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# Drainage Letter

## **Glenarm Subdivision Filing No. 2**

El Paso County Colorado

MVE Project No. 61122

**August 10, 2020**

PCD Proj No. SF1929

# **Drainage Letter**

for

**Glenarm Subdivision Filing No. 2**  
El Paso County Colorado

**Project No. 61122**

**August 10, 2020**

prepared for:

**Stratmoor Hills Water District**  
1811 B Street  
Colorado Springs, CO 80906  
719.491.1227

prepared by:

**MVE, Inc.**  
1903 Lelaray Street, Suite 200  
Colorado Springs, CO 80909  
719.576.0311

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61122 Drainage Letter Cover.odt

# Statements and Acknowledgments

## Engineer's Statement

This attached Drainage plan and report of Glenarm Subdivision Filing No. 2 were prepared by under my direct supervision and are correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the criteria established by the County for drainage reports and said report is in conformity with the applicable 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.

\_\_\_\_\_  
Charles C. Crum, P.E.  
For and on Behalf of MVE, Inc.

Colorado No. 13348

\_\_\_\_\_  
Date

## Developer's Statement

Stratmoor Hills Water District the Owner/developer of Glenarm Subdivision Filing No. 2 have read and will comply with all the requirements specified in this drainage report and plan.

\_\_\_\_\_  
Kevin W. Niles, District Manager  
Stratmoor Hills Water District  
1811 B Street  
Colorado Springs, CO 80906

\_\_\_\_\_  
Date

## El Paso County

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

\_\_\_\_\_  
Jennifer Irvine, P.E.,  
County Engineer / ECM Administrator

\_\_\_\_\_  
Date

# Drainage Letter

The purpose of this Drainage Letter is to fulfill the drainage report requirements of the proposed Glenarm Subdivision Filing No. 2, a Vacation and Replat of Tract A & Lot 1, Glenarm Subdivision.

The proposed subdivision to be known as “GLENARM SUBDIVISION FILING No. 2” is located in the Southwest Quarter of Section 3, Township 15 South, Range 66 West of the 6<sup>th</sup> P.M., El Paso County, Colorado. The property has El Paso County Tax Schedule No.'s 65033-22-006 & 65033-22-007. The current addresses for the properties are 3115 & 3118 Glenarm Road which are currently vacant parcels. The proposed subdivision is located on the north side of Glenarm Road, and north, west, & south of the cul-de-sac at the end of Glenarm Road. The area of land under consideration for vacating and replatting is 5.710± acres and the property is zoned PUD (Planned Unit Development).

Stratmoor Hills Water District, a Colorado Special District is the owner of the proposed Lot 2, Glenarm Subdivision. Stratmoor Hills Water District, a Colorado Special District is proposing to construct a new potable water treatment facility on said Lot 2. Lot 2, Glenarm Subdivision Filing No. 2 consists of 0.759 acres (33,061 SF). The property is zoned PUD (Planned Unit Development). There will no change in the Glenarm PUD current use on Lot 1 which consists of 4.951 acres (6,749,666 SF). A **Vicinity Map** is included with this Drainage Letter for reference.

The site is vacant with Glenarm Road (public) being adjacent to Lot 2 and paved private drives interior to the new Lot 1, Glenarm Subdivision Filing No. 2. These roads and drives were constructed in the past. The site was the subject of the approved Preliminary & Final Drainage Report For Glenarm Subdivision prepared by M.V.E., Inc. which was filed with El Paso County August 4, 2006.

According to the Federal Emergency Management Agency's Flood Insurance Rate Map (FIRM) Community Panel Number 08041C0744G, dated December 7, 2018, for El Paso County, Colorado the site is not located within any Federal Emergency Management Agency (FEMA) designated Special Flood Hazard Areas (SFHA). A portion of the **FIRM** is included with this Drainage Letter for reference..

According to the Natural Resources Conservation Service Web National Cooperative Soil Survey, the soil of the site is Chasville Gravelly Sandy Loam (map unit 16), which is part of hydrologic soil group A. The Chasville soil is deep and well drained. The permeability of the soil is fast, surface runoff is fast and hazard of erosion is moderate to high. A portion of the **National Cooperative Soil Survey Map** is included with this Drainage Letter.

The development of the site will not change the existing drainage patterns of the site. The site will continue to drain southerly. Off-site flows will continue to enter the site as described in the approved Preliminary & Final Drainage Report For Glenarm Subdivision. The developed flow runoff quantities will not change from those described in the approved Preliminary & Final Drainage Report For Glenarm Subdivision with the development of the water treatment plant on proposed Lot 2 because the treatment plant replaces one of residential units that was previously planned with only a very minor increase in impervious area. There are no channels or other significant drainage features within the site.

For this final drainage report the Rational Method as described in the *City of Colorado Springs Drainage Criteria Manual* has been used for all Storm Runoff calculations, as the development and all sub-basins are less than 130 acres in area. “Colorado Springs Rainfall Intensity Duration Frequency” curves, Figure 6-5 in the DCM, was used to obtain the design rainfall values; a copy is included in the **Appendix**. The “Overland (Initial) Flow Equation” (Eq. 6-8) in the DCM, and Manning's equation with estimated depths were used in time of concentration calculations. “Runoff Coefficients for Rational Method”, Table 6-6 in the DCM, was utilized as a guide in estimating runoff coefficient and Percent Impervious values; a copy is included in the **Appendix**. Peak runoff discharges were calculated for each drainage sub-basin for both the 5-year storm event and 100-year storm event with the Rational Method formula, (Eq. 6-5) in the DCM.

The approved Preliminary & Final Drainage Report For Glenarm Subdivision was filed with El Paso County August 4, 2006 as previously stated. During the spring of 2010 El Paso County Development Services requested additional engineering data concerning sizing of a new retention pond and the data was provided by M.V.E., Inc. A Private Retention Basin/Stormwater Quality Best Management Practices Agreement and Easement was presented to the County and we have no record of the County ever recording said Agreement. Then in the fall of 2010 the County requested more data and calculations. The pond was required by the County to collect up gradient stormwater flows from the Glenarm Road and an eight inch PVC pipe entering from Basin OSD1 described in said Glenarm Drainage report. Pond was sized and approved to be 4,800 cubic feet which is in excess of 1.5 times the 100 year storm Water Flow volume. The pond was called a retention pond. The previous owner of the pond has stated that the pond has never retained (ponded) water for more than a couple of hours during a storm event. The non-ponding is most likely because the soil type is Chaseville Gravely Sandy Loam and with a rapid permeability rate as designated by the Soils Conservation Service as type A in the *Soils Survey of El Paso County Area, Colorado*. We have no records of water rights for the pond. The previous owner of the land originally had agree to maintain the pond. The majority of the new Lot 2 is located within Basin D1 of said Glenarm Subdivision Drainage Report.

The future proposed drainage characteristics remain substantially the same as existing. The increase in impervious is 0.55% which is an increase of 1,510 Square Feet (SF). Existing storm water flows will not be affected by this expansion and the general drainage patterns across the site will not be affected.

Calculations for the new Lot 2, Glenarm Subdivision Filing No. 2 are included herein. A small portion of Lot 2 developed stormwater flow is proposed to be collected in a sump area adjacent to the north side of the proposed Potable Water Treatment facility. These developed flows of  $Q_5 = 0.3$  cfs and  $Q_{100} = 0.9$  cfs will be added to the pond and were not accounted for in the original sizing. Sizing for the added treatment as required by the proposed development of said Lot 2 was completed and requires an additional 241 cubic feet of pond. The pond has had no maintenance in the last (10) years. We propose that the pond be reconstructed with the Stratmoor Hills Water District new Potable Water Treatment Facility as a Water Quality Sand Filter Basin no more the 3 feet deep. The pond layout will need to allow for the inflow from where the existing curb & gutter ends on Glenarm Road. As previously stated, the pond was sized and approved to be 4,800 cubic feet which is in excess of 1.5 times the 100 year stormwater flow volume. The site generates  $Q_5 = 0.5$  cfs and  $Q_{100} = 0.9$  cfs of developed storm water flows that flow via a 12” storm drain pipe to the pond. This is about a 20% increase and will adequately fit within a 4800 cubic foot pond. A **Drainage Map** of the new Lot 2 area is included with this Drainage Letter for reference.

The El Paso County Engineering Criteria Manual (Appendix I, Section I.7.2 ) requires the consideration of a “Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long term source controls”. The Four Step Process is incorporated in this project and the elements are discussed below.

1) Runoff Reduction Practices are employed in this project. Impervious surfaces have been reduced as much as practically possible. Pervious surfaces on the site are being preserved. Minimized Directly Connected Impervious Areas (MDCIA) is employed on the project with runoff from the proposed pervious surfaces being discharges over the open space impervious surfaces before exiting the site.

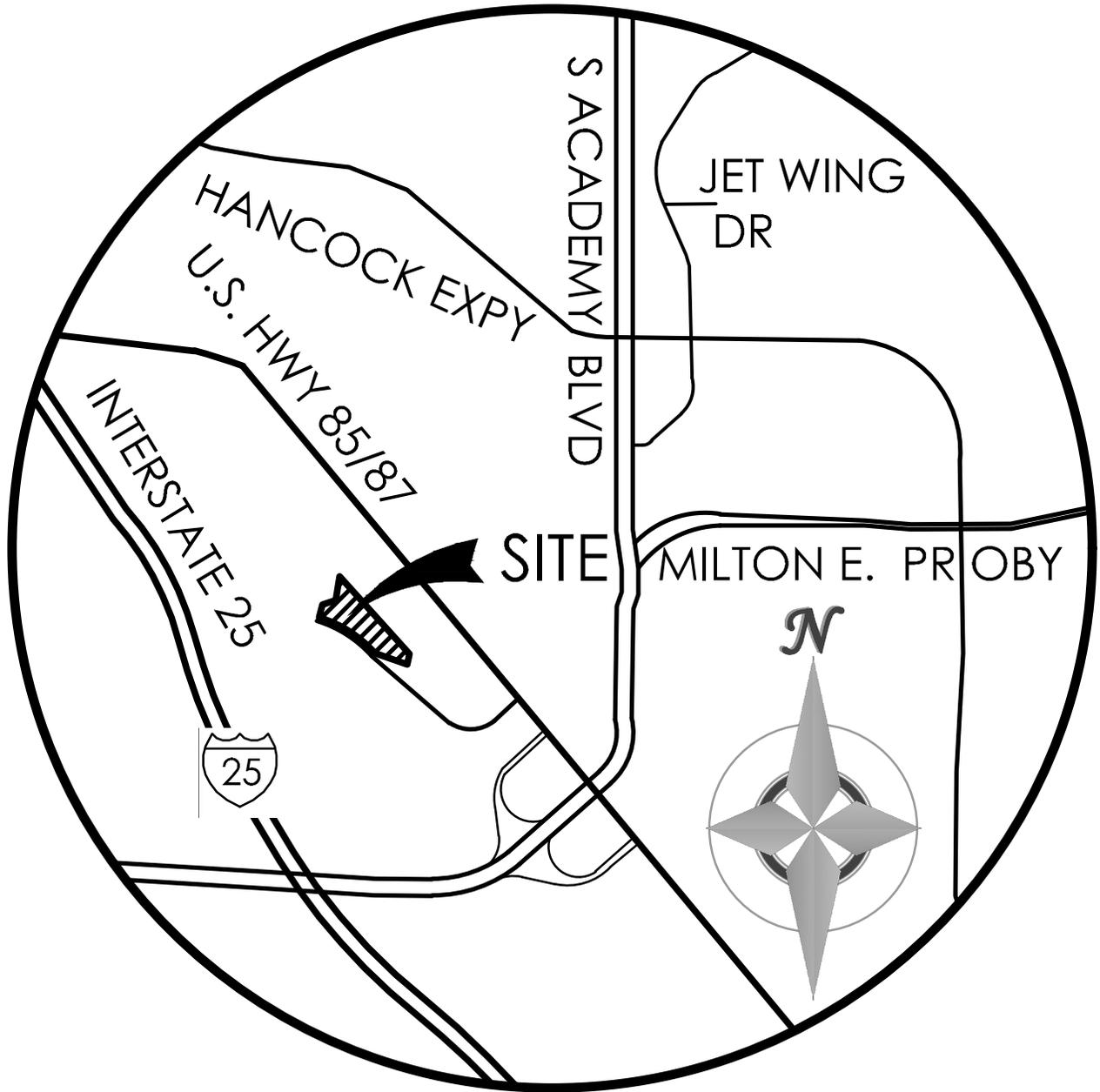
2) All drainage paths on the site are stabilized with pavement or appropriate landscape treatment. The existing/rejuvenated quality pond is intended to intercept flows from the new developed areas.

3) The project contains no potentially hazardous uses. The new water treatment area as well as a portion of existing Glenarm Road drain into the WQCV BMP.

4) The site contains no storage of potentially harmful substances or use of potentially harmful substances. No Site Specific or Other Source Control BMP's are required.

Drainage Fees are due for this project as it is a vacation and replat of property. Fees are based on additional impervious land created by the vacation and replat of the land. The proposed water treatment plant site replaces one residential unit having an impervious area of 1048 SF according to the approved PUD plan for the site. The impervious area of the new treatment plant is 5448 SF. The additional impervious area created by the future use of the replated land is 4400 SF, which is 0.101 impervious acres. The 2020 Drainage Basin Fee for the Carson Street / Little Johnson Drainage Basin is \$11,640 per impervious acre. The drainage Fee to be paid is 0.101 impervious acres x \$11,640/impervious acres = \$1,175.76. There are no Bridge fees for this Drainage Basin.

In Conclusion, the drainage patterns generated by the Glenarm Subdivision Filing No. 2 site under proposed developed conditions are essentially the same as those which existed for the existing PUD Plan. The site and drainage are substantially in accordance with the previously approved Drainage Report prepared at the time of the PUD Plan in 2006. The proposed development of said Lot 2 as described in this Drainage Letter will have no adverse impacts to downstream and surrounding developments or downstream drainage ways or storm drain facilities.



# VICINITY MAP

NOT TO SCALE

# National Flood Hazard Layer FIRMette

104°46'26"W 38°46'33"N



## 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**

- Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs *Zone D*
- Area of Undetermined Flood Hazard *Zone D*

**GENERAL STRUCTURES**

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

**CROSS SECTIONS WITH 1% ANNUAL CHANCE WATER SURFACE ELEVATION**

- 20.2
- 17.5
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

**OTHER FEATURES**

- Digital Data Available
- No Digital Data Available
- Unmapped

**MAP PANELS**

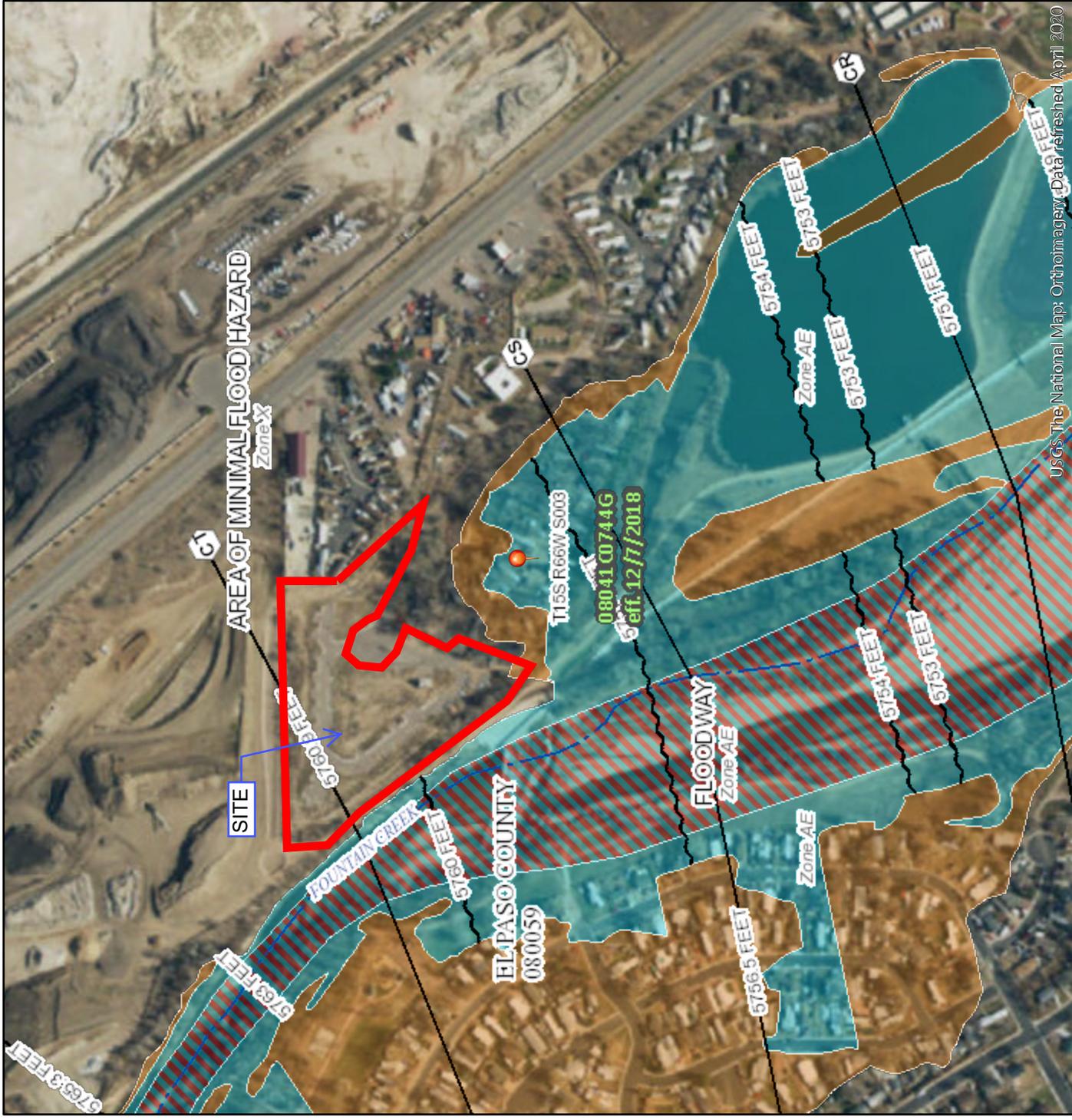
- Digital Data Available
- No Digital Data Available
- Unmapped

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 6/18/2020 at 4:52 PM 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.



USGS The National Map: Orthoimagery Data refreshed April 2020  
104°46'26"W 38°46'33"N

Custom Soil Resource Report  
Soil Map (3115 Glenarm Road)



## MAP LEGEND

<b>Area of Interest (AOI)</b>	 Area of Interest (AOI)	 Spoil Area
<b>Soils</b>	 Soil Map Unit Polygons	 Stony Spot
	 Soil Map Unit Lines	 Very Stony Spot
	 Soil Map Unit Points	 Wet Spot
<b>Special Point Features</b>	 Blowout	 Other
	 Borrow Pit	 Special Line Features
	 Clay Spot	<b>Water Features</b>
	 Closed Depression	 Streams and Canals
	 Gravel Pit	<b>Transportation</b>
	 Gravelly Spot	 Rails
	 Landfill	 Interstate Highways
	 Lava Flow	 US Routes
	 Marsh or swamp	 Major Roads
	 Mine or Quarry	 Local Roads
	 Miscellaneous Water	<b>Background</b>
	 Perennial Water	 Aerial Photography
	 Rock Outcrop	
	 Saline Spot	
	 Sandy Spot	
	 Severely Eroded Spot	
	 Sinkhole	
	 Slide or Slip	
	 Sodic Spot	

## 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 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 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.

## Map Unit Legend (3115 Glenarm Road)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
16	Chaseville gravelly sandy loam, 1 to 8 percent slopes	0.7	100.0%
<b>Totals for Area of Interest</b>		<b>0.7</b>	<b>100.0%</b>

## Map Unit Descriptions (3115 Glenarm Road)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

## Custom Soil Resource Report

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## El Paso County Area, Colorado

### 16—Chaseville gravelly sandy loam, 1 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 3671  
*Elevation:* 6,100 to 7,000 feet  
*Mean annual precipitation:* 16 to 18 inches  
*Mean annual air temperature:* 46 to 48 degrees F  
*Frost-free period:* 125 to 145 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Chaseville and similar soils:* 98 percent  
*Minor components:* 2 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Chaseville

##### Setting

*Landform:* Terraces, alluvial fans, hills  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from arkose

##### Typical profile

*A1 - 0 to 6 inches:* gravelly sandy loam  
*A2 - 6 to 19 inches:* very gravelly sandy loam  
*C1 - 19 to 40 inches:* extremely gravelly loamy coarse sand  
*C2 - 40 to 60 inches:* very gravelly loamy sand

##### Properties and qualities

*Slope:* 1 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water storage in profile:* Very low (about 2.4 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* A  
*Ecological site:* Gravelly Foothill (R049BY214CO)  
*Hydric soil rating:* No

#### Minor Components

##### Other soils

*Percent of map unit:* 1 percent  
*Hydric soil rating:* No

## Custom Soil Resource Report

### **Pleasant**

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

## Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 2

**Designer:** D. Gorman  
**Company:** M.V.E., inc.  
**Date:** June 20, 2020  
**Project:** Lot 2 Glenarm Filing No. 2  
**Location:** sand filter basin - (Sub-Basn D1)

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, <math>I_a</math> (100% if all paved and roofed areas upstream of sand filter)</p> <p>B) Tributary Area's Imperviousness Ratio (<math>i = I_a/100</math>)</p> <p>C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time <math>WQCV = 0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)</math></p> <p>D) Contributing Watershed Area (including sand filter area)</p> <p>E) Water Quality Capture Volume (WQCV) Design Volume <math>V_{WQCV} = WQCV / 12 * Area</math></p> <p>F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p>	<p><math>I_a = </math> <input style="width: 50px;" type="text" value="17.0"/> %</p> <p><math>i = </math> <input style="width: 50px;" type="text" value="0.170"/></p> <p>WQCV = <input style="width: 50px;" type="text" value="0.08"/> watershed inches</p> <p>Area = <input style="width: 50px;" type="text" value="36,061"/> sq ft</p> <p><math>V_{WQCV} = </math> <input style="width: 50px;" type="text" value=""/></p> <p><math>d_e = </math> <input style="width: 50px;" type="text" value="0.42"/> in</p> <p><math>V_{WQCV\ OTHER} = </math> <input style="width: 50px;" type="text" value="241"/> cu ft</p> <p><math>V_{WQCV\ USER} = </math> <input style="width: 50px;" type="text" value=""/></p>
<p>2. Basin Geometry</p> <p>A) WQCV Depth</p> <p>B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.</p> <p>C) Minimum Filter Area (Flat Surface Area)</p> <p>D) Actual Filter Area</p> <p>E) Volume Provided</p>	<p><math>D_{WQCV} = </math> <input style="width: 50px;" type="text" value="3.0"/> ft</p> <p><math>Z = </math> <input style="width: 50px;" type="text" value="4.00"/> ft / ft</p> <p><math>A_{Min} = </math> <input style="width: 50px;" type="text" value="77"/> sq ft</p> <p><math>A_{Actual} = </math> <input style="width: 50px;" type="text" value="100"/> sq ft</p> <p><math>V_T = </math> <input style="width: 50px;" type="text" value="1020"/> cu ft</p>
<p>3. Filter Material</p>	<p>Choose One</p> <div style="border: 1px solid black; padding: 5px;"> <p><input checked="" type="radio"/> 18" CDOT Class B or C Filter Material</p> <p><input type="radio"/> Other (Explain):</p> </div> <p>_____</p> <p>_____</p>
<p>4. Underdrain System</p> <p>A) Are underdrains provided?</p> <p>B) Underdrain system orifice diameter for 12 hour drain time</p> <p style="margin-left: 20px;">i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice</p> <p style="margin-left: 20px;">ii) Volume to Drain in 12 Hours</p> <p style="margin-left: 20px;">iii) Orifice Diameter, 3/8" Minimum</p>	<p>Choose One</p> <div style="border: 1px solid black; padding: 5px;"> <p><input type="radio"/> YES</p> <p><input checked="" type="radio"/> NO</p> </div> <p><math>y = </math> <input style="width: 50px;" type="text" value="N/A"/> ft</p> <p><math>Vol_{12} = </math> <input style="width: 50px;" type="text" value="N/A"/> cu ft</p> <p><math>D_o = </math> <input style="width: 50px;" type="text" value="N/A"/> in</p>

Design Procedure Form: Sand Filter (SF)

Sheet 2 of 2

Designer: D. Gorman  
Company: M.V.E., inc.  
Date: June 20, 2020  
Project: Lot 2 Glenarm Filing No. 2  
Location: sand filter basin - (Sub-Basn D1)

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric

A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

Choose One

YES  NO

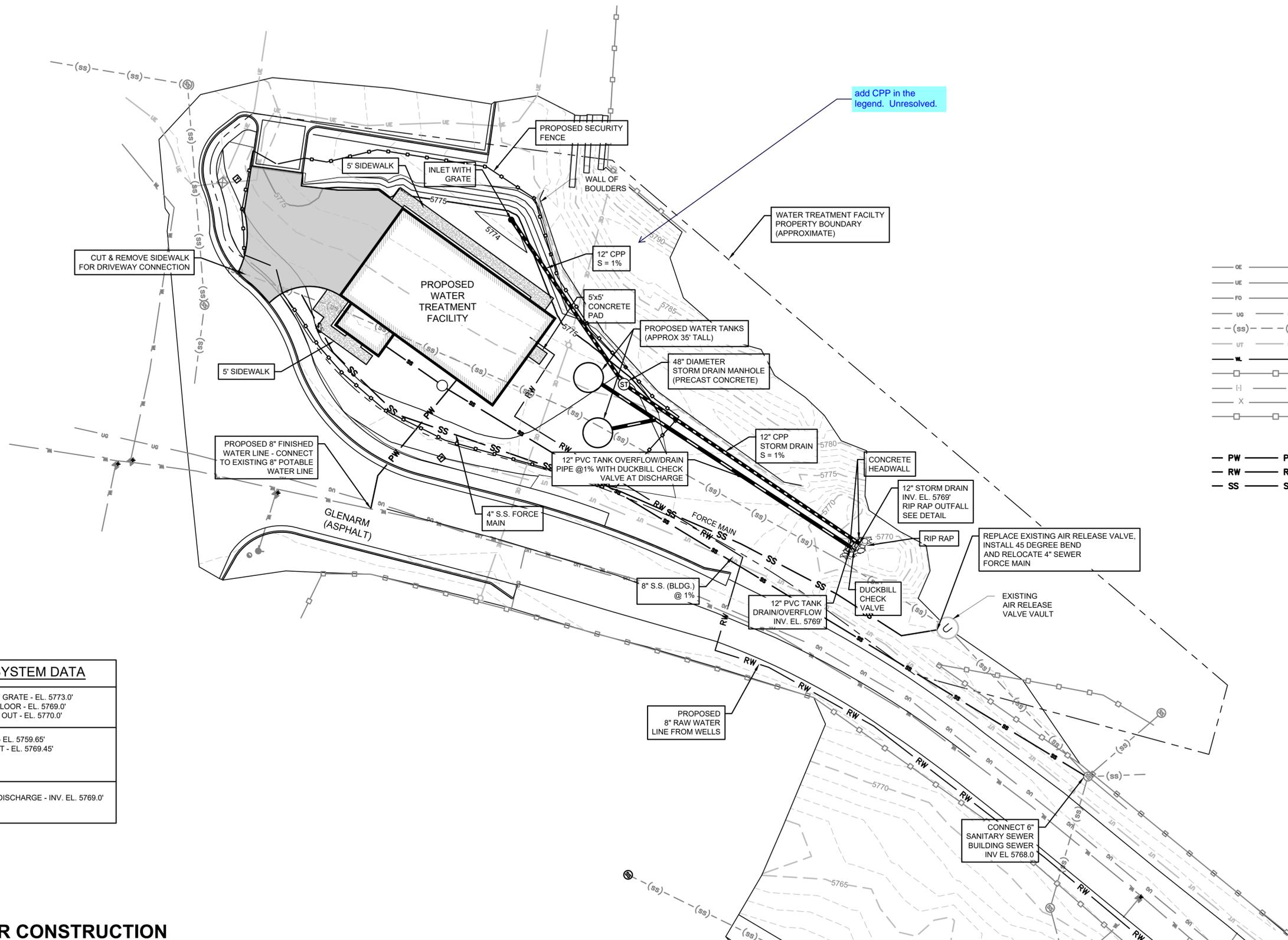
6. Inlet / Outlet Works

A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet

Any overflows enter Glenarm Road and drain south east to Fountain Creek

Notes: \_\_\_\_\_

P:\Clients\Stratmoor Hills WSDs\04-18-0103 - Centralized Treatment\CAD\SHEETS\GRADING PLAN AREA- GRADING PLAN.dwg - - 4/3/2020 4:05 PM



add CPP in the legend. Unresolved.

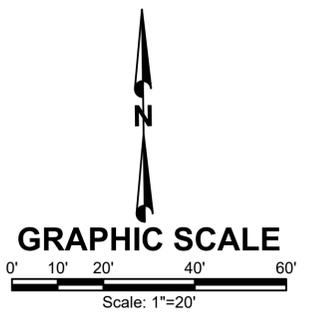
**EXISTING LEGEND**

- ~A~ ASPHALT SURFACE
- ~C~ CONCRETE SURFACE
- FL FLOW LINE
- TBC TOP/BACK OF CURB
- ROW RIGHT-OF-WAY
- ~LS~ LANDSCAPING
- FO FIBER OPTIC VAULT
- ⊕ GAS SIGN
- ⊙ LIGHT POLE
- ☐ MAILBOX
- ⊙ SANITARY SEWER MANHOLE
- ⊙ TRAFFIC BOLLARD
- ⊙ TRAFFIC SIGN
- ⊙ TELEPHONE PEDESTAL
- ⊙ UNKNOWN MANHOLE
- UTILITY GUY WIRE
- ⊙ UTILITY POLE
- ⊙ VENT PIPE
- ⊙ WATER HYDRANT
- ⊙ WATER METER
- ⊙ WATER VALVE
- ⊙ WATER MANHOLE
- OE — OE — OVERHEAD UTILITY LINE(S)
- UE — UE — UNDERGROUND ELECTRICAL LINE(S)
- FO — FO — UNDERGROUND FIBER OPTIC LINE(S)
- UG — UG — UNDERGROUND GAS LINE(S)
- (SS) — (SS) — UNDERGROUND SANITARY SEWER LINE(S)
- UT — UT — UNDERGROUND TELEPHONE LINE(S)
- WM — WM — UNDERGROUND WATERMAIN LINE(S)
- [ ] — [ ] — CHAIN-LINK FENCE
- [ ] — [ ] — WOOD FENCE
- X — X — PLASTIC FENCE
- [ ] — [ ] — WIRE STRAND FENCE

**PROPOSED LEGEND**

- PW — PW — POTABLE WATER LINE
- RW — RW — RAW WATER LINE
- SS — SS — SANITARY SEWER LINE

STORM DRAIN SYSTEM DATA	
INLET	<ul style="list-style-type: none"> <li>• TOP OF GRATE - EL. 5773.0'</li> <li>• INLET FLOOR - EL. 5769.0'</li> <li>• 12" INV. OUT - EL. 5770.0'</li> </ul>
STORM MANHOLE	<ul style="list-style-type: none"> <li>• INV. IN - EL. 5759.65'</li> <li>• INV. OUT - EL. 5769.45'</li> </ul>
EXISTING INFILTRATION BASIN	<ul style="list-style-type: none"> <li>• 12" SD DISCHARGE - INV. EL. 5769.0'</li> </ul>



**90% SUBMITTAL - NOT FOR CONSTRUCTION**

NO.	REVISIONS	BY	DATE

DRAWN E. WOODWARD  
 DESIGNED \_\_\_\_\_  
 APPROVED M. WARESAK  
 QA M. WARESAK

**ATTENTION**  
 LINE IS 2 INCHES  
 AT FULL SIZE  
 (IF NOT 2" SCALE ACCORDINGLY)

**STRATMOOR HILLS  
 WATER DISTRICT**

**FORSGREN**  
*Associates Inc.*  
 56 INVERNESS DRIVE EAST #112, ENGLEWOOD, CO 80112  
 PH: 720-214-5884

CENTRALIZED WATER TREATMENT

**WATER TREATMENT PLANT -  
 GRADING AND DRAINAGE PLAN**

PROJECT NO:  
**04-18-0103**  
 SHEET NO:  
**C-08**  
 DATE:  
 NOV, 2019  
 PAGE NO:  
 12 OF 35