# FINAL DRAINAGE LETTER FOR PEAK GYMNASTICS
## (LOTS 9&10 OF ROLLING THUNDER BUSINESS PARK)

**November 2018**

Prepared for:

**Hammers Construction Inc.**
1411 Woolsey Heights
Colorado Springs, CO, 80915
(719) 570-1599

Prepared by:

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Project #44-032

PCD-PPR 18-035

**FINAL DRAINAGE LETTER FOR PEAK GYMNASTICS**
**(LOTS 9&10 OF ROLLING THUNDER BUSINESS PARK)**

**SIGNATURE & DRAINAGE PLAN STATEMENTS**

ENGINEERS STATEMENT

The attached drainage plan and report was 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 County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____
Virgil A. Sanchez, P.E. #37160
For and on Behalf of M&S Civil Consultants, Inc

DEVELOPER'S STATEMENT

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

BY:_____

TITLE:_____
DATE:_____

ADDRESS: Hammers Construction, LLC
1411 Woolsey Heights
Colorado Springs, CO80915

EL PASO COUNTY'S STATEMENT

Filed in accordance with the requirements of El Paso County Land Development Code, Drainage Criteria Manual Volumes 1 and 2, and the El Paso County Engineering Criteria Manual, as amended.

BY:_____ DATE:_____
Jennifer Irvine, P.E.
County Engineer/ECM Administrator

CONDITIONS

**FINAL DRAINAGE LETTER FOR**
**PEAK GYMNASTICS**
**(LOTS 9&10 OF ROLLING THUNDER BUSINESS PARK)**

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**APPENDIX**

# FINAL DRAINAGE LETTER FOR
# PEAK GYMNASTICS
# (LOTS 9&10 OF ROLLING THUNDER BUSINESS PARK)

## PURPOSE

This drainage letter is intended to present the final drainage design and improvements for Peak Gymnastics, Lots 9&10 of Rolling Thunder Business Park. Springs Engineering has prepared the Rolling Thunder Business Park Final Drainage Report in September 2008, and Nolte Associates has prepared a Final Drainage Letter for Lot 1 in October 2008. Both reports apply to this area and components of the reports are included in the appendix. The purpose of this drainage letter is to ensure that post development runoff is in conformance to the Final Drainage Report (Springs Engineering), as well as to analyze the on and offsite drainage patterns, and to identify changes in drainage characteristics due to the development of Lot 1 north of the proposed site.

## GENERAL LOCATION AND DESCRIPTION

Peak Gymnastics is located in Section 11, Township 13 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The site is located adjacent to the west Maltese Point cul-de-sac, south of Woodmen Road, north of Rolling Thunder Way, and east of Golden Sage Road. The site lies within the Sand Creek Drainage Basin.

The site consists of 1.680 acres which is presently undeveloped. Vegetation is sparse, consisting of native grasses. Lot 1, directly north of the site, was analyzed in the Final Drainage Letter by Nolte Associates and is currently developed. Runoff from Lot 1 and Maltese Point is routed through the proposed site, via an existing swale between Lots 9&10, into the existing water quality capture pond (WQCP). The site has experienced overlot grading activities with the development of Rolling Thunder Business Park. Existing site terrain generally slopes from north to south at grade rates that vary between 1.5% and 4.0%.

The site is currently platted and zoned "PUD" for Planned Unit Development. The proposed principal uses for Lots 9&10 will be an office/warehouse facility. The majority of the site shall consist of a warehouse building, asphalt, curb, lighting, a storm water quality facility and landscaping.

## SOILS

Soils for this project are delineated by the map in the appendix as Blakeland-Fluvaquentic Haplaquolls (9) is characterized as Hydrologic Soil Types "A". Soils in the study area are shown as mapped by S.C.S. in the "Soils Survey of El Paso County Area". Vegetation is sparse, consisting of native grasses and weeds. A Geologic Hazard report was completed by Entech Engineering, Inc. dated June 1, 2007. According to the described report, portions of both Lot 9 & 10, have been identified with areas of hydrocompaction. It is recommended that the developer refer to the report for further specific details.

## HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual and where applicable the Urban Storm Drainage Criteria Manual. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

## HYDRAULIC CALCULATIONS

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual. The relevant data sheets are included in the appendix of this report. All culverts and inlets were designed to carry the 100-year storm event, as described in the DCM Volume 1. Per the original FDR design by Springs Engineering, the water quality ponds were designed to drain a 2-year storm event in a 40-hour drain time. The facility includes a 1-year outlet structure.

## FOUR STEP PROCESS

**Step1 Employ Runoff Reduction Practices** – Runoff from the west half of the proposed building rooftop will be directed into the proposed drainage swale located adjacent to the west wall of the proposed building. Runoff will then travel south in the proposed swale across permeable surfaces prior to entering the proposed parking lot. Due to the proposed improvements in relation to the size of the property, provides little to no opportunity for runoff reduction practice.

**Step 2 Stabilize Drainageways** –The development of this project does not anticipate having any negative effects on downstream drainageways.

**Step 3 Provide Water Quality Capture Volume** – The existing Storm Water Quality Facility was previous design by Springs Engineering. Due to the configuration of the proposed parking lot north of the pond, and already existing changes to the pond geometry due to erosion, the existing Storm Water Quality Facility is proposed to be reshaped with 3:1 side slopes. The proposed reshaping is minor in nature and increase the capacity from 0.17 Ac*ft to 0.21 Ac*ft. This reshaping does not have any negative effects on the performance of the existing Storm Water Quality Facility.

**Step4 Consider Need for Industrial and Commercial BMP's** – This submittal provides a final grading and erosion control plans with BMPs in place. The proposed project will use silt fence, a vehicle tracking control pad, and concrete washout area, mulching and reseeding to mitigate the potential for erosion across the site.

## DRAINAGE CRITERIA

This drainage analysis has been prepared in accordance with the current City of Colorado Springs/El Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities for the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres.

## EXISTING DRAINAGE CONDITIONS

The area was originally studied in the Sand Creek Drainage Basin Planning Study (DBPS) and more recently the proposed site was analyzed within the Rolling Thunder Business Park Final Drainage

Report (FDR, September 2008) by Springs Engineering. An Existing Drainage Map is provided from this FDR and located in the appendix of this report. The site is currently undeveloped and existing site terrain generally slopes from north to south.

A water quality capture pond (WQCP), Southwest Pond, was constructed with the overall development of the Rolling Thunder Business Park and occupies the south portion of Lots 9&10. Analysis performed in the FDR by Springs Engineering shows Basin D-7 and Basin D-7a as the contributing tributary area to the Southwest WQCP. Basin D-7a drains to an existing 5' curb cut (Design Point DP-14) located in the southwest end of the west cul-de-sac in Maltese Point. Theses flows are directed south to the Southwest Pond through an existing swale located in a 15' drainage easement between Lots 9 and Lot 10. During the development of Lot 1 to the north, a Final Drainage Letter (FDL) was submitted by Nolte Associates. The Nolte FDL addresses an increase in the size of existing Basin D-7a from 1.58 acres to 1.90 acres with portions of existing Basins D-2 and D-7 contributing due to design constraints. This increased flows to the 5' curb cut and swale from 13.6 cfs (Springs Egineering FDR) to 16.4 cfs. A summary table from the Nolte FDL is included in the Referenced Documents section of the appendix.

## PROPOSED DRAINAGE CONDITIONS

In the proposed condition the site shall consist of a warehouse building, asphalt, curb, lighting, a storm water quality facility and landscaping. Runoff tributary to the existing EDB Southwest Pond is produced within Basins A, B, C and by Design Point 1 ($Q_5$=8.6 cfs, $Q_{100}$=16.4 cfs). In general surface flows travel from north to south/southeast via asphalt paving and curb and gutter into 4' curb cuts at Design Point 2 ($Q_5$=2.7 cfs, $Q_{100}$=5.0 cfs) and Design Point 3 ($Q_5$=1.2 cfs, $Q_{100}$=2.5 cfs). Surface flows at the curb cuts travel down two proposed riprap swales and settle in the pre-sedimentation forebay basin on the west side of the pond. Runoff from the west half of the proposed building rooftop travels south in a swale located adjacent to the west wall of the proposed building. Flows from the swale, Design Point 2 and Design Point 3 are tributary to the Southwest Pond remaining consistent with existing drainage conditions (Existing Basin D-7, Existing Drainage Map).

Design Point 1 uses flow values of $Q_5$=8.6 cfs & $Q_{100}$=16.4 cfs from the Nolte Final Drainage Letter for the development of Lot 1. The existing 5' curb cut located in the southwest end of the cul-de-sac in Maltese Point is proposed to be replaced with a 10' CDOT Type R sump inlet. Flows captured by the sump inlet are routed south from Design Point 1 by a proposed 24" storm pipe to the pre-sedimentation forebay basin within the Southwest Pond.

The Southwest Pond water quality capture pond is an existing extended detention basin and features a pre-sedimentation forebay and outlet structure with an orifice plate. This pond was designed per criteria for extended detention basins at that time and approved with the Rolling Thunder Business Park Final Drainage Report. The Southwest Pond is capable of detaining and releasing the 100-year event from runoff tributary to the existing outlet structure at Design Point 4 ($Q_5$=12.4 cfs, $Q_{100}$=22.6 cfs). See the Water Quality Provisions and Maintenance section below for more details.

All surface runoff produced within Basin D ($Q_5$=0.1 cfs, $Q_{100}$=0.5 cfs) is shed into existing streets Golden Sage Road and Rolling Thunder Way, and ultimately travel to an existing 10' sump inlet at Design Point 5. The existing conditions FDR Proposed Drainage Plan map by Springs Engineering shows existing Basin D-2 and existing Basin D-3 contributing flows to existing Design Point 2 ($Q_5$=7.6 cfs, $Q_{100}$=14.3 cfs). Existing Basin D-2 closely mimics the boundary of proposed Basin D adjacent to Golden Sage Road and was anticipated to be captured by the existing 10' sump inlet at Design Point 5. An inlet calculation of the existing 10' sump inlet is provided in the Hydrologic Calculations portion

of the appendix. This calculation shows that even with direct summation of runoff $Q_5$=7.7 cfs and $Q_{100}$=14.8 cfs from existing Design Point 2 ($Q_5$=7.6 cfs, $Q_{100}$=14.3 cfs) and proposed Basin D ($Q_5$=0.1 cfs, $Q_{100}$=0.5 cfs) the inlet is capable of capturing flow values of $Q_5$=8.7 cfs, $Q_{100}$=14.8 cfs.

## WATER QUALITY PROVISIONS AND MAINTENANCE

A water quality capture pond (WQCP), Southwest Pond, was constructed with the overall development of the Rolling Thunder Business Park and occupies the south portion of Lots 9&10. The Southwest Pond water quality capture pond is an extended detention basin with a 40-hour drain time for the 2-year water quality release. This pond was designed per criteria for extended detention basins at that time and approved with the Rolling Thunder Business Park Final Drainage Report. Flows from the proposed site, and offsite flows from Lot 1 north of the site, are directed to this WQCP. The Southwest Pond has a pre-sedimentation forebay basin with a 6" PVC pipe and an outlet structure with an orifice plate of one column of (12) 0.375" diameter perforations. The FDR designed volume is 0.17 Ac*ft with a tributary watershed area of 3.710 Ac with an imperviousness of 95%.

Proposed minor grading/reshaping activities will be required, due to the configuration of the proposed parking lot north of the pond and to install (2) riprap rundowns to the pre-sedimentation forebay basin. These shall include steepening the side slopes from 4:1 to 3:1, generally restoring even grading within the WQCP. With these activities the overall capacity of the Southwest Pond will increase from 0.17 Ac*ft to 0.21 Ac*ft. All components of the pond such as the pre-sedimentation forebay basin, micropool and outlet structure will remain functional in the proposed conditions. From the outlet structure, the Southwest Pond is connected to an existing 30" RCP storm sewer system running east alongside Rolling Thunder Way. An existing 24" RCP routes flows from the existing Firehouse Pond to the east. Both the 30" RCP and the 24" RCP combine in an existing manhole and are routed offsite. Pond design calculations from Springs Engineering and a "Proposed Pond Improvement Volume" calculation can be found in the Referenced Documents section of the appendix.

The Springs Engineering FDR states that "the streets and major improvements within this site will be maintained by the Rolling Thunder Business Park Property Owners Association (POA) for ownership and maintenance. This includes the roads, drainage facilities, and water quality ponds." Therefore no additional pond maintenance agreements shall be required.

## CONSTRUCTION COST ESTIMATE (Private)

| Item | Description | Quantity | | Unit Cost | | | Cost |
|---|---|---|---|---|---|---|---|
| 1. | 24" ADS HP STORM | 170 | LF | $45 | /LF | | $7,650.00 |
| 2. | 24" ADS-FES | 1 | EA | $250 | /EA | | $250.00 |
| 3. | 10' CDOT Type R Sump Inlet | 1 | EA | $5,000 | /EA | | $5,000.00 |
| 4. | Additional Pond Riprap | 250 | SF | $8 | /EA | | $2,000.00 |
| | | | | | | **Total $** | **$14,900.00** |

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost in 2018.

## DRAINAGE FEES:

No drainage fees are due as the site has been previous platted.

## SUMMARY

Development of the Peak Gymnastics, Lots 9&10 of Rolling Thunder Business Park, site shall not adversely affect adjacent or downstream properties per this final drainage letter and remain consistent with the Rolling Thunder Business Park Final Drainage Report. The proposed drainage improvements and facilities will adequately convey, detain and route runoff from tributary onsite and existing offsite flows to the East Fork Sand Creek drainage channel. All drainage facilities described herein and shown on the included drainage map are subject to change due to formal design considerations during the construction document preparation stage. Care will be taken to accommodate overland emergency flow routes on site and temporary drainage conditions.

## REFERENCES


1.) "El Paso County Drainage Criteria Manual".

2.) "Urban Storm Drainage Criteria Manual"

3.) SCS Soils Map for El Paso County.

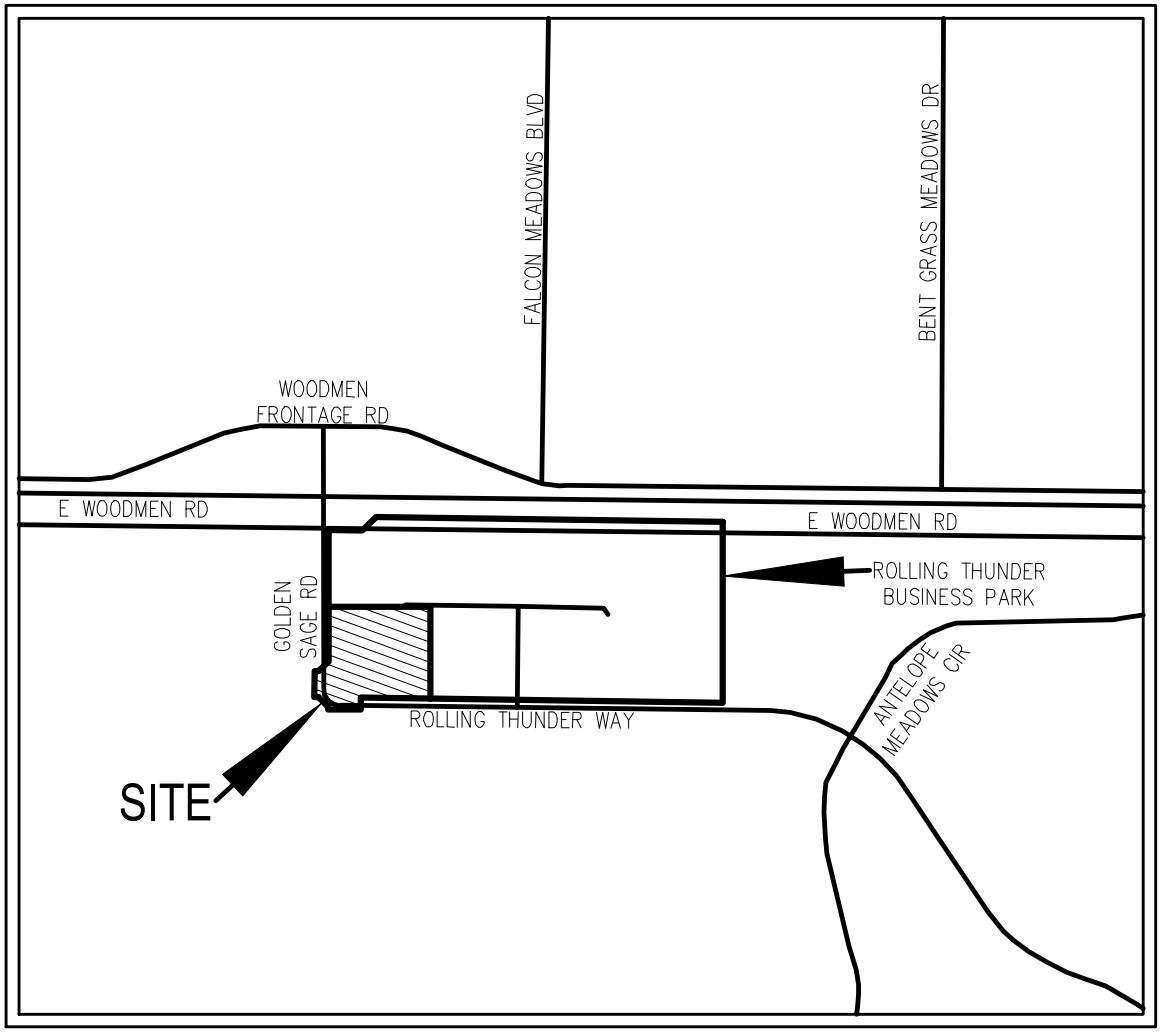
4.) "Final Drainage Report for Rolling Thunder Business Park", dated September 2008, by Springs Engineering.

5.) "Final Drainage Letter for Rolling Thunder Business Park, Lot 1", dated October 2008, by Nolte Associates Inc.

6.) "Sand Creek Drainage Basin Planning Study" (DBPS) prepared by Kiowa Corporation, revised March 1996

# APPENDIX

# Vicinity Map




# VICINITY MAP

N.T.S.

# Soils Map


104° 37' 55" W
104° 37' 48" W
38° 56' 23" N
38° 56' 20" N
531900
531910
531920
531930
531940
531950
531960
531970
531980
531990
532000
532010
532020
532030
532040
532050
4310170
4310160
4310150
4310140
4310130
4310120
4310110
4310100
4310090
4310080
4310070
9
Soil Map may not be valid at this scale.
Map Scale: 1:733 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 10 20 40 60
Feet
0 35 70 140 210
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 15, Oct 10, 2017

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

Date(s) aerial images were photographed: May 22, 2016—Mar 9, 2017

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 |
|---|---|---|---|---|
| 9 | Blakeland-Fluvaquentic Haplaquolls | A | 1.8 | 100.0% |
| **Totals for Area of Interest** | | | **1.8** | **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

# Hydrologic Calculations

# *PEAK GYMNASTICS (LOTS 9&10 OF ROLLING THUNDER BUSINESS PARK)*
# *PROPOSED DRAINAGE CALCULATIONS*
## *(Area Runoff Coefficient Summary)*

| | | | *STREETS / DEVELOPED* | | | *OVERLAND / DEVELOPED* | | | *OVERLAND / UNDEVELOPED* | | | *WEIGHTED* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BASIN** | **TOTAL AREA** *(SF)* | **TOTAL AREA** *(Acres)* | **AREA** *(Acres)* | **$C_5$** | **$C_{100}$** | **AREA** *(Acres)* | **$C_5$** | **$C_{100}$** | **AREA** *(Acres)* | **$C_5$** | **$C_{100}$** | **$C_5$** | **$C_{100}$** |
| ***A*** | ***28372.16*** | 0.65 | 0.65 | 0.81 | 0.88 | 0.00 | | | 0.00 | | | ***0.81*** | ***0.88*** |
| ***B*** | ***17906.72*** | 0.41 | 0.31 | 0.81 | 0.88 | 0.10 | 0.12 | 0.39 | 0.00 | | | ***0.64*** | ***0.76*** |
| ***C*** | ***7867.131*** | 0.18 | 0.00 | | | 0.18 | 0.12 | 0.39 | 0.00 | | | ***0.12*** | ***0.39*** |
| ***D*** | ***6789.15*** | 0.16 | 0.00 | | | 0.16 | 0.12 | 0.39 | | | | ***0.12*** | ***0.39*** |

# *PEAK GYMNASTICS (LOTS 9&10 OF ROLLING THUNDER BUSINESS PARK)*
# *PRELIMINARY/FINAL DRAINAGE REPORT*
## *(Area Drainage Summary)*

| *From Area Runoff Coefficient Summary* | | | | *OVERLAND* | | | | *STREET / CHANNEL FLOW* | | | | *Time of Travel ($T_t$)* | | *INTENSITY ** | | *TOTAL FLOWS* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BASIN** | **AREA TOTAL** *(Acres)* | **$C_5$** *From DCM Table 5-1* | **$C_{100}$** *From DCM Table 5-1* | **$C_5$** | **Length** *(ft)* | **Height** *(ft)* | **$T_C$** *(min)* | **Length** *(ft)* | **Slope** *(%)* | **Velocity** *(fps)* | **$T_t$** *(min)* | **TOTAL** *(min)* | **CHECK** *(min)* | **$I_5$** *(in/hr)* | **$I_{100}$** *(in/hr)* | **$Q_5$** *(c.f.s.)* | **$Q_{100}$** *(c.f.s.)* |
| ***A*** | 0.65 | 0.81 | 0.88 | 0.81 | 60 | 1 | 3.4 | 200 | 1.9% | 2.8 | 1.2 | 4.6 | 11.4 | 5.2 | 8.7 | ***2.7*** | ***5.0*** |
| ***B*** | 0.41 | 0.64 | 0.76 | 0.64 | 80 | 2 | 5.5 | 170 | 1.1% | 2.1 | 1.4 | 6.8 | 11.4 | 4.7 | 7.9 | ***1.2*** | ***2.5*** |
| ***C*** | 0.18 | 0.12 | 0.39 | 0.12 | 25 | 4 | 3.5 | 115 | 1.7% | 2.0 | 1.0 | 4.5 | 10.8 | 5.2 | 8.7 | ***0.1*** | ***0.6*** |
| ***D*** | 0.16 | 0.12 | 0.39 | 0.12 | 5 | 5 | 0.9 | 25 | 2.0% | 2.8 | 0.1 | 1.0 | 10.2 | 5.2 | 8.7 | ***0.1*** | ***0.5*** |

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: CMN
Date: 9/30/2018
Checked by: VAS

# *PEAK GYMNASTICS (LOTS 9&10 OF ROLLING THUNDER BUSINESS PARK)*
# *PRELIMINARY/FINAL DRAINAGE REPORT*
# *(Basin Routing Summary)*

| *From Area Runoff Coefficient Summary* | | | | *OVERLAND* | | | | *PIPE / CHANNEL FLOW* | | | | *Time of Travel ($T_t$)* | *INTENSITY ** | | *TOTAL FLOWS* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DESIGN POINT** | **CONTRIBUTING BASINS** | **$CA_5$** | **$CA_{100}$** | **$C_5$** | **Length** *(ft)* | **Height** *(ft)* | **$T_C$** *(min)* | **Length** *(ft)* | **Slope** *(%)* | **Velocity** *(fps)* | **$T_t$** *(min)* | **TOTAL** *(min)* | **$I_5$** *(in/hr)* | **$I_{100}$** *(in/hr)* | **$Q_5$** *(c.f.s.)* | **$Q_{100}$** *(c.f.s.)* | **COMMENTS** |
| *1* | **Nolte Associates Basin D-7a** | 1.72 | 1.80 | | | | | | | | | | 5.0 | 9.1 | ***8.6*** | ***16.4*** | Nolte Final Drainge Letter values used for Intensities, Q5 & Q100 |
| *2* | **A** | 0.53 | 0.57 | | | | | | | | | 5.0 | 5.2 | 8.7 | ***2.7*** | ***5.0*** | |
| *3* | **B** | 0.26 | 0.31 | | | | | | | | | 6.8 | 4.7 | 7.9 | ***1.2*** | ***2.5*** | |
| *4* | **C, DP1, DP2, DP3** | 2.53 | 2.76 | 0.66 | 50 | 1 | 4.5 | 320 | 2.8% | 3.3 | 1.6 | 6.1 | 4.9 | 8.2 | ***12.4*** | ***22.6*** | Springs Eng. FDR uses a Tc of 6.0 min for all areas tributary to the Southwest Pond. |
| *5* | **D** | 0.02 | 0.06 | | | | | | | | | 1.0 | 7.6 | 12.7 | ***0.1*** | ***0.5*** | |

Calculated by: CMN
Date: 9/30/2018
Checked by: VAS

# *PEAK GYMNASTICS (LOTS 9&10 OF ROLLING THUNDER BUSINESS PARK)*
# *PRELIMINARY/FINAL DRAINAGE REPORT*
## *(Storm Sewer Routing Summary)*

| | | | | | Intensity* | | Flow | |
|---|---|---|---|---|---|---|---|---|
| ***PIPE*** | ***Contributing Pipes/Design Points*** | ***Equivalent $CA_5$*** | ***Equivalent $CA_{100}$*** | ***Maximum $T_C$*** | ***$I_5$*** | ***$I_{100}$*** | ***$Q_5$*** | ***$Q_{100}$*** |
| ***1*** | **EX. DP14 (Nolte Associates Inc. Basin D-7a)** | | | | 5.0 | 9.1 | ***8.6*** | ***16.4*** |

* Intensity equations assume a minimum travel time of 5 minutes.

DP - Design Point

EX - Existing Design Point

FB- Flow By from Design Point

INT- Intercepted Flow from Design Point

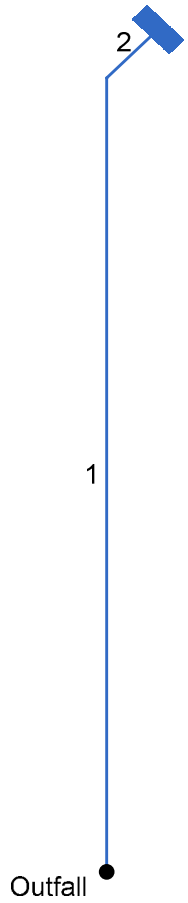
Calculated by: CMN

Date: 9/30/2018

Checked by: VAS

# Hydraulic Calculations

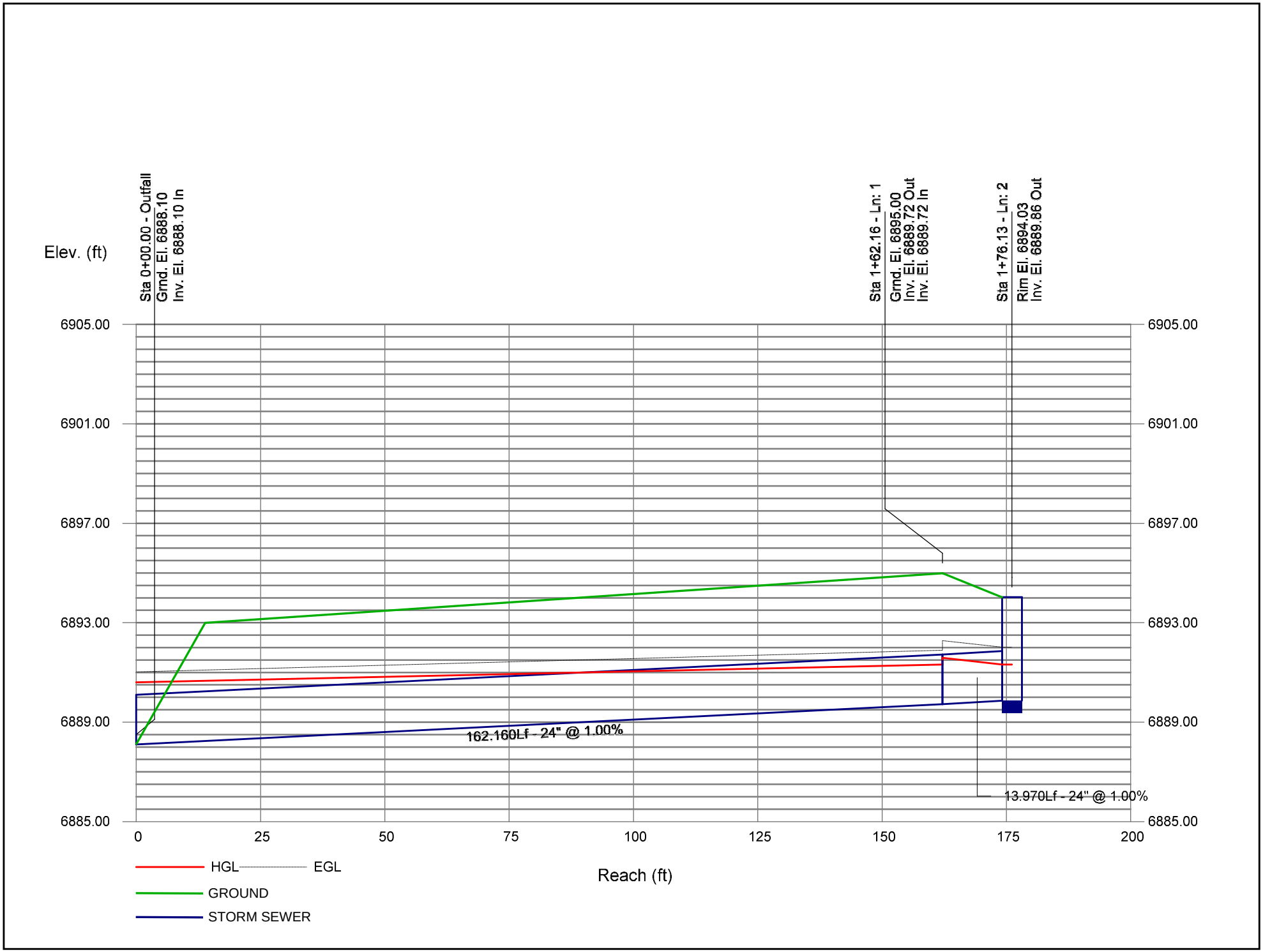
# Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan




| Project File: Maltese Point Inlet.stm | Number of lines: 2 | Date: 5/31/2018 |
|---|---|---|

# Storm Sewer Profile

Proj. file: Maltese Point Inlet.stm



# MyReport



| Line No. | Line ID | Line Size (in) | Line Type | Junct Type | J-Loss Coeff | n-val Pipe | Flow Rate (cfs) | Invert Dn (ft) | Invert Up (ft) | Line Slope (%) | HGL Dn (ft) | HGL Up (ft) | Minor Loss (ft) | HGL Jnct (ft) | Vel Ave (ft/s) | Line Length (ft) | Rim-Hw (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Cul-De-Sac Inlet | 24 | Cir | None | 0.35 | 0.013 | 16.40 | 6888.10 | 6889.72 | 1.00 | 6890.60 | 6891.32 | 0.20 | 6891.52 | 5.66 | 162.160 | 3.48 | |
| 2 | Cul-De-Sac Inlet(2) | 24 | Cir | Generic | 1.25 z | 0.013 | 16.40 | 6889.72 | 6889.86 | 1.00 | 6891.59 | 6891.32 | 0.87 | 6891.32 | 6.03 | 13.970 | 2.71 | |

Project File: Maltese Point Inlet.stm | Number of lines: 2 | Date: 5/31/2018

NOTES: ** Critical depth

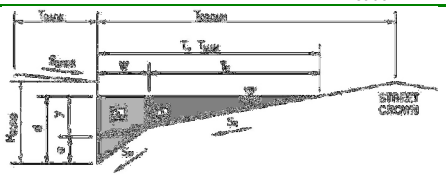
Version 4.05 Released March 2017

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** Peak Gymnastics

**Inlet ID:** Inlet at DP1




**Gutter Geometry (Enter data in the blue cells)**

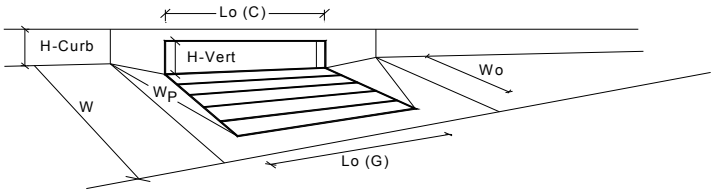
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.018 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.020 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.012 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 21.0 | 21.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.6 | 7.8 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| **MINOR STORM Allowable Capacity is based on Depth Criterion** | | | | |
| **MAJOR STORM Allowable Capacity is based on Depth Criterion** | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 5.6 | 7.8 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.30 | 0.48 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.53 | 0.74 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.91 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **8.7** | **18.7** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 8.6 | 16.4 | cfs |

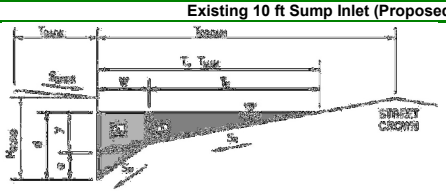
Version 4.05 Released March 2017

# ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

**(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)**

**Project:** Peak Gymnastics

**Inlet ID:** Existing 10 ft Sump Inlet (Proposed Design Point 5)




**Gutter Geometry (Enter data in the blue cells)**

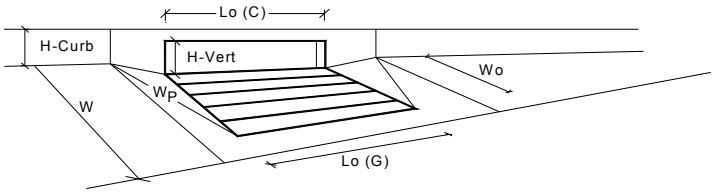
| | | | |
|---|---|---|---|
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK}$ = | 7.5 | ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK}$ = | 0.020 | ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK}$ = | 0.018 | |
| Height of Curb at Gutter Flow Line | $H_{CURB}$ = | 6.00 | inches |
| Distance from Curb Face to Street Crown | $T_{CROWN}$ = | 21.0 | ft |
| Gutter Width | W = | 2.00 | ft |
| Street Transverse Slope | $S_X$ = | 0.083 | ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W$ = | 0.083 | ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_O$ = | 0.000 | ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET}$ = | 0.012 | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX}$ = | 21.0 | 21.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX}$ = | 5.6 | 7.8 | inches |
| Check boxes are not applicable in SUMP conditions | | ☐ | ☐ | |

| | | Minor Storm | Major Storm | |
|---|---|---|---|---|
| **MINOR STORM Allowable Capacity is based on Depth Criterion** | | | | |
| **MAJOR STORM Allowable Capacity is based on Depth Criterion** | **$Q_{allow}$ =** | **SUMP** | **SUMP** | **cfs** |

# INLET IN A SUMP OR SAG LOCATION

**Version 4.05 Released March 2017**




| **Design Information (Input)** | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|---|---|---|---|---|---|
| Type of Inlet | | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from above) | | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | | Ponding Depth = | 5.6 | 7.8 | inches |
| **Grate Information** | | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | | $C_o$ (C) = | 0.67 | 0.67 | |
| **Low Head Performance Reduction (Calculated)** | | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | $d_{Grate}$ = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | | $d_{Curb}$ = | 0.30 | 0.48 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | | $RF_{Combination}$ = | 0.53 | 0.74 | |
| Curb Opening Performance Reduction Factor for Long Inlets | | $RF_{Curb}$ = | 0.91 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | | $RF_{Grate}$ = | N/A | N/A | |
| | | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | | **$Q_a$ =** | **8.7** | **18.7** | **cfs** |
| **Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)** | | $Q_{PEAK\ REQUIRED}$ = | 7.7 | 14.8 | cfs |

# Referenced Documents

# Nolte Final Drainage Letter Basin Comparison

## *Existing Basins*

| Basin | Area Acres | $C_5$ | $C_{100}$ | $I_5$ | $I_{100}$ | $Q_5$ CFS | $Q_{100}$ CFS |
|---|---|---|---|---|---|---|---|
| D-2 | 0.05 | 0.90 | 0.95 | 5.1 | 9.1 | 0.2 | 0.4 |
| D-7 | 0.33 | 0.90 | 0.95 | 5.1 | 9.1 | 1.5 | 2.8 |
| D-7a | 1.52 | 0.90 | 0.95 | 5.1 | 9.1 | 6.8 | 13.1 |

## *Proposed Basins*

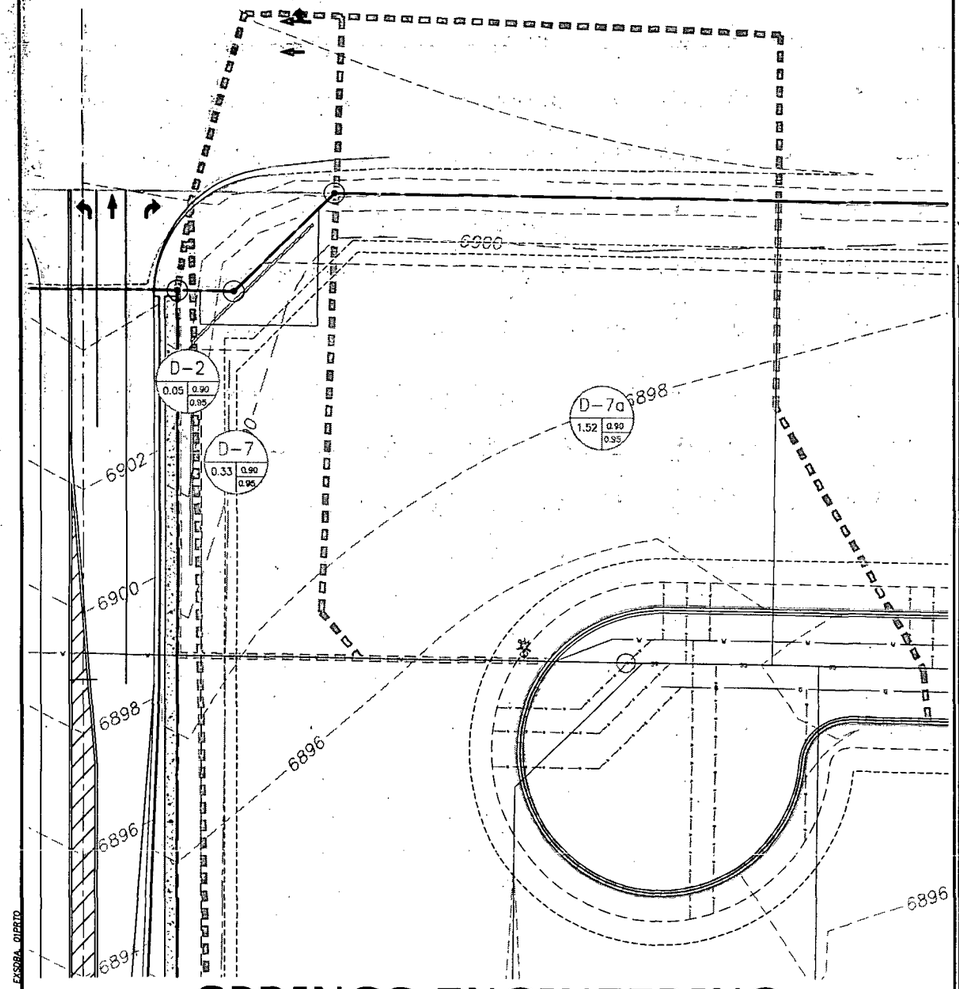
| Basin | Area Acres | $C_5$ | $C_{100}$ | $I_5$ | $I_{100}$ | $Q_5$ CFS | $Q_{100}$ CFS |
|---|---|---|---|---|---|---|---|
| D-2 | - | - | - | - | - | - | - |
| D-7 | - | - | - | - | - | - | - |
| D-7a | 1.90 | 0.90 | 0.95 | 5.0 | 9.1 | 8.6 | 16.4 |

The proposed flows are not greater than those within the Rolling Thunder Business Park Final Drainage Report by Springs Engineering. Therefore no changes to the downstream drainage facilities are required. See Appendix D of this letter for the proposed drainage map.

DATE: 10/16/08 TIME: 11:36:15 AM DRAWING NAME: D1DR.DWG
SURVEY: DESIGNER: TAH PROJ MGR: PLOTTED BY: JAMES
PATH: N:\CSB0213\00\CADD\DWG\PLOT PLAN\LOT 1

LEGEND

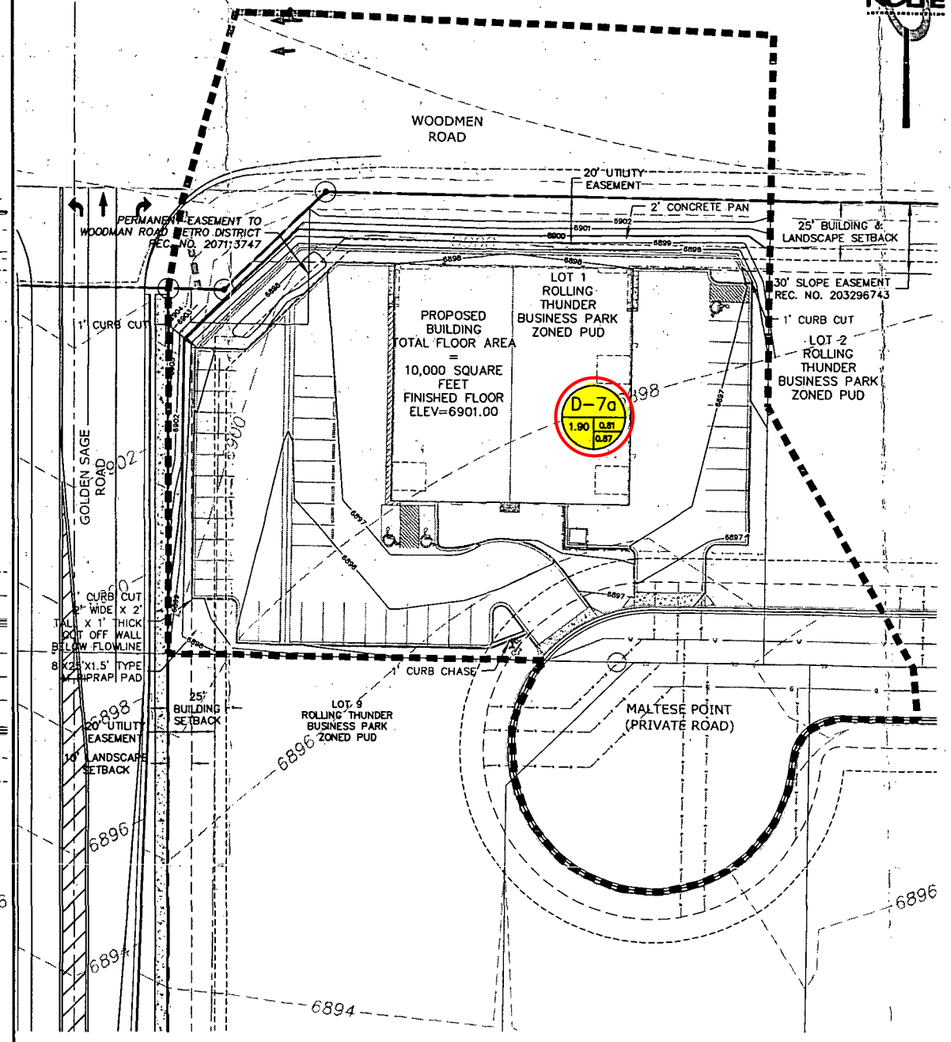
- 6900 — EXISTING MAJOR CONTOUR
- 6902 — EXISTING MINOR CONTOUR
- 6900 — PROPOSED MAJOR CONTOUR
- 6901 — PROPOSED MINOR CONTOUR
- PROPOSED PROPERTY BOUNDARY
- EXISTING BUILDING & LANDSCAPE SETBACK
- EXISTING UTILITY EASEMENT
- EXISTING LANDSCAPE EASEMENT
- EXISTING SLOPE EASEMENT
- SS — EXISTING SANITARY SEWER
- W — EXISTING WATER
- G — EXISTING GAS
- EXISTING BARBED WIRE FENCE
- HANDICAP PARKING
- EXISTING SANITARY SEWER MANHOLE
- EXISTING WATER VALVE
- EXISTING FIRE HYDRANT
- PROPOSED CONCRETE
- 2.0% PROPOSED SLOPE AND DIRECTION
- PROPOSED CHAIN LINK FENCE
- PROPOSED DRAINAGE BASIN (SPRINGS ENGINE)
- PROPOSED DRAINAGE BASIN




# SPRINGS ENGINEERING
# PROPOSED CONDITIONS

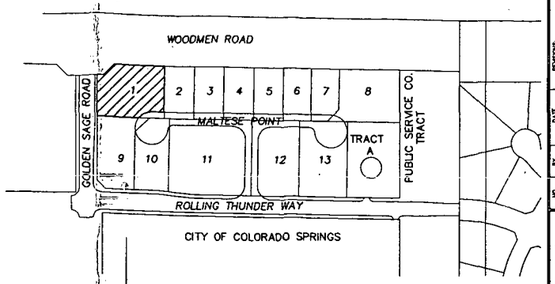
| BASIN | AREA ACRES | C5 | C100 | I5 | I100 | Q5 CFS | Q100 CFS |
|---|---|---|---|---|---|---|---|
| D-2 | 0.05 | 0.90 | 0.95 | 5.1 | 9.1 | 0.2 | 0.4 |
| D-7 | 0.33 | 0.90 | 0.95 | 5.1 | 9.1 | 0.9 | 2.8 |
| D-7a | 1.52 | 0.90 | 0.95 | 5.1 | 9.1 | 3.9 | 13.1 |

NOTE:
1. INTENSITY IS TAKEN FROM THE RATIONAL CALCULATION FOR THE ENTIRE EXISTING BASIN.




# PROPOSED CONDITIONS

| BASIN | AREA ACRES | C5 | C100 | I5 | I100 | Q5 CFS | Q100 CFS |
|---|---|---|---|---|---|---|---|
| D-2 | 0.00 | – | – | – | – | – | – |
| D-7 | 0.00 | – | – | – | – | – | – |
| D-7a | 1.90 | 0.81 | 0.87 | 5.0 | 9.1 | 8.6 | 16.4 |




NOTE

0 15 30 60
1 inch = 30 ft.

## DEVELOPERS STATEMENT

ANY CHANGES OR ALTERATIONS AFFECTING THE GRADE, ALIGNMENT, ELEVATION, OR DEPTH OF COVER OF SEWERS AND APPURTENANCES SHOWN ON THESE DRAWINGS SHALL BE THE RESPONSIBILITY OF THE OWNER/DEVELOPER.

HAMMERS CONSTRUCTION, INC. DATE

COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

COUNTY ENGINEER/DIRECTOR DATE

ANY PROPOSED MODIFICATION TO THE APPROVED GRADING AND EROSION CONTROL PLAN MUST BE SUBMITTED, ALONG WITH SUPPORTING DOCUMENTS, TO THE COUNTY ENGINEER FOR APPROVAL PRIOR TO ANY WORK RELATED TO THE PROPOSED MODIFICATION TAKING PLACE. APPROVAL FROM THE COUNTY ENGINEER SHALL BE ISSUED IF THE APPLICANT DEMONSTRATES THAT THE MODIFICATION WILL PROVIDE SOIL EROSION CONTROLS EQUIVALENT TO OR EXCEEDING THOSE OF THE PREVIOUSLY APPROVED GRADING AND EROSION CONTROL PLAN.

THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSE FOR WHICH THE PARTICULAR DRAINAGE FACILITY IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.

THESE PLANS WERE PREPARED UNDER THE SUPERVISION OF:

REESE M. LUNDGREN, P.E. 35730 DATE
FOR AND ON BEHALF OF NOLTE ASSOCIATES, INC.

EL PASO COUNTY PROJECT NUMBER: PPR-08-005

| NO. | BY | DATE | REVISIONS |
|---|---|---|---|

CAUTION

This engineer prepared these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of these plans.

# ROLLING THUNDER BUSINESS PARK
## LOT 1
## DRAINAGE PLAN

DATE SUBMITTED: OCTOBER 2008

PREPARED FOR: HAMMERS CONSTRUCTION, INC.


NOLTE
BEYOND ENGINEERING
1975 RESEARCH PARKWAY, Suite 165 COLORADO SPRINGS, CO 80920
719.268.8500 TEL 719.268.9200 FAX WWW.NOLTE.COM


PRELIMINARY
NOT FOR CONSTRUCTION

SHEET NUMBER 1 OF 1 SHEETS

SCALE
VERTICAL: NA
HORIZONTAL: 1" = 30'

JOB NUMBER CSB0213

XREFS: DIRRDN_EXHA_EXTD_EXUT_KEYMAP_EXSDBA_DIRRTO

# ROLLING THUNDER BUSINESS PARK - FDR - DEVELOPED CONDITIONS
## (RATIONAL METHOD Q=CIA)

| BASIN | TOTAL FLOWS | | | | | | AREA | WEIGHTED | | OVERLAND | | | | CHANNEL | | | | Tc | INTENSITY | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q2 | $Q_5$ | $Q_{100}$ | | CA(equiv.) | | TOTAL | $C_5$ | $C_{100}$ | $C_5$ | Length | Slope | Tco | Length | Slope | Velocity | Tcc | TOTAL | $I_2$ | $I_5$ | $I_{100}$ | |
| | (c.f.s.) | (c.f.s.) | (c.f.s.) | 2 YR | 5 YR | 100 YR | (Ac) | | | | (ft) | (ft) | (min) | (ft) | (%) | (fps) | (min) | (min) | (in/hr) | (in/hr) | (in/hr) | |
| D-1 | 2.3 | 3.2 | 6.1 | 0.6 | 0.63 | 0.67 | 0.70 | 0.90 | 0.95 | 0.90 | 5 | 2.0% | 0.7 | 500 | 3.5% | 3.7 | 2.2 | 5.0 | 3.7 | 5.1 | 9.1 | |
| D-2 | 2.7 | 3.7 | 6.9 | 0.7 | 0.72 | 0.76 | 0.80 | 0.90 | 0.95 | 0.90 | 5 | 2.0% | 0.7 | 500 | 3.5% | 3.7 | 2.2 | 5.0 | 3.7 | 5.1 | 9.1 | |
| D-3 | 3.3 | 4.5 | 8.5 | 1.1 | 1.06 | 1.12 | 1.18 | 0.90 | 0.95 | 0.90 | 40 | 2.0% | 1.9 | 715 | 0.7% | 1.7 | 7.1 | 9.0 | 3.1 | 4.3 | 7.6 | |
| D-4 | 2.2 | 3.1 | 5.8 | 0.7 | 0.67 | 0.71 | 0.74 | 0.90 | 0.95 | 0.90 | 5 | 2.0% | 0.7 | 560 | 0.5% | 1.4 | 6.6 | 7.3 | 3.3 | 4.6 | 8.2 | |
| D-5 | 3.9 | 5.4 | 10.2 | 1.3 | 1.33 | 1.41 | 1.48 | 0.90 | 0.95 | 0.90 | 40 | 2.0% | 1.9 | 1,000 | 1.0% | 2.0 | 8.3 | 10.2 | 3.0 | 4.1 | 7.2 | |
| D-6 | 3.8 | 5.2 | 9.7 | 1.1 | 1.12 | 1.19 | 1.25 | 0.90 | 0.95 | 0.90 | 5 | 2.0% | 0.7 | 775 | 1.0% | 2.0 | 6.5 | 7.1 | 3.4 | 4.6 | 8.2 | |
| D-7 | 7.1 | 9.8 | 18.4 | 1.9 | 1.92 | 2.02 | 2.13 | 0.90 | 0.95 | 0.90 | 40 | 2.0% | 1.9 | 515 | 3.1% | 3.5 | 2.4 | 5.0 | 3.7 | 5.1 | 9.1 | |
| D-7a | 5.3 | 7.3 | 13.6 | 1.4 | 1.42 | 1.50 | 1.58 | 0.90 | 0.95 | 0.90 | 40 | 2.0% | 1.9 | 285 | 4.3% | 4.1 | 1.2 | 5.0 | 3.7 | 5.1 | 9.1 | |
| D-8 | 3.4 | 4.6 | 8.7 | 0.9 | 0.91 | 0.96 | 1.01 | 0.90 | 0.95 | 0.90 | 5 | 2.0% | 0.7 | 245 | 1.2% | 2.2 | 1.8 | 5.0 | 3.7 | 5.1 | 9.1 | |
| D-9 | 12.0 | 16.5 | 31.0 | 4.4 | 4.45 | 4.69 | 4.94 | 0.90 | 0.95 | 0.90 | 300 | 2.0% | 5.2 | 715 | 0.6% | 1.5 | 7.7 | 12.8 | 2.7 | 3.7 | 6.6 | |
| D-10 | 7.2 | 9.9 | 18.6 | 1.9 | 1.94 | 2.04 | 2.15 | 0.90 | 0.95 | 0.90 | 60 | 2.0% | 2.3 | 300 | 2.0% | 2.8 | 1.8 | 5.0 | 3.7 | 5.1 | 9.1 | |
| D-11 | 5.9 | 8.2 | 19.4 | 1.6 | 1.60 | 2.13 | 5.33 | 0.30 | 0.40 | 0.90 | 60 | 2.0% | 2.3 | 500 | 2.8% | 3.3 | 2.5 | 5.0 | 3.7 | 5.1 | 9.1 | |
| D-12 | 5.3 | 7.3 | 13.6 | 1.4 | 1.42 | 1.50 | 1.58 | 0.90 | 0.95 | 0.90 | 10 | 2.0% | 0.9 | 250 | 1.6% | 2.5 | 1.6 | 5.0 | 3.7 | 5.1 | 9.1 | |
| | | | | | | | | | | | | | | | | | | | | | | |
| Offsite | 68.8 | 94.7 | 194.5 | 32.5 | 32.50 | 37.50 | 50.00 | 0.65 | 0.75 | 0.35 | 100 | 2.0% | 11.2 | 1,500 | 1.5% | 2.4 | 10.2 | 21.4 | 2.1 | 2.9 | 5.2 | |
| Formula: | | C*I*A | C*I*A | | Q/I | Q/I | | | | | | | *1 | | | *2 | *3 | Tco+Tcc | *4 | *5 | *6 | |
| | | | | | | | 86.95 | | | | | | | | | 20 | | | 1.09 | 1.5 | 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* $I_2$ = (26.65*1.09)/(10+Tc)^0.76 (City Letter of 1/7/2003)
5* $I_5$ = (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)

Springs Engineering FDR Hydrologic Calculations

# 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) |
|---|---|---|---|---|---|---|---|---|
| 14 | D-7a | 1.42 | 1.50 | 5.0 | 5.1 | 9.1 | 7.3 | 13.6 |
| | | | | TRAVEL TIME | | | | |
| | | 1.42 | 1.50 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | Channel | 165 | 2.8 | 1.0 | 6.0 |
| 1 | D-8 | 0.91 | 0.96 | 6.0 | 4.9 | 8.7 | 20.7 | 38.9 |
| | D-7 | 1.92 | 2.02 | TRAVEL TIME | | | | |
| | DP-14 | 1.42 | 1.50 | | | | | |
| | | 4.25 | 4.48 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.7 | 0.0 | 6.0 |
| 2 | D-2 | 0.72 | 0.76 | 9.0 | 4.3 | 7.6 | 7.6 | 14.3 |
| | D-3 | 1.06 | 1.12 | TRAVEL TIME | | | | |
| | | 1.78 | 1.88 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 9.0 |
| 3 | D-1 | 0.63 | 0.67 | 5.0 | 5.1 | 9.1 | 3.2 | 6.1 |
| | | | | TRAVEL TIME | | | | |
| | | 0.63 | 0.67 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 5.0 |
| 4 | Inlet 3 | 0.23 | 0.31 | 7.3 | 4.6 | 8.2 | 1.0 | 2.5 |
| | | | | TRAVEL TIME | | | | |
| | | 0.23 | 0.31 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 7.3 |
| 5 | D-4 | 0.67 | 0.71 | 7.3 | 4.6 | 8.2 | 3.1 | 5.8 |
| | | | | TRAVEL TIME | | | | |
| | | 0.67 | 0.71 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 7.3 |
| 6 | D-5 | 1.33 | 1.41 | 10.2 | 4.1 | 7.2 | 5.4 | 10.2 |
| | | | | TRAVEL TIME | | | | |
| | | 1.33 | 1.41 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 10.2 |
| 7 | D-6 | 1.12 | 1.19 | 7.1 | 4.6 | 8.2 | 5.2 | 9.7 |
| | | | | TRAVEL TIME | | | | |
| | | 1.12 | 1.19 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 7.1 |

| 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) |
| 8 | D-9 | 4.45 | 4.69 | 12.8 | 3.7 | 6.6 | 16.5 | 31.0 |
| | | | | TRAVEL TIME | | | | |
| | | 4.45 | 4.69 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | CHANNEL | 510 | 4.6 | 1.8 | 14.7 |
| 9 | D-10 | 1.94 | 2.04 | 14.7 | 3.5 | 6.2 | 27.3 | 51.2 |
| | D-12 | 1.42 | 1.50 | | | | | |
| | DP 8 | 4.45 | 4.69 | TRAVEL TIME | | | | |
| | | 7.80 | 8.24 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | CHANNEL | 375 | 4.6 | 1.4 | 16.1 |
| 10 | D-11 | 1.60 | 2.13 | 16.1 | 3.4 | 6.0 | 133.7 | 254.6 |
| | DP-9 | 7.80 | 8.24 | TRAVEL TIME | | | | |
| | Add Flow from MDDP | 30.43 | 32.26 | | | | | |
| | | 39.83 | 42.63 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 16.1 |
| 11 | DP-6 | 1.33 | 1.41 | 16.1 | 3.4 | 6.0 | 141.9 | 270.1 |
| | DP-7 | 1.12 | 1.19 | | | | | |
| | DP-10 | 39.83 | 42.63 | TRAVEL TIME | | | | |
| | | 42.29 | 45.22 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 16.1 |
| 12 | DP-2 | 1.78 | 1.88 | 9.0 | 4.3 | 7.6 | 11.3 | 21.7 |
| | DP-3 | 0.63 | 0.67 | | | | | |
| | DP-4 | 0.23 | 0.31 | TRAVEL TIME | | | | |
| | | 2.64 | 2.85 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 9.0 |
| 13 | DP-1 | 4.25 | 4.48 | 9.0 | 4.3 | 7.6 | 32.2 | 61.1 |
| | DP-5 | 0.67 | 0.71 | | | | | |
| | DP-12 | 2.64 | 2.85 | TRAVEL TIME | | | | |
| | | 7.56 | 8.04 | Type/flow | Length (ft) | Velocity (fps) | d. Time (min) | T. Time (min) |
| | | | | | | 0.0 | 0.0 | 9.0 |

# ROLLING THUNDER BUSINESS PARK - FDR - DEVELOPED 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 |
| 2 | 10 | SUMP | 2.0% | SAG | 8 | 14 | 7.6 | 1.78 | 0 | 0.00 | 0.50 | | 10.9 | 1.44 | 3 | 0.44 | 0.50 | |
| 3 | 10 | FLOW-BY | 2.0% | 2.0% | 3 | 6 | 2.1 | 0.41 | 1 | 0.23 | 0.28 | 9.8 | 3.3 | 0.36 | 3 | 0.31 | 0.33 | 12.4 |
| 6 | 10 | SUMP | 2.0% | SAG | 5 | 10 | 5.4 | 1.33 | 0 | 0.00 | 0.50 | | 10.2 | 1.41 | 0 | 0.00 | 0.50 | |
| 7 | 10 | SUMP | 2.0% | SAG | 5 | 10 | 5.2 | 1.12 | 0 | 0.00 | 0.50 | | 9.7 | 1.19 | 0 | 0.00 | 0.50 | |

# Springs Engineering Southwest Pond Design Data

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



**Designer:** Charlene Sammons
**Company:** Springs Engineering
**Date:** September 3, 2008
**Project:** ~~Rolling Thunder~~ Business Park
**Location:** Southwest Pond

| | |
|---|---|
| 1. Basin Storage Volume | |
| A) Tributary Area's Imperviousness Ratio (i = $I_a$ / 100 ) | $I_a$ = 95.00 % <br> i = 0.95 |
| B) Contributing Watershed Area (Area) | Area = 3.710 acres |
| C) Water Quality Capture Volume (WQCV) <br> (WQCV =1.0 * (0.91 * $I^3$ - 1.19 * $I^2$ + 0.78 * I)) | WQCV = 0.45 watershed inches |
| D) Design Volume: Vol = (WQCV / 12) * Area * 1.2 | Vol = 0.17 acre-feet |
| 2. Outlet Works | |
| A) Outlet Type (Check One) | X Orifice Plate <br> Perforated Riser Pipe <br> Other: |
| B) Depth at Outlet Above Lowest Perforation (H) | H = 3.89 feet |
| C) Recommended Maximum Outlet Area per Row, ($A_o$) | $A_o$ = 0.1 square inches |
| D) Perforation Dimensions: <br> i) Circular Perforation Diameter or <br> ii) Width of 2" High Rectangular Perforations | D = 0.375 inches <br> W = inches |
| E) Number of Columns (nc, See Table 6a-1 For Maximum) | nc = 1 number |
| F) Actual Design Outlet Area per Row ($A_o$) | $A_o$ = 0.1 square inches |
| G) Number of Rows (nr) | nr = 12 number |
| H) Total Outlet Area ($A_{ot}$) | $A_{ot}$ = 1.3 square inches |
| 3. Trash Rack | |
| A) Needed Open Area: $A_t$ = 0.5 * (Figure 7 Value) * $A_{ot}$ | $A_t$ = 47 square inches |
| B) Type of Outlet Opening (Check One) | X ≤ 2" Diameter **Round** <br> 2" High **Rectangular** <br> Other: |
| C) For 2", or Smaller, **Round Opening** (Ref.: Figure 6a): | |
| i) Width of Trash Rack and Concrete Opening ($W_{conc}$) from Table 6a-1 | $W_{conc}$ = 3 inches |
| ii) Height of Trash Rack Screen ($H_{TR}$) | $H_{TR}$ = 7.7 inches |

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



**Designer:** Charlene Sammons
**Company:** Springs Engineering
**Date:** November 7, 2007
**Project:** Rolling Thunder Business Park
**Location:** Southwest Pond

| | |
|---|---|
| iii) Type of Screen (Based on Depth H), Describe if "Other" | x S.S. #93 VEE Wire (US Filter)<br>____ Other: ____ |
| iv) Screen Opening Slot Dimension, Describe if "Other" | X 0.139" (US Filter)<br>____ Other: ____ |
| v) Spacing of Support Rod (O.C.)<br>Type and Size of Support Rod (Ref.: Table 6a-2) | 0.75 inches<br>#156 VEE |
| vi) Type and Size of Holding Frame (Ref.: Table 6a-2) | 3/8 in. x 1.0 in. flat bar |
| D) For 2" High **Rectangular Opening** (Refer to Figure 6b): | |
| I) Width of Rectangular Opening (W) | W = inches |
| ii) Width of Perforated Plate Opening ($W_{conc}$ = W + 12") | $W_{conc}$ = inches |
| iii) Width of Trashrack Opening ($W_{opening}$) from Table 6b-1 | $W_{opening}$ = inches |
| iv) Height of Trash Rack Screen ($H_{TR}$) | $H_{TR}$ = inches |
| v) Type of Screen (based on depth H) (Describe if "Other") | ____ Klemp™ KPP Series Aluminum<br>____ Other: ____ |
| vi) Cross-bar Spacing (Based on Table 6b-1, Klemp™ KPP Grating). Describe if "Other" | inches<br>____ Other: ____ |
| vii) Minimum Bearing Bar Size (Klemp™ Series, Table 6b-2) (Based on depth of WQCV surcharge) | |
| 4. Detention Basin length to width ratio | 4.50 (L/W) |
| 5 Pre-sedimentation Forebay Basin - Enter design values | |
| A) Volume (3% to 5% of Design Volume from 1D) (3% - 5% of Design Volume (0.005 - 0.0083 acre-feet.) | 0.0050 acre-feet |
| B) Surface Area | 0.001 acres |
| C) Connector Pipe Diameter (Size to drain this volume in 5-minutes under inlet control) | 6 inches |
| D) Paved/Hard Bottom and Sides | n yes/no |

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



**Designer:** Charlene Sammons
**Company:** Springs Engineering
**Date:** November 7, 2007
**Project:** Rolling Thunder Business Park
**Location:** Southwest Pond

| | |
|---|---|
| 6. Two-Stage Design - See Figure EDB-1 | |
| A) Top Stage (Depth $D_{WQ}$ = 2' Minimum)<br>Top Stage Storage: no less than 96.49% of Design Volume (0.1601 acre-feet.) | $D_{WQ}$ = 2.00 feet<br>Storage= 0.1700 acre-feet |
| B) Bottom Stage Depth ($D_{BS}$ = 0.33' Minimum Below Trickle Channel Invert)<br>Bottom Stage Storage: no less than 0.5% of Design Volume (0.0008 acre-feet.)<br>Storage = A * Depth Above WS To Bottom Of Top Stage | $D_{BS}$ = 0.40 feet<br>Storage= 0.0009 acre-feet<br>Surf. Area= 0.002 acres |
| C) Micro Pool (Minimum Depth = the Larger of<br>0.50 * Top Stage Depth (1 ') or 2.5 ' | Depth= 2.50 feet |
| D) Total Volume: $Vol_{tot}$ = Storage from 5A + 6A + 6B<br>(Must be > Design Volume in 1D, or 0.1659 acre-feet.) | $Vol_{tot}$ = 0.1759 acre-feet |
| 7. Basin Side Slopes (Z, horizontal distance per unit vertical)<br>Minimum Z = 4, Flatter Preferred | Z = 4.00 (horizontal/vertical) |
| 8. Dam Embankment Side Slopes (Z, horizontal distance)<br>per unit vertical) Minimum Z = 3, Flatter Preferred | Z = 3.00 (horizontal/vertical) |
| 9. Vegetation (Check the method or describe "Other") | x Native Grass<br>_____ Irrigated Turf Grass<br>_____ Other: _____ |

Notes:

Proposed Pond Improvement Volume

# Cut/Fill Report

**Generated:** 2018-05-31 11:41:46

**By user:** cneises

**Drawing:** O:\44032A-Peak Gymnastics\Peak Gymnastics\dwg\Eng Exhibits\O:\44032A-Peak Gymnastics\Peak Gymnastics\dwg\Eng Exhibits\Pond Volume Comparison.dwg

**Volume Summary**

| Name | Type | Cut Factor | Fill Factor | 2d Area (Sq. Ft.) | Cut (Cu. Yd.) | Fill (Cu. Yd.) | Net (Cu. Yd.) |
|---|---|---|---|---|---|---|---|
| Southwest Pond Volume | full | 1.000 | 1.000 | 4575.62 | 1.39 | 348.96 | 347.57<Fill> |

**Totals**

| | 2d Area (Sq. Ft.) | Cut (Cu. Yd.) | Fill (Cu. Yd.) | Net (Cu. Yd.) |
|---|---|---|---|---|
| Total | 4575.62 | 1.39 | 348.96 | 347.57<Fill> |

* Value adjusted by cut or fill factor other than 1.0

347.57 Cu. Yd. = 0.215 Ac*Ft

**This Cut/Fill Report provides volume calculation to show that with the proposed re-shaping of the pond, that the change in capacity shall be negligible.**

# Existing and Proposed Drainage Maps

WOODMEN ROAD

GOLDEN SAGE

MALTESE POINT

ROLLING THUNDER WAY

FALCON HIGHLANDS FILING NO. 1

EXISTING DRAINAGE CHANNEL

PROPOSED SITE (LOTS 9&10)

WOODMEN ROAD METRO DISTRICT
520 E. COLORADO AVE
COLORADO SPRINGS, CO 80903

CYGNET LAND LLC
31 N. TEJON, SUITE 500
COLORADO SPRINGS, CO 80903

CITY OF COLORADO SPRINGS
PO BOX 1575
COLORADO SPRINGS, CO 80903

PROPOSED SWALE

15.00' DRAINAGE EASEMENT

45.00' DRAINAGE EASEMENT

PROPOSED DRAINAGE EASEMENT

PROPOSED 80.00' EASEMENT

EXISTING 10' SUMP INLET

EXISTING 10' AT-GRADE INLET

PROPOSED TYPE R INLET

TYPE VL RIPRAP PROTECTION

EXISTING 24" RCP

EXISTING 18" RCP

EXISTING 36" RCP

24" RCP

30" RCP

36" RCP

EXISTING 48" RCP

EXISTING TWIN 48" RCP'S

PROPOSED MANHOLE

EXISTING 10' SUMP INLET

EXISTING DRAINAGE CHANNEL

SOUTHWEST WATER QUALITY POND
REQ'D VOL=0.09 AC-FT
Q100=17.3 CFS
Q5=9.2 CFS
TOP EMBANKMENT=6890.00

EMERGENCY OVERFLOW WEIR - ELEV = 6889.60
WIDTH = 25.0 FT

FIRE WATER QUALITY POND
REQ'D VOL=1,312 CU. FT.
Q100=8.7 CFS
Q5=4.6 CFS
TOP EMBANKMENT=6892.00

EMERGENCY OVERFLOW WEIR
ELEV = 6891.50
WIDTH = 15.0 FT

TANK WATER QUALITY POND
REQ'D VOL=0.39 AC-FT
Q100=47.25 CFS
Q5=27.61 CFS
TOP EMBANKMENT=6890.50

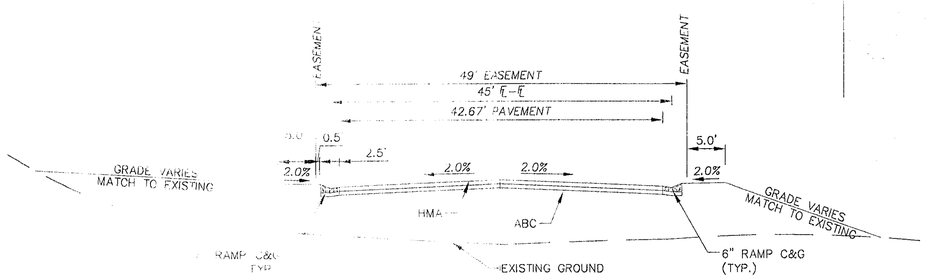
EMERGENCY OVERFLOW WEIR ~ ELEV = 6890.50
WIDTH = 50'FT

2.80%
3.87%
2.00%
0.96%
0.50%
0.74%
1.36%

D-1 3.2 | 6.1 | 0.70
D-2 4.7 | 6.9 | 0.80
D-3 4.5 | 8.5 | 1.18
D-4 3.1 | 5.8 | 0.74
D-5 5.4 | 10.2 | 1.48
D-6 5.2 | 9.7 | 1.25
D-7 9.8 | 18.4 | 2.13
D-7a 7.3 | 13.6 | 1.58
D-8 4.6 | 8.7 | 1.01
D-9 16.5 | 31.0 | 4.94
D-10 9.9 | 18.6 | 2.75
D-11 8.2 | 15.4 | 5.33
D-12 7.3 | 13.6 | 1.58

| DESIGN POINT | Q (5) | Q (100) |
|---|---|---|
| DP-14 | 7.3 | 13.6 |
| DP-1 | 20.7 | 38.9 |
| DP-2 | 7.6 | 14.3 |
| DP-3 | 3.2 | 6.1 |
| DP-4 | 1.0 | 2.5 |
| DP-5 | 3.1 | 5.8 |
| DP-6 | 5.4 | 10.2 |
| DP-7 | 5.2 | 9.7 |
| DP-8 | 16.5 | 31.0 |
| DP-9 | 27.3 | 51.2 |
| DP-10 | 133.7 | 254.6 |
| DP-11 | 141.9 | 270.1 |
| DP-12 | 11.3 | 21.7 |
| DP-13 | 32.2 | 61.1 |

BASIN
$Q_5$ | $Q_{100}$
AREA




*TYPICAL SECTION*
*(NON RESIDENTIAL COLLECTOR - MODIFIED)*
*PRIVATE ROAD*
SCALE N.T.S.

REVISIONS:

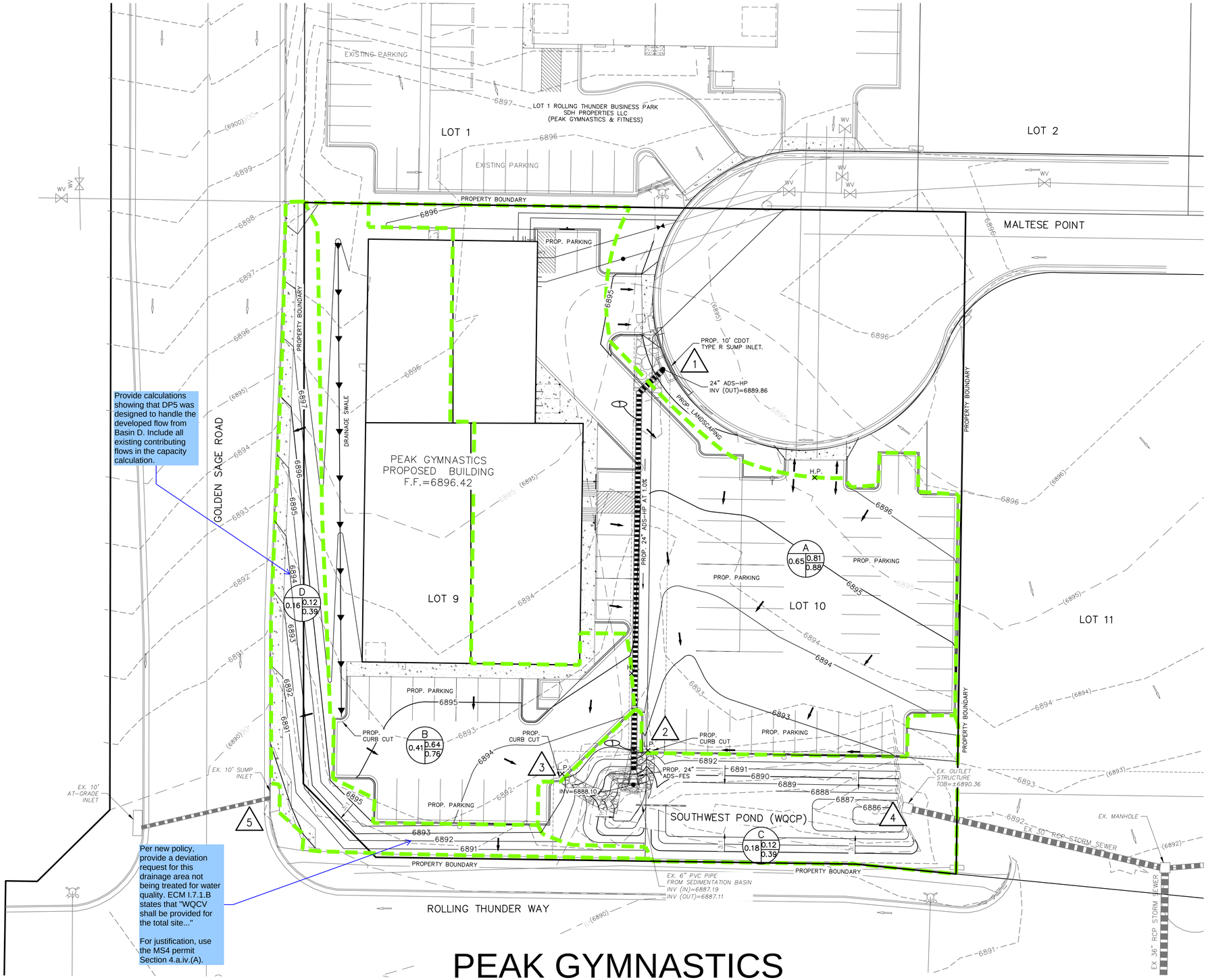
| NO. | DESCRIPTION | DATE |
|---|---|---|
| | | |

ENGINEER:
DESIGNED BY: CMS DATE: 10/03/06
DRAWN BY: CMS DATE: 10/03/06
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 318
COLORADO SPRINGS, CO 80903
P: (719) 227-7388
F: (719) 227-7392


PROJECT ROLLING THUNDER BUSINESS PARK
SHEET TITLE PROPOSED DRAINAGE PLAN
FROM N/A TO N/A
JOB NO. 06-0041 SHEET 1 OF 1




Provide calculations showing that DP5 was designed to handle the developed flow from Basin D. Include all existing contributing flows in the capacity calculation.

Per new policy, provide a deviation request for this drainage area not being treated for water quality. ECM I.7.1.B states that "WQCV shall be provided for the total site..."

For justification, use the MS4 permit Section 4.a.iv.(A).

## LEGEND

BASIN DESIGNATION (Z; 25 ACRES; .25 C5; .35 C100)

- PIPE RUN REFERENCE LABEL
- SURFACE DESIGN POINT
- BASIN BOUNDARY
- PROPOSED DRAINAGE SWALE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SITE BOUNDARY
- PROPOSED STORM SEWER PIPE
- EXISTING STORM SEWER PIPE
- CROSSPAN
- INLET
- EXISTING FLOW DIRECTION ARROW
- FLOW DIRECTION
- FLARED END SECTION
- H.P. HIGH POINT
- L.P. LOW POINT

| BASIN SUMMARY | | | |
|---|---|---|---|
| BASIN | AREA (ACRES) | $Q_5$ | $Q_{100}$ |
| A | 0.65 | 2.7 | 5.0 |
| B | 0.41 | 1.2 | 2.5 |
| C | 0.18 | 0.1 | 0.6 |
| D | 0.16 | 0.1 | 0.5 |

| DESIGN POINT SUMMARY | | | | |
|---|---|---|---|---|
| DESIGN POINT | $Q_5$ | $Q_{100}$ | CONTRIBUTING BASINS AND DP | STRUCTURE |
| 1 | 8.6 | 16.4 | NOLTE, BASIN D-7a | 10' CDOT TYPE R SUMP INLET |
| 2 | 2.7 | 5.0 | A | 4' CURB OPENING & RIPRAP RUNDOWN |
| 3 | 1.2 | 2.5 | B | 4' CURB OPENING & RIPRAP RUNDOWN |
| 4 | 12.4 | 22.6 | C, DP1, DP2, DP3 | WQCP OUTLET STRUCT. |
| 5 | 0.1 | 0.5 | D | CURB INLET SE OF GOLDEN SAGE ROAD |

| STORM SEWER SUMMARY | | | | |
|---|---|---|---|---|
| PIPE RUN | $Q_5$ | $Q_{100}$ | PIPE SIZE | CONTRIBUTING DESIGN POINTS |
| 1 | 8.6 | 16.4 | 24" RCP | DP1 |

| SOUTHWEST POND SUMMARY | |
|---|---|
| INITIAL DESIGN VOLUME (SPRINGS ENGINEERING) | 0.17 Ac-Ft |
| PROPOSED DESIGN VOLUME | 0.21 Ac-Ft |

1" = 20'

0 10' 20' 40'

Scale in Feet

# PEAK GYMNASTICS

## (LOTS 9&10 OF ROLLING THUNDER BUSINESS PARK)

COUNTY OF EL PASO, STATE OF COLORADO

# PROPOSED DRAINAGE MAP

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION 48 HRS BEFORE YOU DIG CALL 1-800-922-1987


M&S CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485


PEAK GYMNASTICS

PROPOSED DRIANGE MAP

PROJECT NO. 44-032

DESIGNED BY: CMN
DRAWN BY: CMN
CHECKED BY: VAS

SCALE: HORIZONTAL: 1"=20' VERTICAL: N/A

DATE: 11/12/2018

SHEET 1 OF 1

PDM

File: Q:\44032A-Peak Gymnastics\Peak Gymnastics\dwg\Eng Exhibits\Proposed Drain Map.dwg Plotstamp: 11/12/2018 2:16 PM