Les Schwab Tire Center
Storm Report

EPC STORMWATER REVIEW COMMENTS IN ORANGE BOXES WITH BLACK TEXT

7105 Old Meridian RD.
Falcon Colorado

Prepared For:

SFP-E, LLC
PO Box 5350
20900 Cooley Road
Bend, OR 97701

Prepared By:

Cushing Terrell

Cushing Terrell

Zack Graham, PE
411 E Main ST #101
Bozeman, MT 59715
(406) 922-7137
www.cushingterrell.com

COLORADO LICENSED PROFESSIONAL ENGINEER
ZACHARY W. GRAHAM
39039

Date: 2021.04.19 14:56:08-06'00'

Cushing Terrell Project No. LSCO_21WIN

April, 16, 2021

Add the following text:

PCD Filling No.:
PPR-21-023

TABLE OF CONTENTS

1.0 CONTENTS

LIST OF TABLES

APPENDICES

2.0 GENERAL LOCATION AND DESCRIPTION

2.1 Location

The project site is located at 7105 Old Meridian Rd, Falcon, Colorado and falls within El Paso County. The parcel is part of the larger Meridian Crossing Development, which includes the existing stormwater system infrastructure, including the treatment pond to the south. The site is located on the northeast side of the intersection of Meridian Rd and Old Meridian Rd. The site is located to north west of the existing storm water treatment facilities maintained by the Meridian Crossing Development and an existing storm line runs along the south west property line of the site. The property lies within the NE ¼ of Section 12, Township 13 S, Range 65 West of the Sixth Principal Meridian.

Include a statement about what major drainage basin (Falcon) the site is located in.

2.2 Description of Property

The existing site consists of an undeveloped 2.48 acre lot covered with native grasses and shrubs. In areas taken from the ALTA Survey the site consists of roughly 12% impervious road and sidewalk area with the remaining 88% being the native vegetation. There are no stream crossings or significant waterways located within the area being developed by this project. The site is accessed via the existing private roads that are centered on the north east and south east property lines of the site. These roads will provide means of vehicular ingress and egress.

The topography of the existing site consists of a roughly consistent grade which directs flow from the north of the site towards the south at slopes ranging from 2-5%. There is an existing storm line that runs west to east along the southern edge of the site before crossing Old [illegible] that ultimately connects to the adjacent detention pond. The site is not located in a [illegible] flood plain and is designated as area of minimal flood hazard (Zone X).

Please include the panel number the site is located in.

state the name/number of the pond (Pond WU).

3.0 DRAINAGE BASINS

3.1 Existing Drainage Basins

See appendix A for drainage maps showing basin locations.

Revise to appendix B, per report contents.

3.1.1 BASIN Z

Per existing conditions drainage report it appears the name of the basin is "X". Change report contents to remove inconsistencies.

Basin Z is the sole existing basin that consists on the entire 2.48 acres site. The flow path of this basin is from north to south into the existing private drive. Once leaving the property across the existing private drive runoff enters the adjacent lot. The groundcover of this basin is primarily native grasses but also contains a portion of the private drive. The rational calculation for the basin is shown below in table 3.1

Please revise to show Q5 instead for minor storm per EPC's adoption of the City of CS's DCMV1 Chapter 6 in Jan 2015.

Table 3.1

RATIONAL CALC EXISTING									
Basin	% Impervious	C10	C100	Area	TC	I 10 year	I 100 yesr	Q 10	Q 100
X	12	0.33	0.42	2.48	21	3.24	5.1	2.64	5.31
TOTAL	12			2.48				2.64	5.31

Please clarify if storm drain system is being proposed or is existing. FAE does not list any storm drain improvements. If storm drain system is existing, update existing drainage conditions narrative to mention that.

3.2 Proposed Drainage Basins

See appendix B for drainage maps showing basin locations. In general, all basins are collected by curb inlets and routed to the existing storm manhole located in the southern corner of the site. This manhole then drains to the existing stormwater pond described in section 5. The exception to this being basin OS which does not have its flows captured and instead follows the historic drainage pattern.

label as Pond WU or PLD(s).

3.2.1 BASIN A

Basin A consists of much of the parking lot, drive aisle and the landscaped areas located in front of the building. The runoff for this basin is captured by curb and gutter and directed to the proposed curb inlet at the north corner of the parking lot.

3.2.2 BASIN B

Basin B consists of the building roof flows which are conveyed via downspouts to the proposed storm line along the rear of the structure.

3.2.3 BASIN C

Basin C consists of the parking, tire storage bullpen, and drive aisles located along the rear of the building. The flows are collected by curb and gutter and directed to the proposed curb inlet at the south corner of the parking.

3.2.4 BASIN D

Basin D is a small section of the drive aisle and the southern two parking spaces located in front of the building. This basin also receives flows from a small portion of the landscaping along Meridian Rd. this basin is collected in the proposed curb inlet located at he south west corner of the parking row.

3.2.5 BASIN E

Basin E consists of a portion of the south western drive aisle. Runoff is collected in the proposed inlet opposite the building.

3.2.6 BASIN F

Basin F consist of the drive aisle on the south end of the site. Runoff is collected by an inlet located just past the southern entrance to the site.

3.2.7 BASIN OS

Basin OS contains all areas not captured in the storm system. This basin follows existing drainage patterns and flows to the south into the adjacent lot. The total flows from this basin do not exceed the historic values.

Update drainage letter contents to include design points for existing and proposed conditions. In a conclusion determine whether design will be compliant with originally proposed conditions.

Table 3.2

RATIONAL CALC PROPOSED									
Basin	% Impervious	C10	C100	Area	TC*	I 10 year	I 100 yesr	Q 10	Q 100
A	49	0.57	0.64	0.80	5	6	9	2.74	4.61
B	100	0.90	0.95	0.24	5	6	9	1.30	2.05
C	98	0.89	0.94	0.62	5	6	9	3.29	5.22
D	52	0.59	0.66	0.05	5	6	9	0.16	0.27
E	100	0.90	0.95	0.06	5	6	9	0.30	0.47
F	100	0.90	0.95	0.07	5	6	9	0.36	0.56
OS	56	0.61	0.69	0.66	5	6	9	2.42	4.10
TOTAL	70	0.71	0.77	2.48				10.56	17.29

*Due to small basin sizes the minimum time of concentration of 5 minutes was used for proposed basins

4.0 DRAINAGE DESGIN CRITERIA

4.1 Development Criteria Reference

This report was prepared using the El Paso County Drainage Criteria Manual (DCM) and the Mile High Flood District Criteria Manual. In creating this report reference was made to the "Meridian Crossing Final Drainage Report" which is included in Appendix F and describes the existing stormwater quality treatment and detention facilities that will be used by this project.

EPC has adopted City of Colorado Springs Ch. 6. Please update report to reference that criteria and update rational calculations to use table 6-6 runoff coefficients/land use.

4.2 Hydrologic Criteria

Because the site in question peak stormwater runoff for all basins. For the purposes of sizing proposed stormwater structures, the major 100-year storm as described in the DCM was used. The rational method coefficients for these calculations were selected from Table 5-1 of the DCM. Time of concentration was assumed to be the 5-minute minimum value for all proposed basins due to their small size. For the existing basin, Figure 5-2 of the DCM was used to determine the time of concentration. All rainfall values were taken from Figure 5-1 of the DCM.

5.0 DRAINAGE FACILITY DESGIN

The drainage facilities proposed for this project consist of a series of curb inlets and storm manholes designed to collect the additional flows generated by the site and direct them to the existing treatment facility. The connection point to the existing storm infrastructure is the existing stormwater manhole located at the south corner of the site. The water enters the existing storm lines at this location where they are directed to the existing stormwater treatment and detention facility.

Describe what happens when the PLD overflows and how SW normally (non-overflow) is routed to Pond WU from the PLD. Referencing a page in the previous report and/or showing a quote from that report to satisfy most of this request is sufficient.

The design and calculations of this existing stormwater treatment and detention facility are not within the scope of this report and can be found in the "Meridian Crossing Final Drainage Report" which is included in Appendix F. This facility is described as a "Porous Landscape Detention" (PLD) and is described in detail on page 16 of the referenced report. This facility was sized to include flows created by the future development we are now proposing. The proposed

Also explain if you will be utilizing both PLD's shown in the old DR or just the western one.

For the pond/PLD, please still provide a summary comparison (via text and/or tables) that shows what was designed for in that old report, versus the actual proposed development in terms of Q5, Q100, C, pond/PLD names and capacities.

Engineer must confirm in the DR that the existing stormwater facilities and their structures are functioning as intended (including forebay, trickle channel, outlet structure, overall pond volume, vegetation, trash/debris, etc as applicable). Do this for both the PLD and Pond WU.

Les Schwab site can be described as the northern half of basin D-2 using the terminology of the referenced report. The assumed runoff coeffient for basin D-2 was 0.95 compared to 0.77 calculated above. No improvements are required for this existing pond and the pond is maintained by Park Place Enterprises, LLC.

Also briefly describe the PLD that will be used and it's features (ex: grassy swale with outlet structure).

Please clarify which pond you are referring to. PLD? Pond WU? In either case, we would like to see a statement like this for both (saying who owns and operates/maintains each and that they are in sufficient currently operating has designed).

Show the "Four-Step Process" for selecting structural BMPs (ECM Section I.7.2 BMP Selection)

Step 4 should include a discussion of the uncovered tire storage bullpen.

-Update report contents to include a list of references that includes all reports/manuals that were used to create drainage letter.

-Update runoff calculations for 5 year and 100 year (time of concentration and runoff coefficients) per CSDCM Vol. 1 Ch. 6.

-Provide design point for outfall.

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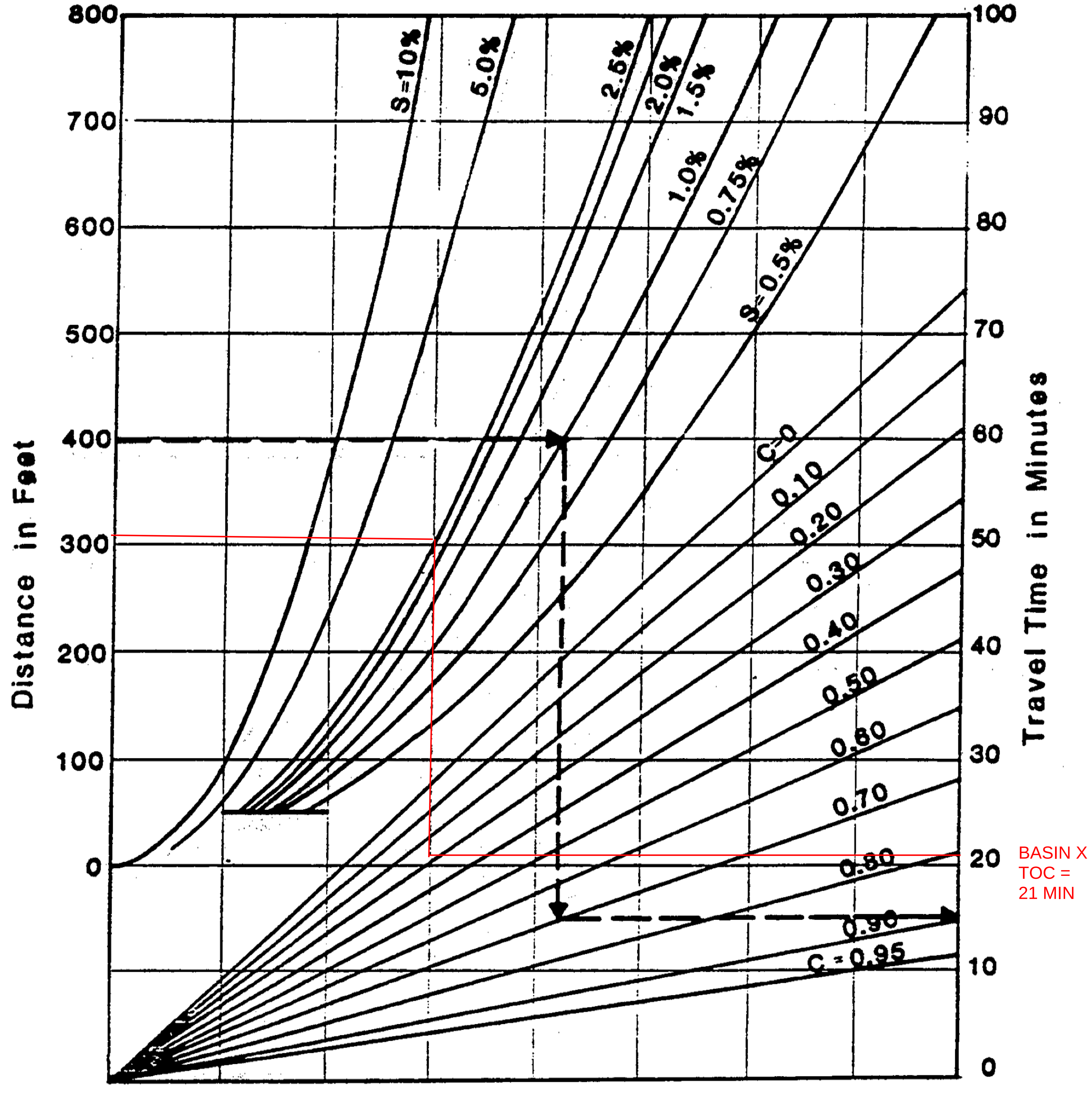
APPENDIX A: HYDROLOGIC CALCULATION



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

Please refer to CSDCM Vol. 1 Ch. 6 to calculate time of concentration and provide those calculations in the drainage letter.

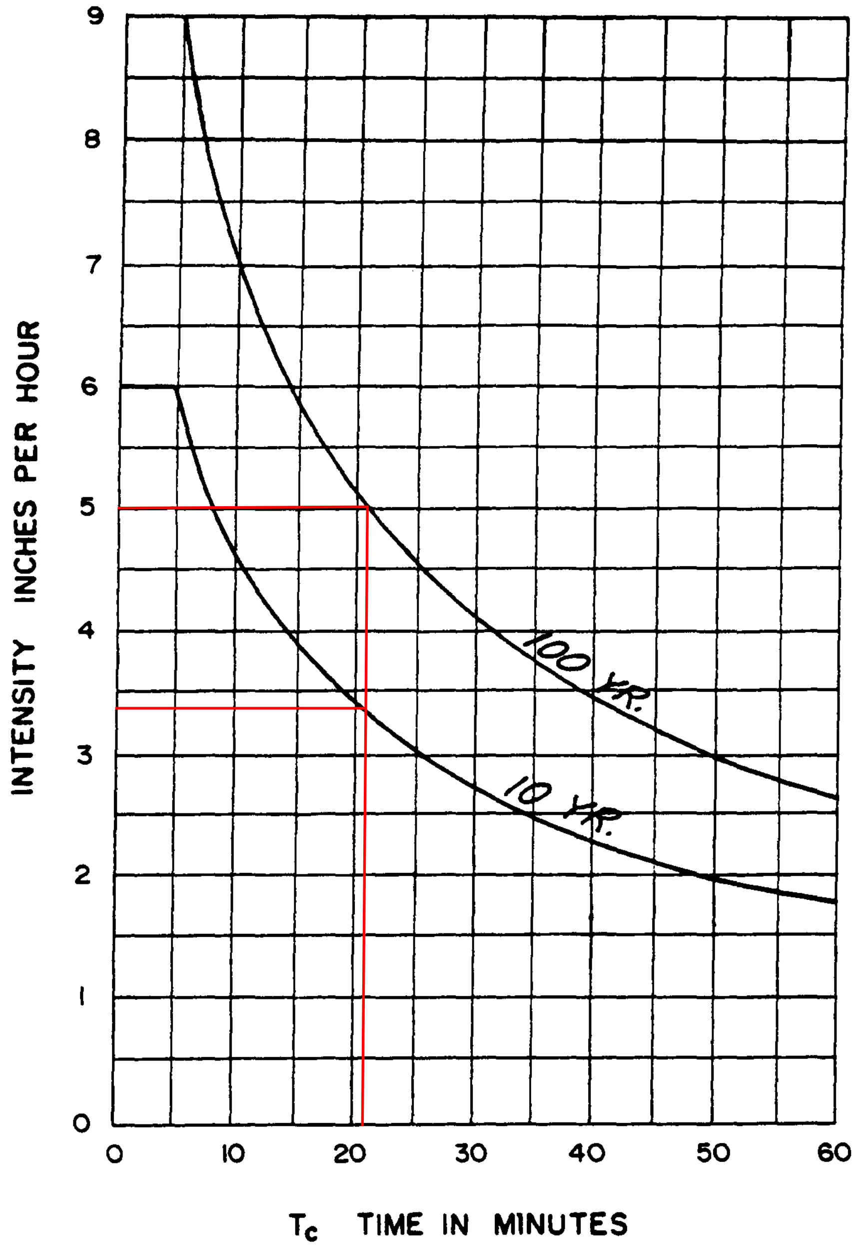
HDR Infrastructure, Inc.
A Centerra Company

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

Overland Flow Curves

Date
OCT. 1987

Figure
5-2



RE: Based upon Pikes Peak area council of governments/ areawide urban runoff control manual.

BASIN X:
10 YEAR = 3.24 IN/ HR
100 YR= 5.1 IN/HR

ALL PROPOSED:
10 YEAR = 6 IN/HR
100 YEAR = 9IN/HR

HDR Infrastructure, Inc. A Centerra Company	The City of Colorado Springs / El Paso County Drainage Criteria Manual	Date OCT. 1987
	Storm Rainfall Time Intensity-Frequency Curves	Figure 5 - 1

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Subject:	RATIONAL METHOD CALCULATIONS			Page:	1
Project No.	LSCO_20FAL	By:	RW	Date:	4.14.21
Project Name:	LES SCHWAB TIRE CENTER				

RATIONAL CALC EXISTING									
Basin	% Impervious	C10	C100	Area	TC	I 10 year	I 100 yesr	Q 10	Q 100
X	12	0.33	0.42	2.48	21	3.24	5.1	2.64	5.31
TOTAL	12	0.33	0.42	2.48				2.64	5.31

Per CSDCM Ch 6, revise minor storm to be 5 year.

RATIONAL CALC PROPOSED									
Basin	% Impervious	C10	C100	Area	TC*	I 10 year	I 100 yesr	Q 10	Q 100
A	49	0.57	0.64	0.80	5	6	9	2.74	4.61
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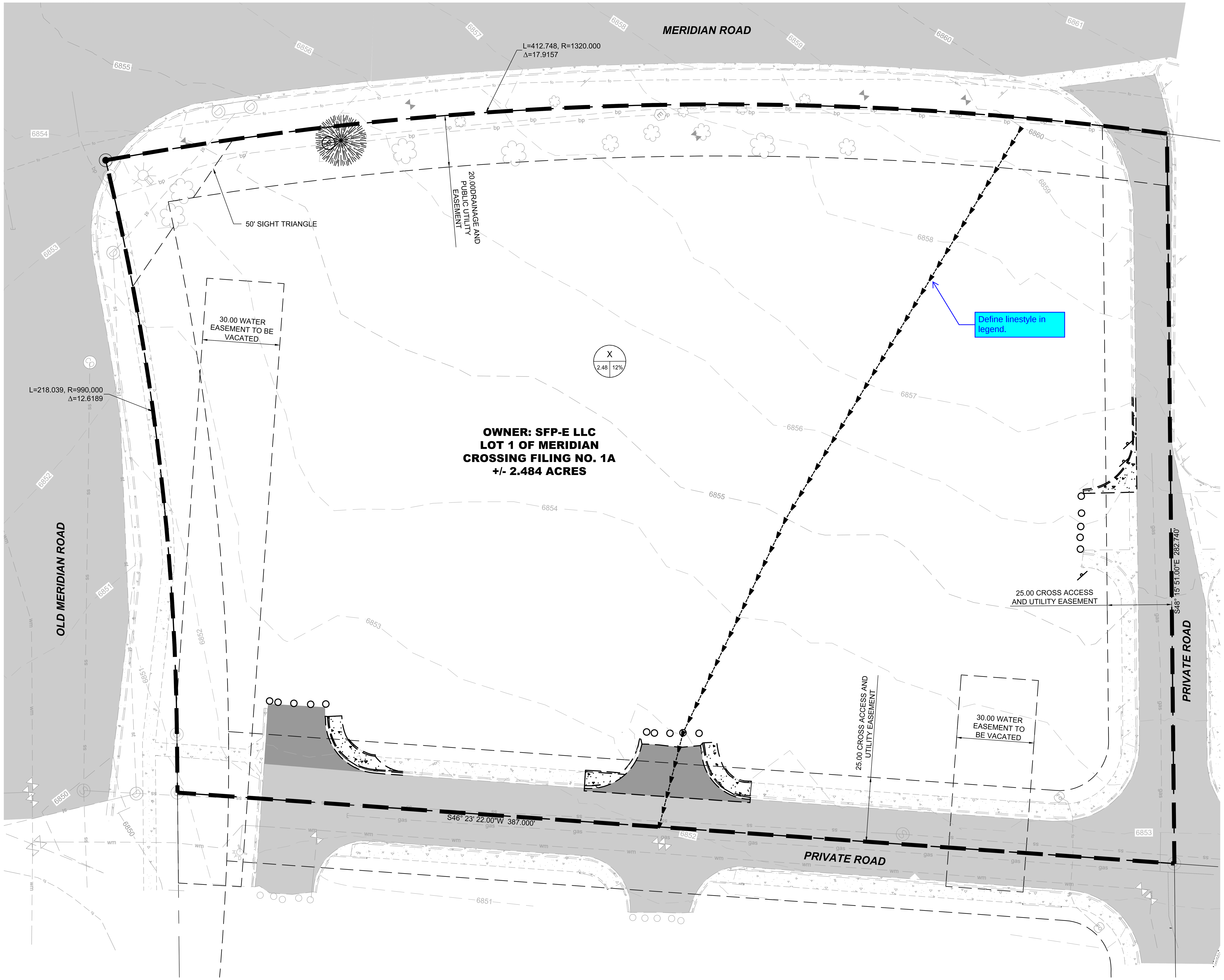
F	100	0.90	0.95	0.07	5	6	9	0.36	0.56
OS	56	0.61	0.69	0.66	5	6	9	2.42	4.10
TOTAL	70	0.71	0.77	2.48				10.56	17.29

*Due to small basin sizes the minimum time of concentration of 5 minutes was used for proposed basins

APPENDIX B: BASIN MAPS

Add a legend to define linestyles in both existing and proposed drainage maps.



1
C001
EXISTING CONDITIONS PLAN

NORTH

0 10 20 40

SCALE: 1" = 20'

1 — BASIN DESIGNATION

100 — % IMPERVIOUS

0.00 — BASIN AREA IN ACRES

4/16/2021 5:42 AM | L:\LesSchwab\New\LSCO_20FAL\BIMCAD\Civil\LSCO_20FAL_D.1.dwg

NOT FOR CONSTRUCTION - PRELIMINARY DESIGN

Cushing Terrell.

cushingterrell.com
800.757.9522

Tires LES SCHWAB

LES SCHWAB TIRE CENTER

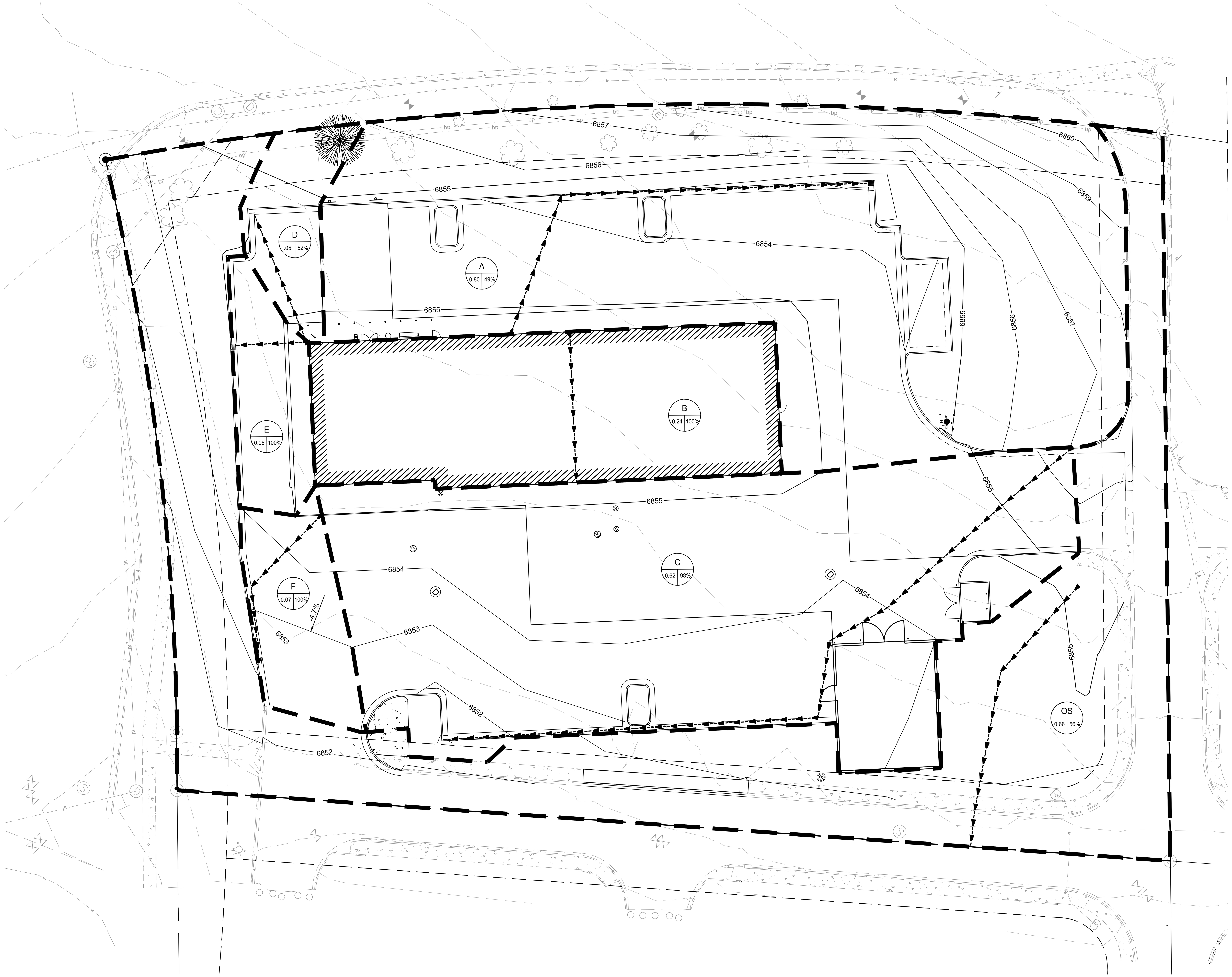
7105 OLD MERIDIAN RD.
FALCON, CO

SITE DEVELOPEMENT PLANS

04.16.2021
DRAWN BY | WALKER
CHECKED BY | GRAHAM
REVISIONS
-

EXISTING BASIN MAP

D.1



1 C200 GRADING PLAN

NORTH

0 10 20 40
SCALE: 1" = 20'

1 — BASIN DESIGNATION
0.00 | 100 — % IMPERVIOUS
BASIN AREA IN ACRES

Cushing Terrell

cushingterrell.com
800.757.9522

Tires LES SCHWAB

LES SCHWAB TIRE CENTER

7105 OLD MERIDIAN RD.
FALCON, CO

NOT FOR CONSTRUCTION - PRELIMINARY DESIGN

SITE DEVELOPEMENT PLANS

04.16.2021
DRAWN BY | WALKER
CHECKED BY | GRAHAM
REVISIONS
-

EXISTING BASIN MAP

D.2

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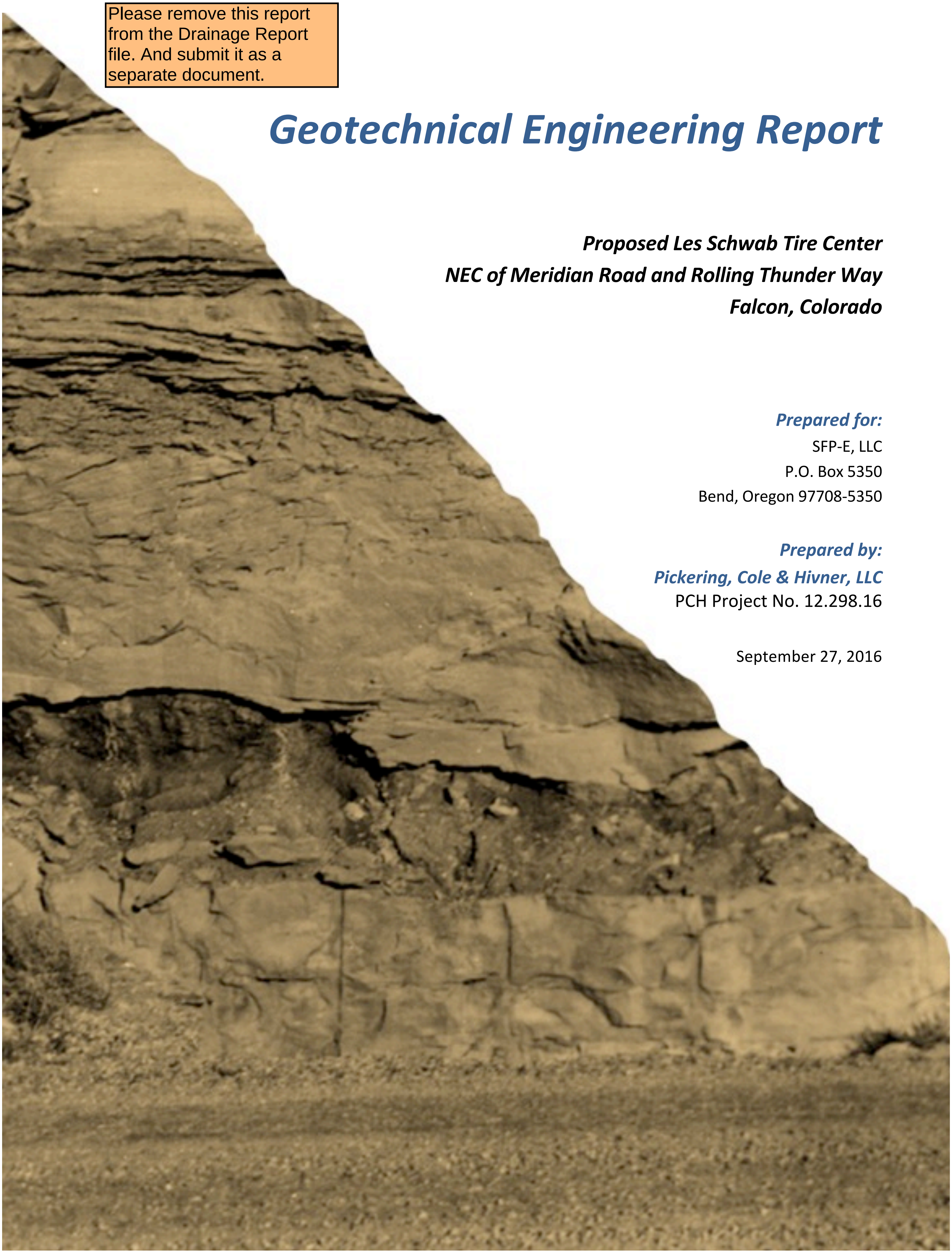
APPENDIX C: SOILS REPORT

Please remove this report from the Drainage Report file. And submit it as a separate document.



Geotechnical Engineering Report

Proposed Les Schwab Tire Center
NEC of Meridian Road and Rolling Thunder Way
Falcon, Colorado

Prepared for:

SFP-E, LLC
P.O. Box 5350
Bend, Oregon 97708-5350

Prepared by:

Pickering, Cole & Hivner, LLC

PCH Project No. 12.298.16

September 27, 2016

September 27, 2016

SFP-E, LLC
P.O. Box 5350
Bend, Oregon 97708-5350

Attn: Mr. Matt Hannigan

Re: Geotechnical Engineering Report
Proposed Les Schwab Tire Center
NEC of Meridian Road and Rolling Thunder Way
Falcon, Colorado
PCH Project No. 12.298.16

Pickering Cole & Hivner, LLC (PCH) has completed a geotechnical engineering investigation for the proposed Les Schwab Tire Center to be located at the northeast corner of the above-referenced intersection in Falcon, Colorado. This study was performed in general accordance with our proposal number P12.333.16, executed August 10, 2016.

This geotechnical summary should be used in conjunction with the entire report for design and/or construction purposes. It should be recognized that specific details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled General Comments should be read for an understanding of the report limitations.

- **Subsurface Conditions:** The soils at the site consist of silty to clayey sands, fine to coarse sands, and varying layers of lean clays. Sedimentary claystone bedrock was encountered below the sands/clays at depths ranging from about 13 to 18 feet below existing site grades. The bedrock extended to the depths explored. Groundwater was encountered in our building borings immediately after drilling at depths ranging from about 10 to 15 feet below existing site grades. The shallow pavement borings were dry at that time. When checked about three weeks later, ***groundwater was encountered in the deeper borings at depths ranging from about 4 to 7-½ feet below existing site grades***. The shallow pavement borings remained dry at that time. Other specific information regarding the lithology encountered is noted on the attached Boring Logs.

- **Shallow Groundwater and Below-Grade Construction:** As discussed, groundwater was encountered at the site at depths ranging from about 4 to 7-½ feet below existing site grades. As currently planned the northeast portion of the building will include below-grade maintenance pits (maximum of about 7 feet below planned FFE). ***We recommend construction be limited to excavation depths as high as practical in these areas in order to reduce the potential for water intrusion, as well as to minimize encountering potentially soft/unstable soil conditions during construction.***

We recommend these maintenance pit areas be designed as water-tight structures, designed for buoyancy and hydrostatic pressures. Waterproofing consultants should be contacted for recommendations regarding the design and construction of water-tight below-grade foundations. As an alternative, subsurface drainage systems can be installed to collect subsurface water and maintain dry interior conditions. At a minimum, the drainage system would include installation of a perimeter drain system around and below the foundations of these below grade areas which would empty into the storm sewer or a sump pit where collected water could be discharged via a submersible pump.

- **Foundations and Floor Slabs:** Based on the information obtained from our subsurface exploration and laboratory testing of selected samples, the site appears suitable for proposed development. The native sand/clay soils encountered near foundation bearing elevations are considered suitable for support of conventional spread footing foundations and slab-on-grade floors at the site. However, areas of soft, unstable or low-density soils may also be encountered in the foundation excavations and may require the need for removal and recompaction/replacement prior to foundation and floor slab construction. Therefore, it is imperative that the soils exposed in foundation excavations be observed by the geotechnical engineer to confirm or modify our recommendations.

- **Pavement Design and Structural Sections**: Design of pavements for the project is based on the procedures outlined in the 1993 *Guideline for Design of Pavement Structures* by the American Association of State Highway and Transportation Officials (AASHTO) using an assumed traffic volume.

  Light-duty pavements for automobile parking areas should include a minimum of 5-½ inches of asphalt concrete or, alternately, 5 inches of Portland cement concrete. Paved access drives should be paved with 6-½ inches of asphalt concrete. Heavy-duty pavements such as for driveway entrances, drive isles, heavy truck parking, and other areas where trucks will park and turn should include a minimum of 6 inches of Portland cement concrete.

We appreciate being of service to you in the geotechnical engineering phase of this project, and are prepared to assist you during the construction phases as well. Please do not hesitate to contact us if you have any questions concerning this report or any of our testing, inspection, design and consulting services.

Sincerely,
Pickering, Cole & Hivner, LLC

Glenn D. Ohlsen, P.E.
Project Engineer

Andrew J. Garner, P.E.
Senior Project Manager

COLORADO REGISTERED PROFESSIONAL ENGINEER
ANDREW J. GARNER
34273
9/27/16

Copies to: Addressee (1 PDF copy)

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GEOTECHNICAL ENGINEERING REPORT

PROPOSED LES SCHWAB TIRE CENTER
NEC of MERIDIAN ROAD and ROLLING THUNDER WAY
FALCON, COLORADO

PCH Project No. 12.298.16
September 27, 2016

INTRODUCTION

This report contains the results of our geotechnical engineering exploration for the proposed Les Schwab Tire Center to be located at the northeast corner of the intersection of Meridian Road and Rolling Thunder Way in Falcon, Colorado.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil and bedrock conditions
- Groundwater conditions
- Foundation design and construction
- Lateral earth pressures
- Floor slab design and construction
- Pavement structural sections
- Earthwork
- Drainage

The recommendations contained in this report are based upon the results of field and laboratory testing, engineering analyses, our experience with similar subsurface conditions and structures, and our understanding of the proposed project.

PROJECT INFORMATION

We understand that the project will include the development of an approximate 2.5-acre site at the referenced intersection. Development will include construction of a new single-story Les Schwab Tire Center building encompassing approximately 11,878 square feet. We assume construction will include either load bearing CMU or light-gauge steel framed superstructure along with interior steel columns supporting a metal roof system. Reinforced concrete foundations will support the structures. The interior of the structures will include a conventional slab-on-grade with some bays having a recessed slab. Portions of the slab will bear approximately 6-½ to 7 feet below finished floor elevation (FFE). Maximum wall and column loads are anticipated to be on the order of about 3 to 5 kips per lineal foot and 100 to 200 kips, respectively. We assume that a majority of the site is near rough construction grade, slightly below planned FFE.

Other major site development will include the installation of underground utilities, construction of a trash enclosure, as well as the construction of private asphalt or concrete paved parking areas and site landscape improvements.

If our understanding of the project, or assumptions above, is not accurate, or if you have additional useful information, please inform us as soon as possible.

SITE EXPLORATION PROCEDURES

The scope of the services performed for this project included site reconnaissance by a field engineer, a subsurface exploration program, laboratory testing and engineering analysis.

Field Exploration: As part of this study, we investigated the subsurface conditions on the site with a total of six (6) test borings. Borings were advanced to depths of about 25 to 35 feet below existing site grades with a truck-mounted drilling rig utilizing 4-inch diameter, solid stem auger.

A lithologic log of each boring was recorded by our field representative during the drilling operations. At selected intervals, samples of the subsurface materials were obtained by driving modified California barrel samplers. Penetration resistance measurements were obtained by driving the sample barrel into the subsurface materials with a 140-pound automatic hammer falling 30 inches. The penetration resistance value is a useful index to the consistency, relative density or hardness of the materials encountered.

Groundwater measurements were made in each boring at the time of site exploration and about three weeks later. Borings were loosely backfilled with the auger cuttings upon completion of groundwater measurements.

Laboratory Testing: Samples retrieved during the field exploration were returned to the laboratory for observation by the project geotechnical engineer, and were classified in general accordance with the Unified Soil Classification System described in Appendix C. Samples of bedrock were classified in general accordance with the general notes for Rock Classification. At that time, an applicable laboratory-testing program was formulated to determine engineering properties of the subsurface materials. Following the completion of the laboratory testing, the field descriptions were confirmed or modified as necessary, and Boring Logs were prepared. These logs are presented in Appendix A.

Laboratory test results are presented in Appendix B. These results were used for the geotechnical engineering analyses and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable local or other accepted standards.

Selected soil and bedrock samples were tested for the following engineering properties:

- Water content
- Dry density
- Consolidation/Swell
- Grain size
- Plasticity Index
- Water-soluble sulfates

SITE CONDITIONS

The site is located at the northeast corner of Meridian Road and Rolling Thunder Way in Falcon, Colorado. The site is generally bordered by Meridian Road to the northwest, Rolling Thunder Way/Old Meridian Road to the southwest, and currently undeveloped lots and asphalt-paved private access roads in the other directions. In general, the surrounding area consists of commercial/retail development. At the time of our field exploration, the ground surface at the site was covered with a low to moderate growth of grass and weeds. The site was generally level, with a slight slope downwards to the south. We anticipate that cuts and fills of up to about 1 to 3 feet could be required to bring the site to construction grades and to provide positive site drainage.

SUBSURFACE CONDITIONS

Geology: Surficial geologic conditions at (or in the vicinity of) the site, as mapped by the U.S. Geological Survey (USGS) ([1]Scott, et al, 1976) and ([2]Madole, R.F., 2003), consist of Eolian Sand of Holocene and Pleistocene Age. These materials are typically described as sand, sandy silt, and sandy clay. Bedrock underlying the surface units consists of the Dawson Formation of Paleocene and Upper Cretaceous Age. This formation generally includes sandstone, claystone and conglomerate.

The site is located just east of mapping completed by the Colorado Geological Survey ([3]Hart, 1972) for potentially swelling soil and bedrock. However, areas of "Low Swell Potential" were mapped to the west of the site. Potentially expansive materials in this category generally include bedrock and some surficial soils.

Due to the gently sloping nature of the site, the potential for other geologic hazards at the site is anticipated to be low. Seismic activity in the area is anticipated to be low, and the property should be relatively stable from a structural standpoint. With proper site grading around proposed structures, erosional problems at the site should be reduced.

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[1] Scott, G.R., Taylor, R.B., Epis, R.C., and Wobus, R.A., 1976, ***Geologic Map of the Pueblo 1 Degree x 2 Degree Quadrangle, South-Central Colorado,*** United States Geological Survey, Map MF-775.

[2] Madole, R.F., 2003, ***Geologic Map of the Falcon, NW 7.5 Minute Quadrangle, El Paso County, Colorado,*** United States Geological Survey, Map OF03-08.

[3] Hart, Stephen S., 1972, ***Potentially Swelling Soil and Rock in the Front Range Urban Corridor, Colorado***, Colorado Geological Survey, Sheet 3 of 4.

Soil and Bedrock Conditions: The soils at the site consist of silty to clayey sands, fine to coarse sands, and varying layers of lean clays. Sedimentary claystone bedrock was encountered below the sands/clays at depths ranging from about 13 to 18 feet below existing site grades. The bedrock extended to the depths explored. Other specific information regarding the lithology encountered is noted on the attached Boring Logs.

Field and Laboratory Test Results: Field test results indicate that the sand soils vary from medium dense to dense in relative density. The clay soils are very stiff to hard in consistency. Laboratory test results indicate that the clayey soils and claystone bedrock at the site exhibit low expansive potential when inundated in our laboratory.

Groundwater Conditions: Groundwater was encountered in our building borings immediately after drilling at depths ranging from about 10 to 15 feet below existing site grades. The shallow pavement borings were dry at that time. ***When checked about three weeks later, groundwater was encountered in the deeper borings at depths ranging from about 4 to 7-½ feet below existing site grades.*** The shallow pavement borings remained dry at that time.

Based upon review of U.S. Geological Survey Maps ([4]Hillier, et al, 1980), regional groundwater beneath the project area is expected to be encountered in unconsolidated alluvial deposits or in the Dawson Aquifer at depths generally greater than 20 feet below present ground surface.

Zones of perched and/or trapped groundwater, where not already present, may also occur at times in the subsurface soils overlying bedrock, on top of the bedrock surface or within permeable fractures in the bedrock materials. The location and amount of perched water is dependent upon several factors including hydrologic conditions, type of site development, irrigation demands on or adjacent to the site, fluctuations in water features, seasonal and weather conditions.

The possibility of groundwater fluctuations should be considered when developing design and construction plans for the project.

ENGINEERING RECOMMENDATIONS

Geotechnical Considerations: The site appears suitable for the proposed construction as long as the recommendations included herein are incorporated into the design and construction aspects of the project. Based on our borings, the site should be suitable for the proposed construction, however, the presence of relatively shallow groundwater may impact both the design and construction of the project.

As discussed, groundwater was encountered at the site at depths ranging from about 4 to 7-½ feet below existing site grades. As currently planned the northeast portion of the building will include below-

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[4]Hillier, Donald E.; and Hutchinson, E. Carter, 1980, ***Depth to Water Table (1976-1977) in the Colorado Springs-Castle Rock Area, Front Range Urban Corridor, Colorado***, United States Geological Survey, Map I-857-H.

grade maintenance pits (maximum of about 7 feet below planned FFE). ***We recommend construction be limited to excavation depths as high as practical in these areas in order to reduce the potential for water intrusion, as well as to minimize encountering potentially soft/unstable soil conditions during construction.***

We recommend these maintenance pit areas be designed as water-tight structures, designed for buoyancy and hydrostatic pressures. Waterproofing consultants should be contacted for recommendations regarding the design and construction of water-tight below-grade foundations. As an alternative, subsurface drainage systems can be installed to collect subsurface water and maintain dry interior conditions. At a minimum, the drainage system would include installation of a perimeter drain system around and below the foundations of these below grade areas which would empty into the storm sewer or a sump pit where collected water could be discharged via a submersible pump.

Design and construction recommendations for the foundation system and other earth-connected phases of the project are outlined below.

Foundation Design and Construction: Due to the presence of non- to low expansive soils, spread footing foundations are considered acceptable for support of the structure on this site. Based on the borings advanced on the site, we believe that the native soils will be suitable for support of foundations; however, it is possible that soft, unstable, or low-density soils may also be present, particularly for foundations approaching the groundwater level. ***The geotechnical engineer responsible for special inspections should be contacted to observe and evaluate the suitability of the soils beneath foundation excavations at the site, prior to forming for footing construction. If any areas of soft, unstable or low-density soils are observed, removal and recompaction/replacement will be required.***

The following foundation design criteria may be used for the structural design of foundations:

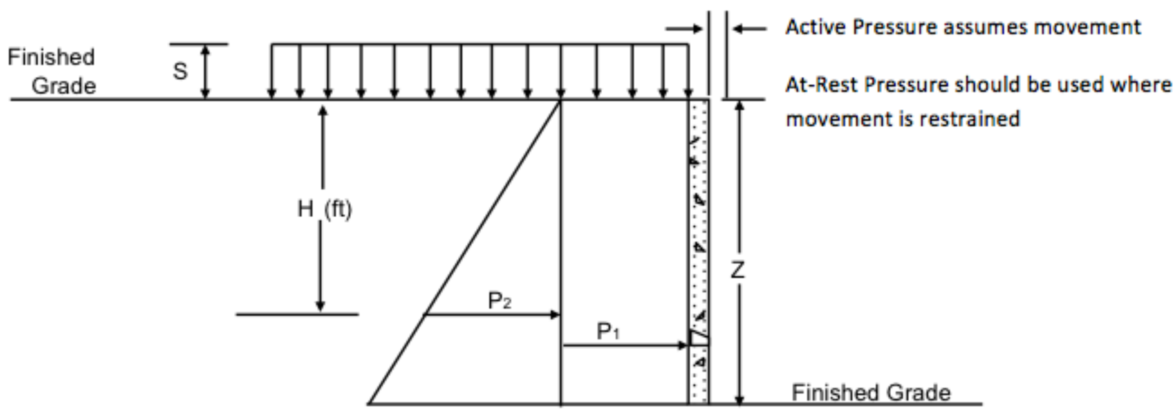
Criteria	Design Value
Bearing Strata	Undisturbed native sand/clay soils or properly compacted fill materials approved by the Geotechnical Engineer
Maximum net allowable bearing pressure[1]	2,000 psf
Min. depth below grade, exterior wall footings[2]	36 inches
Min. depth below grade, interior footings[2]	12 inches
Estimated maximum total foundation movement[3]	1 inch
Estimated maximum differential foundation movement[3]	½ to ¾ inch

1. The design bearing pressure above applies to dead loads plus one-half of design live load conditions. The design bearing pressure may be increased by 1/3 when considering total loads that include wind or seismic conditions.
2. Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings.

3. Based on assumed structural loads. Footings should be proportioned to apply relative constant dead load pressure in order to reduce differential movement between adjacent footings.

Foundation movements could occur if water from any source infiltrates the foundation soils; therefore, proper drainage should be provided in the final design and during construction. Failure to maintain proper surface drainage could result in excessive soil-related foundation movement.

Lateral Earth Pressures: Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction, wetting of backfill materials, and/or compaction and the strength of the materials being restrained. Loads that should be considered by the structural engineer on walls are shown below.



Active earth pressure is commonly used for design of freestanding cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall rotation. Walls with unbalanced backfill levels on opposite sides (i.e. basement walls) should be designed for earth pressures at least equal to those indicated in the following table. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls.

EARTH PRESSURE COEFFICIENTS

Earth pressure conditions	Coefficient for backfill type	Equivalent fluid pressure, pcf	Surcharge pressure P_1, psf	Earth pressure P_2, psf
Active (Ka)	On-site clayey soils - 0.38	45	(0.38)S	(45)H
At-Rest (Ko)	On-site clayey soils - 0.54	65	(0.54)S	(65)H
Passive (Kp)	On-site clayey soils – 2.3	275	---	---

Conditions applicable to the above conditions include:

- for active earth pressure, wall must rotate about base, with top lateral movements 0.01 Z to 0.02 Z, where Z is wall height

- for passive earth pressure, wall must move horizontally to mobilize resistance
- uniform surcharge, where S is surcharge pressure
- in-situ soil backfill weight a maximum of 120 pcf
- horizontal backfill, compacted to at least 95 percent of standard Proctor maximum dry density
- loading from heavy compaction equipment not included
- ***no groundwater acting on wall***
- no safety factor included
- ignore passive pressure in frost zone

Backfill placed against structures may consist of the on-site soils processed to a soil-like consistency with maximum particle sizes on the order of 4 to 6 inches. The design equivalent fluid pressures may be reduced if the imported granular soils are used. To calculate the resistance to sliding, a value of 0.35 may be used as the ultimate coefficient of friction between the footing and the underlying soil. If utilizing passive pressure for resistance, a coefficient of 0.30 should be used.

We recommend a perimeter drain be installed at the foundation level to control the water level behind any basement/below-grade walls. ***If this is not possible or if the below-grade space is being designed to be watertight, then combined hydrostatic and lateral earth pressures should be calculated for lean clay backfill using an equivalent fluid weighing 90 and 100 pcf for active and at-rest conditions, respectively***. These pressures do not include the influence of surcharge, equipment or floor loading, which should be added. Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than those provided.

Below-grade Construction: As discussed, groundwater (perched water) was encountered at the site at depths ranging from about 4 to 7-½ feet below existing site grades. As currently planned the northeast portion of the building will include below-grade maintenance pits (maximum of about 7 feet below planned FFE). ***We recommend construction be limited to excavation depths as high as practical in these areas in order to reduce the potential for water intrusion, as well as to minimize encountering potentially soft/loose soil conditions during construction.***

Based on the limited size of the maintenance pits, we believe it is prudent to construct these below-grade areas to be water-tight. This would include waterproofing the foundation and walls of the pits and designing the pits for buoyancy forces and hydrostatic lateral loading conditions below groundwater depth. Waterproofing consultants should be contacted for recommendations regarding the design and construction of water-tight below-grade foundations.

As an alternative, installation of a perimeter drainage system is recommended around the perimeter of these below-grade spaces. The drainage system should include a trench in which a perforated pipe is placed, sloped at a minimum 1/8 inch per foot to a suitable outlet, such as the storm sewer or a sump and pump system.

In our opinion, the drainage system should consist of a minimum 4-inch diameter perforated or slotted pipe, embedded in free-draining gravel, placed in a trench at least 12 inches in width. The edge of the trench should be sloped at a 1:1 slope beginning at the bottom outside edge of the footing. The trench should not be cut vertically at the edge of the footing. Gravel should extend a minimum of 2 to 3 inches beneath the bottom of the pipe and at least 6 inches above the pipe. The gravel should be encapsulated in a filter fabric prior to placement of foundation backfill. A general detail of this system is included herein. If the pits are designed to be water-tight, the drain system would not be required.

Seismic Considerations: Based on the soil conditions encountered in the test holes drilled on the site, we estimate that a Site Class D is appropriate for the site according to the 2009 International Building Code (Table 1613.5.2). This parameter was estimated based on extrapolation of data beyond the deepest depth explored, using methods allowed by the code. Actual shear wave velocity testing/analysis and/or exploration to 100 feet was not performed.

Floor Slab Design and Construction: The existing, non- to low expansive soils at the site are generally considered suitable for support of the floor slab. Some movement of a slab-on-grade floor system is still possible should the subgrade soils become elevated in moisture content. We estimate that total slab movement will be about 1-inch. If movement cannot be tolerated, we should be contacted to provide alternatives for additional subgrade preparation or the use of a structural floor system.

To reduce potential slab movements, the subgrade soils should be prepared as outlined in the "Earthwork" section of this report and adequate surface drainage needs to be maintained.

For structural design of concrete slabs-on-grade, a modulus of subgrade reaction of 100 pounds per cubic inch (pci) may be used for floors supported on the on-site soils. Additional floor slab design and construction recommendations are as follows:

- Positive separations and/or isolation joints should be provided between slabs and all foundations, columns or utility lines to allow independent movement.

- Control joints should be provided in slabs to control the location and extent of cracking.

- A minimum 2-inch void space should be constructed above or below non-bearing partition walls placed on the floor slab. If this void space is constructed as a slip joint at the top of the wall, some minor drywall cracking could occur due to slab movement, prior to mobilization of this joint. Special framing details should be provided at doorjambs and frames within partition walls to avoid potential distortion. Partition walls should be isolated from suspended ceilings.

- Interior trench backfill placed beneath slabs should be compacted in accordance with recommended specifications outlined below.

- The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer and slab contractor should refer to ACI 302 for procedures and cautions regarding the use and placement of a vapor retarder.

- Floor slabs should not be constructed on frozen subgrade.

- Other design and construction considerations, as outlined in Section 302.1R of the *ACI Design Manual*, are recommended.

Private Pavement Thickness Design and Construction: Design of private pavements for the project is based on the procedures outlined in the 1993 *Guideline for Design of Pavement Structures* by the American Association of State Highway and Transportation Officials (AASHTO). The AASHTO design method takes into account several variables, including subgrade soil and traffic conditions. We assume that there will be no new pavements in the public right-of-way. If public roadway construction is to be included in the project, additional geotechnical investigation and a formal pavement design may be required for those improvements.

- **Subgrade Soil:** The on-site sandy and clayey soils are considered to generally provide good to poor pavement support, respectively. We estimated a design R-value of 5 for flexible pavement (asphalt) thickness design based on the properties of the poorer clayey soils. Likewise, modulus of subgrade reaction (K-value) of 100 pounds per cubic inch (pci) was used for design of rigid concrete pavements.

- **Assumed Traffic:** We assume that pavements associated with the project will include private drive lanes, driveways, fire lanes, and surface parking for automobiles and light trucks. We assume that private pavements will be surfaced with either asphalt concrete or Portland cement concrete. Any improvements to adjacent public roadways will need to be designed and constructed according to the governing standards.

  Based on our experience with similar projects, the following traffic criteria were used for determining pavement thicknesses using a design life of 20 years:

  - Driveways and parking stalls - maximum daily traffic of 1,000 cars per day (equivalent single-axle loads, ESAL's of 22,000)
  - Main site access drives and fire lanes – up to 5 trips/day by single-axle delivery trucks per day, 1 combined-axle truck per day and 1 trash truck per day, plus maximum daily traffic of 1,000 cars per day (73,000 ESAL's)

The owner should review these assumptions, and we should be contacted to confirm or modify these resulting pavement sections, if needed.

- **Pavement Sections:** For flexible pavement design a drainage coefficient of 1.0, a terminal serviceability index of 2.0, and an inherent reliability of 85 percent were used. Using, the appropriate ESAL values, environmental criteria and other factors, the design structural numbers (SN) of the pavement sections were determined on the basis of the 1993 AASHTO design equation.

  In addition to the flexible pavement design analyses, a rigid pavement design analysis was completed based upon AASHTO design procedures. Along with soil and traffic conditions, rigid pavement design is based on the Modulus of Rupture of the concrete, and other factors previously outlined. A modulus of rupture of 600 psi (working stress 450 psi) was used for pavement concrete. The rigid pavement thickness for each traffic category was determined on the basis of the AASHTO design equation.

  We have considered full depth-asphalt paving, a composite section with asphalt concrete over aggregate base course, and full depth rigid concrete sections. Alternatives for flexible and rigid pavements are summarized for each traffic area as follows:

Traffic Area	Alternative	Private Pavement Thickness (Inches)		
		Asphalt Concrete (AC)	Aggregate Base Course (ABC)	Portland Cement Concrete (PCC)
Automobile Parking and Standard-Duty Automobile and Light Truck Parking Only	A	5-½	--	--
	B	4	6	--
	C	--	--	5
Main Access Drives, and Heavy-Duty areas Private Drives, Fire Lanes, Delivery truck access	A	6-½	--	--
	B1	4	9	--
	B2	4-½	7	--
	B3	5	6	--
	C	--	--	6

  A minimum 6-inch thickness of Portland cement concrete pavement is recommended at the location of dumpsters where trash trucks park and load, and should be considered in other areas with heavy truck traffic. Each alternative should be investigated with respect to current material availability and economic conditions.

- **Subgrade Preparation:** We recommend the pavement areas be rough graded and then thoroughly proof rolled with a loaded tandem axle dump truck, water truck, or other heavy equipment approved by the observing engineer prior to final grading and paving. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted engineered fills.

At a minimum, in order to provide a more uniform subgrade for site pavements, we recommend that all pavements be constructed on a minimum of 12 inches of properly moisture conditioned and recompacted on-site soils. Confirmation of the moisture content and compaction level of the subgrade soils should be confirmed just prior to paving.

- **Pavement Materials:** Aggregate base course (if used on the site) should consist of a blend of sand and gravel which meets strict specifications for quality and gradation. Use of materials meeting Colorado Department of Transportation (CDOT) Class 5 or 6 specifications is recommended for base course. Aggregate base course should be placed in lifts not exceeding 6 inches and compacted to a minimum of 95 percent of the standard Proctor density (ASTM D698).

  Asphalt concrete should be composed of a mixture of aggregate, filler and additives (if required) and approved bituminous material. The asphalt concrete should conform to approved mix designs stating the Hveem properties, optimum asphalt content, and job mix formula and recommended mixing and placing temperatures. Aggregate used in asphalt concrete should meet particular gradations. Material meeting CDOT Grading S or SX specifications or equivalent is recommended for asphalt concrete. Mix designs should be submitted prior to construction to verify their adequacy. Asphalt material should be placed in maximum 3-inch lifts and compacted within a range of 92 to 96 percent of the theoretical maximum (Rice) density (ASTM D2041) or 95 percent Hveem density (ASTM D1560, D1561).

  Where rigid pavements are used, the concrete should meet CDOT Class P requirements and be obtained from an approved mix design with the following minimum properties:

  - Modulus of Rupture @ 28 days .... 600 psi minimum
  - Strength Requirements .... ASTM C94
  - Cement Type .... Type II Portland
  - Entrained Air Content .... 6 to 8%
  - Concrete Aggregate .... ASTM C33 and CDOT Section 703

  Concrete should be deposited by truck mixers or agitators and placed a maximum of 90 minutes from the time the water is added to the mix. Other specifications outlined by CDOT should be followed.

  Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/contraction and isolation. The location and extent of joints should be based upon the final pavement geometry. Sawed joints should be cut within 24 hours of concrete placement and should be a minimum of 25 percent of slab thickness plus 1/4 inch. All joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer.

- **Compliance:** Recommendations for pavement design and construction presented depend upon compliance with recommended material specifications. To assess compliance, observation and testing should be performed under the observation of the geotechnical engineer.

- **Pavement Performance:** Future performance of pavements constructed on the subgrade at this site will be dependent upon several factors, including:

  - Maintaining stable moisture content of the subgrade soils.
  - Providing for a planned program of preventative maintenance.

  The performance of all pavements can be enhanced by minimizing excess moisture, which can reach the subgrade soils. The following recommendations should be considered at minimum:

  - Site grading at a minimum 2 percent grade onto or away from pavements.
  - Water should not be allowed to pond behind curbs.
  - Compaction of any utility trenches for landscaped areas to the same criteria as the pavement subgrade.
  - Sealing all landscaped areas in or adjacent to pavements to minimize or prevent moisture migration to subgrade soils.
  - Placing compacted backfill against the exterior side of curb and gutter.
  - Placing curb, gutter and/or sidewalk directly on subgrade soils without the use of base course materials.

  Preventative maintenance should be planned and provided for an ongoing pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment.

  Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

Earthwork:

General Considerations: The following presents recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project.

All earthwork on the project should be observed and evaluated by the geotechnical engineer contracted for special inspection services. The evaluation of earthwork should include observation and testing of engineered fills, subgrade preparation, foundation bearing soils and other geotechnical conditions exposed during the construction of the project.

Site Preparation: Strip and remove existing vegetation and other deleterious materials from proposed building and pavement areas. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction. Stripped materials consisting of vegetation and organic materials should be wasted from the site or used to revegetate landscaped areas or exposed slopes after completion of grading operations.

The site should be initially graded to create a relatively level surface to receive fill and to provide for a relatively uniform thickness of fill beneath proposed building structures. All exposed areas that will receive fill, once properly cleared, should be scarified to a minimum depth of 8 to 12 inches, conditioned to near optimum moisture content and compacted.

Perched groundwater and/or soft subgrade soils may be encountered in foundation excavations. Stabilization of these materials will be required prior to foundation construction, if encountered. Stabilization would likely include placing or "crowding" larger-sized crushed gravel or recycled concrete into the high moisture content, weak clay soils in order to provide for a stable base. We estimate that the amount of aggregate required to build a stable base may be on the order of 18 to 24 inches in thickness. The thickness of this gravel layer may be reduced using a layer bi-axial (or trixial) geogrid reinforcement below the gravel. The removed clays should be replaced with engineered fill consisting of imported granular soils. Engineered fills should be placed as described below. ***The geotechnical engineer contracted for special inspection services should be contacted during excavation to provide further guidance based on actual site conditions.***

It is anticipated that excavations for the proposed construction can be accomplished with conventional, heavy-duty earthmoving equipment. The stability of the site subgrade may also be affected by precipitation, repetitive construction traffic, or other factors. If unstable conditions are encountered or develop during construction, workability may be improved by scarifying and aeration. Overexcavation of wet zones and replacement with granular materials may be necessary.

Subgrade Preparation: The engineer should evaluate foundation subgrade soils in order to confirm or modify our recommendations for the bearing soils. All subgrade soils below new fill, slab-on-grade floors, exterior PCC flatwork, and pavements should be scarified to a minimum depth of 12 inches, moisture conditioned and compacted as discussed below just prior to construction of these elements.

Fill Materials: Clean on-site soils or approved imported materials may be used as fill material. Imported soils (if required) should conform to the following:

Gradation	Percent finer by weight (ASTM C136)
6"	100
3"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	20-50

- Liquid Limit .... 35 (max)
- Plasticity Index .... 15 (max)
- Maximum expansive potential (%)* 1.0

*Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about optimum water content. The sample is confined under a 500 psf surcharge and submerged.

Compaction Requirements: Engineered fill for site development and grading should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill soils should be placed and compacted according to the following criteria:

Item	Description
Fill Lift Thickness	8 to 12 inches or less in loose thickness
Compaction Requirements	Clayey soils: 95% of standard Proctor dry density (ASTM D698) Non-plastic sands: 95% of modified Proctor dry density (ASTM 1557)
Moisture Content	Clayey soils: Optimum to +4% above optimum moisture content Optimum to +2% above optimum in pavement areas Non-plastic sands: -2% below to +2% above optimum

At a minimum, fill soils placed for any sub-excavation fill, site grading, utility trench backfill and foundation backfill should be tested to confirm that earthwork is being performed according to our recommendations and project specifications. Subsequent lifts of fill should not be placed on previous lifts if the moisture content or dry density is determined to be less than specified.

Excavation and Trench Construction: Caving sand soils may be encountered in excavations during construction. The individual contractor(s) should be made responsible for designing and constructing stable, temporary excavations as needed to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards.

The soils to be penetrated by the proposed excavations may vary significantly across the site. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, the actual conditions should be evaluated to determine any excavation modifications necessary to maintain safe conditions.

As a safety measure, it is recommended that all vehicles and soil piles be kept to a minimum lateral distance from the crest of the slope equal to no less than the slope height. The exposed slope face should be protected against the elements.

As discussed, shallow groundwater was encountered at depths ranging from 4 to 7-½ feet below existing site grades. Where excavations penetrate the groundwater, temporary dewatering will be required during excavation, foundation work and backfilling operations for proper construction. Pumping from sumps may be utilized to control water within the excavations.

Additional Design and Construction Considerations:

Exterior Slab Design and Construction: Flatwork will be subject to movement, particularly when bearing on backfill soils adjacent to the foundation and underground utility lines. The amount of movement will be related to the compactive effort used when the fill soils are placed and future wetting of the subgrade soils. The potential for damage would be greatest where exterior slabs are constructed adjacent to the building or other structural elements.

To reduce the potential for damage, we recommend:

- exterior slabs in critical areas be supported on a zone of recompacted soils.
- Supporting of flatwork at building entrances and other critical areas on haunches attached by the building foundations.
- placement of effective control joints on relatively close centers and isolation joints between slabs and other structural elements.
- provision for adequate drainage in areas adjoining the slabs.
- use of designs which allow vertical movement between the exterior slabs and adjoining structural elements.

Underground Utility Systems: All underground piping within or near the proposed structure should be designed with flexible couplings, so minor deviations in alignment do not result in breakage or distress. Utility knockouts in foundation walls should be oversized to accommodate differential movements.

It is strongly recommended that a representative of the geotechnical engineer provide full-time observation and compaction testing of trench backfill within building and pavement areas.

Concrete Corrosion Protection: Water-soluble sulfate concentrations of select samples ranged up to 400 parts per million (ppm). ACI rates the measured concentrations as being a low to moderate risk of concrete sulfate attack. Based on these results, Type II Portland cement (or equivalent) should be used for concrete on and below grade. Project concrete should be designed in accordance with the provisions of the *ACI Design Manual*, Section 318, Chapter 4.

Surface Drainage: All grades must be adjusted to provide positive drainage away from the structures during construction and maintained throughout the life of the proposed project. Infiltration of water into utility or foundation excavations must be prevented during construction. Landscaped irrigation adjacent to the foundation system should be minimized or eliminated.

Water permitted to pond near or adjacent to the perimeter of the structure (either during or post-construction) can result in significantly higher soil movements than those discussed in this report. As a result, any estimations of potential movement described in this report cannot be relied upon if positive drainage is not obtained and maintained, and water is allowed to infiltrate the fill and/or subgrade.

Exposed ground (unpaved, landscaped areas) should be sloped at a minimum of 5 to 10 percent grade for at least 5 feet beyond the perimeter of the building/structure, where possible. Swales sidewalk chases, area drains may be required to facilitate drainage. Backfill against footings, exterior walls and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration. After building construction and prior to project completion, we recommend that verification of final grading be performed to document that positive drainage, as described above, has been achieved.

Flatwork will be subject to post construction movement due to soil heave/settlement and frost action. Maximum grades practical should be used for paving and flatwork to prevent areas where water can pond. In addition, allowances in final grades should take into consideration post-construction movement of flatwork, particularly if such movement would be critical. Where paving or flatwork abuts the structure, care should be taken that joints are properly sealed and maintained to prevent the infiltration of surface water.

Planters located adjacent to the structure should preferably be self-contained. Landscaping in close proximity to the foundation should be limited to well-maintained and timed drip irrigation only. Sprinkler mains and spray heads should be located a minimum of 5 feet away from the building line.

Roof drains should discharge on pavements or be extended away from the structure a minimum of 5 feet through the use of splash blocks or downspout extensions. A preferred alternative is to have the roof drains discharge to storm sewers by solid pipe or daylighted to a detention pond or other appropriate outfall.

GENERAL COMMENTS

PCH should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. PCH should also be retained to provide testing and observation during the excavation, grading, foundation and construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include, either specifically or by implication, any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes are planned in the nature, design, or location of the project as outlined in this report, the conclusions and recommendations contained in this report shall not be considered valid unless PCH reviews the changes, and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

BORING LOCATION DIAGRAM
BORING LOGS

PCH

1
PROPOSED BORING LOCATIONS

BORING LOCATION DIAGRAM
LES SCHWAB TIRE CENTER
FALCON, COLORADO
PCH PROJECT NO. 12.298.16

PCH

Pickering, Cole, & Hivner, LLC
1070 W. 124th Ave., Suite 300
Westminster, CO 80234
(303) 996-2999

Pickering, Cole, & Hivner
1070 W. 124 Avenue, Suite 300
Westminster, CO. 80234
Telephone: 303.996.2999

BORING NUMBER 1

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way
DATE STARTED 8/17/16 **COMPLETED** 8/17/16
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR Elite Drilling
SURFACE CONDITIONS Low to moderate growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** 15.00 ft
LOGGED BY SM **CHECKED BY** AG
▼ **AFTER DRILLING** 7.50 ft - 9/6/16

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	FINE to COARSE SAND with SILT, varies trace clay, brown, light brown, white, moist, medium dense	0							
		5	SW-SM	CB	100	30 / 12	5.8	121	
7	**CLAYEY SAND**, grey to bluish-grey, moist to wet, medium dense ▼								
		10	SC	CB	100	38 / 12	11.1	123	+0.3/500
	▽	15	SC	CB	100	46 / 12	12.1	124	
17	**CLAYSTONE BEDROCK**, varies sandy, brown, dark brown, grey, calcareous, moist to wet, very hard								
		20	-	CB	100	50 / 7	11.7	125	
		25	-	CB	100	50 / 6	10.1	127	
		30	-	CB	100	50 / 4	11.5	126	
35		35	-	CB	100	50 / 6	15.6	117	

Approximate bottom of borehole at 35.0 feet.

Pickering, Cole, & Hivner
1070 W. 124 Avenue, Suite 300
Westminster, CO. 80234
Telephone: 303.996.2999

BORING NUMBER 2

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way
DATE STARTED 8/17/16 **COMPLETED** 8/17/16
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR Elite Drilling
SURFACE CONDITIONS Low to moderate growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
∇ **DURING DRILLING** 10.00 ft
LOGGED BY SM **CHECKED BY** AG
▼ **AFTER DRILLING** 7.50 ft - 9/6/16

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	CLAYEY SAND, varies to Silty Sand, dark brown, light brown, white, grey, calcareous, moist to wet, medium dense to dense	0							
			SC	CB	100	23 / 12	6.9	126	-0.2/200
		5	SM	CB	100	25 / 12	4.1	117	
	▼								
	∇	10	SC	CB	100	50 / 9	8.3	134	
13	**CLAYSTONE BEDROCK**, varies sandy, grey to bluish-grey, moist, hard to very hard								
		15	-	CB	100	50 / 9	10.9	119	+0.6/1000
		20	-	CB	100	50 / 5	12.2	126	
25		25	-	CB	100	50 / 3	10.7	128	

Approximate bottom of borehole at 25.0 feet.

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Westminster, CO. 80234
Telephone: 303.996.2999

BORING NUMBER 3

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way
DATE STARTED 8/17/16 **COMPLETED** 8/17/16
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR Elite Drilling
SURFACE CONDITIONS Low to moderate growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** 11.00 ft
LOGGED BY SM **CHECKED BY** AG
▼ **AFTER DRILLING** 5.00 ft - 9/6/16

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY to CLAYEY SAND, brown, grey to bluish-grey, moist, medium dense to dense	0							
	▼	5	SM	CB	100	25 / 12	9.5	118	
		10	SM	CB	100	50 / 12	9.5	127	
	▽								
13	**CLAYSTONE BEDROCK**, varies sandy, grey to bluish-grey, moist, very hard								
		15	-	CB	100	50 / 6	9.4	123	+0.4/1000
		20	-	CB	100	50 / 6	11.1	125	
25		25	-	CB	100	50 / 4	10.5	123	

Approximate bottom of borehole at 25.0 feet.

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1070 W. 124 Avenue, Suite 300
Westminster, CO. 80234
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BORING NUMBER 4

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way
DATE STARTED 8/17/16 **COMPLETED** 8/17/16
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR Elite Drilling
SURFACE CONDITIONS Low to moderate growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
▽ **DURING DRILLING** 11.00 ft
LOGGED BY SM **CHECKED BY** AG
▼ **AFTER DRILLING** 4.00 ft - 9/6/16

GRAPHIC LOG (depth)	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	CLAYEY SAND, dark brown, moist, medium dense	0							
	▼	5	SC	CB	100	29 / 12	9.8	117	
7	**LEAN CLAY with SAND**, grey to bluish-grey, moist, very stiff to hard								
		10	CL	CB	100	32 / 12	10.7	122	+1.8/500
	▽								
		15	CL	CB	100	50 / 8	10.6	117	+0.1/1000
18	**CLAYSTONE BEDROCK**, varies sandy, brown, grey to bluish-grey, olive, dry to moist, hard to very hard								
		20	-	CB	100	50 / 6	11.1	125	
		25	-	CB	100	50 / 3	10.8	125	
		30	-	CB	100	50 / 9	18.1	112	
35		35	-	CB	100	50 / 3	10.9	121	

Approximate bottom of borehole at 35.0 feet.

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BORING NUMBER P1

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way
DATE STARTED 8/17/16 **COMPLETED** 8/17/16
GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided
DRILLING CONTRACTOR Elite Drilling
SURFACE CONDITIONS Low to moderate growth of grass and weeds
DRILLING METHOD CME-55/Solid Stem Auger
GROUND WATER LEVELS:
HAMMER TYPE Automatic
DURING DRILLING None
LOGGED BY SM **CHECKED BY** AG
AFTER DRILLING None - 9/6/16

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
	SILTY SAND, brown, light brown, white, tan, dry to moist, medium dense	0							
3			SM	CB	100	20 / 12	4.6	122	
	SANDY LEAN CLAY, bluish-grey, dry to moist, very stiff								
5		5	CL	CB	100	34 / 12	4.6	116	

Approximate bottom of borehole at 5.0 feet.

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BORING NUMBER P2

CLIENT SFP-E, LLC c/o Galloway

PROJECT NAME Les Schwab Tire Center - Falcon, CO

PROJECT NUMBER 12.298.16

PROJECT LOCATION Meridian Rd. & Rolling Thunder Way

DATE STARTED 8/17/16 **COMPLETED** 8/17/16

GROUND SURFACE ELEV. Not Provided **PROPOSED ELEV.** Not Provided

DRILLING CONTRACTOR Elite Drilling

SURFACE CONDITIONS Low to moderate growth of grass and weeds

DRILLING METHOD CME-55/Solid Stem Auger

GROUND WATER LEVELS:

HAMMER TYPE Automatic

DURING DRILLING None

LOGGED BY SM **CHECKED BY** AG

AFTER DRILLING None - 9/6/16

GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	USCS SYMBOL	SAMPLE TYPE	RECOVERY %	PENETRATION blows/in	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SWELL-CONSOL /SURCHARGE LOAD, %psf
		0							
2	**SANDY LEAN CLAY**, dark brown, grey to bluish-grey, moist								
	SILTY SAND, white, tan, dry to moist, medium dense		SM	CB	100	23 / 12	8.7	115	-0.1/200
5		5	SM	CB	100	18 / 12	12.1	121	

Approximate bottom of borehole at 5.0 feet.

APPENDIX B

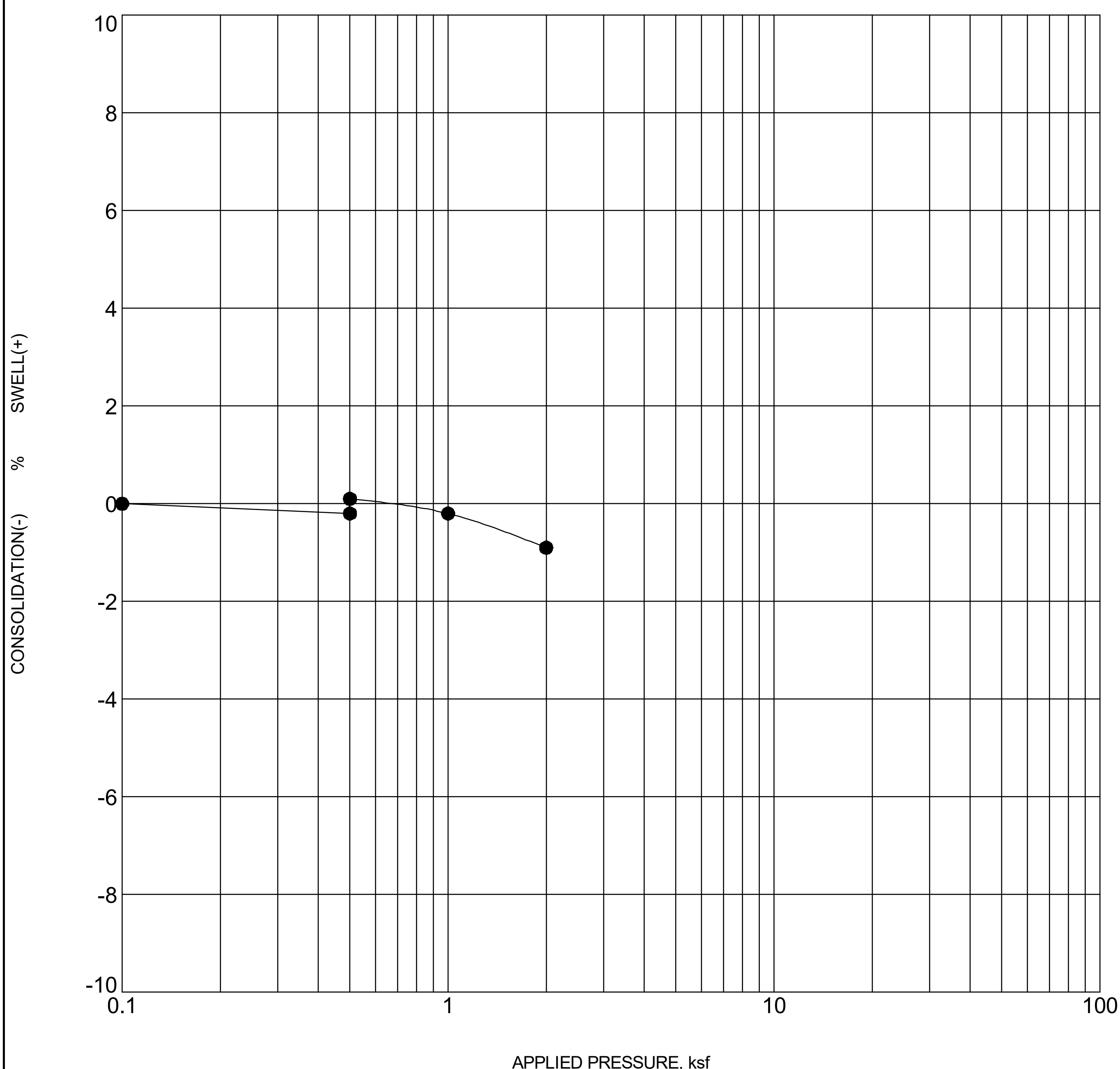
LABORATORY TEST RESULTS

Pickering, Cole, & Hivner
1070 W. 124 Avenue, Suite 300
Westminster, CO. 80234
Telephone: 303.996.2999

SWELL/CONSOLIDATION TEST

CLIENT SFP-E, LLC c/o Galloway **PROJECT NAME** Les Schwab Tire Center - Falcon, CO

PROJECT NUMBER 12.298.16 **PROJECT LOCATION** Meridian Rd. & Rolling Thunder Way



BOREHOLE	DEPTH	Classification	γ_d	MC%
● 1	9.0	CLAYEY SAND	123	11

Note: Water Added to Sample at 500 psf. **Date: 9/6/16**

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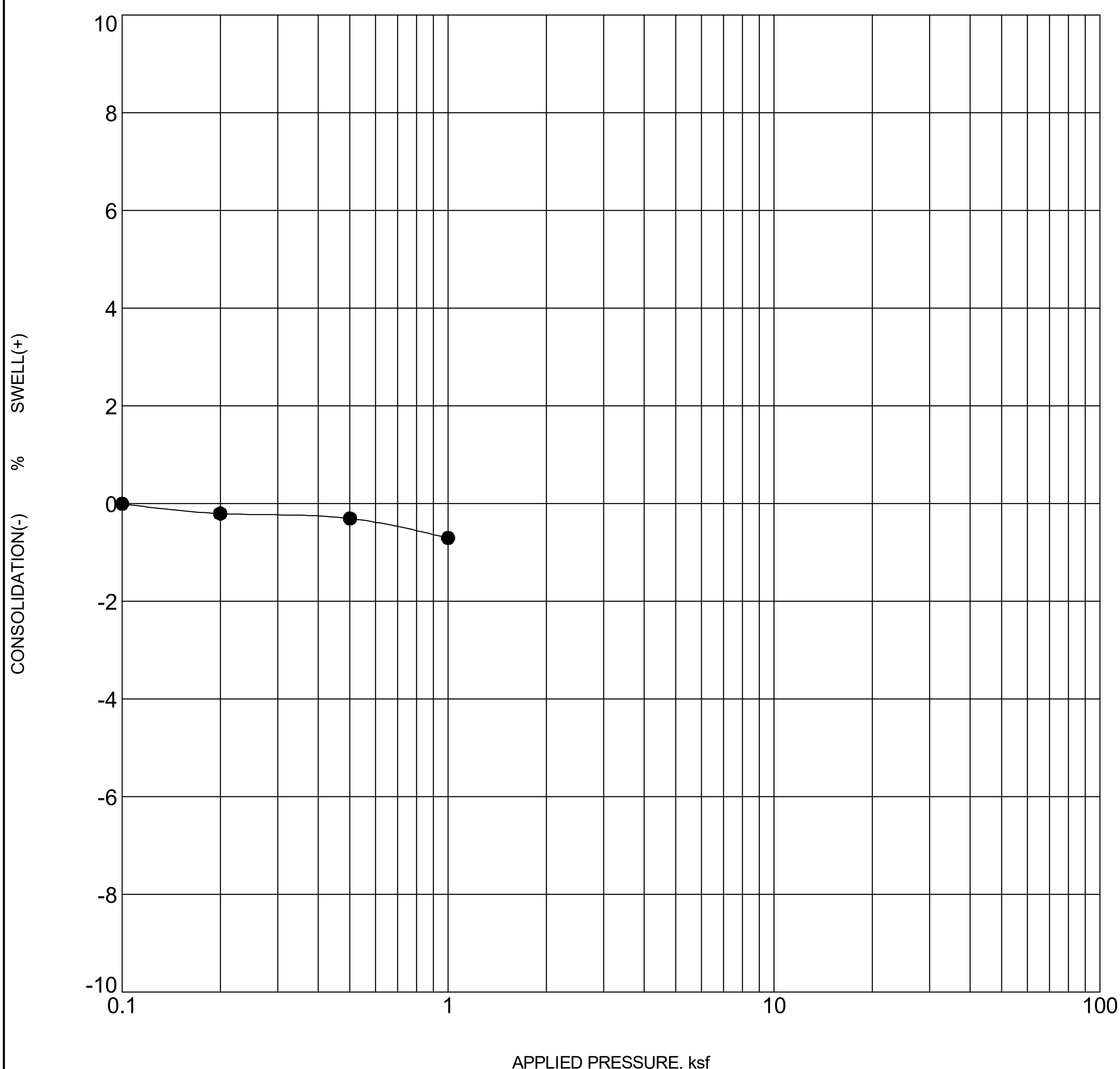
SWELL/CONSOLIDATION TEST

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way



BOREHOLE	DEPTH	Classification	γ_d	MC%
● 2	2.0	CLAYEY SAND	126	7

Note: Water Added to Sample at 200 psf.

Date: 9/6/16

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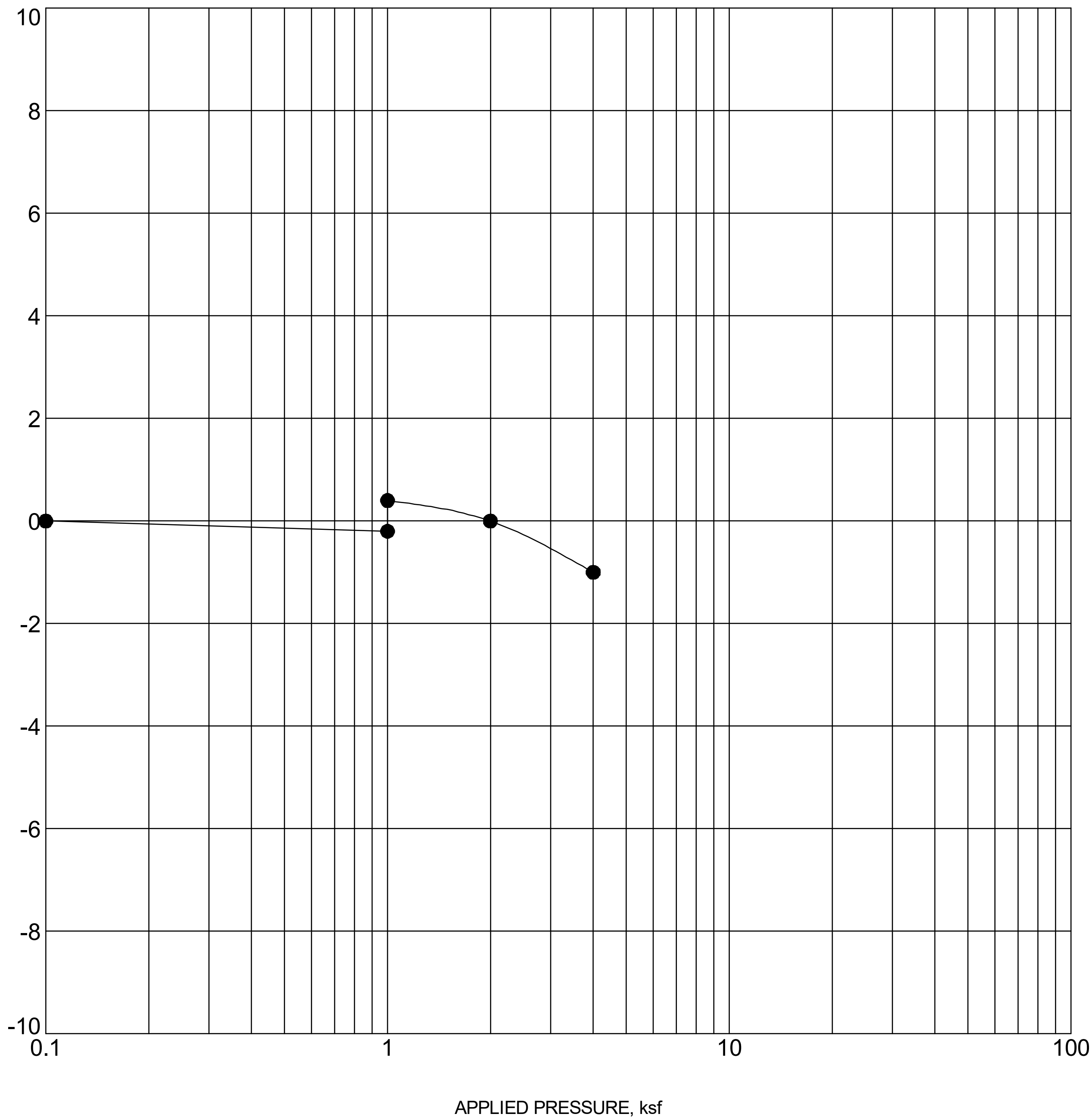
SWELL/CONSOLIDATION TEST

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way



BOREHOLE	DEPTH	Classification	γ_d	MC%
● **2**	**14.0**	**CLAYSTONE BEDROCK**	**119**	**11**

Note: Water Added to Sample at 1000 psf. **Date: 9/6/16**

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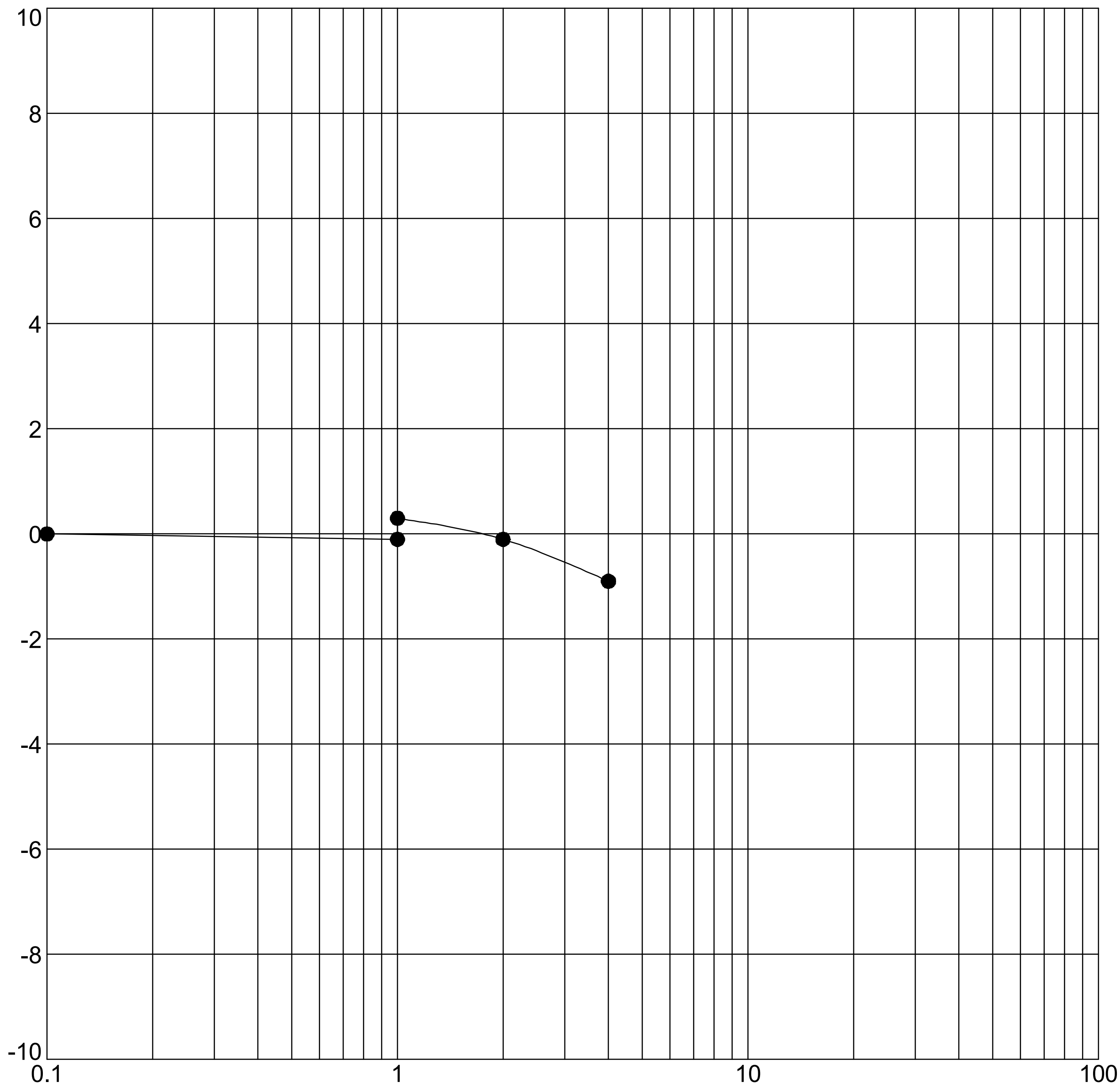
SWELL/CONSOLIDATION TEST

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way



BOREHOLE	DEPTH	Classification	γ_d	MC%
● 3	**14.0**	**CLAYSTONE BEDROCK**	**123**	**9**

Note: Water Added to Sample at 1000 psf. **Date: 9/6/16**

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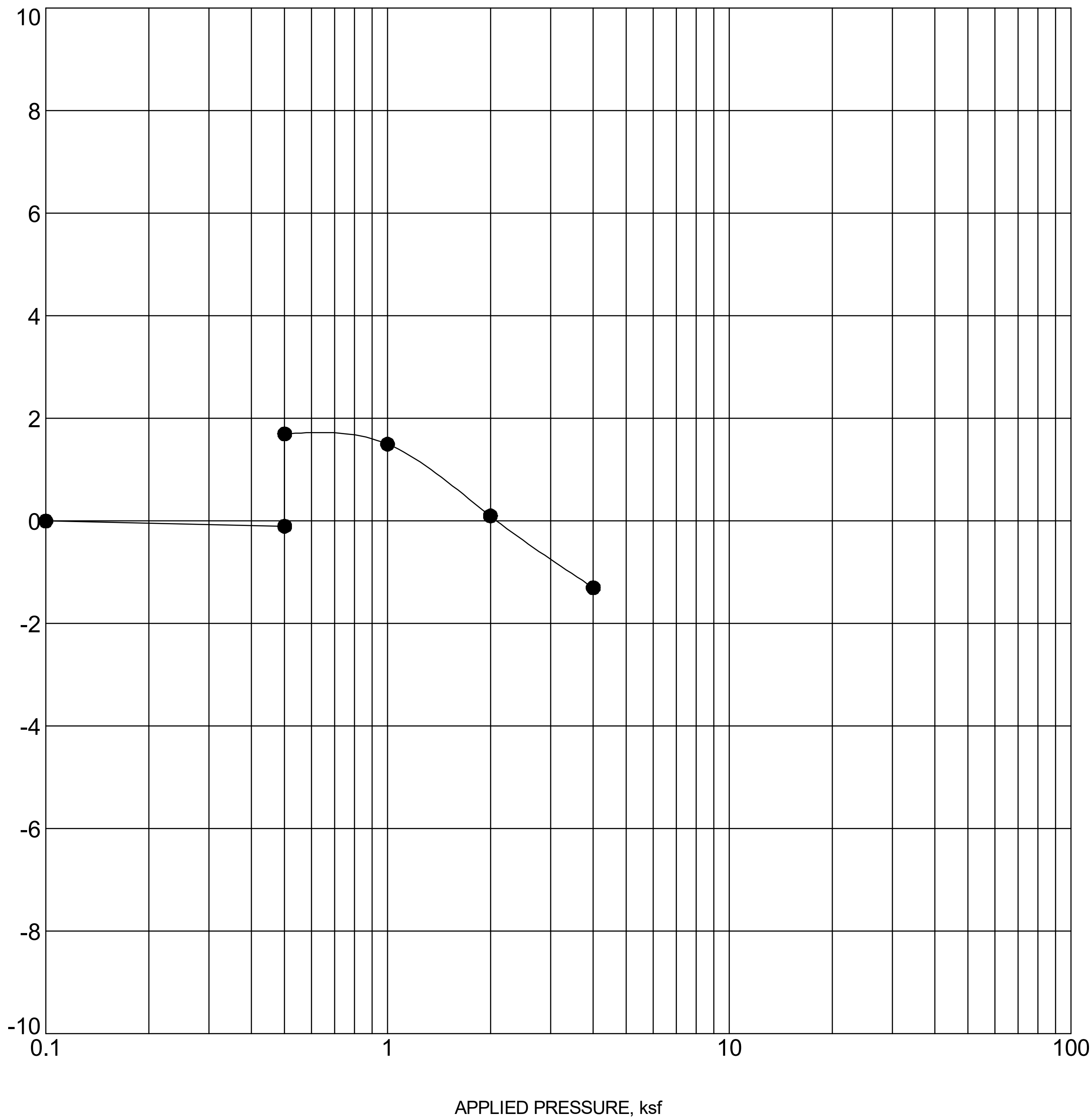
Telephone: 303.996.2999

SWELL/CONSOLIDATION TEST

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way



BOREHOLE	DEPTH	Classification	γ_d	MC%
● 4	9.0	SANDY LEAN CLAY(CL)	122	11

Note: Water Added to Sample at 500 psf. **Date: 9/6/16**

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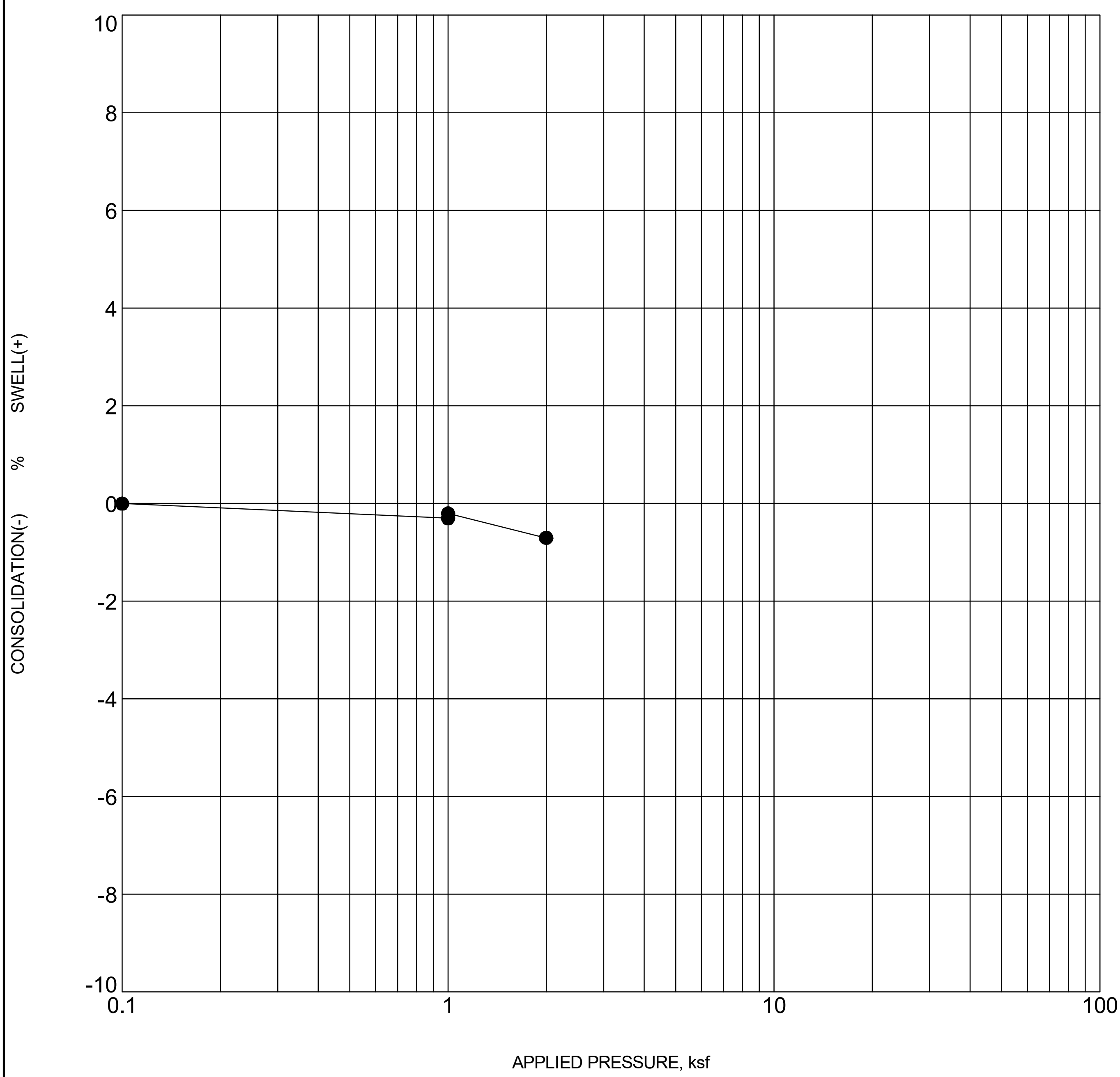
SWELL/CONSOLIDATION TEST

CLIENT SFP-E, LLC c/o Galloway

PROJECT NAME Les Schwab Tire Center - Falcon, CO

PROJECT NUMBER 12.298.16

PROJECT LOCATION Meridian Rd. & Rolling Thunder Way



BOREHOLE	DEPTH	Classification	γ_d	MC%
● **4**	**14.0**	**LEAN CLAY with SAND**	**117**	**11**

Note: Water Added to Sample at 1000 psf. **Date: 9/6/16**

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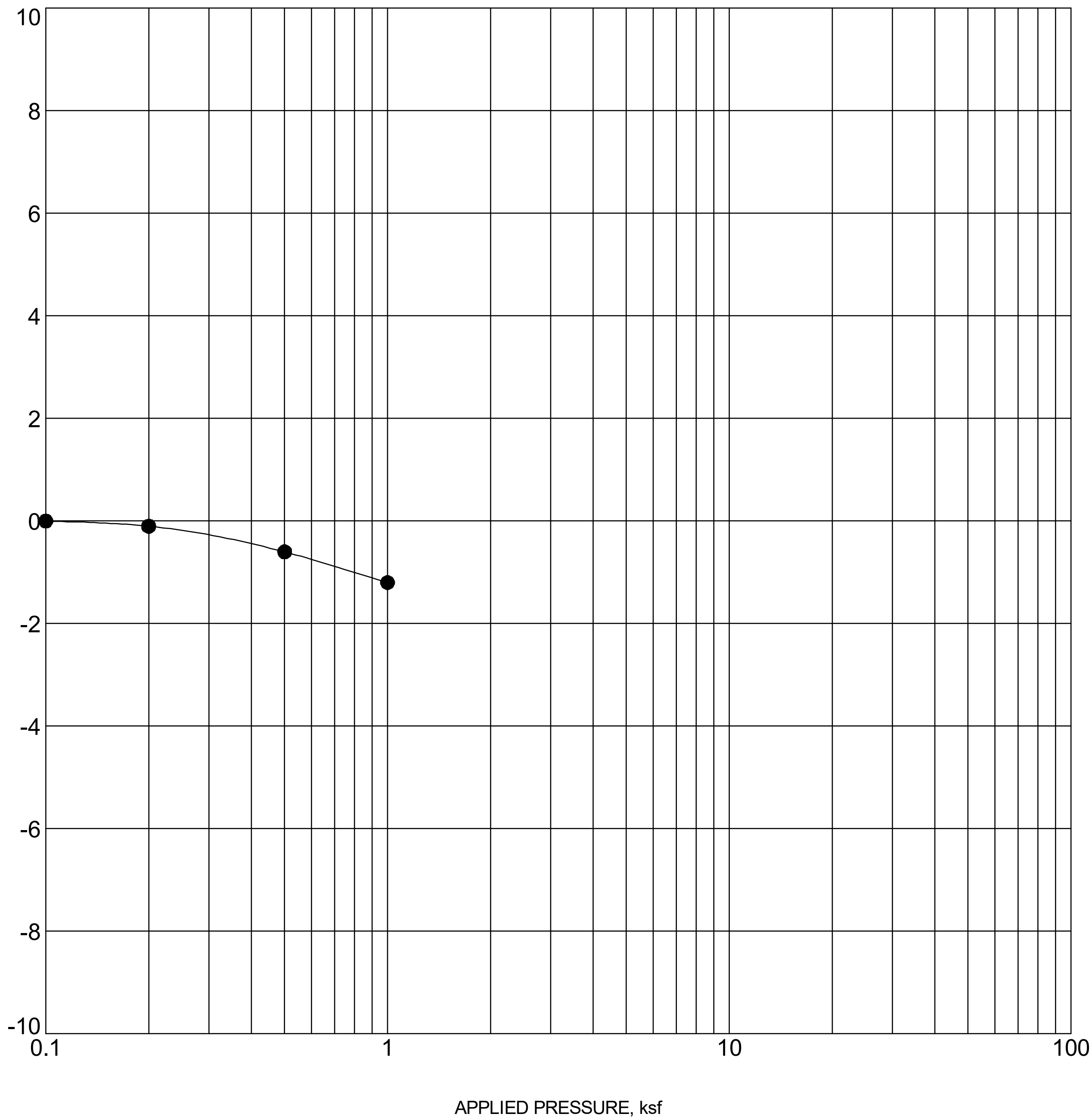
SWELL/CONSOLIDATION TEST

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way



BOREHOLE	DEPTH	Classification	γ_d	MC%
● **P2**	**2.0**	**SILTY SAND(SM)**	**115**	**9**

Note: Water Added to Sample at 200 psf. **Date: 9/6/16**

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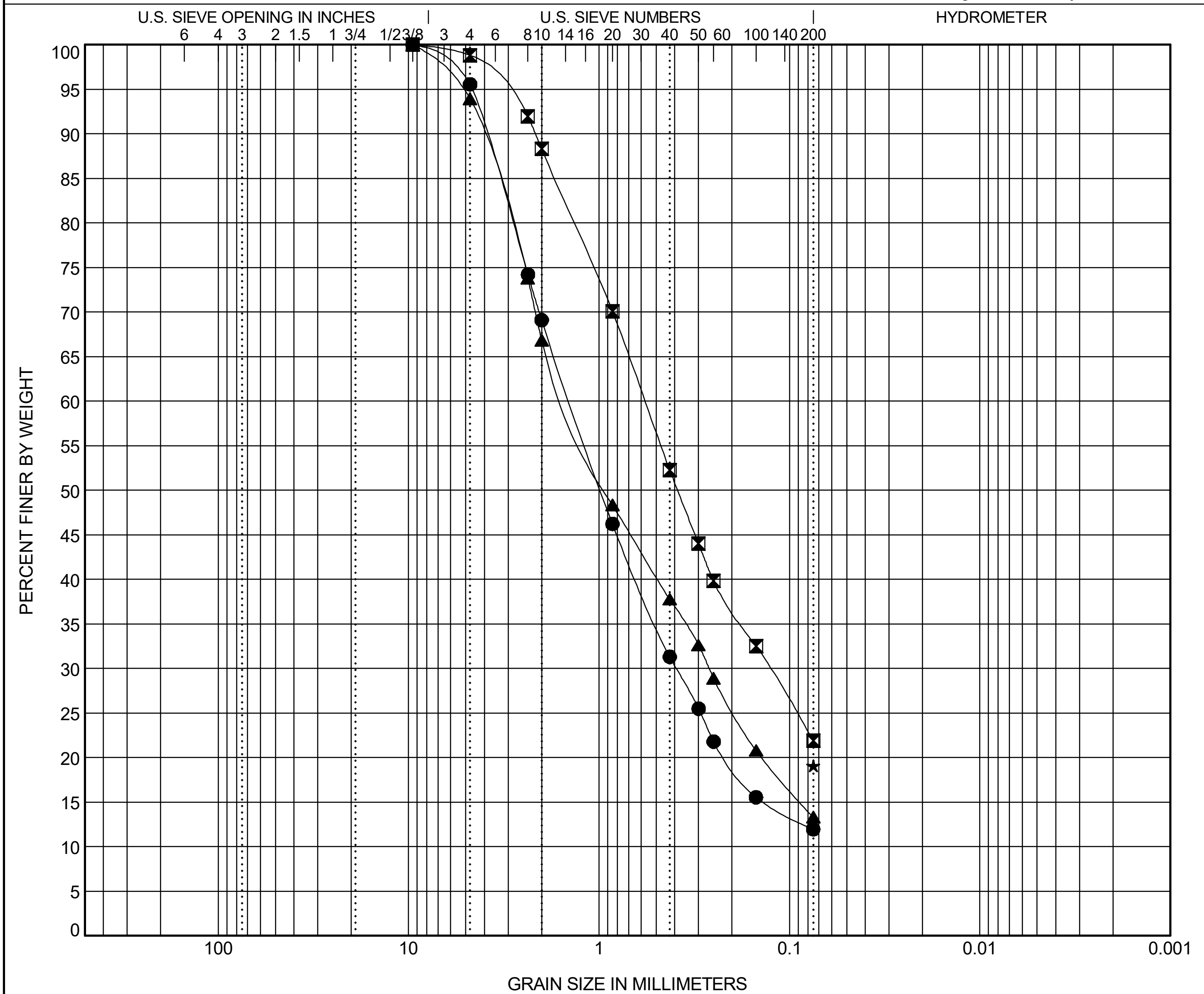
GRAIN SIZE DISTRIBUTION

CLIENT SFP-E, LLC c/o Galloway **PROJECT NAME** Les Schwab Tire Center

PROJECT NUMBER 12.298.16 **PROJECT LOCATION** Meridian Rd. & Rolling Thunder Way - Falcon, CO



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**1**	**4.0**	**WELL-GRADED SAND with SILT(SW-SM)**	**NP**	**NP**	**NP**	**2.11**	**27.68**
⊠	**3**	**9.0**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**		
▲	**P1**	**2.0**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**		
★	**P2**	**2.0**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**1**	**4.0**	**9.5**	**1.423**	**0.393**		**4.4**	**83.6**	**12.0**	
⊠	**3**	**9.0**	**9.5**	**0.574**	**0.127**		**1.2**	**76.9**	**21.9**	
▲	**P1**	**2.0**	**9.5**	**1.456**	**0.264**		**6.1**	**80.6**	**13.3**	
★	**P2**	**2.0**	**0.075**						**19.1**	

GRAIN SIZE - GINT STD US LAB.GDT - 9/26/16 10:07 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS GEO 2016\12.298.16 LES SCHWAB - FALCON.GPJ

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1070 W. 124 Avenue, Suite 300
Westminster, CO. 80234
Telephone: 303.996.2999

SUMMARY OF LABORATORY RESULTS

CLIENT SFP-E, LLC c/o Galloway
PROJECT NAME Les Schwab Tire Center - Falcon, CO
PROJECT NUMBER 12.298.16
PROJECT LOCATION Meridian Rd. & Rolling Thunder Way

Borehole	Depth	Soil Description	Water Content (%)	Dry Density (pcf)	Swell (+) or Consolidation (-)/ Surcharge (%/psf)	Water Soluble Sulfates (ppm)	Passing #200 Sieve (%)	Atterberg Limits		
								Liquid Limit	Plastic Limit	Plasticity Index
1	4	FINE to COARSE SAND with SILT	5.8	121.4			12	NP	NP	NP
1	9	CLAYEY SAND	11.1	122.9	+0.3/500					
1	14	CLAYEY SAND	12.1	124.2						
1	19	CLAYSTONE BEDROCK	11.7	125.0						
1	24	CLAYSTONE BEDROCK	10.1	127.5						
1	29	CLAYSTONE BEDROCK	11.5	125.7						
1	34	CLAYSTONE BEDROCK	15.6	117.2						
2	2	CLAYEY SAND	6.9	126.2	-0.2/200	0				
2	4	CLAYEY SAND	4.1	117.5						
2	9	CLAYEY SAND	8.3	134.1						
2	14	CLAYSTONE BEDROCK	10.9	118.6	+0.6/1000					
2	19	CLAYSTONE BEDROCK	12.2	125.8						
2	24	CLAYSTONE BEDROCK	10.7	127.7						
3	4	CLAYEY SAND to SILTY SAND	9.5	117.9						
3	9	SILTY SAND(SM)	9.5	127.1			22	NP	NP	NP
3	14	CLAYSTONE BEDROCK	9.4	123.2	+0.4/1000					
3	19	CLAYSTONE BEDROCK	11.1	125.1						
3	24	CLAYSTONE BEDROCK	10.5	123.3						
4	4	CLAYEY SAND	9.8	117.3						
4	9	SANDY LEAN CLAY(CL)	10.7	122.4	+1.8/500	400	70	39	22	17
4	14	LEAN CLAY with SAND	10.6	117.3	+0.1/1000					
4	19	CLAYSTONE BEDROCK	11.1	124.7						
4	24	CLAYSTONE BEDROCK	10.8	124.9						
4	29	CLAYSTONE BEDROCK	18.1	111.8						
4	34	CLAYSTONE BEDROCK	10.9	121.1						
P1	2	SILTY SAND (SM)	4.6	122.5			13	NP	NP	NP
P1	4	SANDY LEAN CLAY	4.6	115.9						
P2	2	SILTY SAND(SM)	8.7	115.0	-0.1/200		19	NP	NP	NP
P2	4	SILTY SAND	12.1	121.2						

LAB SUMMARY - GINT STD US LAB.GDT - 9/27/16 09:02 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS GEO 2016\12.298.16 LES SCHWAB - FALCON.GPJ

APPENDIX C

GENERAL NOTES
PERIMETER DRAIN DETAIL

PCH

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1⅜" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube – 2.5" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
CB:	California Barrel - 1.92" I.D., 2.5" O.D., unless otherwise noted	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the “Standard Penetration” or “N-value”. For 2.5” O.D. California Barrel samplers (CB) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as “blows per inch,” and is not considered equivalent to the “Standard Penetration” or “N-value”.

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling
WCI:	Wet Cave in	WD:	While Drilling
DCI:	Dry Cave in	BCR:	Before Casing Removal
AB:	After Boring	ACR:	After Casing Removal

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

FINE-GRAINED SOILS			COARSE-GRAINED SOILS			BEDROCK		
(CB) Blows/Ft.	(SS) Blows/Ft.	Consistency	(CB) Blows/Ft.	(SS) Blows/Ft.	Relative Density	(CB) Blows/Ft.	(SS) Blows/Ft.	Consistency
< 3	0-2	Very Soft	0-5	< 3	Very Loose	< 24	< 20	Weathered
3-5	3-4	Soft	6-14	4-9	Loose	24-35	20-29	Firm
6-10	5-8	Medium Stiff	15-46	10-29	Medium Dense	36-60	30-49	Medium Hard
11-18	9-15	Stiff	47-79	30-50	Dense	61-96	50-79	Hard
19-36	16-30	Very Stiff	> 79	> 50	Very Dense	> 96	> 79	Very Hard
> 36	> 30	Hard						

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Terms of Other Constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Terms of Other Constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification: Group Symbol	Soil Classification: Group Name[B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]	SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		Organic	**Liquid limit - oven dried** / **Liquid limit - not dried** < 0.75	OL	Organic clay[K,L,M,N]
					Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		Organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic clay[K,L,M,P]
					Organic silt[K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well graded gravel with silt, GW-GC well graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well graded sand with silt, SW-SC well graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

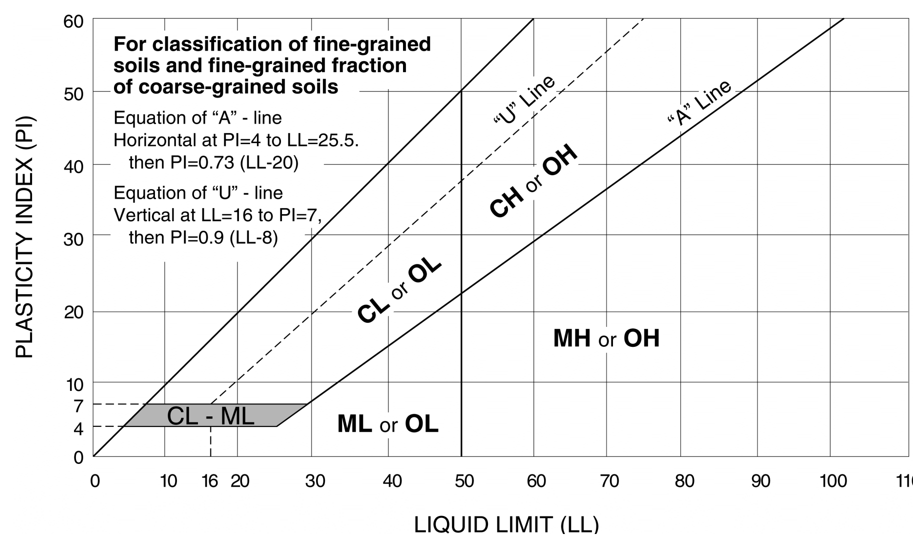
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



ROCK CLASSIFICATION
(Based on ASTM C-294)

Sedimentary Rocks

Sedimentary rocks are stratified materials laid down by water or wind. The sediments may be composed of particles or pre-existing rocks derived by mechanical weathering, evaporation or by chemical or organic origin. The sediments are usually indurated by cementation or compaction.

Chert Very fine-grained siliceous rock composed of micro-crystalline or cyrptocrystalline quartz, chalcedony or opal. Chert is various colored, porous to dense, hard and has a conchoidal to splintery fracture.

Claystone Fine-grained rock composed of or derived by erosion of silts and clays or any rock containing clay. Soft massive and may contain carbonate minerals.

Conglomerate Rock consisting of a considerable amount of rounded gravel, sand and cobbles with or without interstitial or cementing material. The cementing or interstitial material may be quartz, opal, calcite, dolomite, clay, iron oxides or other materials.

Dolomite A fine-grained carbonate rock consisting of the mineral dolomite [$CaMg(CO_3)_2$]. May contain noncarbonate impurities such as quartz, chert, clay minerals, organic matter, gypsum and sulfides. Reacts with hydrochloric acid (HCL).

Limestone A fine-grained carbonate rock consisting of the mineral calcite ($CaCO_3$). May contain noncarbonate impurities such as quartz, chert, clay minerals, organic matter, gypsum and sulfides. Reacts with hydrochloric acid (HCL).

Sandstone Rock consisting of particles of sand with or without interstitial and cementing materials. The cementing or interstitial material may be quartz, opal, calcite, dolomite, clay, iron oxides or other material.

Shale Fine-grained rock composed of or derived by erosion of silts and clays or any rock containing clay. Shale is hard, platy, of fissile may be gray, black, reddish or green and may contain some carbonate minerals (calcareous shale).

Siltstone Fine grained rock composed of or derived by erosion of silts or rock containing silt. Siltstones consist predominantly of silt sized particles (0.0625 to 0.002 mm in diameter) and are intermediate rocks between claystones and sandstones and may contain carbonate minerals.

ROCK CLASSIFICATION
(Based on ASTM C-294)

Metamorphic Rocks

Metamorphic rocks form from igneous, sedimentary, or pre-existing metamorphic rocks in response to changes in chemical and physical conditions occurring within the earth's crust after formation of the original rock. The changes may be textural, structural, or mineralogic and may be accompanied by changes in chemical composition. The rocks are dense and may be massive but are more frequently foliated (laminated or layered) and tend to break into platy particles. The mineral composition is very variable depending in part on the degree of metamorphism and in part on the composition of the original rock.

Marble A recrystallized medium- to coarse-grained carbonate rock composed of calcite or dolomite, or calcite and dolomite. The original impurities are present in the form of new minerals, such as micas, amphiboles, pyroxenes, and graphite.

Metaquartzite A granular rock consisting essentially of recrystallized quartz. Its strength and resistance to weathering derive from the interlocking of the quartz grains.

Slate A fine-grained metamorphic rock that is distinctly laminated and tends to split into thin parallel layers. The mineral composition usually cannot be determined with the unaided eye.

Schist A highly layered rock tending to split into nearly parallel planes (schistose) in which the grain is coarse enough to permit identification of the principal minerals. Schists are subdivided into varieties on the basis of the most prominent mineral present in addition to quartz or to quartz and feldspars; for instance, mica schist. Greenschist is a green schistose rock whose color is due to abundance of one or more of the green minerals, chlorite or amphibole, and is commonly derived from altered volcanic rock.

Gneiss One of the most common metamorphic rocks, usually formed from igneous or sedimentary rocks by a higher degree of metamorphism than the schists. It is characterized by a layered or foliated structure resulting from approximately parallel lenses and bands of platy minerals, usually micas or prisms, usually amphiboles, and of granular minerals, usually quartz and feldspars. All intermediate varieties between gneiss and schist and between gneiss and granite are often found in the same areas in which well-defined gneisses occur.

ROCK CLASSIFICATION
(Based on ASTM C-294)

Igneous Rocks

Igneous rocks are formed by cooling from a molten rock mass (magma). Igneous rocks are divided into two classes (1) plutonic, or intrusive, that have cooled slowly within the earth; and (2) volcanic, or extrusive, that formed from quickly cooled lavas. Plutonic rocks have grain sizes greater than approximately 1 mm, and are classified as coarse- or medium-grained. Volcanic rocks have grain sizes less than approximately 1 mm, and are classified as fine-grained. Volcanic rocks frequently contain glass. Both plutonic and volcanic rocks may consist of porphyries that are characterized by the presence of large mineral grains in a fine-grained or glassy groundmass. This is the result of sharp changes in rate of cooling or other physico-chemical conditions during solidification of the melt.

Granite — Granite is a medium- to coarse-grained light-colored rock characterized by the presence of potassium feldspar with lesser amounts of plagioclase feldspars and quartz. The characteristic potassium feldspars are othoclase or microcline, or both; the common plagioclase feldspars are albite and oligoclase. Feldspars are more abundant than quartz. Dark-colored mica (biotite) is usually present, and light-colored mica (muscovite) is frequently present. Other dark-colored ferromagnesian minerals, especially honblende, may be present in amounts less than those of the light-colored constituents.

Quartz-Monzonite and Grano-Diorite — Rocks similar to granite but contain more plagioclase feldspar than potassium feldspar.

Basalt — Fine-grained extrusive equivalent of gabbro and diabase. When basalt contains natural glass, the glass is generally lower in silica content than that of the lighter-colored extrusive rocks.

LABORATORY TEST
SIGNIFICANCE AND PURPOSE

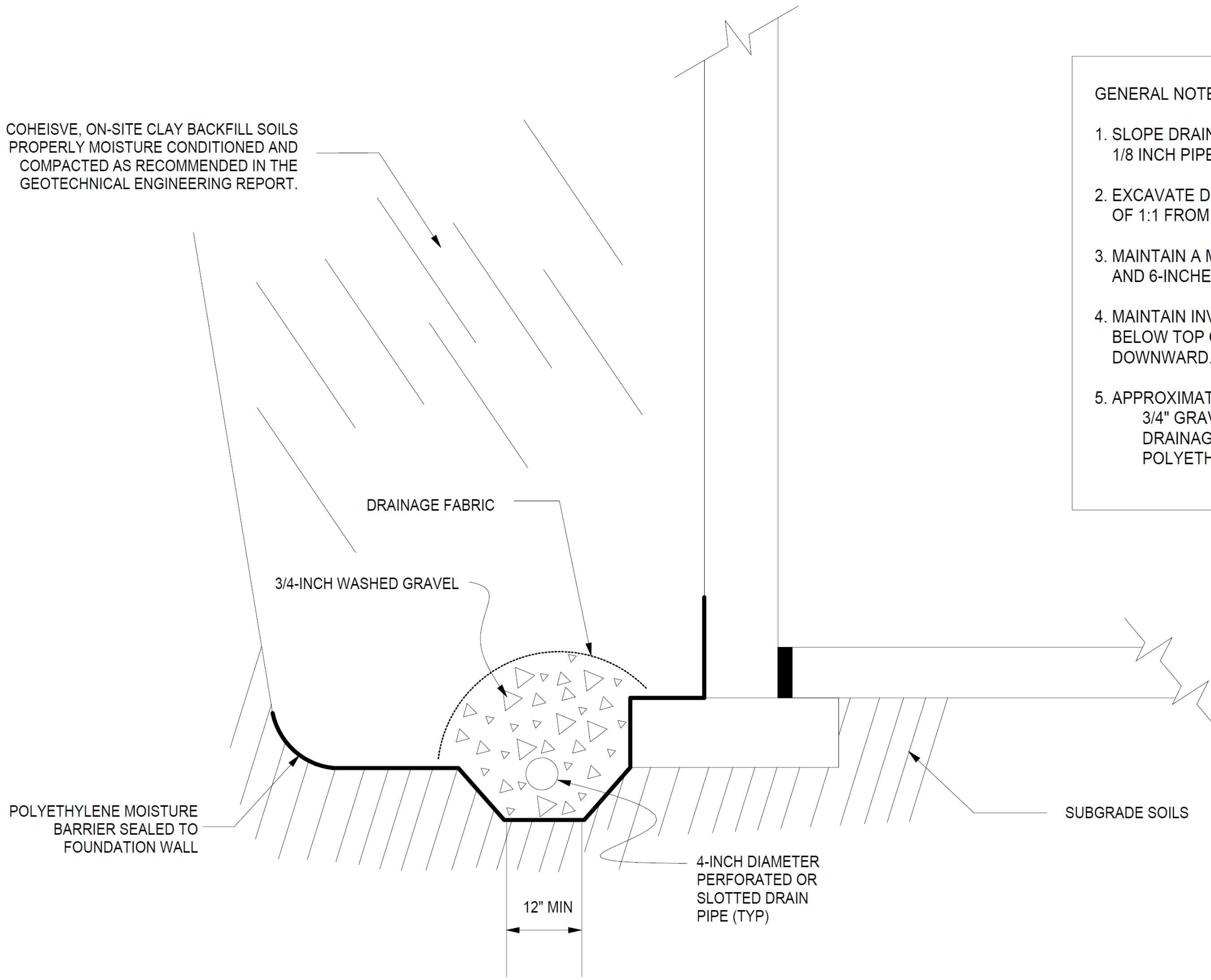
TEST	SIGNIFICANCE	PURPOSE
California Bearing Ratio	Used to evaluate the potential strength of subgrade soil, subbase, and base course material, including recycled materials for use in road and airfield pavements.	***Pavement Thickness Design***
Consolidation	Used to develop an estimate of both the rate and amount of both differential and total settlement of a structure.	***Foundation Design***
Direct Shear	Used to determine the consolidated drained shear strength of soil or rock.	***Bearing Capacity, Foundation Design, and Slope Stability***
Dry Density	Used to determine the in-place density of natural, inorganic, fine-grained soils.	***Index Property Soil Behavior***
Expansion	Used to measure the expansive potential of fine-grained soil and to provide a basis for swell potential classification.	***Foundation and Slab Design***
Gradation	Used for the quantitative determination of the distribution of particle sizes in soil.	***Soil Classification***
Liquid & Plastic Limit, Plasticity Index	Used as an integral part of engineering classification systems to characterize the fine-grained fraction of soils, and to specify the fine-grained fraction of construction materials.	***Soil Classification***
Permeability	Used to determine the capacity of soil or rock to conduct a liquid or gas.	***Groundwater Flow Analysis***
pH	Used to determine the degree of acidity or alkalinity of a soil.	***Corrosion Potential***
Resistivity	Used to indicate the relative ability of a soil medium to carry electrical currents.	***Corrosion Potential***
R-Value	Used to evaluate the potential strength of subgrade soil, subbase, and base course material, including recycled materials for use in road and airfield pavements.	***Pavement Thickness Design***
Soluble Sulfate	Used to determine the quantitative amount of soluble sulfates within a soil mass.	***Corrosion Potential***
Unconfined Compression	To obtain the approximate compressive strength of soils that possess sufficient cohesion to permit testing in the unconfined state.	***Bearing Capacity Analysis for Foundations***
Water Content	Used to determine the quantitative amount of water in a soil mass.	***Index Property Soil Behavior***

REPORT TERMINOLOGY
(Based on ASTM D653)

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Alluvium	Soil, the constituents of which have been transported in suspension by flowing water and subsequently deposited by sedimentation.
Aggregate Base Course	A layer of specified material placed on a subgrade or subbase usually beneath slabs or pavements.
Backfill	A specified material placed and compacted in a confined area.
Bedrock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Bench	A horizontal surface in a sloped deposit.
Caisson (Drilled Pier or Shaft)	A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier or drilled shaft.
Coefficient of Friction	A constant proportionality factor relating normal stress and the corresponding shear stress at which sliding starts between the two surfaces.
Colluvium	Soil, the constituents of which have been deposited chiefly by gravity such as at the foot of a slope or cliff.
Compaction	The densification of a soil by means of mechanical manipulation
Concrete Slab-on-Grade	A concrete surface layer cast directly upon a base, subbase or subgrade, and typically used as a floor system.
Differential Movement	Unequal settlement or heave between, or within foundation elements of structure.
Earth Pressure	The pressure exerted by soil on any boundary such as a foundation wall.
ESAL	Equivalent Single Axle Load, a criteria used to convert traffic to a uniform standard, (18,000 pound axle loads).
Engineered Fill	Specified material placed and compacted to specified density and/or moisture conditions under observations of a representative of a geotechnical engineer.
Equivalent Fluid	A hypothetical fluid having a unit weight such that it will produce a pressure against a lateral support presumed to be equivalent to that produced by the actual soil. This simplified approach is valid only when deformation conditions are such that the pressure increases linearly with depth and the wall friction is neglected.
Existing Fill (or Man-Made Fill)	Materials deposited throughout the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.

REPORT TERMINOLOGY
(Based on ASTM D653)

Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Finished Grade	The final grade created as a part of the project.
Footing	A portion of the foundation of a structure that transmits loads directly to the soil.
Foundation	The lower part of a structure that transmits the loads to the soil or bedrock.
Frost Depth	The depth at which the ground becomes frozen during the winter season.
Grade Beam	A foundation element or wall, typically constructed of reinforced concrete, used to span between other foundation elements such as drilled piers.
Groundwater	Subsurface water found in the zone of saturation of soils or within fractures in bedrock.
Heave	Upward movement.
Lithologic	The characteristics which describe the composition and texture of soil and rock by observation.
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil, sometimes referred to as natural soil.
Optimum Moisture Content	The water content at which a soil can be compacted to a maximum dry unit weight by a given compactive effort.
Perched Water	Groundwater, usually of limited area maintained above a normal water elevation by the presence of an intervening relatively impervious continuous stratum.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Skin Friction (Side Shear)	The frictional resistance developed between soil and an element of the structure such as a drilled pier.
Soil (Earth)	Sediments or other unconsolidated accumulations of solid particles produced by the physical and chemical disintegration of rocks, and which may or may not contain organic matter.
Strain	The change in length per unit of length in a given direction.
Stress	The force per unit area acting within a soil mass.
Strip	To remove from present location.
Subbase	A layer of specified material in a pavement system between the subgrade and base course.
Subgrade	The soil prepared and compacted to support a structure, slab or pavement system.



GENERAL NOTES:

1. SLOPE DRAIN TRENCH AND PIPE AT A MINIMUM OF 1/8 INCH PIPE PER LINEAL FOOT TO SUITABLE OUTFALL.
2. EXCAVATE DRAIN TRENCH AT A MAXIMUM SLOPE OF 1:1 FROM EDGE OF FOOTING.
3. MAINTAIN A MINIMUM OF 3-INCHES OF GRAVEL BELOW AND 6-INCHES ABOVE DRAIN PIPES.
4. MAINTAIN INVERT OF DRAIN PIPE A MINIMUM OF 6 INCHES BELOW TOP OF FOOTING. PERFORATIONS SHOULD BE FACING DOWNWARD.
5. APPROXIMATE QUANTITIES (PER LINEAL FOOT):
   - 3/4" GRAVEL - 1 1/2 CUBIC FT.
   - DRAINAGE FABRIC - 2 SQUARE FT.
   - POLYETHELENE - 6 SQUARE FT.

NOT TO SCALE

TYPICAL EXTERIOR
PERIMETER DRAIN DETAIL
FOOTING FOUNDATION

PCH
Pickering, Cole, & Hivner, LLC
1070 W. 124TH Ave., Suite 300
Westminster, CO 80234
(303) 996-2999

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APPENDIX D: FEMA RIMETTE

National Flood Hazard Layer FIRMette

FEMA

104°36'53"W 38°56'17"N

104°36'15"W 38°55'49"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/14/2021 at 9:15 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

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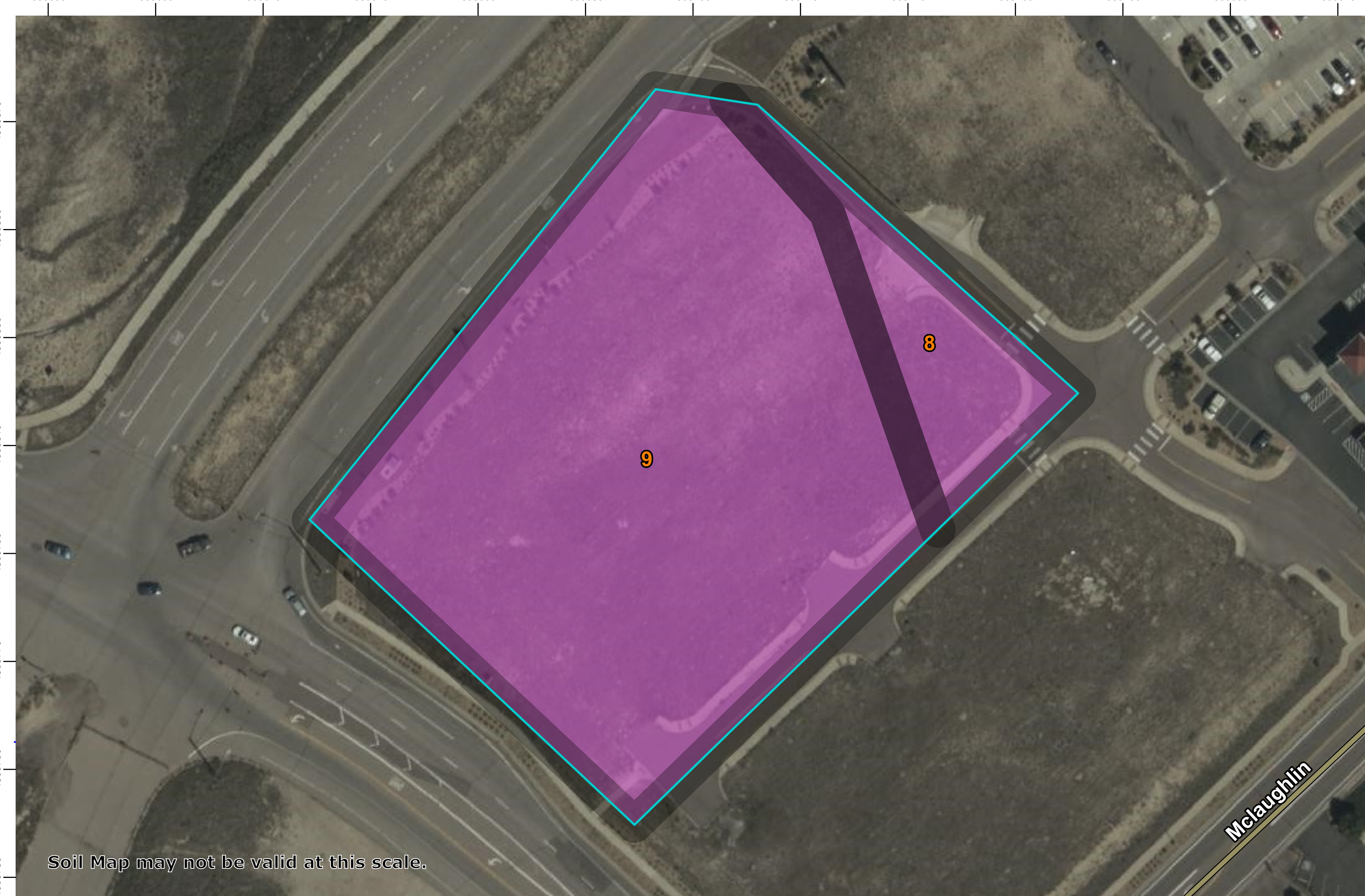
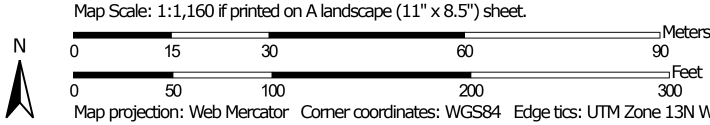
APPENDIX E: WEB SOIL SURVEY



Map Scale: 1:1,160 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	0.3	13.1%
9	Blakeland-Fluvaquentic Haplaquolls	A	2.2	86.9%
Totals for Area of Interest			**2.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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APPENDIX F: MERIDIAN CROSSING STORM REPORT

MERIDIAN CROSSING
FINAL DRAINAGE REPORT
EL PASO COUNTY, COLORADO

July 2008

PREPARED FOR:

Park Place Enterprises
15 Miranda Road
Colorado Springs, CO 80906

PREPARED BY:

Springs Engineering
31 N. Tejon, Suite 315
Colorado Springs, CO 80903
719.227.7388

PROJECT NO. 057-07-032

CERTIFICATIONS

Engineer's Statement:

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

Charlene M. Sammons
Charlene M. Sammons, P.E. #36727

COLORADO REGISTERED PROFESSIONAL ENGINEER
CHARLENE M. SAMMONS
Seal
36727

Developer's Statement:

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

By (signature): [signature]
Park Place Enterprises, LLC
Title: Managing Member
Address: 15 Mirada Rd.
Colorado Springs, CO 80906

El Paso County's Statement:

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

for [signature]
John McCarty, County Engineer/Director

8-19-08
Date

Conditions:

Table of Contents

List of Figures

Appendix

EXECUTIVE SUMMARY

The purpose of this Preliminary Drainage Report (PDR) and Final Drainage Report (FDR) is to present final drainage design and improvements for Meridian Crossing, located at the northeast corner of Meridian Road and Old Meridian Road, in the Falcon Highlands development. Runoff quantities and proposed facilities have been calculated using the current City of Colorado Springs/El Paso County Drainage Criteria Manual (DCM). Existing facilities have been analyzed to ensure they are able to function as designed with the new facilities and construction.

This report encompasses approximately 9.5 acres of proposed commercial development in the southeast corner of the Falcon Highlands development. A proposed collector (Flower Road) will traverse the site, connecting Meridian Road to McLaughlin Road. This development will also include improvements to McLaughlin Road.

Flower Road and McLaughlin Road are to be designed as Non-Residential Collectors, per the El Paso County Criteria Manual, with a design speed of 40 miles per hour (mph) and a posted speed of 35 mps. Curb and gutter will be installed along both of these roads.

INTRODUCTION

The Meridian Crossing subdivision is a 9.5 acre commercial development located on the northwest side of the Town of Falcon. Meridian Crossing is located east and south of Falcon Highlands Market Place Filing No. 1 and adjacent to the southeast side of the "New" Meridian Road alignment. Existing development occurring in the area includes the Falcon Highlands subdivision to the west, the Beckett at Woodmen Hills development to the east and the Falcon Highlands Market Place to the west.

The area containing Meridian Crossing has been studied as part of the Falcon Area Drainage Basin Planning Study (DBPS)-Preliminary Design Report by URS, dated December 15, 2000 and Falcon Highlands Master Drainage and Development Plan (MDDP) by URS, dated October 2004.

Purpose

The purpose of the following Final Drainage Report (FDR) is to present the final design drainage improvements for the Meridian Crossing commercial development. Drainage improvements will include curb inlets, roadside ditches, and Water Quality Capture Ponds.

Runoff quantities and proposed facilities have been calculated using the current City of Colorado Springs/El Paso County Drainage Criteria Manual (DCM) Volumes I and II.

Limits of Study

The Meridian Crossing FDR details the hydrology and hydraulics for the West Tributary of the Falcon Basin. Storm flow is routed by and from the proposed site and then directed through the proposed and future developments to US Highway 24. This includes an analysis of the storm systems, which includes the culverts and inlets along Meridian Road and Rolling Thunder Way. The area of study is bounded by Flower Road to the north and east, Meridian Road to the north and west, Old Meridian Road to the west and McLaughlin Road on the south

EXISTING CONDITIONS

General Location

The proposed Meridian Crossing is approximately 9.5 acres and is located at the southeast corner of Meridian Road and Old Meridian Road in Falcon, Colorado, Section 12, Township 13 South, Range 65 West of the 6th Principal Meridian. Currently, the site is zoned CR.

Falcon Highlands, Woodmen Hills, Falcon Vista, Meridian Ranch, Elkhorn Estates and Falcon Hills are all developments within a 5-mile radius of the site.

Land Use

The proposed site has just recently been rezoned to a Commercial Regional (CR) zone.

Topography and Floodplains

The topography of the surrounding area is typical of a high desert, short prairie grass with relatively flat slopes generally ranging from 2% to 4%. The area generally drains to the south. The site combines with the outlet flow of Detention Pond WU prior to crossing through the existing box culverts at Highway 24. Existing drainage swales convey these flows.

The Flood Insurance Rate Map (FIRM No. 08041C0575-F dated 3/17/99) indicates that there is a floodplain north and east of the proposed site (Falcon Basin Middle Tributary). FEMA has approved a LOMR for the Middle Tributary Floodplain (Case No. 06-08-B427P, with an effective date of November 3, 2006). This flow will now be contained within a storm drainage system and detention pond, which realigns the floodplain to the east of the site. (See Figure 3: Floodplain Map) The floodplain ties in with the FIRM after the detention pond at McLaughlin Road.

Geology

Soil Conservation Service soil survey records indicate the project area is covered by soils classified in the Blakeland Series, which are categorized in the Hydrological Group B.

The Blakeland (8) loamy sand is a deep, excessively drained soil that can exceed depths of 60 inches. Permeability of this soil is rapid with an effective rooting depth of 60 inches. This soil has good potential for urban development. The available water capacity is moderate to low. Surface runoff is slow, and the hazard of erosion is moderate.

The Blakeland (9) complex soil is comprised of approximately 60 percent Blakeland loamy sand, 30 percent Fluvaquentic Haplaquolls and 10 percent other soils. This soil is found more in sloping areas. It is deep and somewhat excessively drained. It formed in sandy alluvium and eolian material derived from arkosic sedimentary rock. Permeability of Blakeland soils is rapid, with an effective rooting depth of 60 inches. The available water capacity is moderate to low. Surface runoff is slow, and the hazard of erosion is moderate. The Fluvaquentic Haplaquolls are generally located in swale areas, and are deep, poorly drained soils. They formed in alluvium derived from arkosic sedimentary rock.

The Blakeland soil is well suited to wildlife habitat, home sites, streets and roads. This soil needs to be protected from erosion when vegetation has been removed from building sites. The Fluvaquentic Haplaquolls soil is good for wetlands. This soil has poor potential for home sites. The main limitation of this soil is the high water table and potential for flooding.

Note: (#) indicated Soil Conservation Survey soil classification number. See Figure 2: SCS Soils Map.

Climate

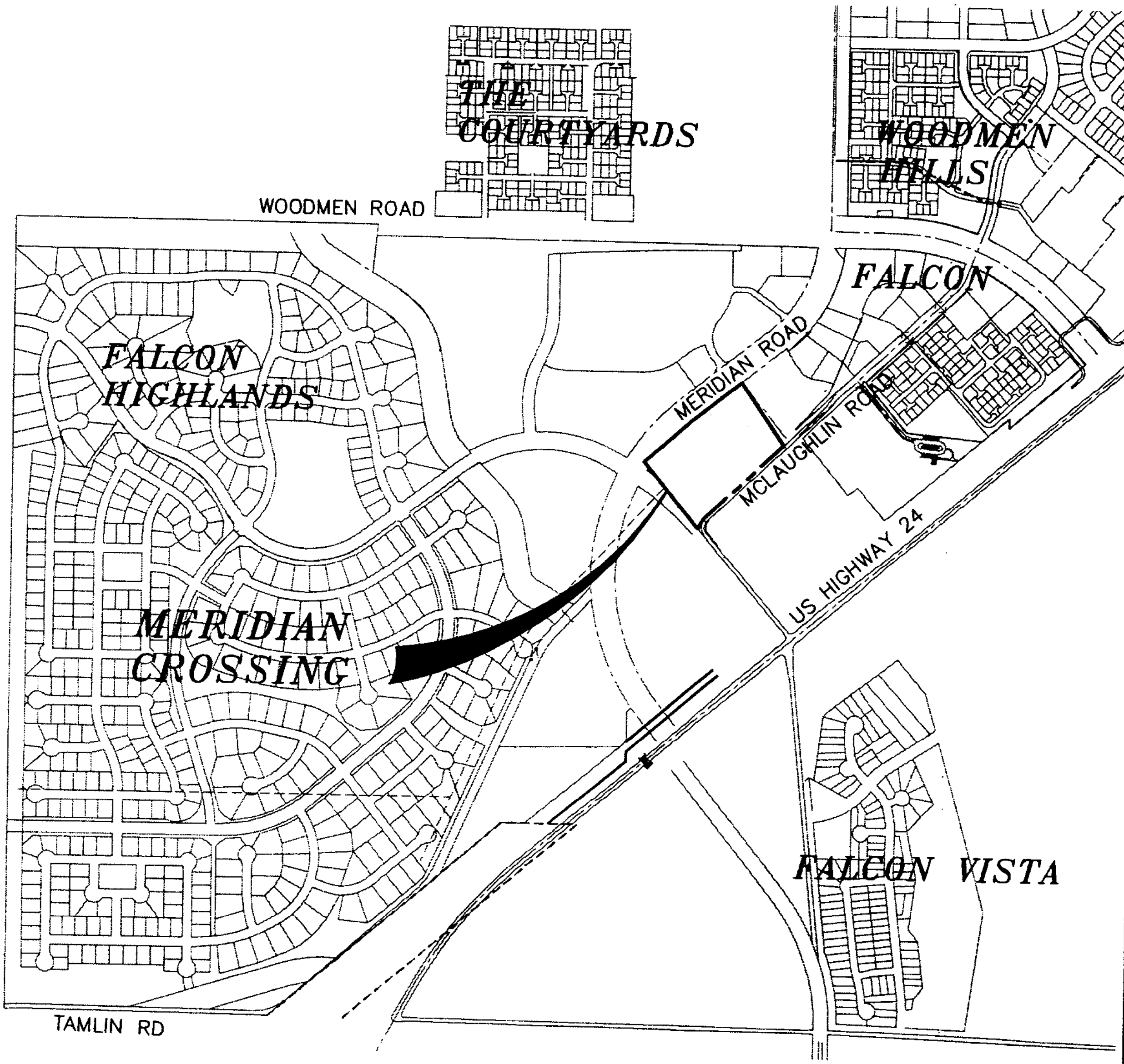
Mild summers and winters, light precipitation; high evaporation and moderately high wind velocities characterize the climate of the study area.

The average annual monthly temperature is 48.4 F with an average monthly low of 30.3 F in the winter and an average monthly high of 68.1 F in the summer. Two years in ten will have a maximum temperature higher than 98 F and a minimum temperature lower than –16 F. Precipitation averages 15.73 inches annually, with 80% of this occurring during the months of April through September. The average annual Class A pan evaporation is 45 inches.

Natural Hazards Analysis

Natural hazards analysis indicates that there is high ground water, potentially expansive claystone bedrock and wetlands located on or near the proposed site. Refer to the Geologic Hazards Evaluation Retail Site Woodmen Road and Meridian Road report by Entech Engineering. Usually, in areas where high ground water is an issue, underdrains are built to help alleviate the problem. However, since the proposed site is a commercial development, construction will be done as slab-on-grade and no basements. If lower levels are built, an underdrain system would be required. Wetland areas in the site have been identified and approved by Corps of Engineers. A mitigation plan for the site has been approved and implementation began in the fall of 2005. A copy of this plan is on file with the Falcon Highlands Metropolitan District.

Soils in this area are cohesionless, sloughing of steep banks during drilling and/or excavation could occur. By siting improvements in a manner that provides an opportunity to lay the banks of excavations back at a 1:1 slope during construction, the problems associated with sloughing soils can be minimized.

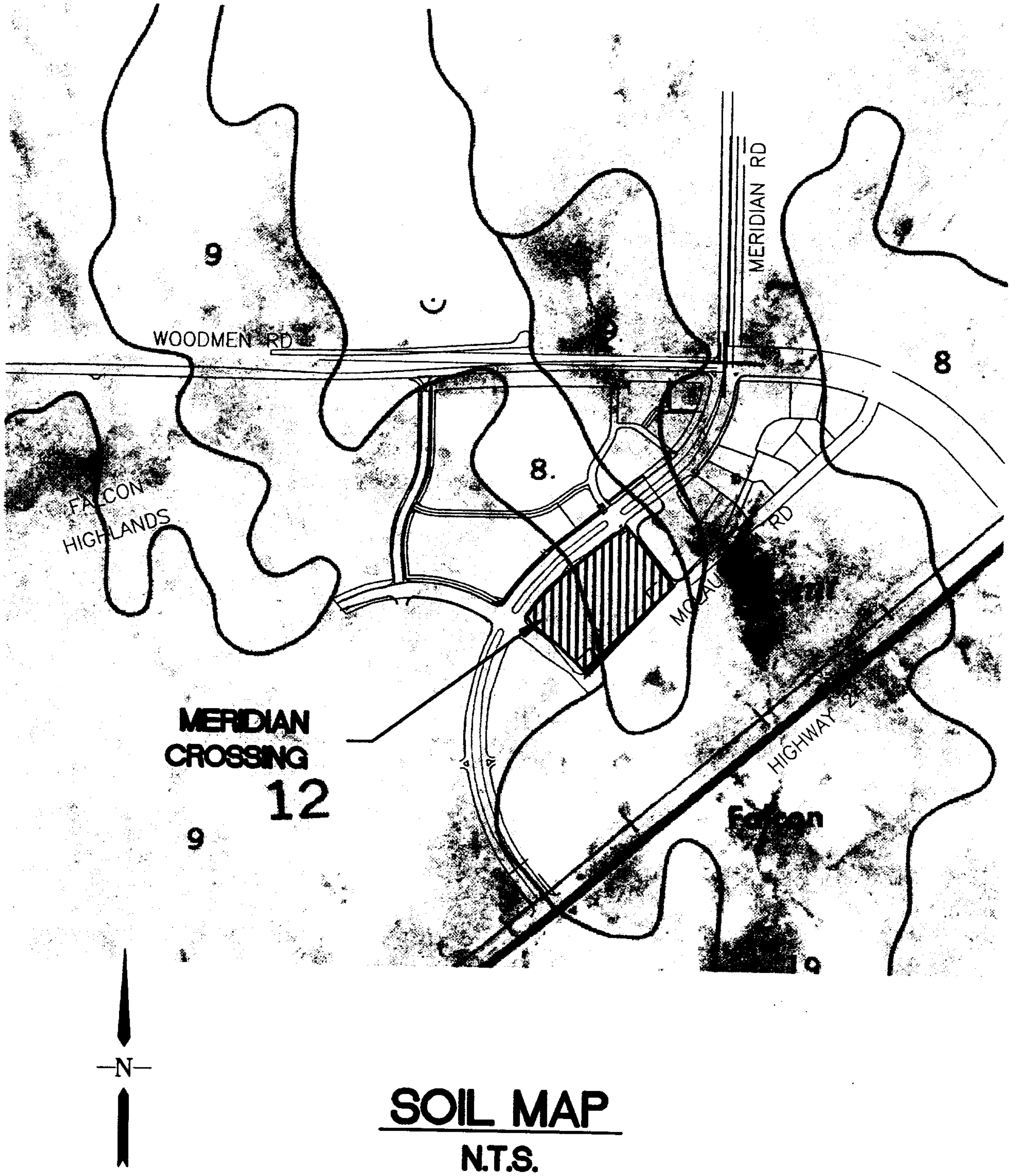


VICINITY MAP

N.T.S.

MERIDIAN CROSSING	SE Springs Engineering — 31 NORTH TEJON, SUITE 315, COLORADO SPRINGS, CO 80903, TEL: (719) 227-7388, FAX: (719) 227-7392
VICINITY MAP	FIGURE 1

PROJECT NO. 057-07-032



SOIL MAP

N.T.S.

MERIDIAN CROSSING	SE Springs Engineering 31 NORTH TEJON, SUITE 315 COLORADO SPRINGS, CO 80903 TEL: (719) 227-7388 FAX: (719) 227-7392
SCS Soils Map	FIGURE 2
	PROJECT NO. 057-07-032

DRAINAGE DESIGN CRITERIA

SCS Hydrograph Method

Hydrologic modeling was used to the West Tributary of the Falcon Basin, which routes through Meridian Crossing. Modeling was completed using The United States Army Corps of Engineers Hydrologic Engineering Center-HEC-1 version 4.1. The Soil Conservation Service (SCS) (since renamed National Resources Conservation Service (NRCS)) curve number method was selected for calculating the runoff volume from the drainage basins per the Drainage Criteria Manual (DCM). The precipitation data, basin delineation, CN runoff coefficients, and time of concentrations were taken from the Falcon Basin DBPS. Modifications have been performed on the original data, as new developments have been built and boundary lines have changed. The model has been updated to reflect the most current changes occurring in the Falcon area. The existing models in the appendix are those which were included in the FDR for Pond WU, as this report updated and modified the existing conditions of the West Tributary as originally analyzed in the Falcon Basin DBPS. Below is a summary of major design points entering the Falcon Highlands development, through the site, and where the flows exit the Falcon Highlands site. The Falcon Highlands Master Drainage Development Plan (MDDP) corrected an area in the volume of the Woodmen Hills detention pond (Pond W).

The West Tributary was analyzed in the MDDP/PDR/FDR for Falcon Highlands Filing No. 1. This report made the assumption that Pond WU would capture flows from Basins W-39, W-40, W-41 and W-42. With the construction of Meridian Road, flows from Basin W-42 do not release into the detention pond and instead combine with the outflow from the pond. With this change in routing, actual design point locations have changed slightly. The existing DBPS analysis and this report show design point WU as the flow at Highway 24 as it passes through the existing box culverts. The proposed DBPS analysis and the Market Place report have Design Point WU as the flows entering the pond with the pond release flows as the Highway 24 flows. This report made the change, as stated previously, Basin W-42 no longer enters the pond, but combines at Highway 24 and a design point was needed to evaluate flows at this location. See the table below for a summary of major design points through the West Tributary in the Falcon Highlands development. Pond WU will release at less than historic rates for both, the 5-year and 100-year events.

Design Point	Existing*		Proposed		Location
	5-Yr	100-Yr	5-Yr	100-Yr	
WS	137	1575	145	1705	Woodmen
WT	143	1621	244	1867	Tamlin Road (Removed)
Pond WU			118	1313	Highway 24/Pond Outlet
WU	148	1648	135	1339	Highway 24 (Pr Condition)
WV	149	1640	135	1338	Falcon Highway

*Existing flows have been modified per the approved Falcon Highlands Final Drainage Report for Regional Detention Pond WU. This report adjusted routing for Basin W-42 and has modified the existing flows at Design Point WU. The "existing" flows which will be the target in this report are those existing flows which have been identified in the previous mentioned report, not those which were stated in the DBPS.

Rational Method

Because the Meridian Crossing is less than 100 acres, the rational method was used to estimate stormwater runoff for basins, and to size inlets, culverts and ditches, as required by the current

City of Colorado Springs/El Paso County Drainage Criteria Manual (DCM). The rational method coefficients "C" were selected from Table 5-1 of the DCM, the time of concentration was calculated per DCM requirements and intensities for each basin were calculated from storm intensity curve formulas provided by the City of Colorado Springs. The rational method was used to determine onsite flows. Rational Method results are shown in Appendix B and C.

Water Quality Criteria

The water quality capture volume (WQCV) was calculated based on equations found in the Drainage Criteria Manual Volume 2, Stormwater quality Policies, Procedures and Best Management Practices (BMP's). The WQCV allows suspended sediment and absorbed pollutants to settle out of the water and improve the overall quality of runoff leaving the facility and reduce the potential for erosion. The positive impact on water quality is significant see appendix for proposed pond calculations.

Street Capacity

Street capacity is based on the DCM criteria, as stated in Chapter 6. Capacity of the streets (Flower Road and McLaughlin Road) will be based on the minor and major storms. Minor storm criteria is based on pavement encroachment and the major storm criteria is based on allowable depth and pavement encroachment. In all cases, flow encroachment shall not extend past the right-of-way (R.O.W.). Mannings equation will be used to determine the street capacity based on the following criteria from the DCM. Flower and McLaughlin Roads are both collector roads. Both streets shall meet the following criteria from the Table 6-1 in the DCM:

Roadway	**Use of street in storm**		**Cross flow in streets for storm**	
Classification	**Initial**	**Major**	**Initial**	**Major**
Collector	No curb overtopping. Flow spread must be limited to a max. 20 foot spread from each curb face	Residential dwellings, public, commercial and industrial buildings shall not be inundated at the ground line. The depth of water at the gutter flow line shall not exceed 12 inches.	Where cross pans are allowed, depth of flow shall not exceed 6 inches at flow line.	12 inches of depth at gutter flow line.

DRAINAGE BASINS

Existing Drainage Analysis

Since the site is currently undeveloped, the existing drainage analysis was determined by analyzing existing runoff quantities and patterns. The site is covered predominantly with grasses. Existing storm runoff is generally from the north to the south through natural drainage swales, as well as gutter flow in a previously constructed roadway (Meridian Road). (See Figure 5: Existing Drainage Plan) On-site basins, being smaller than 100 acres, were analyzed using the rational method. See below for a brief discussion of each of these basins.

- Basin E-1 (2.18 acres) consists of the southeast half of Meridian Road, at a high point in the road adjacent to Pond MN. Basin E-1 slopes to the south to design point 1. An existing at grade inlet intercepts this flow. Any flow-by from this inlet will be directed onto Old Meridian Road. The remainder of the flow will continue east along Old Meridian Road, which allows street flow to runoff into an existing roadside ditch. This flow then enters a temporary culvert under Old Meridian Road. Basin E-1 produces runoff quantities of 9.4 cfs and 17.6 cfs for the 5-year and 100-year storms.

- Basin E-2 (8.76 acres) consists of an area just east of Old Meridian Road and between Meridian Road and McLaughlin Road. This area is currently undeveloped. Basin E-2 slopes to the southwest to design point 2. Currently, a temporary culvert exists to transfer flow from the east side of Old Meridian Road to the south side. An estimated 13.7 cfs and 31.4 cfs are produced for the 5-year and 100-year storms.

- Basin E-3 (13.96 acres) consists of an area northeast of Old Meridian and McLaughlin Roads in the "Town of Falcon". The flow from this basin will be directed towards the intersection of State Highway 24 and Meridian Road, where it is conveyed under an existing culvert under Old Meridian Road. This flow is directed towards the existing structure at Design Point 6. The basin generates 16.4 cfs and 37.5 cfs for the 5-year and 100-year storms.

- Basin E-4 (2.15 acres) consists of the east half of Meridian Road from Old Meridian Road to the right-in access point to the south. Basin E-4 slopes to the south. Flow from this basin will be conveyed through curb and gutter to the right in access drive, where a sump inlet intercepts the flow. An 18-inch rcp will then release into a temporary channel along Meridian Road, which conveys the flow to design point 6. An estimated 9.3 cfs and 17.5 cfs are produced for the 5-year and 100-year storms.

- Basin E-5 (9.41 acres) consists of an undeveloped native area just east and south of the Falcon Highlands detention pond (Pond WU). Runoff from this basin combines with flows from design point 7 and the detention pond outlet and crosses under US Highway 24 through existing culverts at design point 8. Basin E-5 generates 12.1 cfs and 27.8 cfs for the 5-year and 100-year storms.

- Basin E-6 (2.62 acres) consists of the west half of Meridian Road from the right-in access point to Highway 24. Basin E-6 slopes to the south to design point 4. Runoff will flow south via curb and gutter along this section of Meridian Road. A sump inlet at the low point, just before Highway 24, intercepts the runoff. This inlet connects to the box culvert under Meridian Road. This flow will continue to the existing box culverts at Highway 24. The Falcon Highlands detention pond also discharges to the existing culvert at Highway 24. However, the detention pond was designed to release flows at 80% of historic flow. The existing culvert under Highway 24 will have enough capacity, because the peak discharge from design point 7 will occur long before the peak discharge of the pond. An estimated 11.6 cfs and 21.7 cfs are produced for the 5-year and 100-year storms.

- Basin E-7 (2.32 acres) consists of the east half of Meridian Road from the right-in access point south to Highway 24. Basin E-7 slopes to the south to design point 15. Runoff will flow south through curb and gutter along this section of Meridian Road. A sump inlet intercepts this flow and connects to the box culvert under Meridian Road. An estimated 10.5 cfs and 19.7 cfs are produced from Basin E-7 for the 5-year and 100-year storms.

- Basin E-8 (23.89 acres) consists of the area south of Old Meridian Road and east of Meridian Road. This area is currently undeveloped. This flow sheetflows across the basin to design point 6. A concrete box culvert conveys the flow under Meridian Road to the existing culvert under Highway 24. An estimated 32.2 cfs and 73.7 cfs are produced for the 5-year and 100-year storms.

Existing Design Points

- Design Point 1 is an existing 15' on-grade inlet in Meridian Road, north of Old Meridian Road. This inlet intercepts flow from Basin E-1, street flow from Meridian Road, south of Pond MN to Old Meridian Road. The inlet releases the flow into a temporary ditch along Old Meridian Road, which conveys the flow to Design Point 2. Flows at this location are 9.4 and 17.6 cfs.

- Design Point 2 collects flow from Basin E-2 and combines it with the flow in the temporary channel from DP-1. A temporary 24-inch culvert under Old Meridian Road conveys the flow to the south towards Design Point 6. This design point has flows of 22.9 and 48.7 cfs.

- Design Point 3 is an existing 20' sump inlet that intercepts the street flow in Meridian Road from Basin D-4. The inlet releases flows into an existing temporary roadside ditch along Meridian Road to Design Point 6. Flows at this location are 9.3 and 17.5 cfs.

- Design Point 4 is an existing 25' sump inlet used to intercept the west side of Meridian Road, north of Highway 24 (Basin E-6). This flow enters the existing storm system and is conveyed to Design Point 7. This design point has flows of 11.6 and 21.7 cfs.

- Design Point 5 is an existing 20' sump inlet in Meridian Road opposite Design Point 4. This inlet intercepts street flow from Basin E-7 and combines with flows in the storm system under Meridian Road. Flows are released at Design Point 7. The design point generates flows of 10.5 and 19.7 cfs.

- Design Point 6 combines flows from Basins E-3 and E-8 with flows from Design Points 2 and 3. Two 12' (W) x 3' (H) reinforced concrete box culverts (RCBC's) convey the flow under Meridian Road to Design Point 7. Flows generated at this design point are 67.8 and 149.7 cfs.

- Design Point 7 is the location where the storm system releases flows. It is the combined flow from Design Points 4, 5 and 6. Once released, flows will continue through an existing ditch to Design Point 8 at Highway 24. Flows at this location are 67.0 and 148.5 cfs.

- Design Point 8 combines the flow from Basin E-5 with flows from Design Point 7 and Detention Pond WU. There are three 12' (W) x 6' (H) RCBC's under Highway 24 to convey flows. These flows will continue towards the south, in a FEMA floodplain, along their existing paths. Flows generated at this location are 147.7 and 1286.1 cfs. This design point corresponds to Design Point WU in the HEC models.

Developed Drainage Analysis

The proposed site was studied in the Falcon Basin DBPS. Efforts have been made to comply with the recommendations set forth in the approved DBPS. The flows in the commercial development will combine with the outlet flows of Detention Pond WU and continue under Highway 24 through the existing box culverts. Figure 6: Developed Drainage Plan illustrates the basin boundaries used for the rational hydrologic model.

Basins D-1 and D-4 through D-7 do not have any changes from the corresponding, existing basins (E-1 and E-4 through E-7), as they have already been developed and the drainage structures have been designed. Basin E-2, a proposed commercial site (Meridian Crossing, whose preliminary plan has been approved by the Board of County Commissioners (BOCC)), the proposed site and adjacent roadways, has been divided into five new developed basins. Changes to Basins D-3 and D-8, is the assumption that these basins will be developed in the future as commercial use. The description of these basins follows.

- Basin D-2 (5.14 acres) consists of approximately the south half of the Meridian Crossing commercial development. It is anticipated for this basin to drain towards the south, where it will be intercepted by a proposed water quality facility (Porous Landscape Detention – PLD). This storm system will release flows into a temporary drainage swale through Basin D-8. This drainage pattern is consistent with the approved Master Drainage Development Plan Amendment to Falcon Highlands, which shows these flows reaching the existing box culvert under Highway 24 at design point 8. This basin generates 23.4 cfs and 43.9 cfs for the 5-year and 100-year storm events.

- Basin D-3 (11.49 acres) consists of an area northeast of Old Meridian Road and McLaughlin Road in the "Town of Falcon". It is assumed that this area will be developed as commercial use in the future. The flow from this basin will be directed towards the intersection of Highway 24 and Meridian Road, where it is conveyed under a proposed culvert under Old Meridian Road. The flow is directed towards the existing structure at DP-6. The basin generates 34.7 and 65.1 cfs for the 5 and 100-year events.

Does not match flow path shown on GEC Plans. See my comment on sheet C013 of GEC Plans.

intercepted by the temporary grated lid on the proposed manhole at DP-Z This flow will ultimately reach Highway 24. Flows at this location are 4.7 and 8.9 cfs.

- Design Point X is the released flow from the East PLD. Flow from this area combines with a storm system in Old Meridian Road via a 30" rcp. Flows generated in this location are 16.9 cfs and 31.8 cfs.

- Design Point Z is the flow from DP-B, DP-X intercepted flow from inlet 1 and the flow-by from inlet 1 combined with the released flow from the West PLD (Basin D-2). A 36" rcp connects and conveys this flow to a temporary culvert under Old Meridian Road which will release flows into a temporary ditch. Flows at this junction are 44.6 cfs and 83.8 cfs.

- Design Point Y is a proposed 54" rcp which releases flows across Old Meridian Road. The proposed pipe will replace an existing culvert, which is currently undersized, and intercepts flows from D-3. This design point has a flow of 34.7 cfs and 65.1 cfs. There is no corresponding design point in the Market Place Filing No. 1 drainage report.

- Design Point 3 is an existing 20' sump inlet that intercepts the street flow in Meridian Road from Basin D-4. The inlet currently combines with DP-Z and flows into an existing temporary roadside ditch along Meridian Road to Design Point 6. Flows at this location are 9.3 and 17.5 cfs. This design point corresponds to Design Point 13 in the Market Place FDR.

- Design Point E is the combination of D-3 and DP-Z. Flows are released into a temporary channel which conveys flows to a roadside ditch along Meridian Road. This flow is conveyed all the way to Design Point DP-8 at Highway 24 where flows are released from the Falcon Highlands site. Flows intercepted at this location are 46.938.3 cfs and 58.2 cfs. The Market Place Filing No. 1 report does not have any corresponding design points.

- Design Point 4 is an existing 25' sump inlet used to intercept the west side of Meridian Road, north of Highway 24 (Basin D-6). This flow enters the existing storm system and is conveyed to Design Point 7. This design point has flows of 11.6 and 21.7 cfs. This design point corresponds to Design Point 16 in the Market Place FDR. There is no difference in the drainage flows.

- Design Point 5 is an existing 20' sump inlet in Meridian Road opposite Design Point 4. This inlet intercepts street flow from Basin D-7 and combines with flows in the storm system under Meridian Road. Flows are released at Design Point 7. The design point generates flows of 10.5 and 19.7 cfs. This location corresponds to Design Point 15 in the Market Place FDR. There are no changes in the flows.

- Design Point 6 combines flow from Basin D-8 with DP-E and DP-Y. Two 12' (W) x 3' (H) reinforced concrete box culverts (RCBC's) convey the flow under Meridian Road to Design Point 7. Flows generated at this design point are 127.7 and 239.9 cfs. This location corresponds to Design Point 17 in the Market Place FDR. This report calculated flows to be 157.9 and 300.6 cfs.

DRAINAGE FACILITY DESIGN

General Concept

Meridian Crossing is located completely within the West Tributary of the Falcon Drainage Basin. The site drains towards the southwest where it is directed towards an existing drainage structure under Highway 24. This structure has been analyzed to ensure it still properly functions with the developed flow released here. The flow from these structures will continue along an existing swale to the south. There are two water quality facilities proposed for the site, prior to flows exiting.

Storm Systems

There has been one storm system previously installed with the construction of Meridian Road. This system was designed in the Market Place Filing No. 1 FDR. One new culvert and a temporary culvert have been proposed with the development of this site. StormCAD and CulvertMaster calculations have been included at the end of the report analyzing all of these facilities to ensure they are still adequate for the developed flow associated with this development.

The first system is an existing system located at the intersection of Meridian Road and Highway 24. This system was initially designed in the Market Place Filing No. 1 FDR. The system has been analyzed to ensure it will still function properly with the development of The Shoppes at Falcon. A 20-foot sump inlet is located at DP-5 in Meridian Road. This inlet intercepts 10 cfs and 19 cfs. A 25-foot sump inlet is located on the other side of Meridian Road at DP-4. This inlet intercepts 12 and 22 cfs. Both of these inlets connect to an existing 12'(W) x 3' (H) box culvert under Meridian Road via 24-inch rcp's. This structure intercepts a total flow of 127.7 and 239.9 cfs. This system releases flows into an existing channel parallel to Highway 24 at DP-7. Flows at this location are 140.2 cfs and 264.8 cfs. The channel conveys this flow to DP-8 at Highway 24, where the flow exits Falcon Highlands and continues on its existing path to the south.

Channel Improvements

The temporary channel from DP-Z has a 100-year flow of 73.3 cfs from the proposed storm system. The channel will be shaped similarly to the roadside ditch along the southeast side of Meridian Road, which it connects to. Velocity is this channel is 3.2 ft/s with a flow depth of 1.8 feet. A temporary drainage easement will be recorded on the final plat to accommodate this channel.

The existing roadside ditch along Basin D-7 is located east of Meridian Road from the right-in access point south to Highway 24. The ditch will carry the 100-year storm (88.2 cfs) at a depth of 1.8 feet to DP-6. The velocity in this channel is 5.5 fps. This channel will also be removed upon development of Basin D-8 and the construction of an internal storm drain system.

There is a series of onsite temporary swales in lots 3, 4 and 5. These swales will be utilized to ensure flows are conveyed to the west PLD. Once these lots develop, the swales will no longer be necessary and will be removed. Also, located outside of the Meridian Crossing right-of-way along Old Meridian Road are 3 temporary swales, which convey flows to storm inlets. These swales will be removed upon the construction of Old Meridian Road.

Detention Pond WU

Based on the current configuration of the basins, Pond WU does work as intended. The 5-year release rate is less than the existing flow rate. Refer to the table earlier in the report for flow rates at major design points. Based on the current analysis of the hydrology for the area no modifications will be necessary to the outlet structure of the detention pond as previously assumed. The 100-year storm also functions properly and has a release rate lower than the existing flows.

Proposed Water Quality Pond

Based on the City of Colorado Springs/El Paso County DCM Volume 2, a water quality pond is needed, as the development area is greater than 1.0 acre. There will be two water quality capture ponds (WQCP), which will be porous landscape detention (PLD). Both ponds structures will be located between the northern right of way of McLaughlin road and the proposed curb and gutter for lots 5 and 6. This will enable the ponds to be used for final construction of each of the building sites. The east and west pond combine for a total 8200 square feet.

Ultimate Design

Currently, there is evidence that Old Meridian Road will be improved. If this situation does not happen, there is an "ultimate design" scenario to account for this. Meridian Crossing will be responsible for installing curb and gutter and sidewalk for the portion of Old Meridian Road which fronts their property. The rcp stub behind inlet DP-1 will be extended via 18"rcp to the existing culvert under Old Meridian Road. A 5' type R inlet will be installed to catch the flows of Old Meridian Road (see appendix item I for StormCAD calculations). A 5' manhole will be installed to connect the new and existing pipes. The existing culvert will continue to convey the flow through an existing swale, which releases flows into the roadside swale along Meridian Road. This flow still reaches an ultimate location of DP-8, where all flows leave the Falcon Highlands development.

Downstream Facilities

<u>Falcon West Tributary</u>

Detention Pond WU discharges below the historical rate as described in the Falcon Highlands Filing No. 1 PDR and the Falcon Basin DBPS. Just downstream of Pond WU outlet works is an existing bridge at SH 24. At Highway 24 near Pond WU, triple 12' x 6' RCBC's were installed in 1999. This facility conveys the 1239 cfs 100-year design flow. An analysis of these structures in included in the appendix. The DBPS recommended installing a lined channel with geotextile fabric and grade control drop structures. Currently, this area has no real definable channels, but flows are allowed to spread once they are released through the structure at SH 24. This area is within a FEMA designated floodplain. Historic flows as stated in the DBPS are 1518 cfs.

Downstream of SH 24, flows follow a FEMA floodplain to Falcon Highway. At Falcon Highway there is a 36-inch cmp culvert that is inadequate to carry the 100-year design flow.

DRAINAGE FEES, COST ESTIMATE & MAINTENANCE

Maintenance

The streets and major improvements within this site will be maintained by the Meridian Crossing Property Owners Association (POA) for ownership and maintenance. This includes the roads, drainage facilities, and water quality ponds. The Falcon Highlands Metropolitan District will own and operate water and wastewater systems. The remaining utilities (gas, phone, electric, cable, etc) will be owned and maintained by their respective companies. Easements will be issued to ensure each entity is able to access and maintain their facilities.

Drainage Fees

The proposed development is located within the Falcon Basin. The proposed commercial site encompasses approximately 9.5 acres. Fees will be based on 9.0 acres (95% imperviousness due to commercial development).

Drainage fees in the Falcon Basin are $6,925 and bridge fees are $2,659. Based on these numbers and an impervious area of 9.0 acres fees for this development are $62,325 for drainage and $25,261 for bridge fees. This gives a total fee of $87,586.

Proposed Facilities Estimate

ITEM	UNITS	UNIT COST	QUANTITY	ITEM COST
DRAINAGE				
5' STORM MANHOLE	EA	2,800	1	2,800
30" RCP	LF	55	435	23,925
36" RCP	LF	65	60	3,900
42" RCP	LF	80	105	8,400
RIPRAP	CY	45	30	1,350
SUBTOTAL DRAINAGE				*$40,375*
GRADING AND EROSION CONTROL				
CLEARING AND GRUBBING	AC	$800	9.5	$7,600
EARTHWORK	CY	3.50	13300	46,550
WATER QUALITY PONDS	EA	3,000	2	6,000
CURB BACKFILL	LF	2.50	3200	8,000
MISC SEEDING AND MULCH	AC	3,500	6	21,000
HAY BALE CHECKS	EA	10	37	370
INLET PROTECTORS	EA	200	4	800
VEHICLE TRACKING CONTROL	EA	1,500	1	1,500
SILT FENCING	LF	5	1800	9,000
SUBTOTAL GRADING & EROSION CONTROL				*$100,770*
ULTIMATE DRAINAGE				
5' STORM MANHOLE	EA	2,800	1	2,800
30" RCP	LF	40	259	10,360
5' TYPE R INLET	EA	3,500	1	3,500
SUBTOTAL ULTIMATE DRAINAGE				*$16,660*
SUBTOTAL DRAINAGE & EROSION CONTROL				***$157,805***
Engineering (10%)				$15,781

Contingency (10%)				
				$15,781
TOTAL				
				$189,367

EROSION CONTROL

General Concept

During construction, best management practices for erosion control will be employed based on El Paso County criteria and the erosion control plan.

Ditches will be designed to meet El Paso County criteria for slope and velocity, keeping velocities below scouring levels.

During construction, best management practices (BMP) for erosion control will be employed based on El Paso County Criteria. BMP's will be utilized as deemed necessary by the contractor and/or engineer and are not limited to measures shown on the construction drawing set. The contractor shall minimize the amount of area disturbed during all construction activities.

In general the following shall be applied in developing the sequence of major activities:

- Install downslope and sideslope perimeter BMP's before land disturbing activity occurs.
- Do not disturb an area until it is necessary for construction activity to proceed.
- Cover or stabilize as soon as possible.
- Time the construction activities to reduce the impacts from seasonal climatic changes or weather events.
- The construction of filtration BMP's should wait until the end of the construction project when upstream drainage areas have been stabilized.
- Do not remove temporary perimeter controls until after all upstream areas are stabilized.

Silt Fence

Silt fence will be placed along downstream limits of disturbed areas. This will prevent suspended sediment from leaving the site during infrastructure construction. Silt fencing is to remain in place until vegetation is reestablished.

Erosion Bales

Erosion bales will be placed ten (10) feet from the inlet of all culverts and inlets during construction to prevent culverts from filling with sediment. Erosion bales will remain in place until vegetation is reestablished in graded roadside ditches and channels. Erosion bale ditch checks will be used on slopes greater than 1% to reduce flow velocities until vegetation is reestablished.

Vehicle Tracking Control

This BMP is used to stabilize construction entrances, roads, parking areas and staging areas to prevent the tracking of sediment from the construction site. A vehicle tracking control (VIC) is to be used at all locations where vehicles exit the construction site onto public roads, loading and unloading areas, storage and staging areas, where construction trailers are to be located, any construction area that receives high vehicular traffic, construction roads and parking areas. VTC's should not be installed in areas where soils erode easily or are wet.

Sedimentation Pond

This BMP is used to detain runoff which has become laden with sediment long enough to allow the sediment to settle out. As the construction area is larger than 1 acre, a temporary sediment basin is required per Volume 2 of the Drainage Criteria Manual. The basin will be located in the area of the proposed water quality pond, as this area will need to be excavated and an embankment built. A temporary 8" pvc underdrain will be installed to drain this basin during construction.

REFERENCE MATERIALS

1. "City of Colorado Springs/El Paso County Drainage Criteria Manual" September 1987, Revised November 1991, Revised October 1994.

2. "City of Colorado Springs/El Paso County Drainage Criteria Manual, Volume 2: Stormwater Quality Policies, Procedures and Best Management Practices" November 1, 2002.

3. Soils Survey of El Paso County Area, Natural Resources Conservation Services of Colorado.

4. Flood Insurance Rate Study for El Paso County, Colorado and Incorporated Areas. Federal Emergency Management Agency, Revised March 17, 1997.

5. Falcon Area Drainage Basin Planning Study Preliminary Design Report, December 2000. Prepared by URS Corp.

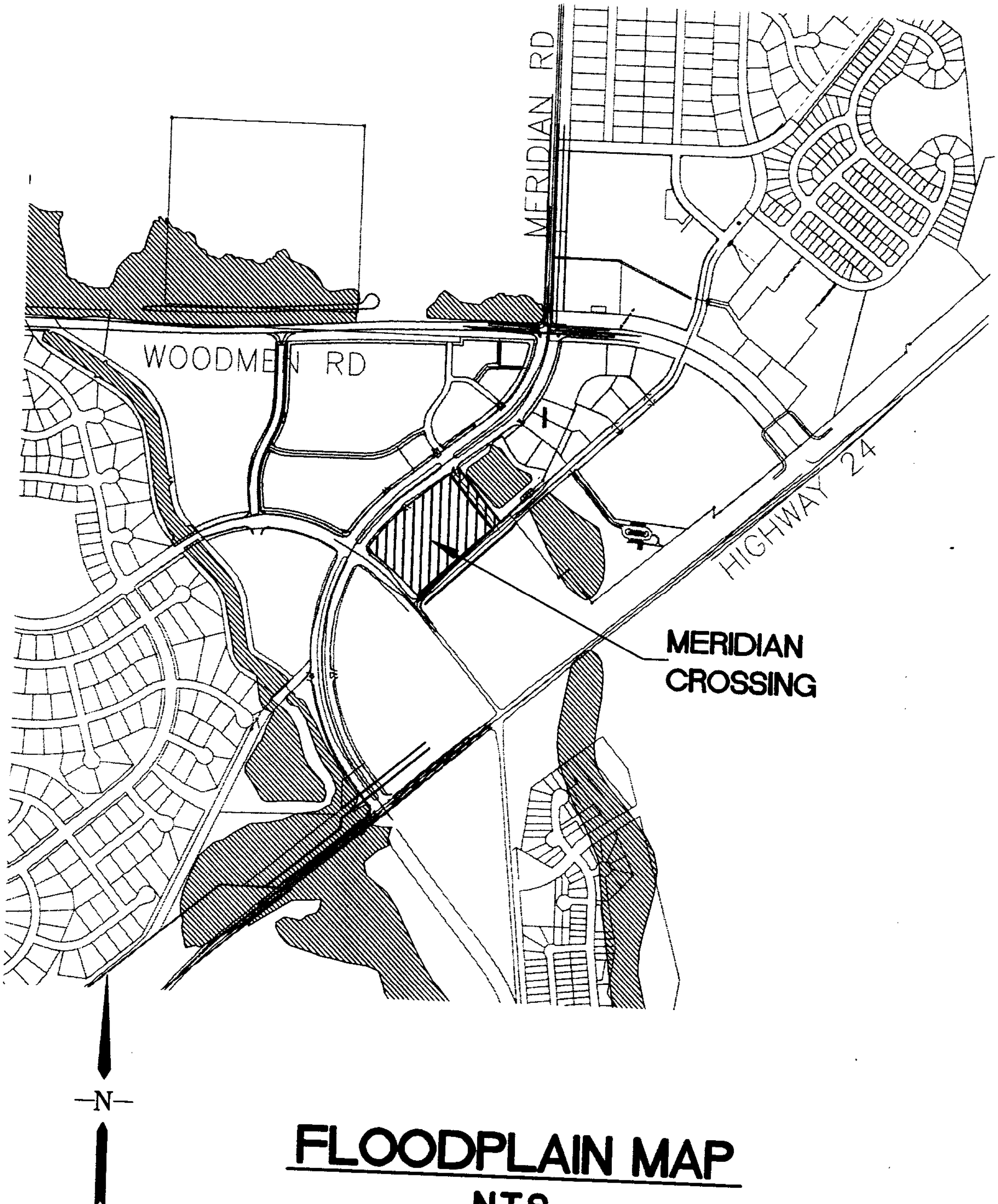
6. Master Development Drainage Plan, and Preliminary Drainage Report and Final Drainage Report for Falcon Highland Filing No. 1, October 2004. Prepared by URS Corp.

7. Floodplain Modification Study and Application for Conditional Letter of Map Revision for the Middle Tributary of the Falcon Basin-Regency Center, January 2005. Prepared by URS Corp.

8. Amendment to Falcon Highlands Master Drainage Development Plan, September 2005. Prepared by URS Corp.

9. Falcon Highlands Market Place Filing No. 1 Preliminary and Final Drainage Report, December 22, 2005. Prepared by URS Corp.

Figure 3: FEMA Floodplain Map



FLOODPLAIN MAP

N.T.S.

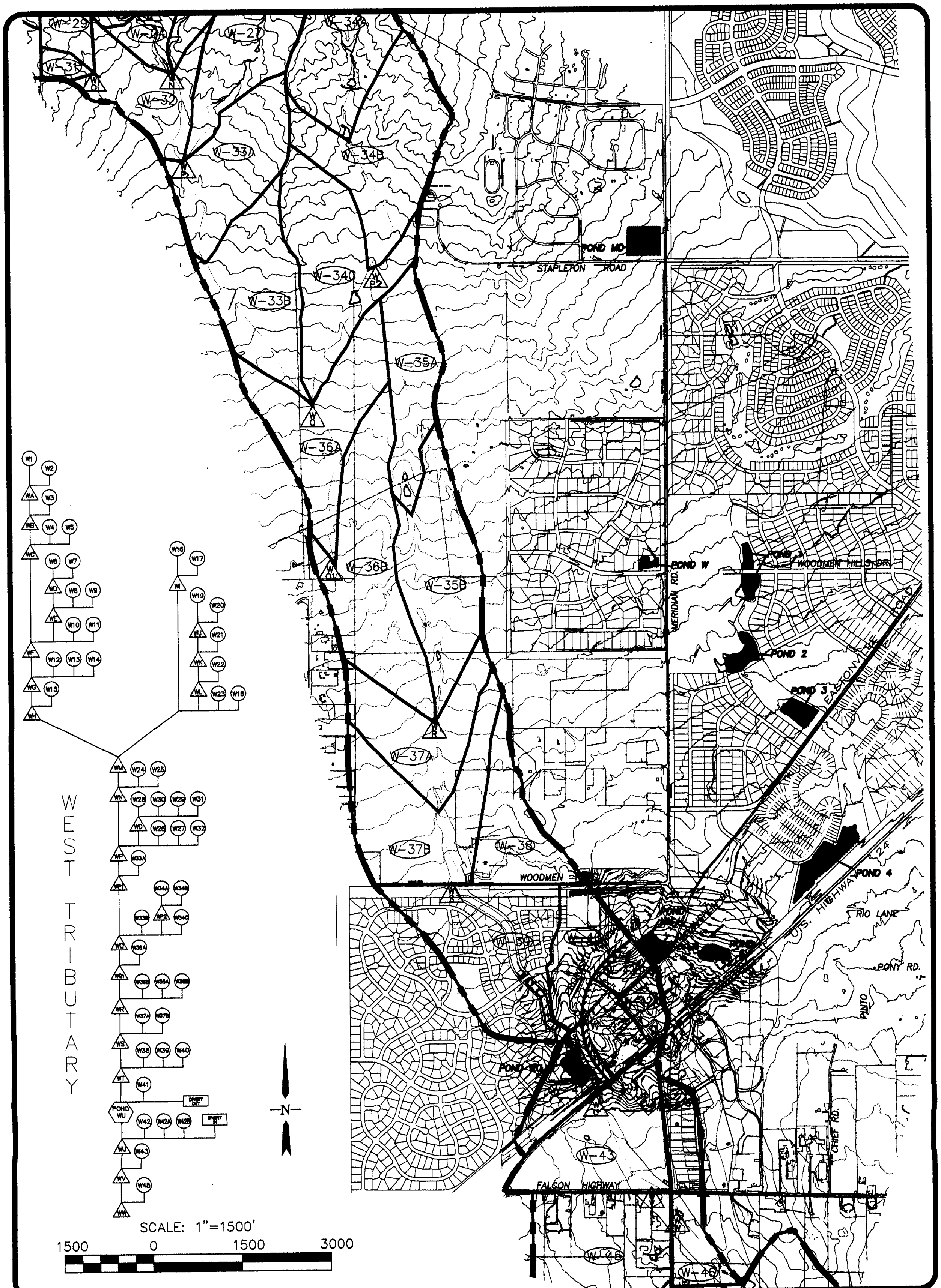
MERIDIAN CROSSING

FIRM MAP 08041C0575 REV 11/26/03

SE Springs Engineering
31 NORTH TEJON, SUITE 315
COLORADO SPRINGS, CO 80903
TEL: (719) 227-7388
FAX: (719) 227-7392

FIGURE 3

PROJECT NO. 057-07-032



MERIDIAN CROSSING

HEC-1 HYDROLOGIC MODEL

SE Springs Engineering

31 NORTH TEJON, SUITE 315
COLORADO SPRINGS, COLORADO 80903
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FIGURE 4

PROJECT NO. 06-0033

Appendix A: Existing HEC-1 Calculations

```
1***************************************                    ***************************************
*                                      *                    *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS      *
*             JUN    1998              *                    *   HYDROLOGIC ENGINEERING CENTER     *
*          VERSION 4.1                 *                    *        609 SECOND STREET            *
*                                      *                    *     DAVIS, CALIFORNIA 95616         *
* RUN DATE    28SEP07  TIME  11:57:06  *                    *        (916) 756-1104               *
*                                      *                    *                                     *
****************************************                    ***************************************

X     X  XXXXXXX   XXXXX           X
X     X  X         X     X        XX
X     X  X         X               X
XXXXXXX  XXXX      X        XXXXX  X
X     X  X         X               X
X     X  X         X     X         X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1        ID    FALCON BASIN 5-YR/ 24-HOUR FLOOD/ EXISTING CONDITIONS
  2        ID         UPPER EAST TRIBUTARY (WOODMEN HILLS) BASED ON CLOMR APPROVED 2/2/99
  3        ID         INCLUDING 2 EXISTING SCS STOCK PONDS, WEST WOODMEN HILLS POND
  4        ID         NOTE: M1-M4 (PAINT BRUSH HILLS) MODELED AS HISTORIC TO ACCOUNT FOR
  5        ID                DETENTION POND AT MC
  6        ID         NOTE: NO CULVERT AT STAPLETON & MERIDIAN, TEMP CULVERTS AT MERIDIAN
  7        ID                DOWNSTREAM OF WOODMEN HILLS DRIVE (DIVERSION)
           *DIAGRAM
  8        IT        5 14JUL99     800     300
  9        IO        5

 10        KK       W1
 11        KM
 12        BA    .0479
 13        PB      2.6
 14        IN       15
 15        PC    .0005   .0015   .0030   .0045   .0060   .0080   .0100   .0120   .0143   .0165
 16        PC    .0188   .0210   .0233   .0255   .0278   .0320   .0390   .0460   .0530   .0600
 17        PC    .0750   .1000   .4000   .7000   .7250   .7500   .7650   .7800   .7900   .8000
 18        PC    .8100   .8200   .8250   .8300   .8350   .8400   .8450   .8500   .8550   .8600
 19        PC    .8638   .8675   .8713   .8750   .8788   .8825   .8863   .8900   .8938   .8975
 20        PC    .9013   .9050   .9083   .9115   .9148   .9180   .9210   .9240   .9270   .9300
 21        PC    .9325   .9350   .9375   .9400   .9425   .9450   .9475   .9500   .9525   .9550
 22        PC    .9575   .9600   .9625   .9650   .9675   .9700   .9725   .9750   .9775   .9800
 23        PC    .9813   .9825   .9838   .9850   .9863   .9875   .9888   .9900   .9913   .9925
 24        PC    .9938   .9950   .9963   .9975   .9988   1.000
 25        LS               60
 26        UD     .097

 27        KK
 28        KM
 29        RK     1519   .0263    .035            TRAP       5       4

 30        KK       W2
 31        KM
 32        BA    .0278
 33        LS               60
 34        UD     .160

 35        KK       WA
 36        KM
 37        HC        2

 38        KK
 39        KM
 40        RK      464   .0151    .035            TRAP       5       4

 41        KK       W3
 42        KM
 43        BA    .0498
 44        LS               61
 45        UD     .139


 46        KK       WB
 47        KM
 48        HC        2

 49        KK
 50        KM
 51        RK      823   .0279    .035            TRAP       5       4                      54

 52        KK       W4
 53        KM
 54        BA    .0054
 55        LS               62
 56        UD     .044

 57        KK
 58        KM
 59        RK     1078   .0482    .035            TRAP       5       4

 60        KK       W5
 61        KM
 62        BA    .0159
 63        LS               60
 64        UD     .075

 65        KK       WC
 66        KM
 67        HC        3

 68        KK
 69        KM
 70        RK      557   .0449    .035            TRAP      10       4

 71        KK       W6
 72        KM
 73        BA    .0486
 74        LS               60
 75        UD     .085
```

```
 76          KK
 77          KM
 78          RK      592   .0372    .035            TRAP       5        4

 79          KK       W7
 80          KM
 81          BA    .0217
 82          LS               60
 83          UD     .074

 84          KK
 85          KM
 86          RK      464   .1466    .035            TRAP       5        4

 87          KK       WD
 88          KM
 89          HC        2

 90          KK      D-E
 91          KM
 92          RK     1044   .0479    .035            TRAP       5        4

 93          KK       W8
 94          KM
 95          BA    .0286
 96          LS               60
 97          UD     .069

 98          KK
 99          KM
100          RK     1449   .0504    .035            TRAP       5        4

101          KK       W9
102          KM
103          BA    .0402
104          LS               61
105          UD     .097

106          KK       WE
107          KM
108          HC        3

109          KK      E-F
110          KM
111          RK      789   .0038    .035            TRAP       5        4

112          KK      W10
113          KM
114          BA    .0431
115          LS               61
116          UD     .096

117          KK
118          KM
119          RK      824   .0388    .035            TRAP       5        4

120          KK      W11
121          KM
122          BA    .0314
123          LS               60
124          UD     .077

125          KK       WF
126          KM
127          HC        4

128          KK      F-G
129          KM
130          RK     2319   .0211    .035            TRAP      10        4

131          KK      W12
132          KM
133          BA    .0398
134          LS               60
135          UD     .095

136          KK
137          KM
138          RK     2478   .0307    .035            TRAP       5        4

139          KK      W14
140          KM
141          BA    .0473
142          LS               61
143          UD     .135

144          KK
145          KM
146          RK       81  0.0001    .035            TRAP       5        4

147          KK      W13
148          KM
149          BA    .1123
150          LS               61
```

151	UD	.182					
152	KK	WG					
153	KM						
154	HC	4					
155	KK	G-H					
156	KM						
157	RK	2632	.0217	.035	TRAP	15	4
158	KK						
159	KM						
160	RK	2447	.0372	.035	TRAP	5	4
161	KK	W15					
162	KM						
163	BA	.0881					
164	LS		61				
165	UD	.141					
166	KK						
167	KM						
168	RK	1763	.0289	.035	TRAP	5	4
169	KK	WH					
170	KM						
171	HC	2					
172	KK	W16					
173	KM						
174	BA	.0292					
175	LS		61				
176	UD	.092					
177	KK						
178	KM						
179	RK	1345	.0260	.035	TRAP	5	4
180	KK	W17					
181	KM						
182	BA	.0184					
183	LS		60				
184	UD	.085					
185	KK	WI					
186	KM						
187	HC	2					
188	KK	I-M					
189	KM						
190	RK	2650	.0370	.035	TRAP	15	4
191	KK	W19					
192	KM						
193	BA	.0428					
194	LS		61				
195	UD	.083					
196	KK						
197	KM						
198	RK	881	.0329	.035	TRAP	5	4
199	KK	W20					
200	KM						
201	BA	.0315					
202	LS		61				
203	UD	.071					
204	KK	WJ					
205	KM						
206	HC	2					
207	KK						
208	KM						
209	RK	3061	.0235	.035	TRAP	5	4
210	KK	W21					
211	KM						
212	BA	.1347					
213	LS		60				
214	UD	.156					
215	KK	WK					
216	KM						
217	HC	2					
218	KK						
219	KM						
220	RK	487	.0246	.035	TRAP	5	4
221	KK	W22					
222	KM						
223	BA	.0086					
224	LS		63				
225	UD	.055					

```
226    KK    WL
227    KM
228    HC     2

229    KK
230    KM
231    RK   1786  .0297  .035        TRAP    5    4

232    KK    W23
233    KM
234    BA  .0244
235    LS           60
236    UD   .112

237    KK    W18
238    KM
239    BA  .1251
240    LS           60
241    UD   .189

242    KK    WM
243    KM
244    HC     5

245    KK    M-N
246    KM
247    RK   1345  .0149  .035        TRAP   20    4

248    KK    W24
249    KM
250    BA  .0442
251    LS           60
252    UD   .140

253    KK    W25
254    KM
255    BA  .0957
256    LS           61
257    UD   .197

258    KK    WN
259    KM
260    HC     3

261    KK    N-P
262    KM
263    RK   1589   .017  .035        TRAP   20    4

264    KK    W28
265    KM
266    BA  .0397
267    LS           63
268    UD   .128

269    KK
270    KM
271    RK   1345  .0208  .035        TRAP    5    4

272    KK    W30
273    KM
274    BA  .0509
275    LS           63
276    UD   .123

277    KK
278    KM
279    RK   1078  .0074  .035        TRAP    5    4

280    KK    W29
281    KM
282    BA  .0409
283    LS           63
284    UD   .145

285    KK    W31
286    KM
287    BA  .0123
288    LS           63
289    UD   .073

290    KK    WO
291    KM
292    HC     4

293    KK    O-P
294    KM
295    RK   2169  .0226  .035        TRAP    5    4

296    KK    W26
297    KM
298    BA  .0301
299    LS           63
300    UD   .062
```

301	KK						
302	KM						
303	RK	4662	.0225	.035	TRAP	5	4
304	KK	W27					
305	KM						
306	BA	.1633					
307	LS		60				
308	UD	.253					
309	KK	W32					
310	KM						
311	BA	.0890					
312	LS		60				
313	UD	.170					
314	KK	WP					
315	KM						
316	HC	5					
317	KK	P-Q					
318	KM						
319	RK	1925	.0182	.035	TRAP	25	4
320	KK	W33A					
321	KM						
322	BA	.1261					
323	LS		60				
324	UD	.186					
325	KK	WP1					
326	KM						
327	HC	2					
328	KK	P1-Q					
329	KM						
330	RK	3000	.020	.035	TRAP	25	4
331	KK	W33B					
332	KM						
333	BA	.1360					
334	LS		60				
335	UD	.225					
336	KK	W34A					
337	KM						
338	BA	.1261					
339	LS		60				
340	UD	.173					
341	KK	34A-P2					
342	KM						
343	RK	2550	.0176	.035	TRAP	25	4
344	KK	W34B					
345	KM						
346	BA	.1766					
347	LS		60				
348	UD	.224					
349	KK	WP2					
350	KM						
351	HC	2					
352	KK	P2-Q					
353	KM						
354	RK	2640	.021	.035	TRAP	25	4
355	KK	W34C					
356	KM						
357	BA	.1625					
358	LS		60				
359	UD	.244					
360	KK	WQ					
361	KM						
362	HC	4					
363	KK	Q-Q1					
364	KM						
365	RK	2940	.022	.035	TRAP	25	4
366	KK	W36A					
367	KM						
368	BA	.1429					
369	LS		60				
370	UD	.234					
371	KK	WQ1					
372	KM						
373	HC	2					
374	KK	Q1-R					
375	KM						
376	RK	3400	.022	.035	TRAP	25	4

```
KK     W36B
KM
BA    .1918
LS              60
UD     .306

KK     W35A
KM
BA    .0958
LS              60
UD     .187

KK   35A-WR
KM
RK     3715   .023    .035          TRAP     25     4

KK     W35B
KM
BA    .1507
LS        0     60
UD     .259

KK       WR
KM
HC        4

KK     WR-S
KM
RK     2922  .0168    .035          TRAP     25     4

KK     W37A
KM
BA    .1138
LS              60
UD     .185

KK    37A-S
KM
RK     1430   .014    .035          TRAP     25     4

KK     W37B
KM
BA    .1636
LS              61
UD     .218

KK       WS
KM
HC        3

KK      S-T
KM
RK     3653  .0164    .035          TRAP     25     4

KK      W38
KM
BA    .0907
LS              62
UD     .190

KK
KM
RK     2922  .0171    .035          TRAP      5     4

KK      W39
KM
BA    .1833
LS              60
UD     .251

KK      W40
KM
BA    .0964
LS              60
UD     .165

KK       WT
KM
HC        4

KK      T-U
KM
RK     1125  .0098    .035          TRAP     25     4

KK      W41
KM
BA    .0601
LS              60
UD     .117

KK      W42
KM
BA    .0581
LS              81
```

```
UD    .127

KK    U-V
KM
RK    2656   .0184   .035         TRAP    5     4

KK    WU
KM
HC       3

KK
KM
RK    2215   .0181   .035         TRAP    25    4

KK    W43
KM
BA   .1457
LS             61
UD    .169

KK    WV
KM
HC       2

KK    V-W
KM
RK     487   .0103   .035         TRAP    25    4

KK    W45
KM
BA   .1931
LS             61
UD    .189

KK    WW
KM
HC       2

KK    W-X
KM
RK    1542   .0149   .035         TRAP    5     4

KK    M1
KM
BA   .0665
LS             60
UD    .108

KK
KM
RK     650   .0308   .035         TRAP    5     4

KK    M2
KM
BA   .0273
LS             60
UD    .114

KK    MB
KM
HC       2

KK
KM
RK     928   .0302   .035         TRAP    5     4

KK    M4
KM
BA   .0346
LS             60
UD    .121

KK
KM
RK     406   .0197   .02          TRAP    40    0

KK    M3
KM
BA   .0149
LS             60
UD    .076

KK    MC
KM
HC       3

KK
KM
RK    1902   .0231   .035         TRAP    5     4

KK    M5
KM
BA   .0176
LS             69
UD    .108
```

```
KK
KM
RK     1717   .0186     .02             TRAP      40        0

KK      M6
KM
BA    .0637
LS              65
UD     .233

KK      MD
KM
HC        3

KK
KM
RK     2841    .019    .035             TRAP       5        4

KK      M7
KM
BA    .0524
LS              69
UD     .170

KK
KM
RK     1044   .0268     .02             TRAP      40        0

KK      M8
KM
BA    .0370
LS              61
UD     .126

KK      ME
KM
HC        2

KK
KM
RK     2992   .0187    .035             TRAP       5        4

KK      M9
KM
BA    .0169
LS              69
UD     .087

KK
KM
RK     3433   .0253     .03             TRAP       5        4

KK     M12A
KM
BA    .0658
LS              60
UD     .159

KK     M12B
KM
BA    .1481
LS              60
UD     .219

KK      MF
KM
HC        5

KK
KM
RK     2586   .0224    .035             TRAP      10        4

KK      M13
KM
BA    .0614
LS              64
UD     .165

KK
KM
RK     1700     .01    .035             TRAP       6        4

KK      M14
KM
BA    .1624
LS              64
UD     .228

KK       MG
KM
HC        2

KK    PONDW
KM          WOODMEN HILLS DETENTION POND WEST (FROM FDR WH FLG F4)
```

```
SV       0     .68     1.5     235     3.6     4.9     6.3    7.34    7.34
SE     968     969     970     971     972     973     974     975     976
SQ       0       8    15.5      41    84.4     110     138     152     205
RS       1    ELEV     968

KK      MH
KM
HC       2

KK
KM
RK    1276   .0212    .035            TRAP      15       4

KK   MH-P2
KM         DIVERT FLOW TO POND 2 VIA TWIN 23x47 ARCH CMPS UNDER MERIDIAN
DT  DIVRT1      90
DI       0      39      72     152     263     318     377     442     591
DQ       0      39      70      80      80      80      85      85      90

KK     M15
KM
BA   .1242
LS              64
UD    .203

KK      MI
KM
HC       2

KK
KM
RK    1995   .0165    .035            TRAP      15       4

KK     M19
KM
BA   .0499
LS              61
UD    .159

KK      MJ
KM
HC       2

KK
KM
RK    2215   .0158    .035            TRAP      15       4

KK     M10
KM
BA   .0581
LS              62
UD    .102

KK   M10-K
KM
RK    3150   .0255     .03            TRAP       5       4

KK    M11A
KM
BA   .1067
LS              61
UD    .231

KK      MK
KM
HC       2

KK   MK-K1
KM
RK    2300    .260     .03            TRAP       5       4

KK    M11B
KM
BA   .0879
LS              60
UD    .150

KK  11B-K1
KM
RK    2400    .025     .03            TRAP       5       4

KK    M11C
KM
BA   .0933
LS              60
UD    .160

KK     MK1
KM
HC       3

KK   K1-ML
KM
RK    1821    .028    .035            TRAP       5       4
```

678	KK	M16					
679	KM						
680	BA	.042					
681	LS		60				
682	UD	.139					
683	KK	ML					
684	KM						
685	HC	2					
686	KK						
687	KM						
688	RK	2099	.02	.035	TRAP	5	4
689	KK	M17					
690	KM						
691	BA	.0765					
692	LS		61				
693	UD	.133					
694	KK	MM					
695	KM						
696	HC	2					
697	KK						
698	KM						
699	RK	2320	.0121	.035	TRAP	10	4
700	KK	M18					
701	KM						
702	BA	.061					
703	LS		61				
704	UD	.142					
705	KK						
706	KM						
707	RK	2122	.017	.035	TRAP	5	4
708	KK	M20					
709	KM						
710	BA	.1341					
711	LS		61				
712	UD	.211					
713	KK	MN					
714	KM						
715	HC	4					
716	KK						
717	KM						
718	RK	1531	.0202	.035	TRAP	25	4
719	KK	M21					
720	KM						
721	BA	.0241					
722	LS		61				
723	UD	.125					
724	KK						
725	KM						
726	RK	1322	.0212	.035	TRAP	5	4
727	KK	M23					
728	KM						
729	BA	.0461					
730	LS		60				
731	UD	.120					
732	KK	MO					
733	KM						
734	HC	3					
735	KK						
736	KM						
737	RK	974	.0133	.035	TRAP	25	4
738	KK	M24					
739	KM						
740	BA	.0776					
741	LS		60				
742	UD	.125					
743	KK	MP					
744	KM						
745	HC	2					
746	KK						
747	KM						
748	RK	290	.0138	.035	TRAP	25	4
749	KK	M25					
750	KM						
751	BA	.0105					
752	LS		60				
753	UD	.130					

```
754     KK     MQ
755     KM
756     HC      2

757     KK
758     KM
759     RK   3305  .0136   .035        TRAP    25     4

760     KK    M26
761     KM
762     BA  .1779
763     LS           65
764     UD   .250

765     KK     MR
766     KM
767     HC      2

768     KK    W44
769     KM
770     BA  .0384
771     LS           60
772     UD   .141

773     KK
774     KM
775     RK   2029  .0148   .035        TRAP     5     4

776     KK    W47
777     KM
778     BA  .0541
779     LS           60
780     UD   .148

781     KK
782     KM
783     RK   1438  .0223   .035        TRAP     5     4

784     KK    W46
785     KM
786     BA  .0418
787     LS           61
788     UD   .154

789     KK    M27
790     KM
791     BA  .0528
792     LS           60
793     UD   .132

794     KK     WX
795     KM
796     HC      6

797     KK
798     KM
799     RK   2563  .0125   .035        TRAP    40     4

800     KK    W48
801     KM
802     BA  .1179
803     LS           61
804     UD   .091

805     KK
806     KM
807     RK   2400  .0188   .035        TRAP     5     4

808     KK    W49
809     KM
810     BA  .2651
811     LS           61
812     UD   .181

813     KK     WZ
814     KM
815     HC      3

816     KK
817     KM
818     RK    800  .0125   .035        TRAP    40     4

819     KK    W50
820     KM
821     BA  .1061
822     LS           61
823     UD   .145

824     KK    WAB
825     KM
826     HC      2

827     KK
828     KM
```

```
RK     742   .0108    .035          TRAP     40      4

KK     W51
KM
BA   .0546
LS              63
UD    .172

KK     WAC
KM
HC       2

KK
KM
RK     638   .0345    .035          TRAP     40      4

KK     W52
KM
BA   .0499
LS              63
UD    .109

KK
KM
RK    1171   .0205    .035          TRAP      5      4

KK     W53
KM
BA   .0531
LS              63
UD    .156

KK     WAD
KM
HC       2

KK
KM
RK     290   .0310    .035          TRAP     10      4

KK     W54
KM
BA   .0078
LS              60
UD    .050

KK     WAE
KM
HC       3

KK
KM
RK    1925   .0052    .035          TRAP     40      4

KK     W56
KM
BA   .1831
LS              60
UD    .191

KK     WAF
KM
HC       2

KK
KM
RK    1032   .0155    .035          TRAP     40      4

KK     W62
KM
BA   .0750
LS              60
UD    .090

KK
KM
RK    2169   .0203    .035          TRAP      5      4

KK     W63
KM
BA    .047
LS              60
UD    .109

KK
KM
RK    1450   .0131    .035          TRAP      5      4

KK     W61
KM
BA    .192
LS              60
UD    .251

KK     WAH
```

```
KM
HC       3

KK
KM
RK    1241   .0153    .035          TRAP       5       4

KK     W57
KM
BA   .0732
LS              60
UD    .140

KK
KM
RK    5903   .0254    .035          TRAP       5       4

KK     W58
KM
BA   .2296
LS              60
UD    .251

KK     WAI
KM
HC       3

KK
KM
RK     232   .0086    .035          TRAP      15       4

KK     E1A
KM
BA   .1151
LS       0      60
UD    .234

KK  E1A-EA
KM
RK    4000    .022    .035          TRAP       5       4

KK     E1B
KM
BA   .1665
LS       0      60
UD    .233

KK      EA
KM
HC       2

KK   EA-EB
KM
RK    1900    .022    .035          TRAP       5       4

KK      E2
KM
BA    .104
LS       0      60
UD    .149

KK      EB
KM
HC       2

KK   POND1
KM       ROUTE FLOW THROUGH SCS POND 1
SV       0     .01     .28    1.12    2.70    5.18    6.00    6.94
SE   945.5     946     948     950     952     954   954.5     955
SQ       0       0       0       0       0    48.5   176.4   351.4
RS       1    ELEV   945.5

KK
KM
RK    1300   .0192    .035          TRAP       5       4

KK      E3
KM
BA    .090
LS              60
UD    .128

KK   MH-P2
KM       RETRIEVE DIVERSION FROM W. MERIDIAN RD DITCH
DR  DIVRT1

KK      EC
KM
HC       3

KK   POND2
KM       ROUTE FLOW THROUGH SCS POND 2
SV       0     .21    1.11    3.19    6.89    9.52   11.08   12.82   14.72   16.70
SE     920     922     924     926     928     929   929.5     930   930.5     931
SQ       0       0       0       0       0       0      25    86.5   186.2   308.4
```

```
RS      1   ELEV    920

KK
KM
RK   1700  .0141   .035      TRAP     5    4

KK    E1C
KM
BA  .0845
LS             60
UD   .200

KK 1C-ED1
KM
RK   3450   .022   .035      TRAP     5    4

KK     E4
KM
BA   .127
LS             60
UD   .200

KK    ED1
KM
HC      2

KK ED1-ED
KM
RK    450  .0178    .03      TRAP     5    4

KK     E5
KM
BA   .094
LS             60
UD   .160

KK     ED
KM
HC      3

KK
KM
RK    950  .0211   .035      TRAP    10    4

KK     E8
KM
BA  .0446
LS             60
UD   .139

KK     EE
KM
HC      2

KK
KM
RK   1500  .0127   .035      TRAP    10    4

KK    E10
KM
BA   .029
LS             60
UD   .158

KK     EF
KM
HC      2

KK    F-G
KM
RK    950  .0074   .035      TRAP    15    4

KK     E6
KM
BA   .119
LS             60
UD   .228

KK     E7
KM
BA   .031
LS             60
UD   .082

KK
KM
RK   1100  .0100   .035      TRAP     5    4

KK    EG1
KM
HC      2

KK   G1-G
KM
RK   1650  .0176   .035      TRAP     5    4
```

1055	KK	E9					
1056	KM						
1057	BA	.077					
1058	LS		60				
1059	UD	.207					
1060	KK						
1061	KM						
1062	RK	1500	.0080	.03	TRAP	5	4
1063	KK	E11					
1064	KM						
1065	BA	.045					
1066	LS		60				
1067	UD	.195					
1068	KK	E12					
1069	KM						
1070	BA	.092					
1071	LS		60				
1072	UD	.156					
1073	KK	EG					
1074	KM						
1075	HC	5					
1076	KK	E13					
1077	KM						
1078	BA	.0165					
1079	LS		60				
1080	UD	.252					
1081	KK	E14					
1082	KM						
1083	BA	.0051					
1084	LS		60				
1085	UD	.153					
1086	KK						
1087	KM						
1088	RK	279	.0108	.03	TRAP	5	4
1089	KK	EH					
1090	KM						
1091	HC	3					
1092	KK						
1093	KM						
1094	RK	2400	.0204	.035	TRAP	10	4
1095	KK	E19					
1096	KM						
1097	BA	.0406					
1098	LS		62				
1099	UD	.127					
1100	KK	EJ1					
1101	KM						
1102	HC	2					
1103	KK	J1-K					
1104	KM						
1105	RK	4013	.013	.035	TRAP	10	4
1106	KK	E15					
1107	KM						
1108	BA	.0355					
1109	LS		63				
1110	UD	.097					
1111	KK						
1112	KM						
1113	RK	951	.0189	.035	TRAP	5	4
1114	KK	E16					
1115	KM						
1116	BA	.0307					
1117	LS		63				
1118	UD	.100					
1119	KK	EI					
1120	KM						
1121	HC	2					
1122	KK						
1123	KM						
1124	RK	1334	.0105	.035	TRAP	5	4
1125	KK	E17					
1126	KM						
1127	BA	.0312					
1128	LS		63				
1129	UD	.097					

```
KK
KM
RK    1728   .0145    .035          TRAP      5       4

KK     E18
KM
BA   .0488
LS              63
UD    .180

KK     EJ2
KM
HC       3

KK
KM
RK    4221   .0123    .035          TRAP     20       4

KK     E23
KM
BA   .1683
LS              62
UD    .250

KK     E24
KM
BA    .140
LS              63
UD    .371

KK      EK
KM
HC       4

KK
KM
RK    2817   .0149    .035          TRAP     25       4

KK     E21
KM
BA   .0873
LS              60
UD    .183

KK
KM
RK    1647   .0121    .035          TRAP      5       4

KK     E20
KM
BA   .0771
LS              62
UD    .219

KK
KM
RK     569   .0141    .035          TRAP      5       4

KK     E22
KM
BA   .0677
LS              61
UD    .240

KK      EL
KM
HC       3

KK
KM
RK    2041   .0162    .035          TRAP     25       4

KK     E25
KM
BA   .1665
LS              61
UD    .176

KK      EM
KM
HC       3

KK
KM
RK     928   .0108    .035          TRAP     40       4

KK     E26
KM
BA   .0361
LS              63
UD    .096

KK      EN
KM
HC       2
```

```
1206    KK
1207    KM
1208    RK    1832   .0126   .035        TRAP    40    4

1209    KK     E27
1210    KM
1211    BA   .1236
1212    LS            63
1213    UD    .172

1214    KK     EO
1215    KM
1216    HC       2

1217    KK
1218    KM
1219    RK    1625   .0133   .035        TRAP     5    3

1220    KK     W55
1221    KM
1222    BA   .0452
1223    LS            60
1224    UD    .093

1225    KK     WAG
1226    KM
1227    HC       2

1228    KK
1229    KM
1230    RK    2025   .0109   .035        TRAP     5    4

1231    KK     W59
1232    KM
1233    BA   .0705
1234    LS            60
1235    UD    .200

1236    KK     WAJ
1237    KM
1238    HC       4

1239    KK
1240    KM
1241    RK    1450   .0124   .035        TRAP    40    4

1242    KK     E28
1243    KM
1244    BA   .0718
1245    LS            61
1246    UD    .223

1247    KK
1248    KM
1249    RK    2064   .0165   .035        TRAP    40    4

1250    KK     E29
1251    KM
1252    BA   .0465
1253    LS            61
1254    UD    .166

1255    KK     EZZ
1256    KM         COMBINE E29 & E30 AT DP ZZ
1257    HC       2

1258    KK     W60
1259    KM
1260    BA   .0711
1261    LS            60
1262    UD    .182

1263    KK      ZZ
1264    KM         COMBINE ALL AT DP ZZ
1265    HC       3
1266    ZZ
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           .           V
           .           V
  136      .
           .           .
           .           .
  139      .           .         W14
           .           .           V
           .           .           V
  144      .           .
           .           .           .
           .           .           .
  147      .           .           .         W13
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  152    WG ....................................
           V
           V
  155    G-H
           V
           V
  158
           .
           .
  161      .         W15
           .           V
           .           V
  166      .
           .           .
           .           .
  169    WH ............
           .
           .
  172      .         W16
           .           V
           .           V
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           .           .
           .           .
  180      .           .         W17
           .           .           .
           .           .           .
  185      .         WI ............
           .           V
           .           V
  188      .         I-M
           .           .
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  191      .           .         W19
           .           .           V
           .           .           V
  196      .           .
           .           .           .
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  199      .           .           .         W20
           .           .           .           .
           .           .           .           .
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           .           .           V
           .           .           V
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           .           .           .
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           .           .           .           .
           .           .           .           .
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           .           .           V
           .           .           V
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           .           .           .
           .           .           .
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           .           .           .           .
           .           .           .           .
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           .           .           V
           .           .           V
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           .           .           .
           .           .           .
  232      .           .           .         W23
           .           .           .           .
           .           .           .           .
  237      .           .           .           .         W18
           .           .           .           .           .
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  242    WM ................................................
           V
           V
  245    M-N
           .
           .
  248      .         W24
           .           .
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                  .
 377              .          W36B
                  .            .
                  .            .
 382              .            .          W35A
                  .            .            V
                  .            .            V
 387              .            .         35A-WR
                  .            .            .
                  .            .            .
 390              .            .            .          W35B
                  .            .            .            .
                  .            .            .            .
 395             WR ...........................................
                  V
                  V
 398            WR-S
                  .
                  .
 401              .          W37A
                  .            V
                  .            V
 406              .         37A-S
                  .            .
                  .            .
 409              .            .          W37B
                  .            .            .
                  .            .            .
 414             WS ..............................
                  V
                  V
 417             S-T
                  .
                  .
 420              .          W38
                  .            V
                  .            V
 425              .
                  .            .
                  .            .
 428              .            .          W39
                  .            .            .
                  .            .            .
 433              .            .            .          W40
                  .            .            .            .
                  .            .            .            .
 438             WT ...........................................
                  V
                  V
 441             T-U
                  .
                  .
 444              .          W41
                  .            .
                  .            .
 449              .            .          W42
                  .            .            V
                  .            .            V
 454              .            .           U-V
                  .            .            .
                  .            .            .
 457             WU ..............................
                  V
                  V
 460
                  .
                  .
 463              .          W43
                  .            .
                  .            .
 468             WV ............
                  V
                  V
 471             V-W
                  .
                  .
 474              .          W45
                  .            .
                  .            .
 479             WW............
                  V
                  V
 482             W-X
                  .
                  .
 485              .          M1
                  .            V
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 490              .
                  .            .
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 493              .            .          M2
                  .            .            .
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 498              .          MB ............
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            .         V
            .         V
501         .
            .         .
            .         .
504         .         .       M4
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509         .         .
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512         .         .         .         M3
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517         .       MC ......................
            .         V
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520         .
            .         .
            .         .
523         .         .       M5
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528         .         .
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531         .         .         .         M6
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536         .       MD .......................
            .         V
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539         .
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542         .         .       M7
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547         .         .
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550         .         .         .         M8
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555         .         .       ME ............
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558         .         .
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561         .         .         .         M9
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574         .         .         .           .         .       M12B
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            .         .         .           .         .         .
579         .       MF ..............................................
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582         .
            .         .
            .         .
585         .         .       M13
            .         .         V
            .         .         V
590         .         .
            .         .         .
            .         .         .
593         .         .         .         M14
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598         .         .       MG............
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601         .         .     PONDW
            .         .         .
            .         .         .
607         .       MH ............
            .         V
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610         .
            .         .
            .         .
615         .         .-------> DIVRT1
613         .     MH-P2
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618         .         .       M15
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            .         .         .
623         .       MI ...........
            .         V
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626         .
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629         .         .       M19
            .         .         .
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634         .       MJ ...........
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637         .
            .
            .         .
640         .         .       M10
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            .         .         V
645         .         .     M10-K
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648         .         .         .      M11A
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653         .         .        MK...........
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656         .         .     MK-K1
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659         .         .         .      M11B
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664         .         .         .    11B-K1
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667         .         .         .         .      M11C
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672         .         .       MK1.....................
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675         .         .     K1-ML
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678         .         .         .       M16
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683         .         .       ML ...........
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686         .         .
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689         .         .         .       M17
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694         .         .       MM ...........
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700         .         .         .       M18
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713         .       MN ................................
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716         .
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719         .         .        M21
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724         .         .
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727         .         .         .       M23
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732         .       MO ....................
            .         V
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735         .
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738         .         .        M24
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860          .         .        W54
             .         .         .
             .         .         .
865         WAE.......................
             V
             V
868
             .
             .
871          .        W56
             .         .
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876         WAF...........
             V
             V
879
             .
             .
882          .        W62
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             .         V
887          .
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890          .         .        W63
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895          .         .
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898          .         .         .         W61
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903          .        WAH.......................
             .         V
             .         V
906          .
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             .         .
909          .         .        W57
             .         .         V
             .         .         V
914          .         .
             .         .         .
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917          .         .         .         W58
             .         .         .          .
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922          .        WAI.......................
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             .         V
925          .
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928          .         .        E1A
             .         .         V
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933          .         .      E1A-EA
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944          .         .       EA-EB
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947          .         .         .         E2
             .         .         .          .
             .         .         .          .
952          .         .        EB ...........
             .         .         V
             .         .         V
955          .         .       POND1
             .         .         V
             .         .         V
961          .         .
             .         .         .
             .         .         .
964          .         .         .          E3
             .         .         .          .
             .         .         .          .
971          .         .         .          .          .<-------  DIVRT1
969          .         .         .          .        MH-P2
             .         .         .          .          .
             .         .         .          .          .
972          .         .        EC .......................
             .         .         V
             .         .         V
975          .         .       POND2
             .         .         V
             .         .         V
981          .         .
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                .           .           .
  984           .           .           .         E1C
                .           .           .           V
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                .           .           .           V
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 1000           .           .           .      ED1-ED
                .           .           .           .
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 1003           .           .           .           .          E5
                .           .           .           .           .
                .           .           .           .           .
 1008           .           .         ED ........................
                .           .           V
                .           .           V
 1011           .           .
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 1014           .           .           .          E8
                .           .           .           .
                .           .           .           .
 1019           .           .         EE ............
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                .           .           .           .
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 1030           .           .         EF ............
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 1036           .           .           .          E6
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 1041           .           .           .           .          E7
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 1086           .           .           .           .
                .           .           .           .           .
                .           .           .           .           .
 1089           .           .         EH ........................
                .           .           V
                .           .           V
 1092           .           .
                .           .           .
                .           .           .
 1095           .           .           .         E19
                .           .           .           .
                .           .           .           .
 1100           .           .         EJ1............
                .           .           V
                .           .           V
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1103           .           .        J1-K
               .           .           .
               .           .           .
1106           .           .           .         E15
               .           .           .           V
               .           .           .           V
1111           .           .           .
               .           .           .           .
               .           .           .           .
1114           .           .           .           .         E16
               .           .           .           .           .
               .           .           .           .           .
1119           .           .           .         EI ............
               .           .           .           V
               .           .           .           V
1122           .           .           .
               .           .           .           .
               .           .           .           .
1125           .           .           .           .         E17
               .           .           .           .           V
               .           .           .           .           V
1130           .           .           .           .
               .           .           .           .           .
               .           .           .           .           .
1133           .           .           .           .           .         E18
               .           .           .           .           .           .
               .           .           .           .           .           .
1138           .           .           .         EJ2........................
               .           .           .           V
               .           .           .           V
1141           .           .           .
               .           .           .           .
               .           .           .           .
1144           .           .           .           .         E23
               .           .           .           .           .
               .           .           .           .           .
1149           .           .           .           .           .         E24
               .           .           .           .           .           .
               .           .           .           .           .           .
1154           .           .         EK ....................................
               .           .           V
               .           .           V
1157           .           .
               .           .           .
               .           .           .
1160           .           .           .         E21
               .           .           .           V
               .           .           .           V
1165           .           .           .
               .           .           .           .
               .           .           .           .
1168           .           .           .           .         E20
               .           .           .           .           V
               .           .           .           .           V
1173           .           .           .           .
               .           .           .           .           .
               .           .           .           .           .
1176           .           .           .           .           .         E22
               .           .           .           .           .           .
               .           .           .           .           .           .
1181           .           .           .         EL ........................
               .           .           .           V
               .           .           .           V
1184           .           .           .
               .           .           .           .
               .           .           .           .
1187           .           .           .           .         E25
               .           .           .           .           .
               .           .           .           .           .
1192           .           .         EM ........................
               .           .           V
               .           .           V
1195           .           .
               .           .           .
               .           .           .
1198           .           .           .         E26
               .           .           .           .
               .           .           .           .
1203           .           .         EN ............
               .           .           V
               .           .           V
1206           .           .
               .           .           .
               .           .           .
1209           .           .           .         E27
               .           .           .           .
               .           .           .           .
1214           .           .         EO ............
               .           .           V
               .           .           V
1217           .           .
               .           .           .
               .           .           .
1220           .           .           .         W55
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                 .         .         .         .
1225             .         .        WAG.........
                 .         .         V
                 .         .         V
1228             .         .
                 .         .         .
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1231             .         .         .        W59
                 .         .         .         .
                 .         .         .         .
1236            WAJ.............................
                 V
                 V
1239

                 .
                 .
1242             .        E28
                 .         V
                 .         V
1247             .
                 .         .
                 .         .
1250             .         .        E29
                 .         .         .
                 .         .         .
1255             .        EZZ.........
                 .         .
                 .         .
1258             .         .        W60
                 .         .         .
                 .         .         .
1263            ZZ....................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
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1***************************************                                        *************************************
*                                       *                                       *                                   *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                       *   U.S. ARMY CORPS OF ENGINEERS    *
*            JUN  1998                  *                                       *   HYDROLOGIC ENGINEERING CENTER   *
*           VERSION 4.1                 *                                       *       609 SECOND STREET           *
*                                       *                                       *     DAVIS, CALIFORNIA 95616       *
* RUN DATE   28SEP07  TIME  11:57:06    *                                       *       (916) 756-1104              *
*                                       *                                       *                                   *
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                    FALCON BASIN 5-YR/ 24-HOUR FLOOD/ EXISTING CONDITIONS
                        UPPER EAST TRIBUTARY (WOODMEN HILLS) BASED ON CLOMR APPROVED 2/2/99
                        INCLUDING 2 EXISTING SCS STOCK PONDS, WEST WOODMEN HILLS POND
                        NOTE: M1-M4 (PAINT BRUSH HILLS) MODELED AS HISTORIC TO ACCOUNT FOR
                              DETENTION POND AT MC
                        NOTE: NO CULVERT AT STAPLETON & MERIDIAN, TEMP CULVERTS AT MERIDIAN
                              DOWNSTREAM OF WOODMEN HILLS DRIVE (DIVERSION)

    9 IO        OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

      IT        HYDROGRAPH TIME DATA
                       NMIN          5  MINUTES IN COMPUTATION INTERVAL
                      IDATE    14JUL99  STARTING DATE
                      ITIME       0800  STARTING TIME
                         NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE    15JUL99  ENDING DATE
                     NDTIME       0855  ENDING TIME
                      ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .08 HOURS
                     TOTAL TIME BASE   24.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA           SQUARE MILES
             PRECIPITATION DEPTH     INCHES
             LENGTH, ELEVATION       FEET
             FLOW                    CUBIC FEET PER SECOND
             STORAGE VOLUME          ACRE-FEET
             SURFACE AREA            ACRES
             TEMPERATURE             DEGREES FAHRENHEIT
1
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

+	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	W1	5.	5.83	1.	0.	0.	.05		
+	ROUTED TO		4.	5.92	1.	0.	0.	.05		
+	HYDROGRAPH AT	W2	2.	5.83	0.	0.	0.	.03		
+	2 COMBINED AT	WA	6.	5.92	1.	0.	0.	.08		
+	ROUTED TO		6.	5.92	1.	0.	0.	.08		
+	HYDROGRAPH AT	W3	5.	5.83	1.	0.	0.	.05		
+	2 COMBINED AT	WB	11.	5.92	2.	1.	1.	.13		
+	ROUTED TO		10.	5.92	2.	1.	1.	.13		
+	HYDROGRAPH AT	W4	1.	5.75	0.	0.	0.	.01		
+	ROUTED TO		1.	5.83	0.	0.	0.	.01		
+	HYDROGRAPH AT	W5	2.	5.75	0.	0.	0.	.02		
+	3 COMBINED AT	WC	11.	5.92	2.	1.	1.	.15		
	ROUTED TO									

+			11.	5.92	2.	1.	1.	.15
+	HYDROGRAPH AT	W6	5.	5.83	1.	0.	0.	.05
+	ROUTED TO		5.	5.83	1.	0.	0.	.05
+	HYDROGRAPH AT	W7	2.	5.75	0.	0.	0.	.02
+	ROUTED TO		2.	5.83	0.	0.	0.	.02
+	2 COMBINED AT	WD	7.	5.83	1.	0.	0.	.07
+	ROUTED TO	D-E	6.	5.83	1.	0.	0.	.07
+	HYDROGRAPH AT	W8	3.	5.75	0.	0.	0.	.03
+	ROUTED TO		3.	5.83	0.	0.	0.	.03
+	HYDROGRAPH AT	W9	5.	5.83	1.	0.	0.	.04
+	3 COMBINED AT	WE	14.	5.83	2.	1.	1.	.14
+	ROUTED TO	E-F	13.	5.92	2.	1.	1.	.14
+	HYDROGRAPH AT	W10	5.	5.83	1.	0.	0.	.04
+	ROUTED TO		5.	5.83	1.	0.	0.	.04
+	HYDROGRAPH AT	W11	3.	5.75	0.	0.	0.	.03
+	4 COMBINED AT	WF	29.	5.92	5.	2.	2.	.36
+	ROUTED TO	F-G	28.	6.00	5.	2.	2.	.36
+	HYDROGRAPH AT	W12	4.	5.83	1.	0.	0.	.04
+	ROUTED TO		4.	5.92	1.	0.	0.	.04
+	HYDROGRAPH AT	W14	5.	5.83	1.	0.	0.	.05
+	ROUTED TO		5.	5.92	1.	0.	0.	.05
+	HYDROGRAPH AT	W13	10.	5.92	2.	1.	1.	.11
+	4 COMBINED AT	WG	43.	6.00	8.	3.	3.	.56
+	ROUTED TO	G-H	41.	6.08	8.	3.	3.	.56
+	ROUTED TO		39.	6.17	8.	3.	3.	.56
+	HYDROGRAPH AT	W15	10.	5.83	1.	1.	1.	.09
+	ROUTED TO		9.	5.92	1.	1.	1.	.09
+	2 COMBINED AT	WH	43.	6.17	9.	4.	4.	.65
+	HYDROGRAPH AT	W16	4.	5.83	0.	0.	0.	.03
+	ROUTED TO		3.	5.92	0.	0.	0.	.03
+	HYDROGRAPH AT	W17	2.	5.83	0.	0.	0.	.02
+	2 COMBINED AT	WI	5.	5.83	1.	0.	0.	.05

	ROUTED TO							
+		I-M	5.	6.00	1.	0.	0.	.05
	HYDROGRAPH AT							
+		W19	5.	5.75	1.	0.	0.	.04
	ROUTED TO							
+			5.	5.83	1.	0.	0.	.04
	HYDROGRAPH AT							
+		W20	5.	5.75	0.	0.	0.	.03
	2 COMBINED AT							
+		WJ	9.	5.83	1.	0.	0.	.07
	ROUTED TO							
+			9.	6.00	1.	0.	0.	.07
	HYDROGRAPH AT							
+		W21	11.	5.83	2.	1.	1.	.13
	2 COMBINED AT							
+		WK	18.	5.92	3.	1.	1.	.21
	ROUTED TO							
+			16.	5.92	3.	1.	1.	.21
	HYDROGRAPH AT							
+		W22	2.	5.75	0.	0.	0.	.01
	2 COMBINED AT							
+		WL	17.	5.92	3.	1.	1.	.22
	ROUTED TO							
+			17.	6.00	3.	1.	1.	.22
	HYDROGRAPH AT							
+		W23	2.	5.83	0.	0.	0.	.02
	HYDROGRAPH AT							
+		W18	9.	5.92	2.	1.	1.	.13
	5 COMBINED AT							
+		WM	66.	6.08	15.	6.	6.	1.06
	ROUTED TO							
+		M-N	65.	6.17	15.	6.	6.	1.06
	HYDROGRAPH AT							
+		W24	4.	5.83	1.	0.	0.	.04
	HYDROGRAPH AT							
+		W25	8.	5.92	1.	1.	1.	.10
	3 COMBINED AT							
+		WN	70.	6.17	17.	7.	7.	1.20
	ROUTED TO							
+		N-P	67.	6.25	16.	7.	7.	1.20
	HYDROGRAPH AT							
+		W28	7.	5.83	1.	0.	0.	.04
	ROUTED TO							
+			6.	5.92	1.	0.	0.	.04
	HYDROGRAPH AT							
+		W30	9.	5.83	1.	0.	0.	.05
	ROUTED TO							
+			8.	5.92	1.	0.	0.	.05
	HYDROGRAPH AT							
+		W29	6.	5.83	1.	0.	0.	.04
	HYDROGRAPH AT							
+		W31	3.	5.75	0.	0.	0.	.01
	4 COMBINED AT							
+		WO	20.	5.92	3.	1.	1.	.14
	ROUTED TO							
+		O-P	20.	6.00	3.	1.	1.	.14
	HYDROGRAPH AT							
+		W26	7.	5.75	1.	0.	0.	.03
	ROUTED TO							
+			6.	6.08	1.	0.	0.	.03
	HYDROGRAPH AT							
+		W27	10.	6.00	2.	1.	1.	.16
	HYDROGRAPH AT							
+		W32	7.	5.92	1.	0.	0.	.09

+	5 COMBINED AT	WP	88.	6.17	23.	10.	9.	1.63
+	ROUTED TO	P-Q	87.	6.25	23.	10.	9.	1.63
+	HYDROGRAPH AT	W33A	9.	5.92	2.	1.	1.	.13
+	2 COMBINED AT	WP1	91.	6.25	24.	10.	10.	1.75
+	ROUTED TO	P1-Q	90.	6.33	24.	10.	10.	1.75
+	HYDROGRAPH AT	W33B	9.	5.92	2.	1.	1.	.14
+	HYDROGRAPH AT	W34A	9.	5.92	2.	1.	1.	.13
+	ROUTED TO	34A-P2	9.	6.08	2.	1.	1.	.13
+	HYDROGRAPH AT	W34B	11.	5.92	2.	1.	1.	.18
+	2 COMBINED AT	WP2	18.	6.00	4.	2.	2.	.30
+	ROUTED TO	P2-Q	18.	6.17	4.	2.	2.	.30
+	HYDROGRAPH AT	W34C	10.	6.00	2.	1.	1.	.16
+	4 COMBINED AT	WQ	114.	6.25	32.	13.	13.	2.36
+	ROUTED TO	Q-Q1	113.	6.33	32.	13.	13.	2.36
+	HYDROGRAPH AT	W36A	9.	5.92	2.	1.	1.	.14
+	2 COMBINED AT	WQ1	118.	6.33	33.	14.	14.	2.50
+	ROUTED TO	Q1-R	117.	6.42	33.	14.	14.	2.50
+	HYDROGRAPH AT	W36B	10.	6.00	2.	1.	1.	.19
+	HYDROGRAPH AT	W35A	7.	5.92	1.	1.	1.	.10
+	ROUTED TO	35A-WR	6.	6.25	1.	1.	1.	.10
+	HYDROGRAPH AT	W35B	9.	6.00	2.	1.	1.	.15
+	4 COMBINED AT	WR	131.	6.42	38.	17.	16.	2.94
+	ROUTED TO	WR-S	130.	6.50	38.	16.	16.	2.94
+	HYDROGRAPH AT	W37A	8.	5.92	1.	1.	1.	.11
+	ROUTED TO	37A-S	8.	6.00	1.	1.	1.	.11
+	HYDROGRAPH AT	W37B	13.	5.92	2.	1.	1.	.16
+	3 COMBINED AT	WS	137.	6.50	42.	18.	17.	3.21
+	ROUTED TO	S-T	134.	6.67	42.	18.	17.	3.21
+	HYDROGRAPH AT	W38	10.	5.92	2.	1.	1.	.09
+	ROUTED TO		9.	6.08	2.	1.	1.	.09
+	HYDROGRAPH AT	W39	11.	6.00	2.	1.	1.	.18
	HYDROGRAPH AT							

+		W40	7.	5.83	1.	1.	1.	.10
+	4 COMBINED AT	WT	143.	6.58	46.	20.	19.	3.59
+	ROUTED TO	T-U	142.	6.67	46.	20.	19.	3.59
+	HYDROGRAPH AT	W41	6.	5.83	1.	0.	0.	.06
+	HYDROGRAPH AT	W42	50.	5.75	5.	2.	2.	.06
+	ROUTED TO	U-V	49.	5.83	5.	2.	2.	.06
+	3 COMBINED AT	WU	148.	6.67	51.	22.	21.	3.70
+	ROUTED TO		146.	6.75	51.	22.	21.	3.70
+	HYDROGRAPH AT	W43	13.	5.83	2.	1.	1.	.15
+	2 COMBINED AT	WV	149.	6.75	53.	23.	22.	3.85
+	ROUTED TO	V-W	148.	6.75	53.	23.	22.	3.85
+	HYDROGRAPH AT	W45	17.	5.92	3.	1.	1.	.19
+	2 COMBINED AT	WW	152.	6.75	56.	24.	23.	4.04
+	ROUTED TO	W-X	149.	6.83	55.	24.	23.	4.04
+	HYDROGRAPH AT	M1	7.	5.83	1.	0.	0.	.07
+	ROUTED TO		6.	5.83	1.	0.	0.	.07
+	HYDROGRAPH AT	M2	3.	5.83	0.	0.	0.	.03
+	2 COMBINED AT	MB	9.	5.83	1.	1.	0.	.09
+	ROUTED TO		8.	5.92	1.	1.	0.	.09
+	HYDROGRAPH AT	M4	3.	5.83	0.	0.	0.	.03
+	ROUTED TO		3.	5.83	0.	0.	0.	.03
+	HYDROGRAPH AT	M3	2.	5.75	0.	0.	0.	.01
+	3 COMBINED AT	MC	11.	5.83	2.	1.	1.	.14
+	ROUTED TO		11.	6.00	2.	1.	1.	.14
+	HYDROGRAPH AT	M5	6.	5.75	1.	0.	0.	.02
+	ROUTED TO		6.	5.92	1.	0.	0.	.02
+	HYDROGRAPH AT	M6	10.	5.92	2.	1.	1.	.06
+	3 COMBINED AT	MD	26.	5.92	4.	2.	2.	.22
+	ROUTED TO		25.	6.08	4.	2.	2.	.22
+	HYDROGRAPH AT	M7	16.	5.83	2.	1.	1.	.05
+	ROUTED TO		15.	5.92	2.	1.	1.	.05
+	HYDROGRAPH AT	M8	4.	5.83	1.	0.	0.	.04

+	2 COMBINED AT	ME	18.	5.83	2.	1.	1.	.09		
+	ROUTED TO		18.	6.00	2.	1.	1.	.09		
+	HYDROGRAPH AT	M9	7.	5.75	1.	0.	0.	.02		
+	ROUTED TO		6.	5.92	1.	0.	0.	.02		
+	HYDROGRAPH AT	M12A	5.	5.83	1.	0.	0.	.07		
+	HYDROGRAPH AT	M12B	10.	5.92	2.	1.	1.	.15		
+	5 COMBINED AT	MF	59.	6.00	10.	4.	4.	.54		
+	ROUTED TO		57.	6.08	10.	4.	4.	.54		
+	HYDROGRAPH AT	M13	10.	5.83	1.	1.	0.	.06		
+	ROUTED TO		9.	6.00	1.	1.	0.	.06		
+	HYDROGRAPH AT	M14	22.	5.92	4.	1.	1.	.16		
+	2 COMBINED AT	MG	30.	5.92	5.	2.	2.	.22		
+	ROUTED TO	PONDW	9.	6.50	5.	2.	2.	.22		
+									969.11	6.50
+	2 COMBINED AT	MH	64.	6.08	14.	6.	5.	.77		
+	ROUTED TO		62.	6.17	14.	6.	5.	.77		
+	DIVERSION TO	DIVRT1	61.	6.17	14.	6.	5.	.77		
+	HYDROGRAPH AT	MH-P2	1.	6.17	0.	0.	0.	.77		
+	HYDROGRAPH AT	M15	18.	5.92	3.	1.	1.	.12		
+	2 COMBINED AT	MI	18.	5.92	3.	1.	1.	.89		
+	ROUTED TO		17.	6.00	3.	1.	1.	.89		
+	HYDROGRAPH AT	M19	5.	5.83	1.	0.	0.	.05		
+	2 COMBINED AT	MJ	20.	6.00	3.	1.	1.	.94		
+	ROUTED TO		20.	6.08	3.	1.	1.	.94		
+	HYDROGRAPH AT	M10	8.	5.83	1.	0.	0.	.06		
+	ROUTED TO	M10-K	8.	5.92	1.	0.	0.	.06		
+	HYDROGRAPH AT	M11A	8.	5.92	2.	1.	1.	.11		
+	2 COMBINED AT	MK	16.	5.92	3.	1.	1.	.16		
+	ROUTED TO	MK-K1	16.	6.00	3.	1.	1.	.16		
+	HYDROGRAPH AT	M11B	7.	5.83	1.	0.	0.	.09		
+	ROUTED TO	11B-K1	7.	6.00	1.	0.	0.	.09		
+	HYDROGRAPH AT	M11C	7.	5.83	1.	1.	0.	.09		
	3 COMBINED AT									

+		MK1	27.	6.00	5.	2.	2.	.35
+	ROUTED TO	K1-ML	26.	6.00	5.	2.	2.	.35
+	HYDROGRAPH AT	M16	4.	5.83	1.	0.	0.	.04
+	2 COMBINED AT	ML	28.	6.00	5.	2.	2.	.39
+	ROUTED TO		28.	6.08	5.	2.	2.	.39
+	HYDROGRAPH AT	M17	9.	5.83	1.	0.	0.	.08
+	2 COMBINED AT	MM	31.	6.08	7.	3.	3.	.46
+	ROUTED TO		29.	6.17	7.	3.	3.	.46
+	HYDROGRAPH AT	M18	7.	5.83	1.	0.	0.	.06
+	ROUTED TO		6.	6.00	1.	0.	0.	.06
+	HYDROGRAPH AT	M20	11.	5.92	2.	1.	1.	.13
+	4 COMBINED AT	MN	57.	6.17	13.	5.	5.	1.60
+	ROUTED TO		55.	6.25	13.	5.	5.	1.60
+	HYDROGRAPH AT	M21	3.	5.83	0.	0.	0.	.02
+	ROUTED TO		3.	5.92	0.	0.	0.	.02
+	HYDROGRAPH AT	M23	4.	5.83	1.	0.	0.	.05
+	3 COMBINED AT	MO	57.	6.25	14.	6.	5.	1.67
+	ROUTED TO		56.	6.25	14.	6.	5.	1.67
+	HYDROGRAPH AT	M24	7.	5.83	1.	0.	0.	.08
+	2 COMBINED AT	MP	58.	6.25	15.	6.	6.	1.75
+	ROUTED TO		57.	6.25	15.	6.	6.	1.75
+	HYDROGRAPH AT	M25	1.	5.83	0.	0.	0.	.01
+	2 COMBINED AT	MQ	58.	6.25	15.	6.	6.	1.76
+	ROUTED TO		57.	6.42	15.	6.	6.	1.76
+	HYDROGRAPH AT	M26	26.	5.92	4.	2.	2.	.18
+	2 COMBINED AT	MR	66.	6.42	18.	8.	7.	1.94
+	HYDROGRAPH AT	W44	3.	5.83	1.	0.	0.	.04
+	ROUTED TO		3.	6.00	1.	0.	0.	.04
+	HYDROGRAPH AT	W47	4.	5.83	1.	0.	0.	.05
+	ROUTED TO		4.	5.92	1.	0.	0.	.05
+	HYDROGRAPH AT	W46	4.	5.83	1.	0.	0.	.04
+	HYDROGRAPH AT	M27	5.	5.83	1.	0.	0.	.05

+	6 COMBINED AT	WX	192.	6.75	76.	33.	31.	6.17
+	ROUTED TO		191.	6.83	76.	32.	31.	6.17
+	HYDROGRAPH AT	W48	14.	5.83	2.	1.	1.	.12
+	ROUTED TO		14.	5.92	2.	1.	1.	.12
+	HYDROGRAPH AT	W49	24.	5.92	4.	2.	2.	.27
+	3 COMBINED AT	WZ	199.	6.83	81.	35.	34.	6.55
+	ROUTED TO		196.	6.92	81.	35.	34.	6.55
+	HYDROGRAPH AT	W50	11.	5.83	2.	1.	1.	.11
+	2 COMBINED AT	WAB	198.	6.92	83.	35.	34.	6.66
+	ROUTED TO		198.	6.92	83.	35.	34.	6.66
+	HYDROGRAPH AT	W51	7.	5.83	1.	0.	0.	.05
+	2 COMBINED AT	WAC	199.	6.92	83.	36.	34.	6.71
+	ROUTED TO		198.	6.92	83.	36.	34.	6.71
+	HYDROGRAPH AT	W52	9.	5.83	1.	0.	0.	.05
+	ROUTED TO		8.	5.83	1.	0.	0.	.05
+	HYDROGRAPH AT	W53	8.	5.83	1.	0.	0.	.05
+	2 COMBINED AT	WAD	16.	5.83	2.	1.	1.	.10
+	ROUTED TO		14.	5.83	2.	1.	1.	.10
+	HYDROGRAPH AT	W54	1.	5.75	0.	0.	0.	.01
+	3 COMBINED AT	WAE	200.	6.92	85.	37.	35.	6.82
+	ROUTED TO		199.	7.00	85.	36.	35.	6.82
+	HYDROGRAPH AT	W56	13.	5.92	2.	1.	1.	.18
+	2 COMBINED AT	WAF	202.	7.00	87.	37.	36.	7.01
+	ROUTED TO		200.	7.00	87.	37.	36.	7.01
+	HYDROGRAPH AT	W62	7.	5.83	1.	0.	0.	.08
+	ROUTED TO		7.	5.92	1.	0.	0.	.08
+	HYDROGRAPH AT	W63	5.	5.83	1.	0.	0.	.05
+	ROUTED TO		4.	5.92	1.	0.	0.	.05
+	HYDROGRAPH AT	W61	11.	6.00	3.	1.	1.	.19
+	3 COMBINED AT	WAH	22.	5.92	4.	2.	2.	.31
+	ROUTED TO		21.	6.00	4.	2.	2.	.31
+	HYDROGRAPH AT	W57	6.	5.83	1.	0.	0.	.07

+	ROUTED TO		6.	6.25	1.	0.	0.	.07		
+	HYDROGRAPH AT	W58	13.	6.00	3.	1.	1.	.23		
+	3 COMBINED AT	WAI	35.	6.00	8.	3.	3.	.62		
+	ROUTED TO		34.	6.00	8.	3.	3.	.62		
+	HYDROGRAPH AT	E1A	7.	5.92	2.	1.	1.	.12		
+	ROUTED TO	E1A-EA	7.	6.17	1.	1.	1.	.12		
+	HYDROGRAPH AT	E1B	10.	5.92	2.	1.	1.	.17		
+	2 COMBINED AT	EA	13.	6.17	4.	2.	1.	.28		
+	ROUTED TO	EA-EB	13.	6.25	4.	2.	1.	.28		
+	HYDROGRAPH AT	E2	9.	5.83	1.	1.	1.	.10		
+	2 COMBINED AT	EB	16.	6.25	5.	2.	2.	.39		
+	ROUTED TO	POND1	2.	14.92	2.	1.	1.	.39		
+									952.08	14.92
+	ROUTED TO		2.	15.00	2.	1.	1.	.39		
+	HYDROGRAPH AT	E3	8.	5.83	1.	0.	0.	.09		
+	HYDROGRAPH AT	MH-P2	61.	6.17	14.	6.	5.	.00		
+	3 COMBINED AT	EC	64.	6.17	15.	7.	7.	.48		
+	ROUTED TO	POND2	6.	19.83	6.	2.	2.	.48		
+									929.13	19.83
+	ROUTED TO		6.	20.00	6.	2.	2.	.48		
+	HYDROGRAPH AT	E1C	6.	5.92	1.	0.	0.	.08		
+	ROUTED TO	1C-ED1	5.	6.17	1.	0.	0.	.08		
+	HYDROGRAPH AT	E4	9.	5.92	2.	1.	1.	.13		
+	2 COMBINED AT	ED1	10.	6.17	3.	1.	1.	.21		
+	ROUTED TO	ED1-ED	10.	6.17	3.	1.	1.	.21		
+	HYDROGRAPH AT	E5	7.	5.83	1.	1.	0.	.09		
+	3 COMBINED AT	ED	15.	5.92	7.	4.	3.	.78		
+	ROUTED TO		14.	5.92	7.	4.	3.	.78		
+	HYDROGRAPH AT	E8	4.	5.83	1.	0.	0.	.04		
+	2 COMBINED AT	EE	18.	5.92	7.	4.	4.	.83		
+	ROUTED TO		17.	6.00	7.	4.	4.	.83		
+	HYDROGRAPH AT	E10	2.	5.83	0.	0.	0.	.03		
+	2 COMBINED AT	EF	19.	6.00	7.	4.	4.	.85		

+	ROUTED TO	F-G	18.	6.08	7.	4.	4.	.85
+	HYDROGRAPH AT	E6	7.	5.92	2.	1.	1.	.12
+	HYDROGRAPH AT	E7	3.	5.75	0.	0.	0.	.03
+	ROUTED TO		3.	5.92	0.	0.	0.	.03
+	2 COMBINED AT	EG1	10.	5.92	2.	1.	1.	.15
+	ROUTED TO	G1-G	10.	6.00	2.	1.	1.	.15
+	HYDROGRAPH AT	E9	5.	5.92	1.	0.	0.	.08
+	ROUTED TO		5.	6.00	1.	0.	0.	.08
+	HYDROGRAPH AT	E11	3.	5.92	1.	0.	0.	.05
+	HYDROGRAPH AT	E12	7.	5.83	1.	1.	0.	.09
+	5 COMBINED AT	EG	37.	6.08	10.	6.	6.	1.22
+	HYDROGRAPH AT	E13	1.	6.00	0.	0.	0.	.02
+	HYDROGRAPH AT	E14	0.	5.83	0.	0.	0.	.01
+	ROUTED TO		0.	5.92	0.	0.	0.	.01
+	3 COMBINED AT	EH	39.	6.00	10.	6.	6.	1.24
+	ROUTED TO		38.	6.17	10.	6.	6.	1.24
+	HYDROGRAPH AT	E19	6.	5.83	1.	0.	0.	.04
+	2 COMBINED AT	EJ1	39.	6.17	10.	6.	6.	1.28
+	ROUTED TO	J1-K	39.	6.25	10.	6.	6.	1.28
+	HYDROGRAPH AT	E15	6.	5.83	1.	0.	0.	.04
+	ROUTED TO		6.	5.83	1.	0.	0.	.04
+	HYDROGRAPH AT	E16	5.	5.83	1.	0.	0.	.03
+	2 COMBINED AT	EI	11.	5.83	1.	0.	0.	.07
+	ROUTED TO		10.	5.92	1.	0.	0.	.07
+	HYDROGRAPH AT	E17	5.	5.83	1.	0.	0.	.03
+	ROUTED TO		5.	5.92	1.	0.	0.	.03
+	HYDROGRAPH AT	E18	6.	5.92	1.	0.	0.	.05
+	3 COMBINED AT	EJ2	22.	5.92	3.	1.	1.	.15
+	ROUTED TO		19.	6.25	3.	1.	1.	.15
+	HYDROGRAPH AT	E23	15.	5.92	3.	1.	1.	.17
+	HYDROGRAPH AT	E24	11.	6.08	3.	1.	1.	.14
	4 COMBINED AT							

+		EK	76.	6.25	18.	10.	9.	1.74
+	ROUTED TO		69.	6.42	18.	9.	9.	1.74
+	HYDROGRAPH AT	E21	6.	5.92	1.	0.	0.	.09
+	ROUTED TO		6.	6.00	1.	0.	0.	.09
+	HYDROGRAPH AT	E20	8.	5.92	1.	1.	1.	.08
+	ROUTED TO		7.	6.00	1.	1.	1.	.08
+	HYDROGRAPH AT	E22	5.	5.92	1.	0.	0.	.07
+	3 COMBINED AT	EL	18.	6.00	3.	1.	1.	.23
+	ROUTED TO		17.	6.08	3.	1.	1.	.23
+	HYDROGRAPH AT	E25	15.	5.92	3.	1.	1.	.17
+	3 COMBINED AT	EM	85.	6.33	24.	12.	11.	2.13
+	ROUTED TO		84.	6.42	24.	12.	11.	2.13
+	HYDROGRAPH AT	E26	6.	5.83	1.	0.	0.	.04
+	2 COMBINED AT	EN	85.	6.42	25.	12.	12.	2.17
+	ROUTED TO		84.	6.50	24.	12.	12.	2.17
+	HYDROGRAPH AT	E27	17.	5.83	2.	1.	1.	.12
+	2 COMBINED AT	EO	87.	6.50	26.	13.	13.	2.29
+	ROUTED TO		84.	6.58	26.	13.	12.	2.29
+	HYDROGRAPH AT	W55	5.	5.83	1.	0.	0.	.05
+	2 COMBINED AT	WAG	85.	6.58	27.	13.	13.	2.34
+	ROUTED TO		84.	6.58	27.	13.	13.	2.34
+	HYDROGRAPH AT	W59	5.	5.92	1.	0.	0.	.07
+	4 COMBINED AT	WAJ	269.	7.00	122.	54.	52.	10.03
+	ROUTED TO		267.	7.00	122.	54.	52.	10.03
+	HYDROGRAPH AT	E28	6.	5.92	1.	0.	0.	.07
+	ROUTED TO		6.	6.17	1.	0.	0.	.07
+	HYDROGRAPH AT	E29	4.	5.83	1.	0.	0.	.05
+	2 COMBINED AT	EZZ	7.	6.17	2.	1.	1.	.12
+	HYDROGRAPH AT	W60	5.	5.92	1.	0.	0.	.07
+	3 COMBINED AT	ZZ	271.	7.00	125.	55.	53.	10.22

*** NORMAL END OF HEC-1 ***

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1***************************************                                     ***************************************
*                                     *                                     *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1) *                                     *   U.S. ARMY CORPS OF ENGINEERS      *
*             JUN   1998              *                                     *   HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1               *                                     *         609 SECOND STREET           *
*                                     *                                     *     DAVIS, CALIFORNIA 95616         *
*  RUN DATE   28SEP07  TIME  11:49:21 *                                     *         (916) 756-1104              *
*                                     *                                     *                                     *
***************************************                                     ***************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
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ID    FALCON BASIN 100-YR/ 24-HOUR FLOOD/ EXISTING CONDITIONS
ID         UPPER EAST TRIBUTARY (WOODMEN HILLS) BASED ON CLOMR APPROVED 2/2/99
ID         INCLUDING 2 EXISTING SCS STOCK PONDS, WEST WOODMEN HILLS POND
ID         NOTE: M1-M4 (PAINT BRUSH HILLS) MODELED AS HISTORIC TO ACCOUNT FOR
ID               DETENTION POND AT MC
ID         NOTE: NO CULVERT AT STAPLETON & MERIDIAN, TEMP CULVERTS AT MERIDIAN
ID               DOWNSTREAM OF WOODMEN HILLS DRIVE (DIVERSION)
*DIAGRAM
IT        5 14JUL99     800      300
IO        5

KK      W1
KM
BA    .0479
PB      4.4
IN       15
PC    .0005   .0015   .0030   .0045   .0060   .0080   .0100   .0120   .0143   .0165
PC    .0188   .0210   .0233   .0255   .0278   .0320   .0390   .0460   .0530   .0600
PC    .0750   .1000   .4000   .7000   .7250   .7500   .7650   .7800   .7900   .8000
PC    .8100   .8200   .8250   .8300   .8350   .8400   .8450   .8500   .8550   .8600
PC    .8638   .8675   .8713   .8750   .8788   .8825   .8863   .8900   .8938   .8975
PC    .9013   .9050   .9083   .9115   .9148   .9180   .9210   .9240   .9270   .9300
PC    .9325   .9350   .9375   .9400   .9425   .9450   .9475   .9500   .9525   .9550
PC    .9575   .9600   .9625   .9650   .9675   .9700   .9725   .9750   .9775   .9800
PC    .9813   .9825   .9838   .9850   .9863   .9875   .9888   .9900   .9913   .9925
PC    .9938   .9950   .9963   .9975   .9988   1.000
LS               60
UD     .097

KK
KM
RK     1519   .0263    .035            TRAP       5       4

KK      W2
KM
BA    .0278
LS               60
UD     .160

KK      WA
KM
HC        2

KK
KM
RK      464   .0151    .035            TRAP       5       4

KK      W3
KM
BA    .0498
LS               61
UD     .139

KK      WB
KM
HC        2

KK
KM
RK      823   .0279    .035            TRAP       5       4                54

KK      W4
KM
BA    .0054
LS               62
UD     .044

KK
KM
RK     1078   .0482    .035            TRAP       5       4

KK      W5
KM
BA    .0159
LS               60
UD     .075

KK      WC
KM
HC        3

KK
KM
RK      557   .0449    .035            TRAP      10       4

KK      W6
KM
BA    .0486
LS               60
UD     .085

KK
KM
RK      592   .0372    .035            TRAP       5       4
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 79        KK     W7
 80        KM
 81        BA  .0217
 82        LS            60
 83        UD   .074

 84        KK
 85        KM
 86        RK    464  .1466   .035          TRAP      5      4

 87        KK     WD
 88        KM
 89        HC      2

 90        KK    D-E
 91        KM
 92        RK   1044  .0479   .035          TRAP      5      4

 93        KK     W8
 94        KM
 95        BA  .0286
 96        LS            60
 97        UD   .069

 98        KK
 99        KM
100        RK   1449  .0504   .035          TRAP      5      4

101        KK     W9
102        KM
103        BA  .0402
104        LS            61
105        UD   .097

106        KK     WE
107        KM
108        HC      3

109        KK    E-F
110        KM
111        RK    789  .0038   .035          TRAP      5      4

112        KK    W10
113        KM
114        BA  .0431
115        LS            61
116        UD   .096

117        KK
118        KM
119        RK    824  .0388   .035          TRAP      5      4

120        KK    W11
121        KM
122        BA  .0314
123        LS            60
124        UD   .077

125        KK     WF
126        KM
127        HC      4

128        KK    F-G
129        KM
130        RK   2319  .0211   .035          TRAP     10      4

131        KK    W12
132        KM
133        BA  .0398
134        LS            60
135        UD   .095

136        KK
137        KM
138        RK   2478  .0307   .035          TRAP      5      4

139        KK    W14
140        KM
141        BA  .0473
142        LS            61
143        UD   .135

144        KK
145        KM
146        RK     81 0.0001   .035          TRAP      5      4

147        KK    W13
148        KM
149        BA  .1123
150        LS            61
151        UD   .182

152        KK     WG
153        KM
154        HC      4
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155	KK	G-H					
156	KM						
157	RK	2632	.0217	.035	TRAP	15	4
158	KK						
159	KM						
160	RK	2447	.0372	.035	TRAP	5	4
161	KK	W15					
162	KM						
163	BA	.0881					
164	LS		61				
165	UD	.141					
166	KK						
167	KM						
168	RK	1763	.0289	.035	TRAP	5	4
169	KK	WH					
170	KM						
171	HC	2					
172	KK	W16					
173	KM						
174	BA	.0292					
175	LS		61				
176	UD	.092					
177	KK						
178	KM						
179	RK	1345	.0260	.035	TRAP	5	4
180	KK	W17					
181	KM						
182	BA	.0184					
183	LS		60				
184	UD	.085					
185	KK	WI					
186	KM						
187	HC	2					
188	KK	I-M					
189	KM						
190	RK	2650	.0370	.035	TRAP	15	4
191	KK	W19					
192	KM						
193	BA	.0428					
194	LS		61				
195	UD	.083					
196	KK						
197	KM						
198	RK	881	.0329	.035	TRAP	5	4
199	KK	W20					
200	KM						
201	BA	.0315					
202	LS		61				
203	UD	.071					
204	KK	WJ					
205	KM						
206	HC	2					
207	KK						
208	KM						
209	RK	3061	.0235	.035	TRAP	5	4
210	KK	W21					
211	KM						
212	BA	.1347					
213	LS		60				
214	UD	.156					
215	KK	WK					
216	KM						
217	HC	2					
218	KK						
219	KM						
220	RK	487	.0246	.035	TRAP	5	4
221	KK	W22					
222	KM						
223	BA	.0086					
224	LS		63				
225	UD	.055					
226	KK	WL					
227	KM						
228	HC	2					

```
KK
KM
RK    1786   .0297    .035          TRAP      5      4

KK     W23
KM
BA   .0244
LS             60
UD    .112

KK     W18
KM
BA   .1251
LS             60
UD    .189

KK      WM
KM
HC       5

KK     M-N
KM
RK    1345   .0149    .035          TRAP     20      4

KK     W24
KM
BA   .0442
LS             60
UD    .140

KK     W25
KM
BA   .0957
LS             61
UD    .197

KK      WN
KM
HC       3

KK     N-P
KM
RK    1589    .017    .035          TRAP     20      4

KK     W28
KM
BA   .0397
LS             63
UD    .128

KK
KM
RK    1345   .0208    .035          TRAP      5      4

KK     W30
KM
BA   .0509
LS             63
UD    .123

KK
KM
RK    1078   .0074    .035          TRAP      5      4

KK     W29
KM
BA   .0409
LS             63
UD    .145

KK     W31
KM
BA   .0123
LS             63
UD    .073

KK      WO
KM
HC       4

KK     O-P
KM
RK    2169   .0226    .035          TRAP      5      4

KK     W26
KM
BA   .0301
LS             63
UD    .062

KK
KM
RK    4662   .0225    .035          TRAP      5      4

KK     W27
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```
KM
BA   .1633
LS              60
UD    .253

KK     W32
KM
BA   .0890
LS              60
UD    .170

KK      WP
KM
HC       5

KK     P-Q
KM
RK    1925   .0182     .035            TRAP       25        4

KK    W33A
KM
BA   .1261
LS              60
UD    .186

KK     WP1
KM
HC       2

KK    P1-Q
KM
RK    3000    .020     .035            TRAP       25        4

KK    W33B
KM
BA   .1360
LS              60
UD    .225

KK    W34A
KM
BA   .1261
LS              60
UD    .173

KK  34A-P2
KM
RK    2550   .0176     .035            TRAP       25        4

KK    W34B
KM
BA   .1766
LS              60
UD    .224

KK     WP2
KM
HC       2

KK    P2-Q
KM
RK    2640    .021     .035            TRAP       25        4

KK    W34C
KM
BA   .1625
LS              60
UD    .244

KK      WQ
KM
HC       4

KK    Q-Q1
KM
RK    2940    .022     .035            TRAP       25        4

KK    W36A
KM
BA   .1429
LS              60
UD    .234

KK     WQ1
KM
HC       2

KK    Q1-R
KM
RK    3400    .022     .035            TRAP       25        4

KK    W36B
KM
BA   .1918
LS              60
```

381	UD	.306						
382	KK	W35A						
383	KM							
384	BA	.0958						
385	LS		60					
386	UD	.187						
387	KK	35A-WR						
388	KM							
389	RK	3715	.023	.035		TRAP	25	4
390	KK	W35B						
391	KM							
392	BA	.1507						
393	LS	0	60					
394	UD	.259						
395	KK	WR						
396	KM							
397	HC	4						
398	KK	WR-S						
399	KM							
400	RK	2922	.0168	.035		TRAP	25	4
401	KK	W37A						
402	KM							
403	BA	.1138						
404	LS		60					
405	UD	.185						
406	KK	37A-S						
407	KM							
408	RK	1430	.014	.035		TRAP	25	4
409	KK	W37B						
410	KM							
411	BA	.1636						
412	LS		61					
413	UD	.218						
414	KK	WS						
415	KM							
416	HC	3						
417	KK	S-T						
418	KM							
419	RK	3653	.0164	.035		TRAP	25	4
420	KK	W38						
421	KM							
422	BA	.0907						
423	LS		62					
424	UD	.190						
425	KK							
426	KM							
427	RK	2922	.0171	.035		TRAP	5	4
428	KK	W39						
429	KM							
430	BA	.1833						
431	LS		60					
432	UD	.251						
433	KK	W40						
434	KM							
435	BA	.0964						
436	LS		60					
437	UD	.165						
438	KK	WT						
439	KM							
440	HC	4						
441	KK	T-U						
442	KM							
443	RK	1125	.0098	.035		TRAP	25	4
444	KK	W41						
445	KM							
446	BA	.0601						
447	LS		60					
448	UD	.117						
449	KK	W42						
450	KM							
451	BA	.0581						
452	LS		81					
453	UD	.127						
454	KK	U-V						
455	KM							
456	RK	2656	.0184	.035		TRAP	5	4

```
457        KK     WU
458        KM
459        HC      3

460        KK
461        KM
462        RK   2215  .0181   .035       TRAP     25     4

463        KK    W43
464        KM
465        BA  .1457
466        LS            61
467        UD   .169

468        KK     WV
469        KM
470        HC      2

471        KK    V-W
472        KM
473        RK    487  .0103   .035       TRAP     25     4

474        KK    W45
475        KM
476        BA  .1931
477        LS            61
478        UD   .189

479        KK     WW
480        KM
481        HC      2

482        KK    W-X
483        KM
484        RK   1542  .0149   .035       TRAP      5     4

485        KK     M1
486        KM
487        BA  .0665
488        LS            60
489        UD   .108

490        KK
491        KM
492        RK    650  .0308   .035       TRAP      5     4

493        KK     M2
494        KM
495        BA  .0273
496        LS            60
497        UD   .114
1                                  HEC-1 INPUT                                        PAGE 13

LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


498        KK     MB
499        KM
500        HC      2

501        KK
502        KM
503        RK    928  .0302   .035       TRAP      5     4

504        KK     M4
505        KM
506        BA  .0346
507        LS            60
508        UD   .121

509        KK
510        KM
511        RK    406  .0197    .02       TRAP     40     0

512        KK     M3
513        KM
514        BA  .0149
515        LS            60
516        UD   .076

517        KK     MC
518        KM
519        HC      3

520        KK
521        KM
522        RK   1902  .0231   .035       TRAP      5     4

523        KK     M5
524        KM
525        BA  .0176
526        LS            69
527        UD   .108
```

```
528     KK
529     KM
530     RK    1717   .0186    .02        TRAP    40     0

531     KK     M6
532     KM
533     BA   .0637
534     LS             65
535     UD    .233

536     KK     MD
537     KM
538     HC       3

539     KK
540     KM
541     RK    2841    .019   .035        TRAP     5     4

542     KK     M7
543     KM
544     BA   .0524
545     LS             69
546     UD    .170

547     KK
548     KM
549     RK    1044   .0268    .02        TRAP    40     0

550     KK     M8
551     KM
552     BA   .0370
553     LS             61
554     UD    .126

555 -   KK     ME
556     KM
557     HC       2

558     KK
559     KM
560     RK    2992   .0187   .035        TRAP     5     4

561     KK     M9
562     KM
563     BA   .0169
564     LS             69
565     UD    .087

566     KK
567     KM
568     RK    3433   .0253    .03        TRAP     5     4

569     KK    M12A
570     KM
571     BA   .0658
572     LS             60
573     UD    .159

574     KK    M12B
575     KM
576     BA   .1481
577     LS             60

579     KK     MF
580     KM
581     HC       5

582     KK
583     KM
584     RK    2586   .0224   .035        TRAP    10     4

585     KK     M13
586     KM
587     BA   .0614
588     LS             64
589     UD    .165

590     KK
591     KM
592     RK    1700     .01   .035        TRAP     6     4

593     KK     M14
594     KM
595     BA   .1624
596     LS             64
597     UD    .228

598     KK      MG
599     KM
600     HC       2

601     KK   PONDW
602     KM         WOODMEN HILLS DETENTION POND WEST (FROM FDR WH FLG F4)
603     SV       0     .68    1.5    235    3.6    4.9    6.3   7.34   7.34
604     SE     968     969    970    971    972    973    974    975    976
```

```
BA    .042
LS              60
UD    .139

KK     ML
KM
HC       2

KK
KM
RK    2099     .02     .035          TRAP      5      4

KK     M17
KM
BA   .0765
LS              61
UD    .133

KK     MM
KM
HC       2

KK
KM
RK    2320   .0121     .035          TRAP     10      4

KK     M18
KM
BA    .061
LS              61
UD    .142

KK
KM
RK    2122    .017     .035          TRAP      5      4

KK     M20
KM
BA   .1341
LS              61
UD    .211

KK     MN
KM
HC       4

KK
KM
RK    1531   .0202     .035          TRAP     25      4

KK     M21
KM
BA   .0241
LS              61
UD    .125

KK
KM
RK    1322   .0212     .035          TRAP      5      4

KK     M23
KM
BA   .0461
LS              60
UD    .120

KK     MO
KM
HC       3

KK
KM
RK     974   .0133     .035          TRAP     25      4

KK     M24
KM
BA   .0776
LS              60
UD    .125

KK     MP
KM
HC       2

KK
KM
RK     290   .0138     .035          TRAP     25      4

KK     M25
KM
BA   .0105
LS              60
UD    .130

KK     MQ
```

```
KM
HC       2

KK
KM
RK    3305   .0136    .035          TRAP      25       4

KK     M26
KM
BA   .1779
LS              65
UD    .250

KK      MR
KM
HC       2

KK     W44
KM
BA   .0384
LS              60
UD    .141

KK
KM
RK    2029   .0148    .035          TRAP       5       4

KK     W47
KM
BA   .0541
LS              60
UD    .148

KK
KM
RK    1438   .0223    .035          TRAP       5       4

KK     W46
KM
BA   .0418
LS              61
UD    .154

KK     M27
KM
BA   .0528
LS              60
UD    .132

KK      WX
KM
HC       6

KK
KM
RK    2563   .0125    .035          TRAP      40       4

KK     W48
KM
BA   .1179
LS              61
UD    .091

KK
KM
RK    2400   .0188    .035          TRAP       5       4

KK     W49
KM
BA   .2651
LS              61
UD    .181

KK      WZ
KM
HC       3

KK
KM
RK     800   .0125    .035          TRAP      40       4

KK     W50
KM
BA   .1061
LS              61
UD    .145

KK     WAB
KM
HC       2

KK
KM
RK     742   .0108    .035          TRAP      40       4
```

```
830    KK     W51
831    KM
832    BA   .0546
833    LS            63
834    UD    .172

835    KK     WAC
836    KM
837    HC       2

838    KK
839    KM
840    RK     638  .0345   .035          TRAP     40     4

841    KK     W52
842    KM
843    BA   .0499
844    LS            63
845    UD    .109

846    KK
847    KM
848    RK    1171  .0205   .035          TRAP      5     4

849    KK     W53
850    KM
851    BA   .0531
852    LS            63
853    UD    .156

854    KK     WAD
855    KM
856    HC       2

857    KK
858    KM
859    RK     290  .0310   .035          TRAP     10     4

860    KK     W54
861    KM
862    BA   .0078
863    LS            60
864    UD    .050

865    KK     WAE
866    KM
867    HC       3

868    KK
869    KM
870    RK    1925  .0052   .035          TRAP     40     4

871    KK     W56
872    KM
873    BA   .1831
874    LS            60
875    UD    .191

876    KK     WAF
877    KM
878    HC       2

879    KK
880    KM
881    RK    1032  .0155   .035          TRAP     40     4

882    KK     W62
883    KM
884    BA   .0750
885    LS            60
886    UD    .090

887    KK
888    KM
889    RK    2169  .0203   .035          TRAP      5     4

890    KK     W63
891    KM
892    BA    .047
893    LS            60
894    UD    .109

895    KK
896    KM
897    RK    1450  .0131   .035          TRAP      5     4

898    KK     W61
899    KM
900    BA    .192
901    LS            60
902    UD    .251

903    KK     WAH
904    KM
905    HC       3
```

```
 906        KK
 907        KM
 908        RK    1241   .0153   .035          TRAP      5      4

 909        KK     W57
 910        KM
 911        BA   .0732
 912        LS              60
 913        UD    .140

 914        KK
 915        KM
 916        RK    5903   .0254   .035          TRAP      5      4

 917        KK     W58
 918        KM
 919        BA   .2296
 920        LS              60
 921        UD    .251

 922        KK     WAI
 923        KM
 924        HC       3

 925        KK
 926        KM
 927        RK     232   .0086   .035          TRAP     15      4

 928        KK     E1A
 929        KM
 930        BA   .1151
 931        LS       0      60
 932        UD    .234

 933        KK  E1A-EA
 934        KM
 935        RK    4000    .022   .035          TRAP      5      4

 936        KK     E1B
 937        KM
 938        BA   .1665
 939        LS       0      60
 940        UD    .233

 941        KK      EA
 942        KM
 943        HC       2

 944        KK   EA-EB
 945        KM
 946        RK    1900    .022   .035          TRAP      5      4
```

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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 947        KK      E2
 948        KM
 949        BA    .104
 950        LS       0      60
 951        UD    .149

 952        KK      EB
 953        KM
 954        HC       2

 955        KK   POND1
 956        KM        ROUTE FLOW THROUGH SCS POND 1
 957        SV       0     .01     .28    1.12    2.70    5.18    6.00    6.94
 958        SE   945.5     946     948     950     952     954   954.5     955
 959        SQ       0       0       0       0       0    48.5   176.4   351.4
 960        RS       1    ELEV   945.5

 961        KK
 962        KM
 963        RK    1300   .0192   .035          TRAP      5      4

 964        KK      E3
 965        KM
 966        BA    .090
 967        LS              60
 968        UD    .128

 969        KK   MH-P2
 970        KM        RETRIEVE DIVERSION FROM W. MERIDIAN RD DITCH
 971        DR  DIVRT1

 972        KK      EC
 973        KM
 974        HC       3

 975        KK   POND2
 976        KM        ROUTE FLOW THROUGH SCS POND 2
 977        SV       0     .21    1.11    3.19    6.89    9.52   11.08   12.82   14.72   16.70
```

978	SE	920	922	924	926	928	929	929.5	930	930.5	931
979	SQ	0	0	0	0	0	0	25	86.5	186.2	308.4
980	RS	1	ELEV	920							
981	KK										
982	KM										
983	RK	1700	.0141	.035		TRAP	5	4			
984	KK	E1C									
985	KM										
986	BA	.0845									
987	LS		60								
988	UD	.200									
989	KK	1C-ED1									
990	KM										
991	RK	3450	.022	.035		TRAP	5	4			
992	KK	E4									
993	KM										
994	BA	.127									
995	LS		60								
996	UD	.200									
997	KK	ED1									
998	KM										
999	HC	2									
1000	KK	ED1-ED									
1001	KM										
1002	RK	450	.0178	.03		TRAP	5	4			
1003	KK	E5									
1004	KM										
1005	BA	.094									
1006	LS		60								
1007	UD	.160									
1008	KK	ED									
1009	KM										
1010	HC	3									
1011	KK										
1012	KM										
1013	RK	950	.0211	.035		TRAP	10	4			
1014	KK	E8									
1015	KM										
1016	BA	.0446									
1017	LS		60								
1018	UD	.139									
1019	KK	EE									
1020	KM										
1021	HC	2									
1022	KK										
1023	KM										
1024	RK	1500	.0127	.035		TRAP	10	4			
1025	KK	E10									
1026	KM										
1027	BA	.029									
1028	LS		60								
1029	UD	.158									
1030	KK	EF									
1031	KM										
1032	HC	2									
1033	KK	F-G									
1034	KM										
1035	RK	950	.0074	.035		TRAP	15	4			
1036	KK	E6									
1037	KM										
1038	BA	.119									
1039	LS		60								
1040	UD	.228									
1041	KK	E7									
1042	KM										
1043	BA	.031									
1044	LS		60								
1045	UD	.082									
1046	KK										
1047	KM										
1048	RK	1100	.0100	.035		TRAP	5	4			
1049	KK	EG1									
1050	KM										
1051	HC	2									
1052	KK	G1-G									

```
1204        KM
1205        HC       2

1206        KK
1207        KM
1208        RK    1832   .0126    .035          TRAP      40      4

1209        KK     E27
1210        KM
1211        BA   .1236
1212        LS              63
1213        UD    .172

1214        KK      EO
1215        KM
1216        HC       2

1217        KK
1218        KM
1219        RK    1625   .0133    .035          TRAP       5      3

1220        KK     W55
1221        KM
1222        BA   .0452
1223        LS              60
1224        UD    .093

1225        KK     WAG
1226        KM
1227        HC       2

1228        KK
1229        KM
1230        RK    2025   .0109    .035          TRAP       5      4

1231        KK     W59
1232        KM
1233        BA   .0705
1234        LS              60
1235        UD    .200

1236        KK     WAJ
1237        KM
1238        HC       4

1239        KK
1240        KM
1241        RK    1450   .0124    .035          TRAP      40      4

1242        KK     E28
1243        KM
1244        BA   .0718
1245        LS              61
1246        UD    .223

1247        KK
1248        KM
1249        RK    2064   .0165    .035          TRAP      40      4

1250        KK     E29
1251        KM
1252        BA   .0465
1253        LS              61
1254        UD    .166

1255        KK     EZZ
1256        KM        COMBINE E29 & E30 AT DP ZZ
1257        HC       2

1258        KK     W60
1259        KM
1260        BA   .0711
1261        LS              60
1262        UD    .182

1263        KK      ZZ
1264        KM        COMBINE ALL AT DP ZZ
1265        HC       3
1266        ZZ
```

```
1
             SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   10       W1
              V
              V
   27

              .
              .
   30         .       W2
              .         .
              .         .
   35       WA ..........
              V
              V
   38

              .
              .
   41         .       W3
              .         .
              .         .
   46       WB ..........
              V
              V
   49

              .
              .
   52         .       W4
              .         V
              .         V
   57         .
              .         .
              .         .
   60         .         .       W5
              .         .         .
              .         .         .
   65       WC ....................
              V
              V
   68

              .
              .
   71         .       W6
              .         V
              .         V
   76         .
              .         .
              .         .
   79         .         .       W7
              .         .         V
              .         .         V
   84         .         .
              .         .         .
              .         .         .
   87         .       WD ..........
              .         V
              .         V
   90         .       D-E
              .         .
              .         .
   93         .         .       W8
              .         .         V
              .         .         V
   98         .         .
              .         .         .
              .         .         .
   101        .         .         .       W9
              .         .         .         .
              .         .         .         .
   106        .       WE ....................
              .         V
              .         V
   109        .       E-F
              .         .
              .         .
   112        .         .       W10
              .         .         V
              .         .         V
   117        .         .
              .         .         .
              .         .         .
   120        .         .         .       W11
              .         .         .         .
              .         .         .         .
   125      WF ..............................
              V
              V
   128      F-G
              .
              .
   131        .       W12
```

```
            .         V
            .         V
501         .
            .         .
            .         .
504         .         .       M4
            .         .         V
            .         .         V
509         .         .
            .         .         .
            .         .         .
512         .         .         .         M3
            .         .         .           .
            .         .         .           .
517         .       MC ........................
            .         V
            .         V
520         .
            .         .
            .         .
523         .         .       M5
            .         .         V
            .         .         V
528         .         .
            .         .         .
            .         .         .
531         .         .         .         M6
            .         .         .           .
            .         .         .           .
536         .       MD ........................
            .         V
            .         V
539         .
            .         .
            .         .
542         .         .       M7
            .         .         V
            .         .         V
547         .         .
            .         .         .
            .         .         .
550         .         .         .         M8
            .         .         .           .
            .         .         .           .
555         .         .       ME ............
            .         .         V
            .         .         V
558         .         .
            .         .         .
            .         .         .
561         .         .         .         M9
            .         .         .           V
            .         .         .           V
566         .         .         .
            .         .         .           .
            .         .         .           .
569         .         .         .           .        M12A
            .         .         .           .           .
            .         .         .           .           .
574         .         .         .           .           .        M12B
            .         .         .           .           .           .
            .         .         .           .           .           .
579         .       MF ..............................................
            .         V
            .         V
582         .
            .         .
            .         .
585         .         .       M13
            .         .         V
            .         .         V
590         .         .
            .         .         .
            .         .         .
593         .         .         .         M14
            .         .         .           .
            .         .         .           .
598         .         .       MG............
            .         .         V
            .         .         V
601         .         .     PONDW
            .         .         .
            .         .         .
607         .       MH ............
            .         V
            .         V
610         .
            .         .
            .         .
615         .         .------->  DIVRT1
613         .     MH-P2
            .         .
            .         .
618         .         .       M15
            .         .         .
```

```
              .           .           .
623           .          MI ............
              .           V
              .           V
626           .
              .           .
              .           .
629           .           .          M19
              .           .           .
              .           .           .
634           .          MJ ............
              .           V
              .           V
637           .
              .           .
              .           .
640           .           .          M10
              .           .           V
              .           .           V
645           .           .       M10-K
              .           .           .
              .           .           .
648           .           .           .          M11A
              .           .           .           .
              .           .           .           .
653           .           .          MK............
              .           .           V
              .           .           V
656           .           .       MK-K1
              .           .           .
              .           .           .
659           .           .           .          M11B
              .           .           .           V
              .           .           .           V
664           .           .           .       11B-K1
              .           .           .           .
              .           .           .           .
667           .           .           .           .          M11C
              .           .           .           .           .
              .           .           .           .           .
672           .           .          MK1........................
              .           .           V
              .           .           V
675           .           .       K1-ML
              .           .           .
              .           .           .
678           .           .           .          M16
              .           .           .           .
              .           .           .           .
683           .           .          ML ............
              .           .           V
              .           .           V
686           .           .
              .           .           .
              .           .           .
689           .           .           .          M17
              .           .           .           .
              .           .           .           .
694           .           .          MM ............
              .           .           V
              .           .           V
697           .           .
              .           .           .
              .           .           .
700           .           .           .          M18
              .           .           .           V
              .           .           .           V
705           .           .           .
              .           .           .           .
              .           .           .           .
708           .           .           .           .          M20
              .           .           .           .           .
              .           .           .           .           .
713           .          MN ....................................
              .           V
              .           V
716           .
              .           .
              .           .
719           .           .          M21
              .           .           V
              .           .           V
724           .           .
              .           .           .
              .           .           .
727           .           .           .          M23
              .           .           .           .
              .           .           .           .
732           .          MO ........................
              .           V
              .           V
735           .
              .           .
738           .           .          M24
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860          .         .         W54
             .         .          .
             .         .          .
865       WAE.......................
             V
             V
868
             .
             .
871          .        W56
             .         .
             .         .
876       WAF...........
             V
             V
879
             .
             .
882          .        W62
             .         V
             .         V
887          .
             .         .
             .         .
890          .         .         W63
             .         .          V
             .         .          V
895          .         .
             .         .          .
             .         .          .
898          .         .          .         W61
             .         .          .          .
             .         .          .          .
903          .        WAH.......................
             .         V
             .         V
906          .
             .         .
             .         .
909          .         .         W57
             .         .          V
             .         .          V
914          .         .
             .         .          .
             .         .          .
917          .         .          .         W58
             .         .          .          .
             .         .          .          .
922          .        WAI.......................
             .         V
             .         V
925          .
             .         .
             .         .
928          .         .         E1A
             .         .          V
             .         .          V
933          .         .       E1A-EA
             .         .          .
             .         .          .
936          .         .          .         E1B
             .         .          .          .
             .         .          .          .
941          .         .          EA............
             .         .          V
             .         .          V
944          .         .        EA-EB
             .         .          .
             .         .          .
947          .         .          .         E2
             .         .          .          .
             .         .          .          .
952          .         .          EB ............
             .         .          V
             .         .          V
955          .         .        POND1
             .         .          V
             .         .          V
961          .         .
             .         .          .
             .         .          .
964          .         .          .         E3
             .         .          .          .
             .         .          .          .
971          .         .          .          .          .<-------  DIVRT1
969          .         .          .          .       MH-P2
             .         .          .          .          .
             .         .          .          .          .
972          .         .          EC ........................
             .         .          V
             .         .          V
975          .         .        POND2
             .         .          V
             .         .          V
981          .         .
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1103            .           .         J1-K
                .           .           .
                .           .           .
1106            .           .           .          E15
                .           .           .           V
                .           .           .           V
1111            .           .           .
                .           .           .           .
                .           .           .           .
1114            .           .           .           .          E16
                .           .           .           .           .
                .           .           .           .           .
1119            .           .           .          EI ...........
                .           .           .           V
                .           .           .           V
1122            .           .           .
                .           .           .           .
                .           .           .           .
1125            .           .           .           .          E17
                .           .           .           .           V
                .           .           .           .           V
1130            .           .           .           .
                .           .           .           .           .
                .           .           .           .           .
1133            .           .           .           .           .          E18
                .           .           .           .           .           .
                .           .           .           .           .           .
1138            .           .           .          EJ2.......................
                .           .           .           V
                .           .           .           V
1141            .           .           .
                .           .           .           .
                .           .           .           .
1144            .           .           .           .          E23
                .           .           .           .           .
                .           .           .           .           .
1149            .           .           .           .           .          E24
                .           .           .           .           .           .
                .           .           .           .           .           .
1154            .           .         EK ....................................
                .           .           V
                .           .           V
1157            .           .
                .           .           .
                .           .           .
1160            .           .           .          E21
                .           .           .           V
                .           .           .           V
1165            .           .           .
                .           .           .           .
                .           .           .           .
1168            .           .           .           .          E20
                .           .           .           .           V
                .           .           .           .           V
1173            .           .           .           .
                .           .           .           .           .
                .           .           .           .           .
1176            .           .           .           .           .          E22
                .           .           .           .           .           .
                .           .           .           .           .           .
1181            .           .           .          EL .......................
                .           .           .           V
                .           .           .           V
1184            .           .           .
                .           .           .           .
                .           .           .           .
1187            .           .           .           .          E25
                .           .           .           .           .
                .           .           .           .           .
1192            .           .         EM ........................
                .           .           V
                .           .           V
1195            .           .
                .           .           .
                .           .           .
1198            .           .           .          E26
                .           .           .           .
                .           .           .           .
1203            .           .         EN ............
                .           .           V
                .           .           V
1206            .           .
                .           .           .
                .           .           .
1209            .           .           .          E27
                .           .           .           .
                .           .           .           .
1214            .           .         EO ............
                .           .           V
                .           .           V
1217            .           .
                .           .           .
                .           .           .
1220            .           .           .          W55
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                 .          .         .         .
1225             .          .        WAG...........
                 .          .         V
                 .          .         V
1228             .          .
                 .          .         .
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1231             .          .         .        W59
                 .          .         .          .
                 .          .         .          .
1236           WAJ.................................
                 V
                 V
1239

                 .
                 .
1242             .         E28
                 .          V
                 .          V
1247             .
                 .          .
                 .          .
1250             .          .        E29
                 .          .         .
                 .          .         .
1255             .         EZZ............
                 .          .
                 .          .
1258             .          .        W60
                 .          .         .
                 .          .         .
1263            ZZ.......................
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1***************************************                          ***************************************
*                                      *                          *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                          *   U.S. ARMY CORPS OF ENGINEERS      *
*            JUN   1998                *                          *   HYDROLOGIC ENGINEERING CENTER     *
*          VERSION 4.1                 *                          *        609 SECOND STREET            *
*                                      *                          *     DAVIS, CALIFORNIA 95616         *
* RUN DATE   28SEP07  TIME  11:49:21   *                          *        (916) 756-1104               *
*                                      *                          *                                     *
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                    FALCON BASIN 100-YR/ 24-HOUR FLOOD/ EXISTING CONDITIONS
                        UPPER EAST TRIBUTARY (WOODMEN HILLS) BASED ON CLOMR APPROVED 2/2/99
                        INCLUDING 2 EXISTING SCS STOCK PONDS, WEST WOODMEN HILLS POND
                        NOTE: M1-M4 (PAINT BRUSH HILLS) MODELED AS HISTORIC TO ACCOUNT FOR
                              DETENTION POND AT MC
                        NOTE: NO CULVERT AT STAPLETON & MERIDIAN, TEMP CULVERTS AT MERIDIAN
                              DOWNSTREAM OF WOODMEN HILLS DRIVE (DIVERSION)

 9 IO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                      NMIN           5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     14JUL99  STARTING DATE
                     ITIME        0800  STARTING TIME
                        NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     15JUL99  ENDING DATE
                    NDTIME        0855  ENDING TIME
                     ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

       ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT
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1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	W1	40.	5.75	4.	1.	1.	.05		
+	ROUTED TO		37.	5.83	4.	1.	1.	.05		
+	HYDROGRAPH AT	W2	20.	5.83	2.	1.	1.	.03		
+	2 COMBINED AT	WA	57.	5.83	6.	2.	2.	.08		
+	ROUTED TO		55.	5.83	6.	2.	2.	.08		
+	HYDROGRAPH AT	W3	39.	5.83	4.	1.	1.	.05		
+	2 COMBINED AT	WB	95.	5.83	10.	3.	3.	.13		
+	ROUTED TO		91.	5.83	10.	3.	3.	.13		
+	HYDROGRAPH AT	W4	6.	5.75	0.	0.	0.	.01		
+	ROUTED TO		6.	5.75	0.	0.	0.	.01		
+	HYDROGRAPH AT	W5	15.	5.75	1.	0.	0.	.02		
+	3 COMBINED AT	WC	105.	5.83	11.	4.	4.	.15		
+	ROUTED TO		103.	5.83	11.	4.	4.	.15		
+	HYDROGRAPH AT	W6	43.	5.75	4.	1.	1.	.05		
+	ROUTED TO		40.	5.75	4.	1.	1.	.05		
+	HYDROGRAPH AT	W7	20.	5.75	2.	1.	1.	.02		
+	ROUTED TO		20.	5.75	2.	1.	1.	.02		
+	2 COMBINED AT	WD	60.	5.75	5.	2.	2.	.07		
+	ROUTED TO	D-E	55.	5.75	5.	2.	2.	.07		
+	HYDROGRAPH AT	W8	27.	5.75	2.	1.	1.	.03		
+	ROUTED TO		24.	5.75	2.	1.	1.	.03		
+	HYDROGRAPH AT	W9	36.	5.75	3.	1.	1.	.04		
+	3 COMBINED AT	WE	114.	5.75	11.	4.	4.	.14		
+	ROUTED TO	E-F	108.	5.83	11.	4.	4.	.14		
+	HYDROGRAPH AT	W10	39.	5.75	3.	1.	1.	.04		
+	ROUTED TO		36.	5.75	4.	1.	1.	.04		
+	HYDROGRAPH AT	W11	29.	5.75	2.	1.	1.	.03		
+	4 COMBINED AT	WF	265.	5.83	28.	10.	9.	.36		
	ROUTED TO									

+		F-G	255.	5.83	28.	10.	9.	.36
+	HYDROGRAPH AT	W12	33.	5.75	3.	1.	1.	.04
+	ROUTED TO		32.	5.83	3.	1.	1.	.04
+	HYDROGRAPH AT	W14	38.	5.83	4.	1.	1.	.05
+	ROUTED TO		37.	5.83	4.	1.	1.	.05
+	HYDROGRAPH AT	W13	80.	5.83	9.	3.	3.	.11
+	4 COMBINED AT	WG	403.	5.83	44.	15.	14.	.56
+	ROUTED TO	G-H	382.	5.92	44.	15.	14.	.56
+	ROUTED TO		368.	5.92	44.	15.	14.	.56
+	HYDROGRAPH AT	W15	70.	5.83	7.	2.	2.	.09
+	ROUTED TO		66.	5.83	7.	2.	2.	.09
+	2 COMBINED AT	WH	428.	5.92	51.	17.	17.	.65
+	HYDROGRAPH AT	W16	27.	5.75	2.	1.	1.	.03
+	ROUTED TO		24.	5.83	2.	1.	1.	.03
+	HYDROGRAPH AT	W17	16.	5.75	1.	0.	0.	.02
+	2 COMBINED AT	WI	38.	5.75	4.	1.	1.	.05
+	ROUTED TO	I-M	37.	5.83	4.	1.	1.	.05
+	HYDROGRAPH AT	W19	41.	5.75	3.	1.	1.	.04
+	ROUTED TO		37.	5.75	3.	1.	1.	.04
+	HYDROGRAPH AT	W20	32.	5.75	3.	1.	1.	.03
+	2 COMBINED AT	WJ	69.	5.75	6.	2.	2.	.07
+	ROUTED TO		65.	5.83	6.	2.	2.	.07
+	HYDROGRAPH AT	W21	96.	5.83	10.	3.	3.	.13
+	2 COMBINED AT	WK	161.	5.83	16.	6.	5.	.21
+	ROUTED TO		156.	5.83	16.	6.	5.	.21
+	HYDROGRAPH AT	W22	10.	5.75	1.	0.	0.	.01
+	2 COMBINED AT	WL	161.	5.83	17.	6.	6.	.22
+	ROUTED TO		147.	5.83	17.	6.	6.	.22
+	HYDROGRAPH AT	W23	19.	5.75	2.	1.	1.	.02
+	HYDROGRAPH AT	W18	80.	5.83	9.	3.	3.	.13
+	5 COMBINED AT	WM	690.	5.92	83.	28.	27.	1.06
+	ROUTED TO	M-N	673.	5.92	83.	28.	27.	1.06

+	HYDROGRAPH AT	W24	33.	5.83	3.	1.	1.	.04
+	HYDROGRAPH AT	W25	64.	5.83	8.	3.	3.	.10
+	3 COMBINED AT	WN	756.	5.92	94.	32.	31.	1.20
+	ROUTED TO	N-P	722.	5.92	94.	32.	31.	1.20
+	HYDROGRAPH AT	W28	36.	5.83	4.	1.	1.	.04
+	ROUTED TO		35.	5.83	4.	1.	1.	.04
+	HYDROGRAPH AT	W30	46.	5.83	5.	2.	2.	.05
+	ROUTED TO		46.	5.83	5.	2.	2.	.05
+	HYDROGRAPH AT	W29	37.	5.83	4.	1.	1.	.04
+	HYDROGRAPH AT	W31	14.	5.75	1.	0.	0.	.01
+	4 COMBINED AT	WO	127.	5.83	13.	4.	4.	.14
+	ROUTED TO	O-P	118.	5.83	13.	4.	4.	.14
+	HYDROGRAPH AT	W26	36.	5.75	3.	1.	1.	.03
+	ROUTED TO		35.	5.92	3.	1.	1.	.03
+	HYDROGRAPH AT	W27	89.	5.92	12.	4.	4.	.16
+	HYDROGRAPH AT	W32	61.	5.83	7.	2.	2.	.09
+	5 COMBINED AT	WP	1012.	5.92	128.	44.	43.	1.63
+	ROUTED TO	P-Q	950.	5.92	128.	44.	43.	1.63
+	HYDROGRAPH AT	W33A	82.	5.83	10.	3.	3.	.13
+	2 COMBINED AT	WP1	1023.	5.92	138.	47.	46.	1.75
+	ROUTED TO	P1-Q	1007.	6.00	137.	47.	46.	1.75
+	HYDROGRAPH AT	W33B	78.	5.92	10.	4.	3.	.14
+	HYDROGRAPH AT	W34A	86.	5.83	10.	3.	3.	.13
+	ROUTED TO	34A-P2	82.	5.92	9.	3.	3.	.13
+	HYDROGRAPH AT	W34B	101.	5.92	13.	5.	4.	.18
+	2 COMBINED AT	WP2	183.	5.92	23.	8.	8.	.30
+	ROUTED TO	P2-Q	175.	6.00	23.	8.	8.	.30
+	HYDROGRAPH AT	W34C	90.	5.92	12.	4.	4.	.16
+	4 COMBINED AT	WQ	1325.	6.00	181.	63.	61.	2.36
+	ROUTED TO	Q-Q1	1284.	6.00	181.	63.	60.	2.36
+	HYDROGRAPH AT	W36A	81.	5.92	11.	4.	4.	.14
+	2 COMBINED AT	WQ1	1352.	6.00	191.	66.	64.	2.50

+	ROUTED TO	Q1-R	1311.	6.08	190.	66.	64.	2.50
+	HYDROGRAPH AT	W36B	91.	6.00	14.	5.	5.	.19
+	HYDROGRAPH AT	W35A	62.	5.83	7.	2.	2.	.10
+	ROUTED TO	35A-WR	58.	6.00	7.	2.	2.	.10
+	HYDROGRAPH AT	W35B	81.	5.92	11.	4.	4.	.15
+	4 COMBINED AT	WR	1497.	6.08	222.	78.	75.	2.94
+	ROUTED TO	WR-S	1475.	6.08	222.	77.	75.	2.94
+	HYDROGRAPH AT	W37A	74.	5.83	9.	3.	3.	.11
+	ROUTED TO	37A-S	71.	5.92	9.	3.	3.	.11
+	HYDROGRAPH AT	W37B	102.	5.92	13.	5.	4.	.16
+	3 COMBINED AT	WS	1575.	6.08	242.	85.	82.	3.21
+	ROUTED TO	S-T	1522.	6.17	242.	85.	81.	3.21
+	HYDROGRAPH AT	W38	67.	5.83	8.	3.	3.	.09
+	ROUTED TO		66.	5.92	8.	3.	3.	.09
+	HYDROGRAPH AT	W39	100.	5.92	14.	5.	5.	.18
+	HYDROGRAPH AT	W40	67.	5.83	7.	3.	2.	.10
+	4 COMBINED AT	WT	1621.	6.17	269.	95.	91.	3.59
+	ROUTED TO	T-U	1613.	6.17	269.	95.	91.	3.59
+	HYDROGRAPH AT	W41	45.	5.83	5.	2.	2.	.06
+	HYDROGRAPH AT	W42	125.	5.75	13.	4.	4.	.06
+	ROUTED TO	U-V	122.	5.83	13.	4.	4.	.06
+	3 COMBINED AT	WU	1648.	6.17	285.	100.	96.	3.70
+	ROUTED TO		1612.	6.17	285.	100.	96.	3.70
+	HYDROGRAPH AT	W43	108.	5.83	12.	4.	4.	.15
+	2 COMBINED AT	WV	1640.	6.17	296.	104.	100.	3.85
+	ROUTED TO	V-W	1621.	6.17	296.	104.	100.	3.85
+	HYDROGRAPH AT	W45	134.	5.83	16.	5.	5.	.19
+	2 COMBINED AT	WW	1663.	6.17	311.	109.	105.	4.04
+	ROUTED TO	W-X	1621.	6.25	311.	109.	105.	4.04
+	HYDROGRAPH AT	M1	52.	5.75	5.	2.	2.	.07
+	ROUTED TO		50.	5.83	5.	2.	2.	.07
	HYDROGRAPH AT							

+		M2	21.	5.75	2.	1.	1.	.03		
+	2 COMBINED AT	MB	70.	5.83	7.	2.	2.	.09		
+	ROUTED TO		70.	5.83	7.	2.	2.	.09		
+	HYDROGRAPH AT	M4	26.	5.83	3.	1.	1.	.03		
+	ROUTED TO		26.	5.83	3.	1.	1.	.03		
+	HYDROGRAPH AT	M3	14.	5.75	1.	0.	0.	.01		
+	3 COMBINED AT	MC	105.	5.83	11.	4.	4.	.14		
+	ROUTED TO		102.	5.83	11.	4.	4.	.14		
+	HYDROGRAPH AT	M5	24.	5.75	2.	1.	1.	.02		
+	ROUTED TO		23.	5.83	2.	1.	1.	.02		
+	HYDROGRAPH AT	M6	51.	5.92	7.	2.	2.	.06		
+	3 COMBINED AT	MD	175.	5.83	20.	7.	6.	.22		
+	ROUTED TO		170.	5.92	20.	7.	6.	.22		
+	HYDROGRAPH AT	M7	63.	5.83	7.	2.	2.	.05		
+	ROUTED TO		61.	5.83	7.	2.	2.	.05		
+	HYDROGRAPH AT	M8	30.	5.83	3.	1.	1.	.04		
+	2 COMBINED AT	ME	91.	5.83	10.	3.	3.	.09		
+	ROUTED TO		89.	5.92	10.	3.	3.	.09		
+	HYDROGRAPH AT	M9	25.	5.75	2.	1.	1.	.02		
+	ROUTED TO		23.	5.83	2.	1.	1.	.02		
+	HYDROGRAPH AT	M12A	47.	5.83	5.	2.	2.	.07		
+	HYDROGRAPH AT	M12B	86.	5.92	11.	4.	4.	.15		
+	5 COMBINED AT	MF	401.	5.92	47.	16.	15.	.54		
+	ROUTED TO		388.	5.92	47.	16.	15.	.54		
+	HYDROGRAPH AT	M13	56.	5.83	6.	2.	2.	.06		
+	ROUTED TO		53.	5.92	6.	2.	2.	.06		
+	HYDROGRAPH AT	M14	122.	5.92	16.	5.	5.	.16		
+	2 COMBINED AT	MG	176.	5.92	22.	7.	7.	.22		
+	ROUTED TO	PONDW	16.	7.00	16.	7.	7.	.22		
+									970.02	7.00
+	2 COMBINED AT	MH	403.	5.92	63.	23.	22.	.77		
+	ROUTED TO		385.	6.00	63.	23.	22.	.77		
+	DIVERSION TO	DIVRT1	85.	6.00	43.	18.	18.	.77		

+ HYDROGRAPH AT	MH-P2	300.	6.00	20.	5.	5.	.77
+ HYDROGRAPH AT	M15	101.	5.83	12.	4.	4.	.12
+ 2 COMBINED AT	MI	388.	5.92	32.	9.	9.	.89
+ ROUTED TO		378.	6.00	32.	9.	9.	.89
+ HYDROGRAPH AT	M19	38.	5.83	4.	1.	1.	.05
+ 2 COMBINED AT	MJ	397.	6.00	36.	10.	10.	.94
+ ROUTED TO		381.	6.00	36.	10.	10.	.94
+ HYDROGRAPH AT	M10	54.	5.75	5.	2.	2.	.06
+ ROUTED TO	M10-K	53.	5.83	5.	2.	2.	.06
+ HYDROGRAPH AT	M11A	65.	5.92	9.	3.	3.	.11
+ 2 COMBINED AT	MK	115.	5.83	14.	5.	4.	.16
+ ROUTED TO	MK-K1	111.	5.92	14.	5.	4.	.16
+ HYDROGRAPH AT	M11B	64.	5.83	7.	2.	2.	.09
+ ROUTED TO	11B-K1	58.	5.92	7.	2.	2.	.09
+ HYDROGRAPH AT	M11C	66.	5.83	7.	2.	2.	.09
+ 3 COMBINED AT	MK1	230.	5.83	27.	9.	9.	.35
+ ROUTED TO	K1-ML	225.	5.92	27.	9.	9.	.35
+ HYDROGRAPH AT	M16	31.	5.83	3.	1.	1.	.04
+ 2 COMBINED AT	ML	247.	5.92	30.	10.	10.	.39
+ ROUTED TO		240.	5.92	30.	10.	10.	.39
+ HYDROGRAPH AT	M17	61.	5.83	6.	2.	2.	.08
+ 2 COMBINED AT	MM	282.	5.92	36.	13.	12.	.46
+ ROUTED TO		268.	6.00	36.	12.	12.	.46
+ HYDROGRAPH AT	M18	48.	5.83	5.	2.	2.	.06
+ ROUTED TO		45.	5.92	5.	2.	2.	.06
+ HYDROGRAPH AT	M20	85.	5.83	11.	4.	4.	.13
+ 4 COMBINED AT	MN	747.	6.00	88.	28.	27.	1.60
+ ROUTED TO		724.	6.00	88.	28.	27.	1.60
+ HYDROGRAPH AT	M21	19.	5.83	2.	1.	1.	.02
+ ROUTED TO		19.	5.83	2.	1.	1.	.02
+ HYDROGRAPH AT	M23	34.	5.83	3.	1.	1.	.05
3 COMBINED AT							

+		MO	747.	6.00	93.	30.	29.	1.67
+	ROUTED TO		724.	6.00	93.	30.	29.	1.67
+	HYDROGRAPH AT	M24	58.	5.83	6.	2.	2.	.08
+	2 COMBINED AT	MP	744.	6.00	99.	32.	31.	1.75
+	ROUTED TO		736.	6.00	99.	32.	31.	1.75
+	HYDROGRAPH AT	M25	8.	5.83	1.	0.	0.	.01
+	2 COMBINED AT	MQ	739.	6.00	100.	32.	31.	1.76
+	ROUTED TO		734.	6.08	99.	32.	31.	1.76
+	HYDROGRAPH AT	M26	139.	5.92	18.	6.	6.	.18
+	2 COMBINED AT	MR	825.	6.08	117.	38.	37.	1.94
+	HYDROGRAPH AT	W44	28.	5.83	3.	1.	1.	.04
+	ROUTED TO		27.	5.92	3.	1.	1.	.04
+	HYDROGRAPH AT	W47	39.	5.83	4.	1.	1.	.05
+	ROUTED TO		36.	5.83	4.	1.	1.	.05
+	HYDROGRAPH AT	W46	32.	5.83	3.	1.	1.	.04
+	HYDROGRAPH AT	M27	39.	5.83	4.	1.	1.	.05
+	6 COMBINED AT	WX	2398.	6.17	442.	153.	147.	6.17
+	ROUTED TO		2323.	6.25	441.	152.	147.	6.17
+	HYDROGRAPH AT	W48	108.	5.75	10.	3.	3.	.12
+	ROUTED TO		102.	5.83	10.	3.	3.	.12
+	HYDROGRAPH AT	W49	189.	5.83	21.	7.	7.	.27
+	3 COMBINED AT	WZ	2392.	6.17	471.	163.	157.	6.55
+	ROUTED TO		2383.	6.25	471.	163.	157.	6.55
+	HYDROGRAPH AT	W50	83.	5.83	9.	3.	3.	.11
+	2 COMBINED AT	WAB	2399.	6.25	480.	166.	160.	6.66
+	ROUTED TO		2396.	6.25	480.	166.	160.	6.66
+	HYDROGRAPH AT	W51	46.	5.83	5.	2.	2.	.05
+	2 COMBINED AT	WAC	2406.	6.25	484.	168.	161.	6.71
+	ROUTED TO		2402.	6.25	485.	168.	161.	6.71
+	HYDROGRAPH AT	W52	48.	5.75	5.	2.	1.	.05
+	ROUTED TO		46.	5.83	5.	2.	1.	.05
+	HYDROGRAPH AT	W53	47.	5.83	5.	2.	2.	.05

+	2 COMBINED AT	WAD	92.	5.83	9.	3.	3.	.10		
+	ROUTED TO		92.	5.83	9.	3.	3.	.10		
+	HYDROGRAPH AT	W54	8.	5.75	1.	0.	0.	.01		
+	3 COMBINED AT	WAE	2419.	6.25	494.	171.	165.	6.82		
+	ROUTED TO		2396.	6.25	493.	171.	164.	6.82		
+	HYDROGRAPH AT	W56	116.	5.83	14.	5.	5.	.18		
+	2 COMBINED AT	WAF	2426.	6.25	506.	175.	169.	7.01		
+	ROUTED TO		2405.	6.25	506.	175.	169.	7.01		
+	HYDROGRAPH AT	W62	64.	5.75	6.	2.	2.	.08		
+	ROUTED TO		61.	5.83	6.	2.	2.	.08		
+	HYDROGRAPH AT	W63	36.	5.75	4.	1.	1.	.05		
+	ROUTED TO		36.	5.83	4.	1.	1.	.05		
+	HYDROGRAPH AT	W61	105.	5.92	14.	5.	5.	.19		
+	3 COMBINED AT	WAH	190.	5.83	24.	8.	8.	.31		
+	ROUTED TO		183.	5.92	24.	8.	8.	.31		
+	HYDROGRAPH AT	W57	54.	5.83	6.	2.	2.	.07		
+	ROUTED TO		51.	6.00	6.	2.	2.	.07		
+	HYDROGRAPH AT	W58	126.	5.92	17.	6.	6.	.23		
+	3 COMBINED AT	WAI	345.	5.92	46.	16.	15.	.62		
+	ROUTED TO		341.	5.92	47.	16.	15.	.62		
+	HYDROGRAPH AT	E1A	65.	5.92	9.	3.	3.	.12		
+	ROUTED TO	E1A-EA	64.	6.00	9.	3.	3.	.12		
+	HYDROGRAPH AT	E1B	94.	5.92	13.	4.	4.	.17		
+	2 COMBINED AT	EA	147.	5.92	21.	7.	7.	.28		
+	ROUTED TO	EA-EB	145.	6.00	21.	7.	7.	.28		
+	HYDROGRAPH AT	E2	75.	5.83	8.	3.	3.	.10		
+	2 COMBINED AT	EB	187.	5.92	29.	10.	10.	.39		
+	ROUTED TO	POND1	101.	6.25	23.	9.	8.	.39		
+									954.20	6.25
+	ROUTED TO		95.	6.25	23.	9.	8.	.39		
+	HYDROGRAPH AT	E3	67.	5.83	7.	2.	2.	.09		
+	HYDROGRAPH AT	MH-P2	85.	5.92	43.	18.	18.	.00		
	3 COMBINED AT									

+		EC	187.	6.25	72.	29.	28.	.48		
+	ROUTED TO	POND2	95.	7.17	55.	24.	23.	.48		
+									930.04	7.17
+	ROUTED TO		94.	7.25	55.	24.	23.	.48		
+	HYDROGRAPH AT	E1C	52.	5.83	6.	2.	2.	.08		
+	ROUTED TO	1C-ED1	50.	6.00	6.	2.	2.	.08		
+	HYDROGRAPH AT	E4	78.	5.83	10.	3.	3.	.13		
+	2 COMBINED AT	ED1	123.	5.92	16.	5.	5.	.21		
+	ROUTED TO	ED1-ED	121.	5.92	16.	6.	5.	.21		
+	HYDROGRAPH AT	E5	66.	5.83	7.	2.	2.	.09		
+	3 COMBINED AT	ED	174.	5.92	72.	32.	31.	.78		
+	ROUTED TO		172.	5.92	72.	32.	31.	.78		
+	HYDROGRAPH AT	E8	33.	5.83	3.	1.	1.	.04		
+	2 COMBINED AT	EE	196.	5.92	75.	33.	32.	.83		
+	ROUTED TO		192.	5.92	75.	33.	32.	.83		
+	HYDROGRAPH AT	E10	21.	5.83	2.	1.	1.	.03		
+	2 COMBINED AT	EF	208.	5.92	77.	34.	33.	.85		
+	ROUTED TO	F-G	199.	5.92	77.	34.	33.	.85		
+	HYDROGRAPH AT	E6	68.	5.92	9.	3.	3.	.12		
+	HYDROGRAPH AT	E7	28.	5.75	2.	1.	1.	.03		
+	ROUTED TO		25.	5.83	2.	1.	1.	.03		
+	2 COMBINED AT	EG1	89.	5.83	11.	4.	4.	.15		
+	ROUTED TO	G1-G	87.	5.92	11.	4.	4.	.15		
+	HYDROGRAPH AT	E9	46.	5.83	6.	2.	2.	.08		
+	ROUTED TO		46.	5.92	6.	2.	2.	.08		
+	HYDROGRAPH AT	E11	28.	5.83	3.	1.	1.	.05		
+	HYDROGRAPH AT	E12	66.	5.83	7.	2.	2.	.09		
+	5 COMBINED AT	EG	409.	5.92	103.	43.	42.	1.22		
+	HYDROGRAPH AT	E13	9.	5.92	1.	0.	0.	.02		
+	HYDROGRAPH AT	E14	4.	5.83	0.	0.	0.	.01		
+	ROUTED TO		4.	5.83	0.	0.	0.	.01		
+	3 COMBINED AT	EH	421.	5.92	105.	44.	42.	1.24		
+	ROUTED TO		398.	5.92	105.	44.	42.	1.24		

+	HYDROGRAPH AT	E19	35.	5.83	4.	1.	1.	.04
+	2 COMBINED AT	EJ1	421.	5.92	108.	45.	43.	1.28
+	ROUTED TO	J1-K	411.	6.00	107.	45.	43.	1.28
+	HYDROGRAPH AT	E15	36.	5.75	3.	1.	1.	.04
+	ROUTED TO		33.	5.83	3.	1.	1.	.04
+	HYDROGRAPH AT	E16	31.	5.75	3.	1.	1.	.03
+	2 COMBINED AT	EI	63.	5.75	6.	2.	2.	.07
+	ROUTED TO		61.	5.83	6.	2.	2.	.07
+	HYDROGRAPH AT	E17	32.	5.75	3.	1.	1.	.03
+	ROUTED TO		31.	5.83	3.	1.	1.	.03
+	HYDROGRAPH AT	E18	40.	5.83	4.	2.	1.	.05
+	3 COMBINED AT	EJ2	132.	5.83	13.	4.	4.	.15
+	ROUTED TO		119.	6.00	13.	4.	4.	.15
+	HYDROGRAPH AT	E23	108.	5.92	14.	5.	5.	.17
+	HYDROGRAPH AT	E24	74.	6.00	13.	4.	4.	.14
+	4 COMBINED AT	EK	698.	6.00	147.	59.	56.	1.74
+	ROUTED TO		671.	6.08	146.	58.	56.	1.74
+	HYDROGRAPH AT	E21	57.	5.83	7.	2.	2.	.09
+	ROUTED TO		55.	5.92	7.	2.	2.	.09
+	HYDROGRAPH AT	E20	51.	5.92	7.	2.	2.	.08
+	ROUTED TO		51.	5.92	7.	2.	2.	.08
+	HYDROGRAPH AT	E22	41.	5.92	5.	2.	2.	.07
+	3 COMBINED AT	EL	147.	5.92	19.	6.	6.	.23
+	ROUTED TO		140.	6.00	19.	6.	6.	.23
+	HYDROGRAPH AT	E25	121.	5.83	13.	5.	4.	.17
+	3 COMBINED AT	EM	845.	6.00	177.	69.	67.	2.13
+	ROUTED TO		834.	6.08	177.	69.	67.	2.13
+	HYDROGRAPH AT	E26	37.	5.75	3.	1.	1.	.04
+	2 COMBINED AT	EN	840.	6.08	180.	70.	68.	2.17
+	ROUTED TO		826.	6.08	179.	70.	68.	2.17
+	HYDROGRAPH AT	E27	104.	5.83	11.	4.	4.	.12
	2 COMBINED AT							

+		EO	863.	6.08	189.	74.	71.	2.29
	ROUTED TO							
+			835.	6.08	189.	74.	71.	2.29
	HYDROGRAPH AT							
+		W55	38.	5.75	3.	1.	1.	.05
	2 COMBINED AT							
+		WAG	841.	6.08	192.	75.	72.	2.34
	ROUTED TO							
+			833.	6.17	192.	75.	72.	2.34
	HYDROGRAPH AT							
+		W59	43.	5.83	5.	2.	2.	.07
	4 COMBINED AT							
+		WAJ	3321.	6.25	749.	268.	259.	10.03
	ROUTED TO							
+			3310.	6.25	749.	268.	259.	10.03
	HYDROGRAPH AT							
+		E28	44.	5.92	6.	2.	2.	.07
	ROUTED TO							
+			44.	6.00	6.	2.	2.	.07
	HYDROGRAPH AT							
+		E29	35.	5.83	4.	1.	1.	.05
	2 COMBINED AT							
+		EZZ	69.	5.92	9.	3.	3.	.12
	HYDROGRAPH AT							
+		W60	47.	5.83	5.	2.	2.	.07
	3 COMBINED AT							
+		ZZ	3350.	6.25	763.	274.	263.	10.22

1

*** NORMAL END OF HEC-1 ***

Appendix B: Proposed HEC-1 Calculations

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS        *
 *             JUN   1998                *                    *   HYDROLOGIC ENGINEERING CENTER       *
 *           VERSION 4.1                 *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   20MAY08  TIME  08:48:57   *                    *           (916) 756-1104              *
 *                                       *                    *                                       *
*****************************************                    *****************************************


                    X       X  XXXXXXX   XXXXX           X
                    X       X  X         X     X        XX
                    X       X  X         X               X
                    XXXXXXX    XXXX      X       XXXXX   X
                    X       X  X         X               X
                    X       X  X         X     X         X
                    X       X  XXXXXXX   XXXXX          XXX


    THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

    THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
    THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
    NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
    DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
    KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                              HEC-1 INPUT                                          PAGE  1

      LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

        1         ID    FALCON HIGHLANDS PRELIMINARY DRAINAGE PLAN - BASED ON DBPS MODEL F100FNLQ
        2         ID       ** DETENTION POND AT WU (BETWEEN SH 24 AND TAMLIN RD)
        3         ID       ** 2 Year, 5 Year and 100 Year Storm Events (24hr Storm)
        4         ID       **Basins W40 & W42 revised due to Meridian Crossing development
                  *DIAGRAM
        5         IT       5 25MAY05     800     300
        6         IO       5
        7         JR    PREC       1  1.2381  2.0952

        8         KK      W1
        9         KM
       10         BA   .0479
       11         PB     2.1
       12         IN      15
       13         PC   .0005   .0015   .0030   .0045   .0060   .0080   .0100   .0120   .0143   .0165
       14         PC   .0188   .0210   .0233   .0255   .0278   .0320   .0390   .0460   .0530   .0600
       15         PC   .0750   .1000   .4000   .7000   .7250   .7500   .7650   .7800   .7900   .8000
       16         PC   .8100   .8200   .8250   .8300   .8350   .8400   .8450   .8500   .8550   .8600
       17         PC   .8638   .8675   .8713   .8750   .8788   .8825   .8863   .8900   .8938   .8975
       18         PC   .9013   .9050   .9083   .9115   .9148   .9180   .9210   .9240   .9270   .9300
       19         PC   .9325   .9350   .9375   .9400   .9425   .9450   .9475   .9500   .9525   .9550
       20         PC   .9575   .9600   .9625   .9650   .9675   .9700   .9725   .9750   .9775   .9800
       21         PC   .9813   .9825   .9838   .9850   .9863   .9875   .9888   .9900   .9913   .9925
       22         PC   .9938   .9950   .9963   .9975   .9988   1.000
       23         LS              60
       24         UD    .097

       25         KK
       26         KM
       27         RK    1519   .0263    .035            TRAP       5       4

       28         KK      W2
       29         KM
       30         BA   .0278
       31         LS              60
       32         UD    .160

       33         KK      WA
       34         KM
       35         HC       2

       36         KK
       37         KM
       38         RK     464   .0151    .035            TRAP       5       4

       39         KK      W3
       40         KM
       41         BA   .0498
       42         LS              61
       43         UD    .139
1                                              HEC-1 INPUT                                          PAGE  2

      LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


       44         KK      WB
       45         KM
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```
46      HC       2

47      KK
48      KM
49      RK     823   .0279   .035        TRAP      5      4           54

50      KK      W4
51      KM
52      BA   .0054
53      LS             62
54      UD    .044

55      KK
56      KM
57      RK    1078   .0482   .035        TRAP      5      4

58      KK      W5
59      KM
60      BA   .0159
61      LS             60
62      UD    .075

63      KK      WC
64      KM
65      HC       3

66      KK
67      KM
68      RK     557   .0449   .035        TRAP     10      4

69      KK      W6
70      KM
71      BA   .0486
72      LS             60
73      UD    .085

74      KK
75      KM
76      RK     592   .0372   .035        TRAP      5      4

77      KK      W7
78      KM
79      BA   .0217
80      LS             60
81      UD    .074

82      KK
83      KM
84      RK     464   .1466   .035        TRAP      5      4
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LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

85      KK      WD
86      KM
87      HC       2

88      KK     D-E
89      KM
90      RK    1044   .0479   .035        TRAP      5      4

91      KK      W8
92      KM
93      BA   .0286
94      LS             60
95      UD    .069

96      KK
97      KM
98      RK    1449   .0504   .035        TRAP      5      4

99      KK      W9
100     KM
101     BA   .0402
102     LS             61
103     UD    .097

104     KK      WE
105     KM
106     HC       3

107     KK     E-F
108     KM
109     RK     789   .0038   .035        TRAP      5      4

110     KK     W10
111     KM
112     BA   .0431
113     LS             61
114     UD    .096

115     KK
116     KM
117     RK     824   .0388   .035        TRAP      5      4
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 118          KK     W11
 119          KM
 120          BA   .0314
 121          LS             60
 122          UD    .077

 123          KK     WF
 124          KM
 125          HC      4
1                                           HEC-1 INPUT                                             PAGE  4

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 126          KK     F-G
 127          KM
 128          RK    2319   .0211    .035            TRAP      10       4

 129          KK     W12
 130          KM
 131          BA   .0398
 132          LS             60
 133          UD    .095

 134          KK
 135          KM
 136          RK    2478   .0307    .035            TRAP       5       4

 137          KK     W14
 138          KM
 139          BA   .0473
 140          LS             61
 141          UD    .135

 142          KK
 143          KM
 144          RK      81  0.0001    .035            TRAP       5       4

 145          KK     W13
 146          KM
 147          BA   .1123
 148          LS             61
 149          UD    .182

 150          KK     WG
 151          KM
 152          HC      4

 153          KK     G-H
 154          KM
 155          RK    2632   .0217    .035            TRAP      15       4

 156          KK
 157          KM
 158          RK    2447   .0372    .035            TRAP       5       4

 159          KK     W15
 160          KM
 161          BA   .0881
 162          LS             61
 163          UD    .141

 164          KK
 165          KM
 166          RK    1763   .0289    .035            TRAP       5       4
1                                           HEC-1 INPUT                                             PAGE  5

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 167          KK     WH
 168          KM
 169          HC      2

 170          KK     W16
 171          KM
 172          BA   .0292
 173          LS             61
 174          UD    .092

 175          KK
 176          KM
 177          RK    1345   .0260    .035            TRAP       5       4

 178          KK     W17
 179          KM
 180          BA   .0184
 181          LS             60
 182          UD    .085

 183          KK     WI
 184          KM
 185          HC      2
```

```
   186          KK      I-M
   187          KM
   188          RK     2650   .0370    .035           TRAP        15        4

   189          KK      W19
   190          KM
   191          BA    .0428
   192          LS               61
   193          UD     .083

   194          KK
   195          KM
   196          RK      881   .0329    .035           TRAP         5        4

   197          KK      W20
   198          KM
   199          BA    .0315
   200          LS               61
   201          UD     .071

   202          KK       WJ
   203          KM
   204          HC        2

   205          KK
   206          KM
   207          RK     3061   .0235    .035           TRAP         5        4
1                                          HEC-1 INPUT                                            PAGE  6

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


   208          KK      W21
   209          KM
   210          BA    .1347
   211          LS               60
   212          UD     .156

   213          KK       WK
   214          KM
   215          HC        2

   216          KK
   217          KM
   218          RK      487   .0246    .035           TRAP         5        4

   219          KK      W22
   220          KM
   221          BA    .0086
   222          LS               63
   223          UD     .055

   224          KK       WL
   225          KM
   226          HC        2

   227          KK
   228          KM
   229          RK     1786   .0297    .035           TRAP         5        4

   230          KK      W23
   231          KM
   232          BA    .0244
   233          LS               60
   234          UD     .112

   235          KK      W18
   236          KM
   237          BA    .1251
   238          LS               60
   239          UD     .189

   240          KK       WM
   241          KM
   242          HC        5

   243          KK      M-N
   244          KM
   245          RK     1345   .0149    .035           TRAP        20        4

   246          KK      W24
   247          KM
   248          BA    .0442
   249          LS               60
   250          UD     .140
1                                          HEC-1 INPUT                                            PAGE  7

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


   251          KK      W25
   252          KM
   253          BA    .0957
   254          LS               61
   255          UD     .197
```

```
256           KK     WN
257           KM
258           HC      3

259           KK    N-P
260           KM
261           RK   1589   .017   .035          TRAP      20      4

262           KK    W28
263           KM
264           BA  .0397
265           LS            63
266           UD   .128

267           KK
268           KM
269           RK   1345  .0208   .035          TRAP       5      4

270           KK    W30
271           KM
272           BA  .0509
273           LS            63
274           UD   .123

275           KK
276           KM
277           RK   1078  .0074   .035          TRAP       5      4

278           KK    W29
279           KM
280           BA  .0409
281           LS            63
282           UD   .145

283           KK    W31
284           KM
285           BA  .0123
286           LS            63
287           UD   .073

288           KK     WO
289           KM
290           HC      4
1                                     HEC-1 INPUT                                          PAGE  8

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


291           KK    O-P
292           KM
293           RK   2169  .0226   .035          TRAP       5      4

294           KK    W26
295           KM
296           BA  .0301
297           LS            63
298           UD   .062

299           KK
300           KM
301           RK   4662  .0225   .035          TRAP       5      4

302           KK    W27
303           KM
304           BA  .1633
305           LS            60
306           UD   .253

307           KK    W32
308           KM
309           BA  .0890
310           LS            60
311           UD   .170

312           KK     WP
313           KM
314           HC      5

315           KK    P-Q
316           KM
317           RK   1925  .0182   .035          TRAP      25      4

318           KK   W33A
319           KM
320           BA  .1261
321           LS            60
322           UD   .186

323           KK    WP1
324           KM
325           HC      2

326           KK   P1-Q
327           KM
```

```
 328          RK    3000   .020    .035          TRAP      25       4

 329          KK    W33B
 330          KM
 331          BA   .1360
 332          LS            60
 333          UD    .225
1                                          HEC-1 INPUT                                              PAGE  9

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 334          KK    W34A
 335          KM
 336          BA   .1418
 337          LS            60
 338          UD    .173

 339          KK  34A-P2
 340          KM
 341          RK    2550  .0176    .035          TRAP      25       4

 342          KK    W34B
 343          KM
 344          BA   .1766
 345          LS            60
 346          UD    .224

 347          KK     WP2
 348          KM
 349          HC       2

 350          KK    P2-Q
 351          KM
 352          RK    2640   .021    .035          TRAP      25       4

 353          KK    W34C
 354          KM
 355          BA   .1625
 356          LS            60
 357          UD    .244

 358          KK      WQ
 359          KM
 360          HC       4

 361          KK    Q-Q1
 362          KM
 363          RK    2940   .022    .035          TRAP      25       4

 364          KK    W36A
 365          KM
 366          BA   .1429
 367          LS            60
 368          UD    .234

 369          KK     WQ1
 370          KM
 371          HC       2

 372          KK    Q1-R
 373          KM
 374          RK    3400   .022    .035          TRAP      25       4
1                                          HEC-1 INPUT                                              PAGE 10

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 375          KK    W36B
 376          KM
 377          BA   .1918
 378          LS            60
 379          UD    .306

 380          KK    W35A
 381          KM
 382          BA   .0958
 383          LS            60
 384          UD    .187

 385          KK  35A-WR
 386          KM
 387          RK    3715   .023    .035          TRAP      25       4

 388          KK    W35B
 389          KM
 390          BA   .1507
 391          LS       0    60
 392          UD    .259

 393          KK      WR
 394          KM
 395          HC       4

 396          KK    WR-S
```

```
 397          KM
 398          RK    2922   .0168    .035           TRAP      25       4

 399          KK    W37A
 400          KM
 401          BA   .1138
 402          LS             60
 403          UD    .185

 404          KK   37A-S
 405          KM
 406          RK    1430    .014    .035           TRAP      25       4

 407          KK    W37B
 408          KM
 409          BA   .1636
 410          LS             90
 411          UD    .218

 412          KK     WS
 413          KM
 414          HC      3
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 415          KK     S-T
 416          KM
 417          RK    3653   .0164    .035           TRAP      25       4

 418          KK     W38
 419          KM
 420          BA   .0907
 421          LS             62
 422          UD    .190

 423          KK
 424          KM
 425          RK    2922   .0171    .035           TRAP       5       4

 426          KK     W39
 427          KM
 428          BA   .1833
 429          LS             76
 430          UD    .251

 431          KK     W40
 432          KM
 433          BA   .0706
 434          LS             92
 435          UD    .165

 436          KK     WT
 437          KM
 438          HC      4

 439          KK   T-U
 440          KM
 441          RK    1125   .0098    .035           TRAP      25       4

 442          KK     W41
 443          KM
 444          BA   .0601
 445          LS             83
 446          UD    .117

 447          KK    POND
 448          KM
 449          HC      2

 450          KK   DIVOUT
 451          KM   DIVERT 35.8 CFS (2-YR HISTORIC FLOW) FROM DETENTION POND
 452          DT  DIVERT       0     35.8
 453          DI       0    35.8
 454          DQ       0    35.8
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 455          KK  PONDWU
 456          KM         REGIONAL DETENTION POND  Q5=94, Q100=1214
 457          SV     0.0   0.006     .09     .40    1.19    3.31    7.12   11.50   16.05
 458          SV   20.76   25.61   30.61   35.77   40.99
 459          SE    16.5      17      18      19      20      21      22      23      24
 460          SE      25      26      27      28      29
 461          SQ       0       0   27.40   46.66   67.77   81.84  249.51  544.89  923.33
 462          SQ  1090.5 1212.93 1323.91 1426.18 1521.53
 463          RS       1    ELEV    16.5

 464          KK    B-WU
 465          KM
 466          RK    2215   .0181    .035           TRAP      25       4
```

```
 467          KK   DIVIN
 468          KM   RETRIEVE 35.8 CFS DIVERTED IN CHANNEL
 469          DR   DIVERT

 470          KK     W42A
 471          KM
 472          BA    .0127
 473          LS              92
 474          UD     .180

 475          KK   42A-WU
 476          KM
 477          RK     1970  .0090    .013            TRAP        4        4

 478          KK      W42
 479          KM
 480          BA    .0519
 481          LS              92
 482          UD     .127

 483          KK     W42B
 484          KM
 485          BA    .0195
 486          LS              92
 487          UD     .180

 488          KK   42B-WU
 489          KM
 490          RK     2770  .0100     .013            TRAP        4        4

 491          KK       WU
 492          KM
 493          HC        5

 494          KK    U-V
 495          KM
 496          RK     2200   .0145    .035            TRAP       25        4
1                                              HEC-1 INPUT                                              PAGE 13

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 497          KK      W43
 498          KM
 499          BA    .1457
 500          LS              64
 501          UD     .169

 502          KK       WV
 503          KM
 504          HC        2

 505          KK      V-W
 506          KM
 507          RK      487   .0103    .035            TRAP       25        4

 508          KK      W45
 509          KM
 510          BA    .1931
 511          LS              61
 512          UD     .189

 513          KK       WW
 514          KM
 515          HC        2
 516          ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   8       W1
            V
            V
  25
            .
            .
  28        .        W2
            .         .
            .         .
  33       WA ...........
            V
            V
  36
            .
            .
  39        .        W3
            .         .
            .         .
  44       WB ...........
            V
            V
  47
```

```
                        .
                        .
      50                .              W4
                        .               V
                        .               V
      55                .
                        .               .
                        .               .
      58                .               .               W5
                        .               .                .
                        .               .                .
      63              WC ...............................
                        V
                        V
      66

                        .
                        .
      69                .              W6
                        .               V
                        .               V
      74                .
                        .               .
                        .               .
      77                .               .               W7
                        .               .                V
                        .               .                V
      82                .               .
                        .               .                .
                        .               .                .
      85                .              WD ...............
                        .               V
                        .               V
      88                .              D-E
                        .               .
                        .               .
      91                .               .               W8
                        .               .                V
                        .               .                V
      96                .               .
                        .               .                .
                        .               .                .
      99                .               .                .              W9
                        .               .                .               .
                        .               .                .               .
     104                .              WE ...............................
                        .               V
                        .               V
     107                .              E-F
                        .               .
                        .               .
     110                .               .               W10
                        .               .                V
                        .               .                V
     115                .               .
                        .               .                .
                        .               .                .
     118                .               .                .              W11
                        .               .                .               .
                        .               .                .               .
     123               WF ..............................................
                        V
                        V
     126               F-G
                        .
                        .
     129                .              W12
                        .               V
                        .               V
     134                .
                        .               .
                        .               .
     137                .               .               W14
                        .               .                V
                        .               .                V
     142                .               .
                        .               .                .
                        .               .                .
     145                .               .                .              W13
                        .               .                .               .
                        .               .                .               .
     150               WG ..............................................
                        V
                        V
     153               G-H
                        V
                        V
     156

                        .
                        .
     159                .              W15
                        .               V
                        .               V
     164                .
                        .               .
                        .               .
```

```
 167         WH ............
               .
               .
 170           .         W16
               .           V
               .           V
 175           .
               .           .
               .           .
 178           .           .         W17
               .           .           .
               .           .           .
 183           .         WI ............
               .           V
               .           V
 186           .         I-M
               .           .
               .           .
 189           .           .         W19
               .           .           V
               .           .           V
 194           .           .
               .           .           .
               .           .           .
 197           .           .           .         W20
               .           .           .           .
               .           .           .           .
 202           .           .         WJ ............
               .           .           V
               .           .           V
 205           .           .
               .           .           .
               .           .           .
 208           .           .           .         W21
               .           .           .           .
               .           .           .           .
 213           .           .         WK ............
               .           .           V
               .           .           V
 216           .           .
               .           .           .
               .           .           .
 219           .           .           .         W22
               .           .           .           .
               .           .           .           .
 224           .           .         WL ............
               .           .           V
               .           .           V
 227           .           .
               .           .           .
               .           .           .
 230           .           .           .         W23
               .           .           .           .
               .           .           .           .
 235           .           .           .           .         W18
               .           .           .           .           .
               .           .           .           .           .
 240         WM ................................................
               V
               V
 243         M-N
               .
               .
 246           .         W24
               .           .
               .           .
 251           .           .         W25
               .           .           .
               .           .           .
 256         WN ........................
               V
               V
 259         N-P
               .
               .
 262           .         W28
               .           V
               .           V
 267           .
               .           .
               .           .
 270           .           .         W30
               .           .           V
               .           .           V
 275           .           .
               .           .           .
               .           .           .
 278           .           .           .         W29
               .           .           .           .
               .           .           .           .
 283           .           .           .           .         W31
               .           .           .           .           .
               .           .           .           .           .
 288           .         WO ....................................
               .           V
```

```
                .          V
 291            .         O-P
                .          .
                .          .
 294            .          .         W26
                .          .          V
                .          .          V
 299            .          .
                .          .          .
                .          .          .
 302            .          .          .         W27
                .          .          .          .
                .          .          .          .
 307            .          .          .          .         W32
                .          .          .          .          .
                .          .          .          .          .
 312          WP ........................................
                V
                V
 315           P-Q
                .
                .
 318            .         W33A
                .          .
                .          .
 323          WP1...........
                V
                V
 326          P1-Q
                .
                .
 329            .         W33B
                .          .
                .          .
 334            .          .        W34A
                .          .          V
                .          .          V
 339            .          .      34A-P2
                .          .          .
                .          .          .
 342            .          .          .         W34B
                .          .          .          .
                .          .          .          .
 347            .          .        WP2...........
                .          .          V
                .          .          V
 350            .          .         P2-Q
                .          .          .
                .          .          .
 353            .          .          .         W34C
                .          .          .          .
                .          .          .          .
 358           WQ ...............................
                V
                V
 361          Q-Q1
                .
                .
 364            .         W36A
                .          .
                .          .
 369          WQ1...........
                V
                V
 372          Q1-R
                .
                .
 375            .         W36B
                .          .
                .          .
 380            .          .        W35A
                .          .          V
                .          .          V
 385            .          .      35A-WR
                .          .          .
                .          .          .
 388            .          .          .         W35B
                .          .          .          .
                .          .          .          .
 393           WR ...............................
                V
                V
 396          WR-S
                .
                .
 399            .         W37A
                .          V
                .          V
 404            .        37A-S
                .          .
                .          .
 407            .          .        W37B
                .          .          .
                .          .          .
 412           WS ....................
```

```
                V
                V
415           S-T
                .
                .
418             .        W38
                .          V
                .          V
423             .
                .          .
                .          .
426             .          .         W39
                .          .           .
                .          .           .
431             .          .           .         W40
                .          .           .           .
                .          .           .           .
436           WT ....................................
                V
                V
439        T-U
                .
                .
442             .        W41
                .          .
                .          .
447         POND............
                .
                .
452             .-------> DIVERT
450        DIVOU
                V
                V
455       PONDWU
                V
                V
464        B-WU
                .
                .
469             .          .<-------  DIVERT
467             .      DIVIN
                .          .
                .          .
470             .          .        W42A
                .          .           V
                .          .           V
475             .          .      42A-WU
                .          .           .
                .          .           .
478             .          .           .         W42
                .          .           .           .
                .          .           .           .
483             .          .           .           .        W42B
                .          .           .           .           V
                .          .           .           .           V
488             .          .           .           .      42B-WU
                .          .           .           .           .
                .          .           .           .           .
491            WU...............................................
                V
                V
494         U-V
                .
                .
497             .        W43
                .          .
                .          .
502           WV ............
                V
                V
505           V-W
                .
                .
508             .        W45
                .          .
                .          .
513           WW ............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                        *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*              JUN   1998                *
*            VERSION 4.1                 *
*                                        *
*  RUN DATE   20MAY08  TIME  08:48:57    *
*                                        *
******************************************
```

```
*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
```

FALCON HIGHLANDS PRELIMINARY DRAINAGE PLAN - BASED ON DBPS MODEL F100FNLQ
** DETENTION POND AT WU (BETWEEN SH 24 AND TAMLIN RD)

** 2 Year, 5 Year and 100 Year Storm Events (24hr Storm)
**Basins W40 & W42 revised due to Meridian Crossing development

```
6 IO          OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

  IT          HYDROGRAPH TIME DATA
                     NMIN           5  MINUTES IN COMPUTATION INTERVAL
                    IDATE     25MAY 5  STARTING DATE
                    ITIME        0800  STARTING TIME
                       NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     26MAY 5  ENDING DATE
                   NDTIME        0855  ENDING TIME
                    ICENT          19  CENTURY MARK

               COMPUTATION INTERVAL     .08 HOURS
                    TOTAL TIME BASE   24.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT

  JP           MULTI-PLAN OPTION
                   NPLAN            1  NUMBER OF PLANS

  JR           MULTI-RATIO OPTION
                  RATIOS OF PRECIPITATION
                 1.00      1.24      2.10

      *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

      *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

1
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 1.00	RATIO 2 1.24	RATIO 3 2.10
HYDROGRAPH AT +	W1	.05	1	FLOW	1.	5.	40.
				TIME	5.83	5.83	5.75
ROUTED TO +		.05	1	FLOW	0.	4.	37.
				TIME	6.00	5.92	5.83
HYDROGRAPH AT +	W2	.03	1	FLOW	0.	2.	20.
				TIME	5.92	5.83	5.83
2 COMBINED AT +	WA	.08	1	FLOW	1.	6.	57.
				TIME	6.00	5.92	5.83
ROUTED TO +		.08	1	FLOW	1.	6.	55.
				TIME	6.08	5.92	5.83
HYDROGRAPH AT +	W3	.05	1	FLOW	1.	5.	39.
				TIME	5.83	5.83	5.83
2 COMBINED AT +	WB	.13	1	FLOW	1.	11.	95.
				TIME	6.08	5.92	5.83
ROUTED TO +		.13	1	FLOW	1.	10.	91.
				TIME	6.17	5.92	5.83
HYDROGRAPH AT +	W4	.01	1	FLOW	0.	1.	6.
				TIME	5.75	5.75	5.75
ROUTED TO +		.01	1	FLOW	0.	1.	6.
				TIME	5.92	5.83	5.75

HYDROGRAPH AT +	W5	.02	1	FLOW TIME	0. 5.83	2. 5.75	15. 5.75
3 COMBINED AT +	WC	.15	1	FLOW TIME	1. 6.17	11. 5.92	105. 5.83
ROUTED TO +		.15	1	FLOW TIME	1. 6.25	11. 5.92	103. 5.83
HYDROGRAPH AT +	W6	.05	1	FLOW TIME	1. 5.83	5. 5.83	43. 5.75
ROUTED TO +		.05	1	FLOW TIME	0. 5.92	5. 5.83	40. 5.75
HYDROGRAPH AT +	W7	.02	1	FLOW TIME	0. 5.83	2. 5.75	20. 5.75
ROUTED TO +		.02	1	FLOW TIME	0. 5.83	2. 5.83	20. 5.75
2 COMBINED AT +	WD	.07	1	FLOW TIME	1. 5.83	7. 5.83	60. 5.75
ROUTED TO +	D-E	.07	1	FLOW TIME	1. 5.92	6. 5.83	55. 5.75
HYDROGRAPH AT +	W8	.03	1	FLOW TIME	0. 5.83	3. 5.75	27. 5.75
ROUTED TO +		.03	1	FLOW TIME	0. 5.92	3. 5.83	24. 5.75
HYDROGRAPH AT +	W9	.04	1	FLOW TIME	1. 5.83	5. 5.83	36. 5.75
3 COMBINED AT +	WE	.14	1	FLOW TIME	1. 5.92	14. 5.83	114. 5.75
ROUTED TO +	E-F	.14	1	FLOW TIME	1. 6.08	13. 5.92	108. 5.83
HYDROGRAPH AT +	W10	.04	1	FLOW TIME	1. 5.83	5. 5.83	39. 5.75
ROUTED TO +		.04	1	FLOW TIME	1. 5.92	5. 5.83	36. 5.75
HYDROGRAPH AT +	W11	.03	1	FLOW TIME	0. 5.83	3. 5.75	29. 5.75
4 COMBINED AT +	WF	.36	1	FLOW TIME	3. 6.08	29. 5.92	265. 5.83
ROUTED TO +	F-G	.36	1	FLOW TIME	3. 6.25	28. 6.00	255. 5.83
HYDROGRAPH AT +	W12	.04	1	FLOW TIME	0. 5.83	4. 5.83	33. 5.75
ROUTED TO +		.04	1	FLOW TIME	0. 6.17	4. 5.92	32. 5.83
HYDROGRAPH AT +	W14	.05	1	FLOW TIME	1. 5.83	5. 5.83	38. 5.83
ROUTED TO +		.05	1	FLOW TIME	1. 5.92	5. 5.92	37. 5.83
HYDROGRAPH AT +	W13	.11	1	FLOW	2.	10.	80.

HYDROGRAPH AT +	W33B	.14	1	FLOW TIME	1. 6.33	9. 5.92	78. 5.92
HYDROGRAPH AT +	W34A	.14	1	FLOW TIME	1. 6.33	10. 5.92	96. 5.83
ROUTED TO +	34A-P2	.14	1	FLOW TIME	1. 6.33	10. 6.08	93. 5.92
HYDROGRAPH AT +	W34B	.18	1	FLOW TIME	1. 6.33	11. 5.92	101. 5.92
2 COMBINED AT +	WP2	.32	1	FLOW TIME	2. 6.33	20. 6.00	195. 5.92
ROUTED TO +	P2-Q	.32	1	FLOW TIME	2. 6.75	19. 6.17	186. 6.00
HYDROGRAPH AT +	W34C	.16	1	FLOW TIME	1. 6.33	10. 6.00	90. 5.92
4 COMBINED AT +	WQ	2.37	1	FLOW TIME	19. 6.92	115. 6.25	1336. 6.00
ROUTED TO +	Q-Q1	2.37	1	FLOW TIME	19. 7.08	114. 6.33	1294. 6.00
HYDROGRAPH AT +	W36A	.14	1	FLOW TIME	1. 6.33	9. 5.92	81. 5.92
2 COMBINED AT +	WQ1	2.51	1	FLOW TIME	20. 7.08	118. 6.33	1363. 6.00
ROUTED TO +	Q1-R	2.51	1	FLOW TIME	20. 7.25	117. 6.42	1320. 6.08
HYDROGRAPH AT +	W36B	.19	1	FLOW TIME	1. 6.42	10. 6.00	91. 6.00
HYDROGRAPH AT +	W35A	.10	1	FLOW TIME	1. 6.33	7. 5.92	62. 5.83
ROUTED TO +	35A-WR	.10	1	FLOW TIME	1. 6.92	6. 6.25	58. 6.00
HYDROGRAPH AT +	W35B	.15	1	FLOW TIME	1. 6.42	9. 6.00	81. 5.92
4 COMBINED AT +	WR	2.95	1	FLOW TIME	22. 7.17	132. 6.42	1506. 6.08
ROUTED TO +	WR-S	2.95	1	FLOW TIME	22. 7.33	131. 6.50	1485. 6.08
HYDROGRAPH AT +	W37A	.11	1	FLOW TIME	1. 6.33	8. 5.92	74. 5.83
ROUTED TO +	37A-S	.11	1	FLOW TIME	1. 6.58	8. 6.00	71. 5.92
HYDROGRAPH AT +	W37B	.16	1	FLOW TIME	145. 5.83	201. 5.83	410. 5.83
3 COMBINED AT +	WS	3.23	1	FLOW TIME	145. 5.83	201. 5.83	1705. 6.08
ROUTED TO +	S-T	3.23	1	FLOW TIME	140. 5.92	197. 5.92	1632. 6.17
HYDROGRAPH AT +	W38	.09	1	FLOW TIME	2. 5.92	10. 5.92	67. 5.83

ROUTED TO							
+		.09	1	FLOW	2.	9.	66.
				TIME	6.25	6.08	5.92
HYDROGRAPH AT							
+	W39	.18	1	FLOW	49.	85.	251.
				TIME	5.92	5.92	5.92
HYDROGRAPH AT							
+	W40	.07	1	FLOW	76.	102.	201.
				TIME	5.75	5.75	5.75
4 COMBINED AT							
+	WT	3.57	1	FLOW	244.	359.	1867.
				TIME	5.92	5.83	6.08
ROUTED TO							
+	T-U	3.57	1	FLOW	243.	358.	1821.
				TIME	5.92	5.92	6.17
HYDROGRAPH AT							
+	W41	.06	1	FLOW	40.	60.	142.
				TIME	5.75	5.75	5.75
2 COMBINED AT							
+	POND	3.63	1	FLOW	264.	392.	1839.
				TIME	5.92	5.83	6.17
DIVERSION TO							
+	DIVERT	3.63	1	FLOW	36.	36.	36.
				TIME	5.58	5.50	5.42
HYDROGRAPH AT							
+ -	DIVOU	3.63	1	FLOW	229.	356.	1804.
				TIME	5.92	5.83	6.17
ROUTED TO							
+	PONDWU	3.63	1	FLOW	118.	223.	1313.
				TIME	6.17	6.08	6.33
			** PEAK STAGES IN FEET **				
			1	STAGE	20.68	7.42	26.90
				TIME	5.92	6.08	6.33
ROUTED TO							
+	B-WU	3.63	1	FLOW	116.	219.	1298.
				TIME	10.58	9.92	8.75
HYDROGRAPH AT							
+	DIVIN	.00	1	FLOW	36.	36.	36.
				TIME	5.58	5.50	5.42
HYDROGRAPH AT							
+	W42A	.01	1	FLOW	13.	18.	35.
				TIME	5.83	5.83	5.75
ROUTED TO							
+	42A-WU	.01	1	FLOW	13.	18.	35.
				TIME	6.17	6.17	6.08
HYDROGRAPH AT							
+	W42	.05	1	FLOW	60.	81.	156.
				TIME	5.75	5.75	5.75
HYDROGRAPH AT							
+	W42B	.02	1	FLOW	21.	28.	54.
				TIME	5.83	5.83	5.75
ROUTED TO							
+	42B-WU	.02	1	FLOW	20.	27.	54.
				TIME	5.92	5.92	5.83
5 COMBINED AT							
+	WU	3.72	1	FLOW	135.	256.	1339.
				TIME	10.58	9.92	8.75
ROUTED TO							
+	U-V	3.72	1	FLOW	135.	253.	1333.
				TIME	10.67	10.00	8.75
HYDROGRAPH AT							
+	W43	.15	1	FLOW	7.	24.	132.
				TIME	5.92	5.83	5.83
2 COMBINED AT							
+	WV	3.86	1	FLOW	135.	254.	1338.
				TIME	10.67	10.00	8.75
ROUTED TO							
+	V-W	3.86	1	FLOW	133.	249.	1334.
				TIME	10.75	10.00	8.75
HYDROGRAPH AT							
+	W45	.19	1	FLOW	3.	17.	134.

MERIDIAN CROSSING FILING NO. 1 - FDR - EXISTING CONDITIONS
SURFACE ROUTING

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)
1	E-1	1.96	2.07	6.4	4.8	8.5	9.4	17.6
				TRAVEL TIME				
		1.96	2.07	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					265	4.2	1.1	7.4
2	DP-1	1.96	2.07	7.4	4.6	8.1	22.9	48.7
	E-2	3.07	3.94	TRAVEL TIME				
		5.03	6.01	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					1500	4.7	5.3	12.7
3	E-4	1.94	2.04	6.3	4.8	8.5	9.3	17.5
				TRAVEL TIME				
		1.94	2.04	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					900	4.1	3.7	9.9
5	E-7	2.09	2.20	5.4	5.0	8.9	10.5	19.7
				TRAVEL TIME				
		2.09	2.20	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					347	2.0	2.9	8.3
4	E-6	2.36	2.49	5.8	4.9	8.7	11.6	21.7
				TRAVEL TIME				
		2.36	2.49	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					62	9.0	0.1	5.9
6	DP-2	5.03	6.01	16.1	3.4	6.0	67.8	149.7
	DP-3	1.94	2.04					
	E-8	8.36	10.75					
	E-3	4.89	6.28	TRAVEL TIME				
		20.21	25.09	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					36	1.5	0.4	16.5
7	DP-6	20.21	25.09	16.5	3.3	5.9	67.0	148.5
	DP-5 (INLET)	0.00	0.08					
	DP-4 (INLET)	0.00	0.00	TRAVEL TIME				
		20.21	25.17	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					139	8.4	0.3	16.8
8	DP-7	20.21	25.17	16.8	3.3	5.9	147.7	1286.1
	POND WU*	19.44	188.25					
	WEST TRIB CHAN.*	1.96	2.07					
	E-5	3.29	4.23					
				TRAVEL TIME				
		44.91	219.72	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					83	5.8	0.2	17.0

* VALUES WERE OBTAINED FROM THE APPROVED MARKET PLACE FILING NO. 1 DRAINAGE REPORT

MERIDIAN CROSSING FILING NO. 1 - FDR - EXISTING CONDITIONS
INLET CALCULATIONS

							Q_5						Q_{100}					
DP	Inlet size L(i)	INLET TYPE	CROSS SLOPE	STREET SLOPE	Q(5)	Q(100)	Qi	CA(eqv.)	FB	CA(eqv.)	DEPTH (max)	SPREAD	Qi	CA(eqv.)	FB	CA(eqv.)	DEPTH (max)	SPREAD
1	15	FLOW-BY	2.0%	1.0%	9	18	6.4	1.34	3	0.62	0.42	16.7	10.8	1.27	7	0.80	0.51	21.1
3	20	SUMP	2.0%	SAG	9	17	9.3	1.94	0	0.00	0.50		17.5	2.04	0	0.00	0.50	
4	25	SUMP	2.0%	SAG	12	22	11.6	2.36	0	0.00	0.50		21.7	2.49	0	0.00	0.50	
5	20	SUMP	2.0%	SAG	10	20	10.5	2.09	0	0.00	0.50		18.9	2.12	1	0.08	0.50	

Appendix D: Proposed Rational Calculations

MERIDIAN CROSSING - FDR - PROPOSED CONDITIONS
(RATIONAL METHOD Q=CIA)

BASIN	TOTAL FLOWS				AREA	WEIGHTED		OVERLAND				CHANNEL				Tc	INTENSITY		COMMENTS
	Q_5	Q_{100}	CA(equiv.)		TOTAL	C_5	C_{100}	C_5	Length	Slope	Tco	Length	Slope	Velocity	Tcc	TOTAL	I_5	I_{100}	
	(c.f.s.)	(c.f.s.)	5 YR	100 YR	(Ac)				(ft)	(ft)	(min)	(ft)	(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	
D-1	9.4	17.6	1.96	2.07	2.18	0.90	0.95	0.90	5	2.0%	0.7	867	1.6%	2.5	5.7	6.4	4.8	8.5	
D-2	23.4	43.9	4.63	4.88	5.14	0.90	0.95	0.90	10	2.0%	0.9	675	1.8%	2.6	4.3	5.2	5.1	9.0	
D-3	34.7	65.1	10.34	10.92	11.49	0.90	0.95	0.25	20	2.0%	5.7	1,370	1.2%	2.2	10.4	16.1	3.4	6.0	
D-4	9.3	17.5	1.94	2.04	2.15	0.90	0.95	0.90	5	2.0%	0.7	848	1.6%	2.5	5.6	6.3	4.8	8.5	
D-5	12.1	27.8	3.29	4.23	9.41	0.35	0.45	0.25	60	10.0%	5.8	1,020	1.4%	2.3	7.3	13.0	3.7	6.6	
D-6	11.6	21.7	2.36	2.49	2.62	0.90	0.95	0.90	5	2.0%	0.7	873	2.0%	2.8	5.1	5.8	4.9	8.7	
D-7	10.5	19.7	2.09	2.20	2.32	0.90	0.95	0.90	5	2.0%	0.7	797	2.0%	2.8	4.7	5.4	5.0	8.9	
D-8	82.8	155.5	21.50	22.70	23.89	0.90	0.95	0.25	10	2.0%	4.0	1,315	2.0%	2.8	7.7	11.7	3.8	6.9	
D-9	16.9	31.8	3.31	3.50	3.68	0.90	0.95	0.90	5	2.0%	0.7	525	1.2%	2.2	4.0	5.0	5.1	9.1	
D-10	1.9	3.6	0.38	0.40	0.42	0.90	0.95	0.90	5	2.0%	0.7	400	4.0%	4.0	1.7	5.0	5.1	9.1	
D-11	1.8	3.4	0.35	0.37	0.39	0.90	0.95	0.90	5	2.0%	0.7	400	4.0%	4.0	1.7	5.0	5.1	9.1	
D-12	1.8	3.3	0.43	0.45	0.48	0.90	0.95	0.90	5	2.0%	0.7	800	0.5%	1.4	9.4	10.1	4.1	7.3	
D-20	5.9	11.2	1.47	1.55	1.63	0.90	0.95	0.90	10	2.0%	0.9	800	0.5%	1.4	9.4	10.4	4.0	7.2	
Formula:	C*I*A	C*I*A	Q/I	Q/I	65.80						*1			*2 20	*3	Tco+Tcc	*4 1.5	*6 2.67	

1* Tco = 1.87*(1.1-C5)*(L^0.5)*((S*100)^-0.33) (DCM page 5-11)
2* Vc = 20*S^0.5 (USDCM RO-4)
3* Tcc = 1/V*L/60
4* I_5 = (26.65*1.50)/(10+Tc)^0.76 (City Letter of 1/7/2003)
6* I_{100} =(26.65*2.67)/(10+Tc)^0.76 (City Letter of 1/7/2003)

MERIDIAN CROSSING - FDR - PROPOSED CONDITIONS
SURFACE ROUTING

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(equivalent) CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
1	D-1	1.96	2.07	6.4	4.8	8.5	9.4	17.6
				TRAVEL TIME				
		1.96	2.07	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					250	4.2	1.0	7.4
J	D-10	0.38	0.40	5.0	5.1	9.1	3.7	7.0
	D-11	0.35	0.37	TRAVEL TIME				
		0.73	0.77	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				Gutter	820	5.0	2.7	7.7
B	D-12	0.43	0.45	10.1	4.1	7.3	4.7	8.9
	DP-J	0.73	0.77					
				TRAVEL TIME				
		1.16	1.22	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				Channel	40	1.8	0.4	10.5
X	D-9	3.31	3.50	5.0	5.1	9.1	16.9	31.8
				TRAVEL TIME				
		3.31	3.50	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				Pipe	420	7.9	0.9	5.9
Z	D-2	4.63	4.88	10.5	4.0	7.2	44.6	83.8
	DP-X	3.31	3.50					
	Inlet 1 Flowby	0.62	0.80					
	Inlet 1	1.34	1.27					
	DP-B	1.16	1.22	TRAVEL TIME				
		11.06	11.67	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				Channel	725	3.8	3.2	13.6
Y	D-3	10.34	10.92	16.1	3.4	6.0	34.7	65.1
				TRAVEL TIME				
		10.34	10.92	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				Channel	895	2.4	6.2	22.3
3	D-4	1.94	2.04	6.3	4.8	8.5	9.3	17.5
				TRAVEL TIME				
		1.94	2.04	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						0.0	0.0	6.3

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)
E	DP-3	1.94	2.04	13.6	3.6	6.4	46.9	88.2
	DP-Z	11.06	11.67	TRAVEL TIME				
		12.99	13.71	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				Channel	750	5.8	2.1	15.8
5	D-7	2.09	2.20	5.4	5.0	8.9	10.5	19.7
				TRAVEL TIME				
		2.09	2.20	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					150	2.0	1.3	6.6
4	D-6	2.36	2.49	5.8	4.9	8.7	11.6	21.7
				TRAVEL TIME				
		2.36	2.49	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					85	9.0	0.2	6.0
6	D-8	21.50	22.70	22.3	2.8	5.1	127.7	239.9
	DP-E	12.99	13.71					
	DP-Y	10.34	10.92	TRAVEL TIME				
		44.83	47.33	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				Pipe	36	10.0	0.1	22.4
7	DP-6	44.83	47.33	22.4	2.8	5.1	140.2	264.8
	DP-5 (INLET)	2.09	2.49					
	DP-4 (INLET)	2.36	2.49	TRAVEL TIME				
		49.28	52.30	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				Channel	110	8.4	0.2	22.6
8	DP-7	49.28	52.30	22.6	2.8	5.0	209.4	1243.5
	POND WU*	19.44	188.25					
	WEST TRIB CHAN.*	1.96	2.07					
	D-5	3.29	4.23	TRAVEL TIME				
		73.98	246.86	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					83	5.8	0.2	22.8

* VALUES WERE OBTAINED FROM THE APPROVED MARKET PLACE FILING NO. 1 DRAINAGE REPORT

** VALUES WERE OBTAINED FROM LOWES DRAINAGE REPORT

MERIDIAN CROSSING - FDR - PROPOSED CONDITIONS
INLET CALCULATIONS

							Q_5						Q_{100}					
DP	Inlet size L(i)	INLET TYPE	CROSS SLOPE	STREET SLOPE	Q(5)	Q(100)	Qi	CA(eqv.)	FB	CA(eqv.)	DEPTH (max)	SPREAD	Qi	CA(eqv.)	FB	CA(eqv.)	DEPTH (max)	SPREAD
1	15	FLOW-BY	2.0%	1.0%	9	18	6.4	1.34	3	0.62	0.42	16.7	10.8	1.27	7	0.80	0.51	21.1
3	20	SUMP	2.0%	SAG	9	17	9.3	1.94	0	0.00	0.50		17.5	2.04	0	0.00	0.50	
4	25	SUMP	2.0%	SAG	12	22	11.6	2.36	0	0.00	0.50		21.7	2.49	0	0.00	0.50	
5	20	SUMP	2.0%	SAG	10	20	10.5	2.09	0	0.00	0.50		18.9	2.12	0.7	0.08	0.50	

MERIDIAN CROSSING - FDR - PROPOSED CONDITIONS
PIPE ROUTING

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent)		Tc	INTENSITY		TOTAL FLOWS	
		CA(5)	CA(100)	(min.)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
1	INLET DP-1	1.34	1.27	6.4	4.8	8.5	6	11
				TRAVEL TIME				
		1.34	1.27	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				18" RCP	270	7.1	0.6	7.0
X	DP-X	3.31	3.50	5.0	5.1	9.1	17	32
				TRAVEL TIME				
		3.31	3.50	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				30" RCP	400	7.1	0.9	5.9
Z	DP-B	1.16	1.22	10.5	4.0	7.2	37	69
	DP-2	4.63	4.88					
	DP-X	3.31	3.50	TRAVEL TIME				
		9.10	9.60	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
				36" RCP	400	7.1	0.9	11.4

STREET CAPACITY

VERTICAL CURB

FOR 1/2 STREET SECTION

	Formula	Slope	Slope	n	Type	flow	Q_{max}	Q	Comments
Residential	$Q=171.7\ S^{1/2}$	0.5%	0.02	0.016	V	0.5	34	12.0	
		1.0%					34	17.0	
		1.5%					34	20.8	
		2.0%					34	24.1	
		2.5%					34	26.9	
		3.0%					34	29.5	
		3.5%					34	31.8	
		4.0%					34	34.0	
Collector/Arterial	$Q=171.7\ S^{1/2}$	0.5%	0.02	0.016	V	0.5	34	12.0	
		1.0%					34	17.0	
		1.5%					34	20.8	
		2.0%					34	24.1	
		2.5%					34	26.9	
		3.0%					34	29.5	
		3.5%					34	31.8	
		4.0%					34	34.0	

STREET CAPACITY

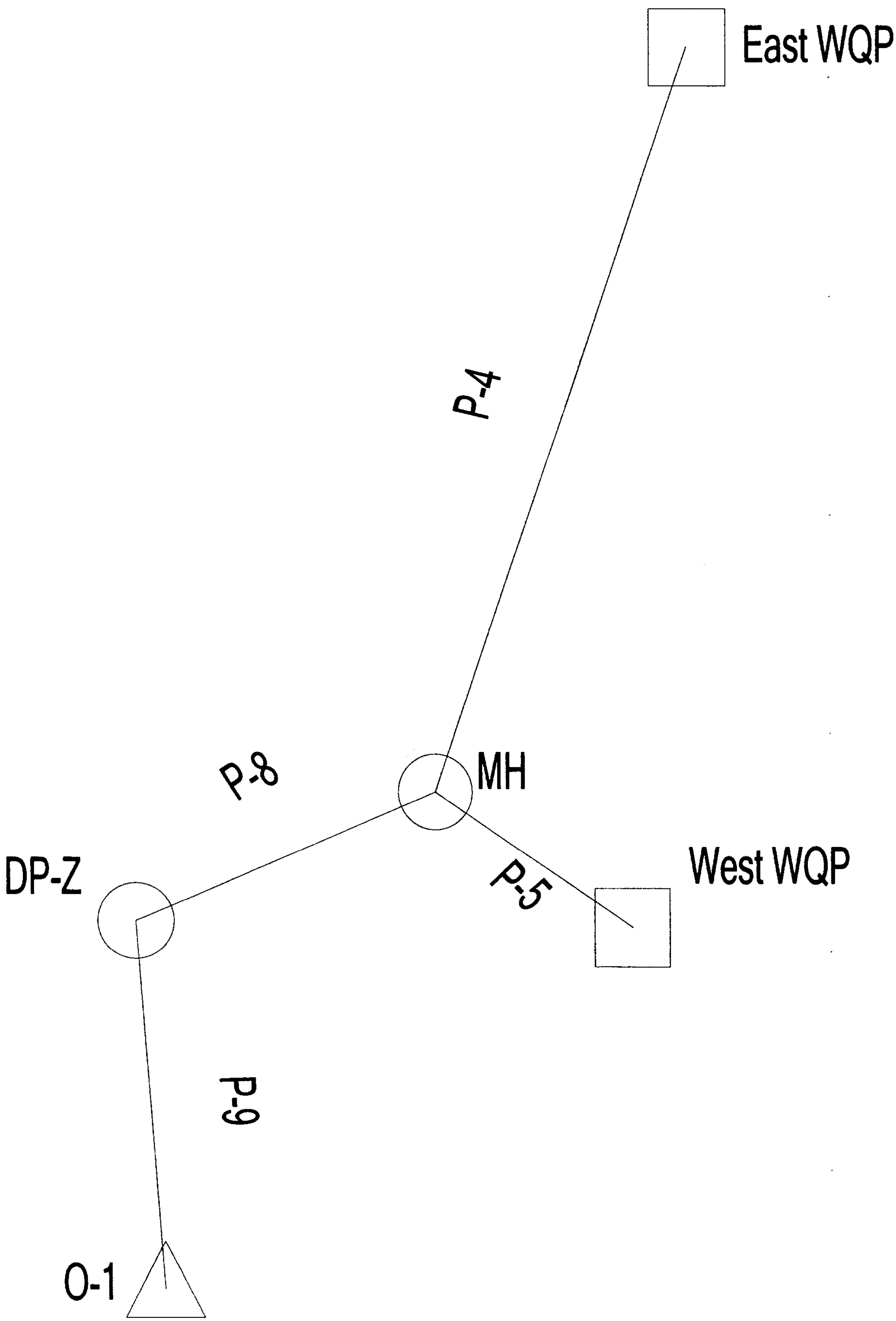
RAMP CURB

FOR 1/2 STREET SECTION

	Formula	Slope	Slope	n	Type	flow	Q_{max}	Q	Comments
Residential	$Q=112.6\ S^{1/2}$	0.5%	0.02	0.016	R	0.5	20	8.0	County ramp curb is 6"
		1.0%					20	11.3	
		1.5%					20	13.8	
		2.0%					20	15.9	
		2.5%					20	17.8	
		3.0%					20	19.5	
		3.15%					20	20.0	

Appendix E: StormCAD Calculations

Scenario: 100-year



Analysis Results
Scenario: 100-year

Note:
The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Title: Old Meridian Road
Project Engineer: Charlene Sammons
Project Date: 11/14/07
Comments: Storm in Old Meridian Road for Meridian Crossing Storm Sewer

Scenario Summary

Scenario	100-year
Physical Properties Alternat	Base-Physical Properties
Catchments Alternative	Catchments-100-year
System Flows Alternative	Base-System Flows
Structure Headlosses Alterr	Base-Structure Headlosses
Boundary Conditions Altern	Base-Boundary Conditions
Design Constraints Alternat	Base-Design Constraints
Capital Cost Alternative	Base-Cost
User Data Alternative	Base-User Data

Network Inventory

Number of Pipes	4	Number of Inlets	2
- Circular Pipes:	4	- Grate Inlets:	0
- Box Pipes:	0	- Curb Inlets:	0
- Arch Pipes:	0	- Combination Inlets:	0
- Vertical Elliptical Pipes:	0	- Slot Inlets:	0
- Horizontal Elliptical Pipes:	0	- Grate Inlets in Ditch:	0
Number of Junctions	2	- Generic Inlets:	2
Number of Outlets	1		

Circular Pipes Inventory

30 inch	426.11 ft	42 inch	167.58 ft
36 inch	5.58 ft		
Total Length	599.27 ft		

Generic Inlet Inventory

Default 100%	2

Junction elements for network with outlet: O-1

Label	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	Headloss Method	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/hr)	System Flow Time (min)	System CA (acres)
DP-Z	5,841.13	5,840.07	1.06	Standai	0.00	0.00	72.94	8.64	6.22	8.38
MH	5,842.25	5,841.42	0.83	Standai	0.00	0.00	73.34	8.68	6.09	8.38

Inlet elements for network with outlet: O-1

Label	Inlet	Total System Flow (cfs)	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Bypass Target	Capture Efficiency (%)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	Headloss Method
East WQP	Generic Default 1	32.00	32.00	0.00	N/A	100.0	5,844.85	5,844.85	0.00	Absolut
West WQP	Generic Default 1	44.27	44.27	0.00	N/A	100.0	5,842.28	5,842.28	0.00	Absolut

Analysis Results
Scenario: 100-year

Outlet: O-1

Label	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/hr)	System Flow Time (min)	System CA (acres)
O-1	;,836.40	;,836.40	0.00	0.00	0.00	72.41	8.57	6.40	8.38

Pipe elements for network with outlet: O-1

Label	Section Shape	Section Size	Length (ft)	Number of Sections	Constructed Slope (ft/ft)	Energy Slope (ft/ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-4	Circular	30 incł	26.11	1	0.008	0.006	32.00	6.52	;,842.25	6,839.05	;,844.85	;,842.25
P-5	Circular	36 incł	5.58	1	0.047	0.004	44.27	6.26	;,839.11	6,838.85	;,842.28	;,842.25
P-8	Circular	42 incł	60.40	1	0.011	0.005	73.34	7.67	;,838.05	6,837.39	;,841.42	;,841.13
P-9	Circular	42 incł	07.18	1	0.009	0.008	72.94	10.03	;,837.39	6,836.40	;,840.07	;,838.71

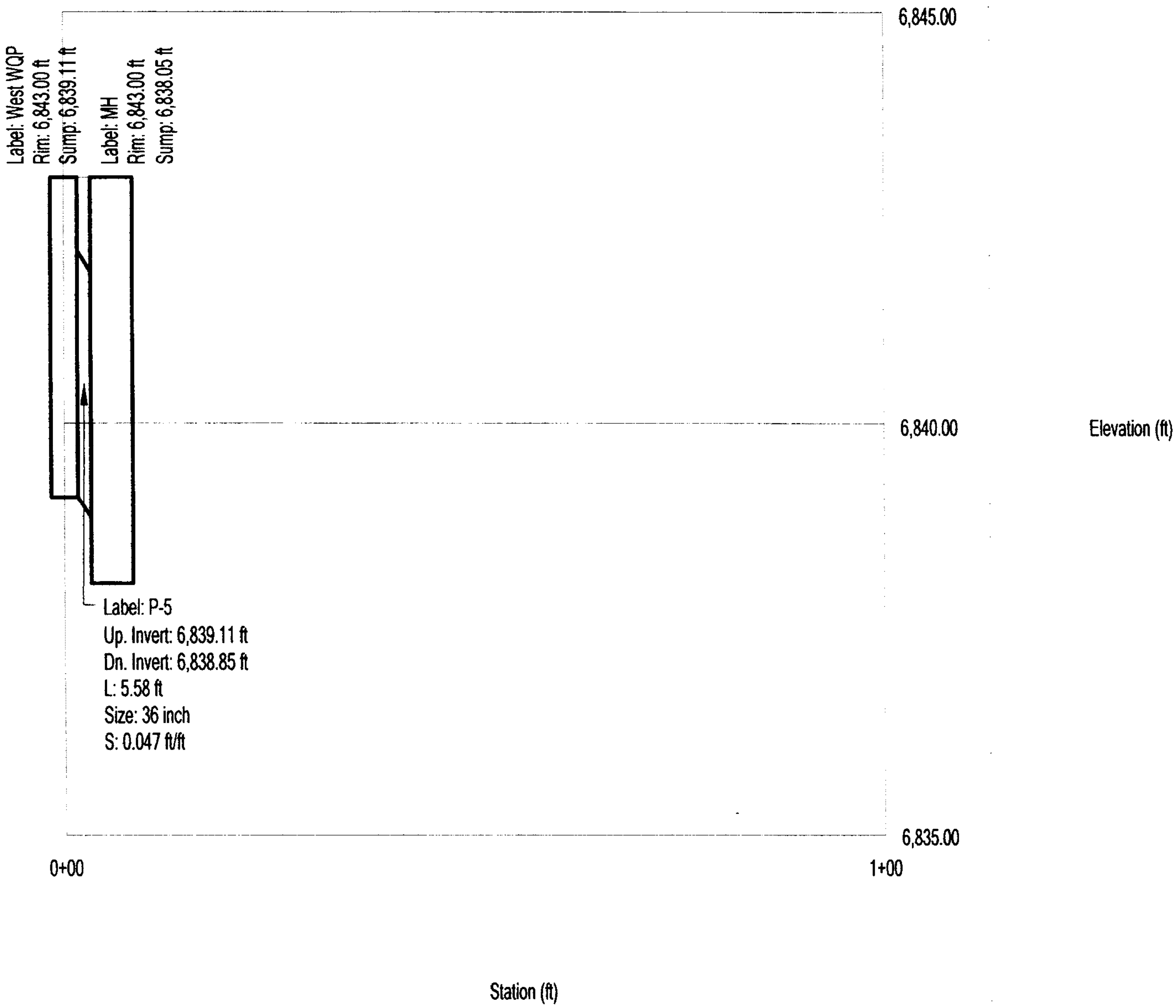
Scenario: 100-year

Combined Pipe\Node Report

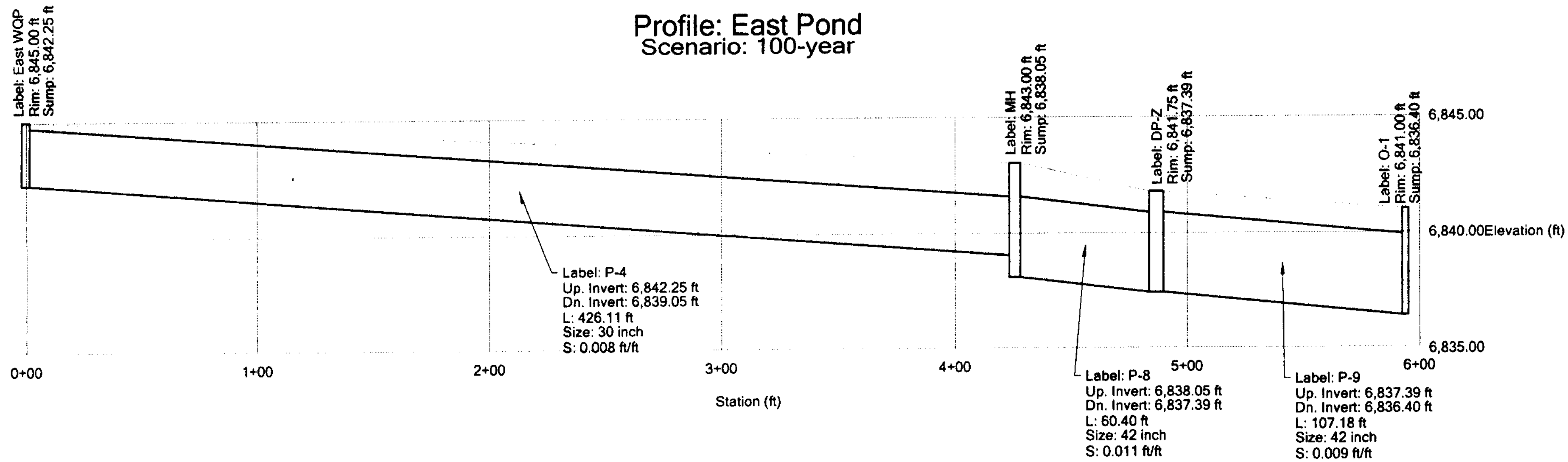
Label	Up. Node	Dn. Node	L (ft)	Up. Inlet Area (acres)	Up. Inlet Rat. Coef.	Up. Inlet Area (acres)	Up. Calc. Sys. CA (acres)	Up.Inlet Rat. Q (cfs)	Size	Q Full (cfs)	Avg. v (ft/s)	Up. Gr Elev. (ft)	HGL In (ft)	Up. Invert (ft)	Dn. Gr. Elev. (ft)	HGL Out (ft)	Dn. Invert (ft)	S (ft/ft)
P-4	East WQF	MH	426.11	3.50	1.00	3.50	3.50	32.00	30 inch	35.54	6.52	6,845.00	6,844.85	6,842.25	6,843.00	6,842.25	6,839.05	0.008
P-5	West WQI	MH	5.58	4.88	1.00	4.88	4.88	44.27	36 inch	143.97	6.26	6,843.00	6,842.28	6,839.11	6,843.00	6,842.25	6,838.85	0.047
P-8	MH	DP-Z	60.40	N/A	N/A	N/A	8.38	N/A	42 inch	105.16	7.67	6,843.00	6,841.42	6,838.05	6,841.75	6,841.13	6,837.39	0.011
P-9	DP-Z	O-1	107.18	N/A	N/A	N/A	8.38	N/A	42 inch	96.69	10.03	6,841.75	6,840.07	6,837.39	6,841.00	6,838.71	6,836.40	0.009

Profile: West Pond

Scenario: 100-year



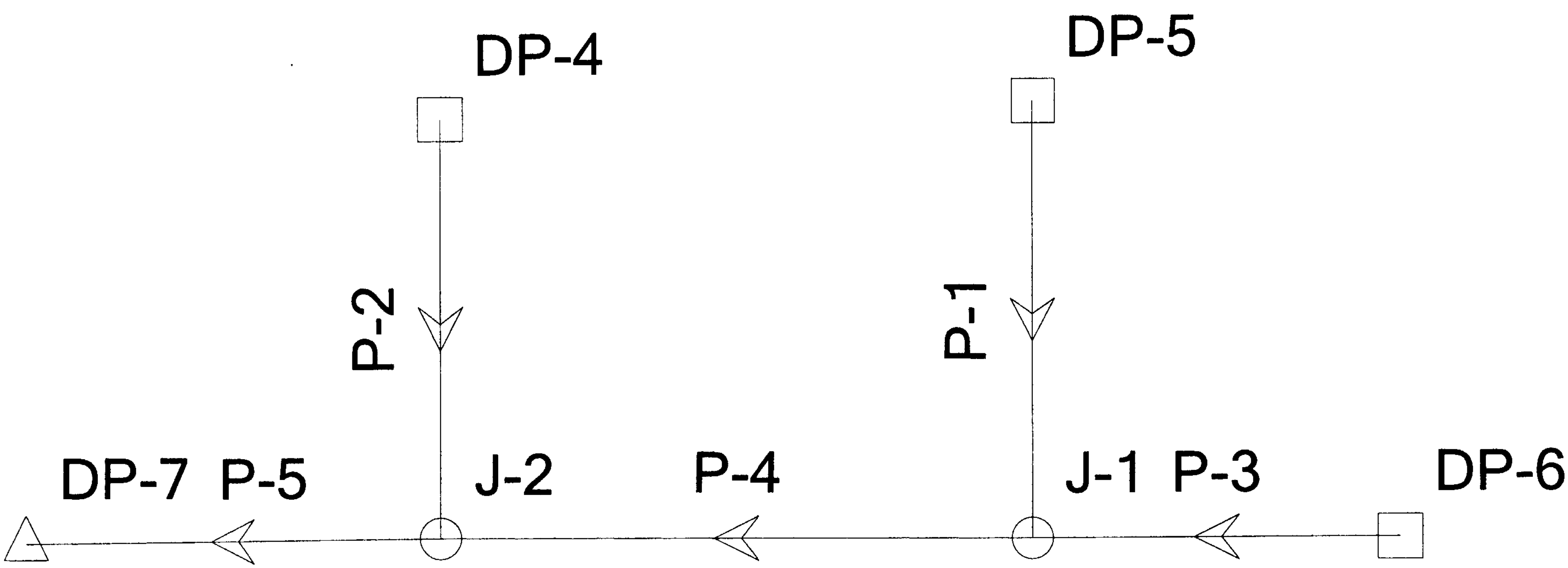
Profile
Scenario: 100-year



Title: Old Meridian Road
z:\...\fdr\calcs\storm cad\meridian crossing.stm
07/23/08 03:55:07 PM

Project Engineer: Charlene Sammons
StormCAD v5.6 [05.06.012.00]

Scenario: 100-year



Analysis Results
Scenario: 100-year

Title: Meridian Crossing
Project Engineer: Charlene Sammons
Project Date: 01/31/05
Comments: Analysis of existing storm system downstream of Meridian Crossing Project in Falcon, CO

Scenario Summary	
Scenario	100-year
Physical Properties Alternat	Base-Physical Properties
Catchments Alternative	Catchments-100-year
System Flows Alternative	Base-System Flows
Structure Headlosses Alterr	Base-Structure Headlosses
Boundary Conditions Altern	Base-Boundary Conditions
Design Constraints Alternat	Base-Design Constraints
Capital Cost Alternative	Base-Cost
User Data Alternative	Base-User Data

Network Inventory			
Number of Pipes	5	Number of Inlets	3
- Circular Pipes:	2	- Grate Inlets:	0
- Box Pipes:	3	- Curb Inlets:	2
- Arch Pipes:	0	- Combination Inlets:	0
- Vertical Elliptical Pipes:	0	- Slot Inlets:	0
- Horizontal Elliptical Pipes:	0	- Grate Inlets in Ditch:	0
Number of Junctions	2	- Generic Inlets:	1
Number of Outlets	1		

Circular Pipes Inventory	
24 inch	185.50 ft
Total Length	185.50 ft

Box Pipes Inventory	
6 x 3 ft	366.02 ft
Total Length	366.02 ft

Curb Inlet Inventory	
Type R 10'	2

Generic Inlet Inventory	
Default 100%	1

Inlet elements for network with outlet: DP-7

Label	Inlet	Total System Flow (cfs)	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Bypass Target	Capture Efficiency (%)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	Headloss Method
DP-4	Curb Type R 10'	22.05	22.05	0.00	N/A	100.0	3,818.78	3,818.78	0.00	Absolut
DP-5	Curb Type R 10'	19.80	19.80	0.00	N/A	100.0	3,818.70	3,818.70	0.00	Absolut
DP-6	Generic Default 1	250.69	250.69	0.00	N/A	100.0	3,817.78	3,817.78	0.00	Absolut

Analysis Results
Scenario: 100-year

Outlet: DP-7

Label	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/hr)	System Flow Time (min)	System CA (acres)
DP-7	3,814.44	3,814.44	0.00	0.00	0.00	273.30	5.21	22.65	52.02

Junction elements for network with outlet: DP-7

Label	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	Headloss Method	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/hr)	System Flow Time (min)	System CA (acres)
J-1	3,817.71	3,817.71	0.00	Absolut	0.00	0.00	262.00	5.25	22.36	49.53
J-2	3,817.08	3,817.08	0.00	Absolut	0.00	0.00	273.54	5.22	22.61	52.02

Pipe elements for network with outlet: DP-7

Label	Section Shape	Section Size	Length (ft)	Number of Sections	Constructed Slope (ft/ft)	Energy Slope (ft/ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-1	Circular	24 inch	94.00	1	0.009043	008925	19.80	7.56	3,817.10	6,816.25	3,818.70	3,817.76
P-2	Circular	24 inch	91.50	1	0.016940	014085	22.05	8.96	3,817.10	6,815.55	3,818.78	3,816.86
P-3	Box	6 x 3 ft	28.85	2	0.005199	005093	:50.69	8.63	3,815.40	6,815.25	3,817.78	3,817.71
P-4	Box	6 x 3 ft	33.50	2	0.005243	005221	:62.00	8.76	3,815.25	6,814.55	3,817.71	3,817.08
P-5	Box	6 x 3 ft	20.66	2	0.005324	004607	:73.54	9.31	3,814.55	6,814.44	3,817.08	3,816.82

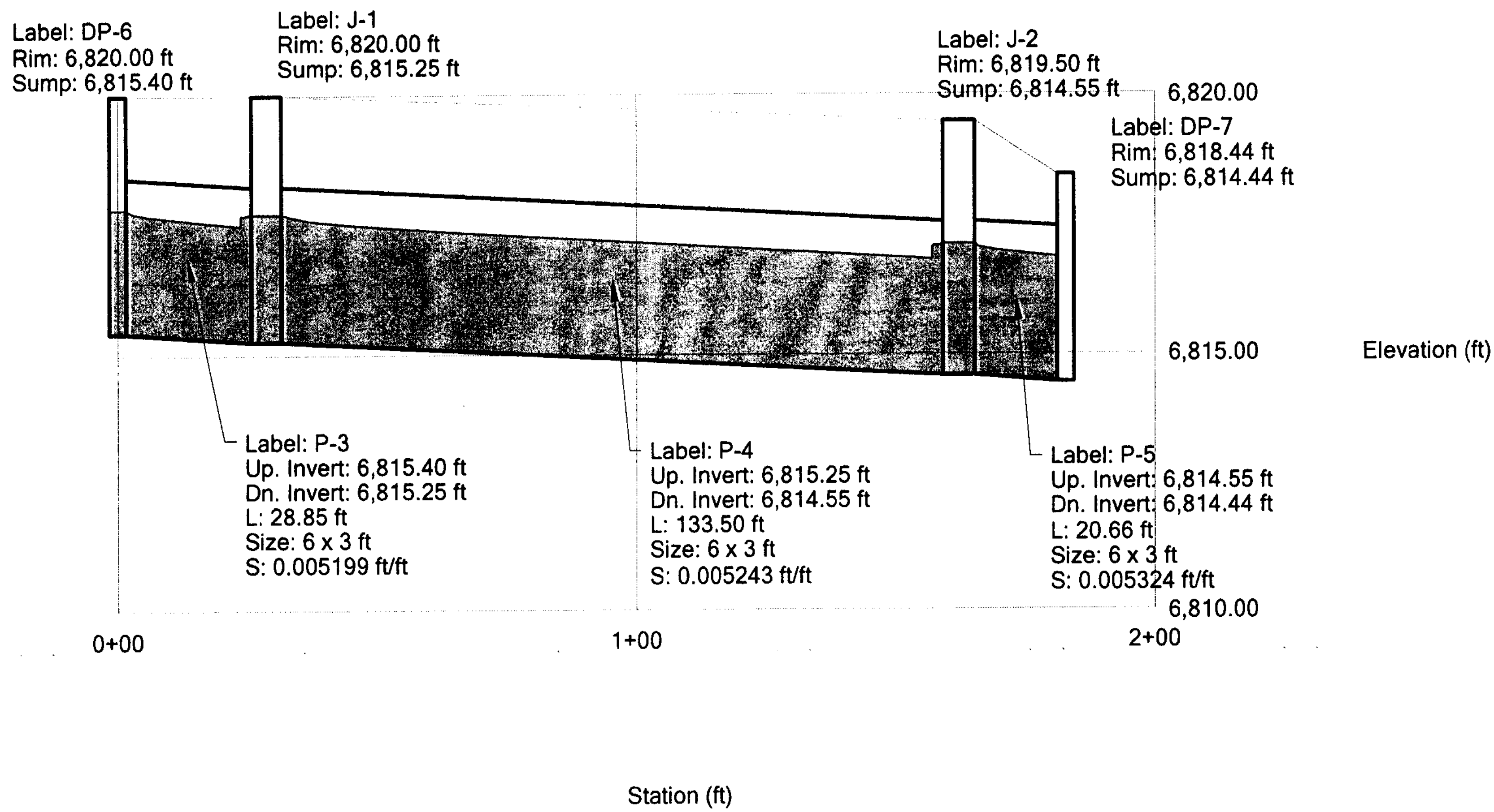
Scenario: 100-year

Combined Pipe\Node Report

Label	Up. Node	Dn. Node	L (ft)	Up. Inlet Area (acres)	Up. Inlet Rat. Coef.	Up. Inlet Area (acres)	Up. Calc. Sys. CA (acres)	Up.Inlet Rat. Q (cfs)	Size	Q Full (cfs)	Avg. v (ft/s)	Up. Gr Elev. (ft)	HGL In (ft)	Up. Invert (ft)	Dn. Gr. Elev. (ft)	HGL Out (ft)	Dn. Invert (ft)	S (ft/ft)
P-2	DP-4	J-2	91.50	2.49	1.00	2.49	2.49	22.05	24 inch	29.44	8.96	6,821.16	6,818.78	6,817.10	6,819.50	6,816.86	6,815.55	).016940
P-1	DP-5	J-1	94.00	2.20	1.00	2.20	2.20	19.80	24 inch	21.51	7.56	6,821.16	6,818.70	6,817.10	6,820.00	6,817.76	6,816.25	).009043
P-3	DP-6	J-1	28.85	47.33	1.00	47.33	47.33	250.69	6 x 3 ft	296.71	8.63	6,820.00	6,817.78	6,815.40	6,820.00	6,817.71	6,815.25	).005199
P-4	J-1	J-2	133.50	N/A	N/A	N/A	49.53	N/A	6 x 3 ft	297.96	8.76	6,820.00	6,817.71	6,815.25	6,819.50	6,817.08	6,814.55	).005243
P-5	J-2	DP-7	20.66	N/A	N/A	N/A	52.02	N/A	6 x 3 ft	300.25	9.31	6,819.50	6,817.08	6,814.55	6,818.44	6,816.82	6,814.44	).005324

Profile: RCB @ Highway 24

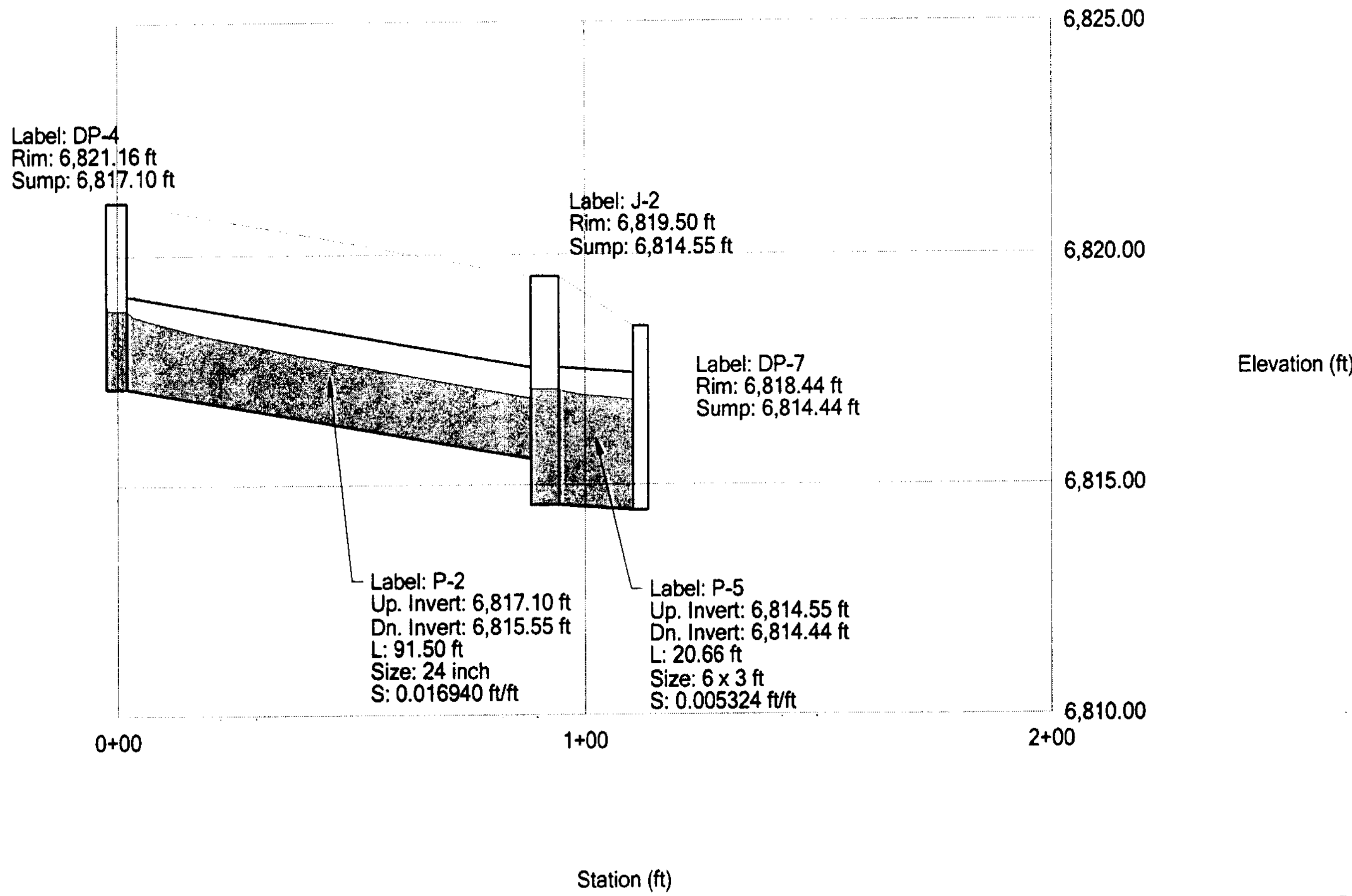
Scenario: 100-year



Profile
Scenario: 100-year

Profile: Sump Inlet Left

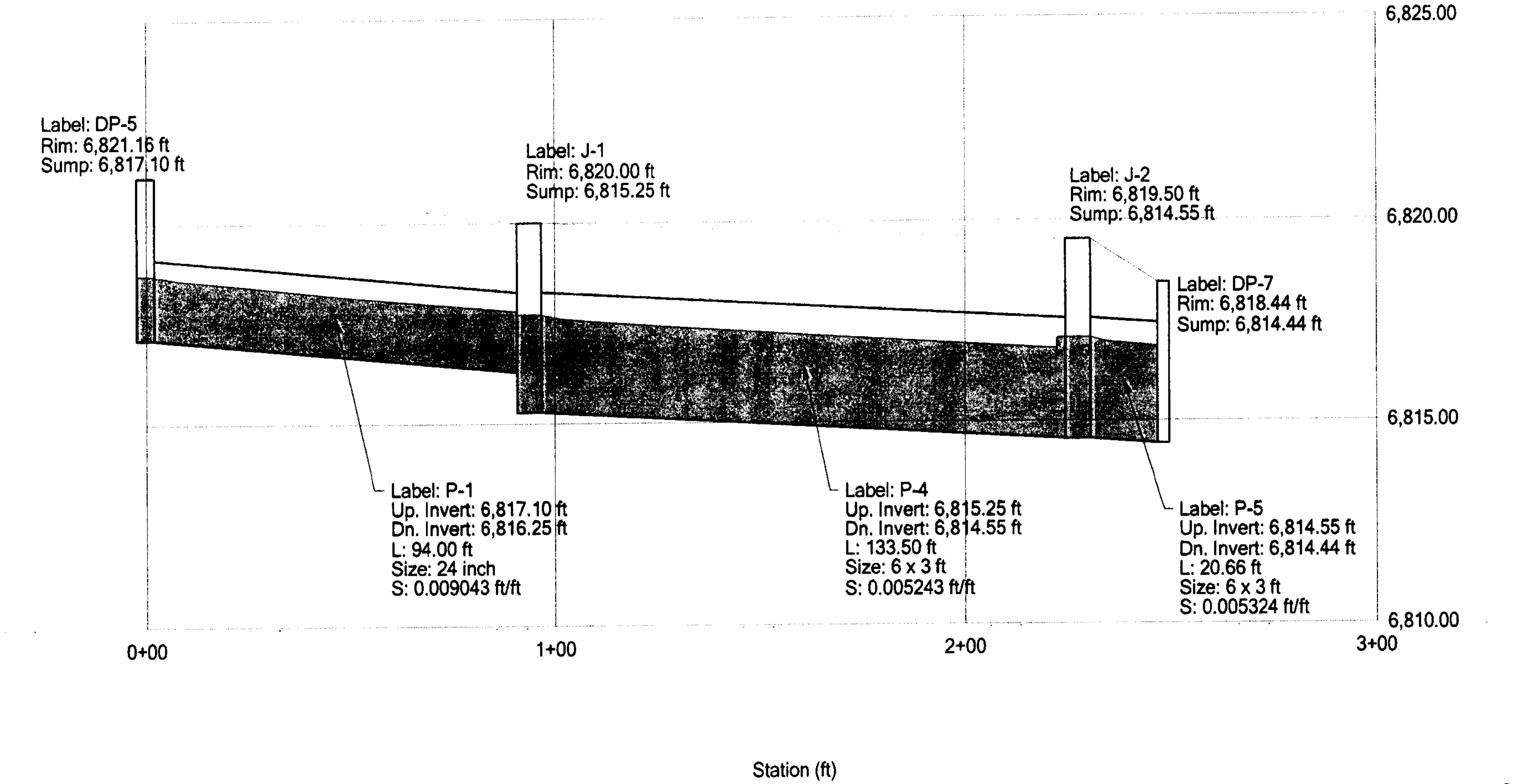
Scenario: 100-year



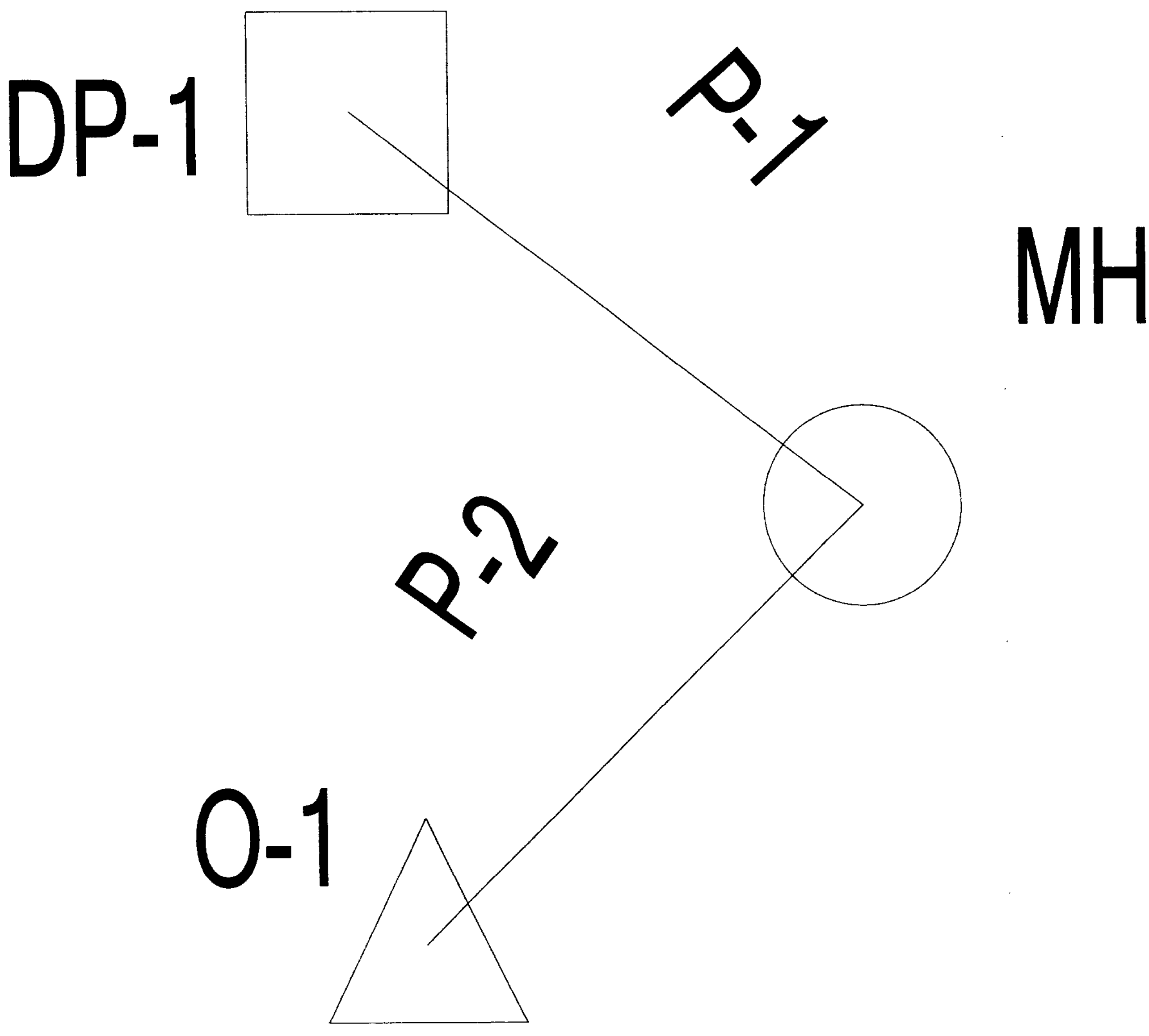
Profile
Scenario: 100-year

Profile: Sump Inlet Right

Scenario: 100-year



Scenario: 100-year



Analysis Results
Scenario: 100-year

Outlet: O-1

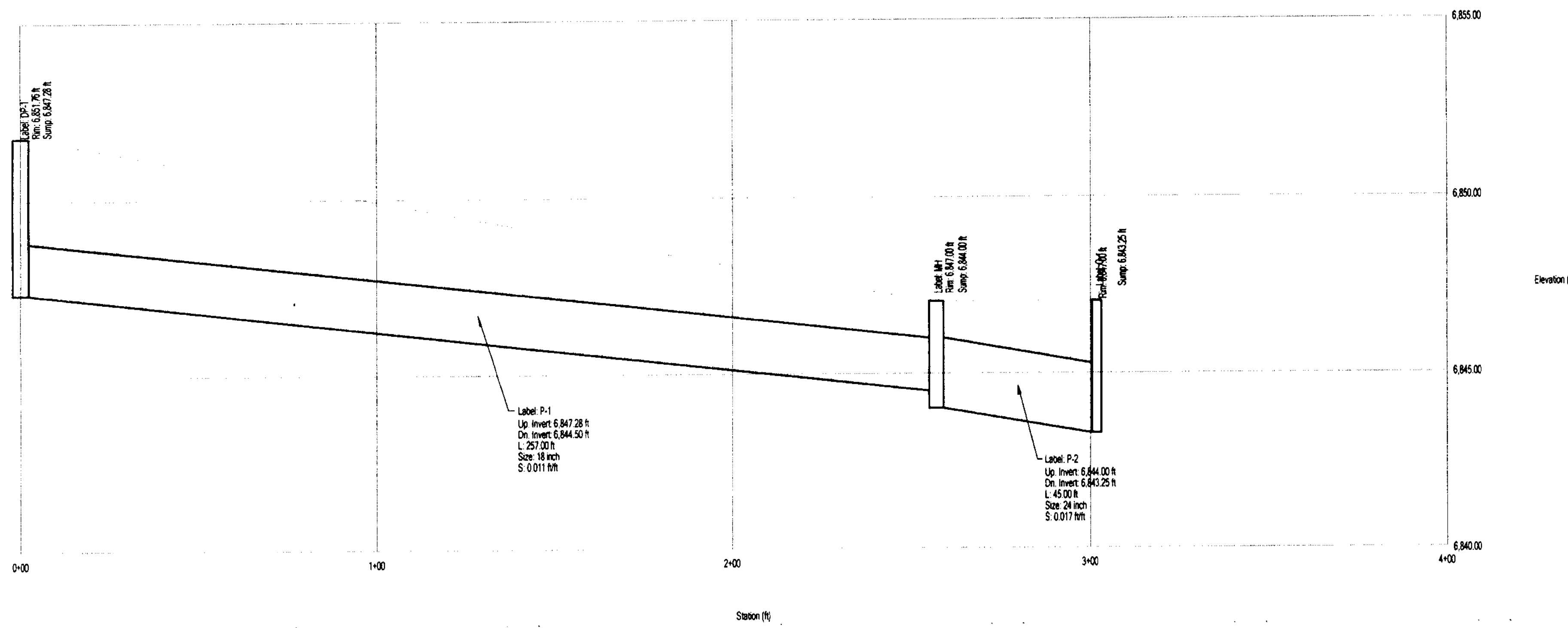
Label	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/hr)	System Flow Time (min)	System CA (acres)
O-1	6,843.25	6,843.25	0.00	0.00	0.00	7.35	8.28	7.22	0.88

Pipe elements for network with outlet: O-1

Label	Section Shape	Section Size	Length (ft)	Number of Sections	Constructed Slope (ft/ft)	Energy Slope (ft/ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-1	Circular	18 inch	57.00	1	0.011	0.011	7.61	6.16	6,847.28	6,844.50	6,848.35	6,845.42
P-2	Circular	24 inch	45.00	1	0.017	0.012	7.39	6.17	6,844.00	6,843.25	6,844.97	6,843.96

Profile
Scenario: 100-year

Profile: Ultimate Design
Scenario: 100-year



Existing Channel along Highway 24 ROW

Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	65.1000 cfs
Slope	0.0090 ft/ft
Manning's n	0.0350
Height	36.0000 in
Bottom width	480.0000 in
Left slope	0.2500 ft/ft (V/H)
Right slope	0.2500 ft/ft (V/H)

Computed Results:

Depth	6.8903 in
Velocity	2.6805 fps
Full Flowrate	1129.3728 cfs
Flow area	24.2864 ft2
Flow perimeter	536.8189 in
Hydraulic radius	6.5148 in
Top width	535.1224 in
Area	156.0000 ft2
Perimeter	776.8636 in
Percent full	19.1397 %

Critical Information

Critical depth	5.1448 in
Critical slope	0.0241 ft/ft
Critical velocity	3.6400 fps
Critical area	17.8847 ft2
Critical perimeter	522.4254 in
Critical hydraulic radius	4.9297 in
Critical top width	521.1587 in
Specific energy	0.6859 ft
Minimum energy	0.6431 ft
Froude number	0.6404
Flow condition	Subcritical

Existing Temporary Channel along Meridian Road (DP-E)

Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	88.2000 cfs
Slope	0.0200 ft/ft
Manning's n	0.0350
Height	36.0000 in
Bottom width	0.0000 in
Left slope	0.2500 ft/ft (V/H)
Right slope	0.1667 ft/ft (V/H)

Computed Results:

Depth	21.4874 in
Velocity	5.5023 fps
Full Flowrate	349.2362 cfs
Flow area	16.0296 ft2
Flow perimeter	219.2720 in
Hydraulic radius	10.5269 in
Top width	214.8480 in
Area	44.9946 ft2
Perimeter	367.3687 in
Percent full	59.6872 %

Critical Information

Critical depth	21.7023 in
Critical slope	0.0190 ft/ft
Critical velocity	5.3939 fps
Critical area	16.3519 ft2
Critical perimeter	221.4655 in
Critical hydraulic radius	10.6322 in
Critical top width	216.9973 in
Specific energy	2.2611 ft
Minimum energy	2.7128 ft
Froude number	1.0252
Flow condition	Supercritical

Proposed Temporary Channel from Old Meridian Road (DP-Z)

Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	73.3000 cfs
Slope	0.0050 ft/ft
Manning's n	0.0350
Height	36.0000 in
Bottom width	60.0000 in
Left slope	0.2500 ft/ft (V/H)
Right slope	0.2500 ft/ft (V/H)

Computed Results:

Depth	21.9888 in
Velocity	3.2444 fps
Full Flowrate	219.3674 cfs
Flow area	22.5927 ft2
Flow perimeter	241.3242 in
Hydraulic radius	13.4813 in
Top width	235.9103 in
Area	51.0000 ft2
Perimeter	356.8636 in
Percent full	61.0800 %

Critical Information

Critical depth	16.0014 in
Critical slope	0.0192 ft/ft
Critical velocity	5.3195 fps
Critical area	13.7795 ft2
Critical perimeter	191.9505 in
Critical hydraulic radius	10.3373 in
Critical top width	188.0108 in
Specific energy	1.9960 ft
Minimum energy	2.0002 ft
Froude number	0.5336
Flow condition	Subcritical

Culvert Designer/Analyzer Report
Highway 24 - DP WU

Analysis Component			
Storm Event	Check	Discharge	1,241.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,241.00 cfs	Check Discharge	1,241.00 cfs

Tailwater properties: Trapezoidal Channel

Tailwater conditions for Check Storm.			
Discharge	1,241.00 cfs	Bottom Elevation	6,813.00 ft
Depth	3.82 ft	Velocity	7.78 ft/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	3-12 x 6 ft Box	1,240.93 cfs	6,818.87 ft	8.71 ft/s
Weir	Roadway (Constant Elevation)	0.00 cfs	6,818.87 ft	N/A
Total	---------------	1,240.93 cfs	6,818.87 ft	N/A

Culvert Designer/Analyzer Report
Highway 24 - DP WU

Component:Culvert-1

Culvert Summary			
Computed Headwater Eleva	6,818.87 ft	Discharge	1,240.93 cfs
Inlet Control HW Elev.	6,818.37 ft	Tailwater Elevation	6,816.82 ft
Outlet Control HW Elev.	6,818.87 ft	Control Type	Outlet Control
Headwater Depth/Height	0.96		

Grades			
Upstream Invert	6,813.10 ft	Downstream Invert	6,812.87 ft
Length	47.00 ft	Constructed Slope	0.005000 ft/ft

Hydraulic Profile			
Profile	S1	Depth, Downstream	3.96 ft
Slope Type	Steep	Normal Depth	2.78 ft
Flow Regime	Subcritical	Critical Depth	3.33 ft
Velocity Downstream	8.71 ft/s	Critical Slope	0.002971 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	12.00 ft
Section Size	12 x 6 ft	Rise	6.00 ft
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev.	6,818.87 ft	Upstream Velocity Head	1.54 ft
Ke	0.50	Entrance Loss	0.77 ft

Inlet Control Properties			
Inlet Control HW Elev.	6,818.37 ft	Flow Control	N/A
Inlet Type	45° wingwall flares - offset	Area Full	216.0 ft2
K	0.49700	HDS 5 Chart	13
M	0.66700	HDS 5 Scale	1
C	0.03020	Equation Form	2
Y	0.83500		

Culvert Designer/Analyzer Report
McLaughlin Bridge

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevä	104.17 ft	Discharge	623.40 cfs
Inlet Control HW Elev.	104.17 ft	Tailwater Elevation	N/A ft
Outlet Control HW Elev.	103.98 ft	Control Type	Inlet Control
Headwater Depth/Height	1.39		

Grades			
Upstream Invert	100.00 ft	Downstream Invert	100.00 ft
Length	50.00 ft	Constructed Slope	0.010000 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	1.99 ft
Slope Type	Steep	Normal Depth	1.76 ft
Flow Regime	Supercritical	Critical Depth	2.49 ft
Velocity Downstream	11.21 ft/s	Critical Slope	0.003719 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 3 ft	Rise	3.00 ft
Number Sections	4		

Outlet Control Properties			
Outlet Control HW Elev.	103.98 ft	Upstream Velocity Head	1.24 ft
Ke	0.20	Entrance Loss	0.25 ft

Inlet Control Properties			
Inlet Control HW Elev.	104.17 ft	Flow Control	N/A
Inlet Type	90° headwall w 45° bevels	Area Full	84.0 ft2
K	0.49500	HDS 5 Chart	10
M	0.66700	HDS 5 Scale	2
C	0.03140	Equation Form	2
Y	0.82000		

Culvert Designer/Analyzer Report
Old Meridian Road - DP Y

Analysis Component			
Storm Event	Check	Discharge	65.10 cfs

Peak Discharge Method: User-Specified			
Design Discharge	34.70 cfs	Check Discharge	65.10 cfs

Tailwater properties: Trapezoidal Channel

Tailwater conditions for Check Storm.			
Discharge	65.10 cfs	Bottom Elevation	6,813.00 ft
Depth	0.89 ft	Velocity	3.45 ft/s

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-54 inch Circular	65.11 cfs	6,824.75 ft	9.95 ft/s
Weir	Roadway (Constant Elevation)	0.00 cfs	6,824.75 ft	N/A
Total	--------------	65.11 cfs	6,824.75 ft	N/A

Culvert Designer/Analyzer Report
Old Meridian Road - DP Y

Component:Culvert-1

Culvert Summary

Computed Headwater Elevi	6,824.75 ft	Discharge	65.11 cfs
Inlet Control HW Elev.	6,824.43 ft	Tailwater Elevation	6,813.89 ft
Outlet Control HW Elev.	6,824.75 ft	Control Type	Entrance Control
Headwater Depth/Height	0.83		

Grades

Upstream Invert	6,821.00 ft	Downstream Invert	6,820.50 ft
Length	50.00 ft	Constructed Slope	0.010000 ft/ft

Hydraulic Profile

Profile	S2	Depth, Downstream	1.94 ft
Slope Type	Steep	Normal Depth	1.78 ft
Flow Regime	Supercritical	Critical Depth	2.35 ft
Velocity Downstream	9.95 ft/s	Critical Slope	0.003794 ft/ft

Section

Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	4.50 ft
Section Size	54 inch	Rise	4.50 ft
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	6,824.75 ft	Upstream Velocity Head	0.93 ft
Ke	0.50	Entrance Loss	0.47 ft

Inlet Control Properties

Inlet Control HW Elev.	6,824.43 ft	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	15.9 ft2
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Designer/Analyzer Report
Old Meridian Road - DP Y

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.00	cfs	Allowable HW Elevation	6,824.75	ft
Roadway Width	44.00	ft	Overtopping Coefficient	2.90	US
Length	150.00	ft	Crest Elevation	6,825.35	ft
Headwater Elevation	N/A	ft	Discharge Coefficient (Cr)	2.90	
Submergence Factor (Kt)	1.00				

Sta (ft)	Elev. (ft)
0.00	6,825.35
150.00	6,825.35

Culvert Outlet Protection

Meridian Crossing - Final Drainage Report

Culvert	Diameter	No of Barrels	Slope	Velocity	Riprap Width	Riprap Length		Riprap Size
	(in)		(%)	ft/s	ft	ft		
DP-Y	54	1	1.20%	10.5	13.5	21.5	3.78	L
DP-Z	42	1	0.90%	10.0	10.5	18.5	3.44	L

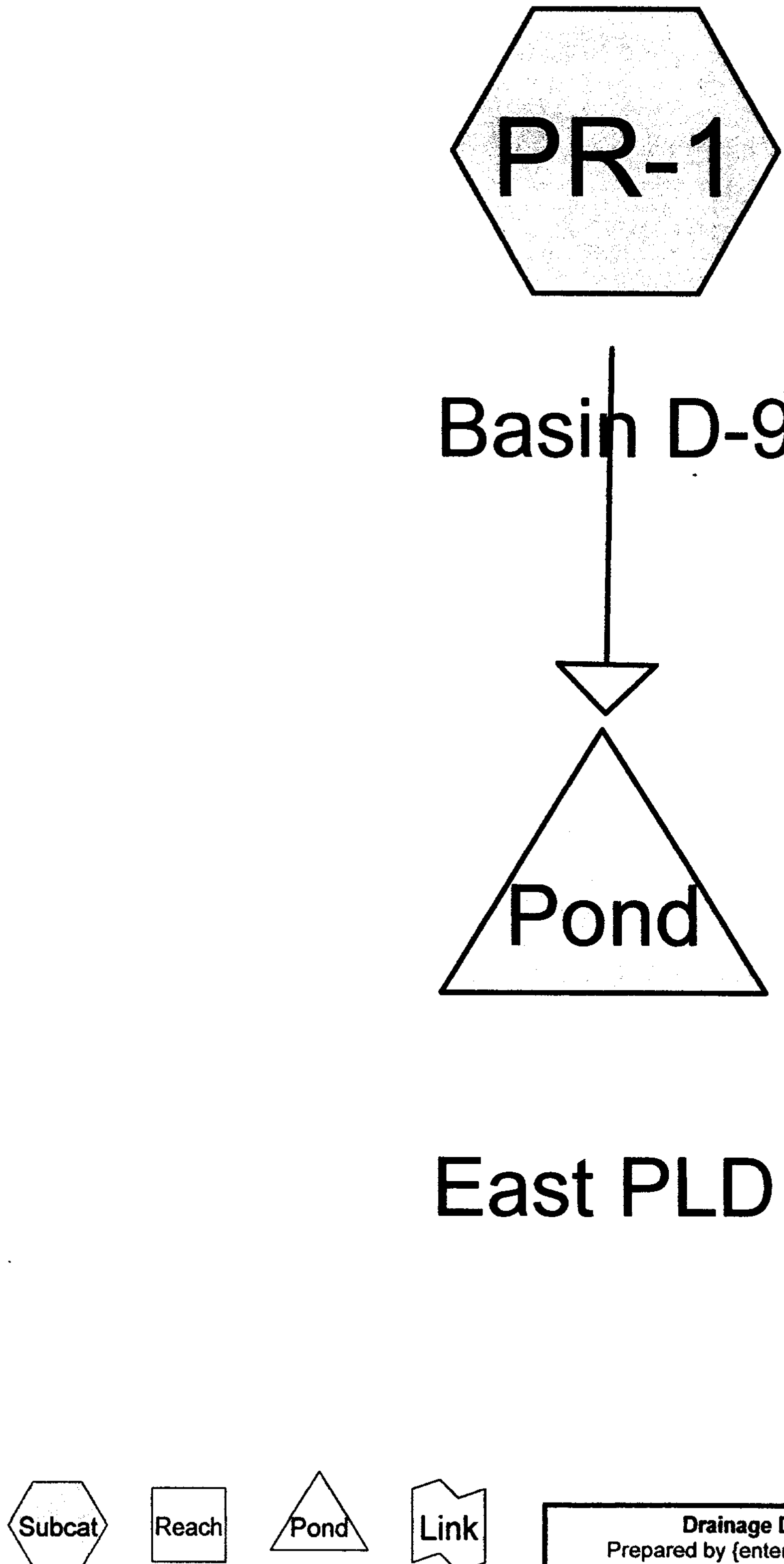
Appendix G: Water Quality Pond Calculations

Design Procedure Form: Porous Landscape Detention (PLD)

Designer: Thomas Roberts
Company: Springs Engineering
Date: July 23, 2008
Project: Merdian Crossing East Pond
Location: Falcon, CO

1. Basin Storage Volume (I_a = 100% if all paved and roofed areas u/s of PLD) A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) B) Contributing Watershed Area Including the PLD (Area) C) Water Quality Capture Volume (WQCV) (WQCV = $0.8 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I)$) D) Design Volume: Vol_{PLD} = (WQCV / 12) * Area	I_a = 79.00 % i = 0.79 Area = 167,616 square feet WQCV = 0.26 watershed inches Vol = 3,600 cubic feet
2. PLD Surface Area (A_{PLD}) and Average Depth (d_{av}) (from 3600.24 square feet to 7200.48 square feet) (d_{av}: = (Vol / A_{PLD}), Min=0.5', Max=1.0')	A_{PLD} = 3,600 square feet d_{av} = 1.00 feet
3. Draining of PLD (Check A, **or** B, **or** C, **answer** D) Based on answers to 3A through 3D, check the appropriate method A) Check box if subgrade is heavy or expansive clay [ ] B) Check box if subgrade is silty or clayey sand [ ] C) Check box if subgrade is well-draining soil [X] D) Check box if underdrains are not desirable or if underdrains are not feasible at this site. [ ] E) Does tributary catchment contain land uses that may have petroleum products, greases, or other chemicals present, such as gas station, hardware store, restaurant, etc.? yes [X] no [ ]	____ Infiltration to Subgrade with Permeable Membrane: 3(C) checked and 3(E) = no ____ Underdrain with Impermeable Liner: 3(A) checked or 3(E) = yes ____ Underdrain with Non-Woven Geotextile Fabric: 3(B) checked and 3(E) = no ____ 16-Mil. Impermeable Membrane with No Underdrain: 3(D) checked - Evapotranspiration only x Other: Type D Inlet
4. Sand/Peat Mix and Gravel Subbase (See Figure PLD-1) A) Heavy or Expansive Clay (NRCS Group D Soils) Present; Perforated HDPE Underdrain Used. B) Silty or Clayey Sand (NRCS Group C Soils) Present; Perforated HDPE Underdrain Used. C) No Potential For Contamination And Well-Draining (NRCS Group A or B Soils) Are Present; Underdrains Elliminated. D) Underdrains Are Not Desirable Or Are Not Feasible At This Site. E) Other:	____ 18" Minimum Depth Sand-Peat Mix with 8" Gravel Layer. 16-Mil. Impermeable Liner and a 3" to 4" Perforated HDPE Underdrain. ____ 18" Minimum Depth Sand-Peat Mix with 8" Gravel Layer and a 3" to 4" Perforated HDPE Underdrain w/ Non-Woven Pemeable Membrane. ____ 18" Minimum Depth Sand-Peat Mix with Non-Woven Pemeable Membrane and No Underdrain (Direct Infiltration). ____ 18" Minimum Depth Sand-Peat Mix with An Additional 18" Minimum Layer Sand-Peat Mix or Sand-Class 'A' Compost Bottom Layer (Total Sand-Peat Depth of 36"). 16-Mil. Impermeable Liner Used. x Other: See Detail on Sheet 8

Notes:



Drainage Diagram for east pond-PLD Sizing
Prepared by {enter your company name here} 7/23/2008
HydroCAD® 8.00 s/n 004515 © 2006 HydroCAD Software Solutions LLC

Pond Pond: East PLD

Inflow Area =	3.680 ac,	Inflow Depth = 0.56"	for 2-Year event	
Inflow =	8.32 cfs @	0.09 hrs, Volume=	0.172 af	
Outflow =	6.50 cfs @	0.27 hrs, Volume=	0.134 af,	Atten= 22%, Lag= 10.7 min
Primary =	6.50 cfs @	0.27 hrs, Volume=	0.134 af	

Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 6,844.47' @ 0.27 hrs Surf.Area= 3,394 sf Storage= 4,371 cf

Plug-Flow detention time= 12.8 min calculated for 0.134 af (78% of inflow)
Center-of-Mass det. time= 10.8 min (20.9 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	6,843.00'	9,728 cf	**Custom Stage Data (Pyramidal)** Listed below

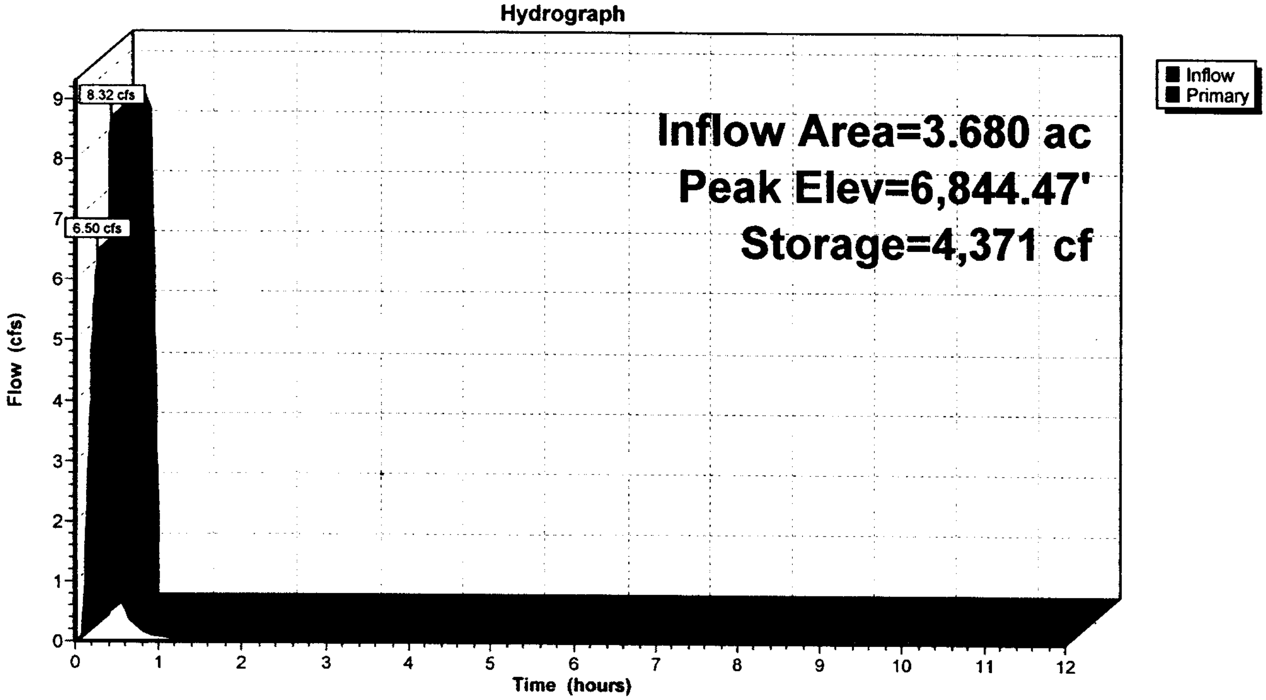
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
6,843.00	2,200	0	0	2,200
6,844.00	3,300	2,731	2,731	3,320
6,846.00	3,700	6,996	9,728	3,939

Device	Routing	Invert	Outlet Devices
#1	Primary	6,845.50'	**3.00' x 3.00' Horiz. Orifice/Grate** Limited to weir flow C= 1.000
#2	Primary	6,843.60'	**2.50' W x 1.25' H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=6.49 cfs @ 0.27 hrs HW=6,844.47' (Free Discharge)
├─**1=Orifice/Grate** (Controls 0.00 cfs)
└─**2=Orifice/Grate** (Orifice Controls 6.49 cfs @ 2.99 fps)

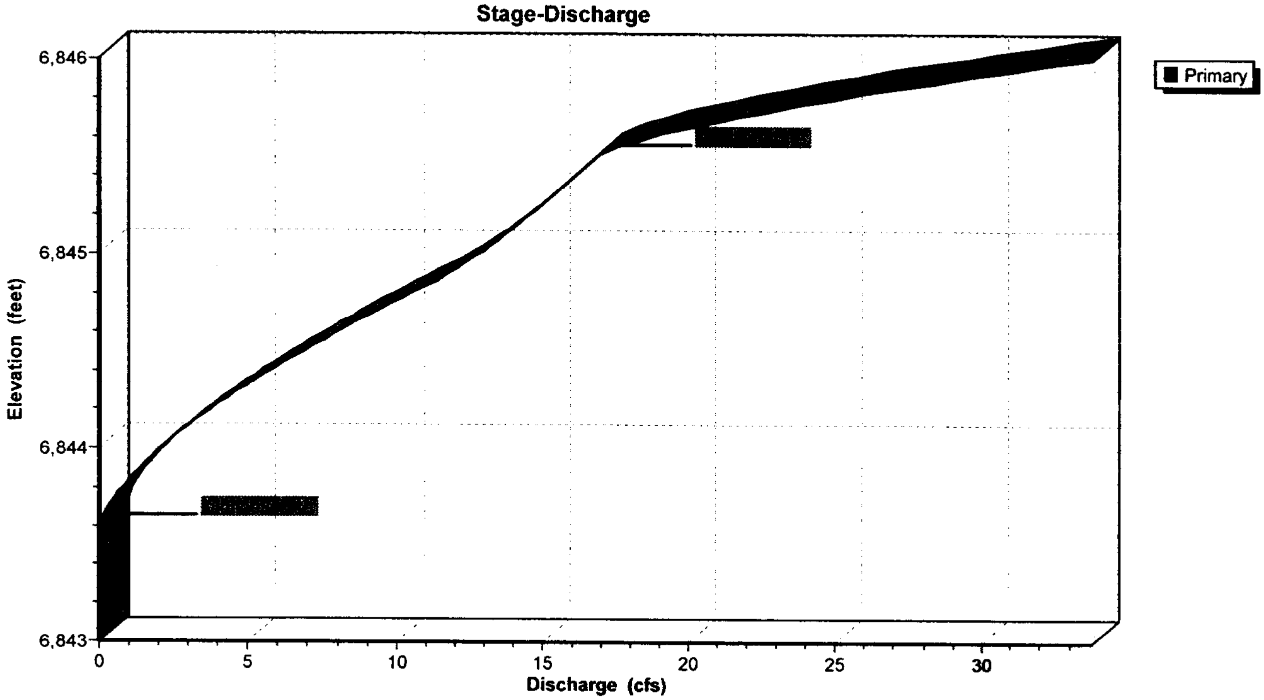
Pond Pond: East PLD

Hydrograph



Pond Pond: East PLD

Stage-Discharge



Pond Pond: East PLD

Inflow Area =	3.680 ac,	Inflow Depth = 0.77"	for 5-Year event		
Inflow =	11.42 cfs @	0.09 hrs,	Volume=	0.236 af	
Outflow =	9.65 cfs @	0.26 hrs,	Volume=	0.198 af,	Atten= 16%, Lag= 10.4 min
Primary =	9.65 cfs @	0.26 hrs,	Volume=	0.198 af	

Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 6,844.73' @ 0.26 hrs Surf.Area= 3,446 sf Storage= 5,288 cf

Plug-Flow detention time= 10.5 min calculated for 0.198 af (84% of inflow)
Center-of-Mass det. time= 9.4 min (19.4 - 10.0)

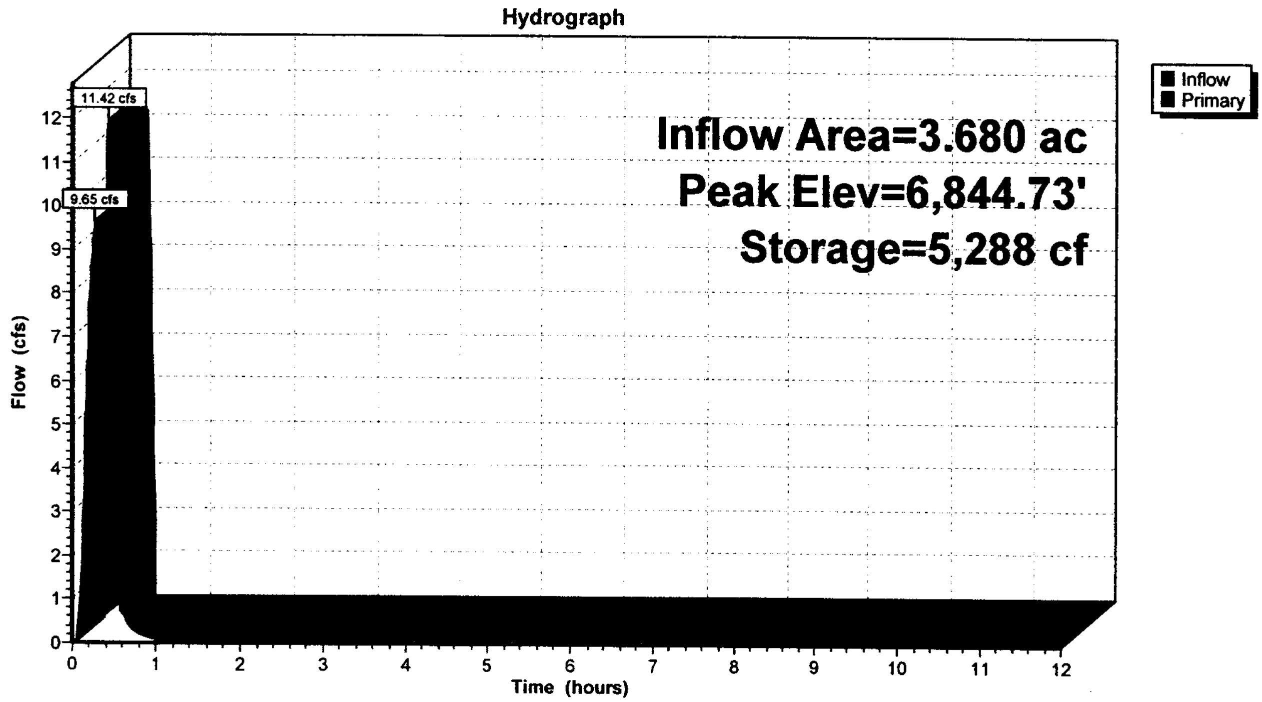
Volume	Invert	Avail.Storage	Storage Description
#1	6,843.00'	9,728 cf	**Custom Stage Data (Pyramidal)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
6,843.00	2,200	0	0	2,200
6,844.00	3,300	2,731	2,731	3,320
6,846.00	3,700	6,996	9,728	3,939

Device	Routing	Invert	Outlet Devices
#1	Primary	6,845.50'	**3.00' x 3.00' Horiz. Orifice/Grate** Limited to weir flow C= 1.000
#2	Primary	6,843.60'	**2.50' W x 1.25' H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=9.63 cfs @ 0.26 hrs HW=6,844.73' (Free Discharge)
├─**1=Orifice/Grate** (Controls 0.00 cfs)
└─**2=Orifice/Grate** (Orifice Controls 9.63 cfs @ 3.41 fps)

Pond Pond: East PLD



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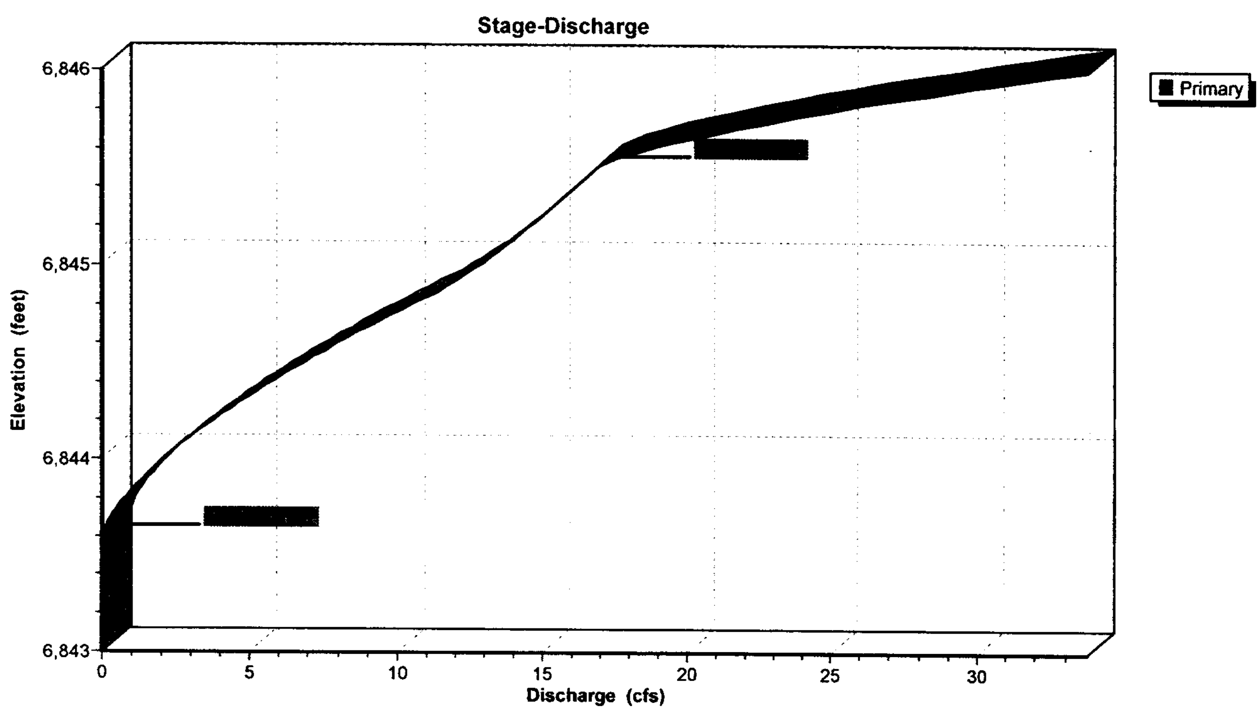

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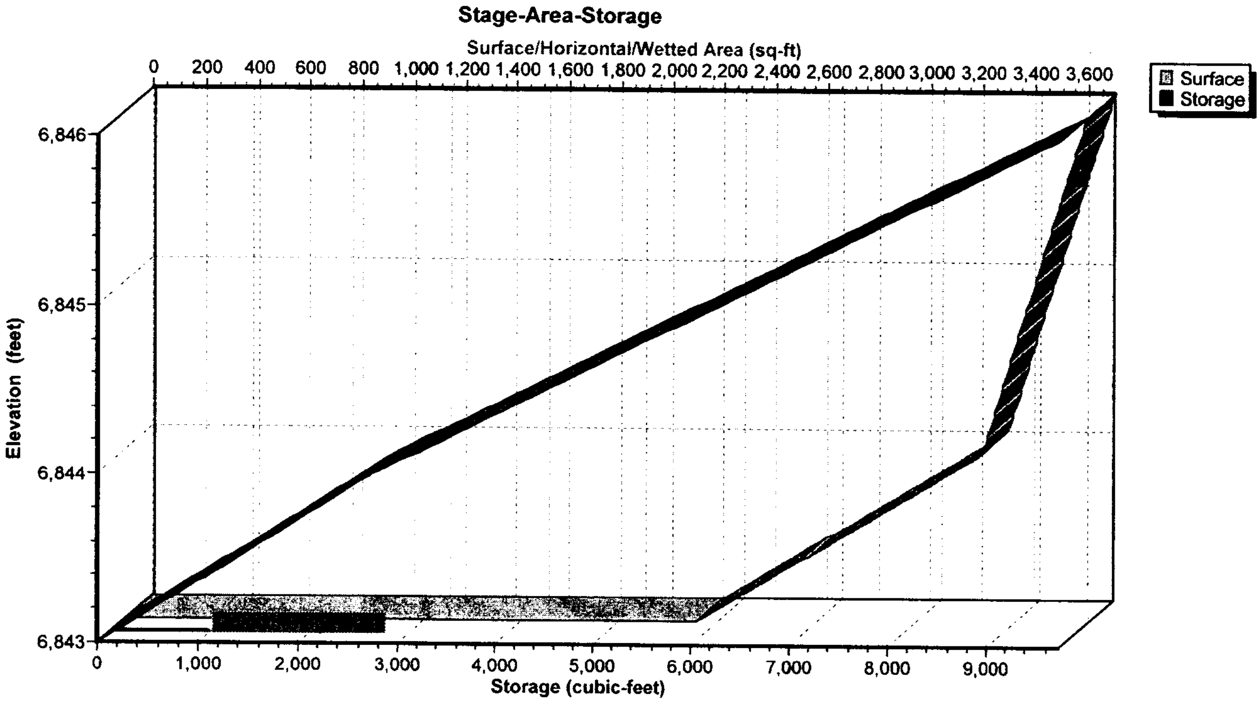


Pond Pond: East PLD

Inflow Area =	3.680 ac, Inflow Depth = 1.37"	for 100-Year event	
Inflow =	20.30 cfs @	0.09 hrs, Volume=	0.420 af
Outflow =	16.97 cfs @	0.26 hrs, Volume=	0.382 af, Atten= 16%, Lag= 10.4 min
Primary =	16.97 cfs @	0.26 hrs, Volume=	0.382 af

Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 6,845.51' @ 0.26 hrs Surf.Area= 3,603 sf Storage= 8,024 cf

Plug-Flow detention time= 8.7 min calculated for 0.382 af (91% of inflow)
Center-of-Mass det. time= 7.8 min (17.8 - 10.0)

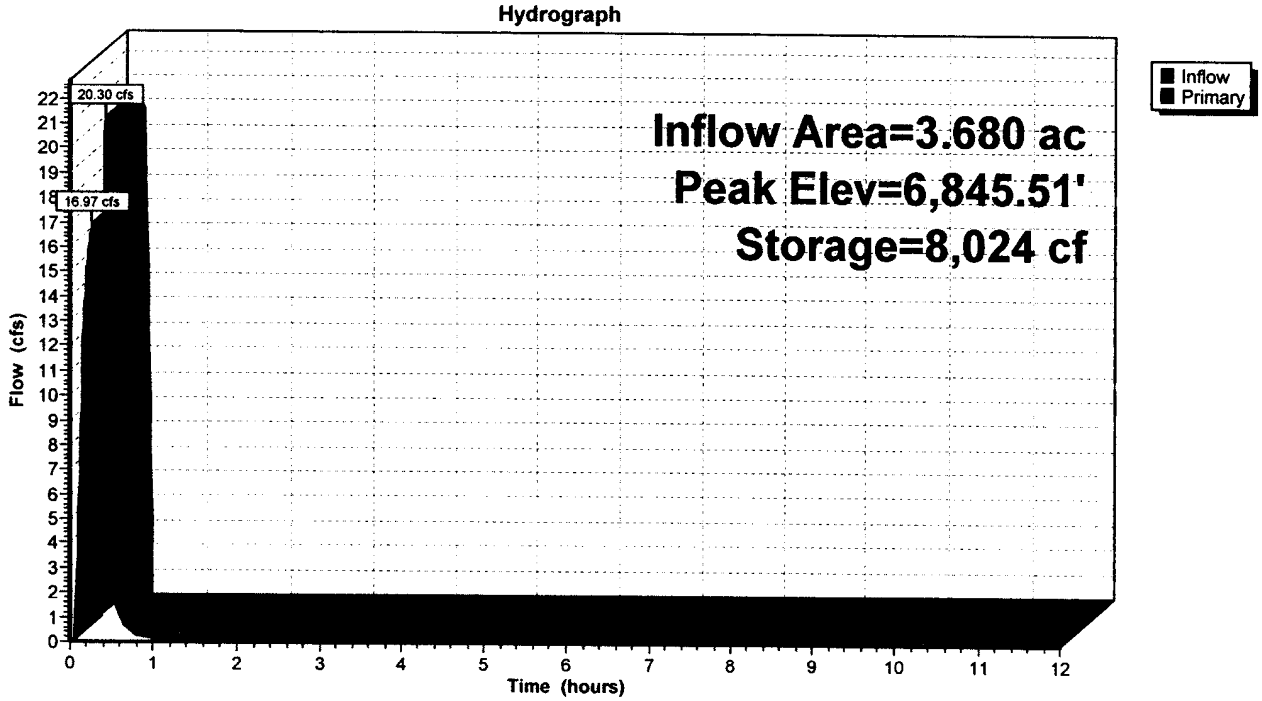
Volume	Invert	Avail.Storage	Storage Description
#1	6,843.00'	9,728 cf	**Custom Stage Data (Pyramidal)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
6,843.00	2,200	0	0	2,200
6,844.00	3,300	2,731	2,731	3,320
6,846.00	3,700	6,996	9,728	3,939

Device	Routing	Invert	Outlet Devices
#1	Primary	6,845.50'	**3.00' x 3.00' Horiz. Orifice/Grate** Limited to weir flow C= 1.000
#2	Primary	6,843.60'	**2.50' W x 1.25' H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=16.92 cfs @ 0.26 hrs HW=6,845.51' (Free Discharge)
├─**1=Orifice/Grate** (Weir Controls 0.04 cfs @ 0.33 fps)
└─**2=Orifice/Grate** (Orifice Controls 16.88 cfs @ 5.40 fps)

Pond Pond: East PLD



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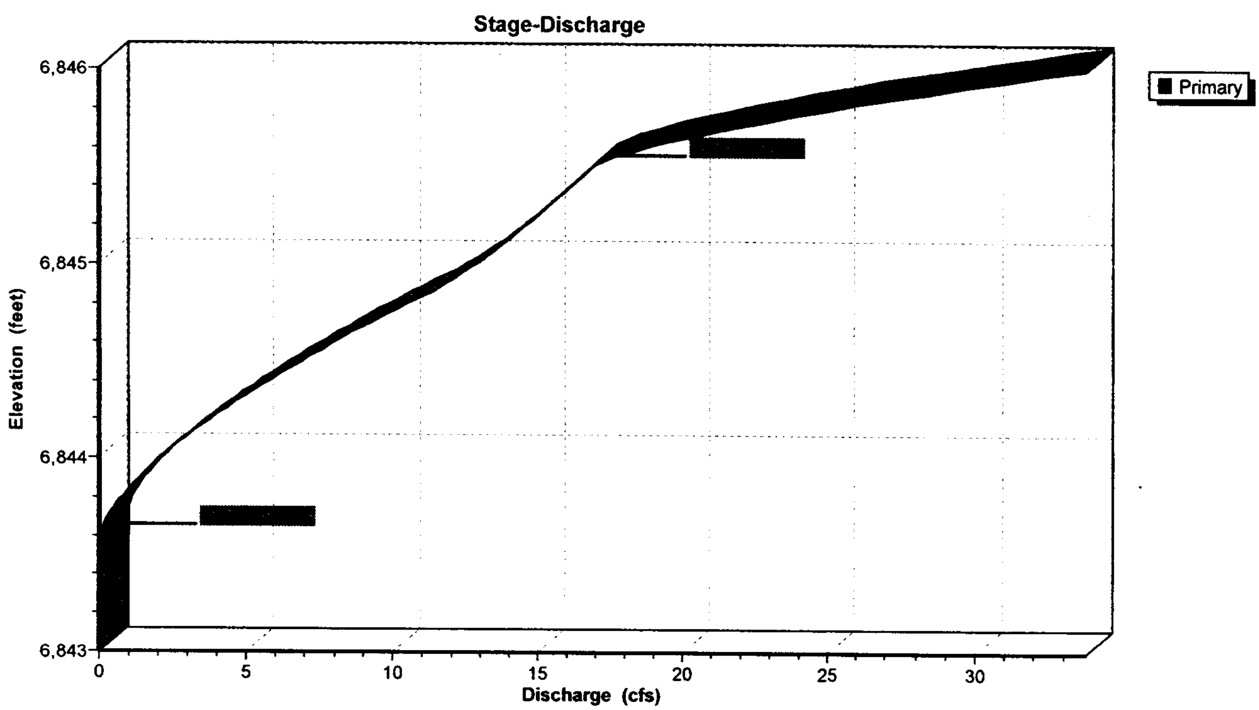

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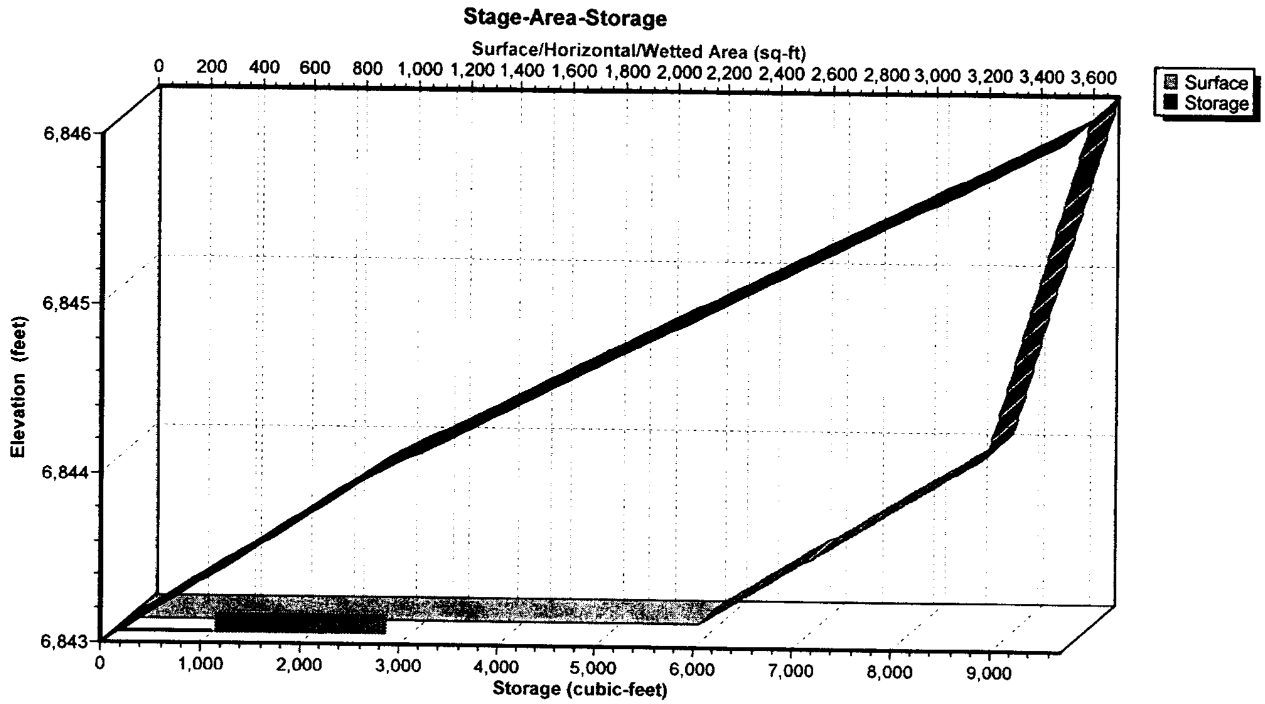
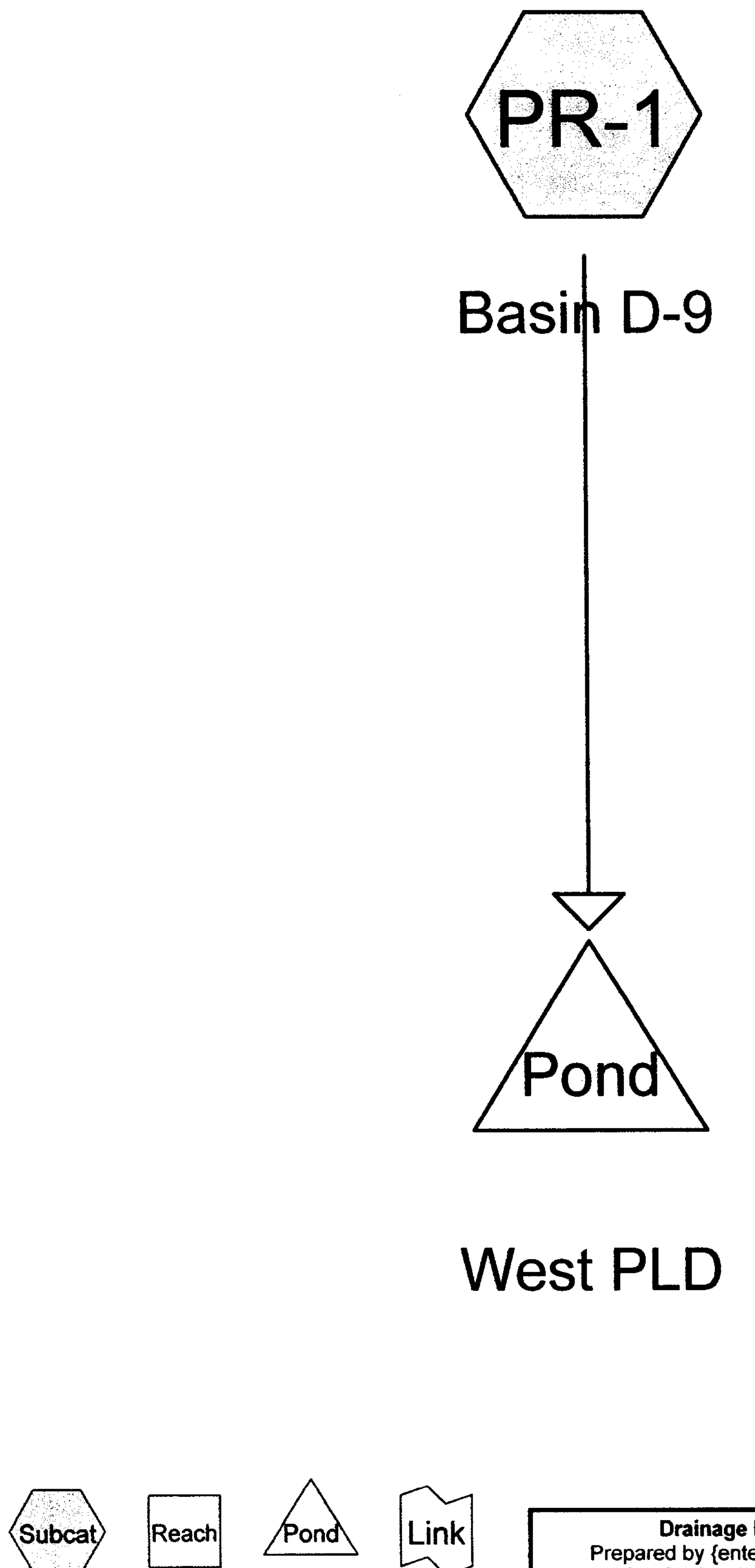


Design Procedure Form: Porous Landscape Detention (PLD)

Designer: **Thomas Roberts**
Company: **Springs Engineering**
Date: **July 23, 2008**
Project: **Meridian Crossing West Pond**
Location: **Falcon, CO**

1. Basin Storage Volume (I_a = 100% if all paved and roofed areas u/s of PLD) A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = 82.00 % i = 0.82
B) Contributing Watershed Area Including the PLD (Area)	Area = 200,821 square feet
C) Water Quality Capture Volume (WQCV) ($WQCV = 0.8 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I)$)	WQCV = 0.27 watershed inches
D) Design Volume: $Vol_{PLD} = (WQCV / 12) * Area$	Vol = 4,568 cubic feet
2. PLD Surface Area (A_{PLD}) and Average Depth (d_{av}) (from 4567.86 square feet to 9135.72 square feet)	A_{PLD} = 4,600 square feet
(d_{av}: = (Vol / A_{PLD}), Min=0.5', Max=1.0')	d_{av} = 0.99 feet
3. Draining of PLD (Check A, **or** B, **or** C, **answer** D) Based on answers to 3A through 3D, check the appropriate method	______ Infiltration to Subgrade with Permeable Membrane: 3(C) checked and 3(E) = no
A) Check box if subgrade is heavy or expansive clay [ ] B) Check box if subgrade is silty or clayey sand [ ] C) Check box if subgrade is well-draining soil [x]	______ Underdrain with Impermeable Liner: 3(A) checked or 3(E) = yes
D) Check box if underdrains are not desirable or if underdrains are not feasible at this site. [ ]	______ Underdrain with Non-Woven Geotextile Fabric: 3(B) checked and 3(E) = no
E) Does tributary catchment contain land uses that may have petroleum products, greases, or other chemicals present, such as gas station, hardware store, restaurant, etc.? yes [x] no [ ]	______ 16-Mil. Impermeable Membrane with No Underdrain: 3(D) checked - Evapotranspiration only x Other: Type D Inlet
4. Sand/Peat Mix and Gravel Subbase (See Figure PLD-1)	
A) Heavy or Expansive Clay (NRCS Group D Soils) Present; Perforated HDPE Underdrain Used.	______ 18" Minimum Depth Sand-Peat Mix with 8" Gravel Layer. 16-Mil. Impermeable Liner and a 3" to 4" Perforated HDPE Underdrain.
B) Silty or Clayey Sand (NRCS Group C Soils) Present; Perforated HDPE Underdrain Used.	______ 18" Minimum Depth Sand-Peat Mix with 8" Gravel Layer and a 3" to 4" Perforated HDPE Underdrain w/ Non-Woven Pemeable Membrane.
C) No Potential For Contamination And Well-Draining (NRCS Group A or B Soils) Are Present; Underdrains Elliminated.	______ 18" Minimum Depth Sand-Peat Mix with Non-Woven Pemeable Membrane and No Underdrain (Direct Infiltration).
D) Underdrains Are Not Desirable Or Are Not Feasible At This Site.	______ 18" Minimum Depth Sand-Peat Mix with An Additional 18" Minimum Layer Sand-Peat Mix or Sand-Class 'A' Compost Bottom Layer (Total Sand-Peat Depth of 36"). 16-Mil. Impermeable Liner Used.
E) Other:	x Other: See Detail on Sheet 8

Notes:



Drainage Diagram for west pond-PLD Sizing
Prepared by {enter your company name here} 7/23/2008
HydroCAD® 8.00 s/n 004515 © 2006 HydroCAD Software Solutions LLC

Pond Pond: West PLD

Inflow Area = 3.680 ac, Inflow Depth = 0.32" for 2-Year event
Inflow = 11.93 cfs @ 0.10 hrs, Volume= 0.098 af
Outflow = 11.81 cfs @ 0.10 hrs, Volume= 0.098 af, Atten= 1%, Lag= 0.2 min
Primary = 11.81 cfs @ 0.10 hrs, Volume= 0.098 af

Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 6,841.48' @ 0.10 hrs Surf.Area= 148 sf Storage= 133 cf

Plug-Flow detention time= 0.2 min calculated for 0.098 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (5.7 - 5.5)

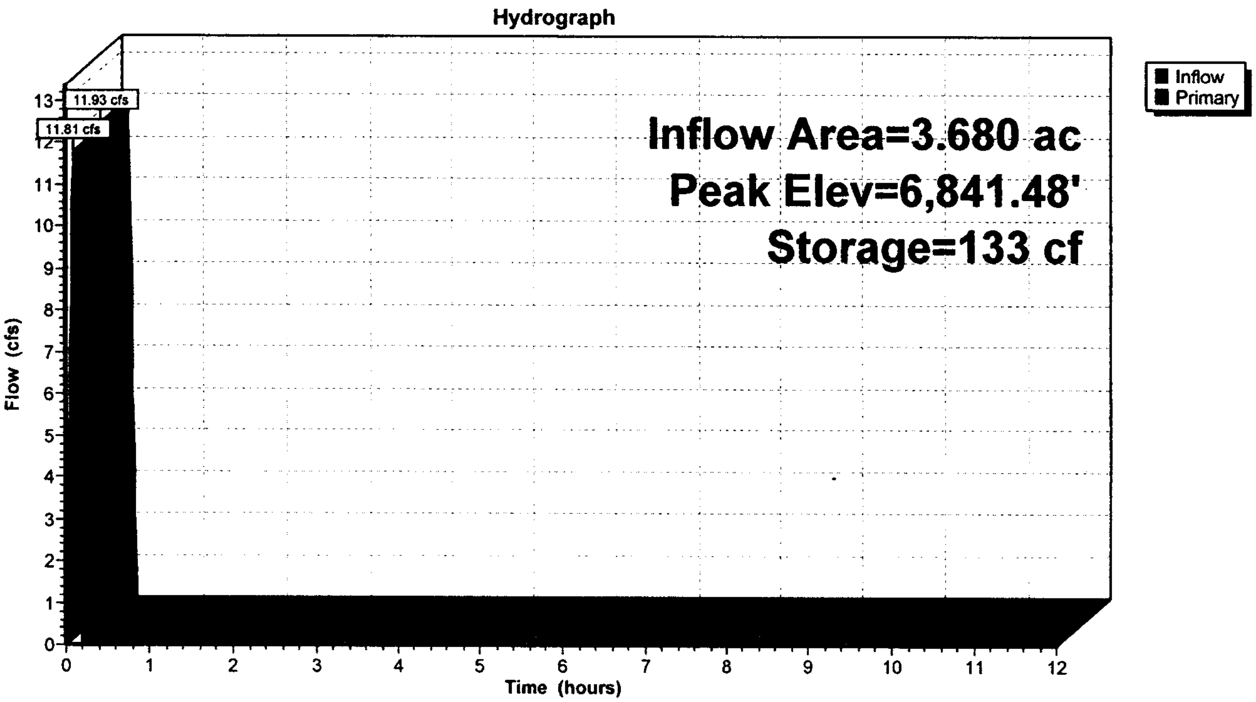
Volume	Invert	Avail.Storage	Storage Description
#1	6,840.00'	6,085 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,840.00	20	0	0
6,841.00	100	60	60
6,842.00	200	150	210
6,843.00	1,500	850	1,060
6,844.50	5,200	5,025	6,085

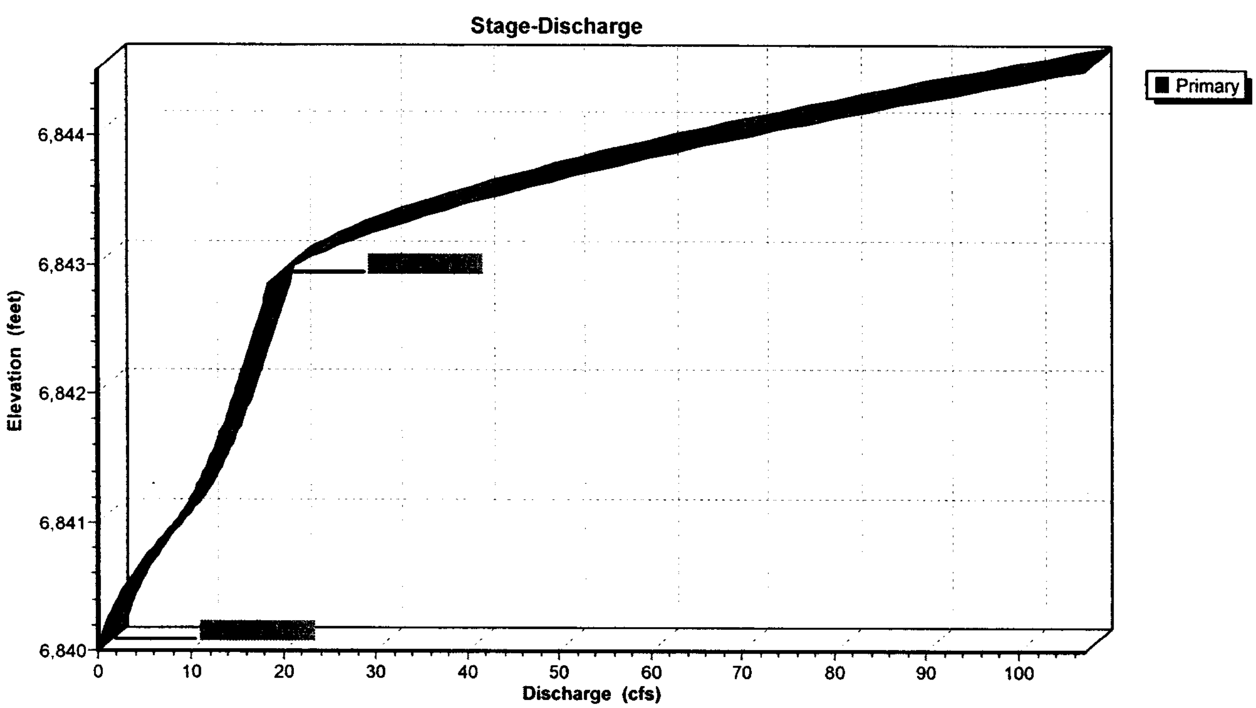
Device	Routing	Invert	Outlet Devices
#1	Primary	6,842.85'	**3.00' x 3.00' Horiz. Orifice/Grate** Limited to weir flow C= 1.000
#2	Primary	6,840.00'	**2.50' W x 1.00' H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=11.74 cfs @ 0.10 hrs HW=6,841.47' (Free Discharge)
↑—**1=Orifice/Grate** (Controls 0.00 cfs)
└—**2=Orifice/Grate** (Orifice Controls 11.74 cfs @ 4.70 fps)

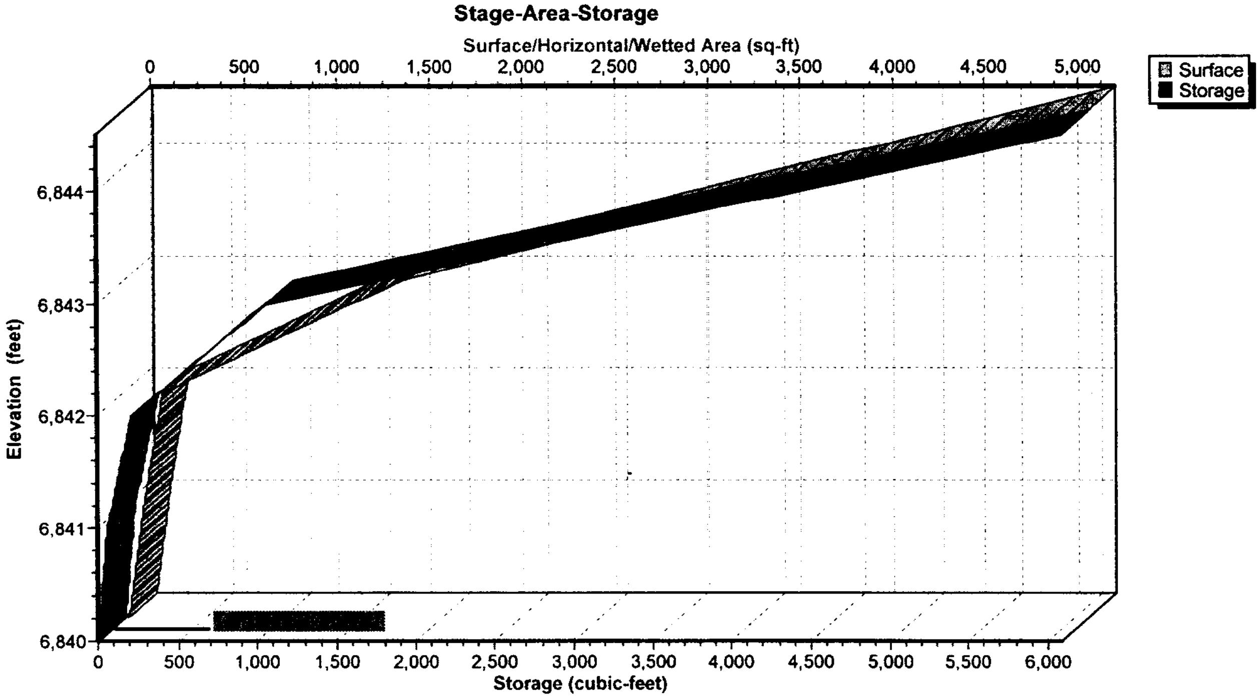
Pond Pond: West PLD



Pond Pond: West PLD



Pond Pond: West PLD



Pond Pond: West PLD

Inflow Area = 3.680 ac, Inflow Depth = 0.44" for 5-Year event
Inflow = 16.39 cfs @ 0.09 hrs, Volume= 0.135 af
Outflow = 15.20 cfs @ 0.11 hrs, Volume= 0.135 af, Atten= 7%, Lag= 0.6 min
Primary = 15.20 cfs @ 0.11 hrs, Volume= 0.135 af

Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 6,842.11' @ 0.11 hrs Surf.Area= 340 sf Storage= 302 cf

Plug-Flow detention time= 0.2 min calculated for 0.134 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (5.7 - 5.5)

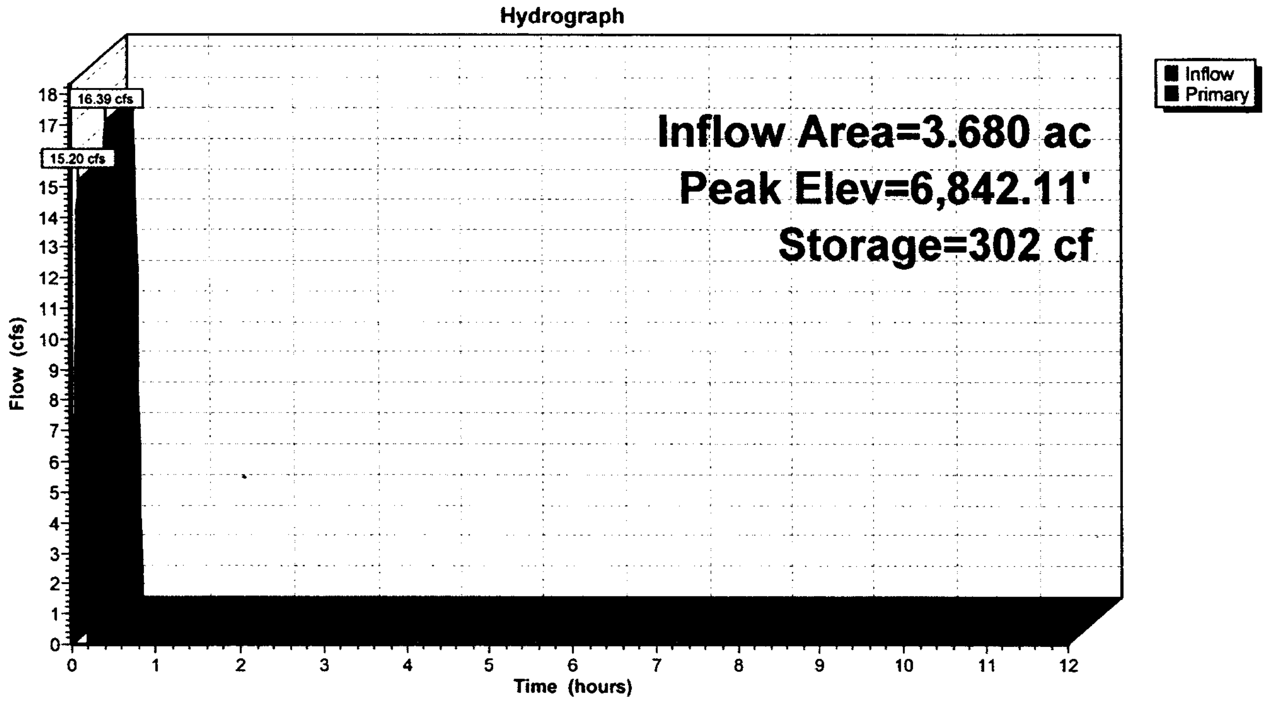
Volume	Invert	Avail.Storage	Storage Description
#1	6,840.00'	6,085 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,840.00	20	0	0
6,841.00	100	60	60
6,842.00	200	150	210
6,843.00	1,500	850	1,060
6,844.50	5,200	5,025	6,085

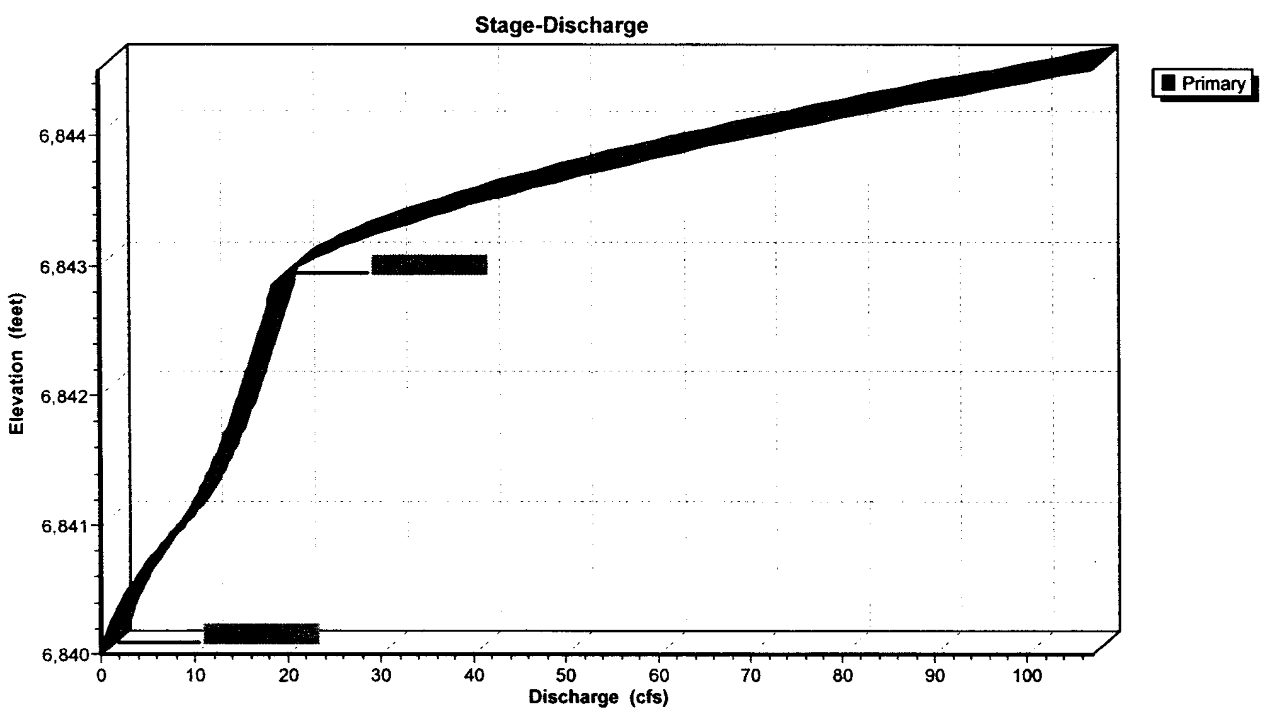
Device	Routing	Invert	Outlet Devices
#1	Primary	6,842.85'	**3.00' x 3.00' Horiz. Orifice/Grate** Limited to weir flow C= 1.000
#2	Primary	6,840.00'	**2.50' W x 1.00' H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=15.16 cfs @ 0.11 hrs HW=6,842.10' (Free Discharge)
1=Orifice/Grate (Controls 0.00 cfs)
2=Orifice/Grate (Orifice Controls 15.16 cfs @ 6.06 fps)

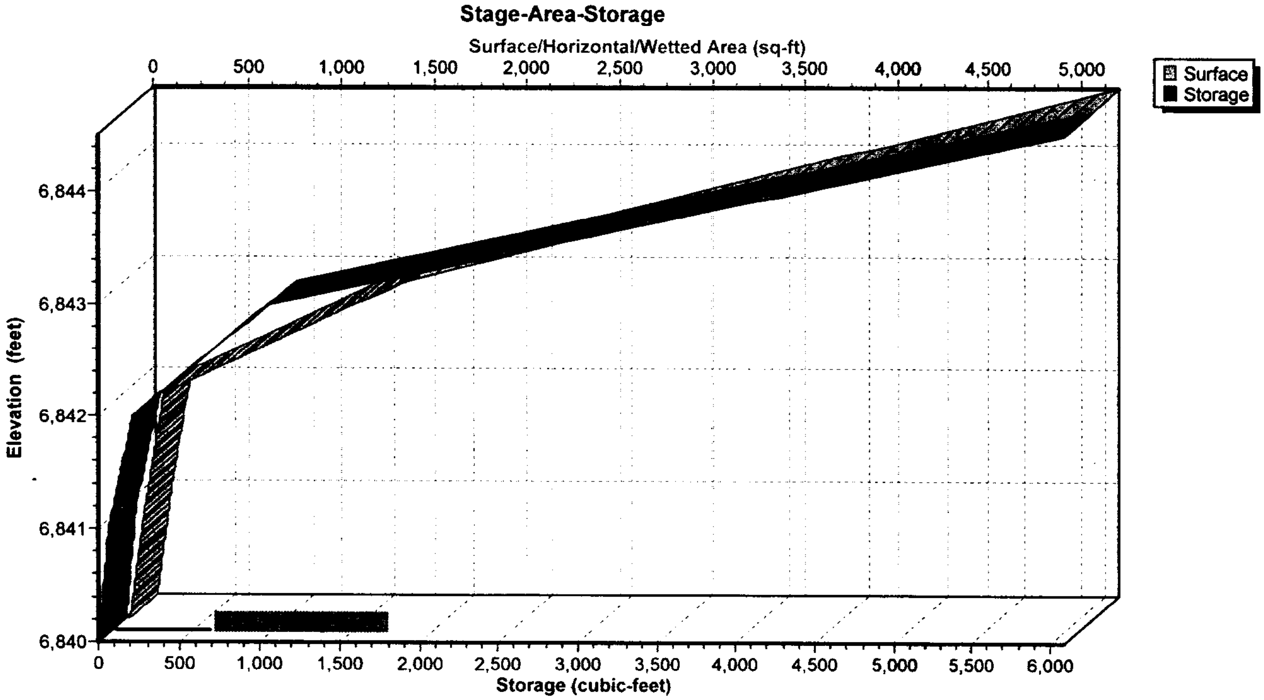
Pond Pond: West PLD



Pond Pond: West PLD



Pond Pond: West PLD



Pond Pond: West PLD

Inflow Area = 3.680 ac, Inflow Depth = 0.78" for 100-Year event
Inflow = 29.14 cfs @ 0.09 hrs, Volume= 0.240 af
Outflow = 25.15 cfs @ 0.11 hrs, Volume= 0.239 af, Atten= 14%, Lag= 1.0 min
Primary = 25.15 cfs @ 0.11 hrs, Volume= 0.239 af

Routing by Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 6,843.13' @ 0.11 hrs Surf.Area= 1,809 sf Storage= 1,479 cf

Plug-Flow detention time= 0.7 min calculated for 0.239 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (6.2 - 5.5)

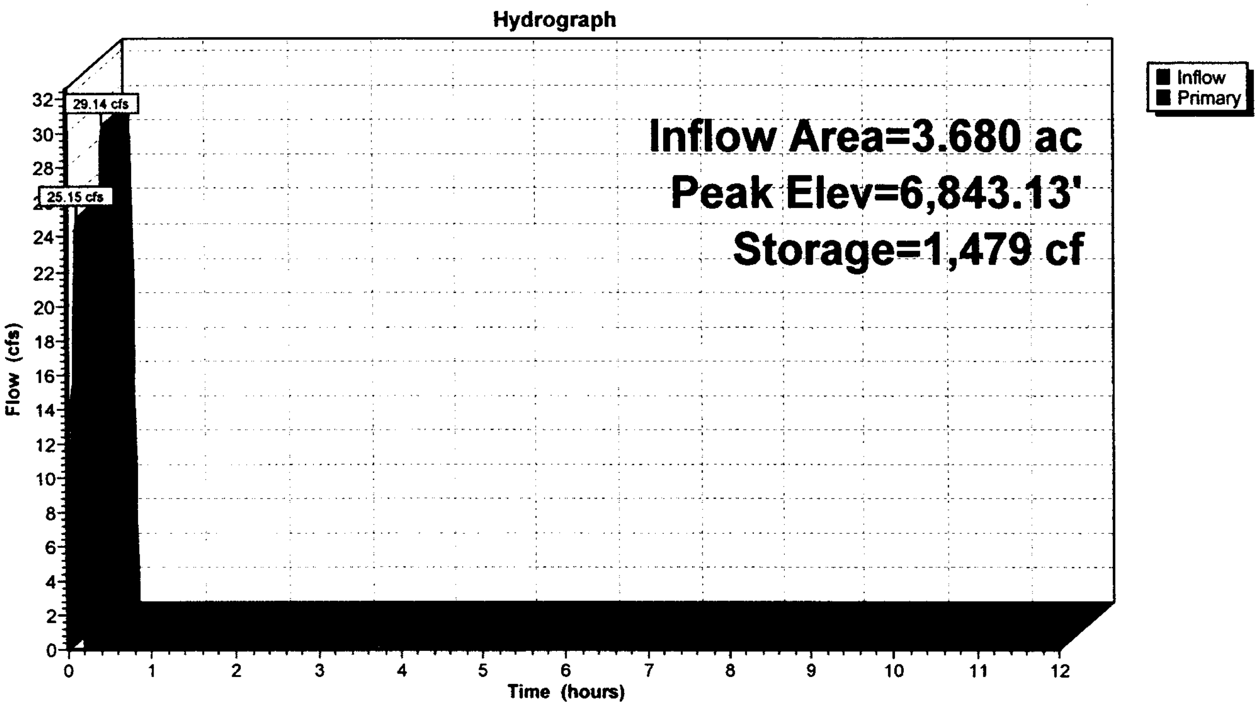
Volume	Invert	Avail.Storage	Storage Description
#1	6,840.00'	6,085 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,840.00	20	0	0
6,841.00	100	60	60
6,842.00	200	150	210
6,843.00	1,500	850	1,060
6,844.50	5,200	5,025	6,085

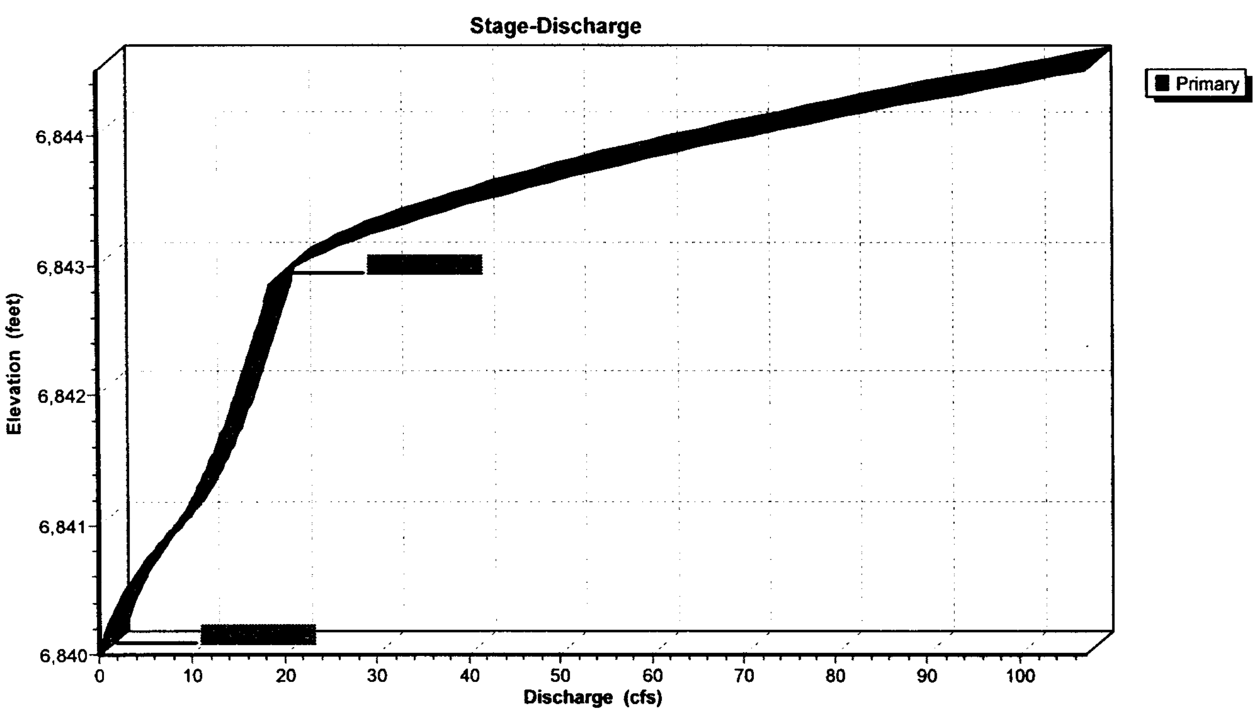
Device	Routing	Invert	Outlet Devices
#1	Primary	6,842.85'	**3.00' x 3.00' Horiz. Orifice/Grate** Limited to weir flow C= 1.000
#2	Primary	6,840.00'	**2.50' W x 1.00' H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=25.05 cfs @ 0.11 hrs HW=6,843.12' (Free Discharge)
├─**1=Orifice/Grate** (Weir Controls 5.58 cfs @ 1.71 fps)
└─**2=Orifice/Grate** (Orifice Controls 19.46 cfs @ 7.79 fps)

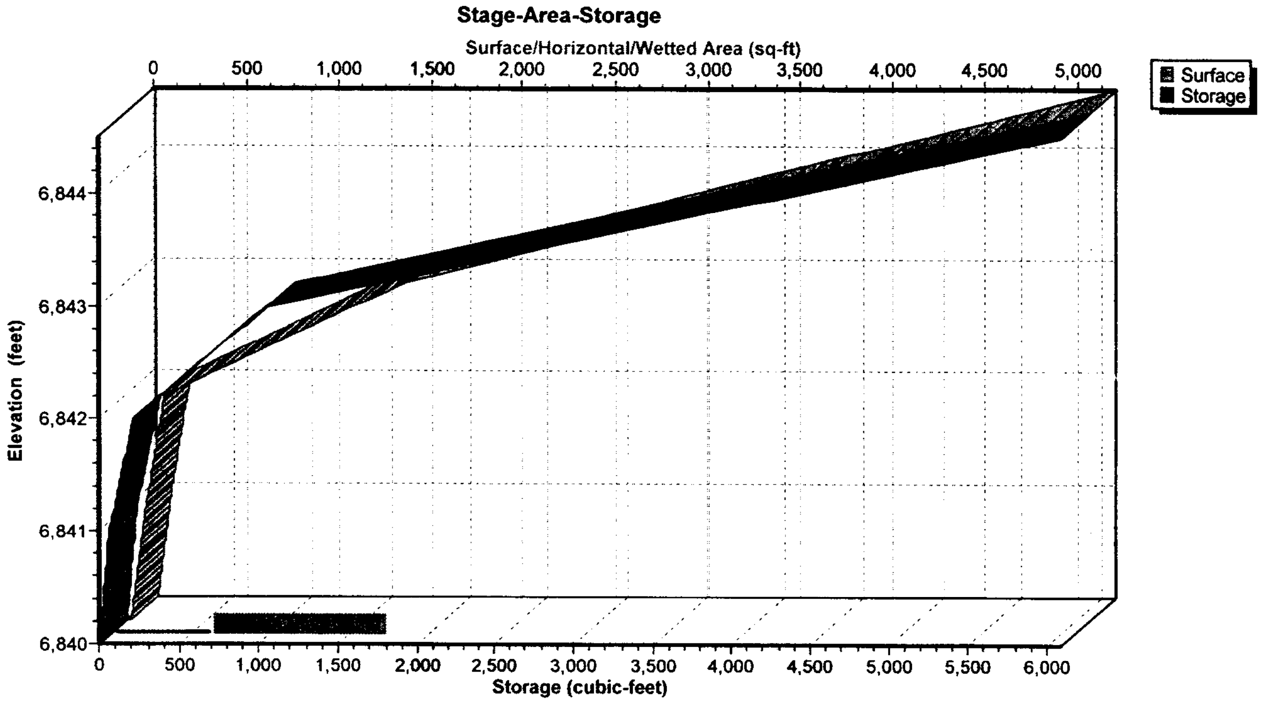
Pond Pond: West PLD



Pond Pond: West PLD



Pond Pond: West PLD



Appendix H: Operations and Maintenance Manual

OPERATION AND MAINTENANCE MANUAL
MERIDIAN CROSSING
PARK PLACE ENTERPRISES
EL PASO COUNTY, COLORADO

May 2008

PREPARED FOR:

Park Place Enterprises
15 Miranda Road
Colorado Springs, CO 80906

PREPARED BY:

Springs Engineering
31 N. Tejon Street
Suite 315
Colorado Springs, CO 80903

PROJECT NO. 07-057-0032

Table of Contents

Introduction

This Operation and Maintenance Plan is being submitted on behalf of Park Place Enterprises for a development known as Meridian Crossing in Falcon, Colorado. The purpose of this Operation and Maintenance Manual (O&M) is to identify facilities which are to be maintained by the Meridian Crossing Properties Owners Association (POA) and the frequency with which these items are to be maintained.

General Location and Description

Meridian Crossing is currently zoned CR and the proposed development includes 6 commercial lots, proposed water quality facilities, streets, and utilities.

Meridian Crossing is approximately 9.5 acres and is located north of the intersection of Meridian Road and Old Meridian Road in Falcon, Colorado, Section 12, Township 13 South, Range 65 West of the 6th Principal Meridian.

Description of Construction

Construction will consist of site grading, utility installation, and road paving. Approximately 9.5 acres of the site will be graded for construction of the proposed commercial units. Erosion control will be provided prior to construction.

Facilities

Water quality facilities will be owned and maintained by the POA. Water and sanitary sewer will be maintained by the Falcon Highlands Metropolitan District. All other utilities are to be maintained by their respective owners.

Inspection and Maintenance

A thorough inspection of the permanent structures shall be performed every 30 days as well as after any significant rain or snowmelt event. Inspectors are to look for any significant deterioration of the facilities including:

- Erosion of channels and side slopes.
- Accumulated trash or debris.

Repairs and removal of debris shall occur as soon as practical.

Porous Landscape Detention Facility

Lawn mowing and vegetative care shall be performed routinely, as aesthetic requirements demand. This shall limit unwanted vegetation. Irrigated turf grass shall be between 2 and 4 inches in height and non irrigated native turf grasses shall be 4 to 6 inches in height. Debris and litter removal shall be performed routinely, as aesthetic requirements demand. Removal of debris and litter from any detention area minimizes clogging of the sand media. Landscaping removal and replacement shall be done every 5 to 10 years depending on infiltration rates needed to drain the area in 12 hours or less. Over time the sandy loam sandy loam turf will clog. The layer will need to be replaced, along with all turf and other vegetation growing on the surface, to rehabilitate infiltration rates. Bin-annual inspections of the hydraulic performance of the area will need to be performed. This will determine if the sand media is allowing acceptable infiltration.

An Operation and Maintenance Log follows.

Operation & Maintenance Log

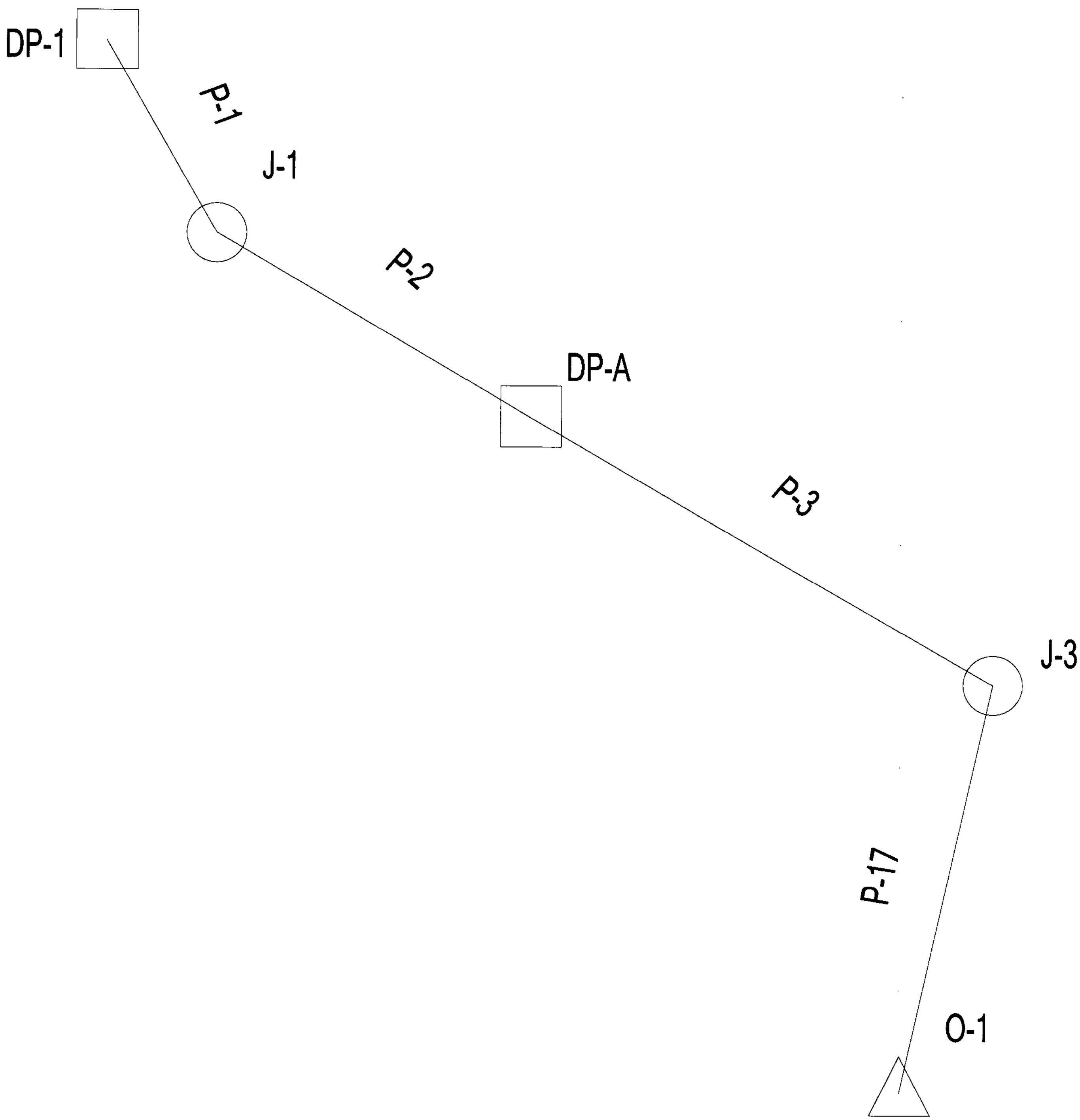
THE SHOPPES AT FALCON
OPERATION AND MAINTENANCE LOG

(Record inspections, items found maintenance and corrective actions taken. Also record any training received by Contractor personnel with regard to erosion control, materials handling and any inspections by outside agencies)

DATE	ITEM	SIGNATURE OF PERSON MAKING ENTRY

Appendix I: Ultimate Design StormCAD Calculations

Scenario: 100-year



Analysis Results
Scenario: 100-year

Note:
The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Title: Old Meridian Road
Project Engineer: Charlene Sammons
Project Date: 11/14/07
Comments: Storm in Old Meridian Road for Meridian Crossing Storm Sewer

Scenario Summary	
Scenario	100-year
Physical Properties Alternat	Base-Physical Properties
Catchments Alternative	Catchments-100-year
System Flows Alternative	Base-System Flows
Structure Headlosses Alterr	Base-Structure Headlosses
Boundary Conditions Altern	Base-Boundary Conditions
Design Constraints Alternat	Base-Design Constraints
Capital Cost Alternative	Base-Cost
User Data Alternative	Base-User Data

Network Inventory			
Number of Pipes	4	Number of Inlets	2
- Circular Pipes:	4	- Grate Inlets:	0
- Box Pipes:	0	- Curb Inlets:	2
- Arch Pipes:	0	- Combination Inlets:	0
- Vertical Elliptical Pipes:	0	- Slot Inlets:	0
- Horizontal Elliptical Pipes:	0	- Grate Inlets in Ditch:	0
Number of Junctions	2	- Generic Inlets:	0
Number of Outlets	1		

Circular Pipes Inventory			
18 inch	274.57 ft	24 inch	55.00 ft
Total Length	329.57 ft		

Curb Inlet Inventory	
Type R 10'	2

Inlet elements for network with outlet: O-1

Label	Inlet	Total System Flow (cfs)	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Bypass Target	Capture Efficiency (%)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	Headloss Method
DP-1	Curb Type R	7.61	7.61	10.28	DP-A	42.5	3,848.83	3,848.83	0.00	Absolut
DP-A	Curb Type R	9.39	2.10	14.37	<Automati	12.8	3,846.39	3,846.08	0.31	Standar

Junction elements for network with outlet: O-1

Label	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	Headloss Method	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/hr)	System Flow Time (min)	System CA (acres)
J-1	3,847.76	3,847.46	0.30	Standar	0.00	0.00	7.55	8.50	6.59	0.88
J-3	3,844.91	3,844.91	0.00	Absolut	0.00	0.00	9.30	8.13	7.63	1.13

Analysis Results
Scenario: 100-year

Outlet: O-1

Label	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Gravity Element Headloss (ft)	System Additional Flow (cfs)	System Known Flow (cfs)	System Rational Flow (cfs)	System Intensity (in/hr)	System Flow Time (min)	System CA (acres)
O-1	6,843.10	6,843.10	0.00	0.00	0.00	9.22	8.06	7.83	1.13

Pipe elements for network with outlet: O-1

Label	Section Shape	Section Size	Length (ft)	Number of Sections	Constructed Slope (ft/ft)	Energy Slope (ft/ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-1	Circular	18 inch	71.21	1	0.012	0.011	7.61	6.31	6,847.76	6,846.90	6,848.83	6,847.79
P-2	Circular	18 inch	17.16	1	0.009	0.009	7.55	5.53	6,846.40	6,845.29	6,847.46	6,846.39
P-3	Circular	18 inch	86.20	1	0.009	0.009	9.39	6.33	6,844.90	6,844.13	6,846.08	6,845.29
P-17	Circular	24 inch	55.00	1	0.007	0.010	9.30	4.62	6,843.50	6,843.10	6,844.91	6,844.19

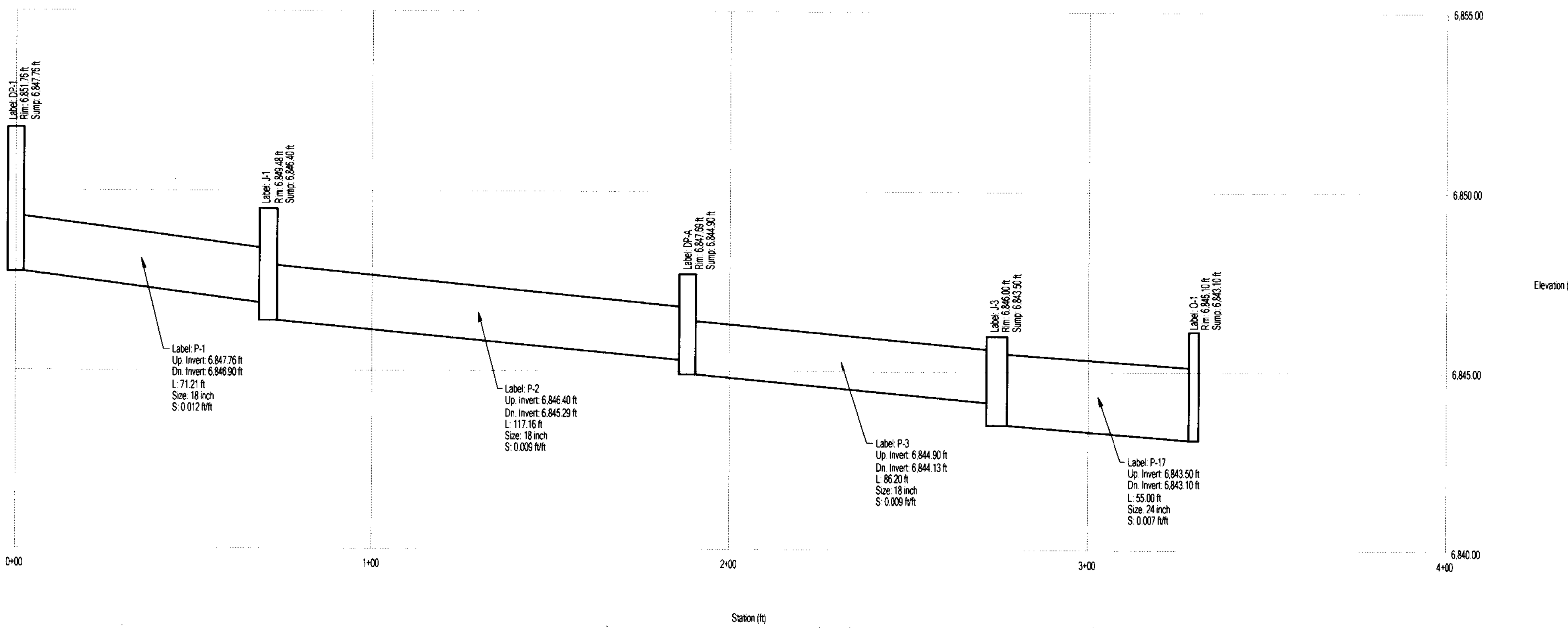
Scenario: 100-year

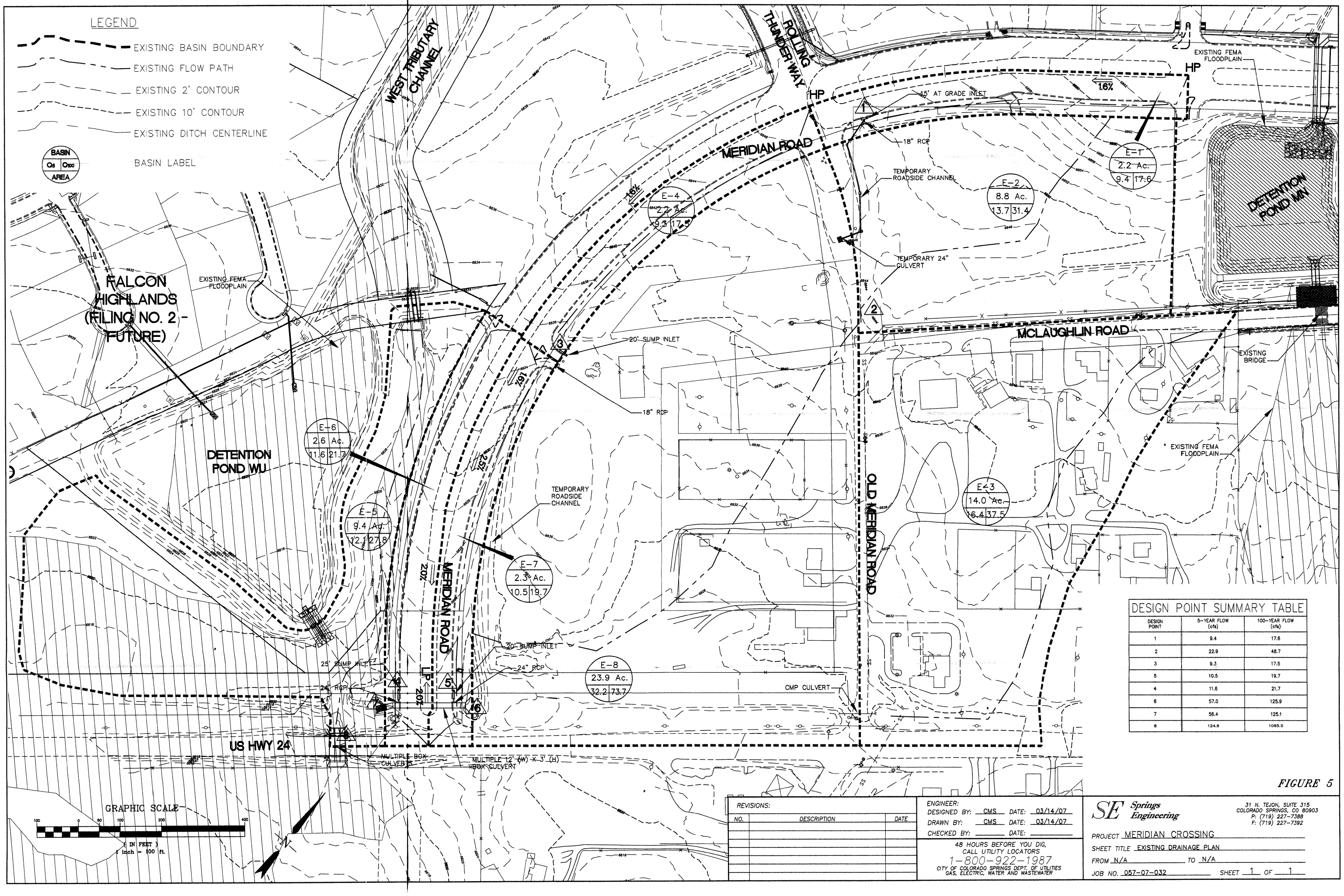
Combined Pipe\Node Report

Label	Up. Node	Dn. Node	L (ft)	Up. Inlet Area (acres)	Up. Inlet Rat. Coef.	Up. Inlet Area (acres)	Up. Calc. Sys. CA (acres)	Up.Inlet Rat. Q (cfs)	Size	Q Full (cfs)	Avg. v (ft/s)	Up. Gr Elev. (ft)	HGL In (ft)	Up. Invert (ft)	Dn. Gr. Elev. (ft)	HGL Out (ft)	Dn. Invert (ft)	S (ft/ft)
P-1	DP-1	J-1	71.21	2.07	1.00	2.07	0.88	17.89	18 inch	11.54	6.31	6,851.76	6,848.83	6,847.76	6,849.48	6,847.79	6,846.90	0.012
P-2	J-1	DP-A	117.16	N/A	N/A	N/A	0.88	N/A	18 inch	10.22	5.53	6,849.48	6,847.46	6,846.40	6,847.69	6,846.39	6,845.29	0.009
P-3	DP-A	J-3	86.20	0.80	1.00	0.80	1.13	6.63	18 inch	9.93	6.33	6,847.69	6,846.08	6,844.90	6,846.00	6,845.29	6,844.13	0.009
P-17	J-3	O-1	55.00	N/A	N/A	N/A	1.13	N/A	24 inch	10.45	4.62	6,846.00	6,844.91	6,843.50	6,846.10	6,844.19	6,843.10	0.007

Profile
Scenario: 100-year

Profile: Ultimate
Scenario: 100-year





DESIGN POINT SUMMARY TABLE		
DESIGN POINT	5-YEAR FLOW (cfs)	100-YEAR FLOW (cfs)
1	9.4	17.6
2	22.9	48.7
3	9.3	17.5
5	10.5	19.7
4	11.6	21.7
6	57.0	125.9
7	56.4	125.1
8	124.6	1085.5

FIGURE 5

REVISIONS:

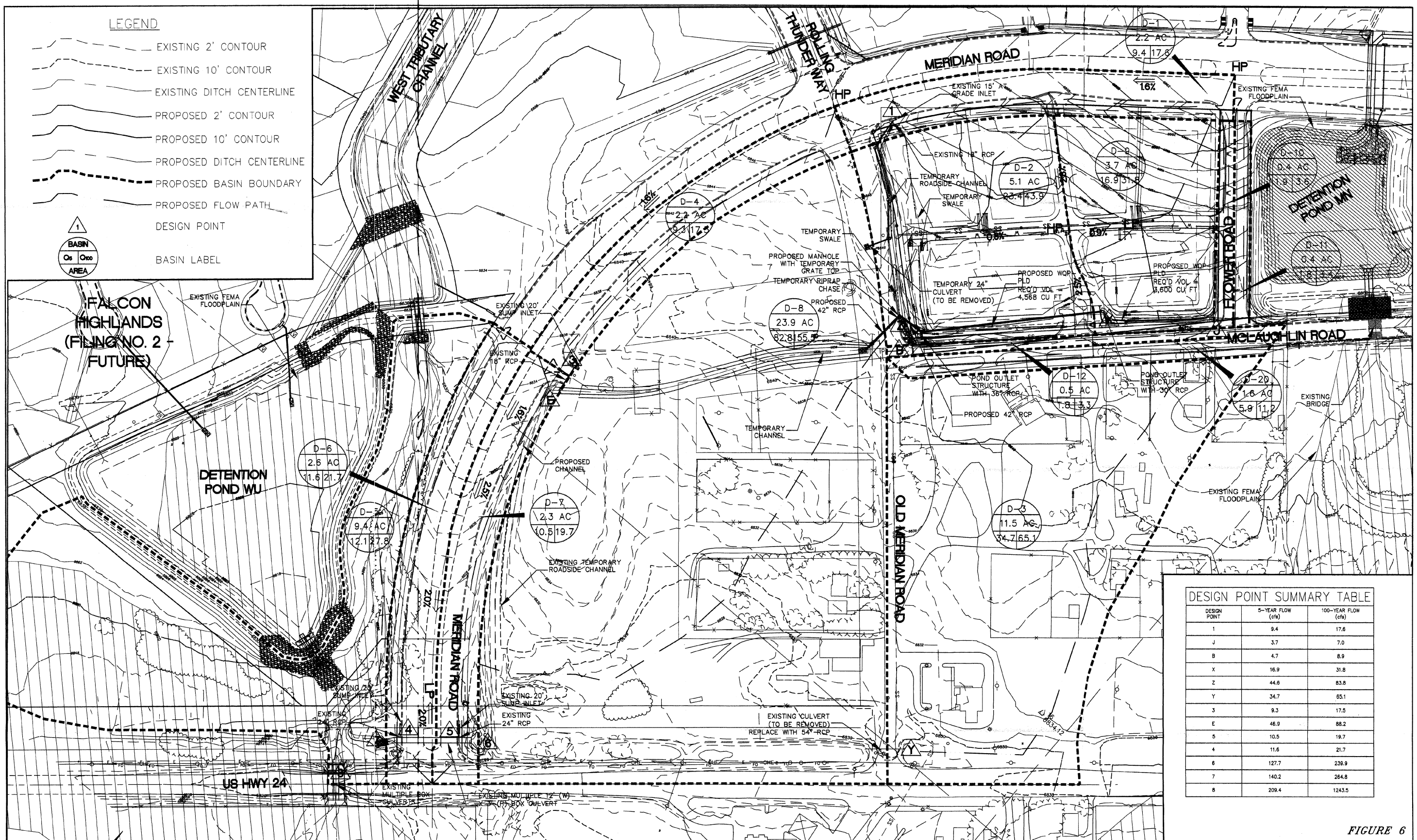
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: CMS DATE: 03/14/07
DRAWN BY: CMS DATE: 03/14/07
CHECKED BY: DATE:

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

SE Springs Engineering
31 N. TEJON, SUITE 315
COLORADO SPRINGS, CO 80903
P: (719) 227-7388
F: (719) 227-7392

PROJECT MERIDIAN CROSSING
SHEET TITLE EXISTING DRAINAGE PLAN
FROM N/A TO N/A
JOB NO. 057-07-032 SHEET 1 OF 1



DESIGN POINT SUMMARY TABLE

DESIGN POINT	5-YEAR FLOW (cfs)	100-YEAR FLOW (cfs)
1	9.4	17.6
J	3.7	7.0
B	4.7	8.9
X	16.9	31.8
Z	44.6	83.8
Y	34.7	65.1
3	9.3	17.5
E	46.9	88.2
5	10.5	19.7
4	11.6	21.7
6	127.7	239.9
7	140.2	264.8
8	209.4	1243.5

FIGURE 6

REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: CMS DATE: 3/14/07
DRAWN BY: CMS DATE: 3/14/07
CHECKED BY: ______ DATE: ______

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
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PROJECT MERIDIAN CROSSING FILING NO.1
SHEET TITLE PROPOSED DRAINAGE PLAN
FROM N/A TO N/A
JOB NO. 057-07-032 SHEET 1 OF 1