Galloway
5500 Greenwood Plaza Blvd., Suite 200
Greenwood Village, CO 80111
303.770.8884 • GallowayUS.com

September 11, 2026

David Van Dellen
Town of Castle Rock Engineering, Water Resources & Stormwater
Castle Rock, CO 80104

RE: Drainage Compliance Letter in support of Walmart 984 – Online Pickup Expansion project located at 133 Sam Walton Lane, Castle Rock, CO 80104.

Mr. Van Dellen,

This drainage conformance letter has been prepared for Walmart 984 located at 133 Sam Walton Lane in the Town of Castle Rock, CO. The objective of this letter is to show the proposed site improvements will result in a negligible increase in flows from the site and will not require additional storm sewer infrastructure improvements.

The existing site is approximately 21.70 acres. The site has frontages on the following roads: Milestone Lane (2-way access road to the north), Trail Boss Drive (2-way road to the east), Sam Walton Lane (2-way access road to the south), and Front Street (2-way, 4-lane road to the west). The lot is bordered to the north by a commercial shopping complex (Milestone Crossing, across Milestone Lane). To the south, across Sam Walton Lane, there is high school athletic complex (Renaissance Expeditionary Magnet School). The site frontage faces Interstate 25 to the west. The existing site is currently occupied by the Walmart building and its adjacent parking areas.

The proposed improvements will include a 6,680 square foot building expansion, new sidewalks, and alterations to existing landscaped islands to provide additional parking. These proposed improvements will not alter the existing drainage patterns. However, alterations to existing landscape islands will increase impervious area by approximately 1,131 SF (<0.03 AC). Due to the size of the site and the capacity of the existing storm sewer infrastructure, this small increase in impervious area will not require additional storm sewer infrastructure improvements. The site will still meet the water quality requirements designed for the Record Drainage Report (reference Appendices B & C).

For a comparison of the existing drainage conditions to the proposed conditions, please refer to the table below:

BASIN NUMBER	EXISTING			PROPOSED		
	BASIN AREA (AC)	LANDSCAPED AREA (AC)	IMPERVIOUSNESS	BASIN AREA (AC)	LANDSCAPED AREA (AC)	IMPERVIOUSNESS (DELTA)
1	1.37	0.26	81.0%	1.27	0.25	80.3% (−0.7%)
2	1.56	0.19	87.8%	1.66	0.18	89.2% (+1.4%)
TOTAL	2.93	0.45	84.6%	2.93	0.43	85.3% (+0.7%)

Please note that the areas shown above only represent the areas of proposed improvements, not the entire site. Please refer to Appendix A for Basin Areas.

Conclusions:
Because the proposed improvements will negligibly affect impervious areas compared to the size of the existing site, and only result in minor increase in flows during storm events and implementation of Low Impact Development design, the proposed improvements will have a negligible impact on the existing infrastructure and will not result in a need for additional storm sewer improvements. Additional future improvements to this site may result in the need for additional storm sewer improvements and drainage

analysis. Further calculation would therefore be required at that time to determine what, if any improvements, would be required.

Sincerely,
GALLOWAY



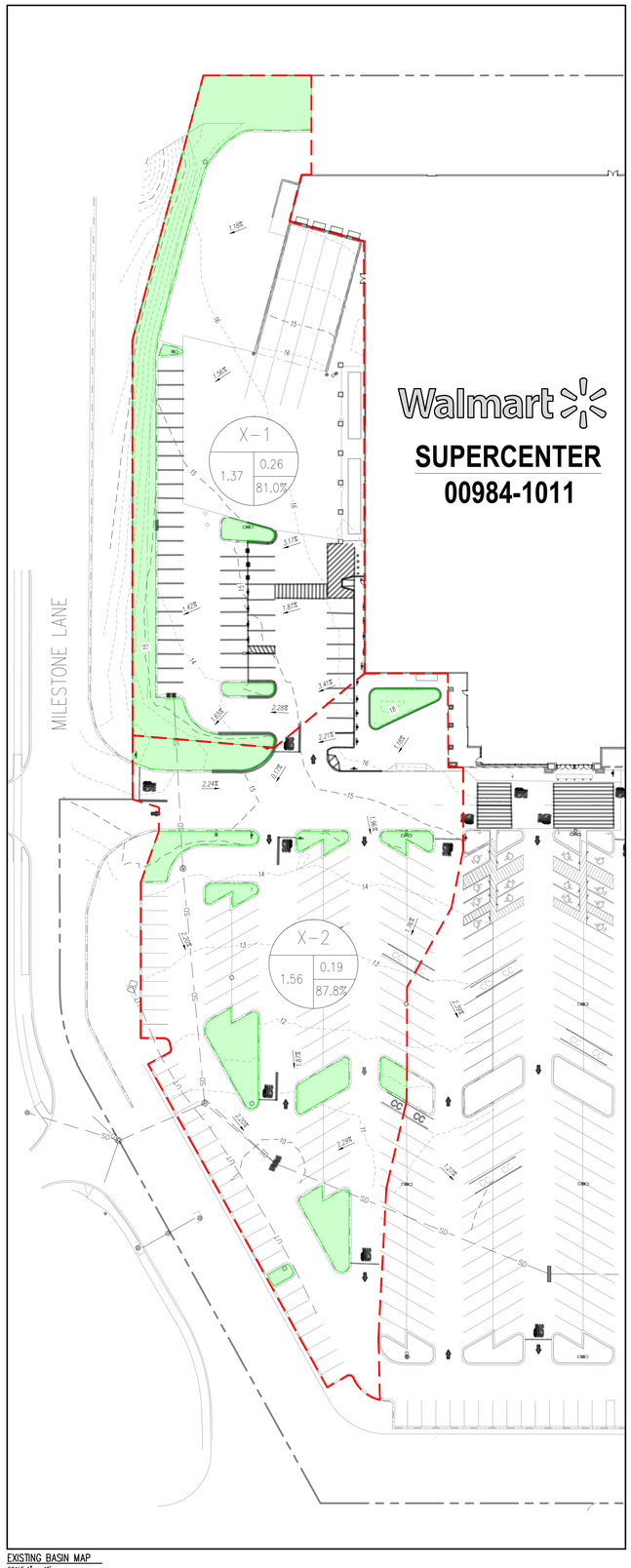
Ryan C. James, PE
Sr. Civil Engineer
Project Manager
RyanJames@GallowayUS.com

Appendices

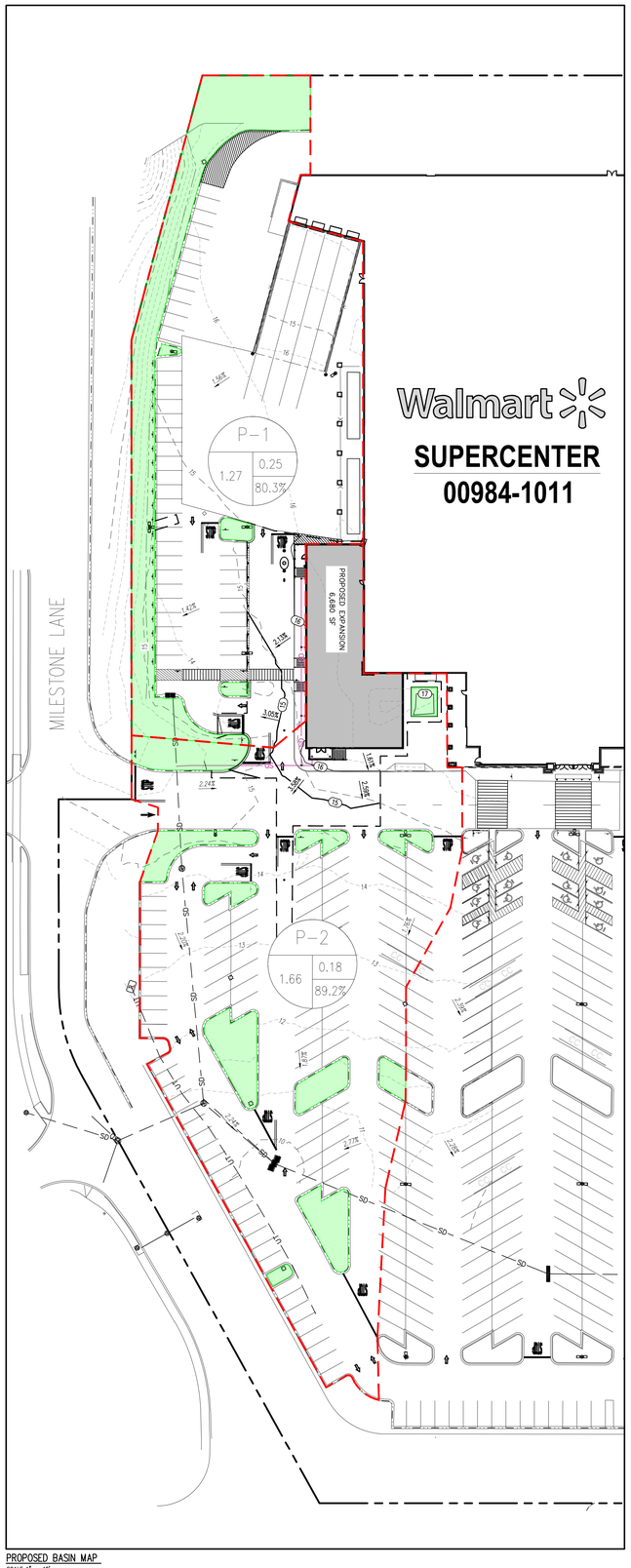
A. Drainage Area Maps
B. Record Drainage Report
C. Record Drainage Report Addenda

APPENDIX A

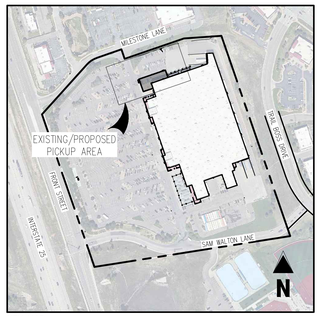
Drainage Area Maps



EXISTING BASIN MAP
SCALE 1" = 40'



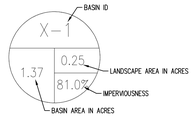
PROPOSED BASIN MAP
SCALE 1" = 40'



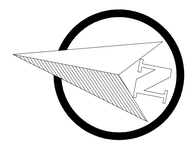
KEY MAP
APPX. 1" = 300'

LEGEND

- PROPERTY BOUNDARY LINE
- PROPOSED SAWCUT
- BASIN BOUNDARY
- LANDSCAPED AREA
- XXXX EXISTING MAJOR CONTOUR
- XX EXISTING MINOR CONTOUR
- XX PROPOSED MAJOR CONTOUR
- XX PROPOSED MINOR CONTOUR
- 2.00% EXISTING SLOPE
- 2.00% PROPOSED SLOPE



BASIN NUMBER	EXISTING			PROPOSED		
	BASIN AREA (AC)	LANDSCAPED AREA (AC)	IMPERVIOUSNESS	BASIN AREA (AC)	LANDSCAPED AREA (AC)	IMPERVIOUSNESS (DELTA)
1	1.37	0.26	81.0%	1.27	0.25	80.3% (-0.7%)
2	1.56	0.19	87.8%	1.66	0.18	89.2% (+1.4%)
TOTAL	2.93	0.45	84.6%	2.93	0.43	85.3% (+0.7%)



GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.

Galloway
5500 Greenwood Plaza Blvd, Suite 200
Greenwood Village, CO 80111
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GallowayUS.com

STIPULATION FOR REUSE
THIS DRAWING WAS PREPARED FOR USE ON A SPECIFIC SITE AT CASTLE ROCK, CO AND WAS PREPARED AND SEALED ON 02/23/2026, AND IT IS NOT SUITABLE OR VALID FOR USE ON ANY OTHER SITE OR AT A LATER TIME. USE OF THESE DRAWINGS FOR REFERENCE OR EXAMPLE ON ANOTHER PROJECT WITHOUT THE EXPRESS WRITTEN CONSENT OF PROPERLY LICENSED ARCHITECTS AND ENGINEERS IS PROHIBITED. ANY REUSE OF THESE DRAWINGS FOR REUSE ON ANOTHER PROJECT, EXTENSION TO THIS PROJECT, OR ANY MODIFICATION TO THESE DRAWINGS MAY BE MADE WITHOUT THE WRITTEN CONSENT OF GALLOWAY AND SHALL BE AT THE RECIPIENT'S SOLE RISK AND WITHOUT LIABILITY TO THE LAW.

Walmart
CASTLE ROCK, CO
133 SAM WALTON LANE
STORE NUMBER: 00984-1011
JOB NUMBER: WMT000984.04
PHOTO:

DRAINAGE MAPS

ISSUE BLOCK

CHECKED BY:	JSB
DRAWN BY:	CTS
PROTO CYCLE:	--
DOCUMENT DATE:	02/23/2026

NOT FOR CONSTRUCTION

EXISTING & PROPOSED DRAINAGE MAP

SHEET: 1

APPENDIX B

Record Drainage Report

867D

FINAL DRAINAGE STUDY
FOR
WAL★MART STORE NO. 98401
LOT 1, MILESTONE FILING NO. 4
TOWN OF CASTLE ROCK, COLORADO

FINAL DRAINAGE STUDY
FOR
WAL★MART STORE NO. 98401
LOT 1, MILESTONE FILING NO. 4
TOWN OF CASTLE ROCK, COLORADO

May 6, 1999

Prepared for:

Wal★Mart Stores, Inc.
701 South Walton Blvd.
Bentonville, Arkansas 72716-8703
Phone: (501) 273-4876
Mr. Thomas C. Oppenheim, P.E.
Engineering Manager

Prepared by:

Joel D. Tompkins, P.E.
CLC Associates, Inc.
8480 E. Orchard Rd, #2000
Englewood, CO 80111

CLC Job No. 97.211

FINAL DRAINAGE STUDY
FOR
WAL★MART STORE NO. 98401
LOT 1, MILESTONE FILING NO. 4
TOWN OF CASTLE ROCK, COLORADO

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Appendix F - Reference Materials

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FIRM Map Excerpt

Back Pocket - Drainage Plan Sheets

FINAL DRAINAGE STUDY
FOR
WAL★MART STORE NO. 98401
LOT 1, MILESTONE FILING NO. 4
TOWN OF CASTLE ROCK, COLORADO

I. CERTIFICATION

ENGINEER'S STATEMENT:

The enclosed drainage report and exhibits, were prepared by me, or under my direct supervision, and are correct to the best of my knowledge and belief. Said drainage report has been prepared in accordance with applicable Town of Castle Rock criteria and is in conformance with the master plan of drainage for the effected area. I accept responsibility for any liability caused by negligent acts, errors, or omissions on my part in preparing this report.

COLORADO REGISTERED JOEL DEAN TOMPKINS 32415 5/6/1999 PROFESSIONAL ENGINEER

Joel D. Tompkins
Colorado P.E. No. 32415
For and on behalf of CLC Associates, Inc.

OWNER / DEVELOPER'S STATEMENT:

As Owner / Developer of land(s) identified within this report; I agree to proceed, implement and comply with all recommendations and requirements outlined herein.

Thomas C. Oppenheim

Mr. Thomas C. Oppenheim, P.E.
Wal★Mart Stores, Inc.

TOWN OF CASTLE ROCK APPROVALS:

Bryan K. Reddick DATE: 5/17/99
ENGINEERING DIVISION

Mark A. Ciancio DATE: 5·18·99
PUBLIC WORKS DIRECTOR

FINAL DRAINAGE STUDY
FOR
WAL★MART STORE NO. 98401
LOT 1, MILESTONE FILING NO. 4
TOWN OF CASTLE ROCK, COLORADO

II. GENERAL LOCATION AND DESCRIPTION

Lot 1, Milestone Filing No. 4 is a portion of the north one-half of Section 35 and the south one-half of Section 26, Township 7 South, Range 87 west of the 6th Principal Meridian, in the Town of Castle Rock, County of Douglas, State of Colorado. More specifically this site is on the east side of I-25 south of Founders Parkway and north of the Town of Castle Rock Park/School site.

The 21.69 acres of Lot 1 is the site of a proposed Wal★Mart Supercenter integral to the total 64.25 acres of Milestone Filing No. 4. The remaining 42.65 acres is divided amongst Lots 2 and 3 of that filing. Lots 2 and 3 will be rough graded and utility stubouts provided thereto; but, their layouts as shown on the enclosed drainage plan are conceptual only and alterations to some degree are expected. However, it will be the responsibility of the developers of those lots to demonstrate compliance with the drainage restraints and assumptions made in this report. The plan accurately reflects development on Lot 1 only and is intended as the design documentation for that construction. However, this report addresses runoff concerns from all three lots as shared drainage facilities (especially detention) make it unfeasible to divorce Lot 1 calculations from the remainder of Milestone Filing No. 4.

The majority of the platted area of Milestone Filing No. 4 is adjacent to dedicated right-of-ways. To the north and west, Filing No. 4 is bordered by Front Street while to the east is Founders Parkway (Miller Boulevard, a.k.a. Founders Parkway, Filing No. 2). The south property line is shared with the Town of Castle Rock School/Park Site, Metzler Ranch Filing No. 1 (single family residential), and an unplatted portion of Metzler Ranch identified as future commercial in the Metzler Ranch Master Drainage Study. The Wal★Mart site (Lot 1) is the southwestern most section of Filing No. 4. Construction of the Supercenter will include the building itself with associated parking and through lanes, as well as north and south access drives connecting to Front Street. The south access drive will connect to the extension of Trail Boss Drive proximal to the east side of the Supercenter and continuing on to an intersection with Founders Parkway.

The increase in runoff from the site expected due to increased impervious area and decreased time of concentrations, will be compensated for with the construction of detention and water quality facilities. Lot 2 and varying portions of Lots 1 and 3 will

be controlled by regional structures on the Park/School site to the south. A sub-regional pond is being provided for the majority of Lot 3 and remaining portions of Lot 1; however, a small section of Lot 3 shown discharging to a separate system may require on-site detention upon future development. The developers of that portion should submit drainage documentation prior to Final PD submittal or replatting for review by the Town of Castle Rock separate from this study.

III. HISTORIC DRAINAGE PATTERNS

Approximately 31 acres of Filing No. 4 (identified as Basin H-1) lie within what is labeled as Sub-Basin 1b in the Metzler Ranch Master Drainage Study. Sub-Basins 1g and 1f, as identified in the Metzler study, also contribute runoff to our site, and are accounted for in the calculations.

Basin H-2 is over 28 acres of open space from which storm runoff is collected at an existing culvert and routed under Front Street to a second culvert underneath I-25. Basin H-3 contributes storm runoff to storm drains of Milestone Filing No. 1. This basin and its off-site contributing areas are accounted for in an undeveloped condition in the Final Drainage Report for that filing. Finally, Basin H-4 is a negligible area just off the ROW of Founders Parkway contributing to gutter flows therein.

Existing grades across the site average approximately 4.5 percent with some in excess of 33 percent. Cover consists of native grass, weeds, and bushes. On-site soils are identified predominately as Kutch sandy loams; hydrologic soil group D.

IV. DEVELOPED DRAINAGE PATTERNS

Extensive grading will be required to create lots with acceptable building and parking pads and roads meeting the criteria of the city and other interested parties.

The following basins are defined for the developed condition:

Basin A consists of the roof area of the proposed Wal★Mart Supercenter. Storm runoff is collected in roof drains and downspouts are tied directly to the parking area drainage system.

Basin B is a section of drive and landscape collected in a double (6') Type 13 Combination inlet (No. 1) at the rear of the Wal★Mart building. Emergency overflow is provided at an elevation one-half foot lower than the finished floor of that structure.

Basin C is a section of drive and landscape collected in a double (6') Type 13 Combination inlet (No. 2) at the rear of the Wal★Mart building. Emergency overflow is provided at an elevation one-half foot lower than the finished floor of that structure.

Basin D is a section of drive and landscape collected in a double (6') Type 13 Combination inlet (No. 3) at a low point in the southeast corner of the truck turning area.

Basin E consists of a large area of parking on the south side of Wal★Mart from which storm runoff will sheet flow to a low point where a double (6') Type 13 Grated inlet (No. 4) will collect it and convey it to the storm drain system.

Basin F is the northeast quarter of the south access road. Runoff will be picked up in a single (5') Type R inlet (No. 5).

Basin G is the southeast quarter of the south access road. Runoff will be picked up in a single (5') Type R inlet (No. 6).

Basin J is a large area of parking and including the garden center of the Wal★Mart site. Storm runoff will be collected by a double (6') Type 13 Combination inlet (No. 7) in the curb of the far southwest corner of Lot 1.

Basin K consists of drive, a portion of the garden center, and the northwest quarter of the south access drive. Runoff will be picked up in a double (10') Type R inlet (No. 8).

Basin L is the southwest quarter of the south access drive. Runoff will be picked up in a double (10') Type R inlet (No. 9).

Basin M is parking and truck turning areas on the north side of the Wal★Mart building. Storm runoff collects at a low point in the curb line where it will be intercepted by a double (6') Type-13 Combination inlet (No. 10).

BASIN N is parking space draining to a low point triple (9') Type 13 Grated inlet (No. 11).

BASIN P is parking space draining to a low point triple (9') Type 13 Grated inlet (No. 12).

BASIN Q is parking space draining to a low point triple (9') Type 13 Grated inlet (No. 13).

BASIN R is primarily the south side of the middle access drive. The westernmost portion of this basin is conjectural; but relatively certain based on that portion of the drive to be constructed with the Wal★Mart. Runoff is conveyed to an on-grade single (5') Type R inlet (No. 14).

BASIN S is primarily the north side of the middle access drive under the same assumptions as Basin R. Runoff is collected by an on-grade single (5') Type R inlet (No. 15).

BASIN T is the bulk of Lot 3. The basin is to be developed as a commercial site. Storm runoff will be conveyed to an on-site detention facility through future storm drains. During the grading of Filing No. 4 sheet and shallow swale flows will be directed to the detention pond with the installation of diversion berms. Additional drainage studies demonstrating compliance with the assumptions and provisions herein will be required.

BASIN V is the west side of Trail Boss Drive and a portion of open space/future development adjacent to Founders Parkway. Runoff will be collected in a low point double (10') Type R inlet (No. 16) and conveyed to the existing swale on Lot 2.

BASIN W is the east side of Trail Boss. Storm runoff will be collected in a low point double (10') Type R inlet (No. 17) and conveyed to the existing swale on Lot 2.

BASIN X consists of the conjectural commercial development of Lot 2. This basin will provide swales for conveying off-site Basins 1, 2, and 3. The combined runoff therefrom will be collected at a 5' RCP headwall (No. 18) and conveyed to the regional storm drain line paralleling the south property line.

BASIN Y combines on-site and off-site portions of Trail Boss Drive and a small portion of residential development (Metzler Ranch). Storm runoff is collected by an on-grade double (10') Type R inlet (No. 19).

BASIN Z combines on-site and off-site portions of Trail Boss Drive. Storm runoff is collected by an on-grade double (10') Type R inlet (No. 20).

BASIN AA is the northermost corner of Lot 3 from which storm runoff will be collected in an existing headwall and conveyed to an existing detention pond on Milestone Filing No. 1. That detention facility does not account for development in within Basin AA and on-site detention facilities for this area may be required.

BASIN OS-1 is 98 plus acres of off-site flow contributing to Basin X through an existing culvert under Founders Parkway. Historic storm runoff from this area is accounted for when sizing on-site drainage structures. However, a regional storm drain is being required to divert developed flows therefrom south along the Founders Parkway ROW. Basin OS-1 is identified as Basins 1f and 1g in the Metzler Ranch Master Drainage Study. That same study identifies the regional storm drain alignment; a portion of which is being built with Metzler Ranch Filing No. 1 and shown on the enclosed drainage plan. The current off-site contribution causes peak runoff velocities in excess of 30 fps in storm line G. However, once the regional interceptor is in place peak velocity will be reduced to just over 27 fps. *Construction of the interceptor is required with the development of Lot 2 or with the development of any portions of Basins 1f and 1g as identified in the Metzler Ranch study, whichever occurs first. The regional interceptor is conceptually indicated on the enclosed drainage study and labeled as "future."* Support calculations are provided in Appendix C of this report.

BASIN OS-2 is a portion of future commercial development which is accounted for on-site in both the historic and developed conditions. It is, however, conveniently collected and conveyed to the regional pipe at that property's northwest corner. Detailed plans of drainage for this section will have to be submitted with the development of Lot 2 and/or OS-2 as additional information becomes available.

BASIN OS-3 is the back of residential lots from a section of Metzler Ranch Filing No. 1. Contributions for this portion are provided for on-site in the developed condition.

BASIN OS-4 is an area identified as Basin H1 in the Final Drainage Report for Milestone Filing No. 1. Contribution to our site is provided for in a historic capacity only and on-site detention will be required when development occurs thereon.

BASIN BY-1 is a small portion of drive upslope of Front Street. Existing drainage patterns will convey runoff therefrom to the regional detention facility; its natural, pre-development, destination.

BASIN BY-2 is a small portion of drive upslope of Front Street. Runoff therefrom is negligible and will collect at existing low point Type R inlets in that street. Due to this basin's small area and short time of concentration, allowing bypass prior to peak accumulation and discharges from the on-site detention facility, it will not adversely impact off-site peak flows.

Basins U1 is an area of sloped landscaping on which no additional imperviousness will be added post development. No alterations or additions to facilities are necessary for this basin.

Basins U2 is an area of sloped landscaping on which no additional imperviousness will be added post development. No alterations or additions to facilities are necessary for this basin.

On-Site Detention Facility will detain storm water for the Water Quality Capture Volume, the 10-year, and the 100-year rainfall events for contributing areas not included in the regional pond to the south or routing to the Milestone Filing No. 1 facilities to the north.

V. DRAINAGE DESIGN CRITERIA

This report is done in accordance with the Town of Castle Rock "Public Works Regulations" (the REGS), and shall follow the provisions of the Urban Drainage and Flood Control District (the MANUAL).

Peak runoff for the 5-year and 100-year rainfall events were calculated by the Rational Method using rainfall intensities provided in the REGS. The calculations appear in the Appendix. Runoff from the 5-year storm was used to size storm sewer inlets with additional provisions made to ensure conveyance of the 100-year event met the constraints established within the REGS. All pipes are sized such that less than 90 percent of the steady state gravity flow capacity of the pipe is being utilized to convey 5-year runoff peaks. Refer to the drainage plan in the back pocket.

Storm sewer sizes were determined using a Manning's coefficient n=0.013 for reinforced concrete pipe. Minimum detention volumes and maximum release rates were calculated in accordance with the provisions of the REGS.

VI. DRAINAGE FACILITY DESIGN

Milestone Filing No. 4 is composed of three large lots designated for commercial development. Lot 1, the site of a proposed Wal★Mart Supercenter, is historically divided into two primary drainage basins. A majority of this lot contributes runoff to the south and to a regional detention and water quality facility on the Town of Castle Rock School/Park Site. Per recorded easement and related documents 0.5 acres of Lot 1 is designated drainage easement for the construction of that facility along with partial compensation for construction costs. The second primary basin contributes runoff north where it combines with flows developing from Lot 3. Storm water runoff from this lot is conveyed overland across roofs, landscaping, and parking areas before being intercepted by inlets and thence into storm drains. Storm drains then convey storm water either to the aforementioned regional facility or the proposed detention facility on Lot 3.

Lot 2 is an area of future development. Runoff from overlot grading proposed in this report along with off-site contributing areas OS-1, 2, and 3 will be collected at a 4.5'

diameter RCP culvert and tied in to the 66" regional storm drain. Contributing areas east of Founders Parkway will be required to divert their runoff south along the ROW as identified in the Metzler Ranch Master Drainage Study as development occurs thereon. Off-site areas to the south of the property boundary are considered both historically and in the developed condition for sizing structures proposed under this cover. Additional drainage studies will be required of Lot 2 and these off-site areas as more detailed construction is proposed thereon. Capacity of the regional storm drain (66" RCP) exceeds that of all contributing areas in their fully developed condition.

Lot 3 is also an area of future development which will require additional drainage study as detailed construction plans become available. Approximately 4.24 acres of this lot plus off-site area OS-4 presently contribute storm flows to a swale and drain system contributing to Milestone Filing No. 1. Drainage structures on that facility are sized to receive only historic flows from these areas; therefore, on-site detention may be required, details of which must be submitted at the time of development.

Calculations were done in accordance with the REGS for the entire site by assuming runoff coefficients from the MANUAL consistent with roofs, drive/walk, and landscaping (lawns, clayey soils). Runoff data for off-site areas were obtained from prior studies identified in the Reference section of this report. For any subsequent improvements upslope and tributary through the site, compliance with the parameters and storm drain systems detailed herein will be required prior to development.

The proposed detention facility has been sized to accommodate and detain developed runoff from a portion of Lots 1 and 3. Total runoff from the developed site will be less than or equal to rates as set forth by the CRITERIA. The average end area method was used to determine the volume and the resulting water surface elevations for design rainfalls. An emergency overflow weir has been sized for the pond to allow undetained discharge rates (100-year) to be directed to the adjacent ROW's without overtopping the pond berms.

VII. INTERIM FACILITIES

Prior to the on-site development of Lot 3 the proposed detention facility will be constructed without the retaining structures identified therein. Grading will be done in such a way as to maintain the location and slope of the access while providing 3:1 earthen slopes in lieu of the future walls. The detention easement dedicated with Milestone Filing No. 4 encompasses this larger area and may be vacated upon completion of the future detention configuration.

Interim orifice and restrictor plat sizes will be installed with the development of Lot 1, sized to detain flows for only the development of that portion of the contributing area. All support calculations are provided in Appendix D and are reflected on Sheet 2 of the plan sheets provided in the back pocket of this report.

VIII. EROSION CONTROL AND BEST MANAGEMENT PRACTICES

Construction Activities Storm Water Quality Control

Silt fences will be used along the edges of the site abutting public right-of-way. The fence will be placed behind the back of curb or, in the case of an attached sidewalk, behind the back of walk. Inlet protection, consisting of gravel filters and straw bale barriers will be used for all of the inlets until disturbed areas are paved or landscaping is established. The contractor is required to use vehicle tracking control where vehicles enter and exit the site from public right-of-way. The detention facility and outlet structure will serve as sediment basins during construction.

Permanent Stabilization and Storm Water Quality Enhancement

Permanent measures used to achieve final stabilization and to control pollutants in storm water discharge after construction operations have been completed include site paving, landscaping, and a "Dry Extended Detention Basin," within the on-site detention facility. When complete, all of the site will be either developed ROW, commercial, or open space. Open space will be mulched and seeded or sodded. Where possible, runoff will be allowed to pass through the detention pond and other landscaped areas providing "turf filtering" and the opportunity for biological digestion of nutrients.

IX. CONCLUSIONS

The drainage improvements for this site are designed in accordance with the Town of Castle Rock "Public Works Regulations" and are intended to limit the impact downstream consistent with those criteria.

X. REFERENCES

1. Subdivision Ordinance, Town of Castle Rock, Colorado, October 16, 1991.

2. Public Works Regulations, Town of Castle Rock, October, 1998.

3. Urban Storm Drainage Criteria Manual, Denver Regional Council of Governments, Denver, Colorado, March 1969, with current revision.

4. Soil Survey of Castle Rock Area, Colorado, U.S. Department of Agriculture Soil Conservation Service, Issued November 1974.

5. Master Drainage Study - Metzler ranch, prepared by Inter-Mountain Engineering, Ltd., dated February, 1996, and revised January 20, 1997.

6. Final Drainage Report for Milestone Filing No. 1, prepared by Rocky Mountain Consultants, Inc., dated October, 1995.

7. Final Drainage Report - Metzler Ranch - Filing No. 1, dated October, 1997, and revised February, 1998.

8. Preliminary Geotechnical Investigation - Milestone, prepared by CTL/Thompson, Inc., dated June 22, 1994.

Appendix A - Hydrologic Calculations

Weighted Runoff Coefficients
Job Name: Milestone Filing No. 4
Job Number: 97.211

Date: 11/18/98
By: J Tompkins

	C5	C10	C100	IMP%
Historic	0.15	0.25	0.50	2

	Land Use (Acres)	Weighted Runoff Coefficient			
Basin	Historic	C5	C10	C100	IMP%
H-1	31.01	0.15	0.25	0.50	2.00
H-2	28.48	0.15	0.25	0.50	2.00
H-3	4.24	0.15	0.25	0.50	2.00
H-4	0.31	0.15	0.25	0.50	2.00
Total:	64.04	0.15	0.25	0.50	2.00

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Milestone Filing No. 4
Calculated by: J Tompkins Date: 11/18/98
Job no: 97.211

Sub-Basin Data			Initial/Overland Time (Ti)			Travel Time Tt				Tc Check Urbanized Basin		Final Tc	Remarks
Desig	C5	Area Ac	Length Ft	Slope %	Ti Min	Length Ft	Slope %	Vel FPS	Tt Min	Tot Len Ft	Tc Min	Min	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	
H-1	0.15	31.01	500	5.01	22.3	1275	5.01	1.65	12.9			35.2	
H-2	0.15	28.48	500	6.43	20.6	962	6.43	1.79	9.0			29.5	
H-3	0.15	4.24	500	10.83	17.3	137	10.83	2.27	1.0			18.3	
H-4	0.15	0.31	30	40.00	2.7	n/a	n/a	n/a	n/a			2.7	Use min. 5.0

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD)

Calculated by: J Tompkins Job No: 97.211
Date: 11/18/98 Project: Milestone Filing No. 4
Checked by: Design Storm: 5-yr

Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
	Area Desig	Area (Ac)	Runoff Coeff	Tc (min)	CA	I (in/hr)	Q (cfs)	Tc (min)	Total CA	I (in/hr)	Q (cfs)	Slope %	Street Flow	Design Flow	Slope %	Pipe Size	Length (Ft)	Vel (fps)	Tt (min)	
	H-1	31.01	0.15	35.22	4.65	2.26	10.51													
	H-2	28.48	0.15	29.52	4.27	2.29	9.77													
	H-3	4.24	0.15	18.29	0.64	3.06	1.94													
	H-4	0.31	0.15	5.00	0.05	4.92	0.23													

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD)

Calculated by: J Tompkins
Date: 11/18/98
Checked by:

Job No: 97.211
Project: Milestone Filing No. 4
Design Storm: 100-yr

	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			
Design Point	Area Desig	Area (Ac)	Runoff Coeff	Tc (min)	CA	I (in/hr)	Q (cfs)	Tc (min)	Total CA	I (in/hr)	Q (cfs)	Slope %	Street Flow	Design Flow	Slope %	Pipe Size	Length (Ft)	Vel (fps)	Tt (min)	Remarks
	H-1	31.01	0.50	35.22	15.51	4.11	63.73													
	H-2	28.48	0.50	29.52	14.24	4.16	59.22													
	H-3	4.24	0.50	18.29	2.12	5.53	11.72													
	H-4	0.31	0.50	5.00	0.16	9.05	1.40													

Weighted Runoff Coefficients
Job Name: Milestone Filing No. 4
Job Number: 97.211

Date: 11/18/98
By: J Tompkins

	C5	C10	C100	IMP%
Roof	0.85	0.90	0.90	90
Drive / Walk	0.87	0.88	0.89	96
Landscaping	0.15	0.25	0.50	0
Commercial	0.87	0.88	0.89	95

	Land Use (Acres)					Weighted Runoff Coefficient			
Basin	Roof	Drive/walk	Landscape	Commercial	Total	C5	C10	C100	IMP%
A	4.72	0.00	0.00	0.00	4.72	0.85	0.90	0.90	90.00
B	0.00	0.19	0.86	0.00	1.05	0.28	0.36	0.57	17.37
C	0.00	0.18	0.70	0.00	0.88	0.30	0.38	0.58	19.64
D	0.00	0.64	2.13	0.00	2.77	0.32	0.40	0.59	22.18
E	0.00	1.15	0.21	0.00	1.36	0.76	0.78	0.83	81.18
F	0.00	0.28	0.03	0.00	0.31	0.80	0.82	0.85	86.71
G	0.00	0.33	0.02	0.00	0.35	0.83	0.84	0.87	90.51
J	0.00	2.66	0.29	0.00	2.95	0.80	0.82	0.85	86.56
K	0.00	0.72	0.42	0.00	1.14	0.60	0.65	0.75	60.63
L	0.00	0.27	0.00	0.00	0.27	0.87	0.88	0.89	96.00
M	0.00	1.21	0.74	0.00	1.95	0.60	0.64	0.74	59.57
N	0.00	1.64	0.12	0.00	1.76	0.82	0.84	0.86	89.45
P	0.00	1.76	0.14	0.00	1.90	0.82	0.83	0.86	88.93
Q	0.00	1.25	0.24	0.00	1.49	0.75	0.78	0.83	80.54
R	0.00	0.45	0.26	0.00	0.71	0.61	0.65	0.75	60.85
S	0.00	0.51	0.00	0.00	0.51	0.87	0.88	0.89	96.00
T	0.00	0.00	0.00	17.96	17.96	0.87	0.88	0.89	95.00
V	0.00	2.74	0.00	0.00	2.74	0.87	0.88	0.89	96.00
W	0.00	0.96	0.00	0.00	0.96	0.87	0.88	0.89	96.00
X	0.00	0.00	0.00	12.64	12.64	0.87	0.88	0.89	95.00
Y	0.26	0.56	0.26	0.00	1.08	0.69	0.73	0.80	71.44
Z	0.00	0.54	0.00	0.00	0.54	0.87	0.88	0.89	96.00
AA	0.00	0.00	0.00	4.24	4.24	0.87	0.88	0.89	95.00
BY-1	0.00	0.12	0.00	0.00	0.12	0.87	0.88	0.89	96.00
BY-2	0.00	0.19	0.00	0.00	0.19	0.87	0.88	0.89	96.00
U1	0.00	0.00	1.17	0.00	1.17	0.15	0.25	0.50	0.00
U2	0.00	0.00	0.56	0.00	0.56	0.15	0.25	0.50	0.00
U3	0.00	0.00	0.45	0.00	0.45	0.15	0.25	0.50	0.00
Sub-Total:	4.98	18.35	8.60	34.84	66.77	0.78	0.80	0.84	82.67
OS-1[1]	n/a	n/a	n/a	n/a	98.80	n/a	0.60	0.73	
OS-2[1]	n/a	n/a	n/a	n/a	7.25	0.87	0.88	0.89	
OS-3[1]	n/a	n/a	n/a	n/a	1.27	0.45	0.50[3]	0.60	
OS-4[1]	n/a	n/a	n/a	n/a	16.00	0.25[2]	0.28[3]	0.31	
Total:					190.09				

[1]Offsite basin information obtained from reference materials / on file drainage reports.
[2]Minor storm (reported "C" value) 2-year event in referenced study.
[3]Not in referenced report. Calculated as 1.10 times "C" 5-year

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Milestone Filing No. 4
Calculated by: J Tompkins Date: 11/18/98
Job no: 97.211

Sub-Basin Data			Initial/Overland Time (Ti)			Travel Time (Sh. Conc / Gutter) Tt				Tc Check Urbanized Basin		Final Tc	Remarks
Desig	C5	Area Ac	Length Ft	Slope %	Ti Min	Length Ft	Slope %	Vel FPS	Tt Min	Tot Len Ft	Tc Min	Min	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	
A	0.85	4.72	380	0.50	11.1					380	12.1	11.1	
B	0.15	1.05	100	25.00	5.8	175	0.75	1.7	1.7	275	11.5	7.6	
C	0.15	0.88	100	25.00	5.8	160	0.75	1.7	1.6	260	11.4	7.4	
D	0.15	2.77	165	14.00	9.1	50	2.00	2.8	0.3	215	11.2	9.4	
E	0.15	1.36	70	6.67	7.6	120	2.00	2.8	0.7	190	11.1	8.3	
F	0.88	0.31	20	2.00	1.4	520	5.00	4.5	1.9	540	13.0	5.0	
G	0.88	0.35	21	2.00	1.4	690	5.00	4.5	2.6	711	14.0	5.0	
J	0.88	2.95	500	2.00	7.0					500	12.8	7.0	
K	0.88	1.14	280	5.00	3.9	450	5.00	4.5	1.7	730	14.1	5.5	
L	0.88	0.27	20	5.00	1.0	550	5.00	4.5	2.0	570	13.2	5.0	
M	0.88	1.95	80	2.00	2.8	325	1.00	2.0	2.7	405	12.3	5.5	
N	0.88	1.76	330	2.30	5.4					330	11.8	5.4	
P	0.88	1.90	325	2.30	5.4					325	11.8	5.4	
Q	0.88	1.49	345	2.20	5.7					345	11.9	5.7	
R	0.15	0.71	115	33.33	5.7	800	3.90	3.9	3.4	915	15.1	9.1	
S	0.88	0.51	30	2.00	1.7	790	3.90	3.9	3.4	820	14.6	5.1	
T	0.88	17.96	500	3.20	6.0	420	5.00	4.5	1.6	920	15.1	7.6	
V	0.88	2.74	150	3.00	3.4	865	3.00	3.5	4.1	1015	15.6	7.5	
W	0.88	0.96	15	2.00	1.2	1115	2.70	3.2	5.8	1130	16.3	7.0	
X	0.88	12.64	500	3.00	6.1	260	3.00	3.5	1.2	760	14.2	7.4	
Y	0.15	1.08	90	5.00	9.5	610	2.00	2.8	3.6	700	13.9	13.1	
Z	0.88	0.54	21	2.00	1.4	640	2.00	2.8	3.8	661	13.7	5.2	
AA	0.15	4.24	450	4.25	22.4					450	12.5	12.5	
BY-1	0.88	0.12	50	5.00	1.6					50	10.3	5.0	
BY-2	0.88	0.19	190	5.00	3.2					190	11.1	5.0	
U1	0.15	1.17	120	7.50	9.6					120	10.7	9.6	
U2	0.15	0.56	60	33.33	4.1					60	10.3	5.0	
U3	0.15	0.45	60	33.33	4.1					60	10.3	5.0	
OS-1	n/a	98.80			n/a						n/a	18.0	CUHP
OS-2	0.88	7.25	500	3.30	5.9	690	3.30	3.6	3.2	1190	16.6	9.1	
OS-3	n/a	1.27			n/a						n/a	10.0	Metzler
OS-4	n/a	16.00			n/a						n/a	17.2	Milestone

NOTE: Five year coeff. reported for initial overflow component only.

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD)

Calculated by: J Tompkins | Job No: 97.211
Date: 11/18/98 | Project: Milestone Filing No. 4
Checked by: | Design Storm: 5-yr

	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			
Design Point	Area Desig	Area (Ac)	Runoff Coeff	Tc (min)	CA	I (in/hr)	Q (cfs)	Tc (min)	Total CA	I (in/hr)	Q (cfs)	Slope %	Street Flow	Design Flow	Slope %	Pipe Size	Length (Ft)	Vel (fps)	Tt (min)	Remarks
	A	4.72	0.85	11.1	4.01	3.73	14.96													
	B	1.05	0.28	7.8	0.29	4.38	1.29													Inlet #1
	C	0.88	0.30	7.4	0.28	4.40	1.15													Inlet #2
	D	2.77	0.32	9.4	0.88	3.97	3.48													Inlet #3
1								11.1	5.44	3.73	20.30						220	10.0	0.4	Manhole
	E	1.38	0.78	8.3	1.03	4.21	4.34													Inlet #4
2								11.4	8.48	3.68	23.85						180	10.0	0.3	Juncture
	F	0.31	0.80	5.0	0.25	4.92	1.22													Inlet #5
3								11.7	8.72	3.85	24.54									Juncture
	G	0.35	0.83	5.0	0.29	4.92	1.43													Inlet #6
4								11.7	7.01	3.65	25.60									Manhole
	J	2.95	0.80	7.0	2.38	4.49	10.58													Inlet #7
	K	1.14	0.60	5.5	0.89	4.81	3.32													Inlet #8
5								7.0	3.05	4.49	13.68									Juncture
	L	0.27	0.87	5.0	0.23	4.92	1.18													Inlet #9
8								7.0	3.28	4.49	14.73									Juncture
7								11.7	31.99	3.65	118.74									Reg. Pond
	M	1.95	0.60	5.5	1.18	4.81	5.60										250	10.0	0.4	Inlet #10
	N	1.78	0.82	5.4	1.44	4.83	8.98													Inlet #11
	P	1.90	0.82	5.4	1.55	4.83	7.50													Inlet #12
8								5.4	3.00	4.83	14.49									Juncture
	Q	1.49	0.75	5.7	1.12	4.79	5.38													Inlet #13
9								5.7	4.12	4.79	19.74						425	10.0	0.7	Juncture
10								8.4	5.28	4.64	24.51									Manhole
	R	0.71	0.61	9.1	0.43	4.03	1.74													Inlet #14
	S	0.51	0.87	5.1	0.44	4.90	2.17													Inlet #15
11								9.1	0.87	4.03	3.53									Manhole
12								9.1	6.16	4.03	24.85									Manhole
	T	17.96	0.87	7.6	15.63	4.38	68.44													
13								9.1	21.784	4.03	87.88									Det. Pond
	V	2.74	0.87	7.5	2.38	4.40	10.49													Inlet #16
	W	0.98	0.87	7.0	0.64	4.49	3.75													Inlet #17
14								7.5	3.22	4.40	14.17									Juncture
	OS-1	98.80					29.64[1]													
	OS-2	7.25	0.87	9.1	8.31	4.03	25.45													
	OS-3	1.27	0.45	10.0	0.57	3.84	2.19													
	X	12.64	0.87	7.4	11.00	4.42	48.64													
15								10.00	17.876	3.84	98.28									Culvert #18
	Y	1.08	0.69	13.1	0.75	3.49	2.61													Inlet #19
	Z	0.54	0.87	5.2	0.47	4.88	2.29													Inlet #20
16								13.12	22.312	3.49	107.57									Ex. Pipe
	OS-4	16.00	0.25	17.2	4.00	3.12	12.49													
	AA	4.24	0.87	12.5	3.69	3.56	13.13													
17								17.20	7.69	3.12	24.02									Ex. Inlet
	BY-1	0.12	0.87	5.0	0.10	4.92	0.51													
	BY-2	0.19	0.87	5.0	0.17	4.92	0.81													
	U1	1.17	0.15	9.8	0.18	3.95	0.69													
	U2	0.56	0.15	5.0	0.08	4.92	0.41													
	U3	0.45	0.15	5.0	0.07	4.92	0.33													

Ultimate analysis for Tie-In to Off-Site / Regional Storm Drain (66" RCP)

	V	2.74	0.87	7.5	2.38	4.40	10.49													Inlet #16
	W	0.98	0.87	7.0	0.64	4.49	3.75													Inlet #17
14								7.5	3.22	4.40	14.17									Juncture
	OS-1	0.00					207.0[2]													
	OS-2	7.25	0.87	9.1	8.31	4.03	25.45													
	OS-3	1.27	0.45	10.0	0.57	3.84	2.19													
	X	12.64	0.87	7.4	11.00	4.42	48.64													
15								10.00	21.095	3.64	81.00									Culvert #18
	Y	1.08	0.89	13.1	0.75	3.49	2.81													Inlet #19
	Z	0.54	0.87	5.2	0.47	4.88	2.29													Inlet #20
18								13.12	22.312	3.49	264.95									Ex. Pipe

[1]10-Year historic / allowable flow from Metzler Ranch Regional Drainage Report. Added in at design point 15 without routing.
[2]10-Year developed flow from Metzler Ranch Regional Drainage Report. Added in at design point 18 without routing.

STANDARD FORM SF-3 — Calculated by: J Tompkins — Job No: 97.211

STORM DRAINAGE SYSTEM DESIGN — Date: 11/18/98 — Project: Milestone Filing No. 4

(RATIONAL METHOD) — Checked by: — Design Storm: 10-yr

	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			
Design Point	Area Desig	Area (Ac)	Runoff Coeff	Tc (min)	CA	I (in/hr)	Q (cfs)	Tc (min)	Total CA	I (in/hr)	Q (cfs)	Slope %	Street Flow	Design Flow	Slope %	Pipe Size	Length (Ft)	Vel (fps)	Tt (min)	Remarks
	A	4.72	0.90	11.1	4.25	4.36	18.52													
	B	1.05	0.38	7.8	0.38	5.13	1.96													Inlet #1
	C	0.88	0.38	7.4	0.33	5.18	1.72													Inlet #2
	D	2.77	0.40	9.4	1.10	4.85	5.10													Inlet #3
1								11.1	8.08	4.38	28.42						220	10.0	0.4	Manhole
	E	1.38	0.78	8.3	1.06	4.93	5.25													Inlet #4
2								11.4	7.12	4.30	30.66						180	10.0	0.3	Juncture
	F	0.31	0.82	5.0	0.25	5.78	1.48													Inlet #5
3								11.7	7.38	4.28	31.44									Juncture
	G	0.35	0.84	5.0	0.30	5.78	1.70													Inlet #6
4								11.7	7.87	4.28	32.70									Manhole
	J	2.95	0.82	7.0	2.41	5.28	12.88													Inlet #7
	K	1.14	0.65	5.5	0.74	5.63	4.18													Inlet #8
5								7.0	3.15	5.28	18.57									Juncture
	L	0.27	0.88	5.0	0.24	5.78	1.37													Inlet #9
8								7.0	3.39	5.28	17.82									Juncture
7								11.7	34.78	4.28	148.21									Reg. Pond
	M	1.95	0.84	5.5	1.25	5.63	7.04										250	10.0	0.4	Inlet #10
	N	1.78	0.84	5.4	1.47	5.66	8.34													Inlet #11
	P	1.90	0.83	5.4	1.58	5.68	8.98													Inlet #12
8								5.4	3.08	5.88	17.30									Juncture
	Q	1.49	0.78	5.7	1.16	5.61	8.51													Inlet #13
9								5.7	4.22	5.61	23.65						425	10.0	0.7	Juncture
10								8.4	5.47	5.43	29.70									Manhole
	R	0.71	0.65	9.1	0.46	4.73	2.18													Inlet #14
	S	0.51	0.88	5.1	0.45	5.73	2.57													Inlet #15
11								9.1	0.91	4.73	4.30									Manhole
12								9.1	8.38	4.73	30.14									Manhole
	T	17.96	0.88	7.6	15.80	5.13	81.08													
13								9.1	22.181	4.73	104.85									Det. Pond
	V	2.74	0.88	7.5	2.41	5.18	12.43													Inlet #18
	W	0.98	0.88	7.0	0.84	5.26	4.44													Inlet #17
14								7.5	3.28	5.16	16.79									Juncture
	OS-1	98.80					29.64[1]													
	OS-2	7.25	0.88	9.1	6.38	4.73	30.16													
	OS-3	1.27	0.50	10.0	0.64	4.50	2.88													
	X	12.64	0.88	7.4	11.12	5.18	57.62													
15								10.00	18.138	4.50	111.26									Culvert #18
	Y	1.08	0.73	13.1	0.79	4.07	3.22													Inlet #19
	Z	0.54	0.88	5.2	0.48	5.71	2.71													Inlet #20
18								13.12	22.661	4.07	121.781									Ex. Pipe
	OS-4	16.00	0.28	17.2	4.48	3.62	16.21													
	AA	4.24	0.88	12.5	3.73	4.15	15.48													
17								17.20	8.21	3.62	29.72									Ex. Inlet
	BY-1	0.12	0.88	5.0	0.11	5.78	0.61													
	BY-2	0.19	0.88	5.0	0.17	5.76	0.98													
	U1	1.17	0.25	9.8	0.29	4.63	1.35													
	U2	0.56	0.25	5.0	0.14	5.76	0.81													
	U3	0.45	0.25	5.0	0.11	5.78	0.65													

Ultimate analysis for Tie-In to Off-Site / Regional Storm Drain (66" RCP)

	V	2.74	0.87	7.5	2.38	5.16	12.29													Inlet #16
	W	0.98	0.87	7.0	0.84	5.28	4.39													Inlet #17
14								7.5	3.22	5.18	18.59									Juncture
	OS-1	0.00					207.0[2]													
	OS-2	7.25	0.87	9.1	8.31	4.73	29.81													
	OS-3	1.27	0.45	10.0	0.57	4.50	2.57													
	X	12.64	0.87	7.4	11.00	5.18	58.97													
15								10.00	21.095	4.50	94.93									Culvert #18
	Y	1.08	0.69	13.1	0.75	4.07	3.04													Inlet #19
	Z	0.54	0.87	5.2	0.47	5.71	2.68													Inlet #20
18								13.12	22.312	4.07	297.74									Ex. Pipe

[1] 10-Year historic / allowable flow from Metzler Ranch Regional Drainage Report. Added in at design point 15 without routing.

[2] 10-Year developed flow from Metzler Ranch Regional Drainage Report. Added in at design point 18 without routing.

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD)

Calculated by: J Tompkins | Job No: 97.211
Date: 11/18/98 | Project: Milestone Filing No. 4
Checked by: | Design Storm: 100-yr

	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			
Design Point	Area Desig	Area (Ac)	Runoff Coeff	Tc (min)	CA	I (in/hr)	Q (cfs)	Tc (min)	Total CA	I (in/hr)	Q (cfs)	Slope %	Street Flow	Design Flow	Slope %	Pipe Size	Length (Ft)	Vel (fps)	Tt (min)	Remarks
	A	4.72	0.90	11.1	4.25	8.80	28.89													
	B	1.05	0.57	7.6	0.60	8.04	4.81													Inlet #1
	C	0.88	0.58	7.4	0.51	8.08	4.12													Inlet #2
	D	2.77	0.59	9.4	1.63	7.28	11.87													Inlet #3
1								11.1	8.99	8.60	47.58						220	10.0	0.4	Manhole
	E	1.38	0.83	8.3	1.13	7.71	8.70													Inlet #4
2								11.4	8.12	8.71	54.53						180	10.0	0.3	Juncture
	F	0.31	0.85	5.0	0.28	9.05	2.39													Inlet #5
3								11.7	8.38	8.85	55.75									Juncture
	G	0.35	0.87	5.0	0.30	9.05	2.75													Inlet #6
4								11.7	8.69	8.85	57.77									Manhole
	J	2.95	0.85	7.0	2.51	8.24	20.70													Inlet #7
	K	1.14	0.75	5.5	0.85	8.85	7.53													Inlet #8
5								7.0	3.38	8.24	27.71									Juncture
	L	0.27	0.89	5.0	0.24	9.05	2.17													Inlet #9
8								7.0	3.60	8.24	29.89									Juncture
7								11.7	39.15	8.85	260.34									Reg. Pond
	M	1.95	0.74	5.5	1.45	8.85	12.80										250	10.0	0.4	Inlet #10
	N	1.78	0.88	5.4	1.52	8.89	13.51													Inlet #11
	P	1.90	0.88	5.4	1.64	8.89	14.54													Inlet #12
8								5.4	3.16	8.89	28.05									Juncture
	Q	1.49	0.83	5.7	1.23	8.81	10.85													Inlet #13
9								5.7	4.39	8.81	38.85						425	10.0	0.7	Juncture
10								8.4	5.64	8.52	49.73									Manhole
	R	0.71	0.75	9.1	0.53	7.39	3.92													Inlet #14
	S	0.51	0.89	5.1	0.45	9.01	4.09													Inlet #15
11								9.1	0.98	7.39	7.27									Manhole
12								9.1	8.82	7.39	50.37									Manhole
	T	17.98	0.89	7.8	15.98	8.04	128.43													
13								9.1	22.804	7.39	168.42									Det. Pond
	V	2.74	0.89	7.5	2.44	8.08	19.89													Inlet #18
	W	0.96	0.89	7.0	0.85	8.24	7.04													Inlet #17
14								7.5	3.29	8.08	26.59									Juncture
	OS-1	98.80					98.80[1]													
	OS-2	7.25	0.89	9.1	6.45	7.39	47.85													
	OS-3	1.27	0.60	10.0	0.78	7.02	5.35													
	X	12.64	0.89	7.4	11.25	8.12	91.30													
15								10.00	18.464	7.02	159.28									Culvert #18
	Y	1.08	0.80	13.1	0.88	6.34	5.47													Inlet #19
	Z	0.54	0.89	5.2	0.48	8.97	4.31													Inlet #20
16								13.12	23.1	6.34	245.353									Ex. Pipe
	OS-4	16.00	0.31	17.2	4.96	5.65	28.03													
	AA	4.24	0.89	12.5	3.77	8.48	24.43													
17								17.20	8.73	5.65	49.35									Ex. Inlet
	BY-1	0.12	0.89	5.0	0.11	9.05	0.97													
	BY-2	0.19	0.89	5.0	0.17	9.05	1.53													
	U1	1.17	0.50	9.6	0.59	7.22	4.23													
	U2	0.56	0.50	5.0	0.28	9.05	2.53													
	U3	0.45	0.50	5.0	0.23	9.05	2.04													

Ultimate analysis for Tie-In to Off-Site / Regional Storm Drain (66" RCP)

	V	2.74	0.87	7.5	2.38	8.08	19.25													Inlet #16
	W	0.96	0.87	7.0	0.84	8.24	6.88													Inlet #17
14								7.5	3.22	8.08	26.00									Juncture
	OS-1	0.00					393.0[2]													
	OS-2	7.25	0.87	9.1	8.31	7.39	48.58													
	OS-3	1.27	0.45	10.0	0.57	7.02	4.01													
	X	12.64	0.87	7.4	11.00	8.12	89.25													
15								10.00	21.095	7.02	148.09									Culvert #18
	Y	1.08	0.69	13.1	0.75	8.34	4.74													Inlet #19
	Z	0.54	0.87	5.2	0.47	8.97	4.21													Inlet #20
18								13.12	22.312	8.34	534.571									Ex. Pipe

[1]100-Year historic / allowable flow from Metzler Ranch Regional Drainage Report. Added in at design point 15 without routing.
[2]100-Year developed flow from Metzler Ranch Regional Drainage Report. Added in at design point 18 without routing.

Appendix B - Inlet Design

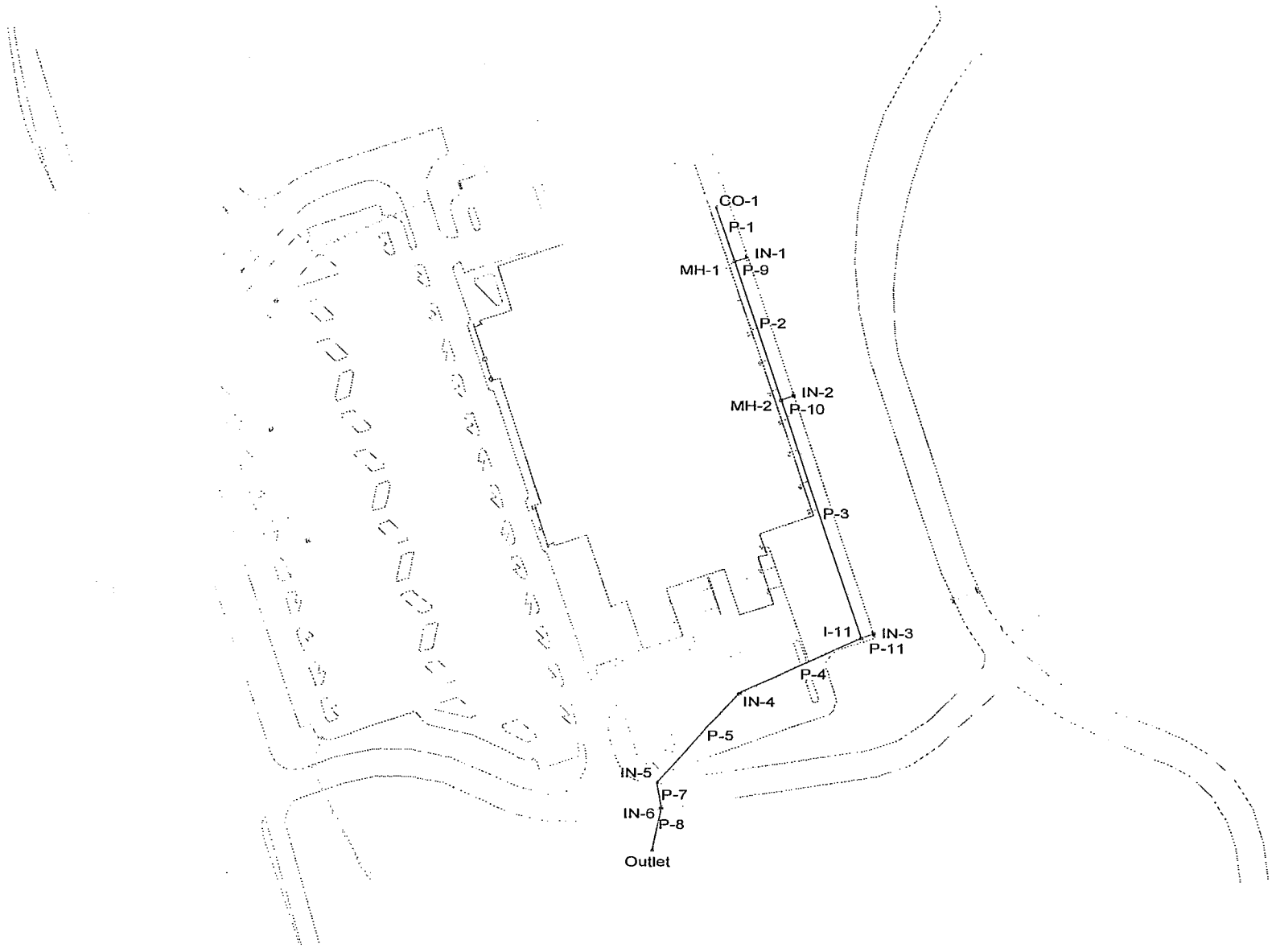
Inlet Sizing Calculations
Job Name: Milestone Filing No. 4
Job Number: 97.211

Date: 12/18/98
by: J.Tompkins

Inlet	Contributing Basin	5-year Runoff	100-year Runoff	Condition	Required Inlet
Inlet #1	B	1.29	4.81	Sump	Double (6') Type-13 Combination
Inlet #2	C	1.15	4.12	Sump	Double (6') Type-13 Combination
Inlet #3	D	3.48	11.87	Sump	Double (6') Type-13 Combination
Inlet #4	E	4.34	8.70	Sump	Double (6') Type-13 Grated
Inlet #5	F	1.22	2.39	4.50% Grade	Single (5') Type R
Inlet #6	G	1.43	2.75	4.50% Grade	Single (5') Type R
Inlet #7	J	10.58	20.70	Sump	Double (6') Type-13 Combination
Inlet #8	K	3.32	7.53	4.00% Grade	Double (10') Type R
Inlet #9	L	1.16	2.17	4.00% Grade	Double (10') Type R
Inlet #10	M	5.60	12.80	Sump	Double (6') Type-13 Combination
Inlet #11	N	6.98	13.51	Sump	Triple (9') Type-13 Grated
Inlet #12	P	7.50	14.54	Sump	Triple (9') Type-13 Grated
Inlet #13	Q	5.38	10.85	Sump	Triple (9') Type-13 Grated
Inlet #14	R	1.74	3.92	5.00% Grade	Single (5') Type R
Inlet #15	S	2.17	4.09	5.00% Grade	Single (5') Type R
Inlet #16	V	10.49	19.69	Sump	Double (10') Type R
Inlet #17	W	3.75	7.04	Sump	Double (10') Type R
Culvert #18	X; OS-1,2,3	98.28	159.26	Sump	5' RCP Headwall
Inlet #19	Y	2.61	5.47	1.00% Grade	Double (10') Type R
Inlet #20	Z	2.29	4.31	1.00% Grade	Double (10') Type R

Assumptions:
1. Refer to figure 902 and 903 of the Criteria and in the Appendix.
2. Allow 0.5 feet of ponding for 5-year event and 1.0 feet for the 100-year event.

Appendix C - Hydraulic Calculations



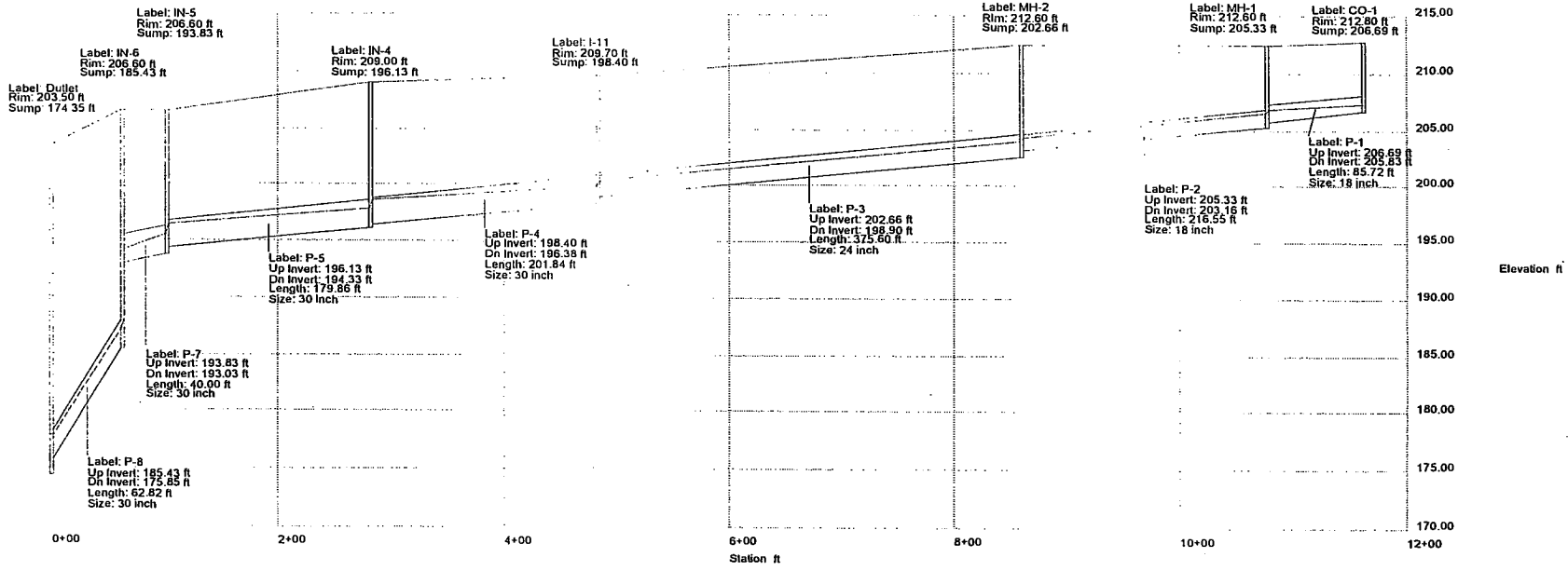
Project Title: Castle Rock Wal Mart
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colorado land consultants
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Project Engineer: joel tompkins
StormCAD v1.5 [158]

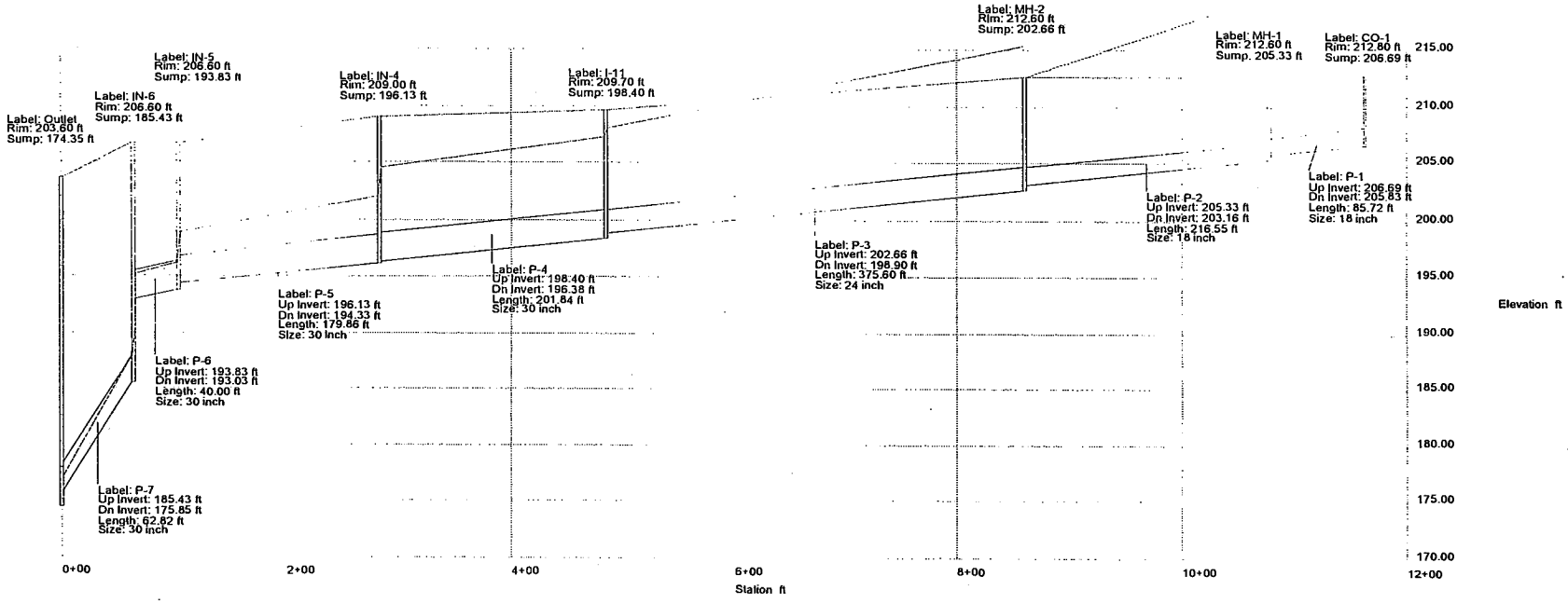
Castle Rock WM - Line A - Minor

Pipe	-Node- Upstream Downstream	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-EGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-1	CO-1	0.00	212.80	207.37	207.63	0.008303	3.21	Circular	85.72	3.35	
	MH-1		212.60	206.82	206.92	0.010033	10.52	18 inch			
P-9	IN-1	0.29	211.80	208.73	208.88	0.102191	1.29	Circular	20.00	2.09	
	MH-1		212.60	206.82	206.83	0.123500	36.91	18 inch			
P-10	IN-2	0.26	211.80	208.70	208.85	0.109990	1.17	Circular	20.00	6.98	
	MH-2		212.60	204.80	206.65	0.183500	44.99	18 inch			
P-2	MH-1	0.29	212.60	206.48	207.04	0.009983	8.76	Circular	216.55	5.88	
	MH-2		212.60	204.38	204.88	0.010021	10.51	18 inch			
P-11	IN-3	0.89	209.31	205.47	205.71	0.078052	3.55	Circular	20.00	8.59	
	I-11		209.70	201.42	204.15	0.183500	96.90	24 inch			
P-3	MH-2	0.56	212.60	204.01	204.62	0.009992	14.11	Circular	375.60	6.06	
	I-11		209.70	200.33	200.86	0.010011	22.63	24 inch			
P-4	I-11	5.46	209.70	199.94	200.59	0.007863	20.44	Circular	201.84	5.38	
	IN-4		209.00	198.71	199.00	0.010008	41.03	30 inch			
P-5	IN-4	6.49	209.00	197.79	198.53	0.009064	23.86	Circular	179.86	6.13	
	IN-5		206.60	196.45	196.90	0.010008	41.03	30 inch			
P-7	IN-5	6.74	206.60	195.51	196.26	0.011069	24.40	Circular	40.00	8.45	
	IN-6		206.60	194.28	195.82	0.020000	58.00	30 inch			
P-8	IN-6	7.03	206.60	187.15	187.92	0.151031	25.39	Circular	62.82	6.49	
	Outlet		203.50	177.89	178.43	0.152499	160.17	30 inch			


Label: IN-5
Rim: 206.60 ft
Sump: 193.83 ft
Label: IN-6
Rim: 206.60 ft
Sump: 185.43 ft
Label: Outlet
Rim: 203.50 ft
Sump: 174.35 ft
Label: IN-4
Rim: 209.00 ft
Sump: 196.13 ft
Label: I-11
Rim: 209.70 ft
Sump: 198.40 ft
Label: P-5
Up Invert: 196.13 ft
Dn Invert: 194.33 ft
Length: 179.86 ft
Size: 30 inch
Label: P-4
Up Invert: 198.40 ft
Dn Invert: 196.38 ft
Length: 201.84 ft
Size: 30 inch
Label: P-7
Up Invert: 193.83 ft
Dn Invert: 193.03 ft
Length: 40.00 ft
Size: 30 inch
Label: P-8
Up Invert: 185.43 ft
Dn Invert: 175.85 ft
Length: 62.82 ft
Size: 30 inch
Label: MH-2
Rim: 212.60 ft
Sump: 202.66 ft
Label: P-3
Up Invert: 202.66 ft
Dn Invert: 198.90 ft
Length: 375.60 ft
Size: 24 inch
Label: MH-1
Rim: 212.60 ft
Sump: 205.33 ft
Label: CO-1
Rim: 212.80 ft
Sump: 206.69 ft
Label: P-1
Up Invert: 206.69 ft
Dn Invert: 205.83 ft
Length: 85.72 ft
Size: 18 inch
Label: P-2
Up Invert: 205.33 ft
Dn Invert: 203.16 ft
Length: 216.55 ft
Size: 18 inch
215.00
210.00
205.00
200.00
195.00
190.00
185.00
180.00
175.00
170.00
Elevation ft
0+00
2+00
4+00
6+00
8+00
10+00
12+00
Station ft

Castle Rock WM - Line A - Major

Pipe	-Node- Upstream Downstream	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-EGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-9	IN-1	0.60	211.80	212.64	212.76	0.002108	4.82	Circular	20.00	2.73	
	MH-1		212.60	212.60	212.72	0.123500	36.91	18 inch			
P-1	CO-1	0.00	212.80	212.90	213.09	0.003473	6.19	Circular	85.72	3.50	
	MH-1		212.60	212.60	212.79	0.010033	10.52	18 inch			
P-2	MH-1	0.60	212.60	219.86	221.70	0.033528	19.23	Circular	216.55	10.88	
	MH-2		212.60	212.60	214.44	0.010021	10.51	18 inch			
P-10	IN-2	0.51	211.80	212.63	212.72	0.001565	4.15	Circular	20.00	2.35	
	MH-2		212.60	212.60	212.69	0.183500	44.99	18 inch			
P-11	IN-3	1.63	209.31	208.17	208.40	0.002798	11.97	Circular	20.00	3.81	
	I-11		209.70	208.12	208.34	0.183500	96.90	24 inch			
P-3	MH-2	1.11	212.60	215.36	216.92	0.019292	31.42	Circular	375.60	10.00	
	I-11		209.70	208.12	209.67	0.010011	22.63	24 inch			
P-4	I-11	6.99	209.70	207.23	208.71	0.013566	47.77	Circular	201.84	9.73	
	IN-4		209.00	204.50	205.97	0.010008	41.03	30 inch			
P-5	IN-4	8.12	209.00	202.07	204.01	0.017903	54.88	Circular	179.86	11.18	
	IN-5		206.60	198.85	200.79	0.010008	41.03	30 inch			
P-6	IN-5	8.38	206.60	196.19	198.32	0.017000	56.17	Circular	40.00	12.17	
	IN-6		206.60	195.15	197.64	0.020000	58.00	30 inch			
P-7	IN-6	8.69	206.60	187.81	190.07	0.056401	58.10	Circular	62.82	18.36	
	Outlet		203.60	177.06	186.52	0.152499	160.17	30 inch			


Label: MH-2
Rim: 212.60 ft
Sump: 202.66 ft
Label: MH-1
Rim: 212.60 ft
Sump. 205.33 ft
Label: CO-1
Rim: 212.80 ft
Sump: 206.69 ft
Label: IN-5
Rim: 206.60 ft
Sump: 193.83 ft
Label: IN-6
Rim: 206.60 ft
Sump: 185.43 ft
Label: Outlet
Rim: 203.60 ft
Sump: 174.35 ft
Label: IN-4
Rim: 209.00 ft
Sump: 196.13 ft
Label: I-11
Rim: 209.70 ft
Sump: 198.40 ft
Label: P-1
Up Invert: 206.69 ft
Dn Invert: 205.83 ft
Length: 85.72 ft
Size: 18 inch
Label: P-2
Up Invert: 205.33 ft
Dn Invert: 203.16 ft
Length: 216.55 ft
Size: 18 inch
Label: P-3
Up Invert: 202.66 ft
Dn Invert: 198.90 ft
Length: 375.60 ft
Size: 24 inch
Label: P-4
Up Invert: 198.40 ft
Dn Invert: 196.38 ft
Length: 201.84 ft
Size: 30 inch
Label: P-5
Up Invert: 196.13 ft
Dn Invert: 194.33 ft
Length: 179.86 ft
Size: 30 inch
Label: P-6
Up Invert: 193.83 ft
Dn Invert: 193.03 ft
Length: 40.00 ft
Size: 30 inch
Label: P-7
Up Invert: 185.43 ft
Dn Invert: 175.85 ft
Length: 62.82 ft
Size: 30 inch
215.00
210.00
205.00
200.00
195.00
190.00
185.00
180.00
175.00
170.00
Elevation ft
0+00
2+00
4+00
6+00
8+00
10+00
12+00
Station ft

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

April 10, 1999
Storm Line "A"
Connect to Existing 66" RCP
Capacity/Velocity Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	631.0
Channel Bottom Slope (feet per foot)	0.0636
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	5.50

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	3.54
Flow Velocity (feet per second)	39.08
Froude Number (Flow is Super-Critical)	3.934
Velocity Head (feet)	23.71
Energy Head (feet)	27.25
Cross-Sectional Area of Flow (square feet)	16.15
Top Width of Flow (feet)	5.27

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

April 10, 1999
Castle Rock Wal Mart
Storm Line A
5-Year Node 4 Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	25.6
Channel Bottom Slope (feet per foot)	0.1525
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	2.50

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	0.68
Flow Velocity (feet per second)	23.89
Froude Number (Flow is Super-Critical)	6.062
Velocity Head (feet)	8.86
Energy Head (feet)	9.54
Cross-Sectional Area of Flow (square feet)	1.07
Top Width of Flow (feet)	2.22

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
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(713) 440-3787. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

April 9, 1999
Castle Rock Wal Mart
Storm Drain Line A
100-Year Flow @ Design Node 4

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	57.8
Channel Bottom Slope (feet per foot)	0.1525
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	2.50

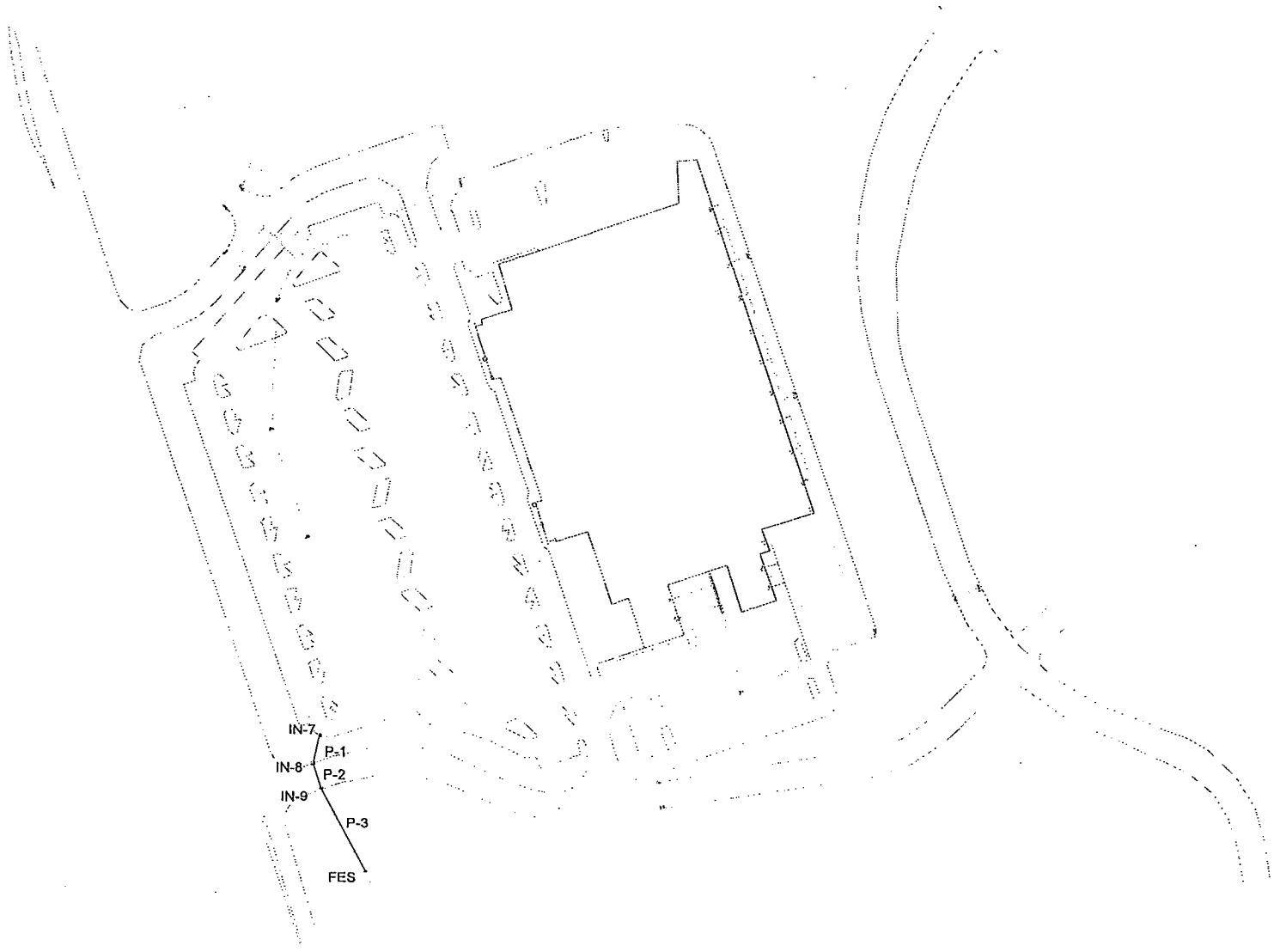
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PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	1.04
Flow Velocity (feet per second)	29.99
Froude Number (Flow is Super-Critical)	5.975
Velocity Head (feet)	13.96
Energy Head (feet)	15.00
Cross-Sectional Area of Flow (square feet)	1.93
Top Width of Flow (feet)	2.46

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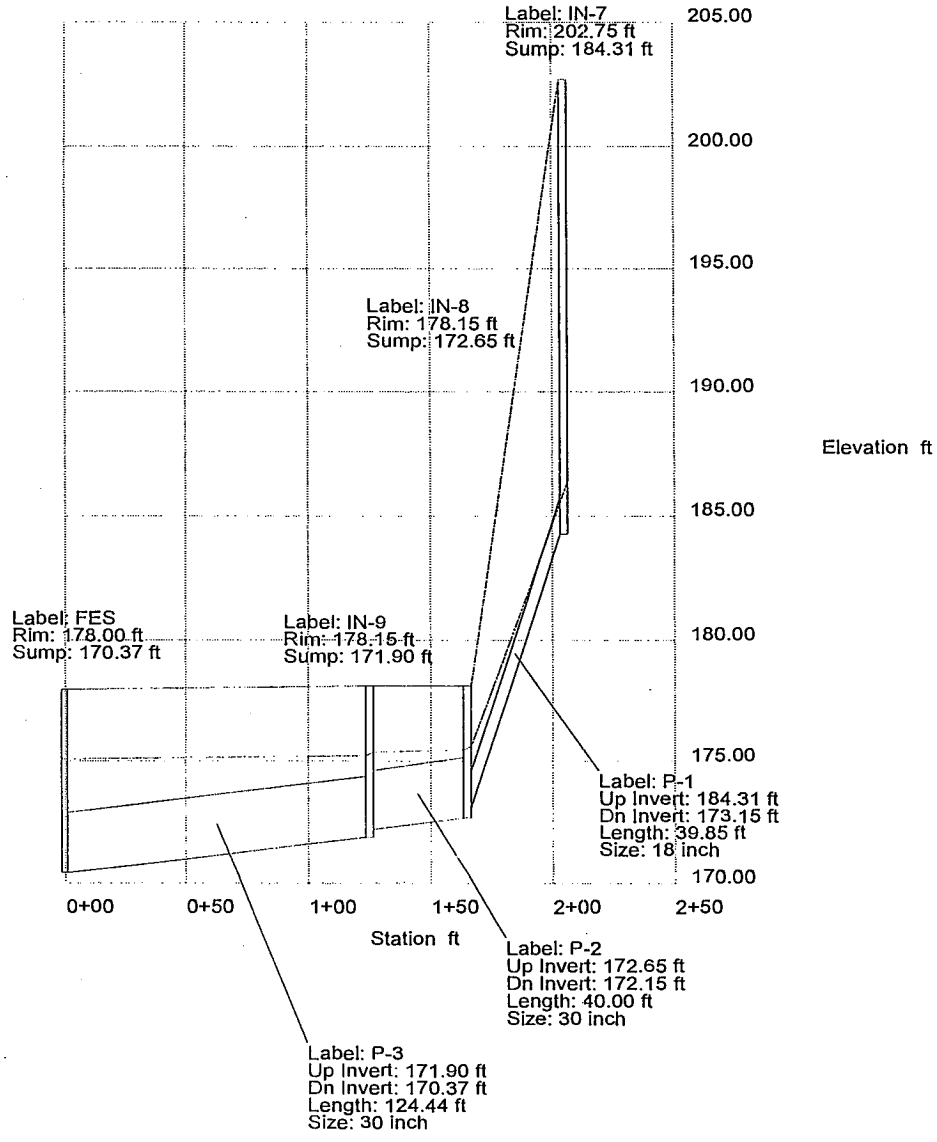
CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
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(713) 440-3787. A complete program manual is available.


IN-7
P-1
IN-8
P-2
IN-9
P-3
FES

Castle Rock WM - Line B - Minor

Pipe	-Node- Upstream Downstream	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-EGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-1	IN-7	2.36	202.75	185.56	186.28	0.253528	10.68	Circular	39.85	6.40	
	IN-8		178.15	175.61	176.17	0.280050	55.59	18 inch			
P-2	IN-8	3.04	178.15	175.45	175.57	0.001116	13.70	Circular	40.00	2.79	
	IN-9		178.15	175.41	175.53	0.012500	45.86	30 inch			
P-3	IN-9	3.28	178.15	175.24	175.37	0.001265	14.59	Circular	124.44	2.97	
	FES		178.00	175.08	175.22	0.012295	45.48	30 inch			

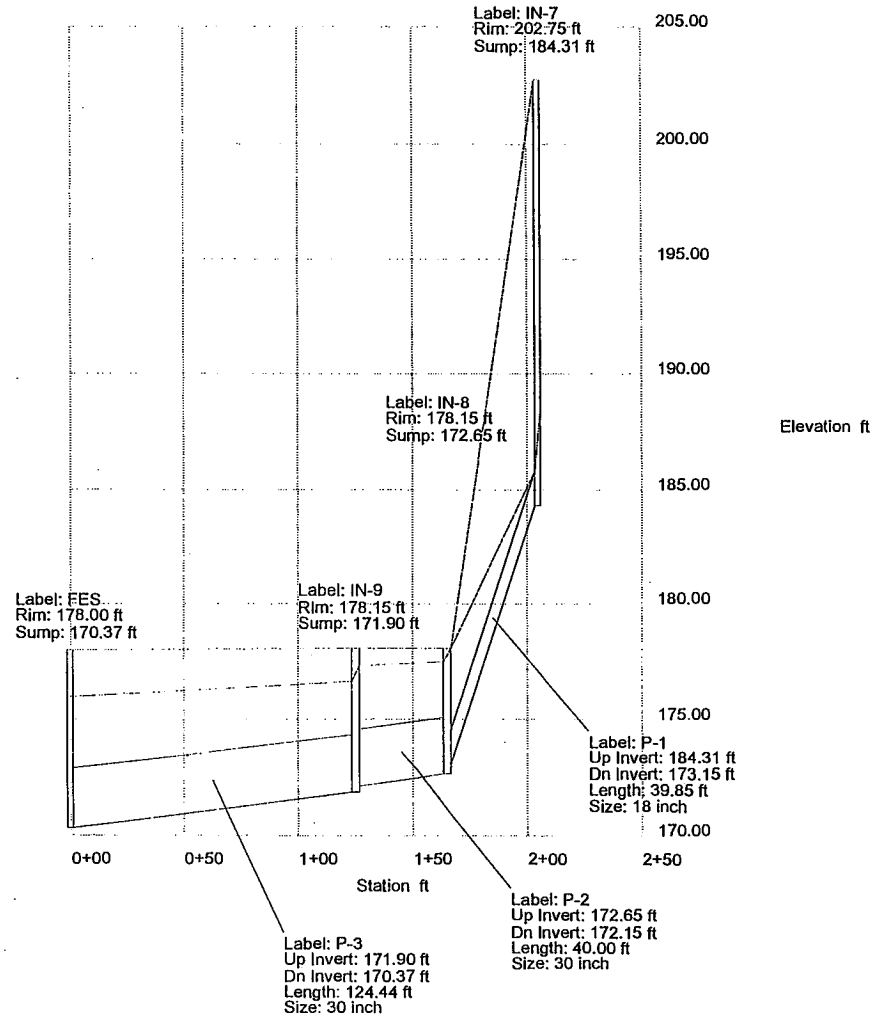
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Castle Rock WM - Line B - Major

Pipe	-Node- Upstream Downstream	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-EGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-1	IN-7	2.51	202.75	185.78	187.96	0.191987	20.82	Circular	39.85	11.81	
	IN-8		178.15	178.15	180.31	0.280050	55.59	18 inch			
P-2	IN-8	3.36	178.15	177.57	178.07	0.004609	27.84	Circular	40.00	5.67	
	IN-9		178.15	177.39	177.89	0.012500	45.86	30 inch			
P-3	IN-9	3.60	178.15	176.68	177.25	0.005230	29.66	Circular	124.44	6.04	
	FES		178.00	176.03	176.60	0.012295	45.48	30 inch			



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CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

April 6, 1999
Castle Rock Wal Mart
Storm Line B
5-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	14.7
Channel Bottom Slope (feet per foot)	0.0125
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	2.50

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	0.98
Flow Velocity (feet per second)	8.31
Froude Number (Flow is Super-Critical)	1.717
Velocity Head (feet)	1.07
Energy Head (feet)	2.05
Cross-Sectional Area of Flow (square feet)	1.77
Top Width of Flow (feet)	2.44

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

April 6, 1999
Castle Rock Wal Mart
Storm Line B
100-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	29.7
Channel Bottom Slope (feet per foot)	0.0125
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	2.50

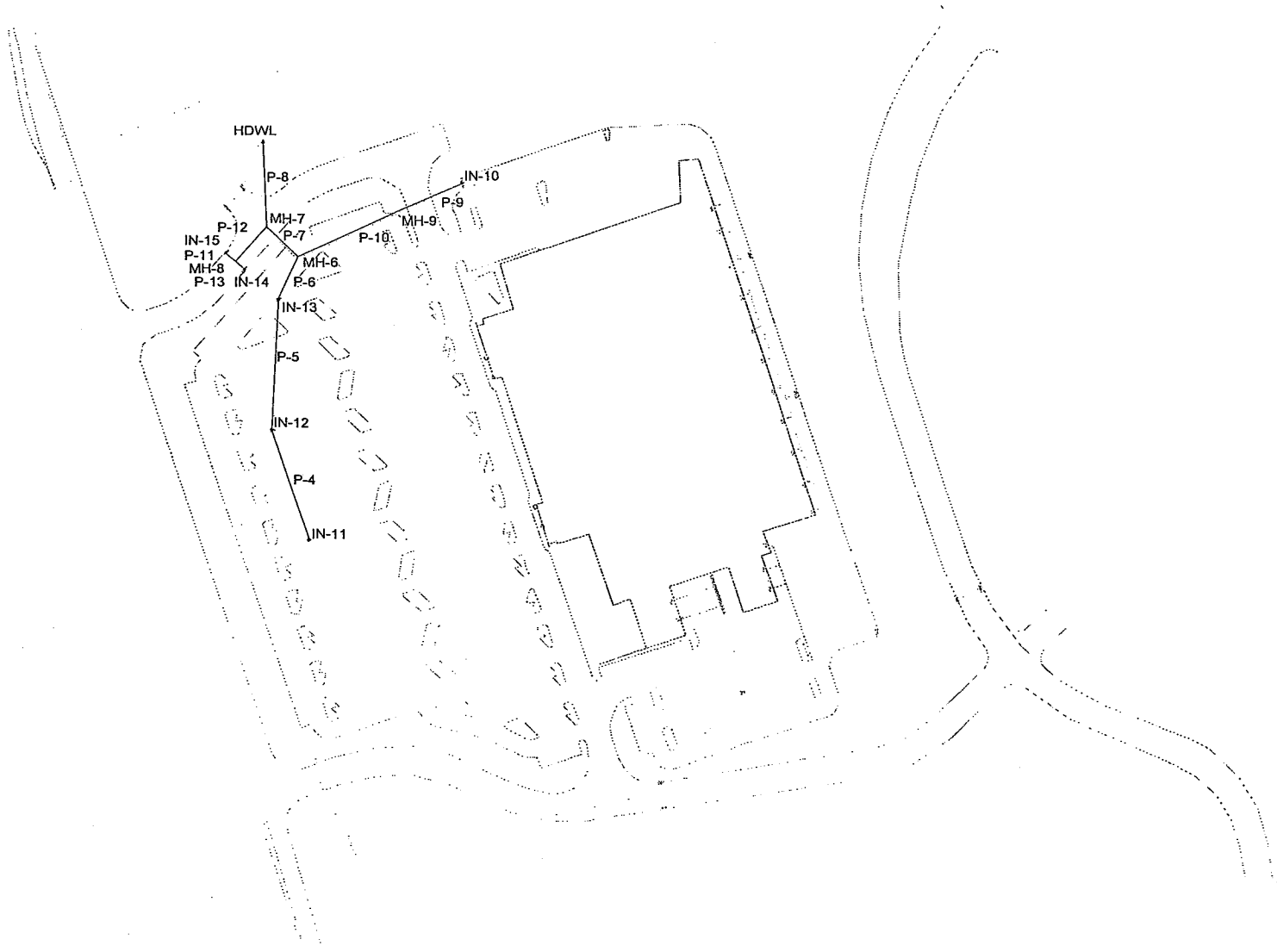
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PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	1.46
Flow Velocity (feet per second)	10.02
Froude Number (Flow is Super-Critical)	1.610
Velocity Head (feet)	1.56
Energy Head (feet)	3.01
Cross-Sectional Area of Flow (square feet)	2.96
Top Width of Flow (feet)	2.47

==========

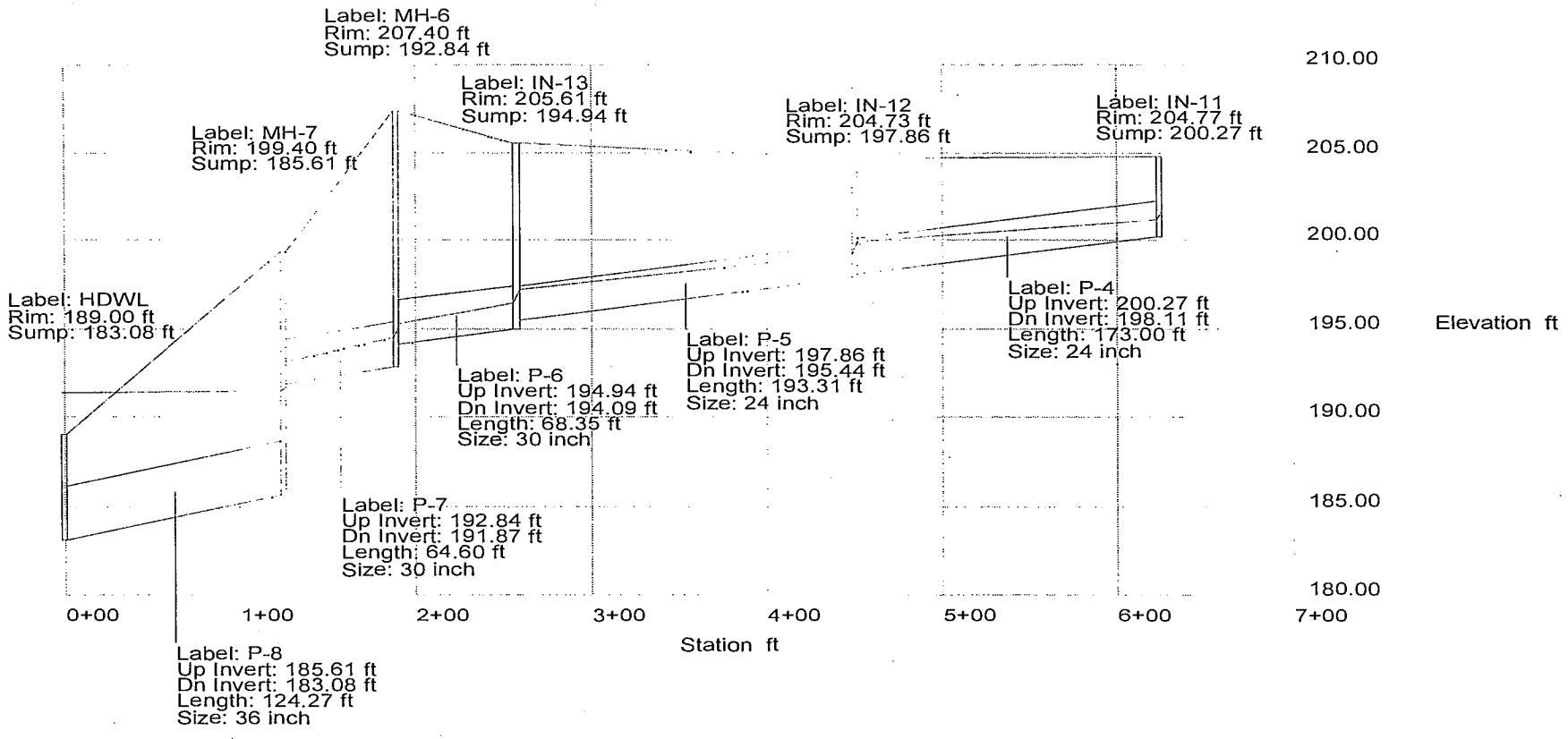
CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

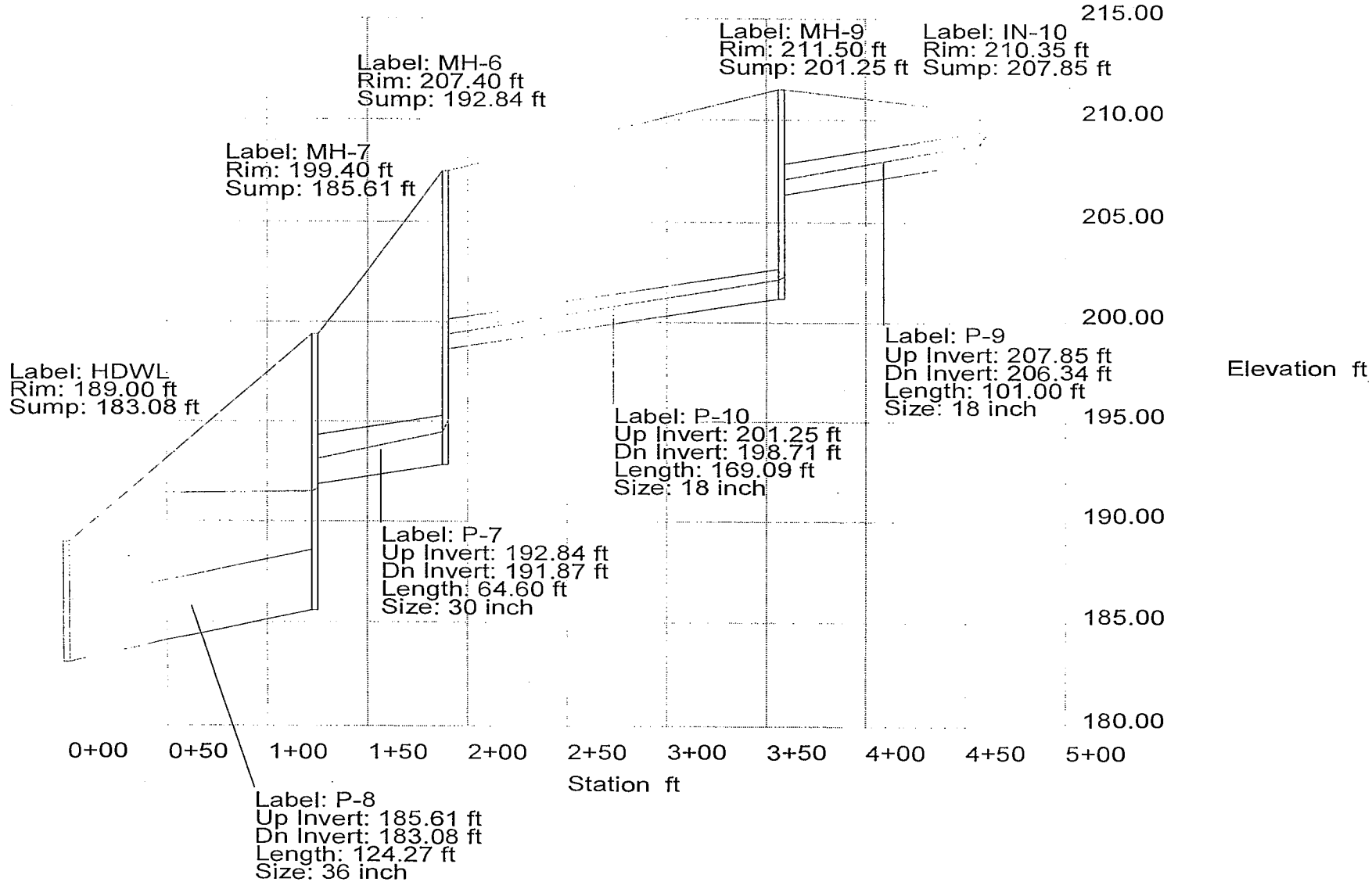

HDWL
P-8
IN-10
P-9
MH-7
MH-9
P-12
P-7
P-10
IN-15
P-11
MH-6
MH-8
P-13
IN-14
P-6
IN-13
P-5
IN-12
P-4
IN-11

Castle Rock WM - Line C - Minor

Pipe	-Node- Upstream Downstream	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-EGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-4	IN-11	1.44	204.77	201.21	201.58	0.008813	7.03	Circular	173.00	3.58	
	IN-12		204.73	199.97	200.05	0.012486	25.28	24 inch			
P-9	IN-10	1.17	210.35	208.77	209.16	0.013352	5.68	Circular	101.00	6.02	
	MH-9		211.50	207.04	207.81	0.014950	12.84	18 inch			
P-5	IN-12	3.00	204.73	199.21	199.82	0.011764	14.10	Circular	193.31	5.55	
	IN-13		205.61	197.17	197.54	0.012519	25.31	24 inch			
P-13	IN-14	0.43	195.60	192.60	192.78	0.009721	1.76	Circular	20.00	4.04	
	MH-8		196.10	192.25	192.59	0.012500	11.74	18 inch			
P-11	IN-15	0.44	195.60	192.66	192.87	0.009504	2.19	Circular	20.00	4.29	
	MH-8		196.10	192.30	192.68	0.012500	11.74	18 inch			
P-10	MH-9	1.17	211.50	202.16	202.55	0.014058	5.60	Circular	169.09	6.00	
	MH-6		207.40	199.40	200.17	0.015022	12.87	18 inch			
P-6	IN-13	4.12	205.61	196.41	197.02	0.009434	18.82	Circular	68.35	7.41	
	MH-6		207.40	195.24	196.38	0.012436	45.74	30 inch			
P-12	MH-8	0.88	196.10	192.07	192.35	0.008939	3.55	Circular	69.23	3.33	
	MH-7		199.40	191.64	191.73	0.012567	11.77	18 inch			
P-7	MH-6	5.29	207.40	194.51	195.25	0.010578	23.99	Circular	64.60	8.23	
	MH-7		199.40	193.14	194.56	0.015015	50.26	30 inch			
P-8	MH-7	6.17	199.40	191.51	191.69	0.001349	24.50	Circular	124.27	3.47	
	HDWL		189.00	191.34	191.53	0.020359	95.16	36 inch			

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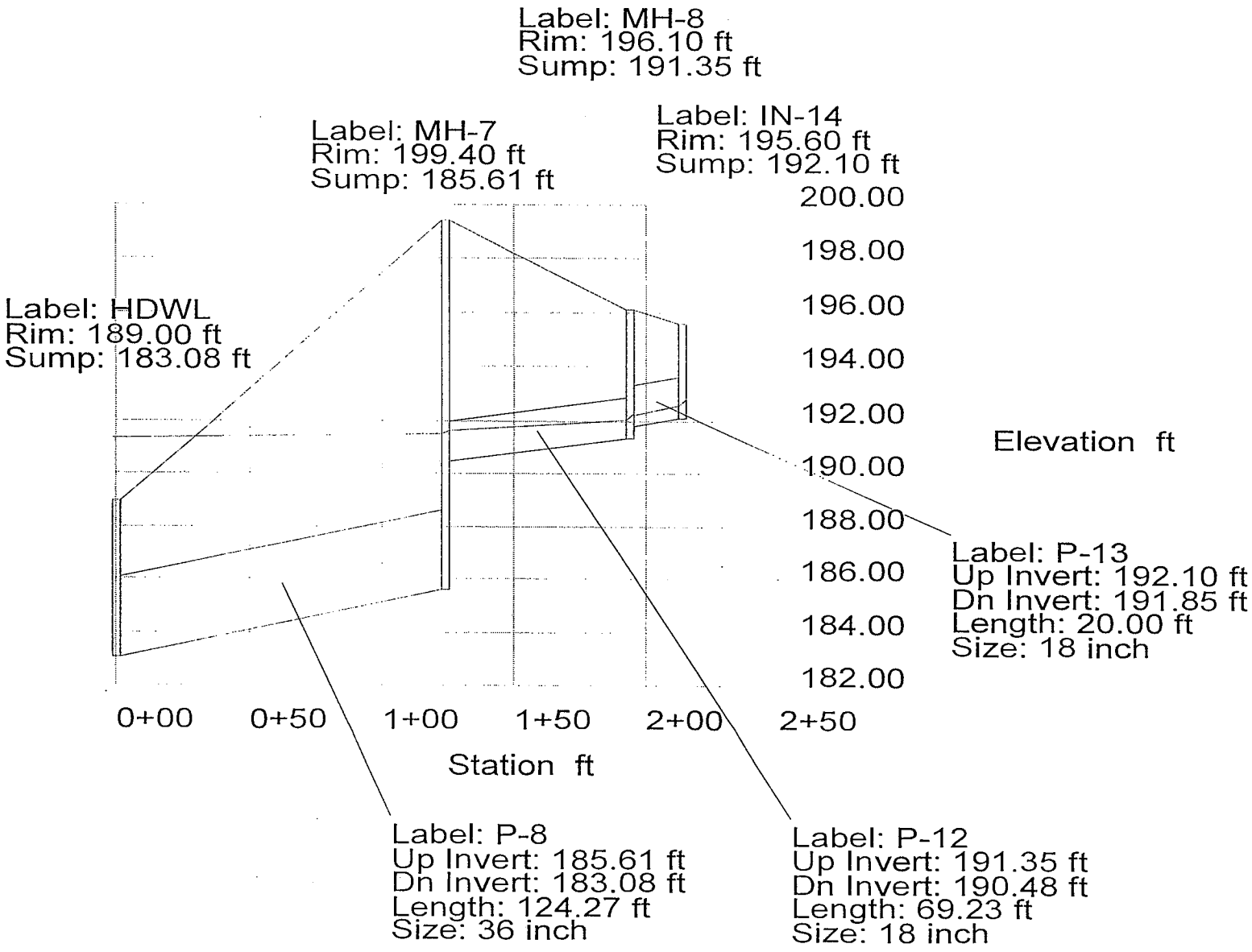

Label: MH-6
Rim: 207.40 ft
Sump: 192.84 ft
Label: IN-13
Rim: 205.61 ft
Sump: 194.94 ft
Label: MH-7
Rim: 199.40 ft
Sump: 185.61 ft
Label: IN-12
Rim: 204.73 ft
Sump: 197.86 ft
Label: IN-11
Rim: 204.77 ft
Sump: 200.27 ft
Label: HDWL
Rim: 189.00 ft
Sump: 183.08 ft
Label: P-4
Up Invert: 200.27 ft
Dn Invert: 198.11 ft
Length: 173.00 ft
Size: 24 inch
Label: P-5
Up Invert: 197.86 ft
Dn Invert: 195.44 ft
Length: 193.31 ft
Size: 24 inch
Label: P-6
Up Invert: 194.94 ft
Dn Invert: 194.09 ft
Length: 68.35 ft
Size: 30 inch
Label: P-7
Up Invert: 192.84 ft
Dn Invert: 191.87 ft
Length: 64.60 ft
Size: 30 inch
Label: P-8
Up Invert: 185.61 ft
Dn Invert: 183.08 ft
Length: 124.27 ft
Size: 36 inch
210.00
205.00
200.00
195.00
190.00
185.00
180.00
Elevation ft
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
Station ft

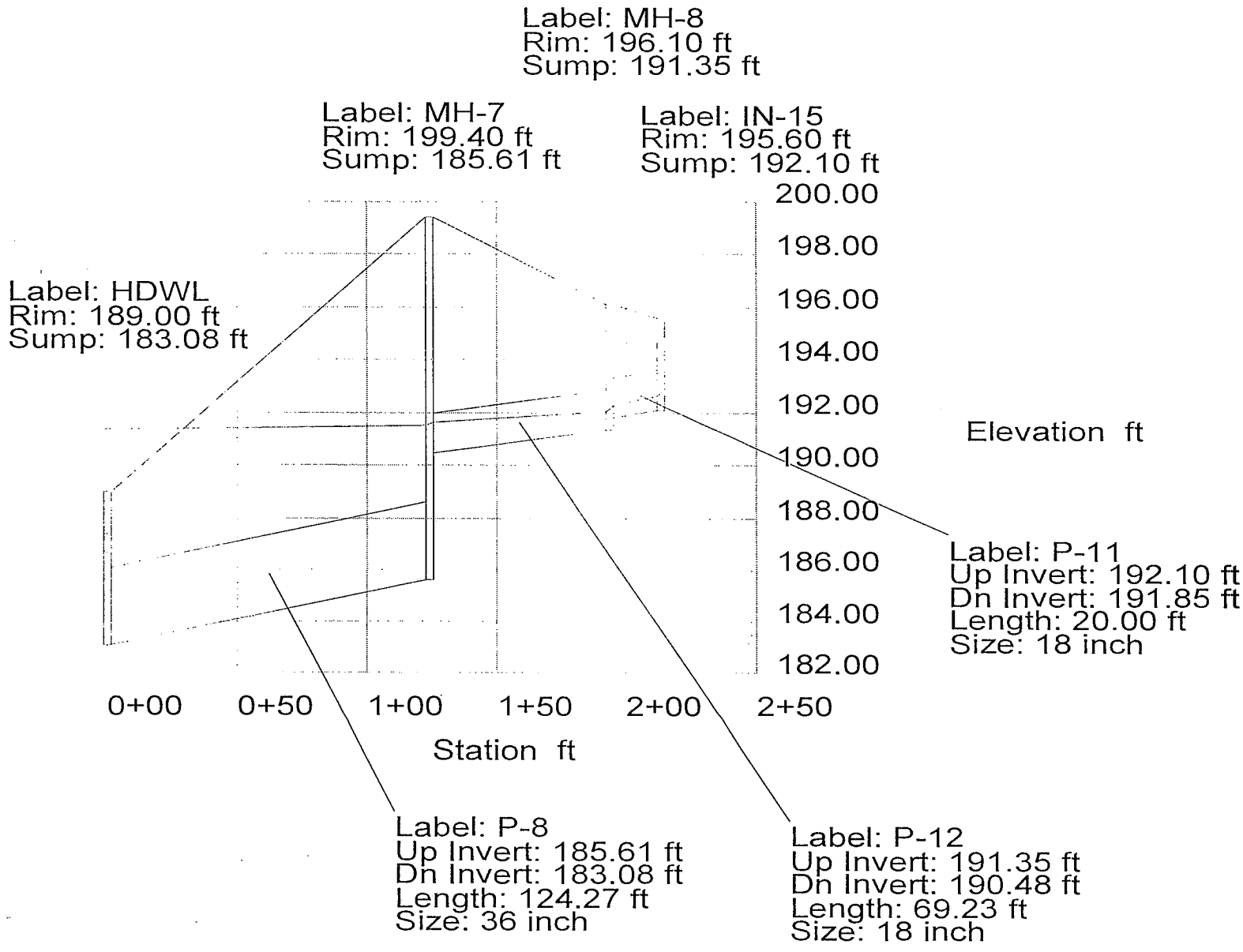


Project Title: Castle Rock Wal Mart
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colorado land consultants
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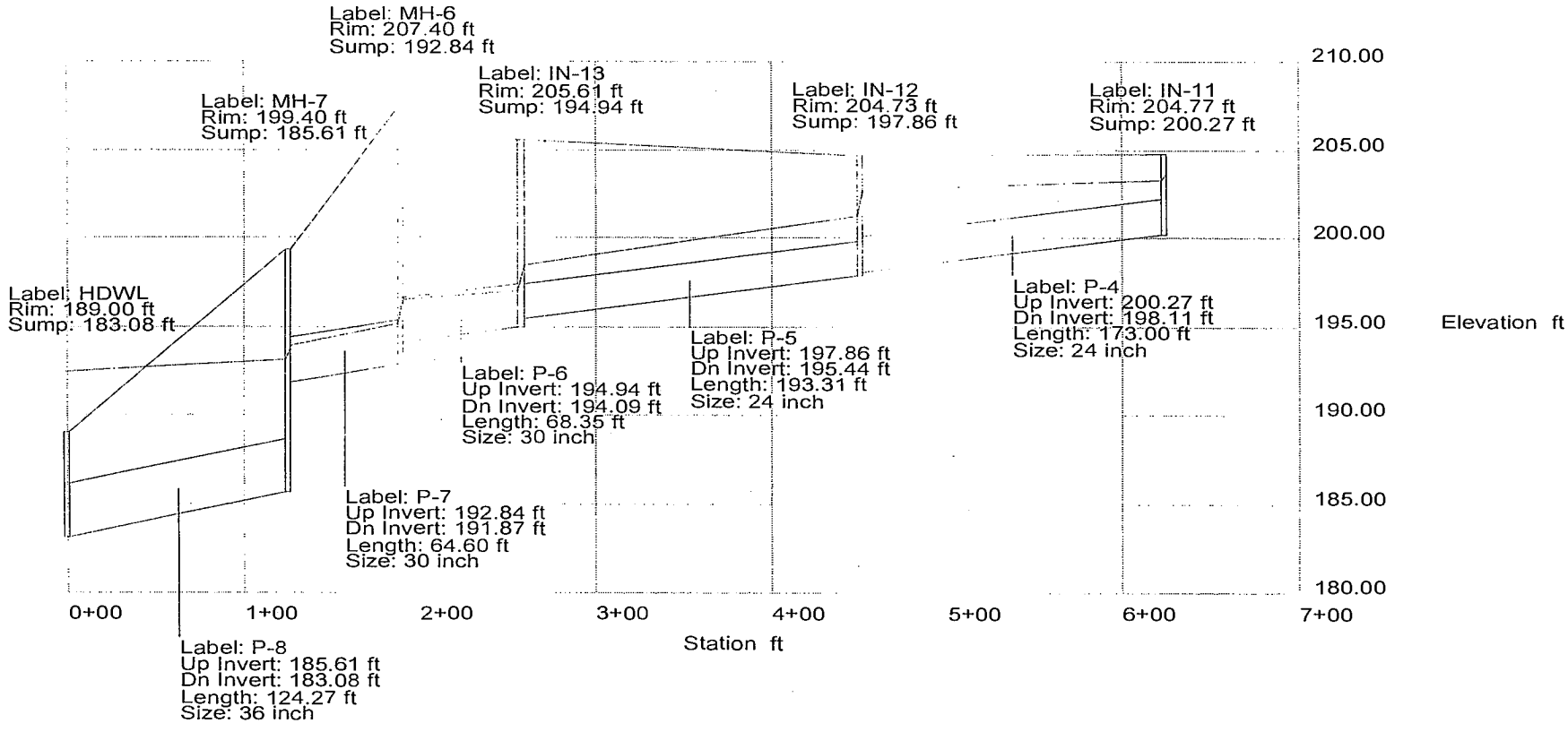
Project Engineer: joel tompkins
StormCAD v1.5 [158]

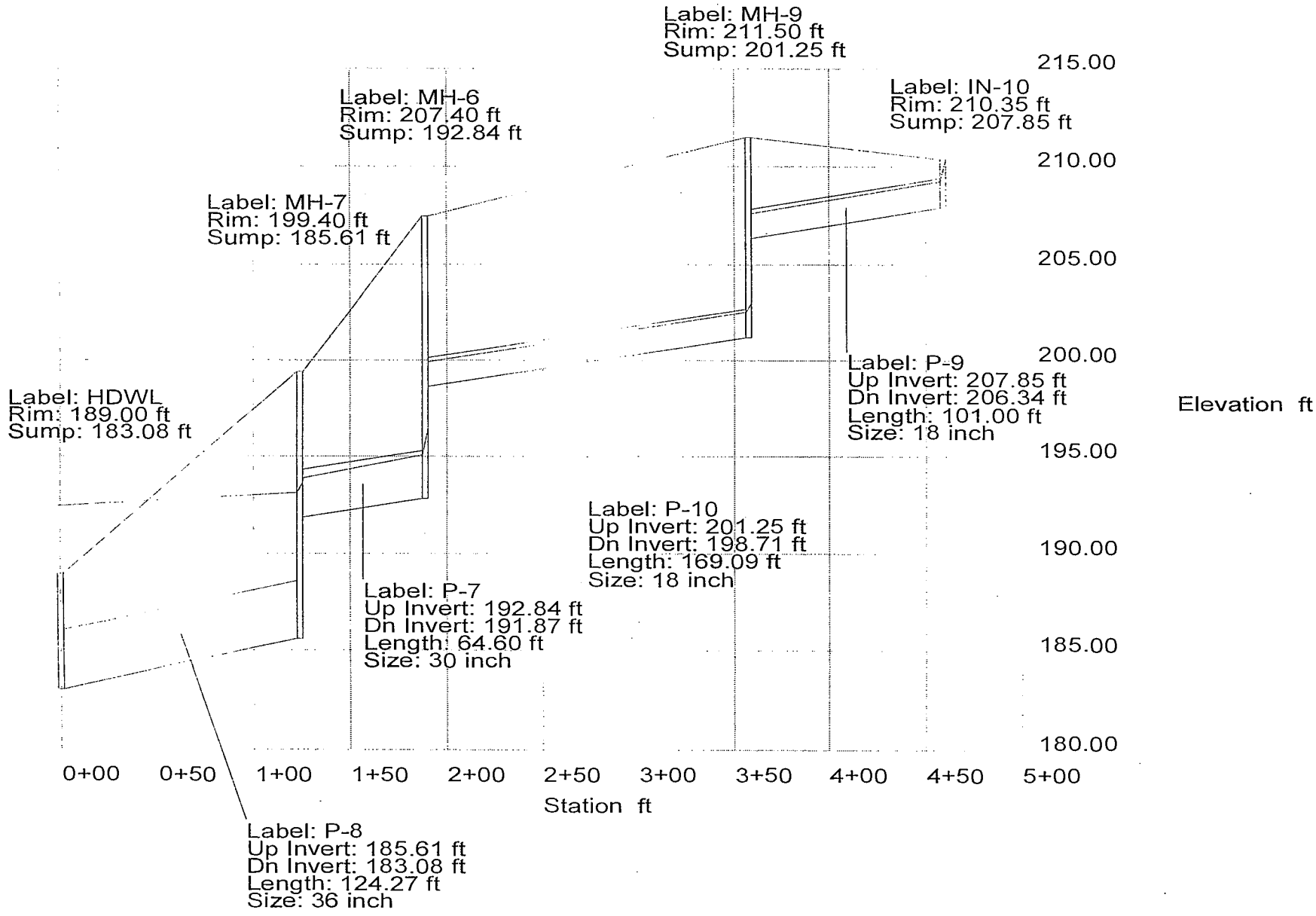

Label: MH-8
Rim: 196.10 ft
Sump: 191.35 ft
Label: MH-7
Rim: 199.40 ft
Sump: 185.61 ft
Label: IN-14
Rim: 195.60 ft
Sump: 192.10 ft
Label: HDWL
Rim: 189.00 ft
Sump: 183.08 ft
200.00
198.00
196.00
194.00
192.00
190.00
188.00
186.00
184.00
182.00
Elevation ft
0+00
0+50
1+00
1+50
2+00
2+50
Station ft
Label: P-13
Up Invert: 192.10 ft
Dn Invert: 191.85 ft
Length: 20.00 ft
Size: 18 inch
Label: P-8
Up Invert: 185.61 ft
Dn Invert: 183.08 ft
Length: 124.27 ft
Size: 36 inch
Label: P-12
Up Invert: 191.35 ft
Dn Invert: 190.48 ft
Length: 69.23 ft
Size: 18 inch

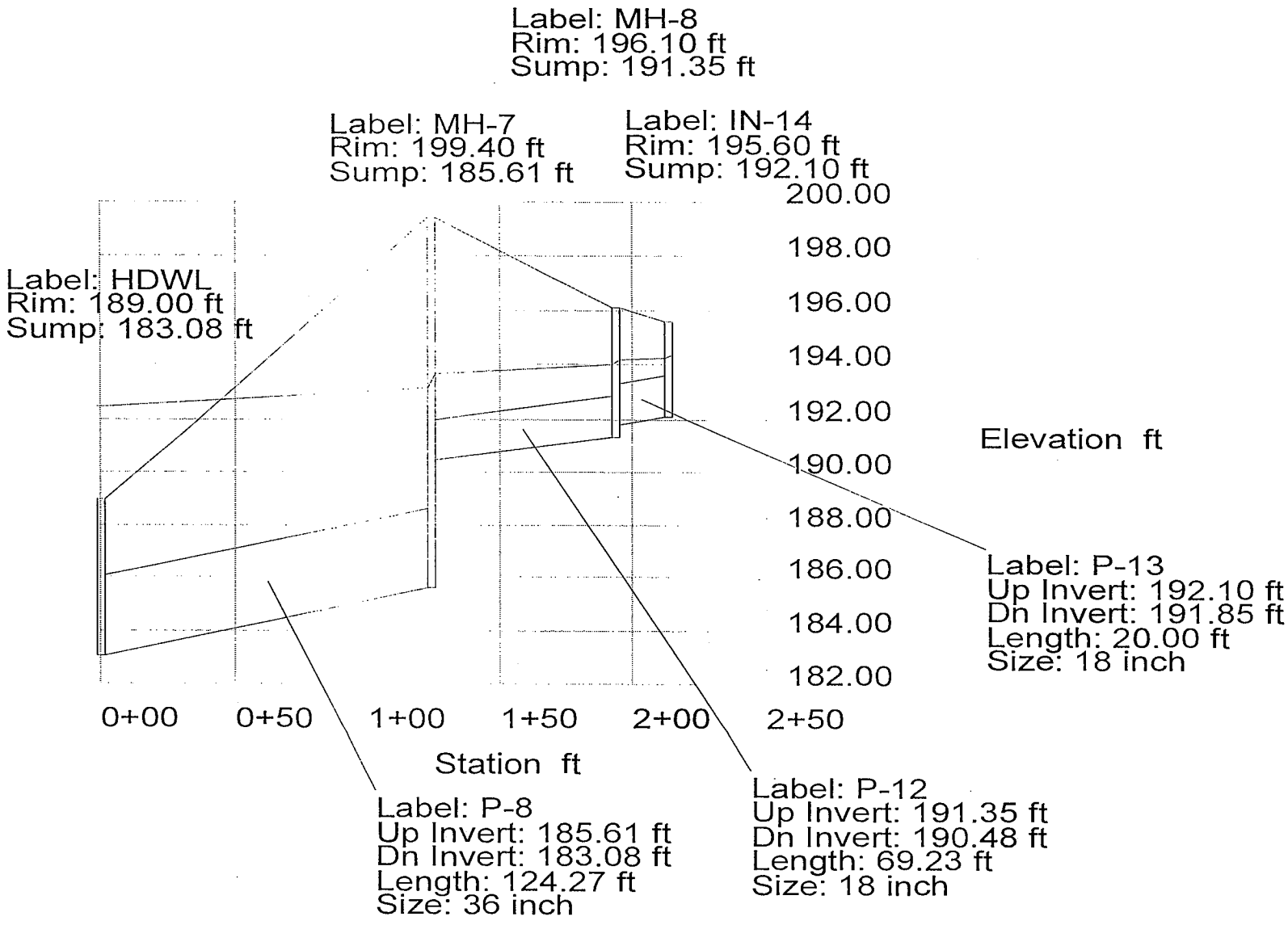

Label: MH-8
Rim: 196.10 ft
Sump: 191.35 ft
Label: MH-7
Rim: 199.40 ft
Sump: 185.61 ft
Label: IN-15
Rim: 195.60 ft
Sump: 192.10 ft
Label: HDWL
Rim: 189.00 ft
Sump: 183.08 ft
200.00
198.00
196.00
194.00
192.00
190.00
188.00
186.00
184.00
182.00
Elevation ft
0+00
0+50
1+00
1+50
2+00
2+50
Station ft
Label: P-11
Up Invert: 192.10 ft
Dn Invert: 191.85 ft
Length: 20.00 ft
Size: 18 inch
Label: P-8
Up Invert: 185.61 ft
Dn Invert: 183.08 ft
Length: 124.27 ft
Size: 36 inch
Label: P-12
Up Invert: 191.35 ft
Dn Invert: 190.48 ft
Length: 69.23 ft
Size: 18 inch

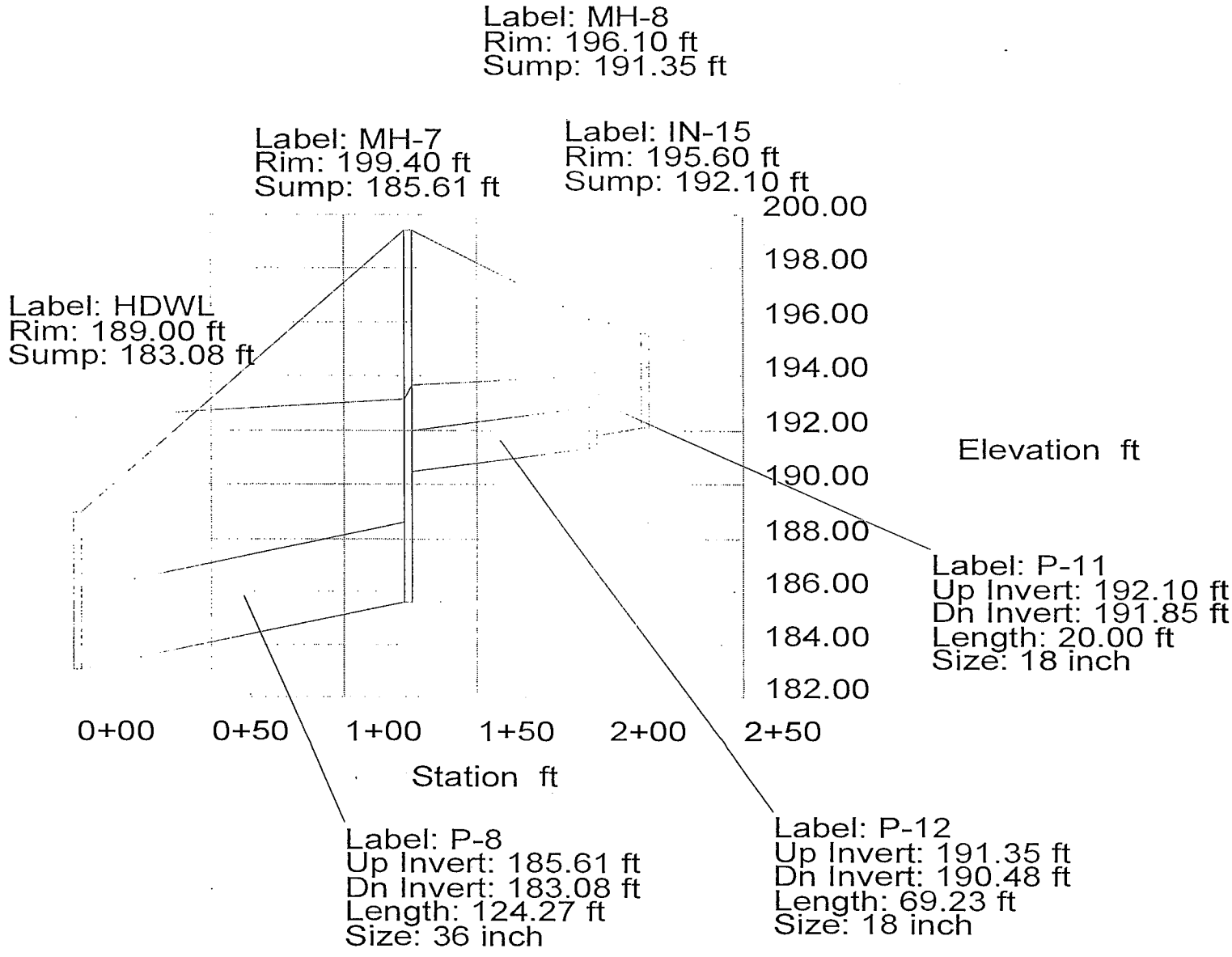
Castle Rock WM - Line C - Major

Pipe	-Node- Upstream Downstream	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-EGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-4	IN-11	1.51	204.77	203.37	203.66	0.003593	13.56	Circular	173.00	4.32	
	IN-12		204.73	202.74	203.03	0.012486	25.28	24 inch			
P-5	IN-12	3.15	204.73	201.27	202.45	0.014605	27.34	Circular	193.31	8.70	
	IN-13		205.61	198.45	199.63	0.012519	25.31	24 inch			
P-9	IN-10	1.44	210.35	209.20	210.12	0.014637	12.87	Circular	101.00	7.99	
	MH-9		211.50	207.57	208.64	0.014950	12.84	18 inch			
P-11	IN-15	0.45	195.60	194.25	194.34	0.001540	4.12	Circular	20.00	2.33	
	MH-8		196.10	194.22	194.31	0.012500	11.74	18 inch			
P-13	IN-14	0.53	195.60	194.25	194.33	0.001424	3.96	Circular	20.00	2.24	
	MH-8		196.10	194.22	194.30	0.012500	11.74	18 inch			
P-6	IN-13	4.38	205.61	197.01	198.16	0.010823	37.41	Circular	68.35	8.16	
	MH-6		207.40	196.50	197.42	0.012436	45.74	30 inch			
P-10	MH-9	1.44	211.50	202.59	203.50	0.014794	12.74	Circular	169.09	7.97	
	MH-6		207.40	199.93	201.00	0.015022	12.87	18 inch			
P-12	MH-8	0.99	196.10	194.01	194.28	0.004808	7.28	Circular	69.23	4.12	
	MH-7		199.40	193.68	193.94	0.012567	11.77	18 inch			
P-7	MH-6	5.83	207.40	195.13	196.84	0.013714	49.40	Circular	64.60	10.94	
	MH-7		199.40	193.93	195.95	0.015015	50.26	30 inch			
P-8	MH-7	6.81	199.40	193.15	193.91	0.005515	49.53	Circular	124.27	7.01	
	HDWL		189.00	192.46	193.22	0.020359	95.16	36 inch			


Label: MH-6
Rim: 207.40 ft
Sump: 192.84 ft
Label: IN-13
Rim: 205.61 ft
Sump: 194.94 ft
Label: IN-12
Rim: 204.73 ft
Sump: 197.86 ft
Label: IN-11
Rim: 204.77 ft
Sump: 200.27 ft
Label: MH-7
Rim: 199.40 ft
Sump: 185.61 ft
Label: HDWL
Rim: 189.00 ft
Sump: 183.08 ft
Label: P-6
Up Invert: 194.94 ft
Dn Invert: 194.09 ft
Length: 68.35 ft
Size: 30 inch
Label: P-5
Up Invert: 197.86 ft
Dn Invert: 195.44 ft
Length: 193.31 ft
Size: 24 inch
Label: P-4
Up Invert: 200.27 ft
Dn Invert: 198.11 ft
Length: 173.00 ft
Size: 24 inch
Label: P-7
Up Invert: 192.84 ft
Dn Invert: 191.87 ft
Length: 64.60 ft
Size: 30 inch
Label: P-8
Up Invert: 185.61 ft
Dn Invert: 183.08 ft
Length: 124.27 ft
Size: 36 inch
210.00
205.00
200.00
195.00
190.00
185.00
180.00
Elevation ft
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
Station ft


Label: MH-9
Rim: 211.50 ft
Sump: 201.25 ft
Label: MH-6
Rim: 207.40 ft
Sump: 192.84 ft
Label: IN-10
Rim: 210.35 ft
Sump: 207.85 ft
Label: MH-7
Rim: 199.40 ft
Sump: 185.61 ft
Label: HDWL
Rim: 189.00 ft
Sump: 183.08 ft
Label: P-9
Up Invert: 207.85 ft
Dn Invert: 206.34 ft
Length: 101.00 ft
Size: 18 inch
Label: P-10
Up Invert: 201.25 ft
Dn Invert: 198.71 ft
Length: 169.09 ft
Size: 18 inch
Label: P-7
Up Invert: 192.84 ft
Dn Invert: 191.87 ft
Length: 64.60 ft
Size: 30 inch
Label: P-8
Up Invert: 185.61 ft
Dn Invert: 183.08 ft
Length: 124.27 ft
Size: 36 inch
215.00
210.00
205.00
200.00
195.00
190.00
185.00
180.00
Elevation ft
0+00
0+50
1+00
1+50
2+00
2+50
3+00
3+50
4+00
4+50
5+00
Station ft


Label: MH-8
Rim: 196.10 ft
Sump: 191.35 ft
Label: MH-7
Rim: 199.40 ft
Sump: 185.61 ft
Label: IN-14
Rim: 195.60 ft
Sump: 192.10 ft
Label: HDWL
Rim: 189.00 ft
Sump: 183.08 ft
200.00
198.00
196.00
194.00
192.00
190.00
188.00
186.00
184.00
182.00
Elevation ft
0+00
0+50
1+00
1+50
2+00
2+50
Station ft
Label: P-13
Up Invert: 192.10 ft
Dn Invert: 191.85 ft
Length: 20.00 ft
Size: 18 inch
Label: P-8
Up Invert: 185.61 ft
Dn Invert: 183.08 ft
Length: 124.27 ft
Size: 36 inch
Label: P-12
Up Invert: 191.35 ft
Dn Invert: 190.48 ft
Length: 69.23 ft
Size: 18 inch


Label: MH-8
Rim: 196.10 ft
Sump: 191.35 ft
Label: MH-7
Rim: 199.40 ft
Sump: 185.61 ft
Label: IN-15
Rim: 195.60 ft
Sump: 192.10 ft
Label: HDWL
Rim: 189.00 ft
Sump: 183.08 ft
200.00
198.00
196.00
194.00
192.00
190.00
188.00
186.00
184.00
182.00
Elevation ft
0+00
0+50
1+00
1+50
2+00
2+50
Station ft
Label: P-11
Up Invert: 192.10 ft
Dn Invert: 191.85 ft
Length: 20.00 ft
Size: 18 inch
Label: P-8
Up Invert: 185.61 ft
Dn Invert: 183.08 ft
Length: 124.27 ft
Size: 36 inch
Label: P-12
Up Invert: 191.35 ft
Dn Invert: 190.48 ft
Length: 69.23 ft
Size: 18 inch

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

April 6, 1999
Castle Rock Wal Mart
Storm Line C
5-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	24.8
Channel Bottom Slope (feet per foot)	0.0200
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	3.00

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	1.05
Flow Velocity (feet per second)	11.25
Froude Number (Flow is Super-Critical)	2.257
Velocity Head (feet)	1.97
Energy Head (feet)	3.02
Cross-Sectional Area of Flow (square feet)	2.21
Top Width of Flow (feet)	2.86

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
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CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

April 6, 1999
Castle Rock Wal Mart
Storm Line C
100-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	50.4
Channel Bottom Slope (feet per foot)	0.0200
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	3.00

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	1.56
Flow Velocity (feet per second)	13.57
Froude Number (Flow is Super-Critical)	2.149
Velocity Head (feet)	2.86
Energy Head (feet)	4.42
Cross-Sectional Area of Flow (square feet)	3.71
Top Width of Flow (feet)	3.00

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
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CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

December 15, 1998
Castle Rock Wal Mart
Storm Line D
5-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	14.2
Channel Bottom Slope (feet per foot)	0.0050
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	2.50

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	1.23
Flow Velocity (feet per second)	5.87
Froude Number (Flow is Super-Critical)	1.052
Velocity Head (feet)	0.53
Energy Head (feet)	1.77
Cross-Sectional Area of Flow (square feet)	2.41
Top Width of Flow (feet)	2.50

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
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CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

December 15, 1998
Castle Rock Wal Mart
Storm Line D
100-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	26.6
Channel Bottom Slope (feet per foot)	0.0050
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	2.50

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	1.88
Flow Velocity (feet per second)	6.72
Froude Number (Flow is Sub-Critical)	0.874
Velocity Head (feet)	0.70
Energy Head (feet)	2.58
Cross-Sectional Area of Flow (square feet)	3.96
Top Width of Flow (feet)	2.16

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
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CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

December 15, 1998
Castle Rock Wal Mart
Storm Line E
10-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	7.9
Channel Bottom Slope (feet per foot)	0.0333
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	2.00

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	0.59
Flow Velocity (feet per second)	10.13
Froude Number (Flow is Super-Critical)	2.734
Velocity Head (feet)	1.59
Energy Head (feet)	2.18
Cross-Sectional Area of Flow (square feet)	0.78
Top Width of Flow (feet)	1.83

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

December 15, 1998
Castle Rock Wal Mart
Storm Line E
100-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	26.3
Channel Bottom Slope (feet per foot)	0.0333
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	2.00

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	1.16
Flow Velocity (feet per second)	13.93
Froude Number (Flow is Super-Critical)	2.511
Velocity Head (feet)	3.01
Energy Head (feet)	4.17
Cross-Sectional Area of Flow (square feet)	1.89
Top Width of Flow (feet)	1.97

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
RATING CURVE COMPUTATION

December 15, 1998
Castle Rock Wal Mart
Storm Line F
24" Section Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Channel Bottom Slope (feet per foot)	0.0150
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	2.00

==========

PROGRAM RESULTS:

Depth (ft)	Flow Rate (cfs)	Velocity (fps)	Froude Number	Velocity Head(ft)	Energy Head(ft)	Flow Area (sq ft)	Top Width (ft)
0.2	0.6	3.54	1.689	0.194	0.394	0.16	1.20
0.4	2.4	5.42	1.808	0.457	0.857	0.45	1.60
0.6	5.4	6.84	1.834	0.728	1.328	0.79	1.83
0.8	9.3	7.96	1.812	0.983	1.783	1.17	1.96
1.0	13.9	8.82	1.754	1.208	2.208	1.57	2.00
1.2	18.6	9.46	1.663	1.389	2.589	1.97	1.96
1.4	23.2	9.88	1.537	1.514	2.914	2.35	1.83
1.6	27.1	10.05	1.365	1.569	3.169	2.69	1.60
1.8	29.5	9.92	1.109	1.527	3.327	2.98	1.20
2.0	28.5	9.09	0.480	1.283	3.273	3.14	0.28

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
RATING CURVE COMPUTATION

December 15, 1998
Castle Rock Wal Mart
Storm Line F
30" Section Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Channel Bottom Slope (feet per foot).....	0.0250
Manning`s Roughness Coefficient (n-value).....	0.0130
Channel Diameter (feet).....	2.50

==========

PROGRAM RESULTS:

Depth (ft)	Flow Rate (cfs)	Velocity (fps)	Froude Number	Velocity Head(ft)	Energy Head(ft)	Flow Area (sq ft)	Top Width (ft)
0.2	0.8	4.60	2.200	0.328	0.528	0.18	1.36
0.4	3.6	7.10	2.380	0.783	1.183	0.51	1.83
0.6	8.2	9.04	2.447	1.270	1.870	0.91	2.14
0.8	14.4	10.62	2.456	1.751	2.551	1.35	2.33
1.0	21.9	11.92	2.428	2.206	3.206	1.83	2.45
1.2	30.2	12.98	2.369	2.617	3.817	2.33	2.50
1.4	39.1	13.83	2.282	2.968	4.368	2.83	2.48
1.6	48.0	14.46	2.167	3.247	4.847	3.32	2.40
1.8	56.3	14.88	2.020	3.437	5.237	3.78	2.24
2.0	63.4	15.06	1.829	3.521	5.521	4.21	2.00
2.2	68.4	14.94	1.569	3.468	5.668	4.58	1.62
2.4	69.5	14.35	1.137	3.196	5.596	4.84	0.98
2.5	66.6	13.58	0.607	2.862	5.352	4.91	0.32

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

December 15, 1998
Castle Rock Wal Mart
Storm Line G
5-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	107.6
Channel Bottom Slope (feet per foot)	0.0645
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	4.50

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	1.42
Flow Velocity (feet per second)	25.05
Froude Number (Flow is Super-Critical)	4.356
Velocity Head (feet)	9.74
Energy Head (feet)	11.16
Cross-Sectional Area of Flow (square feet)	4.29
Top Width of Flow (feet)	4.18

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

December 15, 1998
Castle Rock Wal Mart
Storm Line G
100-Year Analysis

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	245.3
Channel Bottom Slope (feet per foot)	0.0645
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	4.50

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	2.23
Flow Velocity (feet per second)	31.28
Froude Number (Flow is Super-Critical)	4.175
Velocity Head (feet)	15.19
Energy Head (feet)	17.42
Cross-Sectional Area of Flow (square feet)	7.84
Top Width of Flow (feet)	4.50

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

March 22, 1999
Castle Rock Wal Mart
Storm Line G
100-Year Analysis (OS-1 Diverted)

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second)	148.1
Channel Bottom Slope (feet per foot)	0.0645
Manning`s Roughness Coefficient (n-value)	0.0130
Channel Diameter (feet)	4.50

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet)	1.68
Flow Velocity (feet per second)	27.28
Froude Number (Flow is Super-Critical)	4.306
Velocity Head (feet)	11.56
Energy Head (feet)	13.24
Cross-Sectional Area of Flow (square feet)	5.43
Top Width of Flow (feet)	4.35

==========

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A complete program manual is available.

Appendix D - Detention Pond Analysis

Lot 3 Detention Facility

Required Detention Volume Date: 11/18/98

Job Name: Milestone Filing No. 4

Job Number: 97.211

Minimum Required Detention Volume

Contributing basin imperviousness (%) = 89.84

Developed tributary area (ac)= 26.28

V= KA (Equation 1404)

K (100) = 0.140 (Equation 1405)

V (100) = 3.685 Ac-Ft

= 160,505 Cubic Feet

K (10) = 0.083 (Equation 1406)

V (10) = 2.193 Ac-Ft

= 95,525 Cubic Feet

Water Quality Capture Volume

Required Storage (inches) = IA/2400 Section 15.3.1.1

WQCV = 42,851 Cubic Feet

Maximum Allowable Release Rate

	Maximum Release (cfs)	
10-year	7.88	(0.3 cfs/Ac)
100-year	26.28	(1.0 cfs/Ac)

Lot 3 Detention Facility

Detention Volume Provided
Job Name: Milestone Filing No. 4
Job Number: 97.211

Date: 11/18/98
by: J Tompkins

		Volume	Cummulative Volume
6178.0	0		
		311	311
6179.0	621		
		1,771	2,082
6180.0	2,921		
		3,898	5,979
6181.0	4,874		
		6,187	12,166
6182.0	7,500		
		8,180	20,346
6183.0	8,860		
		9,577	29,923
6184.0	10,294		
		11,039	40,962
6185.0	11,783		
		12,328	53,289
6186.0	12,872		
		13,423	66,712
6187.0	13,974		
		14,537	81,249
6188.0	15,099		
		15,675	96,923
6189.0	16,250		
		16,839	113,762
6190.0	17,427		
		18,029	131,791
6191.0	18,631		
		19,247	151,038
6192.0	19,863		
		20,491	171,529
6193.0	21,119		
		Freeboard	
6194.0	22,317		

Flow Allowances
From Douglas County Storm Drainage Design and Technical Criteria.

Water Quality Volume =	42,851	C.F.
10-Year Allowable Release =	7.88	cfs
10-Year Storage Volume =	95,525	C.F.
100-yr Allowable Release =	26.28	cfs
100-yr Storage Volume =	160,505	C.F.

Required Volume / Water surface elevations

	Volume (cubic feet)	For Design	Water Surface Elevation
WQCV =	42,851	42,851	6185.17
10-year =	95,525	138,375	6191.34
100-year =	160,505	160,505	6192.46

Lot 3 Detention Facility

Orifice Sizing
Job Name: Milestone Filing No. 4
Job Number: 97.211

Date: 11/18/98
by: J Tompkins

10-YEAR ORIFICE SIZE[1]

WSEL =	6191.34		
Flowline Elev =	6185.17		
Allowable Discharge =	7.88		
Test Diameter =	0.9152	Q^2 =	62.0944
CHECK	62.0970		

10.98 INCHES

[1]Orifice equation: $Q=C_dA(2gh)^{0.5}$

100-YEAR RESTRICTOR PLATE[2]

Water Surface	=	6192.46
Invert of Pipe	=	6178.00
Allowable Discharge	=	26.28
Pipe dia (in.)	=	24

[2]Trial and error determination:

h (in)	alpha (rad)	Area (sf)	Head (ft)	Q (cfs)	a-sinacosa
11.000	1.65	1.40	13.93	25.24	1.7373
11.900	1.58	1.55	13.89	27.89	1.5875
11.500	1.61	1.49	13.91	26.71	1.6541
11.400	1.62	1.47	13.91	26.41	1.6708
11.300	1.63	1.45	13.92	26.12	1.6874
11.350	1.62	1.46	13.91	26.27	1.6791
11.353	1.62	1.46	13.91	26.28	1.6786

Lot 3 Detention Facility

Weir Capacities
Job Name: Milestone Filing No. 4
Job Number: 97.211

Date: 07/17/98
by: J Tompkins

Outlet Weir Capacity

WSEL =	6192.50
Flowline Elev =	6191.34
Required Discharge =	26.28
Weir Length =	16.00
Weir Coefficient =	3.00
Discharge Capacity[1] =	59.97

[1]Weir Equation = $CLH^{1.5}$

Appendix E - Interim Pond Analysis

Interim Lot 3 Detention Facility

Required Detention Volume Date: 11/18/98
Job Name: Milestone Filing No. 4
Job Number: 97.211

Minimum Required Detention Volume

Contributing basin imperviousness (%) = 78.69
Developed[1] tributary area (ac)= 8.32

V= KA (Equation 1404)

K (100) = 0.124 (Equation 1405)

V (100) = 1.033 Ac-Ft
= 44,985 Cubic Feet

K (10) = 0.073 (Equation 1406)

V (10) = 0.606 Ac-Ft
= 26,404 Cubic Feet

[1]Developed Interim Basins ==> M, N, P, Q, R, & S

Water Qualiity Capture Volume

Required Storage (inches) = IA/2400 Section 15.3.1.1

WQCV = 11,883 Cubic Feet

Maximum Allowable Release Rate

	Maximum Release (cfs)	
10-year	2.50	(0.3 cfs/Ac)
100-year	8.32	(1.0 cfs/Ac)

Interim Lot 3 Detention Facility

Detention Volume Provided
Job Name: Milestone Filing No. 4
Job Number: 97.211

Date: 11/18/98
by: J Tompkins

		Volume	Cummulative Volume
6178.0	0		
		140	140
6179.0	279		
		723	723
6180.0	1,166		
		1,790	2,512
6181.0	2,413		
		3,168	5,680
6182.0	3,923		
		4,670	10,350
6183.0	5,416		
		6,058	16,408
6184.0	6,700		
		7,381	23,788
6185.0	8,061		
		8,771	32,559
6186.0	9,481		
		10,216	42,775
6187.0	10,950		
		11,714	54,489
6188.0	12,478		
		13,272	67,761
6189.0	14,066		
		14,889	82,650
6190.0	15,712		
		16,565	99,214
6191.0	17,417		
		18,299	117,513
6192.0	19,181		
		20,093	137,606
6193.0	21,005		
		Freeboard	
6194.0	18,126		

Flow Allowances
From Douglas County Storm Drainage Design and Technical Criteria.

Water Quality Volume =	11,883	C.F.
10-Year Allowable Release =	2.50	cfs
10-Year Storage Volume =	26,404	C.F.
100-yr Allowable Release =	8.32	cfs
100-yr Storage Volume =	44,985	C.F.

Required Volume / Water surface elevations

	Volume (cubic feet)	For Design	Water Surface Elevation
WQCV =	11,883	11,883	6183.25
10-year =	26,404	38,287	6186.56
100-year =	44,985	44,985	6187.19

Interim Lot 3 Detention Facility

Orifice Sizing
Job Name: Milestone Filing No. 4
Job Number: 97.211

Date: 11/18/98
by: J Tompkins

10-YEAR ORIFICE SIZE[1]

WSEL =	6186.56
Flowline Elev =	6178.00
Allowable Discharge =	2.5
Test Diameter =	0.4630
CHECK	6.2525

Q^2 = 6.25

5.56 INCHES

[1]Orifice equation: $Q=C_dA(2gh)^{0.5}$

100-YEAR RESTRICTOR PLATE[2]

Water Surface =	6191.65
Invert of Pipe =	6178.00
Allowable Discharge =	8.32
Pipe dia (in.) =	24

[2]Trial and error determination:

h (in)	alpha (rad)	Area (sf)	Head (ft)	Q (cfs)	a-sinacosa
5.000	1.11	0.40	8.75	5.71	0.712106
6.000	1.23	0.52	8.71	7.33	0.916690
7.000	1.35	0.64	8.66	9.01	1.130037
6.500	1.29	0.58	8.68	8.16	1.022470
6.600	1.30	0.59	8.68	8.33	1.043853

Interim Lot 3 Detention Facility

Weir Capacities
Job Name: Milestone Filing No. 4
Job Number: 97.211

Date: 07/17/98
by: J Tompkins

Outlet Weir Capacity

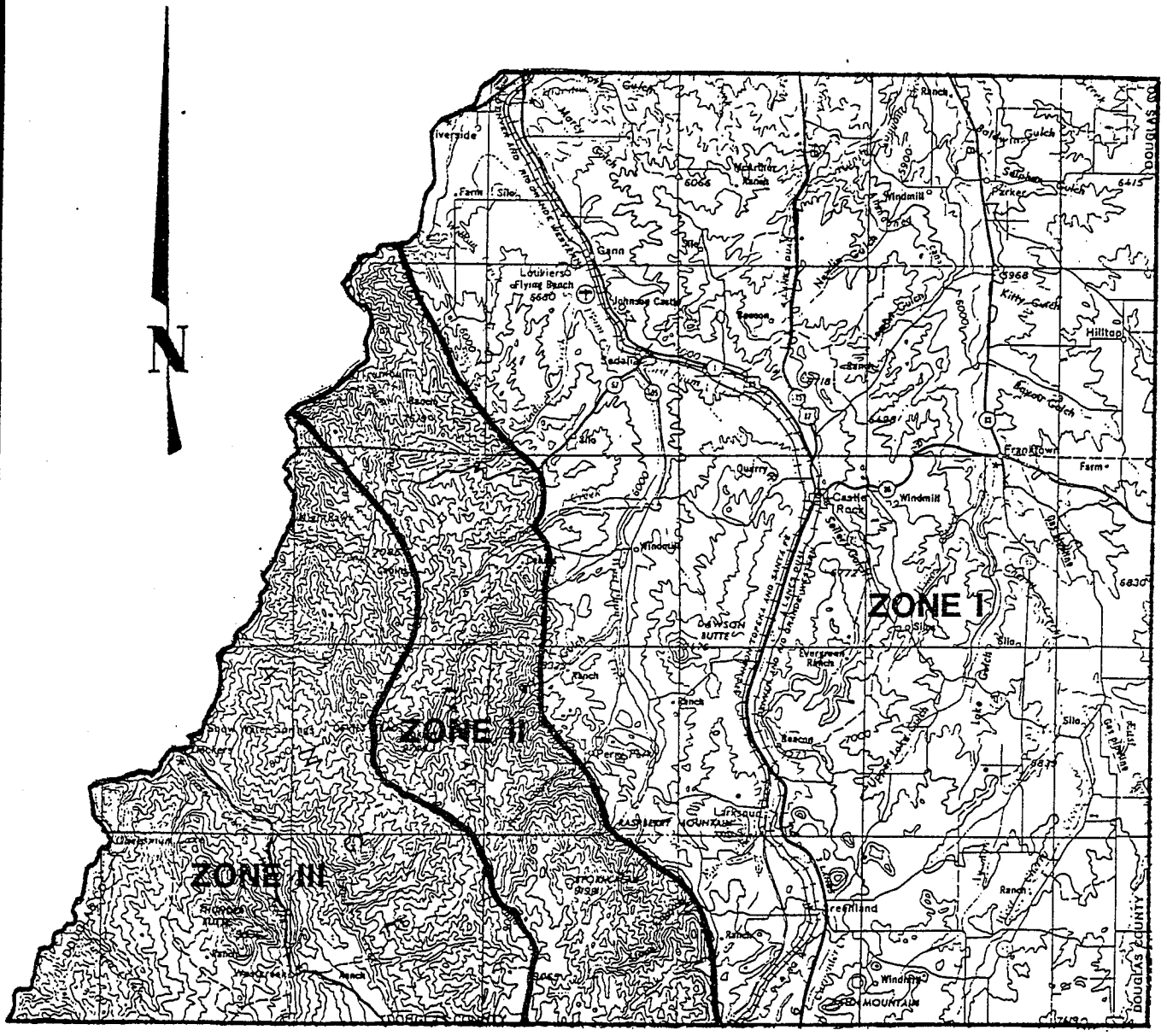
WSEL =	6191.65
Flowline Elev =	6191.34
Required Discharge =	8.32
Weir Length =	16.00
Weir Coefficient =	3.00
Discharge Capacity[1] =	8.28

[1]Weir Equation = $CLH^{1.5}$

Appendix F - Reference Materials

STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA

FIGURE 501



RAINFALL ZONES

Date: NOV 1984
Rev:

REFERENCE: WRC TM-1, 5-24-84

DCSDDTC

TIME - INTENSITY - FREQUENCY TABULATION

DURATION →	5 MIN		10 MIN		15 MIN		30 MIN		60 MIN	
DURATION FACTORS →	0.29		0.45		0.57		0.79		1.00	
ZONE	FREQ.	DEPTH (IN)	INTEN. (IN/HR)	DEPTH (IN)	INTEN. (IN/HR)	DEPTH (IN)	INTEN. (IN/HR)	DEPTH (IN)	INTEN. (IN/HR)	DEPTH (IN)	INTEN. (IN/HR)
I	2-YR	0.31	3.72	0.48	2.88	0.60	2.40	0.84	1.68	1.06	1.06
	5-YR	0.41	4.92	0.64	3.84	0.82	3.28	1.13	2.26	1.43	1.43
	10-YR	0.48	5.76	0.75	4.50	0.95	3.80	1.31	2.62	1.66	1.66
	50-YR	0.66	7.92	1.02	6.12	1.29	5.16	1.79	3.58	2.26	2.26
	100-YR	0.75	9.05	1.17	7.02	1.48	5.93	2.05	4.11	2.60	2.60
II	2-YR	0.28	3.36	0.44	2.64	0.56	2.24	0.77	1.54	0.98	0.98
	5-YR	0.38	4.56	0.59	3.54	0.75	3.00	1.04	2.08	1.32	1.32
	10-YR	0.44	5.28	0.69	4.14	0.87	3.48	1.21	2.42	1.53	1.53
	50-YR	0.60	7.20	0.93	5.58	1.18	4.72	1.64	3.28	2.07	2.07
	100-YR	0.68	8.16	1.05	6.30	1.33	5.32	1.85	3.70	2.34	2.34
III	2-YR	0.21	2.52	0.32	1.92	0.41	1.64	0.57	1.14	0.72	0.72
	5-YR	0.30	3.60	0.47	2.82	0.60	2.40	0.83	1.66	1.05	1.05
	10-YR	0.37	4.44	0.57	3.42	0.72	2.88	1.00	2.00	1.26	1.26
	50-YR	0.52	6.24	0.80	4.80	1.01	4.04	1.41	2.82	1.78	1.78
	100-YR	0.59	7.08	0.92	5.52	1.17	4.68	1.62	3.24	2.05	2.05

NOTE: Depth at each duration = one hour rainfall depth x respective duration factor

TABLE 3-1 (42)

RECOMMENDED RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	FREQUENCY 2	5	10	100
Business:					
Commercial Areas	95	.87	.87	.88	.89
Neighborhood Areas	70	.60	.65	.70	.80
Residential:					
Single-Family	*	.40	.45	.50	.60
Multi-Unit (detached)	50	.45	.50	.60	.70
Multi-Unit (attached)	70	.60	.65	.70	.80
1/2 Acre Lot or Larger	*	.30	.35	.40	.60
Apartments	70	.65	.70	.70	.80
Industrial:					
Light Areas	80	.71	.72	.76	.82
Heavy Acres	90	.80	.80	.85	.90
Parks, Cemetaries:	7	.10	.18	.25	.45
Playgrounds:	13	.15	.20	.30	.50
Schools:	50	.45	.50	.60	.70
Railroad Yard Areas	20	.20	.25	.35	.45
Undeveloped Areas:					
Historic Flow Analysis- Greenbelts, Agricultural	2	(See "Lawns")			
Offsite Flow Analysis (when land use not defined)	45	.43	.47	.55	.65
Streets:					
Paved	100	.87	.88	.90	.93
Gravel (Packed)	40	.40	.45	.50	.60
Drive and Walks:	96	.87	.87	.88	.89
Roofs:	90	.80	.85	.90	.90
Lawns, Sandy Soil	0	.00	.01	.05	.20
Lawns, Clayey Soil	0	.05	.15	.25	.50

NOTE: These Rational Formula coefficients may not be valid for large basins.

*See Figure 2-1 for percent impervious.

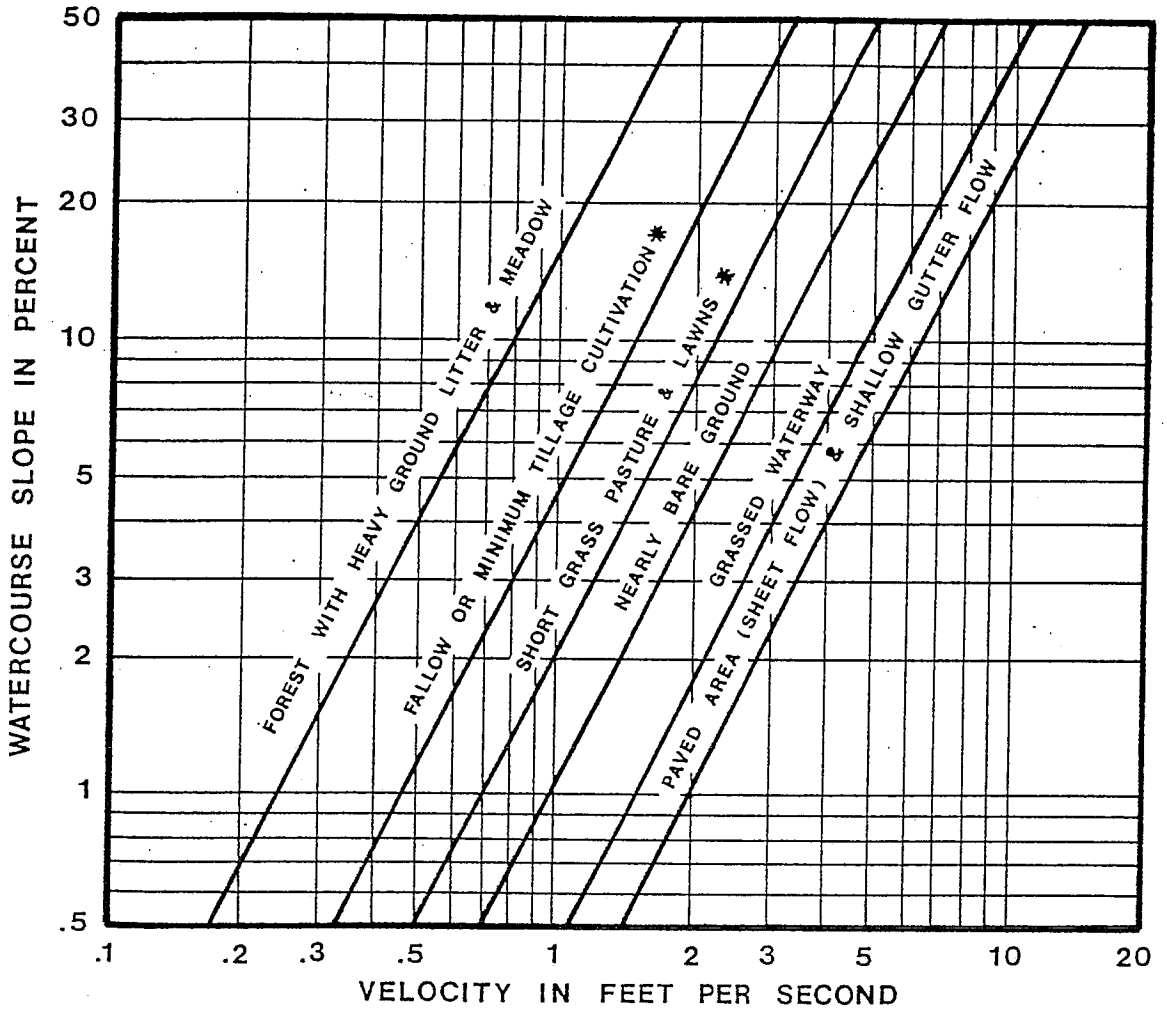


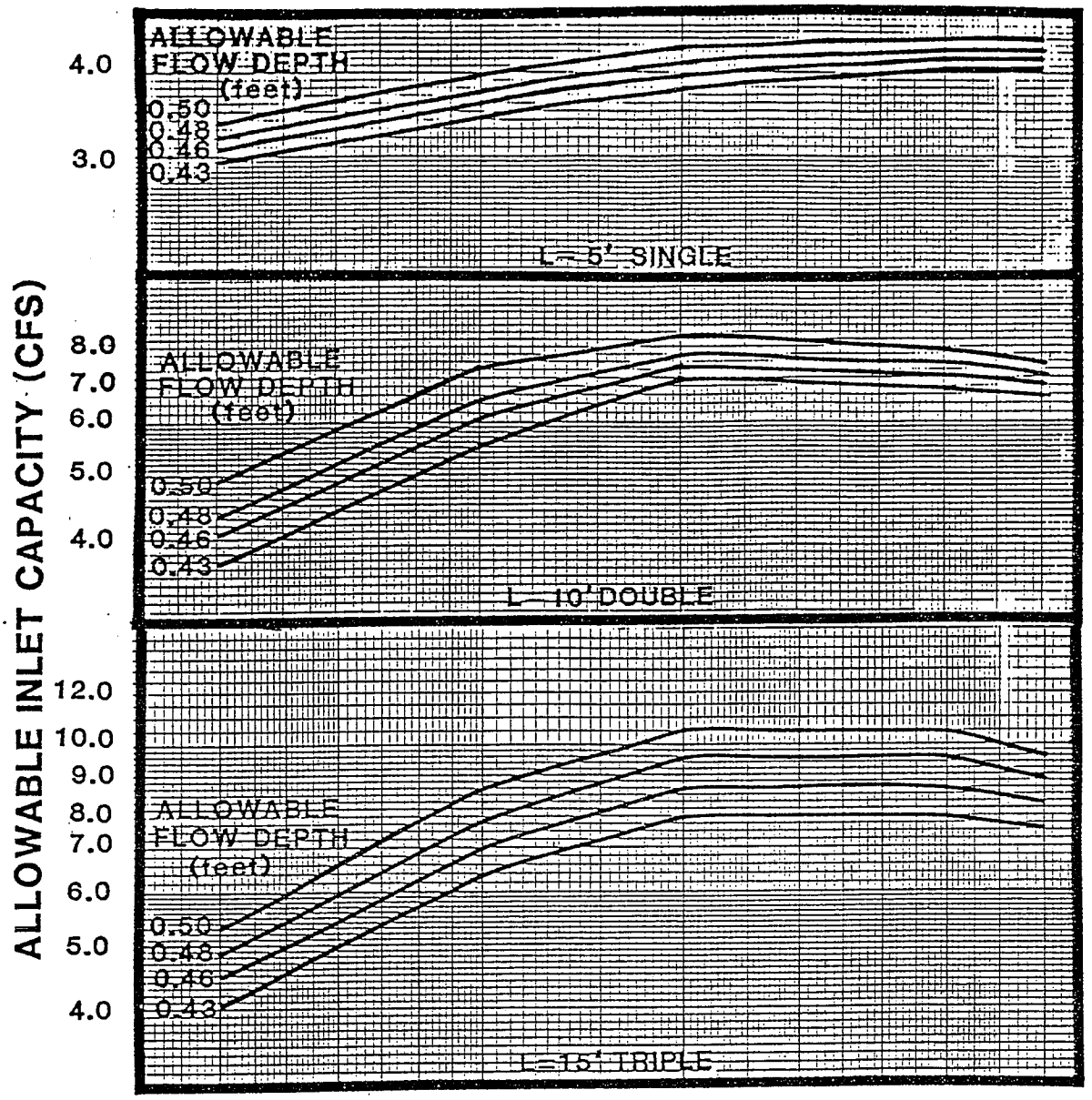
FIGURE 3-2. ESTIMATE OF AVERAGE FLOW VELOCITY FOR USE WITH THE RATIONAL FORMULA.

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

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

ALLOWABLE INLET CAPACITY

TYPE - R CURB OPENING ON A CONTINUOUS GRADE



NOTES:

1. Maximum inlet capacity at maximum allowable flow depth. Proportionally reduce for other depths.
2. Allowable Capacity =
   88% (L = 5')
   92% (L = 10')
   95% (L = 15')
   } of Theoretical Capacity
3. Interpolate for other inlet lengths.

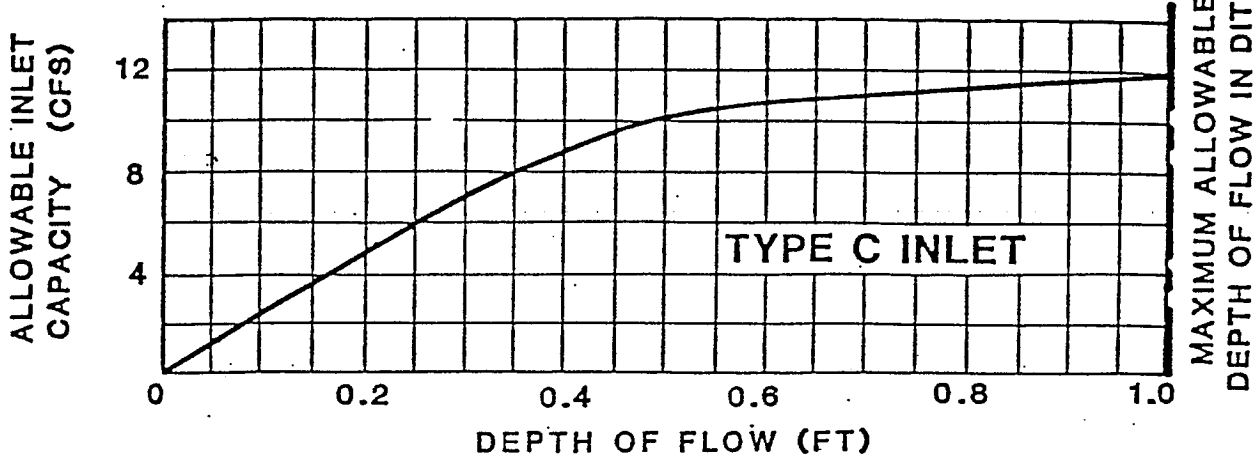
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Rev:

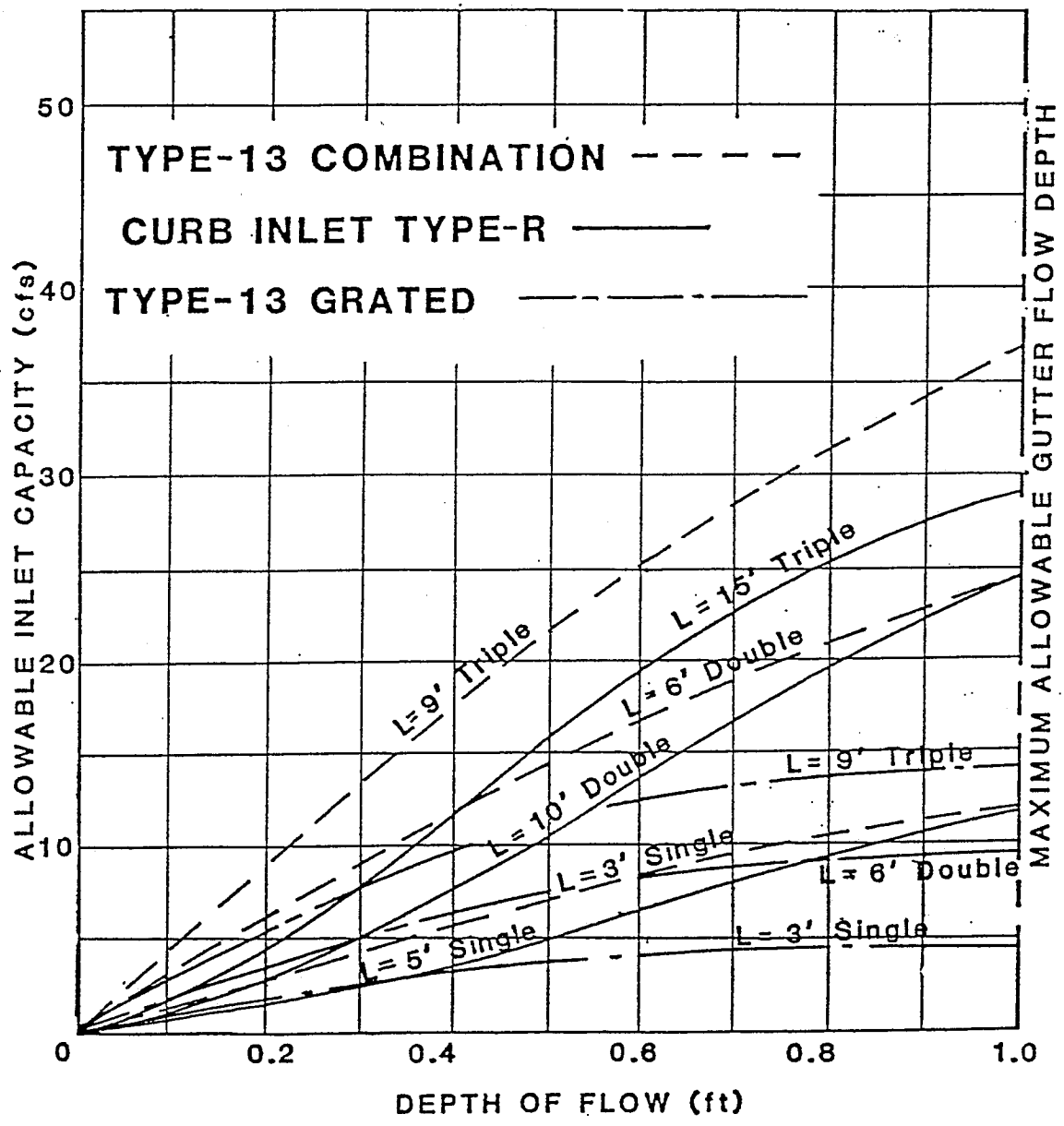
REFERENCE: WRC ENGINEERING, INC., TM-2 AUG. 1984

STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA | FIGURE 903

ALLOWABLE INLET CAPACITY

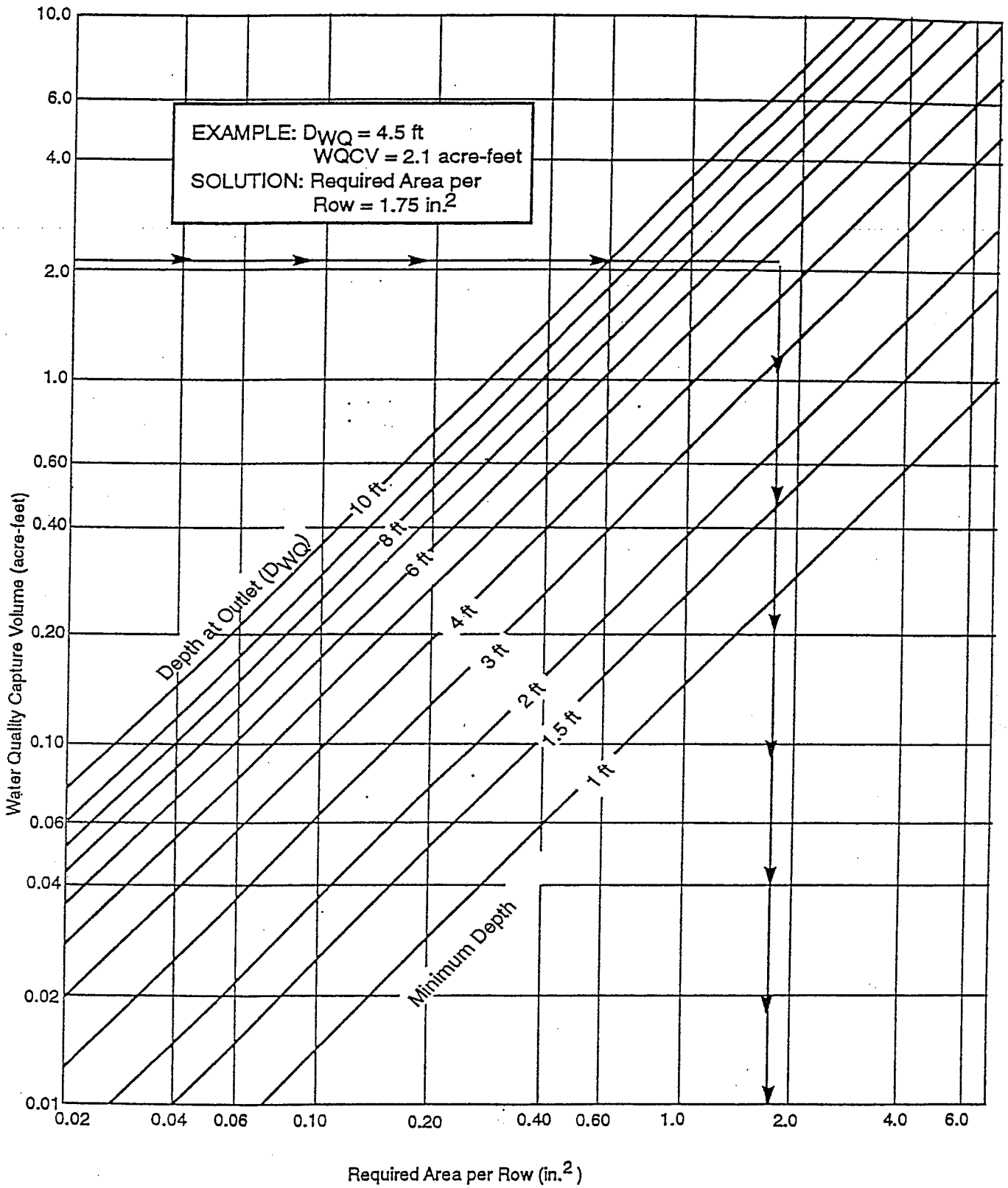
SUMP CONDITIONS - ALL INLETS





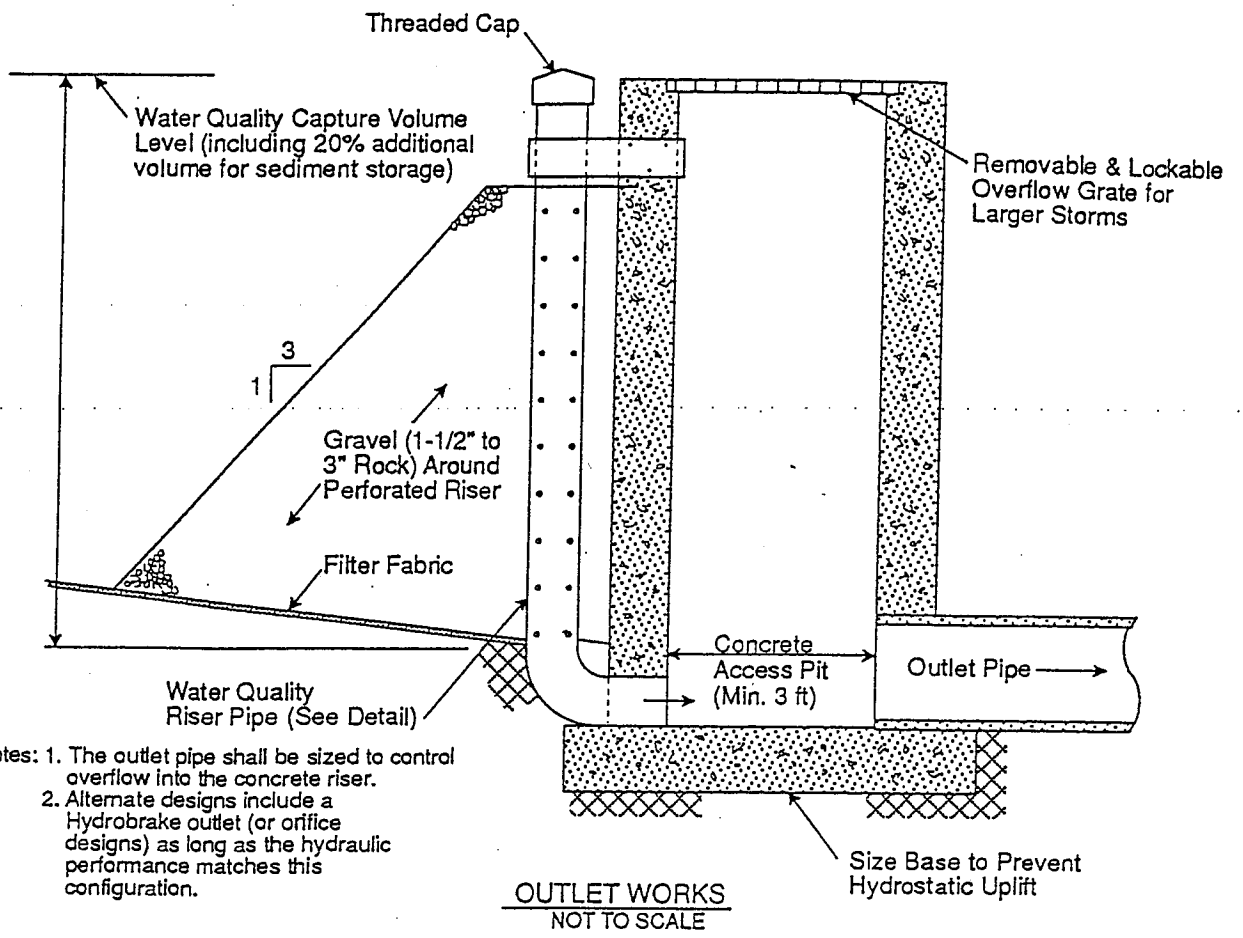
Date: NOV 1984
Rev: JULY 1985

REFERENCE:
WRC ENGINEERING, INC., TM-2 AUG. 1984



Source: *Douglas County Storm Drainage and Technical Criteria*, 1986.

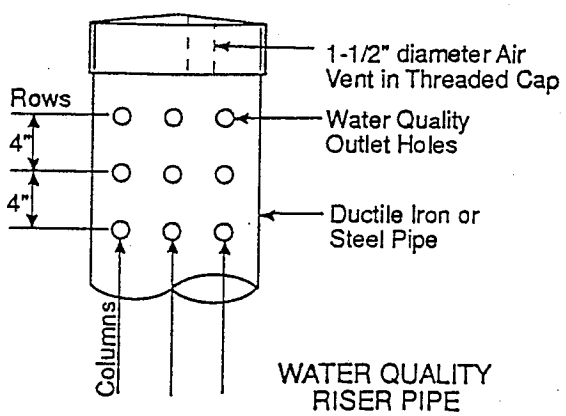
FIGURE 5-3. WATER QUALITY OUTLET SIZING: DRY EXTENDED DETENTION BASIN WITH A 40-HOUR DRAIN TIME OF THE CAPTURE VOLUME



Notes: 1. The outlet pipe shall be sized to control overflow into the concrete riser.
2. Alternate designs include a Hydrobrake outlet (or orifice designs) as long as the hydraulic performance matches this configuration.

OUTLET WORKS
NOT TO SCALE

Notes: 1. Minimum number of holes = 8
2. Minimum hole diameter = 1/8" dia.



WATER QUALITY RISER PIPE
NOT TO SCALE

Maximum Number of Perforated Columns				
Riser Diameter (in.)	Hole Diameter, in.			
	1/4"	1/2"	3/4"	1"
4	8	8	--	--
6	12	12	9	--
8	16	16	12	8
10	20	20	14	10
12	24	24	18	12

Hole Diameter (in.)	Area of Hole (in.^{2})
1/8	0.013
1/4	0.049
3/8	0.110
1/2	0.196
5/8	0.307
3/4	0.442
7/8	0.601
1	0.785

FIGURE 5-2. WATER QUALITY OUTLET FOR A DRY EXTENDED DETENTION BASIN

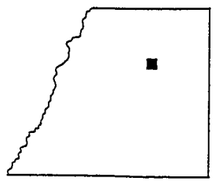
Appendix G - Soil Survey Excerpt
FIRM Map Excerpt

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY,
COLORADO
(UNINCORPORATED AREAS)

PANEL 186 OF 500
(SEE MAP INDEX FOR PANELS NOT PRINTED)



PANEL LOCATION

COMMUNITY-PANEL NUMBER
080049 0186 C

MAP REVISED:
SEPTEMBER 30, 1987

Federal Emergency Management Agency

DOUGLAS COUNTY
TOWN OF CASTLE ROCK

26

25

N

APPROXIMATE SCALE IN FEET
500 0 500

TOWN OF CASTLE ROCK

ROAD

SITE

26

ZONE A

ZONE X

Tributary D

DETENTION DEDICATION

TOWN OF CASTLE ROCK

AREA AFFECTED BY CLOMR CASE NO. 98-08-061R

ZONE X

6064

AQ

ZONE X

43

SOUTH

Tributary D

6069

34

AR

TOWN OF CASTLE ROCK
DOUGLAS COUNTY

LIMIT OF STUDY

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

TOWN OF
CASTLE ROCK,
COLORADO
DOUGLAS COUNTY

PANEL 188 OF 500
(SEE MAP INDEX FOR PANELS NOT PRINTED)



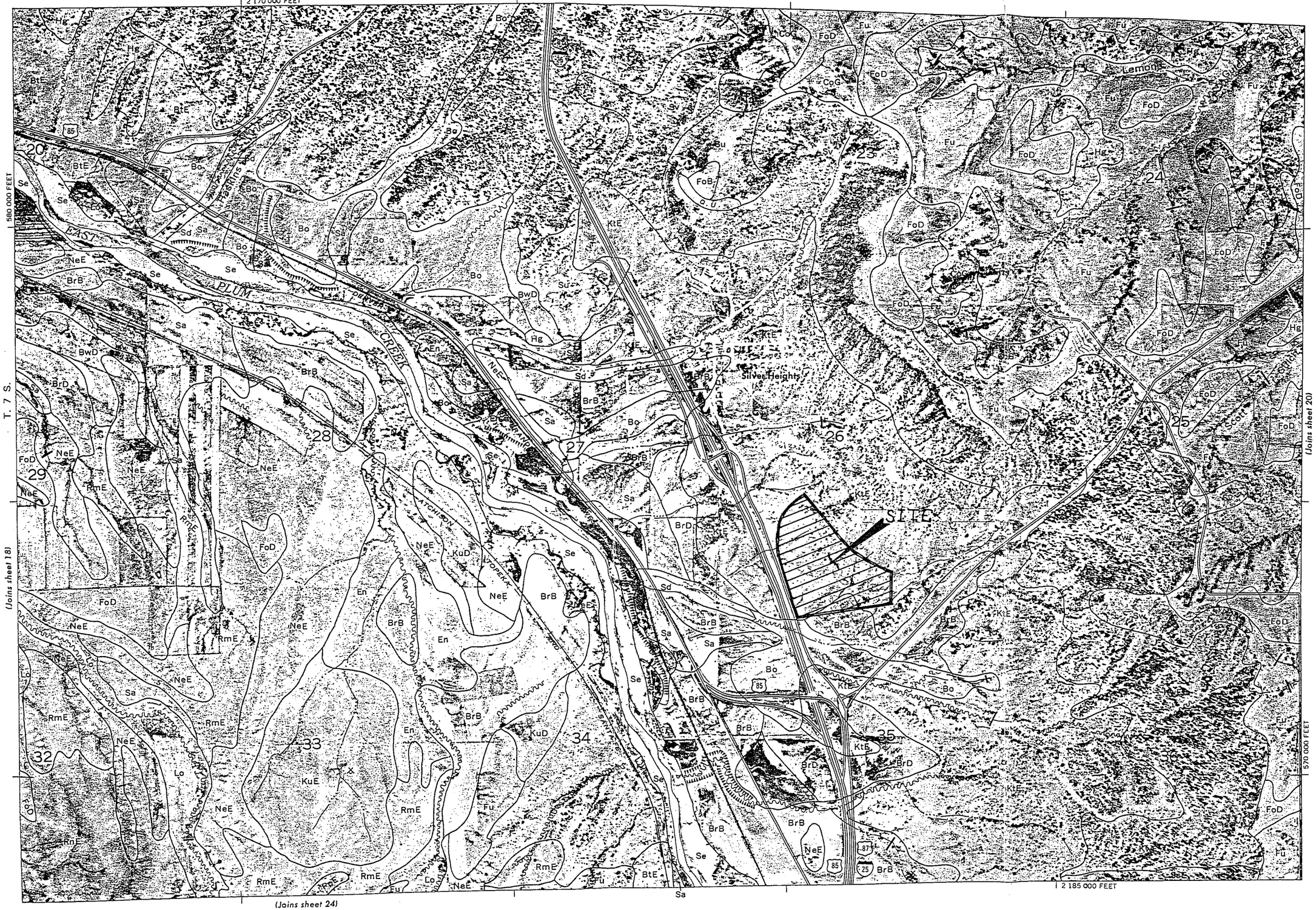
PANEL LOCATION

COMMUNITY-PANEL NUMBER
080050 0188 C

MAP REVISED:
SEPTEMBER 30, 1987

Federal Emergency Management Agency

CASTLE ROCK AREA, COLORADO — SHEET NUMBER 19



Land division corners are approximately positioned on this map.

Photobase from 1967 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Colorado Coordinate system, east zone, 1927 North American datum

Land division corners are approximately positioned on this map.

Soil series and map symbols	Hydrologic soil group	Depth to bedrock	Depth from surface	Classification		
				Dominant USDA texture	Unified	AASHO
		Inches	Inches			
*Fondis: FoB, FoD, Fu----	C	>60	0-24	Clay----------	CH	A-7
			24-60	Sandy clay loam----------	SC	A-7
For Kutch part of Fu, see Kutch series.						
Garber: GaE----------	A	>60	0-60	Very gravelly sandy loam.	SP-SM	A-1
Gove: GoE, GsF----------	B	>60	0-28	Sandy loam or loamy sand-	SM	A-2
			28-56	Sandy clay loam----------	SC	A-4
			56-60	Gravelly sandy loam------	SM	A-2
The properties of the shale outcrop part of GsF are too variable to be estimated.						
Heldt: He----------	C	>60	0-60	Clay----------	CH	A-7
Hilly gravelly land: Hg----	D	20-40	0-20	Cobbly sandy loam to cobbly clay loam.	(1/)	(1/)
			20	Shale.		
*Jarre: Jb----------	B	>60	0-26	Loam to gravelly clay loam.	SC or CL	A-1
			26-60	Very gravelly loamy sand-	SP-SM	A-1
For Brussett part of Jb, see Brussett series.						
Juget: JuF, JvF----------	D	10-20	0-15	Gravelly loamy sand------	GP-GM	A-1
			15	Granite.		
Kassler: Ka----------	A	>60	0-60	Very gravelly loamy sand-	SP-SM	A-1
*Kettle: KeE, KfF----------	B	>60	0-26	Loamy sand----------	SM	A-1
			26-36	Sandy loam----------	SM or SC	A-1 or A-2
			36-60	Loamy coarse sand--------	SP-SM	A-1
For Falcon part of KfF, see Falcon series.						
*Kippen: KnE, KpD2---------	A	>60	0-32	Loamy sand----------	SM	A-2
			32-60	Fine sand----------	SP-SM	A-2
For Pring part of KpD2, see Pring series.						
*Kutch: KtE, KuD, KuE, KwF.	D	20-40	0-32	Clay or clay loam--------	CL or CH	A-6 or A-7
For Newlin part of KwF, see Newlin series; for Stapleton part of KwF, see Stapleton series.						
Larkson: LaD----------	C	>40	0-13	Fine sandy loam and loam-	ML	A-4
			13-54	Clay and clay loam-------	CL or CH	A-7

from arkosic sedimentary rock. These gently undulating to rolling soils are on alluvial fans and valley side slopes in the southern part of the Area. Slopes are 1 to 20 percent. The vegetation is mid and tall grasses. Elevations are 6,600 to 7,400 feet. Annual precipitation is 17 to 21 inches. Mean annual soil temperature is 44° to 47° F., and the frost-free season is 115 to 125 days.

In a representative profile the surface layer is dark grayish-brown and grayish-brown loamy sand about 24 inches thick. The underlying material is brown and light yellowish brown loamy sand and fine sand extending to a depth of 60 inches or more.

Kippen soils have rapid permeability. Available water capacity is low. Plants can penetrate to a depth of 60 inches or more.

Most areas of Kippen soils are in native grasses and are used for grazing livestock. A few areas have been cultivated, but most have been reseeded to grass or abandoned.

Representative profile of a Kippen loamy sand, 200 feet north of the center of sec. 25, T. 10 S., R. 66 W.:

A11--0 to 16 inches, dark grayish-brown (10YR 4/2) loamy sand, very dark brown (10YR 2/2) when moist; weak, medium, subangular blocky structure; soft, very friable; neutral (pH 6.6); clear, smooth boundary.

A12--16 to 24 inches, grayish-brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) when moist; very weak, coarse, prismatic structure; slightly hard, very friable; neutral (pH 6.6); gradual, smooth boundary.

AC--24 to 32 inches, brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) when moist; single grain; loose when dry and moist; neutral (pH 6.6); gradual, wavy boundary.

C--32 to 60 inches, light yellowish-brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) when moist; single grain; loose when dry and moist; neutral (pH 6.6).

The A horizon ranges from 20 to 32 inches in thickness and from gravelly sandy loam to sand in texture. The C horizon extends to a depth of 40 inches or more and in texture ranges from sand to loamy sand. In places gravel is below a depth of 40 inches.

Kippen loamy sand, 1 to 20 percent slopes (KnE).--This gently undulating to rolling soil is on alluvial fans and valley side slopes in the southern part of the Area. Most mapped areas are more than 40 acres in size.

Included with this soil in mapping are small areas of Pring gravelly sandy loam that are small knobs, Crowfoot-Tomah sandy loams, 5 to 25 percent slopes, and Cruckton sandy loam, 1 to 9 percent slopes.

Runoff is slow to medium. The hazard of erosion is slight to moderate. Some gullies are on drainageways. The surface crusts where the soil is cultivated.

Most areas of this soil are used for grazing livestock. A few small areas have been cultivated in the past, but most of these areas have been seeded to grass. (Capability unit VIe-4; Sandy Divide range site)

Kippen and Pring soils, 1 to 12 percent slopes, eroded (KpD2).--This undifferentiated soil group is made up of Kippen and Pring soils. In a typical area of these soils, both soils are present, but in places only one of them is. In most places the Kippen soil areas are larger than the Pring. These gently undulating to rolling soils are on alluvial fans and valley side slopes in the southeastern part of the Area. In most places soil areas are larger than 40 acres in size.

The Kippen soil has a profile similar to the one described as representative for the series, but about 40 percent of soil area has a surface layer of brown loamy sand or sand 6 inches or less in thickness.

The Pring soil has a profile similar to the one described as representative for the series, but as a result of erosion about half of the soil has a dark-colored surface layer 4 to 7 inches thick.

Included with these soils in mapping are small areas of Crowfoot-Tomah sandy loams, 5 to 25 percent slopes, and Peyton sandy loam, 1 to 3 percent slopes. Also included are small areas of soils accumulated by soil blowing or water runoff.

Runoff is medium to rapid. Surface crusting is common. The erosion hazard is moderate to high and gullies 1 to 6 feet deep at intervals of 200 feet are common.

Most areas of these soils are abandoned cultivated fields, but some areas have been reseeded to grass. Where a seed source of older trees is nearby, ponderosa pines is common. (Capability unit VIe-4; Sandy Divide range site)

Kutch Series

The Kutch series consists of moderately deep, well-drained soils that formed in fine-textured, calcareous material weathered from clay shale. These gently sloping to moderately steep soils are on uplands in the northern part of the Area. Slopes are 4 to 20 percent. The vegetation is mainly short and mid grasses, but some areas support ponderosa pine. Elevations are 5,500 to 6,800 feet. Annual precipitation is 15 to 19 inches. Mean annual soil temperature is 47° to 50° F., and the frost-free season is 120 to 135 days.

In a representative profile, the surface layer is grayish-brown clay loam about 3 inches thick. The subsoil, about 16 inches thick, is grayish-brown to light yellowish-brown clay. The underlying material is a light yellowish-brown clay loam. Soft shale is at a depth of about 32 inches.

Kutch soils have slow permeability. Available water capacity is moderate. Plant roots penetrate to the shale.

Most areas of this soil are in native grasses and are used for grazing livestock. Some areas are used fo woodland products, and a few areas are used for gr wing wheat.

Representative profile of a Kutch clay loam at the northeast corner of sec. 21, T. 9 S., R. 65 W.:

A1--0 to 3 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky structure; soft, friable; neutral (pH 7.2); clear, smooth boundary.

B1--3 to 6 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, prismatic structure parting to strong, fine, angular blocky; hard, firm; thin patchy clay film on vertical faces of peds; neutral (pH 7.2); clear, smooth boundary.

B2--6 to 13 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (10YR 3/2) when moist; moderate, medium, prismatic structure parting to strong, medium to fine, angular blocky; very hard, firm; thin nearly continuous clay films on both vertical and horizontal faces of peds; mildly alkaline (pH 7.4); clear, smooth boundary.

B3--13 to 19 inches, light yellowish-brown (2.5Y 6/3) clay, olive brown (2.5Y 5/3) when moist; moderate, medium, prismatic structure; parting to moderate, medium, subangular blocky; very hard, firm; few, thin, patchy clay films on vertical faces of peds; strongly calcareous; moderately alkaline (pH 8.2); clear, smooth boundary.

Cc--19 to 32 inches, light yellowish-brown (10YR 6/3) clay loam, light olive brown (10YR 5/3) when moist; weak, medium to coarse, prismatic structure; hard, friable; strongly calcareous with few, medium, distinct lime concretions; moderately alkaline (pH 8.4); gradual, smooth boundary.

R--32 to 48 inches, light yellowish-brown (2.5Y 6/3) soft shale that weathers to clay loam (2.5Y 5/3) when moist.

The A horizon ranges from 3 to 9 inches in thickne and from sandy loam to clay loam in texture. The B horizon ranges from 6 to 30 inches in thickness. Depth to lime ranges from 10 to 36 inches. We hered shale or siltstone is at a depth of 20 to 40 nches.

Kutch sandy loam, 5 to 20 percent slopes (KtE).--Th strongly sloping to moderately steep soil is on al vial fans and valley side slopes that are below rock cliffs and below stony steep land along major drainageways. Most mapped areas are more than 100 ac s in size.

This soil has a profile similar to that described as representative for the series, except that the surface layer is a sandy loam about 7 inches thick. In places shale is at depths of 20 to 30 inches.

Included with this soil in mapping are small areas of Newlin gravelly sandy loam, 8 to 30 percent slopes, and small areas of Bresser sandy loam, 3 to 9 percent slopes, along drainageways.

Runoff is rapid. The hazard of erosion is moderate. Drainageways are close together and in many places gullied to a depth of more than 1 foot.

Areas of this soil are used for grazing livestock. (Capability unit VIe-1; Sandy Foothill range site)

Kutch clay loam, 4 to 8 percent slopes (KuD).--This sloping soil is on uplands, mainly in the northern part of the Area. Most mapped areas are long and irregularly shaped and more than 40 acres in size.

Included with this soil in mapping are small areas of Fondis clay loam, 3 to 9 percent slopes. Also included are areas of Loamy alluvial land along drainageways. In places there are small rock outcrops.

Runoff is medium. The erosion hazard is slight to moderate. Some gullies have formed along drainageways.

About 60 percent of the acreage is used for grazing livestock. The remaining area is cultivated and is used for growing dryland wheat. A few cultivated areas have been reseeded to grass. (Capability unit IVe-3; Clayey Foothill range site)

Kutch clay loam, 8 to 20 percent slopes (KuE).--This moderately steep soil is on valley side slopes. Most mapped areas are 10 to 40 acres in size.

This soil has a profile similar to that described as representative for the series, except that the dark color extends to depths of 6 to 9 inches. Lime is below a depth of 20 inches.

Included with this soil in mapping are small areas of Fondis clay loam, 3 to 9 percent slopes, and some small knobs of Newlin gravelly sandy loam, 8 to 30 percent slopes.

Runoff is rapid. The erosion hazard is moderate. Some gullying has taken place in drainageways. Slips 6 to 12 inches high are present.

Areas of this soil are used for grazing livestock. (Capability unit VIe-1; Clayey Foothill range site)

Kutch-Newlin-Stapleton complex, 8 to 40 percent slopes (KwF).--This complex is about 35 percent Kutch soils, about 25 percent Newlin soils, and about 25 percent Stapleton soils. Kutch soils are at the highest elevations and extend part way down the slope. Newlin soils are directly below Kutch soils, and Stapleton soils are at the lowest elevations and on small knobs.

Included with these soils in mapping are small areas of cobbly knobs, Fondis soils, Loamy alluvial land, and Larkson fine sandy loam, 3 to 9 percent slopes, on north-facing slopes. Taken together, these make up 15 percent of each mapped area.

Runoff is rapid. The erosion hazard is moderate. Gullies are common along drainageways.

Most areas of these soils are used for grazing livestock and some areas are used for wildlife habitat. Ponderosa pine and a good understory of Gambel oak and mountain-mahogany are common. Mid and tall grasses are also present. Urban development has taken place in some areas. (Capability unit VIe-5)

TABLE 6.--ESTIMATED SOIL PROPERTIES

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or this reason it is necessary to follow carefully the instructions for referring to

Soil series and map symbols	Hydrologic soil group	Depth to bedrock	Depth from surface	Classification		
				Dominant USDA texture	Unified	AASHO
		Inches	Inches			
*Blakeland: BlE, Bo------- For Orsa part of Bo, see Orsa series.	A	>60	0-60	Loamy coarse sand and sand.	SM or SP-SM	A-3
*Bresser: BrB, BrD, BsE, BtE, BuD2. For Louviers part of BsE, see Louviers series; for Truckton parts of BtE and BuD2, see Truckton series.	B	>60	0-8 8-30 30-60	Sandy loam---------- Sandy clay loam---------- Sandy loam or loamy sand-	SM SC or CL SM	A2 A-4 or A-6 A-2
Brussett: BvB, BvD--------	B	>60	0-26 26-60	Clay loam---------- Loam----------	CL CL	A-6 A-6
*Buick: BwD---------- For Satanta part of BwD, see Satanta series.	C	>60	0-22 22-60	Silty clay loam---------- Sandy clay loam or clay loam.	CL SC or CL	A-6 A-4, A-6
Chaseville---------- Mapped only with Redridge soils.	A	>60	0-60	Very gravelly loamy sand-	SP	A-1
Cheeseman---------- Mapped only with Tinytown soils.	B	20-40	0-31 31	Clay loam---------- Shale and sandstone.	SC	A-6
Coni: CoG----------	D	10-20	0-17	Clay loam----------	CL	A-6
*Crowfoot: CrE---------- For Tomah part of CrE, see Tomah series.	B	>60	0-19 19-43 43-60	Loamy sand---------- Sandy clay loam---------- Coarse sand----------	SM SC SC or SP-SM	A-2 A-2 A-1
*Cruckton: CsD, CtE------- For Peyton part of CtE, see Peyton series.	B	>60	0-60	Sandy loam----------	SM or SC	A-2 or A-4
Denver: DeD----------	C	>40	0-55	Clay or clay loam--------	CH or CL	A-7
Englewood: En----------	C	>60	0-60	Clay----------	CH or CL	A-6 or A-7
Falcon---------- Mapped only with Kettle soils.	D	4-20	0-14	Gravelly sandy loam------	SM	A-2

TABLE 1.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Soil	Area	Extent	Soil	Area	Extent
	Acres	Percent		Acres	Percent
ockland-Lonetree complex, 10 to 100 percent slopes	2,530	0.7	Stony rough land	4,770	1.3
Sampson loam	4,480	1.2	Stony steep land	5,930	1.6
andy alluvial land	2,400	.7	Stony steep land, cold	10,270	2.8
andy wet alluvial land	4,480	1.2	Tarryall gravelly loam, 10 to 50 percent slopes	480	.1
Satanta loam	1,320	.4	Tinytown-Cheeseman complex, 5 to 30 percent slopes	2,220	.6
Satanta loam, calcareous variant, 3 to 9 percent slopes	360	.1	Truckton sandy loam, 1 to 3 percent slopes	560	.2
atanta loam, calcareous variant, 9 to 25 percent slopes	280	.1	Truckton sandy loam, 3 to 8 percent slopes	480	.1
tapleton loamy sand, 6 to 30 percent slopes	1,700	.5	Westcreek gravelly loam, 10 to 30 percent slopes	200	.1
Stapleton-Bresser association	9,100	2.5	Total land	360,620	100.0

1/ Less than .05 percent.

olive brown (2.5Y 5/3) when moist; massive; very hard, very friable; pH 6.8.

The A and AC horizons are light sandy loam or coarse loamy sand. The A1 horizon is 6 to 20 inches thick and is thinnest in areas that were ice cultivated.

Blakeland sandy loam, 1 to 15 percent slopes (BlE).--This undulating to rolling soil occurs on plands in the northern part of the Area. Most apped areas are less than 160 acres in size.

Included with this soil in mapping are small areas of Truckton sandy loam, 3 to 8 percent slopes, Bresser sandy loam, 3 to 9 percent slopes, and tapleton loamy sand. Also included are areas of andy alluvial land in drainageways.

Surface runoff is slow to medium, depending on lope. This soil is subject to severe soil blowing f it is tilled or cover is inadequate. The hazard f water erosion is slight to moderate. Gullies form on the steeper parts of drainageways.

Most areas of this soil are in native grass and e used for grazing livestock. Some areas have een cultivated in the past, but most of these areas have been seeded with grass. Wildlife habitat ccurs in places. (Capability unit VIe-3; Sandy oothill range site)

Blakeland-Orsa association (1 to 4 percent slopes) (Bo).--These gently sloping soils are on foot lopes and alluvial fans in the northern part of the rea. Mapped areas are long, irregular in shape, and more than 20 acres in size.

Blakeland soils make up about 50 percent of the creage. They are mostly on small ridges and knolls. Orsa soils make up about 35 percent of the acreage and are mostly on foot slopes and in shallow swales.

Included with these soils in mapping are small areas of Bresser sandy loam, 1 to 3 percent slopes, Kassler gravelly sandy loam, and Sandy alluvial land. Also included are small areas of a soil that is more red than, but otherwise similar to, Blakeland soils.

Runoff is slow to medium. In cultivated areas the erosion hazard is slight to moderate and some gullies have formed. These soils receive runoff from soils at higher elevation.

Most of the acreage is in native grass. A few small areas are used for dryfarmed grain or irrigated alfalfa. (Capability unit IVe-5, dryland; IVs-1, irrigated; Sandy Foothill range site)

Bresser Series

The Bresser series consists of well-drained soils that formed in sandy soil material deposited by wind and water. These gently sloping to moderately steep soils are on terraces and uplands in the warmer, northern part of the Area. Slopes are 1 to 15 percent. The vegetation is mid and tall grasses. Elevations are 5,500 to 6,600 feet. Annual precipitation is 15 to 19 inches. Mean annual soil temperature is 47° to 52° F., and the frost-free season is 120 to 135 days.

In a representative profile the surface layer, about 5 inches thick, is grayish-brown sandy loam. The subsoil, about 25 inches thick, is dark grayish-brown sandy loam and light olive-brown and brown sandy clay loam. The underlying material is light

yellowish-brown loamy sand that extends to a depth of 60 inches or more.

Bresser soils have moderate permeability. Available water capacity is moderate. Plants can penetrate to a depth of 60 inches or more.

Most areas of Bresser soils are in grasses and are used for grazing beef cattle. Some areas are cultivated and are used for growing dryfarmed crops, mostly small grains. Alfalfa and silage corn are grown where irrigation water is available, usually along Cherry and Plum Creeks. Urban development is taking place in some areas. Wildlife habitat occurs in places.

Representative profile of a Bresser sandy loam, in native pasture, 450 feet north and 450 feet east of the center of sec. 18, T. 8 S., R. 65 W.:

A1--0 to 5 inches, grayish-brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; hard, very friable; neutral (pH 6.8); clear, smooth boundary.

B1--5 to 8 inches, dark grayish-brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, prismatic structure parting to moderate, medium, subangular blocky; very hard, friable; few, thin, patchy clay films on vertical faces of peds; neutral (pH 6.8); clear, wavy boundary.

B2t--8 to 20 inches, brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) when moist; moderate, medium, prismatic structure parting to moderate, medium, angular blocky; extremely hard, friable; thin patchy clay films on faces of peds; few dark streaks; neutral (pH 6.8); clear, smooth boundary.

B3t--20 to 30 inches, light olive brown (2.5Y 5/3) sandy clay loam, light olive brown (2.5Y 5/3) when moist; weak to moderate, medium, prismatic structure parting to weak to moderate, coarse, subangular blocky; extremely hard, friable; few, thin, patchy clay films on vertical faces of peds; neutral (pH 6.8); gradual, smooth boundary.

C--30 to 60 inches, light yellowish-brown (2.5Y 6/4) heavy loamy sand, light olive brown (2.5Y 5/4) when moist; very hard, very friable; few horizontal streaks of sandy clay loam less than 2 inches thick; neutral (pH 6.8).

The A1 horizon ranges from 3 to 12 inches in thickness, but in some eroded areas it is missing. Texture of the A1 horizon ranges from sandy loam to loamy sand. The B2t horizon ranges from 6 to 24 inches in thickness and from heavy sandy loam to clay loam in texture. The C horizon ranges from light yellowish brown to pale-brown in color and from loamy sand to sand in texture. Depth to bedrock is greater than 40 inches.

Bresser sandy loam, 1 to 3 percent slopes (BrB).--This nearly level soil is on terraces and uplands in the northern half of the Area. Most mapped areas are less than 60 acres in size, and most slopes are 1 to 2 percent.

Included with this soil in mapping are small areas of Sampson loam and of Truckton sandy loam, 1 to 3 percent slopes.

Surface runoff is slow. This soil is subject to moderate soil blowing where cultivated. The hazard of water erosion is slight to moderate. This soil receives water runoff from higher areas.

Most areas of this soil are cultivated. Wheat and barley are the common dryland crops. Where irrigation water is available, alfalfa and corn for silage are grown. (Capability unit IIIe-1, dryland; IIe-2, irrigated; Sandy Foothill range site)

Bresser sandy loam, 3 to 9 percent slopes (BrD).--This soil is on uplands in the northern part of the Area. Most mapped areas are less than 160 acres in size and have well established drainageways.

Included with this soil in mapping are small areas of Truckton sandy loam, 3 to 8 percent slopes, and of Bresser sandy loam, 1 to 3 percent slopes. Also included along drainageways are areas of Loamy alluvial land that seldom exceed 100 feet in width.

Runoff is medium. Soil blowing and water erosion are moderate hazards. Some gullies are present.

About half of the acreage of this soil is cultivated. Alfalfa and pasture grasses are grown on a few, small, irrigated areas along Cherry Creek. Wheat and barley are the common dryland crops. Some areas have been seeded to grass (plate III, bottom). The remaining areas are in range and are used for grazing beef cattle. (Capability unit IVe-4, dryland; IVe-2, irrigated; Sandy Foothill range site)

Bresser-Louviers complex, 7 to 30 percent slopes (BsE).--This complex is about 45 percent Bresser soils and about 30 percent Louviers soils. These sloping to steep soils are on side slopes in the northern part of the Area. In a typical area the Bresser soil is most common on the lower slopes and the Louviers soil is on knobs on the upper slopes and directly below hill crests. In most places areas of this complex exceed 40 acres in size and are irregularly shaped.

Included with these soils in mapping are areas of a Bresser-like soil that differs only in having shale bedrock at a depth of less than 30 inches and that makes up about 15 percent of each mapped area. Also included are small areas of Newlin gravelly sandy loam, 8 to 30 percent slopes, Buick-Satanta loams, 3 to 9 percent slopes, and shale and sandstone outcrops.

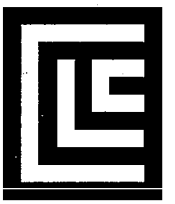
Runoff is medium to rapid. The erosion hazard is moderate to high. Some gullies are present along drainageways.

Most areas of these soils are used for grazing livestock. Wildlife habitat is important in places. (Bresser soils: capability unit VIe-2; Sandy Foothill range site. Louviers soils: capability unit VIe-2; Clayey Foothill range site)

Back Pocket - Drainage Plan

APPENDIX C

Record Drainage Report Addenda



CLC ASSOCIATES

DEC 3 0 2004

PHASE III DRAINAGE ADDENDA
FOR
MILESTONE FILING No. 4, 7th AMENDMENT,
LOT 1
TOWN OF CASTLE ROCK, COLORADO

PHASE III DRAINAGE ADDENDA
FOR
MILESTONE FILING No. 4, SEVENTH AMENDMENT,
LOT 1
TOWN OF CASTLE ROCK, COLORADO

December 29, 2004

Prepared for:

Crowfoot No. 2 LLC
7600 East Arapahoe Road, Ste. 211
Centennial, Colorado 80112
Ph. (303) 771-3344
Mr. Glen Smith, Manager

Prepared by:

Joel D. Tompkins, PE
CLC Associates, Inc.
8480 E. Orchard Rd, #2000
Greenwood Village, CO 80111

(CLC Job No. 03.0242)

PHASE III DRAINAGE ADDENDA
FOR
MILESTONE FILING No. 4, SEVENTH AMENDMENT,
LOT 1
TOWN OF CASTLE ROCK, COLORADO

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APPENDIX - Project VIN
Drainage Plan
Calculations

PHASE III DRAINAGE ADDENDA
FOR
MILESTONE FILING No. 4, SEVENTH AMENDMENT,
LOT 1
TOWN OF CASTLE ROCK, COLORADO

CERTIFICATION

ENGINEER'S STATEMENT:

The enclosed drainage report, and exhibits, were prepared by me, or under my direct supervision, and are correct to the best of my knowledge and belief. Said drainage report has been prepared in accordance with applicable Town of Castle Rock criteria and is in conformance with the master plan of drainage for the effected area. I accept responsibility for any liability caused by negligent acts, errors, or omissions on my part in preparing this report.

COLORADO REGISTERED JOEL DEAN TOMPKINS 32415 PROFESSIONAL ENGINEER

12-22-2004

Joel Dean Tompkins
Colorado P.E. No. 32415
For and on behalf of CLC Associates, Inc.

OWNER / DEVELOPER'S STATEMENT:

As Owner / Developer of land(s) identified within this report; I agree to proceed, implement and comply with all recommendations and requirements outlined herein.

Mr. Glen Smith, Manager
Crowfoot No. 2 LLC

TOWN OF CASTLE ROCK APPROVALS:

ENGINEERING DIVISION DATE

DEVELOPMENT SERVICES DIRECTOR DATE

Approved
Development Services
JAN 25 2005
Town of Castle Rock

PHASE III DRAINAGE ADDENDA
FOR
MILESTONE FILING No. 4, SEVENTH AMENDMENT,
LOT 1
TOWN OF CASTLE ROCK, COLORADO

EXECUTIVE SUMMARY

This addendum demonstrates compliance with or amends the Phase III Drainage Report for Trail Boss Drive at Milestone on file with the Town of Castle Rock. The scope of the report covers all aspects of storm water collection and conveyance necessary to comply with the Public Works Regulations of the Town of Castle Rock. The following key points summarize the presented materials:

- There are no regulated floodplains on or immediately adjacent to the proposed development.
- Site impervious area will be lower than anticipated and accounted for within the previous study listed.
- The existing storm drains, stubs, and inlets installed with the construction of Trail Boss and Barranca Drives are adequate and will not require any modifications.
- Detention is provided for in the existing pond on the Metzler School / Park site.
- TCR Variance V2001-50 waived the owner of Lot 1 from having to install permanent water quality BMPs.

PHASE III DRAINAGE ADDENDA
FOR
MILESTONE FILING No. 4, SEVENTH AMENDMENT,
LOT 1
TOWN OF CASTLE ROCK, COLORADO

1.00 GENERAL LOCATION AND DESCRIPTION

1.01 Location

Milestone Filing No. 4, Seventh Amendment, Lot 1 is a portion of the Milestone Filing No. 4 Commercial Subdivision in the Town of Castle Rock. [Lot 1 was formerly Lot 3 of Milestone Filing No. 4, Third Amendment.] Lot 1 is at the southwest corner ofFounders Parkway and Trail Boss Drive and between Trail Boss and Barranca Drives.

1.02 Description

Mass grading of Lots 1 and 2 of the Seventh Amendment and associated infrastructure improvements has been completed. Water, sanitary, and storm drain utilities have been extended to the property.

1.03 Existing Drainage

The overall drainage patterns for the property were established in the Phase III Drainage Report for Trail Boss Drive at Milestone. General grade of the lot is east to west and currently contributes runoff overland to the Barranca Drive curb and gutter. The storm drain stub in Barranca Drive provides for the fully developed 100-year event flows to be conveyed to the detention facility on the Metzler School / Park site. The development of this lot requires only the installation of drainage improvements necessary to make that connection.

1.04 Proposed Development and Drainage

The development proposal for Lot 1 is a 10,800 square foot Pier One. Associated with that is the construction of access drives, parking, delivery spaces and other appurtenances required for operations of a typical retail facility of similar content. The access to Barranca Drive on the south property line will be a joint access with Lot 2. The access to Trail Boss Drive on the nothwest will be right-in / right-out only

Storm drainage from this development will remain in general conformance with the patterns depicted in the Trail Boss Drive report. Minor deviations can be seen in the overlay of the basin lines from the previous study with those specifically developed for the Pier One construction on the drainage plan included in the back pocket. Deviation of hardscape distribution is less than five percent within any of the Trail Boss Drive basins and total hardscape is only 89% of that anticipated in the Trail Boss Drive report.

2.00 DRAINAGE FACILITY DESIGN

2.01 Runoff and Conveyance

Runoff from the 10,826 s.f. roof and canopy area will be collected in downspouts and tight-lined to the underground storm drains. A series of small area inlets will collect runoff form peripheral landscape areas and the truck well on the east side of the building. All of the

aforementioned collections will combine at Design Point 3 as identified on the enclosed drainage plan.

A Type 13C inlet installed at the south end of the parking lot will collect runoff from the bulk of the remaining site impervious area. Total contribution to this inlet is from 0.68 acres of which 0.57 acres is either parking asphalt or sidewalk. Peak 100-year contribution to the storm inlet in this basin is anticipated at 5.1 cfs.

A second Type 13 inlet will be included in the north curb line of the Barranca Drive access to intercept runoff prior to entering that private roadway. Peak runoff, again for the 100-year event, should be about 2.3 cfs.

The total contribution to the 18-inch storm drain stub provided from Barranca Drive is anticipated to be 5.1 cfs for the 5-year rainfall event and 11.3 cfs for the 100-year event. Lot 1 accounts for 52.1 percent of the Trail Boss C.2 basin; the basin contributing to the Barranca stub. Total C.2 runoff was anticipated at 11.34 cfs and 21.34 cfs for the 5- and 100-year events, respectively. While the total Lot 1 area is 1.85 acres only 1.38 acres overlaps with the C.2 boundary line. That calculates to an allowance of 5.91 and 11.12 cfs, respectively. Five year runoff is less than the allowance but the 100-year runoff exceeds the allowance by 0.18 cfs. Previous runoff totals are for the entire basin area being considered; however, 0.06 acres of common access drive being considered in the total runoff from the site is actually on Lot 2 and accounts for 0.48 cfs. Therefore, the actual Lot 1 contribution is 11.30 – 0.48 = 10.82 cfs and is less than the allowance of 11.12 cfs.

2.02 Detention

In the Trail Boss Drive drainage report that portion of Lot 1 which overlaps the C.2 Basin is assumed to have a 95 percent impervious rate. Given that only 1.38 acres of the contributing area was originally in C.2 that translates to an impervious allowance of 1.38 x 0.95 or 1.31 acres. Actual imperviousness associated with this development, Lot 1 or otherwise, inside or outside of the original C.2 boundary, will be only 1.14 acres. Thus all previous assumptions of the detention volumes necessary to account for this development remain valid.

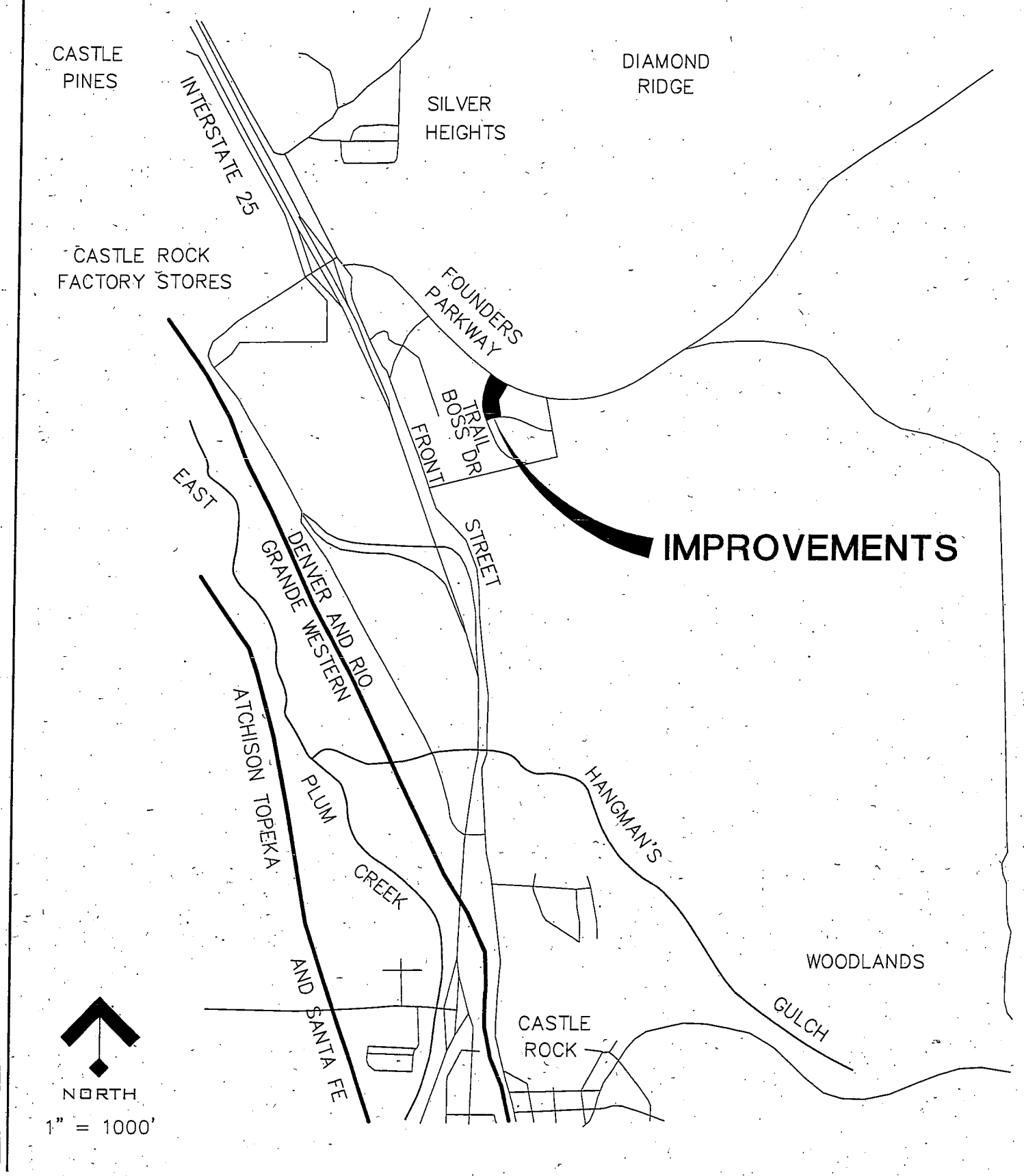
The development of Lot 1 is subject to TCR Variance V2001-50 and is not required to provide for permanent water quality BMPs as delineated in Section 2, Chapter 10, Sub-Chapter 14 of the Public Works Regulations.

PHASE III DRAINAGE ADDENDA
FOR
MILESTONE FILING No. 4, SEVENTH AMENDMENT,
LOT 1
TOWN OF CASTLE ROCK, COLORADO

3.00 CONCLUSION

All storm drain improvements proposed for Lot 1 of Milestone Filing No. 4, Seventh Amendment will be in compliance with the Town of Castle Rock Public Works Regulations as subjected to Variance V2001-50 and any applicable state or federal regulations which may apply. Further, the development will not adversely impact any of the in-place and downgradient drainage appurtenances.

Appendix - Project Map Calculations

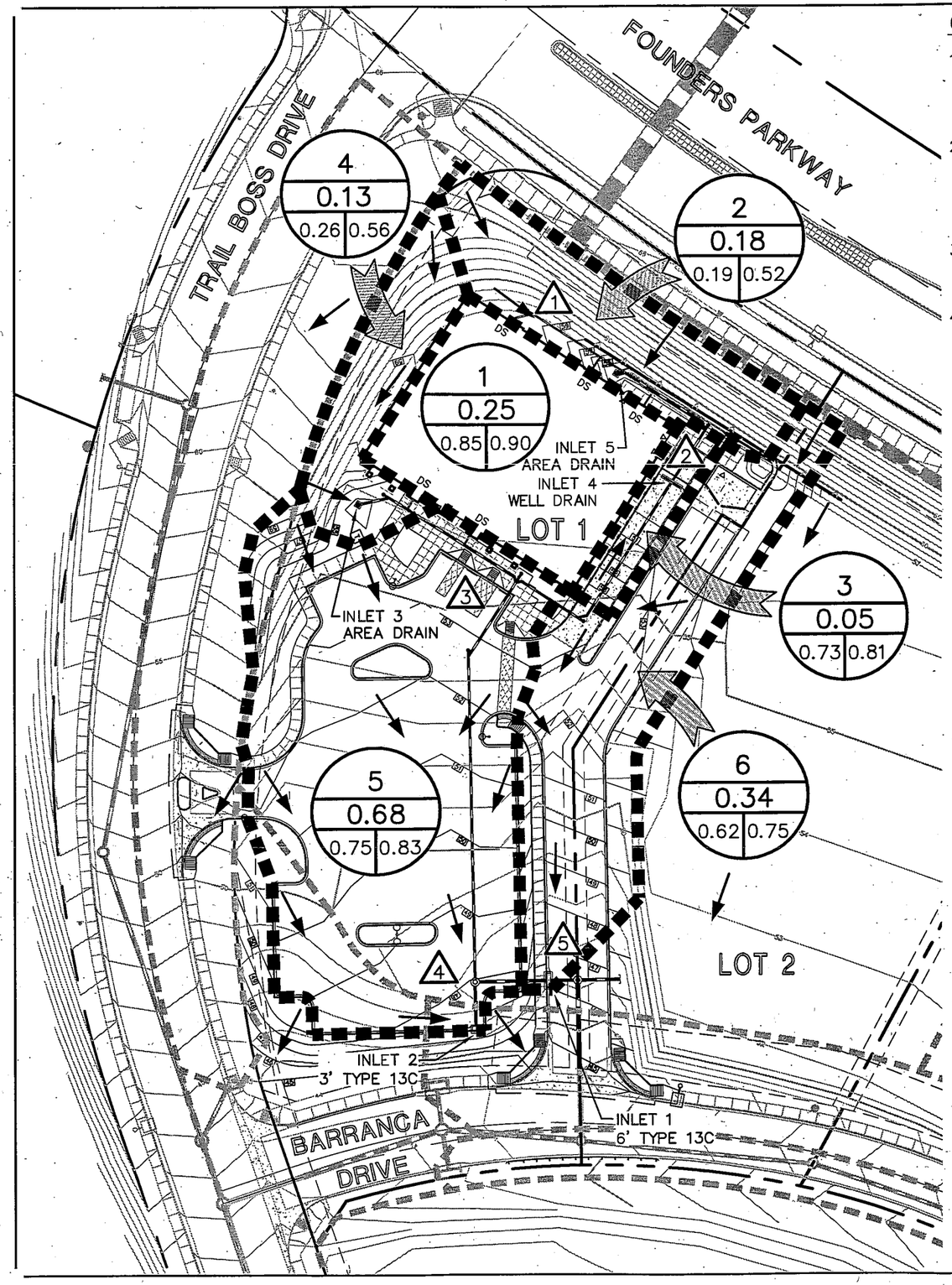


PROJ #: 04.0218
DATE: 10/06/04

LOT 1, MILESTONE FILING NO. 4
7TH AMENDMENT
CASTLE ROCK, COLORADO

VICINITY MAP

CLC ASSOCIATES
8480 E. ORCHARD RD.
SUITE 2000
GREENWOOD VILLAGE
COLORADO 80111
P 303 770 5600
F 303 770 2349
CLCASSOC.COM
ARCHITECTURE
ENGINEERING PLANNING
LANDSCAPE ARCHITECTURE
LAND SURVEYING



GENERAL NOTES

1. THIS PLAN IS INTENDED TO BE USED AS REFERENCE IN CONJUNCTION WITH THE FINAL DRAINAGE REPORT. DO NOT USE THIS PLAN FOR CONSTRUCTION.
2. ALL STORM SEWER CONSTRUCTION (ie PIPE LINE, INLETS, MANHOLES) SHALL BE IN ACCORDANCE WITH TOWN OF CASTLE ROCK STANDARDS AND SPECIFICATIONS.
3. THE CONTACTOR SHALL PHASE GRADING ACTIVITIES TO LIMIT THE POSSIBILITY OF EROSION.
4. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE LOCAL UTILITY LOCATION CENTER AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF THE UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.

LEGEND

PROPOSED		EXISTING
◎	STORM SEWER MANHOLE	○
▭	STORM SEWER INLET	▭
———	STORM SEWER	———
58	CONTOUR LINE	—5845—
■■■■■	DEVELOPED BASIN BOUNDARIES	
▬ ▬ ▬	TRAIL BOSS DR. REPORT BASIN BOUNDARIES	

T — DRAINAGE BASIN DESIGNATION
2.34 — DRAINAGE BASIN ACRES
0.60 | 0.76 — 100-YEAR RUNOFF COEFFICIENT
5-YEAR RUNOFF COEFFICIENT
DIRECTION OF RUNOFF
4 — DESIGN NODE
DS — DOWNSPOUT

DESIGN NODE SUMMARY TABLE

NODE ID	TIME OF CONCENTRATION (MIN)	5-YEAR CA	5-YEAR I (IN/HR)	5-YEAR Q (CFS)	100-YEAR CA	100-YEAR I (IN/HR)	100-YEAR Q (CFS)
1	5.0	0.25	4.9	1.2	0.32	9.0	2.9
2	5.0	0.28	4.9	1.4	0.36	9.0	3.2
3	5.0	0.32	4.9	1.6	0.43	9.0	3.9
4	5.0	0.83	4.9	4.1	0.99	9.0	9.0
5	5.0	1.04	4.9	5.1	1.25	9.0	11.3

BASIN SUMMARY TABLE

BASIN ID	TIME OF CONCENTRATION (MIN)	I_5 (IN/HR)	I_{100} (IN/HR)	AREA (ACRES)	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
1	5.0	4.9	9.0	0.25	0.85	0.90	1.0	2.0
2	5.0	4.9	9.0	0.18	0.19	0.52	0.2	0.8
3	5.0	4.9	9.0	0.05	0.73	0.81	0.2	0.4
4	5.0	4.9	9.0	0.13	0.26	0.56	0.2	0.7
5	5.0	4.9	9.0	0.68	0.75	0.83	2.5	5.1
6	5.0	4.9	9.0	0.34	0.62	0.75	1.0	2.3

NORTH

60 0 30 60
SCALE: 1" =60'

THIS DRAWING IS INTENDED
FOR REFERENCE ONLY
NOT TO BE USED FOR CONSTRUCTION

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CLC ASSOCIATES
5480 E. ORCHARD RD.
SUITE 2000
GREENWOOD VILLAGE
COLORADO 80111
P 303 770 5600
F 303 770 2349
CLC@CLCDC.COM
ARCHITECTURE
ENGINEERING PLANNING
LANDSCAPE ARCHITECTURE
LAND SURVEYING

DRAINAGE PLAN
LOT 1, MILESTONE FILING NO. 4
7TH AMENDMENT
CASTLE ROCK, COLORADO

NO.	DESCRIPTION	DATE
1	ORIGINAL PREPARATION	12/29/04

PROJECT #: 04.021B
DRAWN BY: JJL
DESIGNED BY: JJL
CHECKED BY: JDT

DRAINAGE PLAN

LOT 1, MILESTONE FILING NO. 4

1 OF 1

Weighted Runoff Coefficients
Job Name: Milestone Filing No. 4, 7th Amend., Lot 1

Date: 12/21/04
By: J Tompkins

	C5	C10	C100	IMP%
Roof	0.85	0.90	0.90	90
Drive / Walk	0.87	0.88	0.89	96
Landscaping	0.15	0.25	0.50	0

	Land Use (Acre)				Weighted Runoff Coefficient			
Basin	Roof	Drive/walk	Landscape	Total	C5	C10	C100	IMP%
1	0.25	0.00	0.00	0.25	0.85	0.90	0.90	90.00
2	0.00	0.01	0.17	0.18	0.19	0.29	0.52	5.33
3	0.00	0.04	0.01	0.05	0.73	0.75	0.81	76.80
4	0.00	0.02	0.11	0.13	0.26	0.35	0.56	14.77
5	0.00	0.57	0.11	0.68	0.75	0.78	0.83	80.47
6	0.00	0.22	0.12	0.34	0.62	0.66	0.75	62.12
Total	0.25	0.86	0.52	1.63	0.64	0.68	0.77	64.45

FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD)

Designed By: JDT
Date: 12/21/04
Job: 03.0218

Project: Milestone Filing No. 4, 7th Amendment, Lot 1

RUNOFF CALCULATIONS (RATIONAL METHOD) Design Storm: 5-YR

Design Point	Direct Runoff						
	Basin	Area (Ac)	Runoff Coeff	CA	Tc (min)	I (in/hr)	Q (cfs)
	1	0.25	0.85	0.21	5.0	4.9	1.0
	2	0.18	0.19	0.03	5.0	4.9	0.2
1		0.43	0.57	0.25	5.0	4.9	1.2
	3	0.05	0.73	0.04	5.0	4.9	0.2
2		0.48	0.59	0.28	5.0	4.9	1.4
	4	0.13	0.26	0.03	5.0	4.9	0.2
3		0.61	0.52	0.32	5.0	4.9	1.6
	5	0.68	0.75	0.51	5.0	4.9	2.5
4		1.29	0.64	0.83	5.0	4.9	4.1
	6	0.34	0.62	0.21	5.0	4.9	1.0
5		1.63	0.64	1.04	5.0	4.9	5.1

RUNOFF CALCULATIONS (RATIONAL METHOD) Design Storm: 100-YR

Design Point	Direct Runoff						
	Basin	Area (Ac)	Runoff Coeff	CA	Tc (min)	I (in/hr)	Q (cfs)
	1	0.25	0.90	0.23	5.0	9.0	2.0
	2	0.18	0.52	0.09	5.0	9.0	0.8
1		0.43	0.74	0.32	5.0	9.0	2.9
	3	0.05	0.81	0.04	5.0	9.0	0.4
2		0.48	0.75	0.36	5.0	9.0	3.2
	4	0.13	0.56	0.07	5.0	9.0	0.7
3		0.61	0.71	0.43	5.0	9.0	3.9
	5	0.68	0.83	0.56	5.0	9.0	5.1
4		1.29	0.77	0.99	5.0	9.0	9.0
	6	0.34	0.75	0.26	5.0	9.0	2.3
5		1.63	0.77	1.25	5.0	9.0	11.3

Inlet Sizing Calculations
Job Name: Milestone Filing No. 4, 7th Amendment, Lot 1
Job Number: 04.0218 [Pier One]

Date: 12/21/04
by: JDT

Inlet ID	5-year Runoff	100-year Runoff	Condition	Interception[1]	Required Inlet
2	0.2	0.8	Sump	100%	Neenah R3205 Area Inlet
3	0.2	0.4	Sump	100%	Neenah R3205 Area Inlet
4	0.2	0.7	Sump	100%	Neenah R3205 Area Inlet
5	2.5	5.1	Sump	100%	Single (3') Type-13 Combination
6	1.0	2.3	On-Grade	100%	Double (6') Type-13 Combination

[1]For 100-year event.

CLC ASSOCIATES

8480 E. ORCHARD RD.
SUITE 2000
GREENWOOD VILLAGE
COLORADO 80111
P 303 770 5600
F 303 770 2349

DESIGN PAD

DENVER
SPOKANE
SALT LAKE CITY

PROJECT:	PIER ONE	DATE:	SEPT. 29, '04		
SUBJECT:	DRAINAGE	BY:	JDT	JOB NO:	04.0218

STATS FOR ORIGINAL C2 BASIN "TRAIL BOSS" REPORT

AREA BREAKDOWN 2.65 ACRES TOTAL
@ 95% 2.52 IMPERVIOUS

5-YEAR RUNOFF = 11.34 CFS

100-YEAR RUNOFF = 21.34 CFS

PIER 1

AREA BREAKDOWN

TOTAL LOT AREA = 1.85 ACRE

TOTAL BASIN AREA = 1.63 ACRE

BASIN OVERLAP WITH C2 = 1.52 ACRE

BASIN OVERLAP LOT 3 ONLY = 1.38 ACRE

AS A DEVELOPED PERCENTAGE OF BASIN C2

[LOT 3 ONLY] / [C.2] X 100

1.38 / 2.65 = 52.1% ⟹ ALLOWABLE RUNOFF ⟹ 5-YEAR

11.34 CFS X 0.521 = 5.91 CFS

100-YEAR

21.34 CFS X 0.521 = 11.12 CFS

BASIN 6 AREA OUTSIDE OF LOT 3 (ON LOT 4) = 6429.4 SF = 0.15 ACRE

OF WHICH 2817.6 IS DRIVE (IMPERVIOUS)

OR 0.06 ACRE: $Q_{100} = (0.89)(9.0)(0.06) = 0.48$ CFS

WHICH ACCOUNTS FOR THE 0.1 CFS ABOVE ALLOWED LOT 3 RUNOFF

PIPE DESIGN

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
DP1 → DP2
October 5, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	2.9 ⟹ Q_{100}
Channel Bottom Slope (ft/ft)	0.01
Manning's Roughness Coefficient (n-value)	0.011
Channel Diameter (ft)	1.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.61
Flow Velocity (fps)	5.78
Froude Number	1.421
Velocity Head (ft)	0.52
Energy Head (ft)	1.13
Cross-Sectional Area of Flow (sq ft)	0.5
Top Width of Flow (ft)	0.98

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PIPE DESIGN

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
DP2 → DP3
October 5, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	3.2 ⇒ Q_{100}
Channel Bottom Slope (ft/ft)	0.01
Manning's Roughness Coefficient (n-value)	0.011
Channel Diameter (ft)	1.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.65
Flow Velocity (fps)	5.9
Froude Number	1.377
Velocity Head (ft)	0.54
Energy Head (ft)	1.19
Cross-Sectional Area of Flow (sq ft)	0.54
Top Width of Flow (ft)	0.95

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PIPE DESIGN

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

DP3 → DP4
October 5, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	3.9 ⇒ Q_{100}
Channel Bottom Slope (ft/ft)	0.01
Manning's Roughness Coefficient (n-value)	0.011
Channel Diameter (ft)	1.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.76
Flow Velocity (fps)	6.09
Froude Number	1.241
Velocity Head (ft)	0.58
Energy Head (ft)	1.34
Cross-Sectional Area of Flow (sq ft)	0.64
Top Width of Flow (ft)	0.85

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PIPE DESIGN

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

INLET 2 → DP 4
October 5, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	5.1 ⟹ Q_{100}
Channel Bottom Slope (ft/ft)	0.01
Manning's Roughness Coefficient (n-value)	0.013
Channel Diameter (ft)	1.25

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.84
Flow Velocity (fps)	5.84
Froude Number	1.193
Velocity Head (ft)	0.53
Energy Head (ft)	1.37
Cross-Sectional Area of Flow (sq ft)	0.87
Top Width of Flow (ft)	1.18

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PIPE DESIGN

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
DP4 → DP5
October 5, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	9.0 ⟹ Q_{100}
Channel Bottom Slope (ft/ft)	0.0175
Manning's Roughness Coefficient (n-value)	0.013
Channel Diameter (ft)	1.25

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	1.1
Flow Velocity (fps)	7.88
Froude Number	1.173
Velocity Head (ft)	0.96
Energy Head (ft)	2.06
Cross-Sectional Area of Flow (sq ft)	1.14
Top Width of Flow (ft)	0.82

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Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
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