AMENDMENT NO. 4
PINE CREEK DRAINAGE BASIN PLANNING STUDY AND MASTER DEVELOPMENT DRAINAGE PLAN FOR PINE CREEK SUBDIVISION
(Retrofit of Pine Creek Regional Detention Facility "C" Part of Briargate Parkway Plaza Filing No. 1 (Track A))

In conjunction with:

Powers Boulevard Bridges Project
Briargate, Union, Pine Creek

February xx, 2012

Prepared for:

Colorado Department of Transportation
Region 2, Colorado Springs Residency

Prepared by:

TSIOUVARAS SIMMONS HOLDERNESS
CONSULTING ENGINEERS

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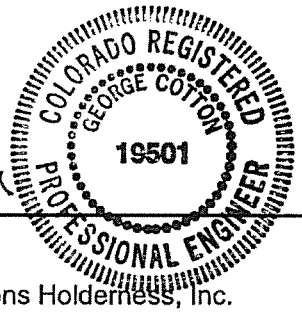
ENGINEERS STATEMENT:
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity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



George K. Cotton, Colorado — 2/28/2012
Colorado PE 19501 — Date
For and On Behalf of Tsiouvaras Simmons Holderness, Inc.

COLORADO DEPARTMENT OF TRANSPORTATION
REGION 2, COLORADO SPRINGS RESIDENCY

2/23/12
Resident Engineer — Date

CITY OF COLORADO SPRINGS:
Filed in accordance with Section 7-7-906 of the Code of the City of Colorado Springs, 2001, as amended

2/28/12
For the City Engineer — Date

TABLE OF CONTENTS

I.	INTRODUCTION	2
II.	GENERAL LOCATION AND DESCRIPTION	2
III.	DRAINAGE BASINS AND SUB-BASINS	3
IV.	DRAINAGE DESIGN CRITERIA	4
V.	DRAINAGE FACILITY DESIGN	4
	A. General Concept	4
	B. Specific Details	7
	C. Grading and Erosion Control	8
	D. Other Government Agency Requirements	8
VI.	DRAINAGE FACILITY MAINTENANCE	8
VII.	REFERENCES	9
APPENDIX		10
	Vicinity Map	11
	Pine Creek RDF-C Site Photos	12
	Design Plans for Pine Creek RDF-C Water Quality Retrofit	14
	Storm Rax Overflow Trash Rack	18
	Water Quality Capture Volume (UDFCD EDB Worksheet)	22
	Comparison of Addendum No. 2 and No. 3 Hydrology	26
	Hydrologic Model Input Data	27
	Hydrologic Model Output	34
	Nationwide 404 Permit	35
	Letter on Briargate and Union Detention Pond (Robin Kidder to Mark Andrew, February 11, 2011)	38
	Information from Other Reports and As-Built Plans	40

I. INTRODUCTION

CDOT is completing the segment of Powers Boulevard between Pine Creek and Briargate Parkway. The construction will complete the mainline bridges over Pine Creek, Union Boulevard and Briargate Parkway; and will pave the mainline. Within CDOT right-of-way limits, the stormwater runoff will be treated in accordance with CDOT and City of Colorado Springs MS4 permits. New permanent stormwater quality facilities (PSQF) will be constructed near Pine Creek and an existing PSQF will treat stormwater runoff for the segment of Powers Boulevard from Union Boulevard to Pine Creek.

Stormwater runoff from Powers Boulevard that is tributary to the Briargate Parkway drainage system currently has no PSQF. CDOTs project requirements allowed for retrofit of Regional Detention Facility "C" (RDF-C) in accordance with an agreement with the City of Colorado Springs. The other option permitted by CDOT design requirements was for construction of a PSQF within Powers Boulevard right-of-way. Because of the difficulty of siting a large volume PSQF within the project, the design-build team of Edward Kramer & Sons (build) and Tsiouvaras Simmons Holderness (design) chose the RDF-C retrofit approach.

This report presents the basis of the retrofit design of the primary outlet for RDF-C. The purpose of the retrofit is to provide regional treatment for all stormwater runoff that is tributary to the facility, which includes runoff from Powers Boulevard to the Briargate Parkway storm drainage system.

II. GENERAL LOCATION AND DESCRIPTION

Regional Detention Facility "C" is located in the northwest quadrant of the intersection of Union Boulevard and Briargate Parkway (see Exhibit 1). The primary outlet for the detention pond is located in the southwest corner. Geodetic coordinates for the outlet are approximately 38°57'59"N and 104°45'37"W.

RDF-C was constructed as a component of the Master Development Drainage Plan for the Pine Creek Subdivision. RDF-C is within the South Fork branch of Pine Creek and is one of four regional detention facilities constructed within that tributary. All of the inflows to RDF-C are conveyed to the basin via closed conduits. The largest inflows to the pond are from the Pine Creek South storm drainage system. This system has two large

inlets to RDF-C: one from Briargate that enters at the southeast corner into the pond forebay, and one from Union along the east side of the pond. There are also two inlets to the pond for local drainage systems that drain areas that are the north of the pond.

While no natural drainageways enter RDF-C, there is a jurisdictional wetland within the pond. When the pond was constructed, a constructed wetland was located along the south side of the pond as mitigation for wetland loses due to development. The wetland is fed by discharges from the pond forebay. Since construction of the pond, additional wetlands have established beyond the limits of the original mitigation area. Other wetlands that now exist in the pond include the area around the pond outlet. These wetlands are below elevation 6870.0, which is the berm height for the constructed wetland. Several wetlands have also formed on the perimeter of the pond where pond excavation intercepted groundwater seeps. Seeps can be observed on the north and east sides of the ponds. Groundwater seeps are not found in the vicinity of the pond outlet. It has been assumed that the entire work area near the pond outlet that is below elevation 6870.0 is jurisdictional wetland. The project has applied for a nationwide permit for work within wetland areas for project (see Appendix for a copy of the permit application).

III. DRAINAGE BASINS AND SUB-BASINS

RDF-C is a component of the drainage system for Pine Creek South Fork. The fully developed hydrology of this drainage basin is described in detail in the "Pine Creek Drainage Basin Planning Study" (JR Engineering, 1998). The watershed has 13 sub-basins of which 10 are tributary to RDF-C. The total drainage area to RDF-C is 1.04 square miles (664 acres) and has a weighted impervious area of 67.6%. The Powers Boulevard drainage basins that drain to Pine Creek South Fork have an area of 43.4 acres with an impervious percentage of 55%.

Sub-basin data is summarized in the appendix of this report (Hydrologic Input Calculations).

IV. DRAINAGE DESIGN CRITERIA

RDF-C is a non-jurisdictional detention dam that is currently privately owned by LP47, LLC and maintained and managed by the City of Colorado Springs. Design of the RDF-C water quality retrofit will conform to criteria of the City of Colorado Springs as stated in City of Colorado Springs "Drainage Criteria Manual" (DCM), Volumes 1, 2 and addenda. Specific sections of the DCM that are relevant to the detention facility retrofit design include Volume 1 Section 6.6 "Detention Storage Criteria" and Chapter 11 "Detention Storage". Criteria for starting water surface elevations for extended detention basins are given in Volume 2 on page 4-22.

V. DRAINAGE FACILITY DESIGN

A. General Concept

The existing primary outlet for detention basin RDF-C will be modified to include a water quality outlet with a 40 hour drain time. The existing primary outlet consists of a 48-inch diameter reinforced concrete pipe that is supported by a standard headwall. To prevent debris from entering the pipe, the headwall has a sloping trash rack that is supported by the headwall and apron.

The new outlet design will raise the height of the headwall and wing-walls to a constant elevation. The elevation will be set to the stage in the RDF-C basin for the water quality capture volume (WQCV) plus 20% for accumulated sediment storage (i.e. design water quality volume).

The WQCV will be released though an orifice plate that is designed to drain that volume in 40 hours. The orifice plate will be placed on the front wall of the raised outlet headwall opposite the 48" outlet pipe. To prevent debris from clogging the orifice openings, a screen will be placed in front of the orifice plate. As a part of the screen design, a 2.5 foot deep micro-pool will be constructed to maintain a permanent pool of water in front of the screen, assuring that the lower portion of the screen will be free of floating debris. The micro-pool will be a square concrete sump that has side lengths equal to the existing headwall width of 8'-0". An additional fence-like screen will be placed along the perimeter of the micro-

pool for the purposed of collecting larger debris and limiting access to the micro-pool except by authorized maintenance personnel.

During regular rainfall conditions, stormwater will pool against the headwall up to the elevation of the design water quality volume and gradually release. A water quality volume of 12.46 ac-ft is calculated for the total watershed area of 658.4 acres (1.03 sq. mi.) and 57.2% imperviousness. The design height of the raised headwalls will be 6'-5". From the base of the micro-pool, the structure will be 8'-11" high.

During storm rainfall conditions, stormwater will pool to the height of the headwall and begin spilling to the 48" outlet pipe. Initially, the headwall will act as a weir and will control the rate that water is released from the pond. However, once the flow increases, the release from the pond will be controlled by the outlet pipe.

Our analysis found that the outlet pipe runs in "inlet" control and that there is extra capacity in the Pine Creek South storm drain. We looked at the option of improving the headwall efficiency by adding a bevel around the outlet pipe (i.e. changing from an HDS Chart 1 outlet to an HDS Chart 3 outlet). This improvement would increase the outlet release from RDF-C by 12 to 14 percent and could partially make up for the initial period, when stormwater fills the WQCV and releases from the retrofit outlet are low. Analysis of this option however showed only minor overall improvement. Pond stage for the 100-year storm only decreased 0.1 foot and peak outflow by about 5.1 cfs (see Appendix, Hydrologic Model Output). This is well within the modeling error and so was not deemed to be a valid option.

To prevent debris from entering the outlet pipe, a sloping trash rack will be installed on top of the headwall. A prefabricated, tented rack was selected with raised sides and 60% open area that will be bolted to the outlet structure.

A new maintenance access road will be constructed from the existing access road near the forebay spillway along the toe slope (above the elevation of the wetland) to the micro-pool. The access road will be 10 feet wide on a level grade

The access road will be surfaced with a 6 inch depth of aggregate base course (CDOT Class 6 material) to stabilize the road.

It was found that even with improvements to the detention basin primary outlet that it will be necessary to increase the storage volume within the detention basin. The existing pond has a volume of 68.9 ac-ft at the spillway crest. Routing (using the HEC-HMS model) through the existing pond for the 100-year storm requires a volume of 72.8 ac-ft, which is equivalent to stage of 6882.1 (0.6 feet above the existing emergency spillway crest). [Note: The flood routing for Addendums No. 2 and No. 3 was accomplished using the older hydrologic analysis program, HEC-1 (USACE, 1990). In this computer program the routing time step is set manually. The hydrologic analysis for the current retrofit design used HEC-HMS, which has replaced HEC-1. In HEC-HMS, the computational time step is computed by the program to meet all tolerances. Addendum No. 2 used a 3.0 minute time step, while HEC-HMS finds this time step to be too long and computed a shorter time step of about 2.0 minutes. The shorter time step results in a more accurate routing computation and a larger volume of runoff stored in the pond. We estimate that continuity error in the original computation to be about 2.8% of the total inflow to the pond (209.3 ac-ft) based on the HEC-HMS analysis. This is a theoretical error and within the operational uncertainty of the detention pond.]

Routing of the 100-year storm with the primary outlet modified for water quality (with an initial stage corresponding to 0.5 WQCV) requires 81.3 ac-ft of flood storage. Raising the spillway approximately 1.5 feet provides 78.8 ac-ft of storage volume. The maximum 100-year stage is 6883.3 or 0.3 feet above the spillway elevation. In theory, this will result in a spill of 85 cfs over the spillway (similar to the estimated 84 cfs spill from the existing pond). The spill would be brief, lasting 36 minutes and releasing 3.3 ac-ft.

To accomplish the spillway raise, the existing concrete cutoff wall will be extended over a length of 190 feet by 1’-6”. The existing riprap protection will be removed and approximately 380 cubic yards of embankment added to the spillway. The riprap protection will then be replaced to match the new elevation

of the cutoff wall. The raised spillway will be 3 feet below the elevation of the basin embankment. If the primary outlet were totally plugged, our analysis shows that the 100-year storm flow could pass over the spillway with 2 feet of freeboard.

B. Specific Details

Design exhibits for the RDF-C water quality retrofit are provided in the Appendix of this report. The design is presented on four plan sheets, which are part of the plan set for the Powers Boulevard Bridges Project. Sheet 181 shows the planned grading for the pond access road. The design shows regrading of the existing access road to the forebay with the new access road extending west along the south perimeter of the pond to the outlet. The detail for extending the existing emergency spillway cutoff wall is also shown on this sheet.

Sheet 182 shows the plan and elevation of the modified outlet. A work pad is provided at the outlet on the east side. To accommodate the embankment slope of the work pad at the micro-pool, the east wall of the micro-pool is extended and sloped to match the embankment slope of the pad. Other components of the outlet shown on this sheet include: the location of the orifice plate and water quality screen, the over flow trash rack, and a perimeter fence around the micro-pool. The perimeter of the micro-pool is fenced with a standard 6' high chain link fence. Access to the micro-poll is provided by a gate on the west side. A two foot concrete walkway around the perimeter of the micro-pool will provide a firm footing for removing debris from the perimeter fence.

Sheet 183 shows reinforcement and related structural details for the vault modifications and new micro-pool.

Sheet 184 shows fabrication details for the orifice plate and trash racks. The orifice place will be mounted on the exterior of the outlet vault and surrounded by bar-grate trash rack. In accordance with UDFCD recommendations for a trash rack of this size, Amico-Klempt grade model 19-W-4 with 4" cross bar spacing is specified. The grate is configured to provide a vertical orientation of the bars, which facilitates cleaning. Access to the orifice place is accomplished by

unbolting the bar grate from its vertical supports. A prefabricated overflow trash rack is specified. The Storm Rax structure is distributed by Contech and is manufactured with structural plastic (see product information in the Appendix).

C. Grading and Erosion Control

It is estimated that the retrofit construction will disturb 0.34 acres and require the placement of approximately 380 cubic yards of fill. Construction erosion control BMPs will be implemented at the site. A grading and erosion control permit will be obtained from the City of Colorado Springs for the retrofit.

D. Other Government Agency Requirements

The primary outlet for RDF-C is adjacent to a jurisdictional wetland. The area near the outlet will be disturbed in order to construct the retrofit. A Nationwide Permit No 43 Section 404 permit has been obtained for construction work in this wetland area from the U.S. Army Corps of Engineers (see Appendix: Letter from Van Truan to George Cotton, February 1, 2012).

VI. DRAINAGE FACILITY MAINTENANCE

CDOT and the City of Colorado Springs have agreed to jointly develop a maintenance plan for the outlet structure (see Appendix: Letter from Robin Kidder to Mark Andrew, February 11, 2011).

VII. REFERENCES

1. City of Colorado Springs / County of El Paso, 1991, “Drainage Criteria Manual”
2. JR Engineering, 1998, “Amendment No. 2 to Pine Creek Drainage Basin Planning Study and Master Development Drainage Plan for Pine Creek Subdivision (portion contributing to Pine Creek)”, prepared for LP47, LLC
3. JR Engineering, 2002, “Amendment No. 3 to Pine Creek Drainage Basin Planning Study and Master Development Drainage Plan for Pine Creek Subdivision (portion contributing to Pine Creek)” , prepared for LP47, LLC
4. Urban Drainage and Flood Control District, 2011, “Urban Storm Drainage Criteria Manual – Volume 3” Section T-5, Extended Detention Basin (EDB) and Section T-12, Outlet Structures
5. Urban Drainage and Flood Control District, 2011, “UD-BMP Workbook” version 3.01
6. USACE, Hydrologic Engineering Center, 2000, “Hydrologic Modeling System, HEC-HMS, Technical Reference Manual”
7. USACE, Hydrologic Engineering Center, 1990, “HEC-1, Flood Hydrographic Package User’s Manual”

APPENDIX

TABLE OF CONTENTS

Vicinity Map 11

Pine Creek RDF-C Site Photos 12

Design Plans for Pine Creek RDF-C Water Quality Retrofit 14

Storm Rax Overflow Trash Rack 18

Water Quality Capture Volume (UDFCD EDB Worksheet) 22

Comparison of Addendum No. 2 and No. 3 Hydrology 26

Hydrologic Model Input Data 27

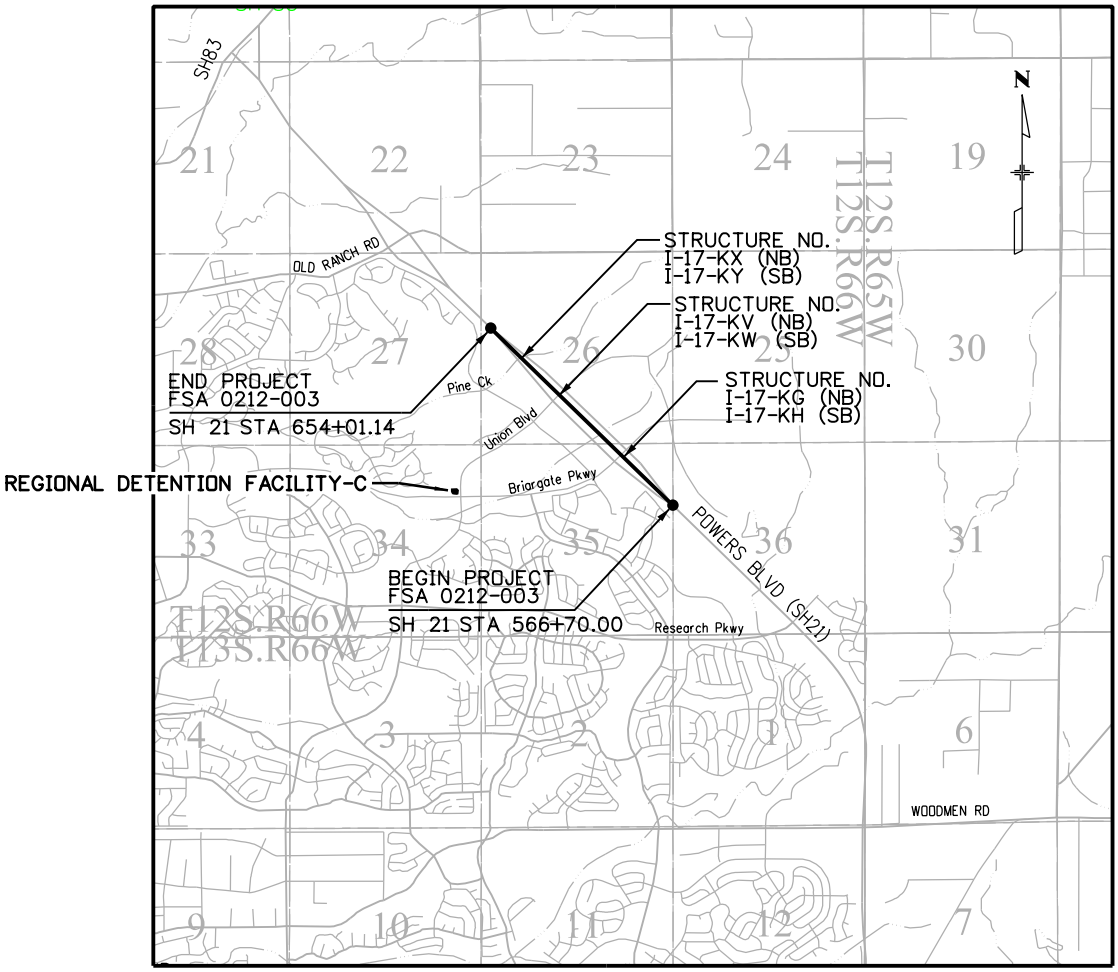
- Sub-basin Parameters / Fully Developed Conditions
  - Addendum No. 2 27
  - Addendum No. 3 28
- Type 2A Storm Pattern
  - Tabulation 29
  - Graph 30
- Outlet Rating Curve
  - Option #1 31
  - Option #2 32
- Pine Creek HEC-HMS Schematic 33

Hydrologic Model Output 34

Nationwide 404 Permit 35

Letter on Briargate and Union Detention Pond (Robin Kidder to Mark Andrew, February 11, 2011) 38

Information from Other Reports and As-Built Plans 40



PROJECT LOCATION MAP

TSIOUVARAS SIMMONS HOLDERNESS CONSULTING ENGINEERS	POWERS BOULEVARD PROJECT LOCATION MAP	EXHIBIT 1

Photo 1. Looking west from main inlet culvert to RDF-C showing existing constructed wetland along south side of pond (left edge of pond bottom). Pond forebay is in foreground below culvert apron. Outlet is in the distance in the southwest corner (top left area of photo).

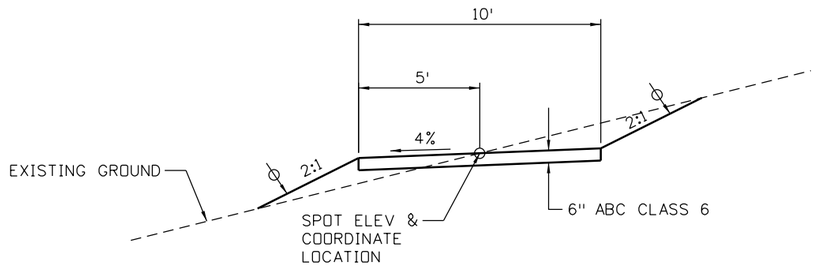
Photo2. Existing pond outlet with steel trash rack. Outlet consists of a 48” RCP with headwall and wingwalls. Constructed wetland is in the background and new wetland has established near the pond outlet.

TSIOUVARAS SIMMONS HOLDERNESS CONSULTING ENGINEERS	POWERS BOULEVARD	EXHIBIT 2
	RDF-C SITE PHOTOS	

Photo 3. Looking east from RDF-C pond embankment showing existing constructed wetland along south side of pond (right half of pond bottom). Additional wetlands have established at other culvert inlets and groundwater seep points along the pond perimeter.

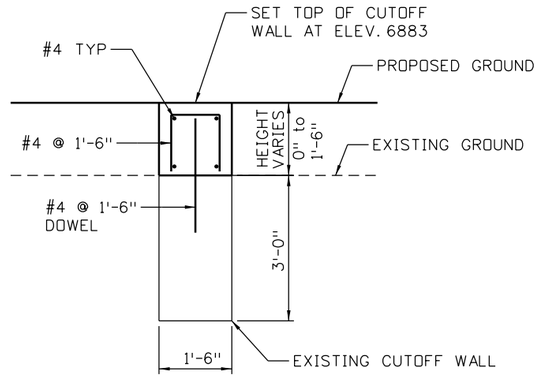
Photo 4. Looking south to pond outlet and spillway (highlighted in yellow) from RDF-C pond embankment.

TSIOUVARAS SIMMONS HOLDERNESS CONSULTING ENGINEERS	POWERS BOULEVARD	EXHIBIT 2
	RDF-C SITE PHOTOS	



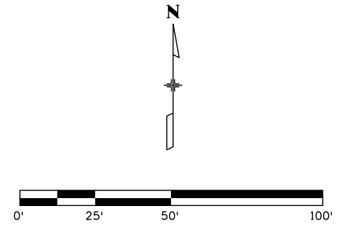
MIN 4" TOPSOIL AND
NATIVE SEEDING

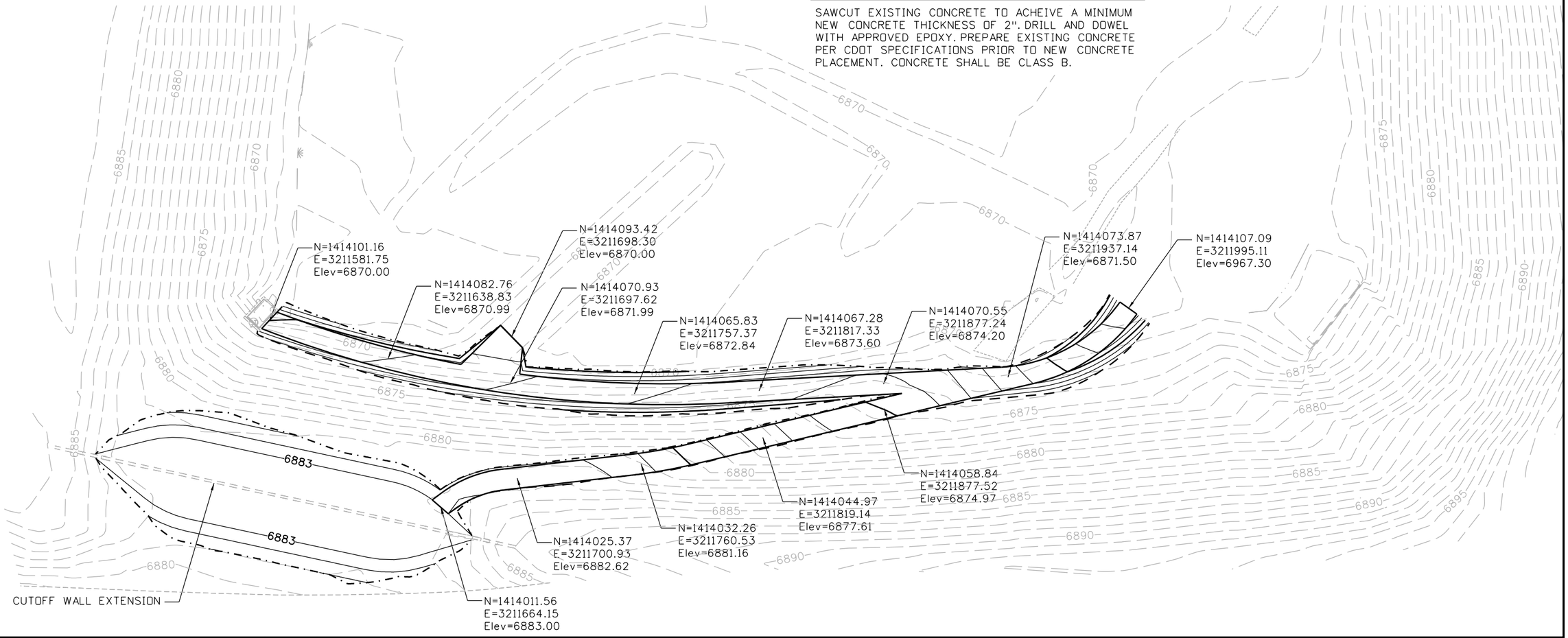
ACCESS ROAD TYPICAL SECTION



EXTENSION TO EXISTING CUTOFF WALL

SAWCUT EXISTING CONCRETE TO ACHEIVE A MINIMUM NEW CONCRETE THICKNESS OF 2". DRILL AND DOWEL WITH APPROVED EPOXY. PREPARE EXISTING CONCRETE PER CDOT SPECIFICATIONS PRIOR TO NEW CONCRETE PLACEMENT. CONCRETE SHALL BE CLASS B.





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Horiz. Scale: 1:50 Vert. Scale: As Noted				Region 2 MSA	Revised:
TSIOUVARAS SIMMONS HOLDERNESS					Void:

POWERS BLVD - BRIARGATE TO PINE CREEK			Project No./Code
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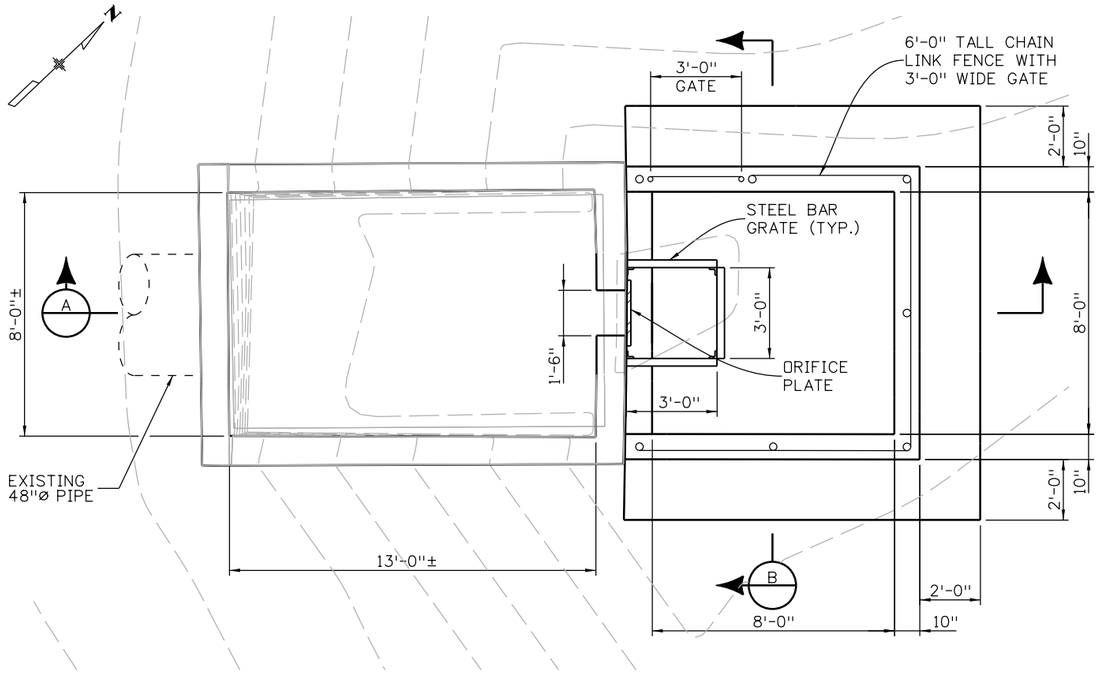
Detailer: RDH			
Sheet Subset: DRAIN	Subset Sheets: 17 of 20		Sheet Number 181



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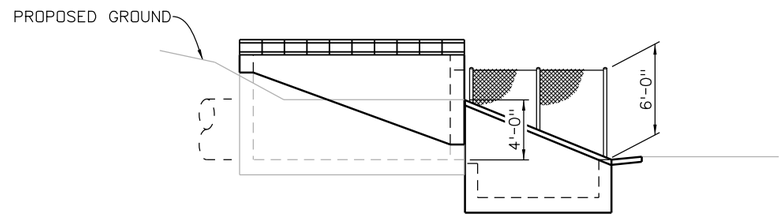

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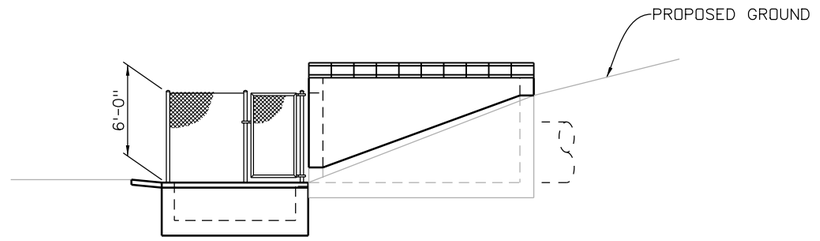

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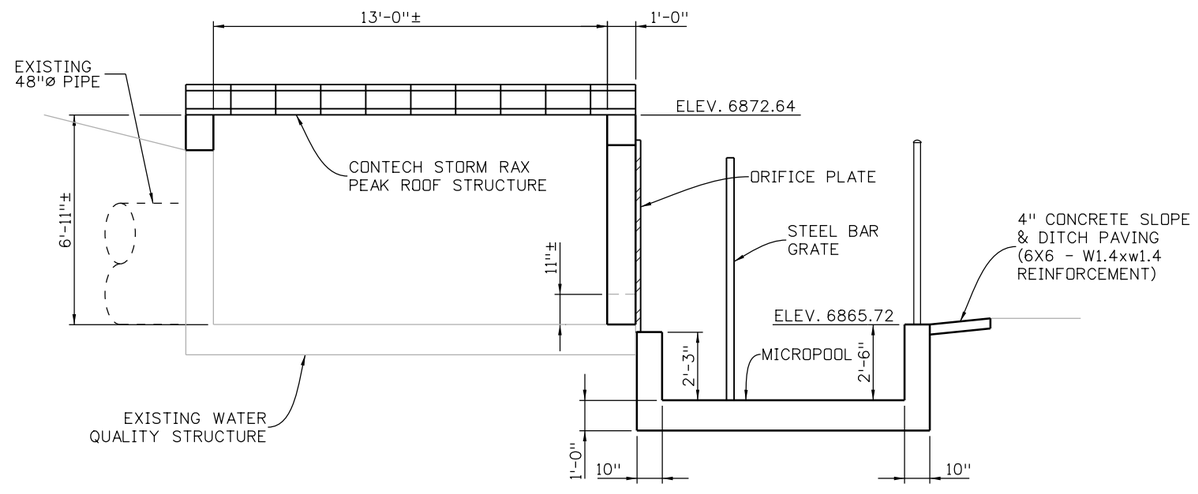

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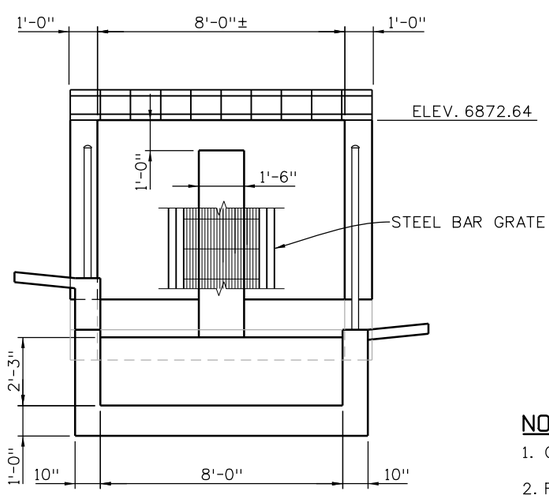

SECTION B

NOTES:

1. CONCRETE SHALL BE CLASS B.
2. FENCE SHALL BE PER CDOT M-607-2.
3. SEE NEXT RETROFIT 2 AND RETROFIT 3 SHEETS FOR REINFORCING AND DETAILS.

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TSIOUVARAS SIMMONS HOLDERNESS					

As Constructed	POWERS BLVD - BRIARGATE TO PINE CREEK POND C WATER QUALITY OUTLET RETROFIT 1			Project No./Code
No Revisions:				FSA 0212-003
Revised:	Designer: RA	Structure Numbers		18095
Void:	Detailer: MW			
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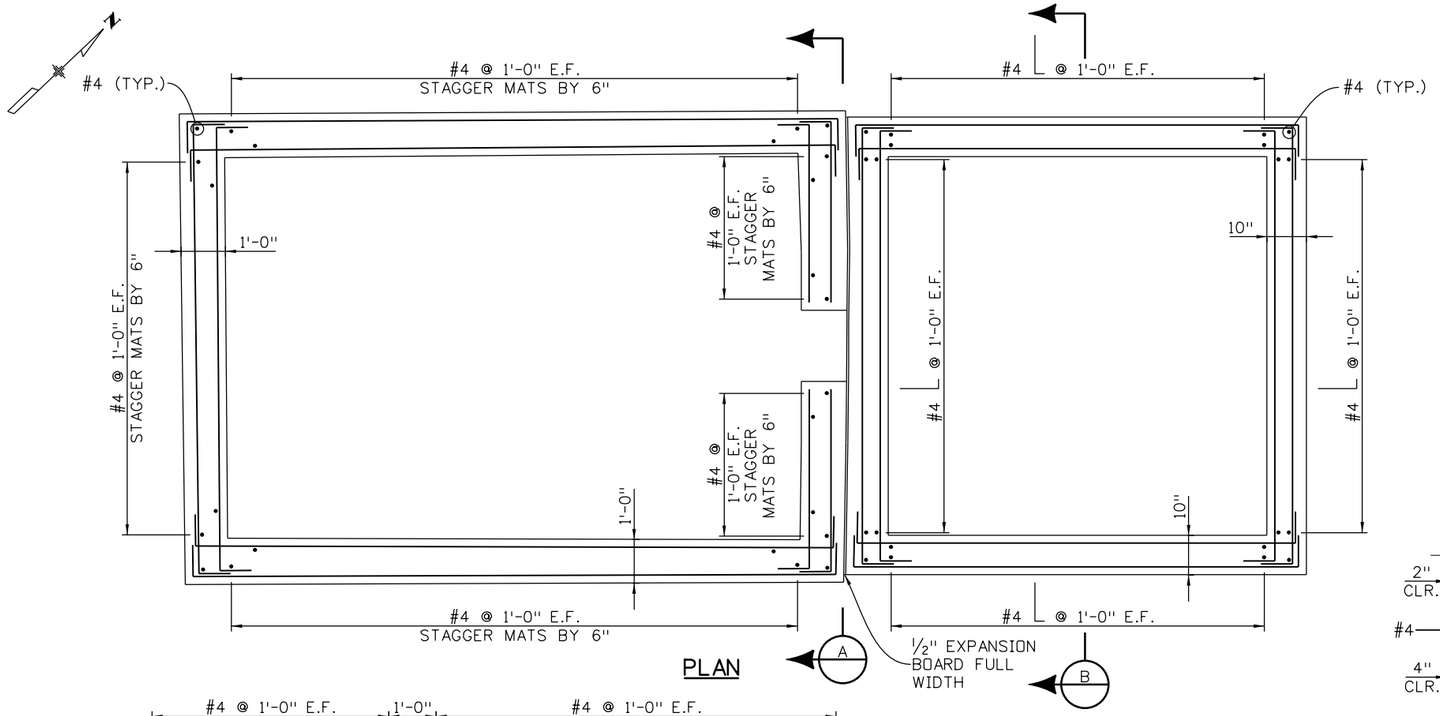

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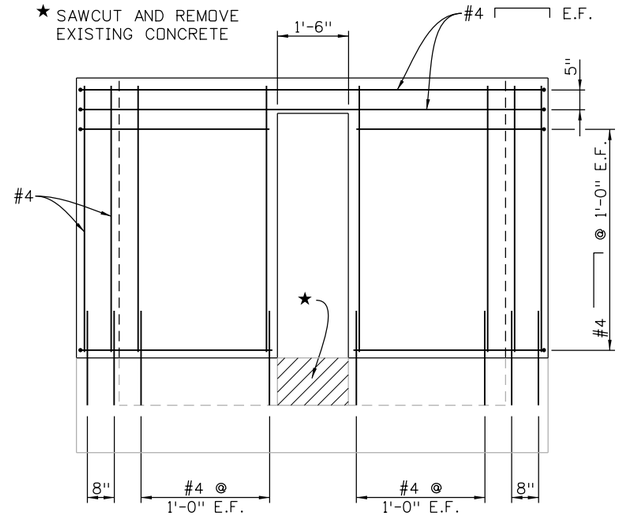

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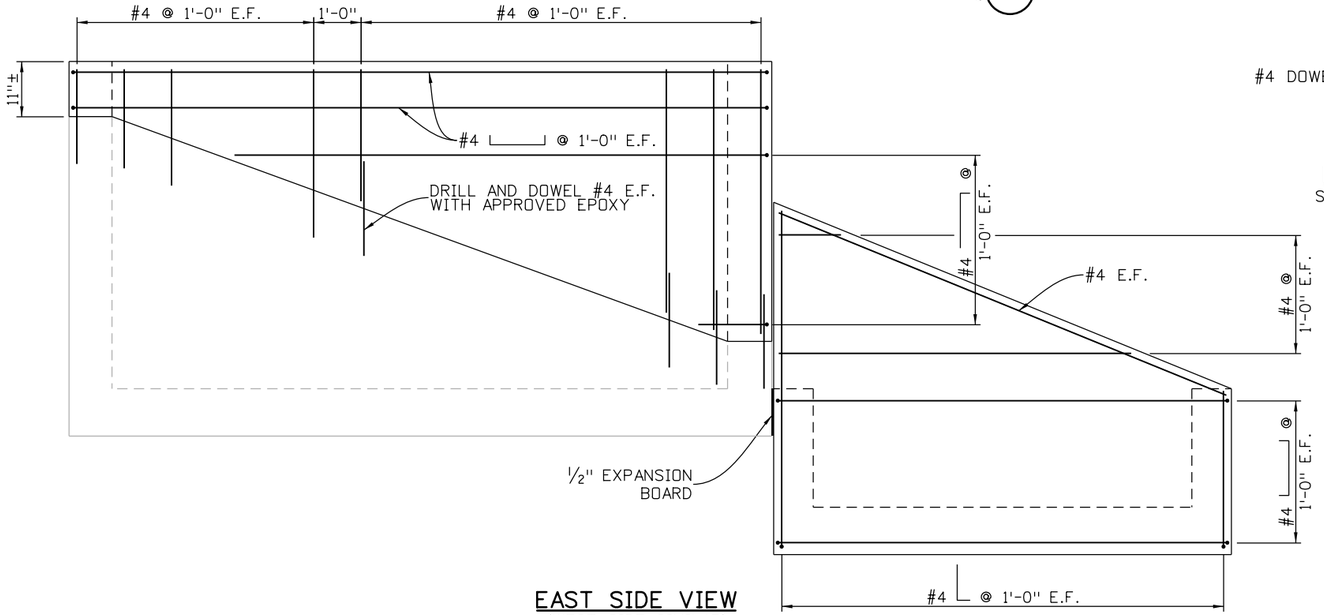
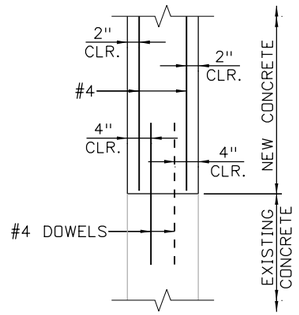
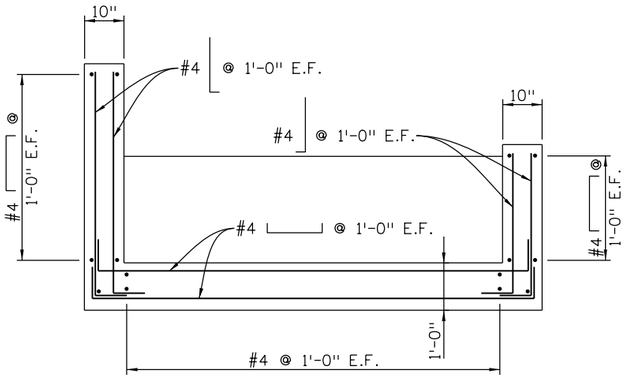


EAST SIDE VIEW
(WEST SIDE SIMILAR)



DOWEL DETAIL
STAGGER INSIDE FACE AND OUTSIDE FACE DOWELS BY 6"



SECTION B

NOTES:

1. DRILL AND DOWEL WITH APPROVED EPOXY TO OBTAIN FULL TENSILE STRENGTH OF THE BAR.
2. PREPARE EXISTING CONCRETE PER CDOT SPECIFICATIONS PRIOR TO NEW CONCRETE PLACEMENT.
3. ALL REINFORCING TO BE GRADE 60.

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TSIOUVARAS SIMMONS HOLDERNESS					Void:

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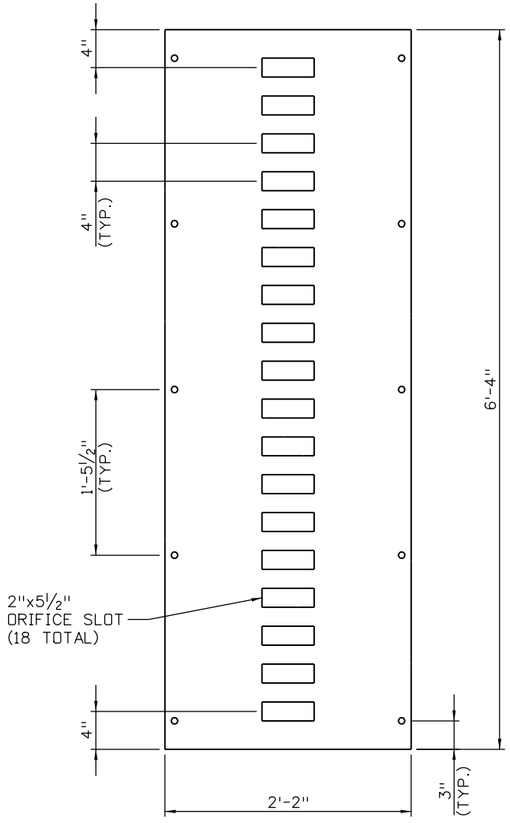
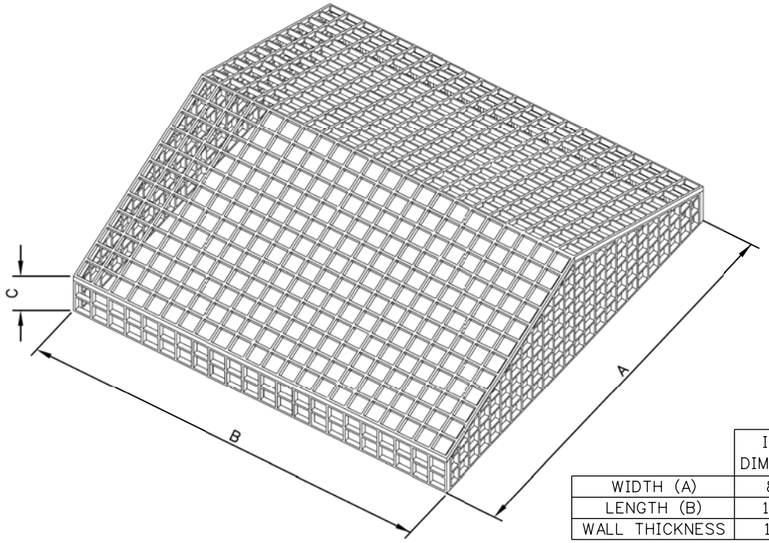
Detailer: MW			
Sheet Subset: DRAIN	Subset Sheets: 19 of 20		Sheet Number 183

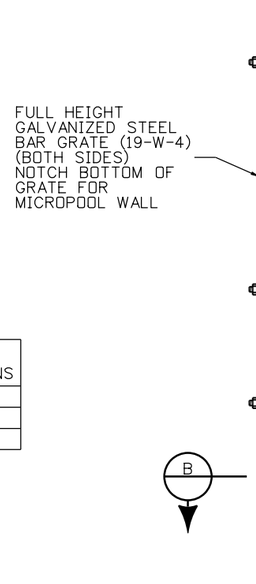


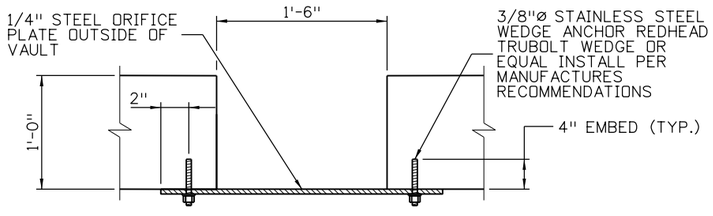
ORIFICE PLATE DETAIL
NTS



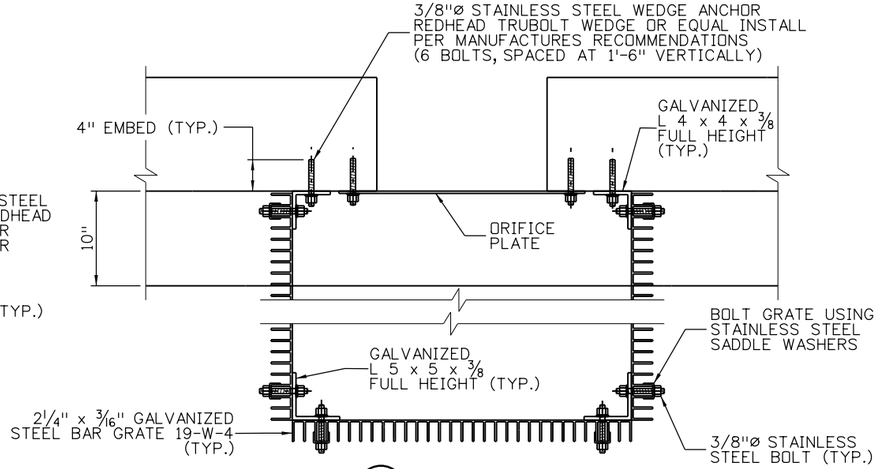
	INSIDE DIMENSIONS
WIDTH (A)	8 FT.
LENGTH (B)	13 FT.
WALL THICKNESS	12 IN.

STORM RAX PEAK ROOF STRUCTURE
NTS
(CONNECT TO OUTLET PER MANUFACTURER'S RECOMMENDATIONS)

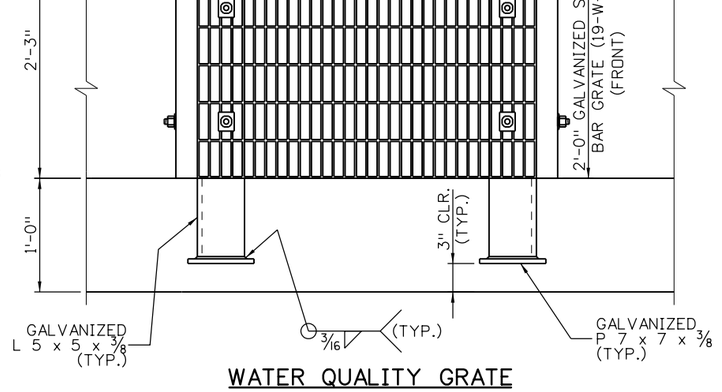




SECTION B ORIFICE PLATE DETAIL
NTS



SECTION B WATER QUALITY GRATE
NTS



WATER QUALITY GRATE
NTS
(REBAR NOT SHOWN FOR CLARITY)

NOTES:

1. ALL STRUCTURAL STEEL SHALL BE GRADE 50 AASHTO M270 (AOTM A709).
2. ALL BOLTS SHALL BE HIGH STRENGTH BOLTS. BOLT, NUTS AND WASHERS SHALL CONFORM TO CDOT STANDARD SPEC. 509.08 HIGH STRENGTH BOLTS.
3. ALL STEEL ELEMENTS SHALL CONFORM TO CDOT SIECIFICATIONS, SECTION 509.
4. ALL STEEL SHALL BE GALVANIZED PER CDOT SPECIFICATIONS, SECTION 509.
5. ALL WELDING SHALL CONFORM TO CDOT SPECIFICATIONS, SECTION 509.

90% REVIEW JANUARY 2012

michael.welch 4:20:43 PM P:\1105209 - PowersDB\18095\Hydraulics\Drawings\18095_Hydraulic_Pond_C_Inlet_3.dgn

Print Date: 1/26/2012	Sheet Revisions			Colorado Department of Transportation
File Name: 18095_Hydraulic_Pond_C_Inlet_3.dgn	Date:	Comments	Init.	1480 Quail Lake Loop, Suite A Colorado Springs, CO 80906 Phone: 719-634-2323 FAX: 719-227-3298
Horiz. Scale: 1:1 Vert. Scale: As Noted				Region 2 MSA
TSIOUVARAS SIMMONS HOLDERNESS				

As Constructed	POWERS BLVD - BRIARGATE TO PINE CREEK POND C WATER QUALITY OUTLET RETROFIT 3		Project No./Code
No Revisions:			FSA 0212-003
Revised:	Designer: RA / Detailer: MW	Structure Numbers	18095
Void:	Sheet Subset: DRAIN	Subset Sheets: 20 of 20	Sheet Number 184

CONTECH®
CONSTRUCTION PRODUCTS INC.

Structural HDPE Products for Water Screening

StormRax™

Knowledge. Solutions. Service.

Key Advantages

Availability

CONTECH® Construction Products Inc. is pleased to introduce StormRax,™ its line of structural plastic trash racks and debris cages for stormwater management basins and pond structures from Plastic Solutions Inc. In addition to the full line of standard sizes, we can also customize to fit your specific requirements.

StormRax trash racks are available in numerous sizes and shapes to accommodate nearly every type of application.

Strength & Durability

Structural plastic has a cellular core surrounded by integral skins forming a totally integrated structure. Structural molded parts made from HDPE and fiberglass have a high strength-to-weight ratio and have 3 to 4 times greater rigidity than solid parts of the same material of equal weight.

Racks are designed to withstand the conditions of pond structures - rough handling, high/low temperatures and long term weather exposure. Structural plastic has replaced wood, concrete, solid plastics and metals in a variety of applications.

Quality Alternative

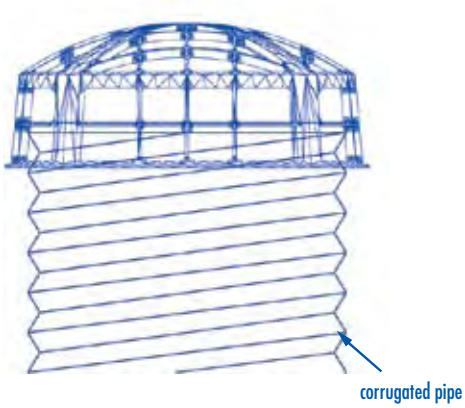
Structural plastic racks are a great alternative to painted and galvanized steel racks for use in stormwater management ponds and general water screening. They also provide a structurally sound product with a long lasting quality appearance.

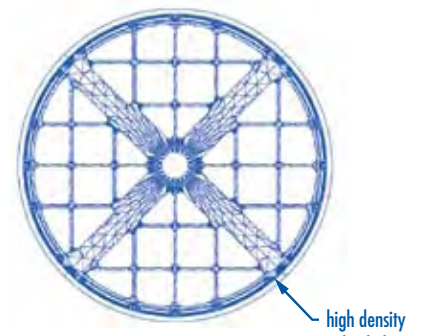
With structural plastic, you can take advantage of the many benefits such as:

- Lighter Weight
- Elimination of Corrosion
- Design Flexibility
- Greater Part Stiffness and Stability
- Chemical Resistance
- Installation Savings

Applications and Options

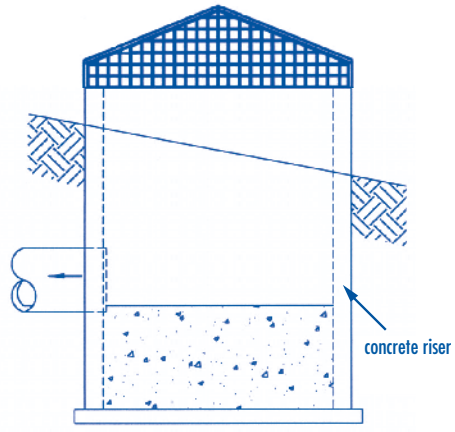
Round Series

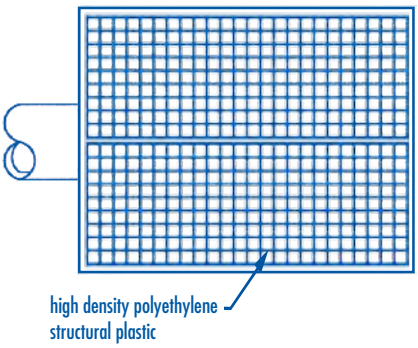




Top View

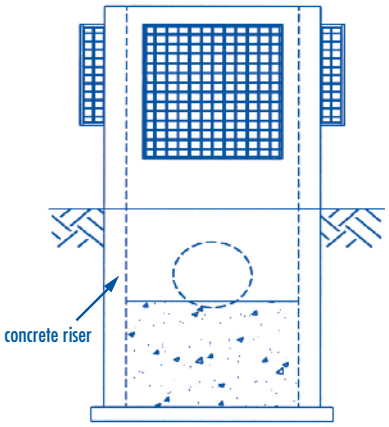
Peak Series

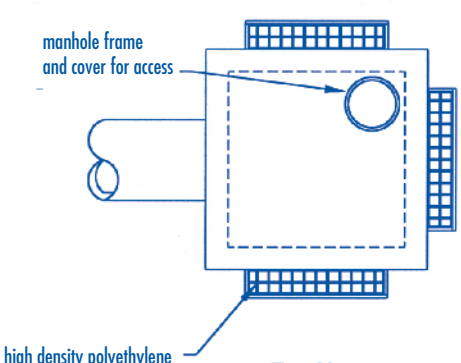




Top View

Flat Series





Top View

StormRax pyramid racks are available with an anti-vortex device and racks can be mounted on concrete structures, plastic and metal pipe.

New Modular Design - Improved 'Round Series'

Our newest trash rack evolution is constructed of Structural Foam Molded High Density Polyethylene, a strong and lightweight replacement for steel that has proven to be a durable and economical alternative.

CONTECH Construction Products Inc. provides site solutions for the civil engineering industry. CONTECH's portfolio includes bridges, drainage, retaining walls, sanitary sewer, stormwater, erosion control and soil stabilization products.

For more information about the products in this brochure, or to reach a sales representative in your region, call CONTECH's Corporate Office at 513-645-7000 or call toll free at 800-338-1122.

Visit our web site: www.contech-cpi.com

stormraxbro 1/09

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**George Cotton**
Company:	**TSH Engineering**
Date:	**February 6, 2012**
Project:	**Powers Blvd (SH 21) Bridges**
Location:	**RDF "C" Pine Creek South Fork**

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 57.2 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.572
C) Contributing Watershed Area	Area = 658.400 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.43 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: (•) Water Quality Capture Volume (WQCV); ( ) Excess Urban Runoff Volume (EURV)
F) Design Volume (1.2 WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area * 1.2)$)	V_{DESIGN} = 14.953 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$)	$V_{DESIGN\ OTHER}$ = 14.953 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$ = ac-ft
I) Predominant Watershed NRCS Soil Group	Choose One: ( ) A; (•) B; ( ) C / D
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = (0.1878i - 0.0104) * Area$ For HSG B: $EURV_B = (0.1178i - 0.0042) * Area$ For HSG C/D: $EURV_{C/D} = (0.1043i - 0.0031) * Area$	EURV = ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	One main inlet with SAF energy dissipator Two other storm drain inlets with riprap aprons

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	George Cotton
Company:	TSH Engineering
Date:	February 6, 2012
Project:	Powers Blvd (SH 21) Bridges
Location:	RDF "C" Pine Creek South Fork

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV) — V_{FMIN} = 0.374 ac-ft

B) Actual Forebay Volume — V_F = 0.510 ac-ft

C) Forebay Depth (D_F = 30 inch maximum) — D_F = 1.6 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 1840.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 36.80 cfs

E) Forebay Discharge Design

Choose One:
- ○ Berm With Pipe
- ◉ Wall with Rect. Notch
- ○ Wall with V-Notch Weir

F) Discharge Pipe Size (minimum 8-inches) — Calculated D_P = in

G) Rectangular Notch Width — Calculated W_N = 2724.1 in

6. Trickle Channel

A) Type of Trickle Channel

Choose One:
- ○ Concrete
- ◉ Soft Bottom

PROVIDE A CONSISTENT LONGITUDINAL SLOPE FROM FOREBAY TO MICROPOOL WITH NO MEANDERING. RIPRAP AND SOIL RIPRAP LINED CHANNELS ARE NOT RECOMMENDED.
MINIMUM DEPTH OF 1.5 FEET

F) Slope of Trickle Channel — S = 0.0063 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 64 sq ft

C) Outlet Type

Choose One:
- ◉ Orifice Plate
- ○ Other (Describe):

D) Depth of Design Volume (EURV or 1.2 WQCV) Based on the Design Concept Chosen Under 1.E. — H = 6.25 feet

E) Volume to Drain Over Prescribed Time — WQCV = 12.461 ac-ft

F) Drain Time (Min T_D for WQCV= 40 hours; Max T_D for EURV= 72 hours) — T_D = 40 hours

G) Recommended Maximum Outlet Area per Row, (A_o) — A_o = 9.55 square inches

H) Orifice Dimensions:
- i) Circular Orifice Diameter or — $D_{orifice}$ = inches
- ii) Width of 2" High Rectangular Orifice — $W_{orifice}$ = 4.78 inches

I) Number of Columns — n_c = 1 number

J) Actual Design Outlet Area per Row (A_o) — A_o = 9.55 square inches

K) Number of Rows (nr) — n_r = 18 number

L) Total Outlet Area (A_{ot}) — A_{ot} = 179.3 square inches

M) Depth of WQCV (H_{WQCV}) (Estimate using actual stage-area-volume relationship and V_{WQCV}) — H_{WQCV} = feet

N) Ensure Minimum 40 Hour Drain Time for WQCV — $T_{D\,WQCV}$ = hours

Design Procedure Form: Extended Detention Basin (EDB)

Designer: George Cotton
Company: TSH Engineering
Date: February 6, 2012
Project: Powers Blvd (SH 21) Bridges
Location: RDF "C" Pine Creek South Fork

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches): D_{IS} = 12.0 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV): V_{IS} = 1,628.4 cu ft

C) Initial Surcharge Provided Above Micropool: V_s = 64.0 cu ft **INCREASE DEPTH OF INITIAL SURCHARGE OR SURFACE AREA OF MICROPOOL**

9. Trash Rack

A) Type of Water Quality Orifice Used — Choose One
- ○ Circular (up to 2" diameter)
- ◉ Rectangular (2" high)

B) Water Quality Screen Open Area: $A_t = 38.5*(e^{-0.095D})*A_{ot}$: A_t = 5,707 square inches

C) For 2", or Smaller, **Circular Opening** (See Fact Sheet T-12):

i) Width of Water Quality Screen and Concrete Opening ($W_{opening}$): $W_{opening}$ = inches

ii) Height of Water Quality Screen (H_{TR}): H_{TR} = inches

iii) Type of Screen, Describe if "Other" — Choose One
- ○ S.S. Well Screen with 60% Open Area*
- ○ Other (Describe):

D) For 2" High **Rectangular Opening**:

i) Width of Rectangular Opening ($W_{orifice}$): W = 4.78 inches

ii) Width of Water Quality Screen Opening ($W_{opening}$): $W_{opening}$ = 6.0 ft

iii) Height of Water Quality Screen (H_{TR}): H_{TR} = 8.6 ft

iv) Type of Screen, Describe if "Other" — Choose One
- ◉ Aluminum Amico-Klemp SR Series (or equal)
- ○ Other (Describe):

v) Cross-bar Spacing: 4.0 inches

vi) Minimum Bearing Bar Size: 2-1/4 inch x 3/16 inch

Design Procedure Form: Extended Detention Basin (EDB)

Designer: George Cotton
Company: TSH Engineering
Date: February 6, 2012
Project: Powers Blvd (SH 21) Bridges
Location: RDF "C" Pine Creek South Fork

10. Overflow Embankment	
A) Describe embankment protection for 100-year and greater overtopping:	175 foot broad crested weir with riprap revetment
B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z_E = 10.00 ft / ft
11. Vegetation	Choose One: ○ Irrigated ◉ Not Irrigated
12. Access	
A) Describe Sediment Removal Procedures	10' wide access road to micropool Access road to forebay currently exists.

Notes:

Comparison of Addendum No. 2 and No. 3 Hydrology

The planning for the Pine Creek Drainage has progressed through three phases. The original planning study was completed by Obering, Worth and Associates in 1988. This plan was updated in 1998 by JR Engineering and again in 2002. The design of Pine Creek Regional Detention Facility "C" was completed in 1998 and constructed in the same year. In 2003, the pond was retrofit to include a constructed wetland.

Addendum No. 2 identified ten (10) sub-basins that where tributary to Pond "C" with a total drainage area of 664.4 acres (1.038 sq. mi.). The weighted SCS curve number for the basin was 87.2 and the impervious fraction of the basin was 67.2%.

Addendum No. 3 refined the watershed and has 20 sub-basins that are tributary to Pond "C" with a total drainage area of 658.4 acres (1.029 sq. mi.). The weighted SCS curve number for the basin decreases slightly to 84.6 and the impervious fraction of the basin to 57.2%.

Despite the additional detail in hydrologic modeling, the inflow to Pond "C" is similar for the two Addendums. The Addendum No. 2 inflow peak was 1840 cfs, which is nearly identical to the Addendum No. 3 inflow peak of 1825 cfs. Peak outflows are essentially the same with Addendum No. 2 releasing at a peak rate of 227 cfs and Addendum No. 3 at 228 cfs. Peak stage and maximum storage volume are 77.4 feet and 69 ac-ft, respectively for Addendum No. 2, and 77.6 feet and 72 ac-ft, respectively for Addendum No. 3.

Given the similarity in hydrology of both models, it was decided that it was acceptable and slightly conservative to base the pond routing on the simpler Addendum No. 2 model. The design water quality volume, however was based on updated impervious data for the watershed provided in Addendum No. 3.

Sub-Basin Parameters / Fully Developed Conditions

from JR Engineering, 1998, "Amendment No. 2"
Appendix - Hydrologic Model Input Calculation

Sub-Basin Label	Total Area acres	Total Area s.m.	Weighted CN	Weighted Percent Impervious	Adjusted CN (1)	Total Lag (min)
PS1	96.2	0.150	78.1	44.9	78.4	12.30
PS2	98.3	0.154	87.4	68.4	85.2	11.29
PS3	103.6	0.162	85.9	68.9	84.8	12.30
PS4	34.8	0.054	92.3	83.6	93.2	8.06
PS5	42.0	0.066	95.6	93.7	98.0	8.11
PS6	48.0	0.075	82.8	59.0	86.5	7.36
PS7	57.0	0.089	93.3	86.8	96.3	7.16
PS8	78.3	0.122	81.6	58.4	86.0	7.63
PS9	81.8	0.128	92.9	85.7	94.5	7.81
PS10	24.4	0.038	72.9	20.5	72.9	9.59
PS11	35.7	0.056	79.1	48.6	80.3	10.35
PS12	98.0	0.153	70.1	10.0	68.5	14.00
PS13	41.9	0.065	73.9	25.0	76.1	8.93
At RDF-C	664.4	1.038		67.6%		

Notes: (1) CNs were adjusted by JRE to match rational method calculations

Sub-Basin Parameters / Fully Developed Conditions

from JR Engineering, 2002, "Amendment No. 3"

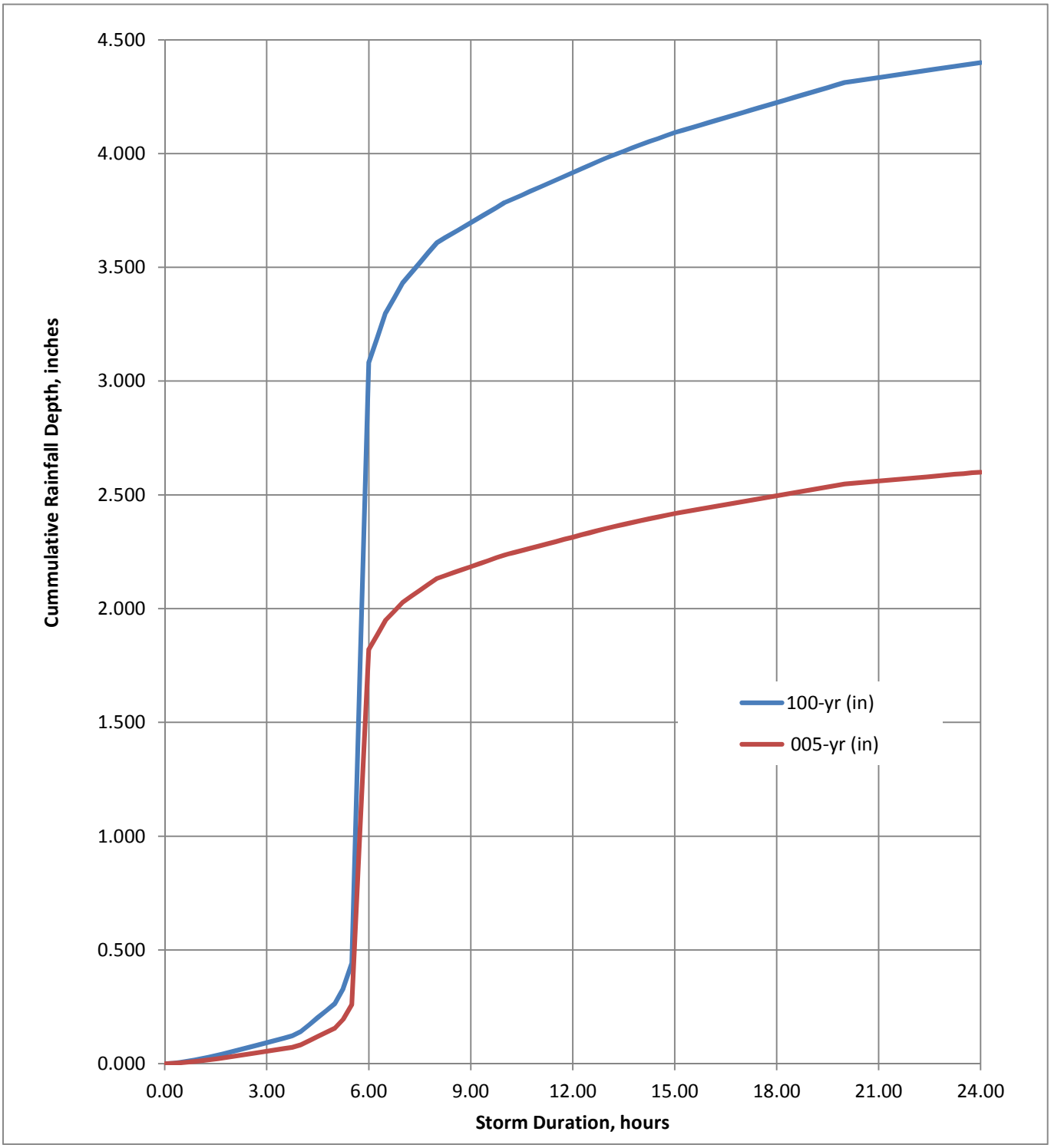
Map 1. Fully Developed Conditions

Sub-Basin Label	Total Area acres	Total Area s.m.	Weighted CN	Weighted Percent Impervious	Adjusted CN (1)	Total Lag (min)
PSE01	21.6	0.034	70.5	30.6	74.5	0.197
PSE02	18.3	0.029	74.9	36.3	77.0	0.169
PSE03	49.9	0.078	79.3	45.7	79.6	0.171
PSE04	47.7	0.075	71.9	32.2	75.6	0.192
PSE05	30.2	0.047	74.2	35.0	76.5	0.181
PSE06	34.6	0.054	78.4	42.1	78.4	0.189
PSE07	37.0	0.058	96.0	90.0	96.5	0.125
PSE08	37.3	0.058	78.8	46.5	80.0	0.165
PSE09	26.5	0.041	90.7	78.1	97.5	0.107
PSE10	22.8	0.036	83.7	60.1	83.2	0.175
PSE11	20.6	0.032	80.0	50.0	80.0	0.210
PS02	15.2	0.024	88.4	73.5	88.4	0.150
PS03	45.1	0.070	92.6	85.1	97.5	0.117
PS04	38.2	0.060	78.7	42.9	78.5	0.178
PS05	19.5	0.030	92.8	85.4	96.0	0.130
PS06	34.0	0.053	93.8	89.4	97.5	0.126
PS07	20.1	0.031	92.8	85.2	97.5	0.118
PS08	71.4	0.112	84.1	58.8	83.0	0.174
PS09	34.8	0.054	87.6	70.9	90.0	0.125
PS10	33.6	0.053	73.2	23.9	73.4	0.177
PS11	34.7	0.054	78.5	47.1	80.3	0.172
PS12	98.0	0.153	70.0	9.9	69.0	0.233
PS13	41.9	0.065	73.9	25.0	74.3	0.149
At RDF-C	658.4	1.029		57.2%		

Type IIA Storm Pattern (15 m interval)

Pine Creek Drainage Basin Colorado Springs, CO

Time (h)	Storm Distribution Type IIA Distri.	100-yr (in)	005-yr (in)	Time (h)	Storm Distribution (cont.) Type IIA Distri.	100-yr (in)	005-yr (in)
0.00	0.0000	0.000	0.000	12.00	0.89	3.92	2.31
0.25	0.0005	0.002	0.001	12.25	0.89	3.93	2.32
0.50	0.0015	0.007	0.004	12.50	0.90	3.95	2.33
0.75	0.0030	0.013	0.008	12.75	0.90	3.97	2.34
1.00	0.0045	0.020	0.012	13.00	0.91	3.98	2.35
1.25	0.0060	0.026	0.016	13.25	0.91	4.00	2.36
1.50	0.0080	0.035	0.021	13.50	0.91	4.01	2.37
1.75	0.0100	0.044	0.026	13.75	0.91	4.03	2.38
2.00	0.0120	0.053	0.031	14.00	0.92	4.04	2.39
2.25	0.0143	0.063	0.037	14.25	0.92	4.05	2.39
2.50	0.0165	0.073	0.043	14.50	0.92	4.07	2.40
2.75	0.0188	0.083	0.049	14.75	0.93	4.08	2.41
3.00	0.0210	0.092	0.055	15.00	0.93	4.09	2.42
3.25	0.0233	0.103	0.061	15.25	0.93	4.10	2.42
3.50	0.0255	0.112	0.066	15.50	0.94	4.11	2.43
3.75	0.0278	0.122	0.072	15.75	0.94	4.13	2.44
4.00	0.0320	0.141	0.083	16.00	0.94	4.14	2.44
4.25	0.0390	0.172	0.101	16.25	0.94	4.15	2.45
4.50	0.0460	0.202	0.120	16.50	0.95	4.16	2.46
4.75	0.0530	0.233	0.138	16.75	0.95	4.17	2.46
5.00	0.0600	0.264	0.156	17.00	0.95	4.18	2.47
5.25	0.0750	0.330	0.195	17.25	0.95	4.19	2.48
5.50	0.1000	0.440	0.260	17.50	0.96	4.20	2.48
5.75	0.4000	1.760	1.040	17.75	0.96	4.21	2.49
6.00	0.7000	3.080	1.820	18.00	0.96	4.22	2.50
6.25	0.7250	3.190	1.885	18.25	0.96	4.24	2.50
6.50	0.7500	3.300	1.950	18.50	0.97	4.25	2.51
6.75	0.7650	3.366	1.989	18.75	0.97	4.26	2.52
7.00	0.7800	3.432	2.028	19.00	0.97	4.27	2.52
7.25	0.7900	3.476	2.054	19.25	0.97	4.28	2.53
7.50	0.8000	3.520	2.080	19.50	0.98	4.29	2.54
7.75	0.8100	3.564	2.106	19.75	0.98	4.30	2.54
8.00	0.8200	3.608	2.132	20.00	0.98	4.31	2.55
8.25	0.8250	3.630	2.145	20.25	0.98	4.32	2.55
8.50	0.8300	3.652	2.158	20.50	0.98	4.32	2.55
8.75	0.8350	3.674	2.171	20.75	0.98	4.33	2.56
9.00	0.8400	3.696	2.184	21.00	0.99	4.33	2.56
9.25	0.8450	3.718	2.197	21.25	0.99	4.34	2.56
9.50	0.8500	3.740	2.210	21.50	0.99	4.35	2.57
9.75	0.8550	3.762	2.223	21.75	0.99	4.35	2.57
10.00	0.8600	3.784	2.236	22.00	0.99	4.36	2.57
10.25	0.8638	3.801	2.246	22.25	0.99	4.36	2.58
10.50	0.8675	3.817	2.256	22.50	0.99	4.37	2.58
10.75	0.8713	3.834	2.265	22.75	0.99	4.37	2.58
11.00	0.8750	3.850	2.275	23.00	1.00	4.38	2.59
11.25	0.8788	3.867	2.285	23.25	1.00	4.38	2.59
11.50	0.8825	3.883	2.295	23.50	1.00	4.39	2.59
11.75	0.8863	3.900	2.304	23.75	1.00	4.39	2.60
12.00	0.8900	3.916	2.314	24.00	1.00	4.40	2.60


4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Cummulative Rainfall Depth, inches
0.00
3.00
6.00
9.00
12.00
15.00
18.00
21.00
24.00
Storm Duration, hours
100-yr (in)
005-yr (in)

Outlet Rating Curves - Retrofit Configuration #1 (Exst Outlet Pipe)

Project Survey (5)			Outlet Pipe Rating (cfs)		WQ Outlet (cfs)		Emergency Spillway (cfs)		Outlet Rating (cfs)		
Elev (ft)	Storage (ac-ft)	Depth (ft)	HDS-5 Ch-1 Exst (1)	HDS-5 Ch-3 Bevel (2)	Weir (3) Retrofit	Orifice Plate (4)	Existing	Retrofit (6)	Existing	Retrofit	Comment
6865.82	**0.00**	0.0	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00	
6867.0	0.0043	1.2	3.7	1.4	0.0	0.80	0.0	0.0	3.70	0.8	
6868.0	0.47	2.2	31.5	32.5	0.0	1.83	0.0	0.0	31.50	1.83	
6869.0	2.27	3.2	56.7	60.9	0.0	3.12	0.0	0.0	56.70	3.12	
6870.0	5.51	4.2	79.5	86.6	0.0	4.62	0.0	0.0	79.50	4.62	
6870.17	6.23	4.35	83.3	91.6	0.0	4.84	0.0	0.0	83.30	4.84	Stage at 1/2 WQCV
6871.0	9.71	5.2	100.1	110.0	0.0	6.29	0.0	0.0	100.10	6.29	
6871.59	12.46	5.77	119.4	132.2	0.0	7.36	0.0	0.0	119.40	7.36	Stage at WQCV
6872.0	14.40	6.2	118.5	131.2	0.0	8.02	0.0	0.0	118.50	8.02	
6872.11	14.95	6.29	129.4	143.8	0.0	8.18	0.0	0.0	129.40	8.18	Stage at WQCV*1.2
6873.0	19.34	7.2	135.1	150.4	41.8	9.33	0.0	0.0	135.10	51.13	
6874.0	24.46	8.2	150.1	167.7	129.6	10.43	0.0	0.0	150.10	140.02	
6875.0	29.76	9.2	163.5	183.5	245.2	11.41	0.0	0.0	163.50	163.50	
6876.0	35.24	10.2	175.6	197.8	382.9	12.31	0.0	0.0	175.60	175.60	
6877.0	40.89	11.2	186.7	210.8	539.8	13.14	0.0	0.0	186.70	186.70	
6878.0	46.73	12.2	196.7	222.8	713.7	13.92	0.0	0.0	196.70	196.70	
6879.0	52.73	13.2	206.1	233.9	903.0	14.66	0.0	0.0	206.10	206.10	
6880.0	58.92	14.2	214.9	244.3	1106.6	15.36	0.0	0.0	214.90	214.90	
6881.0	65.30	15.2	223.3	254.3	1323.6	16.03	0.0	0.0	223.30	223.30	
6881.55	**68.90**	15.7	227.8	259.6	1448.3	16.39	0.0	0.0	**227.80**	227.80	Existing Spillway Crest
6882.0	71.92	16.2	231.5	263.9	1553.1	16.67	121.5	0.0	353.00	231.50	
6883.0	78.80	17.2	239.7	273.4	1794.6	17.30	702.8	0.0	942.48	**239.70**	Raised Spillway (6)
6883.5	82.34	17.7	244.9	279.5	1919.6	17.59	1096.0	142.3	1340.95	387.24	
6884.0	85.87	18.2	248.2	283.0	2047.4	17.89	1543.5	402.5	1791.73	650.70	
6885.0	93.12	19.2	257.0	292.9	2311.1	18.47	2579.3	1138.4	2836.26	1395.44	
6886.0	100.56	20.2	266.3	303.2	2585.2	19.02	3778.4	2091.5	4044.68	2357.75	Top of Dam Embankment

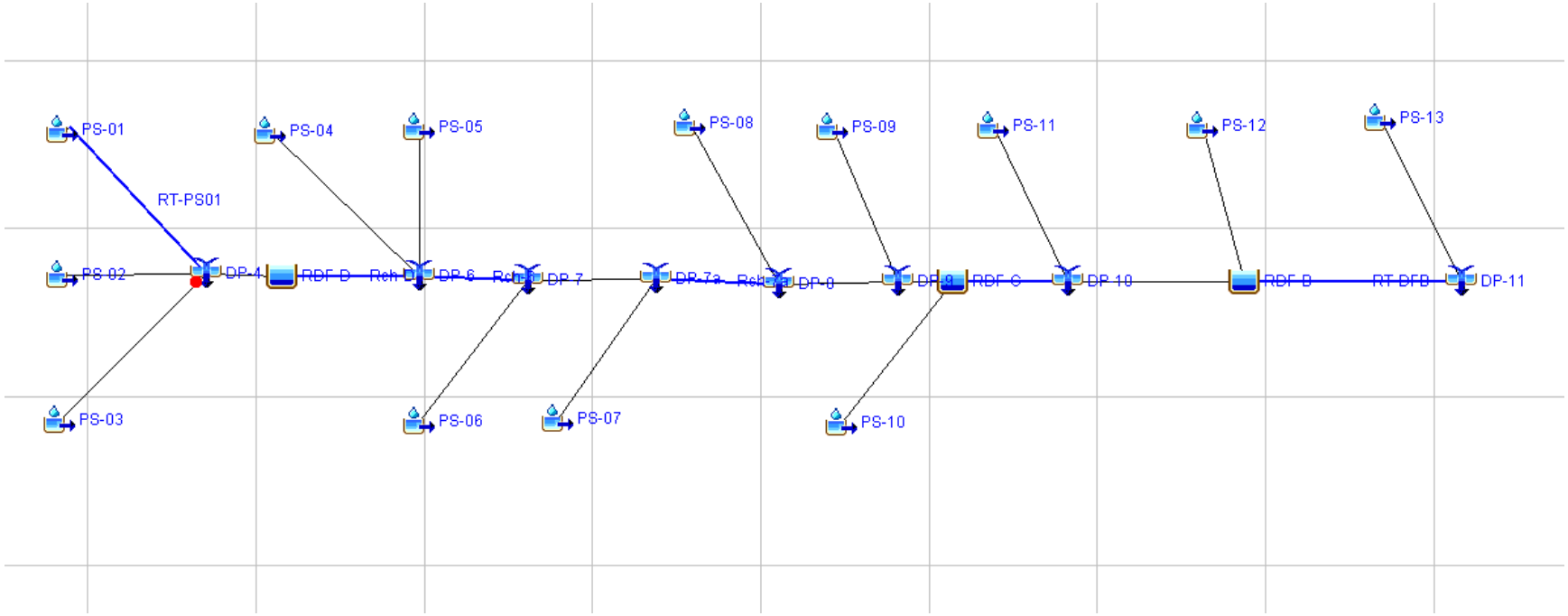
Notes: (1) 4' RCP (Chart 1 / square edge with headwall) S = 0.050 '/'
(2) 4' RCP (Chart 3 / beveled-ring edge with headwall) S = 0.050 '/'
(3) Sharp crested weir, L = 15 ft (effective length)
(4) 15 rows 6.33"x2.0" orifices
(5) Assumes that Csprings datum is NGVD29 and project is NAVD88 (Project = CSprgs + 3.824')
(6) Raised spillway crest 1.5'

Outlet Rating Curves - Retrofit Configuration #2 (Beveled Headwall Outlet Pipe)

Project Survey (5)			Outlet Pipe Rating (cfs)		WQ Outlet (cfs)		Emergency Spillway (cfs)		Outlet Rating (cfs)		
Elev (ft)	Storage (ac-ft)	Depth (ft)	HDS-5 Ch-1 Exst (1)	HDS-5 Ch-3 Bevel (2)	Weir (3) Retrofit	Orifice Plate (4)	Existing	Retrofit (6)	Existing	Retrofit	Comment
6865.82	**0.00**	0.0	0.0	0.00	0.0	0.00	0.0	0.0	0.00	0.00	
6867.0	0.0043	1.2	3.7	1.4	0.0	0.80	0.0	0.0	3.70	0.8	
6868.0	0.47	2.2	31.5	32.5	0.0	1.83	0.0	0.0	31.50	1.83	
6869.0	2.27	3.2	56.7	60.9	0.0	3.12	0.0	0.0	56.70	3.12	
6870.0	5.51	4.2	79.5	86.6	0.0	4.62	0.0	0.0	79.50	4.62	
6870.17	6.23	4.35	83.3	91.6	0.0	4.84	0.0	0.0	83.30	4.84	Stage at 1/2 WQCV
6871.0	9.71	5.2	100.1	110.0	0.0	6.29	0.0	0.0	100.10	6.29	
6871.59	12.46	5.77	119.4	132.2	0.0	7.36	0.0	0.0	119.40	7.36	Stage at WQCV
6872.0	14.40	6.2	118.5	131.2	0.0	8.02	0.0	0.0	118.50	8.02	
6872.11	14.95	6.29	129.4	143.8	0.0	8.18	0.0	0.0	129.40	8.18	Stage at WQCV*1.2
6873.0	19.34	7.2	135.1	150.4	41.8	9.33	0.0	0.0	135.10	51.13	
6874.0	24.46	8.2	150.1	167.7	129.6	10.43	0.0	0.0	150.10	140.02	
6875.0	29.76	9.2	163.5	183.5	245.2	11.41	0.0	0.0	163.50	183.50	
6876.0	35.24	10.2	175.6	197.8	382.9	12.31	0.0	0.0	175.60	197.80	
6877.0	40.89	11.2	186.7	210.8	539.8	13.14	0.0	0.0	186.70	210.80	
6878.0	46.73	12.2	196.7	222.8	713.7	13.92	0.0	0.0	196.70	222.80	
6879.0	52.73	13.2	206.1	233.9	903.0	14.66	0.0	0.0	206.10	233.90	
6880.0	58.92	14.2	214.9	244.3	1106.6	15.36	0.0	0.0	214.90	244.30	
6881.0	65.30	15.2	223.3	254.3	1323.6	16.03	0.0	0.0	223.30	254.30	
6881.55	**68.90**	15.7	227.8	259.6	1448.3	16.39	0.0	0.0	**227.80**	259.60	Existing Spillway Crest
6882.0	71.92	16.2	231.5	263.9	1553.1	16.67	121.5	0.0	353.00	263.90	
6883.0	78.80	17.2	239.7	273.4	1794.6	17.30	702.8	0.0	942.48	**273.40**	Raised Spillway (6)
6883.5	82.34	17.7	244.9	279.5	1919.6	17.59	1096.0	142.3	1340.95	421.81	
6884.0	85.87	18.2	248.2	283.0	2047.4	17.89	1543.5	402.5	1791.73	685.50	
6885.0	93.12	19.2	257.0	292.9	2311.1	18.47	2579.3	1138.4	2836.26	1431.34	
6886.0	100.56	20.2	266.3	303.2	2585.2	19.02	3778.4	2091.5	4044.68	2394.65	Top of Dam Embankment

Notes: (1) 4' RCP (Chart 1 / square edge with headwall) S = 0.050 '/'
(2) 4' RCP (Chart 3 / beveled-ring edge with headwall) S = 0.050 '/'
(3) Sharp crested weir, L = 15 ft (effective length)
(4) 15 rows 6.33"x2.0" orifices
(5) Assumes that Csprings datum is NGVD29 and project is NAVD88 (Project = CSprgs + 3.824')
(6) Raised spillway crest 1.5'

Pine Creek HEC-HMS Schematic



Comparison of reservoir operations in Pine Creek South Fork

Description: Update survey of RDF-C reservoir area

Alternative 1: New water quality outlet w/ 1.45' raised spillway crest

Existing headwall conditions at pipe outlet

	JR Report				Revised HMS (no spillway)						
RDF	Inflow (cfs)	Outflow (cfs)	Max Stored (af)	Max Stage	Inflow (cfs)	Outflow (cfs)	Max Stored (af)	Max Stage	Pond Min Elev (ft)	Pond Max Elev (ft)	Spilllway Elev (ft)
D	1073	99	44	110.7	1265	115	55.8	112.9	100.0	114.0	
C	1840	227	69	77.4	1865	233	72.8	82.1	65.8	86.0	81.55
B	506	247	14	82.9	509	250	14.3	83.2	71.2	88.0	

	Revised HMS (with exst spillway)				RDF-C WQ Retrofit Alt 1 w/ spillway					
RDF	Inflow (cfs)	Outflow (cfs)	Max Stored (af)	Max Stage	Inflow (cfs)	Outflow (cfs)	Max Stored (af)	Max Stage	Spilllway Elev (ft)	
D	1265	115	55.8	112.9	1265	115	55.8	112.9		
C	1865	315*	71.0	81.9	1865	344.5*	81.3	83.3	83.0	with initial 50% WQCV
B	509	266	16.9	84.5	558	282	19.5	85.7		

*51 min / 84 cfs / 3.4 af

*36 min / 85 cfs / 3.3 af

	RDF-C Clogged (with exst spillway)				RDF-C WQ Retrofit Alt 1 w/ Clogging					
RDF	Inflow (cfs)	Outflow (cfs)	Max Stored (af)	Max Stage	Inflow (cfs)	Outflow (cfs)	Max Stored (af)	Max Stage	Spilllway Elev (ft)	
D	1265	115	55.8	112.9	1265	115	55.8	112.9		
C	1865	756	79.2	83.1	1865	439	86.2	84.0	83.0	with initial 50% WQCV
B	508	258	15.5	83.8	520	254	15.0	83.5		

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
Southern Colorado Regulatory Office
200 S. Santa Fe Avenue, Suite 301
Pueblo, Colorado 81003

February 1, 2012

REPLY TO
ATTENTION OF

Regulatory Division

SUBJECT: Action No. SPA-2012-00051, Retrofit of Regional Detention Facility "C", El Paso County, Colorado

George Cotton
Tsiouvaras Simmons Holderness, Inc.
5690 DTC Blvd., Ste 345W
Greenwood Village, Colorado 80111

Mr. Cotton:

We received of your e-mail dated January 31, 2012 concerning Retrofit of Regional Detention Facility "C", El Paso County, Colorado. We have assigned Action No. SPA-2012-00051 to this activity. To avoid delay, please include this number in all future correspondence concerning this project.

We have reviewed this project in accordance with Section 404 of the Clean Water. Under Section 404, the Corps regulates the discharge of dredged and fill material into waters of the United States (U.S.), including wetlands. Based on your description of the proposed work, and other information available to us, we have determined that the proposed project will involve activities subject to Section 404. Therefore, a Department of the Army permit is required.

We have determined that this project is authorized by Nationwide Permit No. 43 for Stormwater Management Facilities. A summary of this permit and the regional conditions for Colorado is e available on our website at www.spa.usace.army.mil/reg/. You are only authorized to conduct the work described in your submittal

Our review of this project also addressed its effects on threatened and endangered species and historic properties in accordance with general conditions 17 and 18. Based on the information provided, we have determined that this project will not affect any species listed as threatened or endangered by the U.S. Fish and Wildlife Service within the permit area. We have also determined that this project will not affect historic properties listed, or eligible for listing, in

the National Register of Historic Places. However, please note that you are responsible for meeting the requirements of general condition 17 on endangered species and general condition 18 on historic properties.

This verification is valid until March 18, 2012, unless the nationwide permit is modified, suspended, revoked or reissued prior to that date. The Corps will issue a public notice when the nationwide permits are reissued. If you commence or are under contract to commence the authorized activity before the date that the relevant nationwide permit(s) is modified, reissued or revoked you will have twelve (12) months from the date of the modification, reissuance, or revocation of the nationwide permits to complete the activity under the present terms and conditions of the nationwide permits. Continued confirmation that an activity complies with the terms and conditions, and any changes to the nationwide permit, is the responsibility of the permittee.

You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being, or has been, accomplished in accordance with the terms and conditions of the nationwide permit.

You must sign and submit to us the enclosed certification that the work, including any required mitigation, was completed in compliance with the nationwide permit. You should submit your certification within 30 days of the completion of work.

This permit is not an approval of the project design features, nor does it imply that the construction is adequate for its intended purpose. This permit does not authorize any injury to property or invasion of rights or any infringement of Federal, state or local laws or regulations. You must possess the authority, including property rights, to undertake the proposed work.

If you have any questions concerning our regulatory program, please contact Joshua Carpenter at 719-543-6914 or by e-mail at joshua.g.carpenter@usace.army.mil. At your convenience, please complete a Customer Service Survey on-line available at http://per2.nwp.usace.army.mil/survey.html.

Sincerely,

Van Truan
Chief, Southern Colorado
Regulatory Office

Certification of Compliance
with Department of the Army Nationwide Permit

Action Number: SPA-2012-00051

Name of Permittee: Colorado Department of Transportation

Nationwide Permit: No. 43 for Stormwater Management Facilities

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

Van Truan
U.S. Army Corps of Engineers, Albuquerque District
Southern Colorado Regulatory Office
200 S. Santa Fe Avenue, Suite 301
Pueblo, Colorado 81003

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit, you are subject to permit suspension, modification, or revocation.

Please enclose photographs showing the completed project (if available).

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

Date Work Started _____

Date Work Completed _____

_____ _____
Date Signature of Permittee

CITY OF COLORADO SPRINGS
We Create Community

ENGINEERING

February 11, 2011

Mark S. Andrew
CDOT Resident Engineer
1480 Quail Lake Loop Suite A
Colorado Springs, CO 80906

Re: Briargate and Union Detention Pond
Colorado Springs, CO

Dear Mark,

This is a follow up letter to the meeting on February 9, 2011, with City Engineering, City Streets Division and CDOT regarding CDOT's request to modify the outlet structure at the large detention pond at Union and Briargate. The City concurs with this request, which will allow CDOT to modify the outlet structure with the following commitments from CDOT:

- During the design process, the City will be involved in the decision making to ensure the design meets current City specifications, as well as accepted industry practices for BMP design. The design will be reviewed and accepted by both the City and CDOT prior to construction.

- The outlet structure will require maintenance at recommended intervals. CDOT will commit to maintaining the outlet structure for every other maintenance cycle. The maintenance cycle will be determined based on the features of the final design of the outlet structure. CDOT will use best design practices to minimize maintenance for both the City and CDOT.

- CDOT will provide better access to the outlet structure to ensure that maintenance equipment can access the site.

30 S. Nevada Avenue, Ste 401, M/C 410, Colorado Springs, Colorado 80903
Tel 719-385-5907 Fax 719-385-5497

- CDOT will also honor all requirements to other regulatory parties such as US Fish and Wildlife Service, which may limit access to seasonal periods.
- CDOT to follow up with an Intergovernmental Agreement that will specify further details including maintenance commitments from CDOT once the final design is completed.

Sincerely,

Robin Kidder
City Engineer

C: Tim Mitros, City of Colorado Springs
Bard Lower, City Streets Division
Dave Poling, CDOT R2 Program Engineer
Yun Han, CDOT Project Engineer

AMENDMENT 2
TO
PINE CREEK DRAINAGE BASIN PLANNING STUDY
FULLY DEVELOPED CONDITION
BASIN MAP AND MASTER PLAN

LEGEND

- CURRENT MAJOR DRAINAGE BASIN BOUNDARY
- CURRENT SUB-BASIN BOUNDARY
- PREVIOUS MAJOR DRAINAGE BASIN BOUNDARY (1988 DBPS)
- LIMIT OF CURRENT STUDY
- EXISTING STORM DRAIN
- EXISTING STORM DRAIN INLET
- EXISTING STORM DRAIN MANHOLE
- PROPOSED STORM DRAIN
- DF'X' — PROPOSED DETENTION FACILITY, DETENTION FACILITY IDENTIFICATION
- 35% — SIGNIFIES ON SITE DETENTION REQUIREMENT OF 35% OF Q_{100} DEVELOPED − Q_{100} UNDEVELOPED FOR ALL NON-RESIDENTIAL PROPERTY EXCLUSIVE OF STREET RIGHT-OF-WAY WITHIN THE SUB-BASIN.
- X — ANALYSIS POINT (AP XX)
- XX — BASIN IDENTIFICATION
- XX — BASIN ACRES
- EXISTING 10 FOOT CONTOUR
- EXISTING 2 FOOT CONTOUR
- PC 1 — PINE CREEK STUDY REACH IDENTIFICATION
- ① — KEYED NOTE REFERENCE
- GENERAL PROPOSED DIRECTION OF DRAINAGE FLOW

GENERAL NOTES:

1. FUTURE STORM DRAINS SHOWN ON THIS PLAN ARE ONLY INTENDED TO INDICATE GENERAL LOCATIONS AND APPROXIMATE SIZES OF FUTURE FACILITIES. ACTUAL STORM DRAIN SIZES AND LOCATIONS SHALL BE DETERMINED WITH MORE DETAILED ANALYSIS AT THE TIME OF DETAILED DESIGN OF THE FACILITIES. IT IS LIKELY THAT ADDITIONAL FACILITIES NOT SHOWN ON THIS PLAN WILL BE REQUIRED.
2. PROPOSED DETENTION FACILITIES SHOWN ON THIS PLAN ARE ONLY INTENDED TO INDICATE GENERAL LOCATIONS AND LAND AREA REQUIRED FOR THESE FACILITIES. ACTUAL LOCATION AND LAND AREA REQUIRED SHALL BE DETERMINED AT THE TIME OF DETAILED DESIGN OF THE FACILITIES.
3. EXCEPT AS OTHERWISE NOTED, THIS PLAN SHALL NOT MODIFY THE REQUIREMENTS OF PREVIOUSLY APPROVED MASTER DEVELOPMENT DRAINAGE PLANS AND FINAL DRAINAGE REPORTS.
4. THE AREA ABOVE POWERS BOULEVARD SHOULD BE RE-EXAMINED AS MORE DETAIL ABOUT LAND PLANNING IS KNOWN. ADDITIONAL DETENTION FACILITIES LOCATED HIGHER IN THE WATERSHED SHOULD BE CONSIDERED.

KEYED NOTES:

① SUB-BASIN PM6 WAS ANALYZED ASSUMING FREE DISCHARGE FROM THE SUB-BASIN. FREE DISCHARGE FROM THE SUB-BASIN MAY BE ALLOWED PROVIDED THE OUTFALL SYSTEM TO PINE CREEK IS SIZED ACCORDINGLY.

② SECTION OF PINE CREEK TO BE ELIMINATED.

PROPOSED TREATMENT FOR PINE CREEK CHANNEL:

REACH ID	PROPOSED TREATMENT **
PC 1	LEAVE NATURAL WITH MINOR BANK AND BED STABILIZATION.
PC 2	LEAVE NATURAL.
PC 3	LEAVE NATURAL WITH MINOR BANK AND BED STABILIZATION.
PC 4	REGRADE TO PROVIDE WIDE DEPRESSED AREA TO SERVE AS EMERGENCY RELIEF CHANNEL. CONSTRUCT 54" STORM DRAIN TO CONVEY 100 YEAR DESIGN FLOW.
PC 5	LEAVE NATURAL WITH BED AND BANK STABILIZATION.
PC 6	LEAVE NATURAL WITH BED AND BANK STABILIZATION.
PC 7	LEAVE NATURAL WITH BED AND BANK STABILIZATION.

** ACTUAL TREATMENT REQUIREMENT TO BE DETERMINED WITH FUTURE DETAILED HYDRAULIC ANALYSIS.

— NATURAL CHANNEL WILL REQUIRE MONITORING TO VERIFY PERFORMANCE AFTER DEVELOPMENT OCCURS.

— EXCEPT FOR THE REACHES NOTED ABOVE, PINE CREEK CHANNEL WILL BE BY-PASSED WITH STORM DRAIN CONVEYANCES AND ELIMINATED WITHIN THE STUDY AREA.

REGIONAL DETENTION FACILITY DATA SUMMARY
FULLY DEVELOPED CONDITION

DETENTION FACILITY I.D.	PEAK INFLOW (cfs)		PEAK OUTFLOW (cfs)		ESTIMATED PEAK STORAGE (ac-ft)	
	Q5	Q100	Q5	Q100	V5	V100
A	102	275	5	9	4	11
B	233	506	159	247	5	14
C	956	1840	153	227	33	69
D	464	1073	57	99	16	41
E	307	724	177	265	7	19
F	269	578	170	239	4	18
G	770	1747	165	250	23	60
No. 1	1297	2809	488	1147	47	96

ANALYSIS POINT DATA SUMMARY
FULLY DEVELOPED CONDITION

ANALYSIS POINT Δ	WATERSHED AREA (acres)	(sq-miles)	Q5 (cfs)	Q100 (cfs)	POINT DESCRIPTION
AP1	198	0.31	262	657	TOTAL FLOW
AP2	256	0.40	356	866	TOTAL FLOW
AP3	371	0.58	532	1285	TOTAL FLOW
APDFG	467	0.73	770	1747	TOTAL POND INFLOW
APDFF	589	0.92	269	578	TOTAL POND INFLOW
AP4	640	1.00	180	309	TOTAL FLOW
APDFE	800	1.25	307	724	TOTAL POND INFLOW
AP5	864	1.35	181	368	TOTAL FLOW
AP5A	1702	2.66	342	654	TOTAL FLOW
APDFD	301	0.47	464	1073	TOTAL FLOW
AP6	378	0.59	247	470	TOTAL FLOW
AP7	422	0.66	349	681	TOTAL FLOW
AP7A	480	0.75	532	998	TOTAL FLOW
AP8	557	0.87	692	1332	TOTAL FLOW
AP9	640	1.00	935	1778	TOTAL FLOW
APDFC	666	1.04	956	1840	TOTAL POND INFLOW
AP10	698	1.09	181	317	TOTAL FLOW
APDFB	806	1.26	233	506	TOTAL POND INFLOW
AP11	838	1.31	162	289	TOTAL FLOW
AP12	1875	2.93	408	985	TOTAL FLOW
AP13	1952	3.04	437	1115	TOTAL FLOW
AP14	77	0.12	167	284	TOTAL FLOW
AP15	115	0.18	223	407	TOTAL FLOW
AP16	147	0.23	239	427	TOTAL FLOW
AP17	141	0.22	51	142	TOTAL FLOW
AP18	173	0.27	88	232	TOTAL FLOW
AP19	2266	3.54	656	1753	TOTAL FLOW
AP20	2381	3.72	712	1978	TOTAL FLOW
AP21	2438	3.81	797	2149	TOTAL FLOW
APDFSF	102	0.16	110	296	TOTAL POND INFLOW
AP22	173	0.27	161	337	TOTAL FLOW
AP22S			NA	77	SURFACE FLOW
AP22P			NA	260	PIPE FLOW
AP23	198	0.31	194	331	TOTAL FLOW
AP23P			NA	298	PIPE FLOW
AP23S			NA	33	SURFACE FLOW
AP24	237	0.37	298	509	TOTAL FLOW
AP24S			NA	159	SURFACE FLOW
AP24P			NA	350	PIPE FLOW
AP25	294	0.46	461	586	TOTAL FLOW
AP25P			NA	461	PIPE FLOW
AP25S			NA	125	SURFACE FLOW
APDF#1	2835	4.43	1297	2809	TOTAL POND FLOW
AP26	2835	4.43	488	1147	TOTAL FLOW
AP27	2873	4.49	492	1162	TOTAL FLOW
AP28	2931	4.58	633	1207	TOTAL FLOW

ANALYSIS POINTS NOTE:
ANALYSIS POINTS CONTAINED IN THE HEC-1 MODEL AND IN THE ABOVE TABLE ARE SHOWN ON THE MAP WITHOUT THE PREFIX "AP."

SUB-BASIN DATA SUMMARY
FULLY DEVELOPED CONDITION

BASIN I.D.	AREA (acres)	(sq-miles)	TC (minutes)	LAG (hours)	CN	PEAK RUNOFF (cfs) Q5	Q100
CN1	93.0	0.145	19.0	0.190	76.8	102	275
CN2	50.0	0.078	21.4	0.214	75.5	47	136
CN3	27.5	0.043	15.7	0.157	80.0	40	98
CS1	33.9	0.053	18.1	0.181	73.6	30	90
CS2	45.0	0.070	10.1	0.101	98.0	149	254
CS3	34.0	0.053	17.7	0.177	84.8	61	137
CS4	34.2	0.053	10.1	0.101	95.5	107	188
F1	76.0	0.119	20.8	0.208	78.3	89	233
F2	25.0	0.039	17.1	0.171	74.0	24	69
F3	73.0	0.114	21.5	0.215	77.0	76	210
F4	24.5	0.038	19.7	0.197	83.0	38	89
F5	41.0	0.064	12.2	0.121	95.5	127	225
F6	24.5	0.038	10.6	0.106	98.0	81	138
F7	33.5	0.052	13.7	0.137	93.0	93	173
PM1	34.5	0.054	20.3	0.203	78.5	41	107
PM2	98.6	0.154	31.0	0.310	66.0	31	139
PM3	43.0	0.067	24.8	0.248	73.5	32	99
PM4	70.9	0.111	17.0	0.170	71.9	57	180
PM5	117.0	0.183	18.5	0.185	70.0	78	265
PM6	56.5	0.088	11.0	0.110	98.0	186	319
PM7	88.0	0.138	35.4	0.353	76.3	66	191
PM8	8.7	0.014	10.0	0.100	98.0	30	51
PM9	43.5	0.068	12.0	0.120	93.0	124	230
PM10	31.0	0.048	9.2	0.092	98.0	102	175
PM11	27.0	0.042	9.6	0.096	98.0	87	149
PN1	105.0	0.164	18.8	0.188	80.2	143	355
PN2	95.4	0.149	19.2	0.192	79.0	120	306
PN3	52.9	0.083	19.6	0.196	85.8	97	213
PN4	73.0	0.114	18.5	0.185	78.5	90	234
PN5	47.3	0.074	17.5	0.175	86.2	92	199
PN6	93.1	0.146	12.7	0.127	95.0	283	507
PN7	49.7	0.078	16.5	0.165	74.6	50	144
PN8	72.5	0.113	17.6	0.176	80.9	104	257
PN9	23.1	0.036	17.0	0.170	72.8	20	61
PN10	27.3	0.043	14.1	0.141	72.7	26	78
PN11	50.4	0.079	18.9	0.189	76.7	55	150
PN12	24.7	0.039	12.9	0.129	68.2	17	60
PN13	81.1	0.127	19.5	0.195	74.0	73	215
PN14	17.5	0.027	15.7	0.157	74.3	17	50
PN15	47.1	0.074	18.7	0.186	72.7	39	120
PS1	96.2	0.150	20.5	0.205	78.4	113	296
PS2	98.3	0.154	18.8	0.188	85.2	177	394
PS3	103.6	0.162	20.5	0.205	84.8	178	397
PS4	34.8	0.054	13.4	0.134	93.2	97	181
PS5	42.0	0.066	13.5	0.135	98.0	138	237
PS6	48.0	0.075	12.3	0.123	86.5	103	218
PS7	57.0	0.089	11.9	0.119	96.3	188	321
PS8	78.3	0.122	12.7	0.127	86.0	163	348
PS9	81.8	0.128	13.0	0.130	94.5	250	446
PS10	24.4	0.038	16.0	0.160	72.9	22	66
PS11	35.7	0.056	17.3	0.172	80.3	51	126
PS12	98.0	0.153	23.3	0.233	68.5	52	189
PS13	41.9	0.065	14.9	0.149	76.1	42	122
TOTAL	2934.0	4.584					

500 250 0 500 1000

SCALE: 1" = 500'

PINE CREEK DRAINAGE BASIN
FULLY DEVELOPED CONDITION BASIN MAP
& MASTER PLAN 10/12/98

JR Engineering, Ltd.
4935 North 30th Street
Colorado Springs, Colorado 80919
(719) 593-2593 • FAX (719) 528-6613

SHEET 1 OF 1

JOB NO. 8716.11

AMENDMENT 3 TO PINE CREEK BASIN PLANNING STUDY FULLY DEVELOPED CONDITION BASIN MAP AND MASTER PLAN

LEGEND

- CURRENT MAJOR DRAINAGE BASIN BOUNDARY
- CURRENT SUB-BASIN BOUNDARY
- PREVIOUS MAJOR DRAINAGE BASIN BOUNDARY (AMENDMENT 2)
- LIMIT OF CURRENT STUDY
- UPPER LIMIT BRIARGATE MASTER PLAN
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- DF'X' — DETENTION FACILITY WITH DETENTION FACILITY IDENTIFICATION
- 35% — SIGNIFIES ON SITE DETENTION REQUIREMENT OF 35% OF Q100 DEVELOPED – Q100 UNDEVELOPED FOR ALL NON-RESIDENTIAL PROPERTY EXCLUSIVE OF STREET RIGHT-OF-WAY WITHIN THE SUB-BASIN.
- X — ANALYSIS POINT (AP XX)
- XX / XX — BASIN IDENTIFICATION / BASIN ACRES
- EXISTING 10 FOOT CONTOUR
- EXISTING 2 FOOT CONTOUR
- PROPOSED 10 FOOT CONTOUR
- PC 6 — PINE CREEK STUDY REACH IDENTIFICATION
- ① — KEYED NOTE REFERENCE
- GENERAL PROPOSED DIRECTION OF DRAINAGE FLOW

SCALE: 1" = 500'

GENERAL NOTES:

1. FUTURE STORM SEWERS SHOWN ON THIS PLAN ARE ONLY INTENDED TO INDICATE GENERAL LOCATIONS AND APPROXIMATE SIZES OF FUTURE FACILITIES. ACTUAL STORM SEWERS SIZES AND LOCATIONS SHALL BE DETERMINED WITH MORE DETAILED ANALYSIS AT THE TIME OF DETAILED DESIGN OF THE FACILITIES. IT IS LIKELY THAT ADDITIONAL FACILITIES NOT SHOWN ON THIS PLAN WILL BE REQUIRED.
2. PROPOSED DETENTION FACILITIES SHOWN ON THIS PLAN ARE ONLY INTENDED TO INDICATE GENERAL LOCATIONS AND LAND AREA REQUIRED FOR THESE FACILITIES. ACTUAL LOCATION AND LAND AREA REQUIRED SHALL BE DETERMINED AT THE TIME OF DETAILED DESIGN OF THE FACILITIES.
3. EXCEPT AS OTHERWISE NOTED, THIS PLAN SHALL NOT MODIFY THE REQUIREMENTS OF PREVIOUSLY APPROVED MASTER DEVELOPMENT DRAINAGE PLANS AND FINAL DRAINAGE REPORTS.

KEYED NOTES:

① SECTION OF PINE CREEK TO BE ELIMINATED.

② FLOW IS TO BE DIVERTED TO A STORM SEWER IN FREQUENT EVENTS AND IS TO BE DIVIDED BETWEEN THE STORM SEWER AND NATURAL CHANNEL IN LARGER EVENTS.

③ AN EMERGENCY OVERFLOW/RELIEF ROUTE SHOULD BE PLANNED ACROSS THIS SITE FROM THE LOW POINT OF TELSTAR DRIVE TO PINE CREEK.

PROPOSED TREATMENT FOR PINE CREEK CHANNEL:

REACH ID	PROPOSED TREATMENT **
PC 1	LEAVE NATURAL WITH ONE DROP/CONTROL STRUCTURE. (COMPLETE)
PC 2	LEAVE NATURAL WITH MINOR BED STABILIZATION AND MODIFICATIONS TO DF No. 1 RUNDOWN CHANNEL.
PC 3	LEAVE NATURAL WITH GRADE CONTROL STRUCTURES.
PC 4	REGRADE TO PROVIDE WIDE DEPRESSED AREA TO SERVE AS EMERGENCY RELIEF CHANNEL. CONSTRUCT 54" STORM DRAIN TO CONVEY 100 YEAR DESIGN FLOW. (COMPLETE)
PC 5	LEAVE NATURAL WITH GRADE CONTROL STRUCTURES.
PC 6	LEAVE NATURAL WITH GRADE CONTROL STRUCTURES.
PC 7	LEAVE NATURAL WITH FREQUENT FLOWS CONVEYED IN BY-PASS STORM SEWER.
PC 8	LEAVE NATURAL. FREQUENT FLOWS CONVEYED IN BY-PASS STORM SEWER.
PC 9	LEAVE NATURAL WITH SOME RESHAPING. FREQUENT FLOWS CONVEYED IN BY-PASS STORM SEWER.

** ACTUAL TREATMENT REQUIREMENT TO BE DETERMINED WITH FUTURE DETAILED HYDRAULIC ANALYSIS.
- NATURAL CHANNEL WILL REQUIRE MONITORING TO VERIFY PERFORMANCE AFTER DEVELOPMENT OCCURS.
- EXCEPT FOR THE REACHES NOTED ABOVE, PINE CREEK CHANNEL WILL BE BY-PASSED WITH STORM DRAIN CONVEYANCES AND ELIMINATED WITHIN THE STUDY AREA.

REGIONAL DETENTION FACILITY DATA SUMMARY
FULLY DEVELOPED CONDITION

DETENTION FACILITY I.D.	WATERSHED AREA (acres)	WATERSHED AREA (sq. miles)	PEAK INFLOW (cfs) Q_5	PEAK INFLOW (cfs) Q_{100}	PEAK OUTFLOW (cfs) Q_5	PEAK OUTFLOW (cfs) Q_{100}	ESTIMATED PEAK STORAGE (ac-ft) V_5	ESTIMATED PEAK STORAGE (ac-ft) V_{100}	ADDITIONAL DATA: PROPOSED OWNERSHIP	ADDITIONAL DATA: STATUS
A	70.4	0.11	86	222	5	9	3	9	PUBLIC	EXISTING
B	793.6	1.24	227	493	153	219	7	21	PUBLIC	EXISTING
C	659.2	1.03	929	1825	156	228	33	72	PUBLIC	PART. EXISTING
D1	204.8	0.32	229	611	64	89	5	19	PUBLIC	PROPOSED
D2	64.0	0.10	131	269	45	61	3	8	PUBLIC	PROPOSED
E	774.4	1.21	254	593	157	224	7	17	PUBLIC	EXISTING
F	588.8	0.92	553	1401	152	220	18	56	PUBLIC	PROPOSED
NE1	89.6	0.14	104	271	59	103	1	6	UNKNOWN	PROPOSED
NE2	108.8	0.17	120	324	67	127	2	7	UNKNOWN	PROPOSED
NE6	12.8	0.02	18	45	8	15	0.3	1	PRIVATE	PROPOSED
No. 1	2816.0	4.40	1153	2671	463	1156	40	86	PUBLIC	EXISTING
SF	102.4	0.16	110	296	92	130	0.1	4	PRIVATE	EXISTING
VC	44.8	0.07	88	188	21	28	2	5.7	PRIVATE	EXISTING

ANALYSIS POINT DATA SUMMARY
FULLY DEVELOPED CONDITION

ANALYSIS POINT △	WATERSHED AREA (acres)	WATERSHED AREA (sq-miles)	Q5 (cfs)	Q100 (cfs)	POINT DESCRIPTION
E1	204.8	0.32	131	239	TOTAL FLOW
E1a	NA	NA	0	83	FLOW TO CHANNEL
E1b	NA	NA	131	156	FLOW TO STORM SEWER
E2	256.0	0.40	164	310	TOTAL FLOW
E3	NA	NA	5	95	TOTAL FLOW FROM CHANNEL
E4	345.6	0.54	238	543	TOTAL FLOW
E4a	NA	NA	90	370	FLOW TO CHANNEL
E4b	NA	NA	148	173	FLOW TO STORM SEWER
E5	NA	NA	185	269	TOTAL FLOW
E6	NA	NA	194	299	TOTAL FLOW
E7	38.4	0.06	41	114	TOTAL FLOW
E8	89.6	0.14	107	281	TOTAL FLOW
E9	76.8	0.12	81	224	TOTAL FLOW
E10	83.2	0.13	80	144	TOTAL FLOW
1	64.0	0.10	198	345	TOTAL FLOW FROM PNE11 & PNE12
2	108.8	0.17	255	493	TOTAL FLOW
3	518.4	0.81	470	1178	TOTAL FLOW TO RUNDOWN
3a	NA	NA	110	437	TOTAL FLOW FROM CHANNEL
4	659.2	1.03	166	309	TOTAL FLOW
5	819.2	1.28	159	276	TOTAL FLOW
5A	1651.2	2.58	313	531	TOTAL FLOW
6	326.4	0.51	236	413	TOTAL FLOW
6A	345.6	0.54	260	478	TOTAL FLOW
6B	364.8	0.57	293	547	TOTAL FLOW
7	448.0	0.70	476	908	TOTAL FLOW
7A	499.2	0.78	637	1190	TOTAL FLOW
8	588.8	0.92	815	1569	TOTAL FLOW
9	627.2	0.98	900	1735	TOTAL FLOW
10	691.2	1.08	175	304	TOTAL FLOW
11	832.0	1.30	155	263	TOTAL FLOW
12	1875.2	2.93	372	899	TOTAL FLOW
13	1945.6	3.04	399	1017	TOTAL FLOW
14	76.8	0.12	167	285	TOTAL FLOW
15	108.8	0.17	224	407	TOTAL FLOW
16	153.6	0.24	242	433	TOTAL FLOW
17	121.6	0.19	51	141	TOTAL FLOW
18	147.2	0.23	88	231	TOTAL FLOW
19	2246.4	3.51	609	1655	TOTAL FLOW
19A	2272.0	3.55	641	1721	TOTAL FLOW
20	2400.0	3.75	712	1943	TOTAL FLOW
21	2419.2	3.78	735	2007	TOTAL FLOW
22	172.8	0.27	161	337	TOTAL FLOW
22S	NA	NA	0	77	SURFACE FLOW
22P	NA	NA	161	260	PIPE FLOW
23	198.4	0.31	194	331	TOTAL FLOW
23S	NA	NA	0	33	SURFACE FLOW
23P	NA	NA	194	298	PIPE FLOW
24	236.8	0.37	274	490	TOTAL FLOW
24S	NA	NA	0	140	SURFACE FLOW
24P	NA	NA	274	350	PIPE FLOW
25	294.4	0.46	421	581	TOTAL FLOW
25S	NA	NA	0	120	SURFACE FLOW
25P	NA	NA	421	461	PIPE FLOW
26	2816.0	4.40	463	1156	TOTAL FLOW
27	2860.8	4.47	466	1170	TOTAL FLOW
28	2918.4	4.56	563	1199	TOTAL FLOW

SUB-BASIN DATA SUMMARY
FULLY DEVELOPED CONDITION

BASIN I.D.	AREA (acres)	AREA (sq-miles)	TC (minutes)	LAG (hours)	CN	PEAK RUNOFF (cfs) Q5	PEAK RUNOFF (cfs) Q100
CN1	70.7	0.110	19.0	0.190	78.4	86	222
CN2	50.0	0.078	21.4	0.214	75.5	47	136
CN3	27.5	0.043	15.7	0.157	80.0	40	98
CS1	33.9	0.053	18.1	0.181	73.6	31	91
CS2	45.0	0.070	10.1	0.101	98.0	149	254
CS3	32.5	0.051	17.7	0.177	85.5	61	134
CS4	42.3	0.066	12.8	0.128	86.0	88	188
F1	76.0	0.119	20.8	0.208	78.3	89	233
F2	25.0	0.039	17.1	0.171	74.0	24	69
F3	73.0	0.114	21.5	0.215	77.0	76	210
F4	24.5	0.038	19.7	0.197	83.0	38	89
F5	41.0	0.064	12.1	0.121	89.0	99	199
F6	24.5	0.038	10.6	0.106	93.5	72	131
F7	33.5	0.052	13.7	0.137	90.5	83	164
PM1	34.5	0.054	20.3	0.203	78.5	41	107
PM2	119.5	0.187	31.0	0.310	68.5	49	193
PM3	37.2	0.058	24.8	0.248	71.0	23	77
PM4	70.9	0.111	17.0	0.170	71.9	57	180
PM5	123.3	0.193	18.5	0.185	70.5	86	286
PM6A	27.0	0.042	13.1	0.131	90.0	67	132
PM6B	23.2	0.036	11.5	0.115	98.0	76	130
PM7	88.0	0.138	35.3	0.353	76.3	66	191
PM8	8.7	0.014	10.0	0.100	98.0	30	51
PM9	43.5	0.068	14.6	0.146	83.5	78	176
PM10	31.0	0.048	11.8	0.118	98.0	101	173
PM11	27.0	0.042	12.1	0.121	98.0	88	152
PN7	45.6	0.071	20.0	0.200	74.0	40	119
PN8	23.1	0.036	12.5	0.125	88.5	54	110
PN9	70.4	0.110	21.9	0.219	70.5	44	152
PN11	53.4	0.083	19.4	0.194	79.0	67	170
PN12	64.6	0.101	22.2	0.222	71.0	42	142
PN13	29.1	0.045	24.1	0.241	64.0	8	42
PN15	44.0	0.069	18.6	0.186	72.7	37	112
PNE1	86.1	0.135	18.6	0.186	78.0	104	271
PNE2	109.3	0.171	21.0	0.210	77.5	120	324
PNE3	8.1	0.013	14.3	0.143	87.0	18	37
PNE4	48.9	0.076	15.8	0.158	77.5	60	159
PNE5	11.6	0.018	19.8	0.198	66.5	5	22
PNE6	12.6	0.020	15.4	0.154	79.5	18	45
PNE7	65.8	0.103	17.5	0.175	76.0	71	196
PNE8	26.5	0.041	15.7	0.157	81.0	40	97
PNE9	8.5	0.013	9.7	0.097	80.0	14	33
PNE10	36.7	0.057	22.8	0.228	69.3	20	73
PNE11	45.4	0.071	13.0	0.130	96.5	144	251
PNE12	16.7	0.026	11.6	0.116	97.5	54	94
PNE13	31.3	0.049	14.6	0.146	81.0	49	118
PNE14	13.1	0.020	13.4	0.134	76.5	16	42
PS2	15.2	0.024	15.0	0.150	88.4	35	71
PS3	45.1	0.070	11.7	0.117	97.5	146	252
PS4	38.2	0.060	17.8	0.178	78.5	48	125
PS5	19.5	0.030	13.0	0.130	96.0	60	105
PS6	34.0	0.053	12.6	0.126	97.5	110	190
PS7	20.1	0.031	11.8	0.118	97.5	65	112
PS8	71.4	0.112	17.4	0.174	83.0	118	274
PS9	34.8	0.054	12.5	0.125	90.0	87	171
PS10	33.6	0.053	17.7	0.177	73.4	30	90
PS11	34.7	0.054	17.2	0.172	80.3	49	121
PS12	98.0	0.153	23.3	0.233	69.0	52	189
PS13	41.9	0.065	14.9	0.149	74.3	43	123
PSE1	21.6	0.034	19.7	0.197	74.5	20	59
PSE2	18.3	0.029	16.9	0.169	77.0	21	58
PSE3	49.9	0.078	17.1	0.171	79.6	68	171
PSE4	47.7	0.075	19.2	0.192	75.6	48	136
PSE5	30.2	0.047	18.1	0.181	76.5	33	90
PSE6	34.6	0.054	18.9	0.189	78.4	42	109
PSE7	37.0	0.058	12.5	0.125	96.5	118	206
PSE8	37.3	0.058	16.5	0.165	80.0	52	131
PSE9	26.5	0.041	10.7	0.107	97.5	86	148
PSE10	22.8	0.036	17.5	0.175	83.2	38	89
PSE11	20.6	0.032	21.0	0.210	80.0	26	66
TOTAL	2917.0	4.558					

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PINE CREEK DBPS
AMENDMENT 3
BASIN MAP & MASTER PLAN
JOB NO. 28716.11
DATE: 10/01/02
SHEET 1 OF 5
REVISED 3-4-03

PINE CREEK DETENTION FACILITY "C"

CITY OF COLORADO SPRINGS, COUNTY OF EL PASO, STATE OF COLORADO

GRADING AND EROSION CONTROL PLANS

JULY 1998

GENERAL NOTES:

1. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE AND LOCATION OF ALL UNDERGROUND UTILITIES ON AND ADJACENT TO THE SITE. THE OMISSION FROM OR THE INCLUSION OF UTILITY LOCATIONS ON THE PLANS SHALL NOT TO BE CONSTRUED AS THE NON-EXISTENCE OF OR A DEFINITE LOCATION OF EXISTING UNDERGROUND UTILITIES.
2. THE CONTRACTOR WILL TAKE THE NECESSARY PRECAUTIONS TO PROTECT EXISTING UTILITIES, BUILDINGS, FENCES, AND ROADWAYS FROM DAMAGE DUE TO THIS OPERATION. ANY DAMAGE TO THE ABOVE WILL BE REPAIRED AT THE CONTRACTOR'S EXPENSE, AND ANY SERVICE DISRUPTION WILL BE SETTLED BY THE CONTRACTOR.
3. OVERLOT GRADING SHALL BE COMPLETED TO A SUBGRADE TOLERANCE OF PLUS OR MINUS 0.2'.
4. CONTRACTOR SHALL OBTAIN COPIES OF THE SOILS REPORT FROM THE GEOTECHNICAL ENGINEER AND KEPT ONSITE DURING ALL EARTHWORK OPERATIONS.
5. THE SITE SHALL BE STRIPPED A MINIMUM OF 0.5' BELOW EXISTING GRADE AND THE TOPSOIL STOCKPILED ON OR OFFSITE FOR REUSE.
6. MAXIMUM CUT/FILL SLOPES SHALL NOT EXCEED 3:1, UNLESS OTHERWISE NOTED.
7. THE PRIMARY FUNCTION OF THIS FACILITY IS STORMWATER DETENTION. AS SUCH IT WILL BE EXPECTED TO ACT AS A DAM FOR PERIOD DURING AND FOLLOWING ANY MAJOR STORM. ANY USE OR ACTIVITY THAT WOULD COMPROMISE THIS FUNCTION SHOULD BE CAREFULLY CONTROLLED, I.E. USES THAT ENTAIL OBJECTS THAT COULD CLOG THE SPILLWAY OR COMPROMISE THE BERM OR OUTLET SPILLWAY AREA.
8. BENCHMARKS:
   1. Ø3 CUT SQUARE ON TOP OF CURB ON BRIARGATE PARKWAY APPROXIMATELY 300± EAST OF THE INTERSECTION OF BRIARGATE PARKWAY AND LEXINGTON DRIVE. EL = 6796.71
   2. THE SOUTH 1/4 CORNER OF SECTION 27 BEING A 3-1/4" ALUMINUM CAP STAMPED L.S. 10958 APPROXIMATELY 2540' EAST OF THE EXISTING END OF CURB ON BRIARGATE PARKWAY AND APPROXIMATELY 660' NORTH OF THE SAME. EL = 6823.58

EROSION CONTROL CRITERIA:

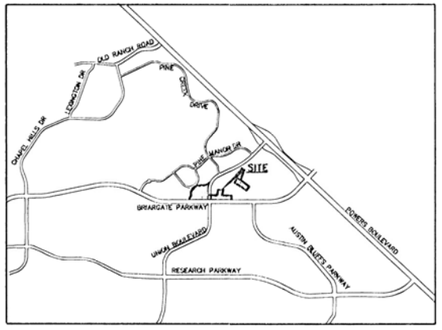
EROSION AND SEDIMENT CONTROL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. EROSION CONTROL MEASURES SHALL BE IMPLEMENTED IN A MANNER THAT WILL PROTECT PROPERTIES AND PUBLIC FACILITIES FROM ADVERSE EFFECTS OF EROSION AND SEDIMENTATION AS A RESULT OF CONSTRUCTION AND EARTH ACTIVITIES WITHIN THE PROJECT SITE.

1. INSTALL ALL EROSION CONTROL MEASURES INDICATED ON THE EROSION CONTROL EROSION PLAN PRIOR TO ANY EARTHWORK DISTURBANCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADDITIONAL EROSION CONTROL MEASURES INCIDENTAL TO THE WORK.
2. THE CONTRACTOR SHALL CHECK ALL EROSION CONTROL MEASURES AFTER EVERY RAINFALL. ALL NECESSARY REPAIRS OR REPLACEMENT SHALL BE DONE IMMEDIATELY.
3. SEDIMENT TRAPPED BY CHECKDAMS, SEDIMENT BASINS AND SILT FENCES SHALL BE PERIODICALLY REMOVED AS NECESSARY TO ENSURE PROPER FUNCTION PROPER FUNCTION OF THESE MEASURES.
4. ALL NECESSARY EROSION AND SEDIMENT CONTROL MEASURES SHALL REMAIN IN PLACE AND MAINTAINED UNTIL SUCH TIME AS THE EROSION AND SEDIMENTATION POTENTIAL IS MITIGATED AND THE SITE DEEMED STABLE BY REVIEW AUTHORITIES. AT SUCH TIME THE CONTRACTOR SHALL REMOVE ALL EROSION CONTROL DEVICES, COLLECTED DEBRIS AND SEDIMENT FROM THE SITE AND AND DISPOSE OF ALL SUCH MATERIALS IN AN ACCEPTABLE MANNER.

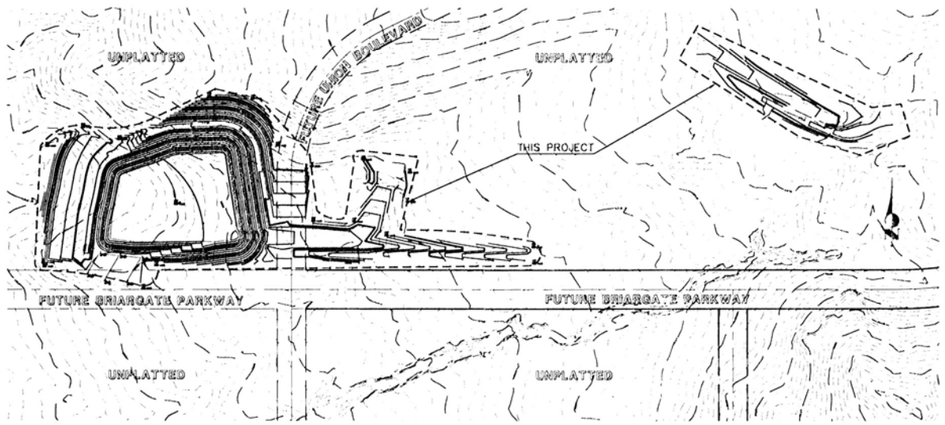
EROSION CONTROL COST OPINION:

1.	9 EACH - STRAW BALE FOR CHECK DAMS @ $4.00/BALE	$ 108
3.	1440 LF SILT FENCE @ $1.00/LF	$ 1440
4.	25% MAINTENANCE AND REPLACEMENT	$ 387
5.	22.0 AC. OF RESEEDING @ $500.00/AC.	$ 11000
	TOTAL	$ 12935

JR ENGINEERING, LTD. CANNOT AND DOES NOT GUARANTEE THAT THE CONSTRUCTION COSTS WILL NOT VARY FROM THESE OPINIONS OR PROBABLE CONSTRUCTION COSTS. THESE OPINIONS REPRESENT OUR BEST JUDGEMENT AS A DESIGN PROFESSIONAL FAMILIAR WITH THE CONSTRUCTION INDUSTRY AND IN BMP DEVELOPMENT.



VICINITY MAP
NTS



INDEX MAP
SCALE 1" = 500'

AGENCIES:

DEVELOPER:	L.P.47, LLC dba LA PLATA INVESTMENTS 7150 CAMPUS DRIVE, SUITE 365 COLORADO SPRINGS, COLORADO 80920 MR. BOB INGELS (719) 260-7477
CIVIL ENGINEER:	JR ENGINEERING, LTD. 4935 NORTH 30TH STREET COLORADO SPRINGS, COLORADO 80918 MR. FRANK TRIPI (719) 593-2593
ENGINEERING DIVISION:	CITY OF COLORADO SPRINGS 101 W. COSTILLA STREET COLORADO SPRINGS, COLORADO 80903 MR. TIM MITROS (719) 385-5061
WATER RESOURCES:	WASTEWATER: CITY OF COLORADO SPRINGS 111 S. CASCADE AVENUE, SUITE 201 COLORADO SPRINGS, COLORADO 80903 MR. JERRY VALLE (719) 448-8252 WATER: CITY OF COLORADO SPRINGS 111 S. CASCADE AVENUE, SUITE 201 COLORADO SPRINGS, COLORADO 80903 MRS. JANET KOSCIELSKI (719) 448-8253
GAS DEPT:	CITY OF COLORADO SPRINGS 101 S. CONEJOS STREET COLORADO SPRINGS, COLORADO 80903 MR. DAVE DEUTSCH (719) 668-3520
ELECTRIC DEPT:	CITY OF COLORADO SPRINGS 7710 DURANT DRIVE COLORADO SPRINGS, COLORADO 80920 MR. DAN GIECK (719) 668-4962
TELEPHONE COMPANY:	U.S. WEST COMMUNICATIONS (LOCATORS) (800) 922-1987 A.T.& T. (LOCATORS) (719) 635-3674

APPROVALS:

IF SUCH WORK IS PERFORMED IN ACCORDANCE WITH THE GRADING AND EROSION CONTROL PLAN, THE WORK WILL NOT BECOME A HAZARD TO LIFE AND LIMB, ENDANGER PROPERTY, OR ADVERSELY AFFECT THE SAFETY, USE, OR STABILITY OF A PUBLIC WAY, DRAINAGE CHANNEL, OR OTHER PROPERTY.

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF JR ENGINEERING, LTD.

KYLE R. CAMPBELL, COLORADO P.E. 29794 — DATE 11.10.98

THE OWNER WILL COMPLY WITH THE REQUIREMENTS OF THIS GRADING AND EROSION CONTROL PLAN.

OWNER — DATE 11/12/98

THIS GRADING PLAN IS FILED IN ACCORDANCE WITH SECTION 15-3-1503 (ENACTED AS ORD. 82-56) OF THE CODE OF THE CITY OF COLORADO SPRINGS, 1980, AS AMENDED. EROSION CONTROL IS REVIEWED IN ACCORDANCE WITH SECTION 4.8 OF THE DRAINAGE CRITERIA MANUAL, OCTOBER 1991, LATEST REVISION.

CITY ENGINEER, CITY OF COLORADO SPRINGS — DATE 12/14/98

SHEET INDEX

TITLE SHEET	SHEET 1 OF 4
GRADING PLAN & EROSION CONTROL PLAN	SHEET 2 & 3 OF 4
DROP STRUCTURE	SHEET 4 OF 4

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING LTD. APPROVES THEIR USE ONLY FOR THE SPECIFIC PROJECT INDICATED BY WRITTEN AUTHORIZATION.

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS DEPT. OF UTILITIES
GAS, ELECTRIC, WATER AND WASTEWATER

JR Engineering, Ltd.
4935 North 30th Street, Colorado Springs, Colorado 80918
(719) 593-2593 FAX (719) 536-6613

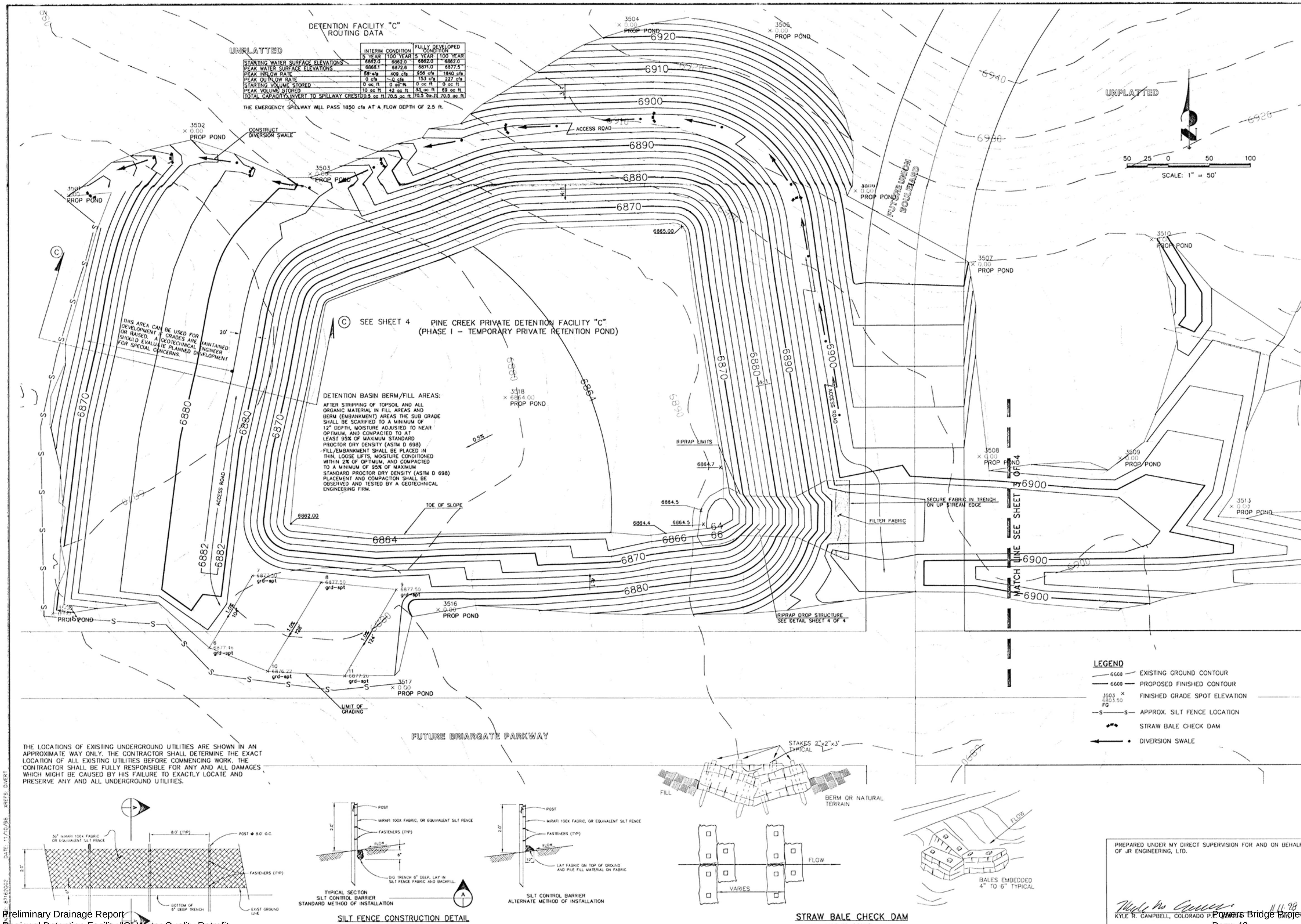
NO.	REVISION	BY	DATE

SCALE: NONE
DATE: 7/9/98
DES. BY: TDS
CHK. BY: JRB
DWN. BY: JAC

PINE CREEK DETENTION FACILITY "C"
GRADING AND EROSION CONTROL PLANS
TITLE SHEET

SHEET 1 OF 4
JOB NO. 8716.20

DATE: 11/10/98 XREFS: NONE
FILE: 8716DOC1



DETENTION FACILITY "C"
ROUTING DATA

	INTERIM CONDITION		FULLY DEVELOPED CONDITION	
	5 YEAR	100 YEAR	5 YEAR	100 YEAR
STARTING WATER SURFACE ELEVATIONS	6862.0	6862.0	6862.0	6862.0
PEAK WATER SURFACE ELEVATIONS	6866.1	6872.6	6871.0	6877.5
PEAK INFLOW RATE	58 cfs	409 cfs	956 cfs	1840 cfs
PEAK OUTFLOW RATE	0 cfs	~0 cfs	153 cfs	227 cfs
STARTING VOLUME STORED	0 ac ft	0 ac ft	0 ac ft	0 ac ft
PEAK VOLUME STORED	10 ac ft	42 ac ft	33 ac ft	69 ac ft
TOTAL CAPACITY, INVERT TO SPILLWAY CREST	70.5 ac ft	70.5 ac ft	70.5 ac ft	70.5 ac ft

THE EMERGENCY SPILLWAY WILL PASS 1850 cfs AT A FLOW DEPTH OF 2.5 ft.

DETENTION BASIN BERM/FILL AREAS:

AFTER STRIPPING OF TOPSOIL AND ALL ORGANIC MATERIAL IN FILL AREAS AND BERM (EMBANKMENT) AREAS THE SUB GRADE SHALL BE SCARIFIED TO A MINIMUM OF 12" DEPTH, MOISTURE ADJUSTED TO NEAR OPTIMUM, AND COMPACTED TO AT LEAST 95% OF MAXIMUM STANDARD PROCTOR DRY DENSITY (ASTM D 698) FILL/EMBANKMENT SHALL BE PLACED IN THIN, LOOSE LIFTS, MOISTURE CONDITIONED WITHIN 2% OF OPTIMUM, AND COMPACTED TO A MINIMUM OF 95% OF MAXIMUM STANDARD PROCTOR DRY DENSITY (ASTM D 698) PLACEMENT AND COMPACTION SHALL BE OBSERVED AND TESTED BY A GEOTECHNICAL ENGINEERING FIRM.

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF JR ENGINEERING, LTD.

KYLE R. CAMPBELL, COLORADO P.E.

11.11.98

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING, LTD. APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS DEPT. OF UTILITIES GAS, ELECTRIC, WATER AND WASTEWATER

JR Engineering, Ltd.
4935 North 30th Street
Colorado Springs, Colorado 80919
(719) 593-2593 • FAX (719) 528-6613

SCALE	1"=50'
DATE	7/9/98
DES. BY	VF/TDS
CHK. BY	JRB
DWN. BY	JAC

PINE CREEK DETENTION FACILITY "C"
GRADING AND EROSION CONTROL PLANS

SHEET 2 OF 4
JOB NO. 8716.20

CAUTION
EXISTING UNDERGROUND PHONE LINE CONTRACTOR TO "POTHOLE" PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY CONFLICT.

MATCH EXISTING GROUND SURFACE

CONSTRUCT SURFACE WATER DIVERSIONS AS SHOWN

CONSTRUCT BERM

SCALE: 1" = 100'

UNPLATTED

DETENTION BASIN BERM/FILL AREAS:

AFTER STRIPPING OF TOPSOIL AND ALL ORGANIC MATERIAL IN FILL AREAS AND BERM (EMBANKMENT) AREAS THE SUB GRADE SHALL BE SCARIFIED TO A MINIMUM OF 12" DEPTH, MOISTURE ADJUSTED TO NEAR OPTIMUM, AND COMPACTED TO AT LEAST 95% OF MAXIMUM STANDARD PROCTOR DRY DENSITY (ASTM D 698) FILL/EMBANKMENT SHALL BE PLACED IN THIN, LOOSE LIFTS, MOISTURE CONDITIONED WITHIN 2% OF OPTIMUM, AND COMPACTED TO A MINIMUM OF 95% OF MAXIMUM STANDARD PROCTOR DRY DENSITY (ASTM D 698) PLACEMENT AND COMPACTION SHALL BE OBSERVED AND TESTED BY A GEOTECHNICAL ENGINEERING FIRM.

EXISTING U.G. PHONE LINE LOCATION TO BE FIELD VERIFIED

FUTURE UNDER BOARD

MATCH LINE SEE SHEET 2 OF 4

60' BOTTOM WIDTH

CONSTRUCT SURFACE WATER DIVERSIONS AS SHOWN

10' MIN

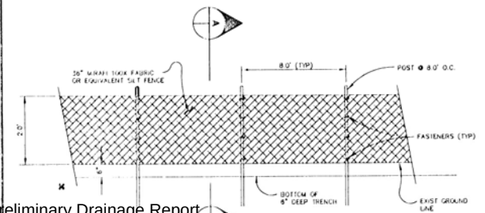
CONSTRUCT BERM

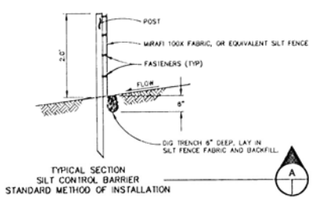
FUTURE BRIARGATE PARKWAY

AUSTIN BLUFFS PARKWAY

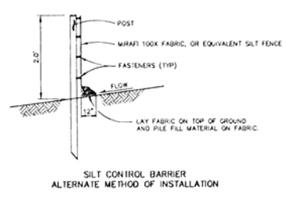
LEGEND

- 6600 — EXISTING GROUND CONTOUR
- 6600 — PROPOSED FINISHED CONTOUR
- 3503 / 6803.50 FG — FINISHED GRADE SPOT ELEVATION
- —S—S— APPROX. SILT FENCE LOCATION
- STRAW BALE CHECK DAM
- DIVERSION SWALE



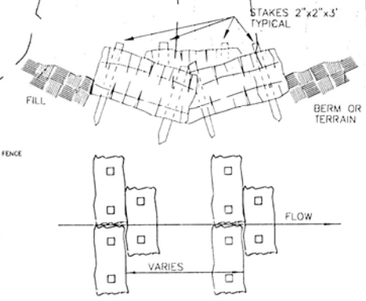


TYPICAL SECTION
SILT CONTROL BARRIER
STANDARD METHOD OF INSTALLATION



SILT CONTROL BARRIER
ALTERNATE METHOD OF INSTALLATION

SILT FENCE CONSTRUCTION DETAIL
NOT TO SCALE



STRAW BALE CHECK DAM
NOT TO SCALE

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF JR ENGINEERING, LTD.

KYLE R. CAMPBELL, COLORADO PE 30004 — 11-11-98

UNTIL SUCH TIME AS THESE PLANS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING, LTD APPROVES THEM FOR USE ONLY FOR REVIEW PURPOSES AND AS DIRECTED BY WRITTEN AUTHORIZATION.

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPGS DEPT. OF UTILITIES
GAS, ELECTRIC, WATER AND WASTEWATER

JR Engineering, Ltd.
4935 North 30th Street
Colorado Springs, Colorado 80919
(719) 593-2593 • FAX (719) 528-6848

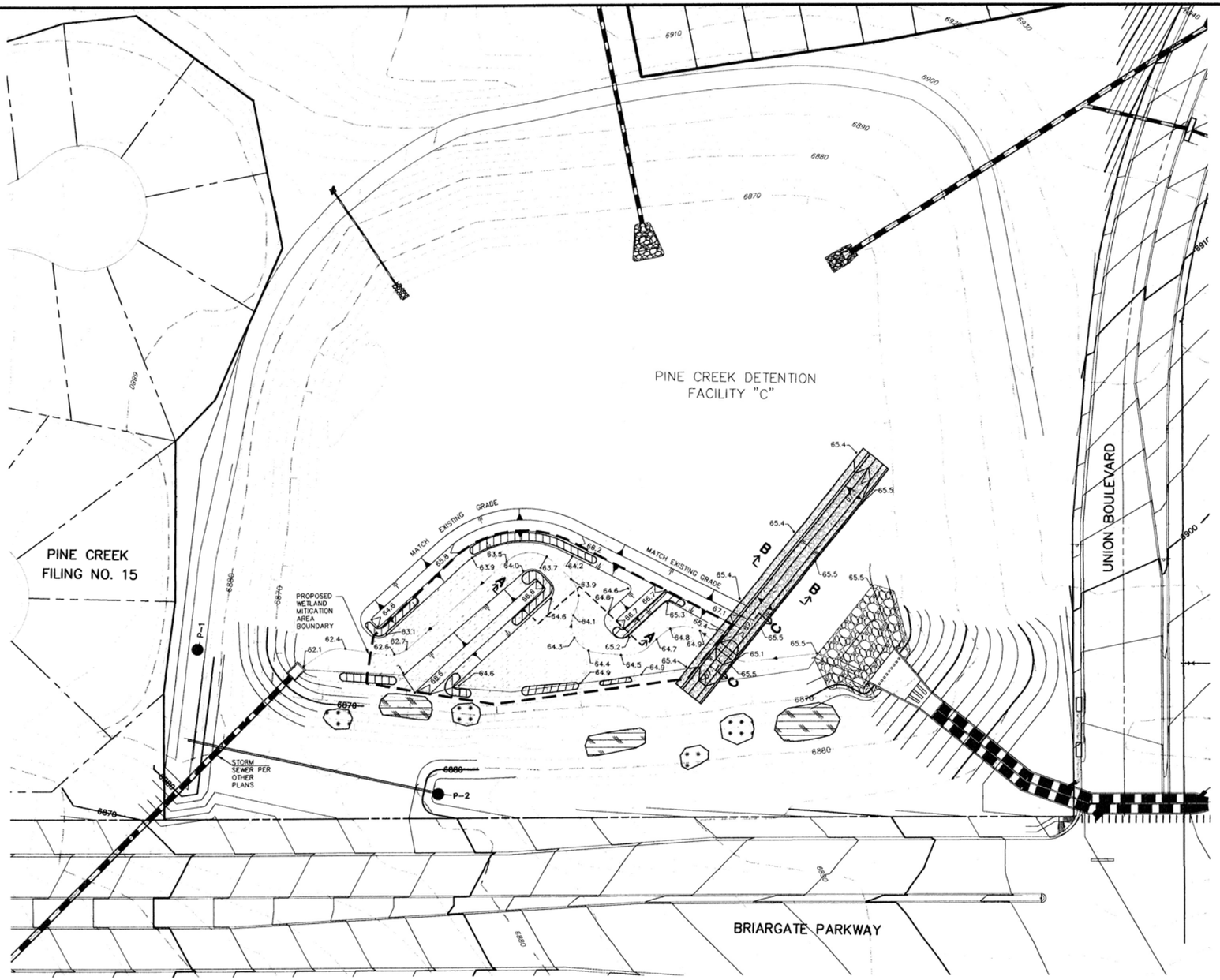
NO.	REVISION	BY	DATE

SCALE	1"=100'
DATE	7/9/98
DES. BY	VF/TDS
CHK. BY	JRB
DWN. BY	JAC

PINE CREEK DETENTION FACILITY "C"
GRADING AND EROSION CONTROL PLANS

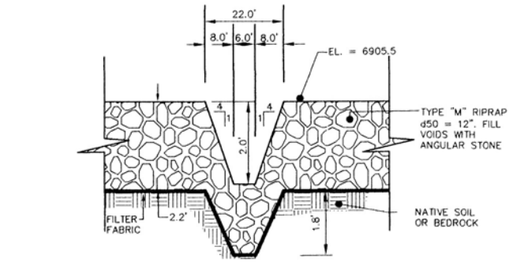
SHEET 3 OF 4
JOB NO. 8716.20

9812-8



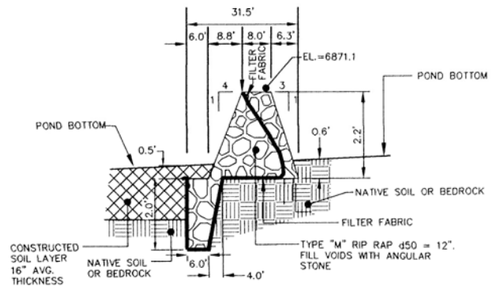
DETENTION FACILITY "C" PLAN VIEW

SCALE: 1"=50'



SECTION A–A TYPICAL DIVERSION DIKE/SWALE

N.T.S.



SECTION B–B RIP–RAP SEDIMENT TRAP BERM

N.T.S.

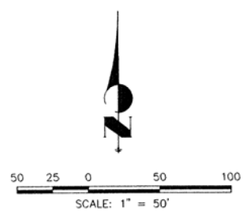
SECTION C–C LOW–FLOW NOTCH THROUGH SEDIMENT TRAP BERM

N.T.S.

BENCHMARKS:

A. SET NAIL WITH BRASS DISK ON THE NORTHWEST CORNER OF STORM INLET ON EAST SIDE OF LEXINGTON DRIVE APPROXIMATELY 50' SOUTH OF BRIARGATE PARKWAY.
ELEVATION = 6805.15

B. NAIL WITH BRASS DISK SOUTHEAST CORNER INLET, NORTH SIDE OF CHARITY DRIVE AT NORTHEAST CORNER OF CHARITY DRIVE ELEVATION = 6910.18



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES SHALL BE IN COMPLIANCE WITH THE CITY OF COLORADO SPRINGS, ENGINEERING DIVISION SUBDIVISION POLICY MANUAL AND STANDARD SPECIFICATIONS.
2. MAJOR GRADING AND INLET AND OUTLET FACILITIES ARE TO BE CONSTRUCTED PER THE PLANS FOR "BRIARGATE PARKWAY STORM DRAIN" AS REVISED JULY 2003, BY JR ENGINEERING. THE PROPOSED WETLAND MITIGATION AREA SHALL BE GRADED PER THIS PLAN.
3. THE ENTIRE AREA SHOWN TO BE PLANTED WITH WETLAND FORBS OR WILLOWS SHALL BE OVER–EXCAVATED BY 16" AVERAGE, 8" MINIMUM AND FILLED WITH TOP SOIL. TOP SOIL SHALL CONTAIN SUFFICIENT ORGANIC MATTER TO SUPPORT THE PROPOSED PLANTS. THE SOIL SHALL BE COMPACTED FIRM ENOUGH TO RETAIN FORM AND RESIST EROSION BUT SHALL BE LOOSE ENOUGH TO ALLOW PLANT GROWTH.
4. PROPOSED CONTOURS ARE NOT SHOWN ON THE POND BOTTOM FOR CLARITY.
5. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE AND LOCATION OF ALL ABOVE GROUND AND UNDERGROUND UTILITIES ALONG THE ROUTE OF THE WORK. THE OMISSION FROM OR THE INCLUSION OF THE UTILITY LOCATIONS ON THE PLANS IS NOT BE CONSIDERED AS THE NONEXISTENCE OF OR A DEFINITE LOCATION OF EXISTING ABOVE GROUND AND UNDERGROUND UTILITIES.
6. THE CONTRACTOR WILL TAKE THE NECESSARY PRECAUTIONS TO PROTECT EXISTING UTILITIES FROM DAMAGE DUE TO THIS OPERATION. ANY DAMAGE TO THE UTILITIES WILL BE REPAIRED AT THE CONTRACTORS EXPENSE, AND ANY SERVICE DISRUPTION WILL BE SETTLED BY THE CONTRACTOR.

PROPOSED PLANTING SYMBOLS

- CHOKECHERRY
- ALDER
- WILLOW
- WETLAND FORBS

QUESTIONS REGARDING PLANTING SHOULD BE DIRECTED TO TRENT MILLER OF SWCA (303) 487–1183.

Reviewed: Kim Mitts 10/27/03

LEGEND

SYMBOL	DESCRIPTION
	TOP OF SLOPE
	TOE OF SLOPE
	PROPOSED EARTHEN BERM
	PROPOSED RIPRAP BERM
	PROPOSED FLOW LINE
XX.X	PROPOSED SPOT ELEVATIONS
	PROPOSED RIPRAP AT GRADE
	PROPOSED RIPRAP (BURIED)
	PROPOSED RIPRAP PER SEPARATE PLAN
P–X	PHOTO POINT

THE LOCATIONS OF EXISTING ABOVE GROUND AND UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL ABOVE GROUND AND UNDERGROUND UTILITIES.

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS TRAFFIC ENGINEERING, COLORADO SPRINGS UTILITIES GAS, ELECTRIC, WATER AND WASTEWATER

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF JR ENGINEERING

VANCEL S. FOSSINGER, COLORADO P.E. #29572 — DATE 10/27/03

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE FOR ANY PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
LP47, LLC dba LA PLATA INVESTMENTS
2315 BRIARGATE PARKWAY, SUITE 100
COLORADO SPRINGS, COLORADO 80920
719-260-7477 • FAX 719-260-7088

J·R ENGINEERING
A Subsidiary of Westrian
4700 ArrowsWest Drive • Colorado Springs, CO 80907
719-593-2593 • Fax: 719-528-6848
www.jrengineering.com

BY	DATE	No.	REVISION

H–SCALE	VARIES
V–SCALE	VARIES
DATE	09/29/03
DESIGNED BY	VSF
DRAWN BY	KMS
CHECKED BY	VSF

PINE CREEK DETENTION FACILITY "C"

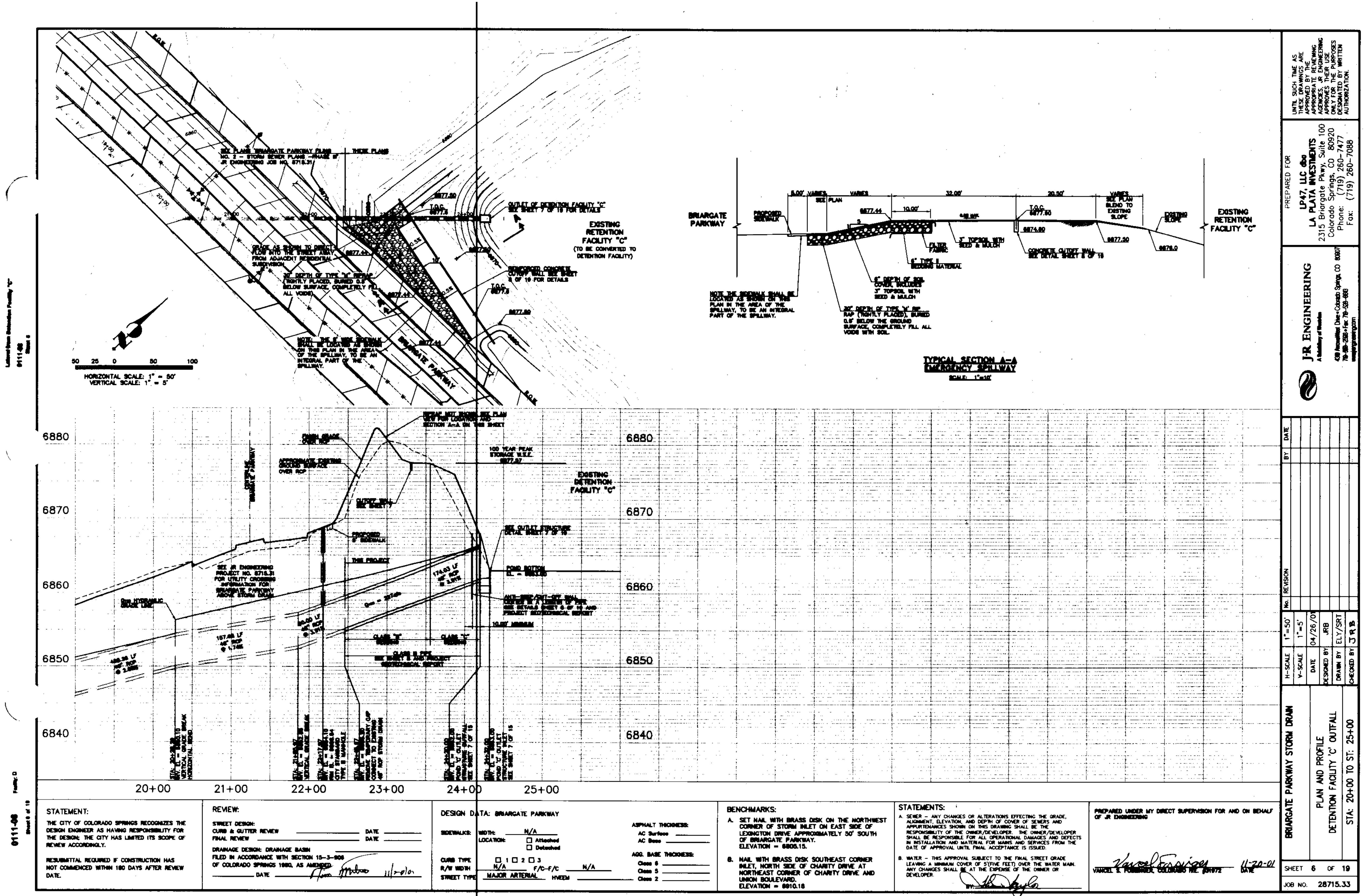
WETLAND GRADING AND PLANTING PLAN

SHEET 1 OF 1

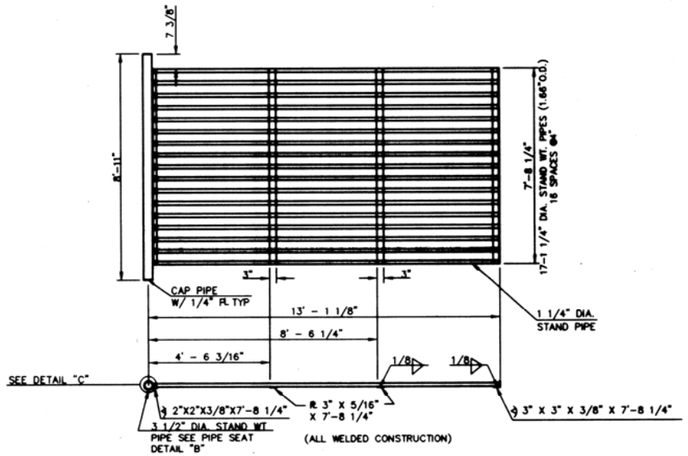
JOB NO. 28716.20

0310-06-1
Wetland Grading, Planting

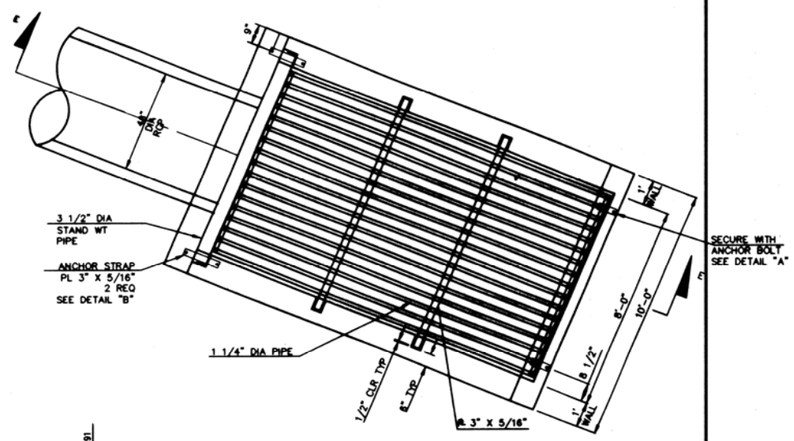
0310-06
Features: Drainage
Sheet 1 of 1



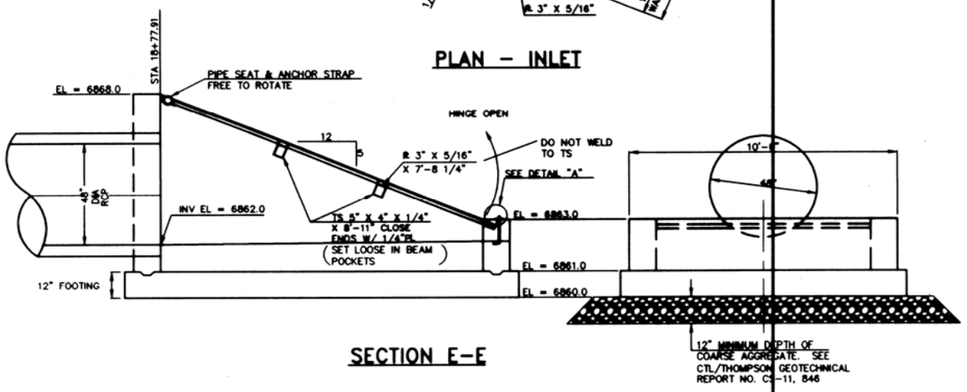
EXISTING RETENTION FACILITY "C"
(TO BE CONVERTED TO DETENTION FACILITY)
BRIARGATE PARKWAY
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 5'
TYPICAL SECTION A-A
EMERGENCY SPILLWAY
SCALE: 1"=10'
6880
6870
6860
6850
6840
20+00
21+00
22+00
23+00
24+00
25+00
UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.
PREPARED FOR
LP47, LLC dba
LA PLATA INVESTMENTS
2315 Briargate Pkwy, Suite 100
Colorado Springs, CO 80920
Phone: (719) 260-7477
Fax: (719) 260-7088
JR ENGINEERING
STATEMENT:
THE CITY OF COLORADO SPRINGS RECOGNIZES THE DESIGN ENGINEER AS HAVING RESPONSIBILITY FOR THE DESIGN. THE CITY HAS LIMITED ITS SCOPE OF REVIEW ACCORDINGLY.
RESUBMITTAL REQUIRED IF CONSTRUCTION HAS NOT COMMENCED WITHIN 180 DAYS AFTER REVIEW DATE.
REVIEW:
DESIGN DATA: BRIARGATE PARKWAY
BENCHMARKS:
STATEMENTS:
BRIARGATE PARKWAY STORM DRAIN
PLAN AND PROFILE
DETENTION FACILITY 'C' OUTFALL
STA: 20+00 TO ST: 25+00
H-SCALE 1"=50'
V-SCALE 1"=5'
DATE 04/26/01
SHEET 6 OF 19
JOB NO. 28715.33
0111-08 6



PLAN & BARGRATE ASSEMBLY

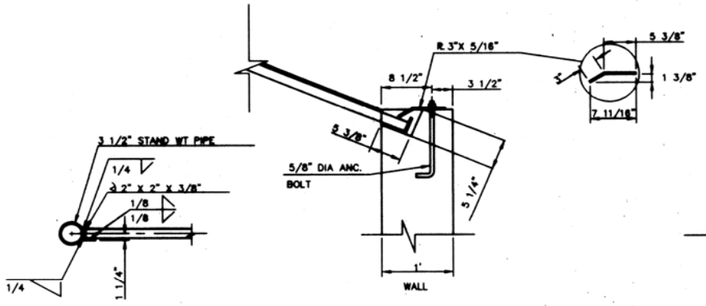


PLAN – INLET

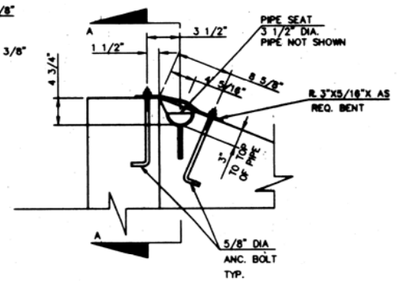


SECTION E–E

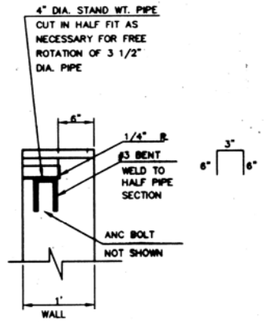
ELEVATION



DETAIL "C"



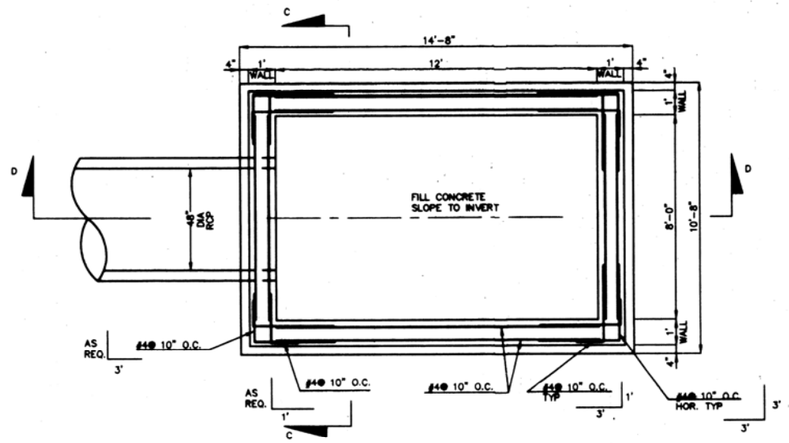
DETAIL "A"



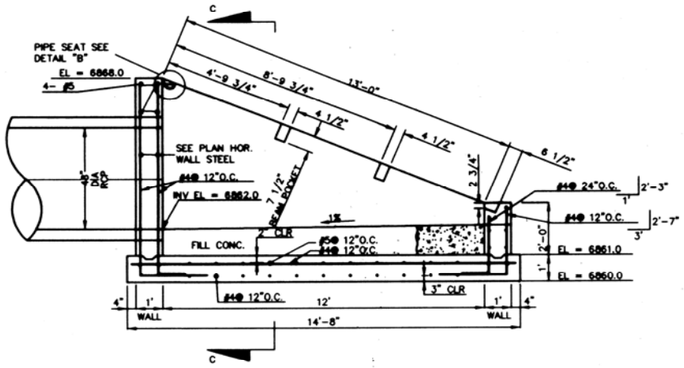
DETAIL "B"

SECTION A–A

SCALE 1"=1'



PLAN– HORIZONTAL WALL REINFORCING STEEL



SECTION D–D

(GRATE & GRATE SUPPORTS NOT SHOWN)

STEEL FABRICATION NOTES:

1. FABRICATED STEEL STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AISC AND AWS SPECIFICATIONS.

2. THE OUTLET STRUCTURE BARGRATE IS DESIGNED FOR A VERTICAL LOAD OF 300 LBS./SQ. FT.

3. ALL STRUCTURAL STEEL SHAPES TO INCLUDE: ANGLE, PLATE, AND BAR SHALL MEET ASTM A36 SPECIFICATIONS, FY= 36 KSI MINIMUM.

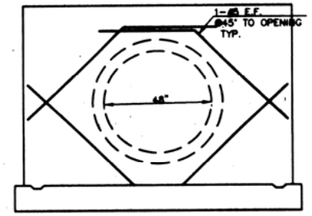
STRUCTURAL TUBING SHALL MEET ASTM A500 GRADE B SPECIFICATIONS, FY= 46 KSI MINIMUM.

STEEL PIPE SHALL BE STANDARD WEIGHT PIPE ASTM A53 GRADE B, FY= 35 KSI MINIMUM.

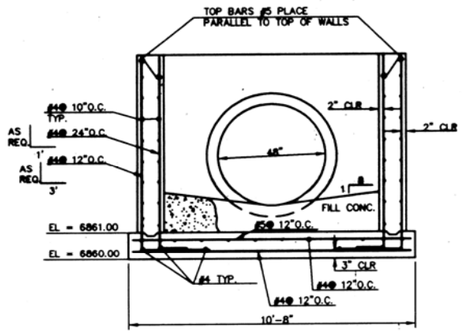
4. WELDS NOT INDICATED SHALL BE 1/8" MINIMUM FILLET OR GROOVE, CONTINUOUS SO FAR AS POSSIBLE. CONSIDER VANDALISM LOADS, WELD ACCORDINGLY AT CRITICAL LOCATIONS.

5. PRIOR TO PAINTING REMOVE ALL OIL, SCALE, AND SLAG, GRIND OFF BURRS AND SHARP EDGES.

6. PAINT WITH ONE SHOP COAT OF ZINC RICH PRIMER AND TWO COATS OF ALUMINUM PAINT, AASHTO M-69



ELEVATION– ADDITIONAL REINF. AT PIPE PENETRATION



SECTION C–C

SCALE 3/8" = 1'

SEE CONCRETE SPECIFICATIONS SHEET 10 OF 15

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF JR ENGINEERING

VANCEL S. POWERS, COLORADO P.E. #31872 — DATE 11-20-01

UNTIL SUCH TIME AS THESE PLANS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

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No.	REVISION	BY	DATE

H-SCALE	VARIES
V-SCALE	VARIES
DATE	04/26/01
DESIGNED BY	JRB
DRAWN BY	SRT/ELY
CHECKED BY	JRB

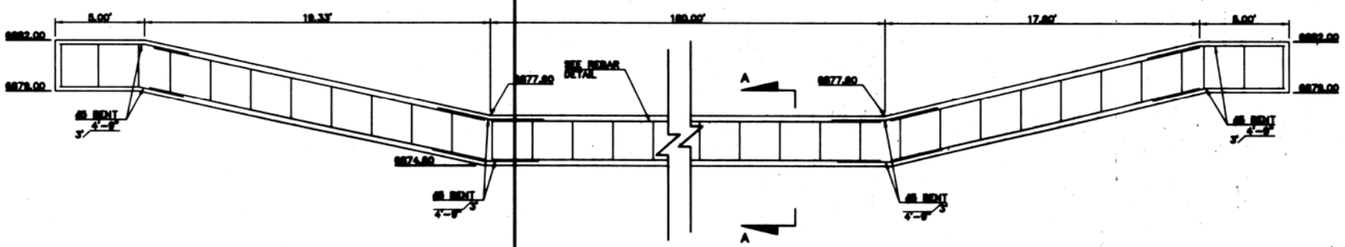
BRIARGATE PARKWAY STORM DRAIN

DETENTION FACILITY "C"
OUTLET STRUCTURE DETAILS

SHEET 7 OF 19

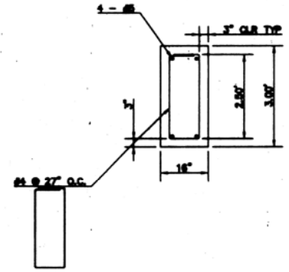
JOB NO. 28715.33

0111-08



REINFORCED CONCRETE CUTOFF WALL FOR DETENTION FACILITY "C" EMERGENCY SPILLWAY

SCALE: 1" = 4'

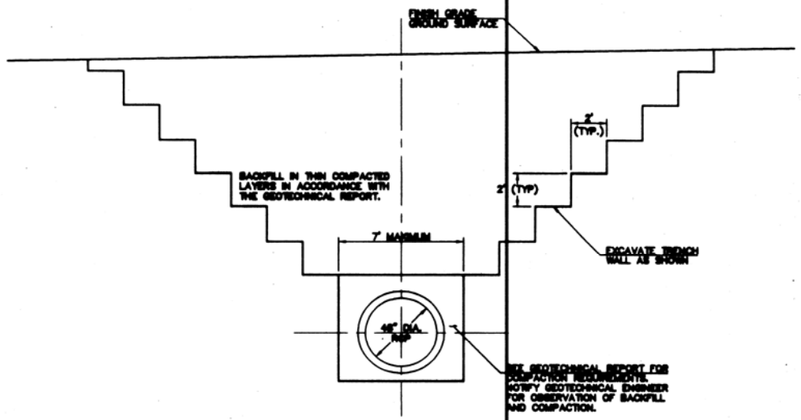


SECTION A-A REBAR DETAIL

SCALE: 1" = 2'

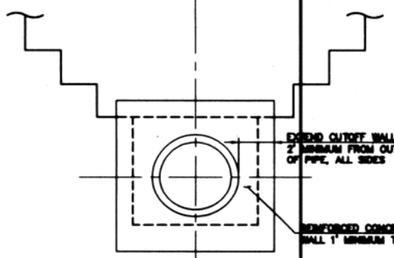
REFER TO CONCRETE AND REINFORCEMENT SPECIFICATIONS

SEE SHEET 18 OF 19



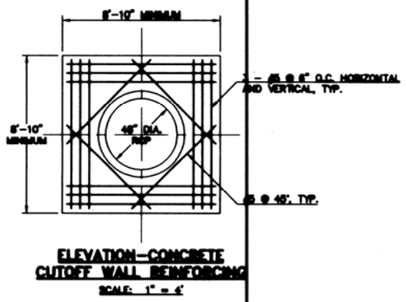
TYPICAL TRENCH SECTION DETENTION FACILITY "C" OUTFALL PIPE

SCALE: 1" = 4'



TYPICAL TRENCH SECTION AT ANTI-SEEP COLLAR/CUTOFF WALL

SCALE: 1" = 4'



ELEVATION-CONCRETE CUTOFF WALL REINFORCING

SCALE: 1" = 4'

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF JR ENGINEERING

Vance E. Fournier 11-20-01

VANCE E. FOURNIER, COLORADO P.E. 25972 DATE

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No.	REVISION	BY	DATE

H-SCALE VARIES
V-SCALE VARIES
DATE 04/26/01
DESIGNED BY JRB
DRAWN BY SRT/ELY
CHECKED BY JRB

BRIARGATE PARKWAY STORM DRAIN

REINFORCED CONCRETE CUTOFF WALL DETENTION FACILITY "C" EMERGENCY SPILLWAY

INCLUDING ANTI-SEEP COLLAR DETAILS

SHEET 8 OF 19

JOB NO. 28715.33

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0111-08 Sheet 8 of 19