
OS-20	22.3	47.6	V-5	1.4	3.1
OS-21	35.8	75.3	V-6	3.7	7.3
OS-22	9.7	20.3			
OS-23	1.4	3.1			
OS-24	2.0	4.2			
OS-25	1.4	3.0			
OS-26	1.4	2.9			
OS-27	2.0	4.2			
OS-28	1.0	2.1			
OS-29	0.5	1.3			

DESIGN POINT SUMMARY

DESIGN POINT	Q5 (CFS)	Q100 (CFS)	INLET SIZE
1	25.0	61.1	RCP CULVERT
2	38.2	92.1	SURFACE
3	40.9	98.2	42" FES
4	1.8	3.9	AREA DRAINS
5	5.5	11.6	AREA DRAINS
6	3.2	6.8	AREA DRAINS
7	4.8	9.9	10' TYPE R SUMP
8	13.8	29.0	SFB #1 SWQ
9a	22.3	47.6	EX. 8' A.G. INLET
9b	47.8	102.0	EX. 8' A.G. INLET
9c	85.3	186.7	EX. 20' & 30' SUMPS
10	28.3	129.7	EX. 20' A.G. INLET
11	12.0	54.1	EX. 20' A.G. INLET
12	3.1	6.0	EX. 5' A.G. INLET
13	3.3	8.0	EX. 5' A.G. INLET
14	1.4	3.1	TYPE D GRATED
17	8.8	18.2	12' TYPE R SUMP
18	18.8	56.8	(3) TYPE D GRATED
19	3.2	6.7	AREA DRAINS
20	2.8	5.9	AREA DRAINS
21	11.4	23.1	SFB #2 SWQ
22	17.6	34.5	PLD #1 SWQ
23	8.3	18.1	TYPE D GRATED
24	16.0	34.9	ONTO VENETUCCI
25	20.1	45.0	EX. ELLIPTICAL CMP
26	2.3	4.6	AREA DRAINS

PIPE RUN SUMMARY

PIPE RUN	Q5 (CFS)	Q100 (CFS)	PIPE SIZE
1	1.8	3.9	18" RCP
2	6.9	14.4	24" RCP
3	9.6	20.2	24" RCP
4	13.6	28.5	30" RCP
5	13.8	29.0	30" RCP
6	3.2	6.7	18" RCP
7	2.8	5.9	18" RCP
8	5.8	12.3	18" RCP
9a	40.9	98.2	42" RCP
9b	48.9	114.9	48" RCP
10a	17.6	34.5	24" RCP
10b	2.3	4.6	12" PVC
11	58.6	134.0	48" RCP
12	2.2	3.6	24" RCP
14	18.8	56.8	36" RCP
15	8.8	18.2	18" RCP
17	8.3	18.1	18" RCP
18	11.4	23.1	24" RCP
19	19.2	40.2	30" RCP
20	31.0	82.2	48" RCP
21	35.9	92.5	48" RCP
22	38.0	96.3	48" RCP

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INDEPENDENCE PLACE AT CHEYENNE MOUNTAIN
FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS

CLASSIC CONSULTING ENGINEERS & SURVEYORS

DESIGNED BY	MAL	SCALE		DATE	1-12-11
DRAWN BY	MAL	(H) 1"= 80'		SHEET	2 OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	2320.00

X:\2320\01\DRAWINGS\DEVELOPMENT\FDR-Developed Map.dwg, 2/7/2012 12:37:00 PM, Canon iPF8300S.pc3