FINAL DRAINAGE REPORT

LOT 1, AIRPORT SPECTRUM FILING NO. 1
KUM & GO #661
COLORADO SPRINGS, CO

Prepared for:

Kum & Go, L.C.
1459 Grand Avenue
Des Moines, IA 50309
Contact: Ryan Halder
(515) 457-6232

Prepared by:

Olsson
1880 Fall River Drive, Suite 200
Loveland, CO 80538
Contact: Josh Erramouspe, PE
(970) 461-7733

August 14, 2019

Olsson Project No. 019-0347

olsson

ENGINEER'S STATEMENT

This report and plan for the drainage design of Lot 1, Airport Spectrum Filling No. 1 (Kum & Go #661) was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

_____
Josh Erramouspe
Colorado Licensed Professional Engineer No. 42141

DEVELOPER'S STATEMENT

Kum & Go, L.C. hereby certifies that the drainage facilities for Lot 1, Airport Spectrum Filling No. 1 (Kum & Go #661) shall be constructed according to the design presented in this report. I understand that City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of Lot 1, Airport Spectrum Filling No. 1 (Kum & Go #661) guarantee that final drainage design review will absolve Kum & Go, L.C. and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

_____
Kum & Go, L.C.

_____ _____
Authorized Signature Date

_____
Title

_____
Address

CITY OF COLORADO SPRINGS

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001 as amended.

_____ _____
For the City Engineer Date

TABLE OF CONTENTS

1.0 Purpose 1
2.0 General Site Description 1
3.0 Existing Conditions 1
4.0 Proposed Drainage CHARACTERISTICS 2
5.0 REGIONAL DETENTION AND STORMWATER QUALITY 3
6.0 erosion control plan 4
7.0 Drainage criteria 5
8.0 FLOODPLAIN STATEMENT 5
9.0 DRAINAGE AND BRIDGE FEES 5
10.0 CONCLUSION 5

APPENDICES

APPENDIX A Vicinity Map
APPENDIX B Web Soil Survey
APPENDIX C FEMA Flood Insurance Rate Map
APPENDIX D Hydrologic and Hydraulic Calculations
APPENDIX E Runoff Basin Maps
APPENDIX F Engineers Probable Opinion of Cost

1.0 PURPOSE

This document is the final drainage report of Lot 1, Airport Spectrum Filling No. 1 (Kum & Go #661, the "SITE"). The purpose of this report is to identify onsite and offsite drainage patterns, storm sewer, inlet locations, and areas tributary to the site with the goal of safely routing developed storm water runoff to adequate outfall facilities.

2.0 GENERAL SITE DESCRIPTION

The SITE is a 1.754-acre parcel located in a portion of Northeast Quarter of Section 1, Township 15 South, Range 66 West of the Sixth Principal Meridian, City of Colorado Springs, County of El Paso, State of Colorado. The SITE is bound on the north by Milton E. Proby Parkway and to the east, south, and west by unplatted land. The SITE is currently a vacant lot that slopes from northeast to southwest. Planned development within the SITE consists of a convenience store, fueling canopy, and associated drives/parking. Refer to the enclosed Developed Runoff plan for the final site design

The average soil condition reflects Hydrologic Group "A" (Blakeland loamy sand) as determined by the "Custom Soil Resource Report for El Paso County Area" derived from a web soil survey (NRCS).

3.0 EXISTING CONDITIONS

The SITE is located in the Windmill Gulch Drainage Basin. In the existing condition, the vacant lot has slopes ranging from 1% to 9% in the southwesterly direction with existing vegetation of unmaintained shrubs and grass. The SITE was previously studied as part of the "Airport Spectrum Filing No. 1 (Off-Site)" drainage study prepared by Classic Consulting Engineers & Surveyors (herein referred to as the "MASTER STUDY"), which is currently under review and is anticipated to be approved in concert with this final drainage report. An existing conditions map from the MASTER STUDY is attached in the Appendices.

The subject site was studied as a commercial/retail land use within the MASTER STUDY. The SITE was identified to be within the MASTER STUDY's basins B1-6, B-5, B-7, B-8 and B-9. No off-site flows are entering the SITE in the condition. Basin B1-6 flows by storm pipe to the Temporary full spectrum detention and water quality facility at DP3. Basin B-5 and B-9 runoff will flow overland to a 15' curb inlet (at-grade) which collects and conveys runoff to the temporary pond at DP3. Basin B-7 and B-8 runoff flows overland onto Globe Street along the curb line to Design Point 7 and into the temporary pond at DP3. The SITE accounts for 1.754-acres within

the total drainage study area of 2.485-acre MASTER STUDY, matches the land use assumed in the MASTER STUDY, and also exhibits similar “C” values for developed conditions.

The Temporary full spectrum detention and water quality facility will be constructed before or in conjunction with convenience store. The pond will release water through an 8” standpipe (with orifice holes) and convey the restricted release into the downstream Windmill Gulch channel corridor. Stormwater will be released at or below all historic discharge rates for the 2, 5, 10, 25, 50, and 100-year prior to being released to Windmill Gulch.

4.0 PROPOSED DRAINAGE CHARACTERISTICS

Developed runoff from the SITE will be conveyed to the south into the temporary full spectrum detention pond described in the MASTER STUDY. Proposed development of the SITE is in general conformance with anticipated land use, associated “C” values, and time of concentration rates assumed in the MASTER STUDY, therefore proposed drainage conditions described herein closely match developed flowrates and outfall points anticipated within the approved MASTER STUDY. Refer to the appendix for hydrologic calculations and Runoff basin maps including both existing conditions from the MASTER STUDY and proposed basin map. Developed drainage basin characteristics and descriptions are as follows:

Basin 1 incorporates 0.13 acres with flow of 0.43 cfs for the 5-year storm and 0.96 cfs for the 100-year storm. Basin 1 is the building area which connects to the private on-site storm sewer system via roof drains. The private storm sewer system drains to the proposed 12” storm sewer pipe to the south of the SITE which will convey flows eventually to the Temporary Pond.

Basin 2 incorporates 0.09 acres with flow of 0.30 cfs for the 5-year storm and 0.67 cfs for the 100-year storm. Basin 2 is the canopy area which consists to the private on-site storm sewer system via roof drains. The private storm sewer system drains to the proposed 12” storm sewer pipe to the south of the SITE which will convey flows eventually to the Temporary Pond.

Basin 3 incorporates 0.29 acres with flow of 1.08 cfs for the 5-year storm and 2.50 cfs for the 100-year storm. Basin 3 consists of the parking areas and sidewalks that are tributary to a proposed 2’x2’ ADS storm sewer Nyloplast grate inlet northeast of the building. The inlet has capacity for this flow. See appendices for Nyloplast Capacity Chart. Runoff from this basin will be conveyed into the 2’x2’ ADS storm sewer Nyloplast grate inlet and discharged into the proposed 12” storm sewer pipe to the south of the SITE which will convey flows eventually to the Temporary Pond.

Basin 4 incorporates 0.16 acres with flow of 1.40 cfs for the 5-year storm and 2.57 cfs for the 100-year storm. Basin 4 consists of the parking areas and sidewalks that are tributary to a proposed 2’x2’ ADS storm sewer Nyloplast grate inlet northwest of the building. The inlet has capacity for this flow. See appendices for Nyloplast Capacity Chart. Runoff from this basin will be conveyed

into the 2'x2' ADS storm sewer Nyloplast grate inlet and discharged into the proposed 12" storm sewer pipe to the south of the SITE which will convey flows eventually to the Temporary Pond.

Basin 5 incorporates 0.35 acres with flow of 0.97 cfs for the 5-year storm and 2.57 cfs for the 100-year storm. Basin 5 consists of the on-site access road drive that connects Kum & Go access to the drive south of the SITE. Runoff from this basin will flow overland to an off-site 15' curb inlet and will then be conveyed to the Temporary Pond.

Basin 6 incorporates 0.28 acres with flow of 0.09 cfs for the 5-year storm and 1.04 cfs for the 100-year storm. Basin 6 consists of landscaping which will flow into a drainage swale designed and built by the overall developer along the east side of Globe Street. Runoff from this basin will flow overland to an off-site 15' curb inlet and will then be conveyed to the Temporary Pond.

Basin 7 incorporates 0.03 acres with flow of 0.10 cfs for the 5-year storm and 0.24 cfs for the 100-year storm. Basin 7 consists of a small concrete drive which flows along Globe Street to the Temporary Pond.

Basin 8 incorporates 0.22 acres with flow of 0.15 cfs for the 5-year storm and 0.92 cfs for the 100-year storm. Basin 8 consists of landscaping area which flows along Globe Street to the Temporary Pond.

Basin 9 incorporates 0.07 acres with flow of 0.28 cfs for the 5-year storm and 0.65 cfs for the 100-year storm. Basin 9 consists of a small pavement area where the trash enclosure will be situated. Runoff from this basin will flow overland to an off-site 15' curb inlet and will then be conveyed to the Temporary Pond.

We do not anticipate any off-site flows will enter or be conveyed across the aforementioned developed drainage basins.

5.0 REGIONAL DETENTION AND STORMWATER QUALITY

The City of Colorado Springs Drainage Criteria manual specifies that this site is required to provide stormwater quality for the 2-year event. This site is part of an overall master planned commercial development with a subregional detention facility (Temporary Pond that serves the subject property). The aforementioned detention facility has been designed with pre-sedimentation forebays, low flow trickle channels, a micropool, and an orifice plate to control the 2-year outlet. As discussed in the MASTER STUDY, this pond provides adequate capacity and quality for the convenience store (Lot 1) development. Also according to the MASTER STUDY, all stormwater will be detained to be released at or below historic levels for all 2, 5, 10, 25, 50, and 100-year events prior to being discharged to Windmill Gulch.

The City of Colorado Springs 4-step process was analyzed and addressed as follows:

Step 1 – Runoff Reduction Practices

During the initial planning phase of the site, every effort was made to reduce the total amount of pavement coverage. The majority of the site is surrounded by landscaping with all water runoff draining to the subregional detention pond for water quality. The water quality is improved in that the grass and landscaping provide a better treatment than flowing over hardscape and the runoff volume is reduced as the grass and landscaping reduces site imperviousness. A runoff reduction spreadsheet is included within the Appendices.

Step 2 – Implement BMPs that Provide a Water Quality Capture Volume with Slow Release Rate

As stated previously, a full spectrum extended detention basin will be constructed to the south of the site in conjunction with the convenience store development. This detention facility will be designed to provide controlled release of the SITE's water quality capture volume.

Step 3 – Stabilize Drainageways

The entire site flows overland into a private storm sewer system which will convey the runoff to the existing "Temporary full spectrum detention and water quality facility" through a 12" storm sewer pipe. A grass-lined drainage swale will be utilized to convey a portion of the SITE's runoff. The drainage swale will be lined with blanket or turf reinforcement mats until its side slopes are fully stabilized with vegetation.

Step 4 – Source Control BMPs

Temporary BMPs to be used during construction include erosion blanket, inlet protection, vehicle tracking, and a surrounding silt fence.

6.0 EROSION CONTROL PLAN

The City of Colorado Springs Drainage Criteria Manual requires that an erosion control plan and cost estimate be submitted with the Final Drainage report. We respectfully request that the erosion control plan and cost estimate be submitted in conjunction with the upcoming Grading, Erosion & Stormwater Quality Plan and that construction assurances posted prior to obtaining a grading permit.

7.0 DRAINAGE CRITERIA

Hydrologic calculations were performed using the current City of Colorado Springs Drainage Criteria manual. The rational method was used to estimate stormwater runoff anticipated from design storms for the 5-year and 100-year recurrence intervals.

8.0 FLOODPLAIN STATEMENT

No portion of this site is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C0763G effective date December 07, 2018 (See Appendix).

9.0 DRAINAGE AND BRIDGE FEES

The SITE is located in the Windmill Gulch Drainage Basin. The associated drainage basin fees are as follows:

Drainage Fee: $14,594/AC x 2.486 AC = $36,280.68
Bridge Fee: $271/AC x 2.486 AC = $673.71
Pond Land Fee: $3,055/AC x 2.486 AC = $7,594.73
Total Fees: $36,280.68 + $673.71 + $7,594.73 = $44,549.12

These fees are based on the 2019 fee schedule and are due prior to recordation of the plat. An opinion of construction costs for the SITE's private, non-reimbursable drainage facilities is included in the Appendices.

10.0 CONCLUSION

Lot 1, Airport Spectrum Filing No. 1 (Kum & Go store #661) is proposed to drain to onsite private storm facilities. All proposed drainage facilities were sized using the current City of Colorado Springs Drainage Criteria and will safely discharge storm water runoff to adequate outfalls. A minor amount of landscaped area stormwater along the south boundary will exit the site and will be collected by the existing curb inlet at Globe Street, however all runoff will enter the same outfall system tributary to the planned subregional stormwater quality and detention facility (Temporary Pond) per the MASTER STUDY. Since the MASTER STUDY anticipated relatively the same land use, "C" runoff coefficients and time of concentration rates, the total stormwater runoff from Lot 1 will be generally equal to what was anticipated in the MASTER STUDY. Stormwater quality for this project will be handled within the temporary detention pond and all detained runoff will be released at or below historic levels for all 2, 5, 10, 25, 50, and 100-year events prior to being discharged to Windmill Gulch. No public facilities are anticipated with the development of this project.

APPENDIX A

Vicinity Map

Kum & Go #661	Vicinity Map	olsson 1880 Fall River Drive, Suite 200 Loveland, CO 80538 Tel. 970-461-7733

APPENDIX B

Web Soil Survey

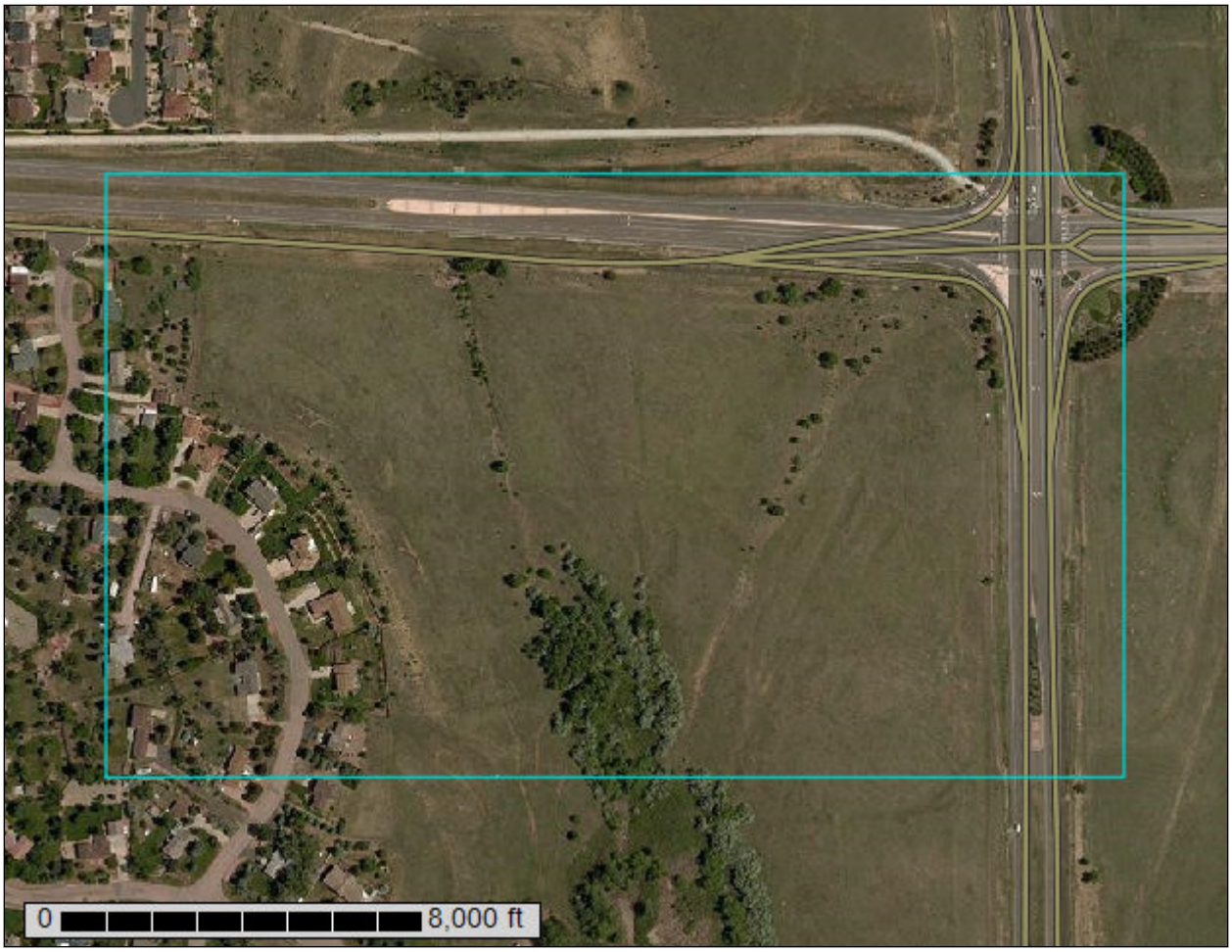
United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

El Paso County Area, Colorado



February 5, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface..... 2
How Soil Surveys Are Made..... 5
Soil Map..... 8
Soil Map..... 9
Legend..... 10
Map Unit Legend..... 11
Map Unit Descriptions..... 11
El Paso County Area, Colorado..... 13
8—Blakeland loamy sand, 1 to 9 percent slopes..... 13
95—Truckton loamy sand, 1 to 9 percent slopes..... 14
References..... 16

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

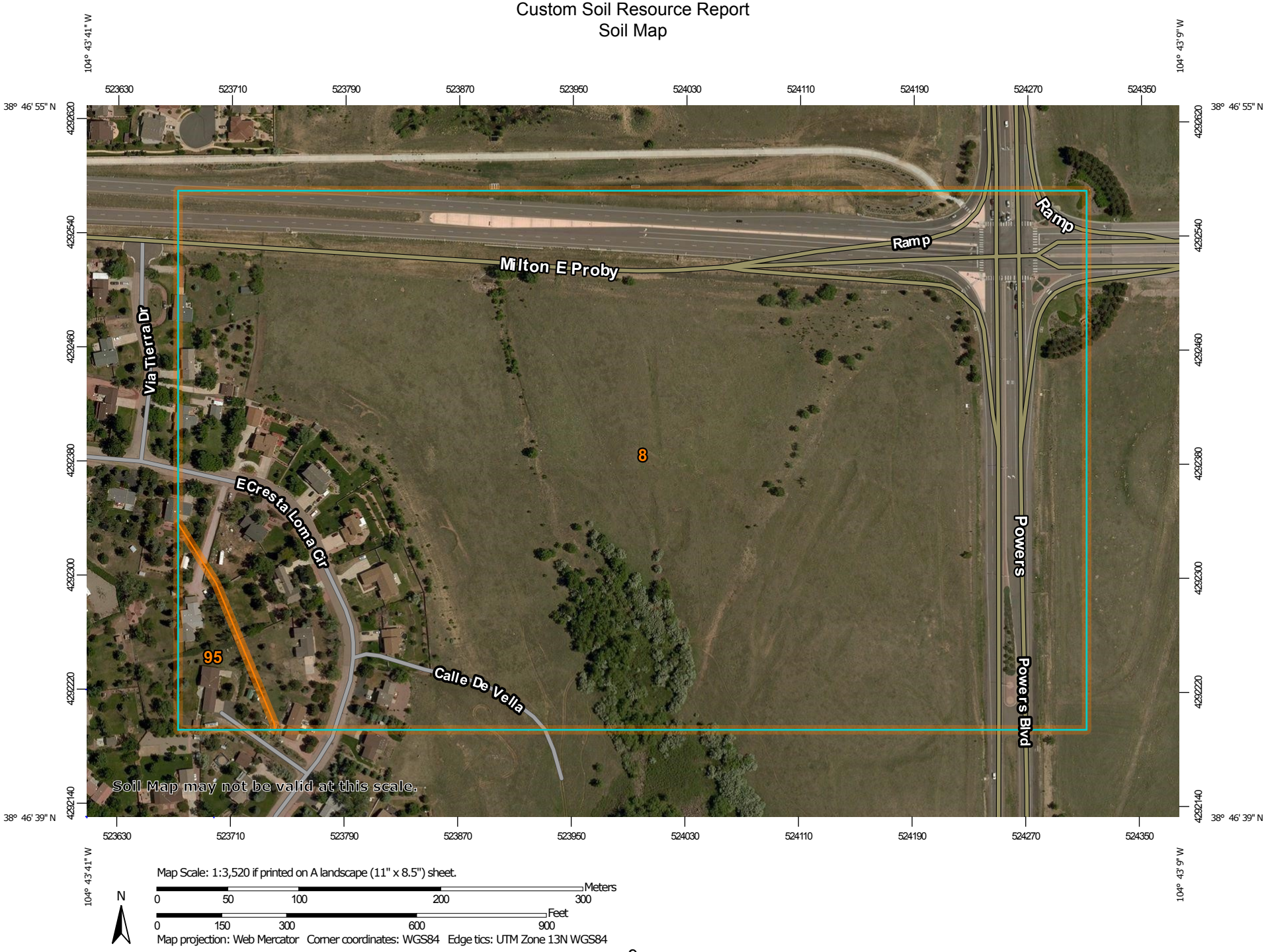
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,520 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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 Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

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 16, Sep 10, 2018

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

Date(s) aerial images were photographed: Apr 15, 2011—Jun 17, 2014

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	58.6	97.7%
95	Truckton loamy sand, 1 to 9 percent slopes	1.4	2.3%
Totals for Area of Interest		**60.0**	**100.0%**

Map Unit Descriptions

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,

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

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 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

Blakeland and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 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 to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

95—Truckton loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 36bd
Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Truckton and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 8 inches: loamy sand
Bt - 8 to 24 inches: sandy loam
C - 24 to 60 inches: coarse sandy loam

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 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: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A

Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit:
Hydric soil rating: No

Pleasant
Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX C

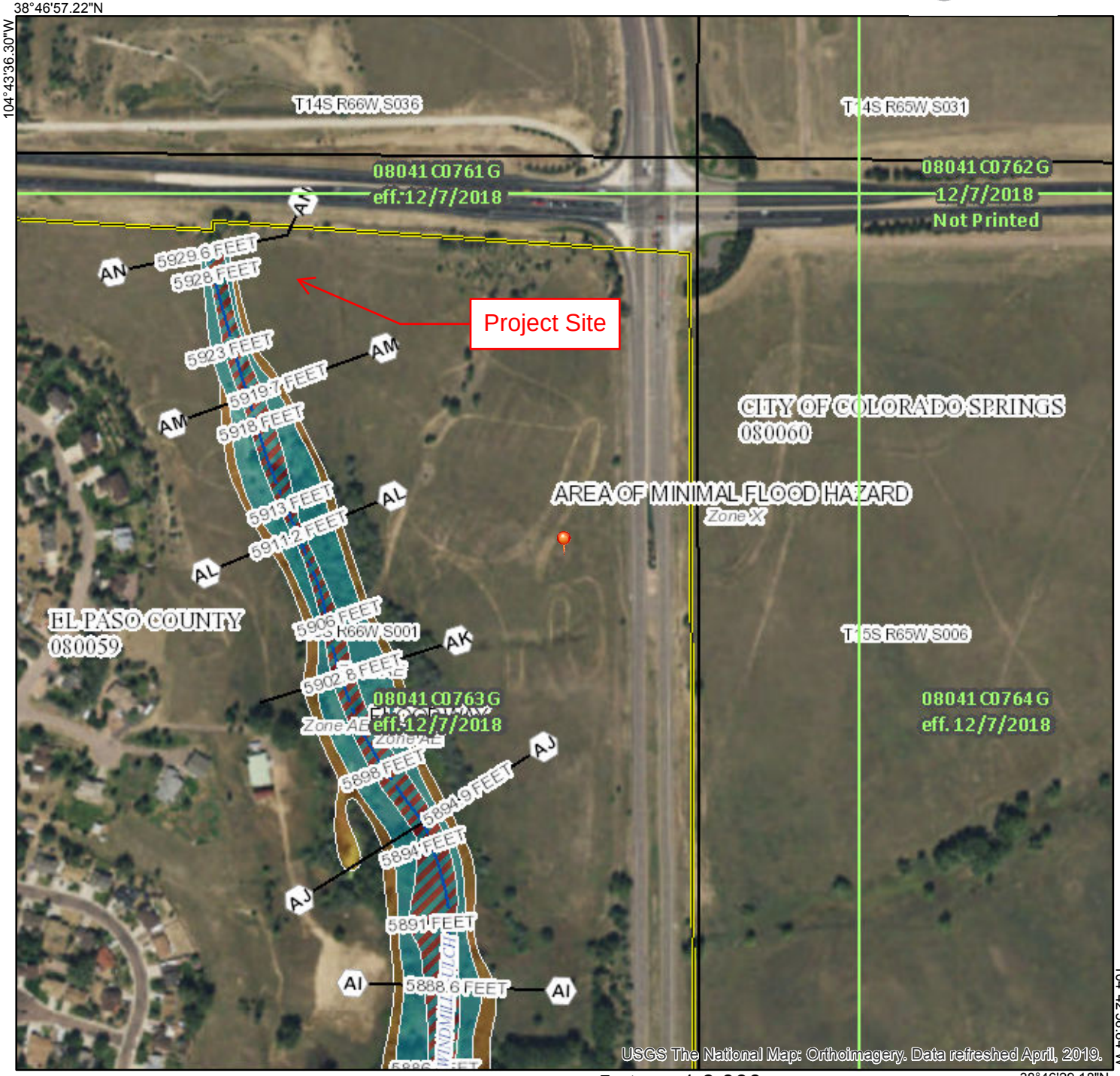
FEMA Flood Insurance Rate Map

National Flood Hazard Layer FIRMette

FEMA

38°46'57.22"N

104°43'36.30"W



104°42'58.84"W

38°46'29.18"N

Feet 1:6,000

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

Legend

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

SPECIAL FLOOD HAZARD AREAS

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

OTHER AREAS OF FLOOD HAZARD

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

OTHER AREAS

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

GENERAL STRUCTURES

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

OTHER FEATURES

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

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/25/2019 at 12:15:25 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.

APPENDIX D

Hydrologic and Hydraulic Calculations

DEVELOPED BASIN COMPOSITE RUNOFF COEFFICIENT & PERCENT IMPERVIOUSNESS

Basin Name	Basin Description	Soil Type	Paved 100% (acres)	Building 90% (acres)	Landscape 2% (acres)	Total Area (acres)	C5	C100	Percent Imperviousness
B-1	BUILDING	A	0.00	0.13	0.00	0.13	0.73	0.81	90.0%
B-2	CANOPY	A	0.00	0.09	0.00	0.09	0.73	0.81	90.0%
B-3	INLET 1.0	A	0.29	0.00	0.00	0.29	0.90	0.96	100.0%
B-4	INLET 2.0	A	0.16	0.00	0.00	0.16	0.90	0.96	100.0%
B-5	DRIVE	A	0.26	0.00	0.10	0.35	0.68	0.79	72.9%
B-6	OFFSITE NORTH	A	0.02	0.00	0.26	0.28	0.15	0.41	9.7%
B-7	OFFSITE GLOBE DR	A	0.03	0.00	0.00	0.03	0.90	0.96	100.0%
B-8	OFFSITE WEST	A	0.04	0.00	0.18	0.22	0.23	0.47	19.4%
B-9	OFFSITE EAST	A	0.07	0.00	0.00	0.07	0.90	0.96	100.0%
					TOTAL	1.61	0.61	0.74	66.4%

DEVELOPED BASIN COMPOSITE TIME OF CONCENTRATION

Basin			Overland Flow			Channelized Flow				Eq. 6-7	Eq. 6-8	Final
			Reach 1			Reach 2						
Basin Name	Description	C5	L1 (ft)	S1 (ft/ft)	T_i (min)	L2 (ft)	K	S2 (ft/ft)	T_t (min)	T_c (min)	T_c (min)	T_c (min)
B-1	BUILDING	0.73	25	0.010	3.34	0	20	0.000	0.00	0.00	3.34	5.00
B-2	CANOPY	0.73	25	0.010	3.34	0	20	0.000	0.00	0.00	3.34	5.00
B-3	INLET 1.0	0.90	100	0.022	2.78	33	20	0.009	0.29	9.25	3.06	5.00
B-4	INLET 2.0	0.90	75	0.034	2.09	18	20	0.030	0.08	9.07	2.18	5.00
B-5	DRIVE	0.68	55	0.042	3.54	252	20	0.029	1.23	14.89	4.77	5.00
B-6	OFFSITE NORTH	0.15	7	0.331	1.37	102	20	0.019	0.61	25.52	1.98	5.00
B-7	OFFSITE GLOBE DR	0.90	40	0.033	1.55	22	20	0.039	0.09	9.08	1.64	5.00
B-8	OFFSITE WEST	0.23	21	0.106	3.29	158	20	0.056	0.56	23.65	3.85	5.00
B-9	OFFSITE EAST	0.90	23	0.020	1.39	78	20	0.026	0.40	9.35	1.79	5.00

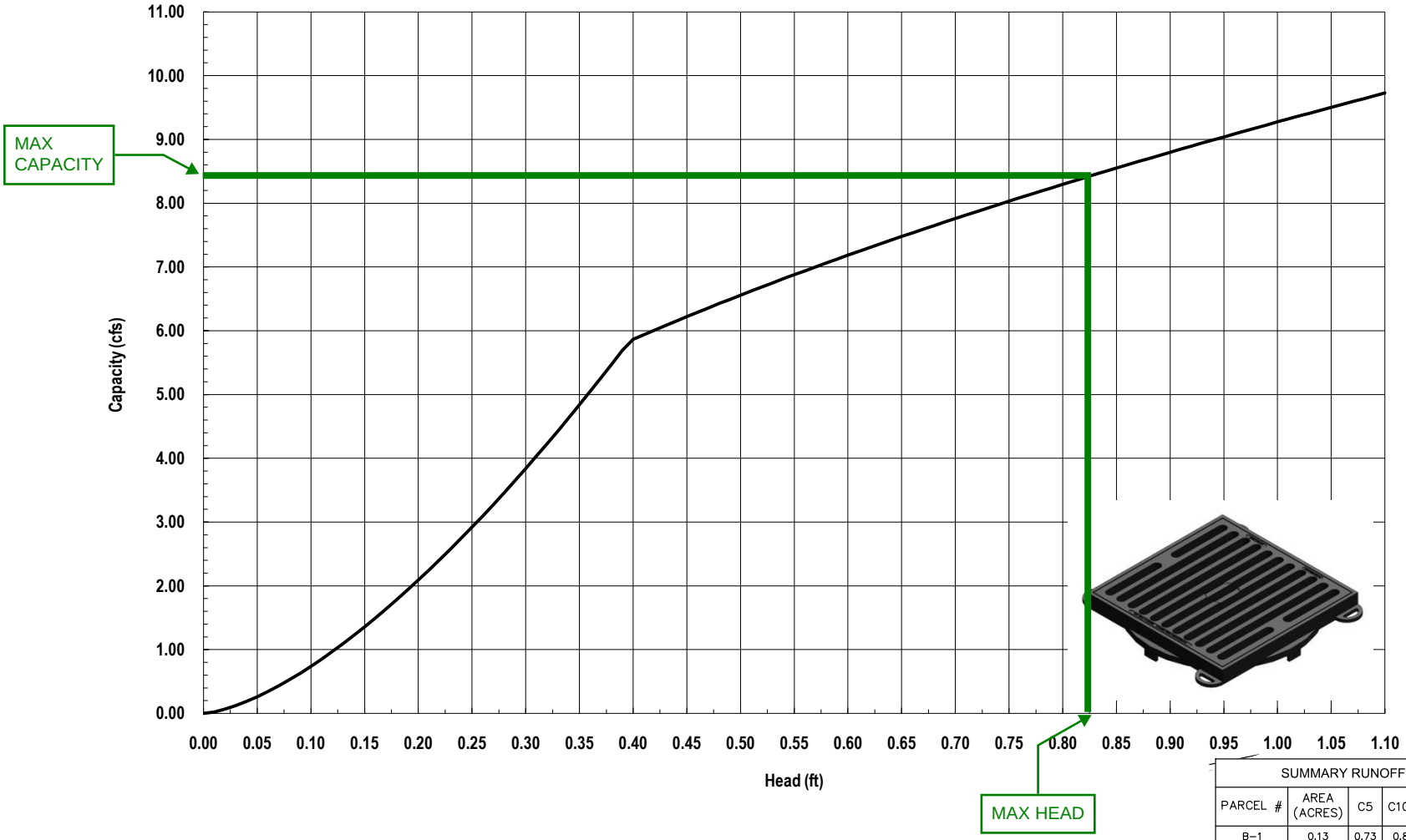
1880 Fall River Drive, Suite 200
Loveland, CO 80538
Tel. 970-461-7733

DEVELOPED BASIN RUNOFF CALCULATIONS

Basin Characteristics						Intensities		Sub-basin	
Basin Name	Description	Area (acres)	C5	C100	Tc* (min)	I5 (in/hr)	I 100 (in/hr)	Q 5-yr (cfs)	Q 100-yr (cfs)
B-1	BUILDING	0.13	0.73	0.81	5.00	4.49	9.14	0.43	0.96
B-2	CANOPY	0.09	0.73	0.81	5.00	4.49	9.14	0.30	0.67
B-3	INLET 1.0	0.29	0.90	0.96	5.00	4.49	9.14	1.15	2.50
B-4	INLET 2.0	0.16	0.90	0.96	5.00	4.49	9.14	0.64	1.40
B-5	DRIVE	0.35	0.68	0.79	5.00	4.49	9.14	1.07	2.57
B-6	OFFSITE NORTH	0.28	0.15	0.41	5.00	4.49	9.14	0.19	1.04
B-7	OFFSITE GLOBE DR	0.03	0.90	0.96	5.00	4.49	9.14	0.11	0.24
B-8	OFFSITE WEST	0.22	0.23	0.47	5.00	4.49	9.14	0.23	0.92
B-9	OFFSITE EAST	0.07	0.90	0.96	5.00	4.49	9.14	0.30	0.65
* If time of concentration was less than 5 minutes, 5 minutes was used.									

olsson
1880 Fall River Drive, Suite 200
Loveland, CO 80538
Tel. 970-461-7733

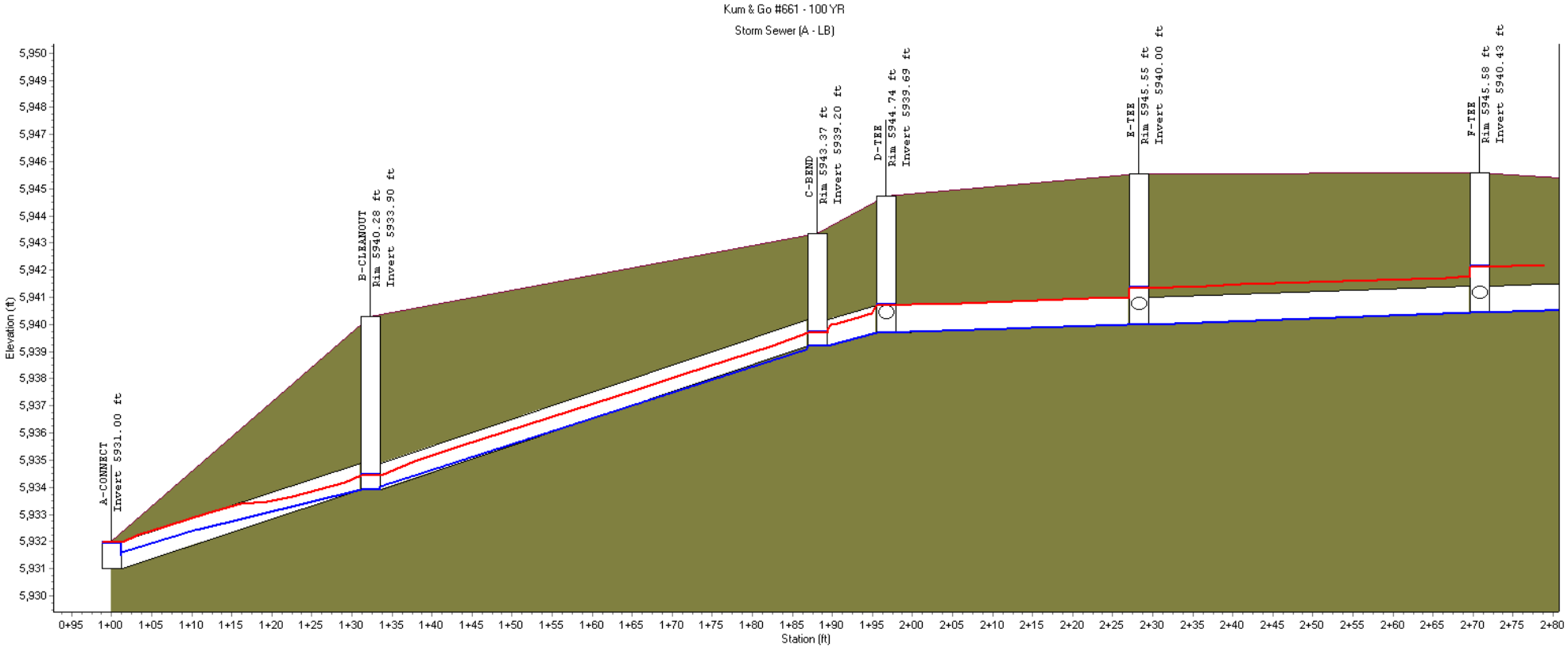
Nyloplast 2' x 2' Road & Highway Grate Inlet Capacity Chart



SUMMARY RUNOFF TABLE

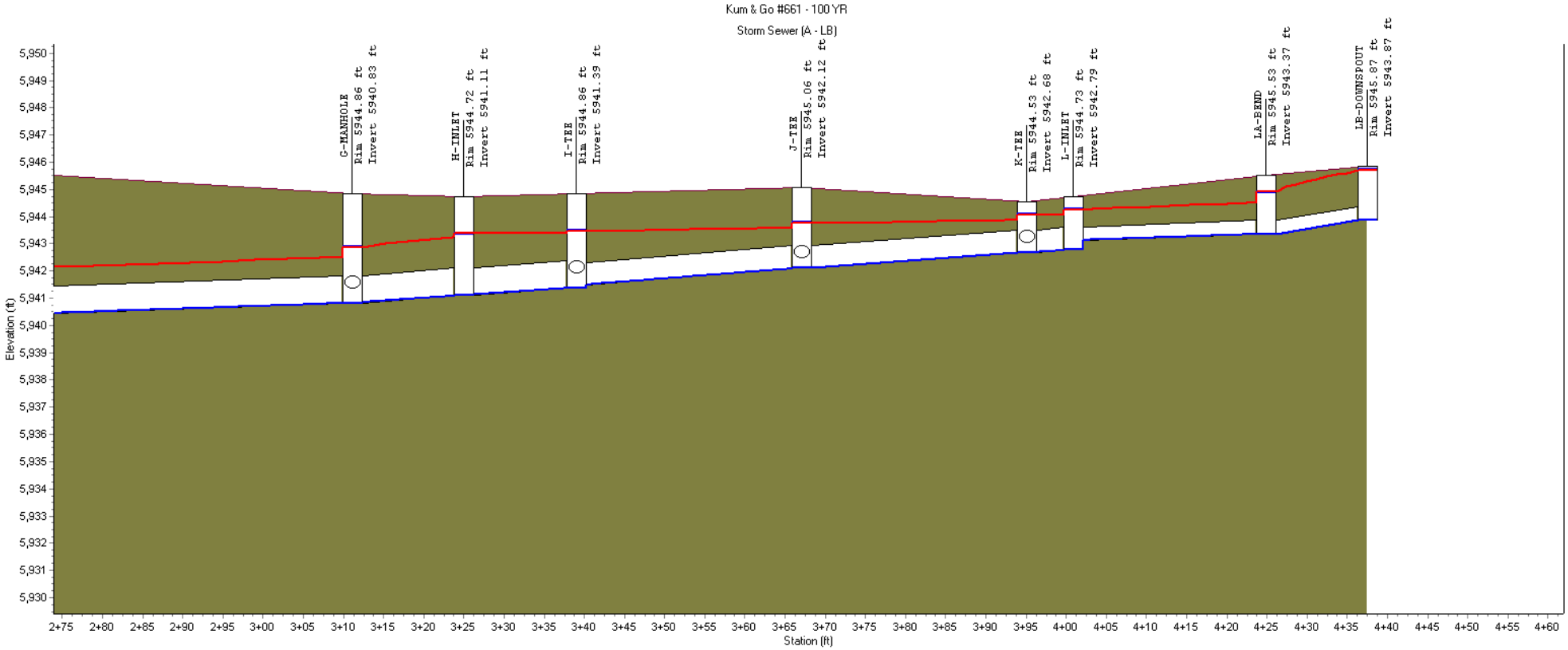
PARCEL #	AREA (ACRES)	C5	C100	Q5 (CFS)	Q100 (CFS)
B-1	0.13	0.73	0.81	0.43	0.96
B-2	0.09	0.73	0.81	0.30	0.67
B-3	0.29	0.90	0.96	1.08	2.50
B-4	0.16	0.90	0.96	0.60	1.40
B-5	0.35	0.68	0.79	0.97	2.57
B-6	0.28	0.15	0.41	0.09	1.04
B-7	0.03	0.90	0.96	0.10	0.24
B-8	0.22	0.23	0.47	0.15	0.92
B-9	0.07	0.90	0.96	0.28	0.65

Nyloplast®
3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490
© Nyloplast Inlet Capacity Charts June 2012



:	A-CONNECT	B-CLEANOUT	C-BEND	D-TEE	E-TEE	F-TEE
Rim (ft):		5940.28	5943.37	5944.74	5945.55	5945.58
Invert (ft):	5931.00	5933.90	5939.20	5939.69	5940.00	5940.43
Min Pipe Cover (ft):		5.38	3.17	4.06	4.55	4.15
Max HGL (ft):	5931.96	5934.44	5939.71	5940.72	5941.52	5942.36

Link ID:	Pipe - (18) (1) (1)	Pipe - (18) (1)	Pipe - (17)	Pipe - (16)	Pipe - (15)
Length (ft):	32.28	55.82	8.50	31.62	42.60
Dia (ft):	1.00	1.00	1.00	1.00	1.00
Slope (ft/ft):	0.0899	0.0949	0.0571	0.0099	0.0100
Up Invert (ft):	5933.90	5939.20	5939.69	5940.00	5940.43
Dn Invert (ft):	5931.00	5933.90	5939.20	5939.69	5940.00
Max Q (cfs):	4.74	4.75	4.76	3.90	3.90
Max Vel (ft/s):	7.51	11.46	7.52	4.98	4.97
Max Depth (ft):	0.75	0.52	0.75	1.00	1.00



:		G-MANHOLE	H-INLET	I-TEE	J-TEE	K-TEE	L-INLET	LA-BEND	LB-DOWNSPOUT
Rim (ft):		5944.86	5944.72	5944.86	5945.06	5944.53	5944.73	5945.53	5945.87
Invert (ft):		5940.83	5941.11	5941.39	5942.12	5942.68	5942.79	5943.37	5943.87
Min Pipe Cover (ft):		3.03	2.61	2.47	2.11	1.02	1.10	1.67	1.50
Max HGL (ft):		5943.24	5943.80	5943.89	5944.71	5944.53	5944.73	5945.43	5945.87

Link ID:	Pipe - (14)	Pipe - (13)	Pipe - (12)	Pipe - (11)	Pipe - (10)	Pipe - (9)	Pipe - (2)	Pipe - (1)	
Length (ft):	40.19	14.00	14.00	28.00	28.00	5.87	23.96	12.62	
Dia (ft):	1.00	1.00	1.00	0.83	0.83	0.83	0.50	0.50	
Slope (ft/ft):	0.0100	0.0200	0.0200	0.0230	0.0200	0.0200	0.0100	0.0398	
Up Invert (ft):	5940.83	5941.11	5941.39	5942.12	5942.68	5942.79	5943.37	5943.87	
Dn Invert (ft):	5940.43	5940.83	5941.11	5941.47	5942.12	5942.68	5943.13	5943.37	
Max Q (cfs):	3.90	3.90	1.91	1.87	1.94	2.08	0.68	0.67	
Max Vel (ft/s):	4.96	4.97	2.80	4.64	4.68	3.93	3.46	3.50	
Max Depth (ft):	1.00	1.00	1.00	0.83	0.83	0.83	0.50	0.50	

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer:	**Mark Gibbs**
Company:	**Olsson**
Date:	**August 14, 2019**
Project:	**Kum&Go #661**
Location:	**Colorado Springs, CO**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.44 inches

Depth of Average Runoff Producing Storm, d_6 = 0.42 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	DCIA	DCIA	DCIA	DCIA	UIA:RPA	SPA	DCIA	SPA	DCIA			
Area ID	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9			
Downstream Design Point ID	A	A	A	A	EX CI	OFFSITE	EX CI	EX CI	EX CI			
Downstream BMP Type	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB			
DCIA (ft^2)	5,663	3,920	12,632	6,970	--	--	1,307	--	3,049			
UIA (ft^2)	--	--	--	--	11,326	--	--	--	--			
RPA (ft^2)	--	--	--	--	4,356	--	--	--	--			
SPA (ft^2)	--	--	--	--	--	12,197	--	9,583	--			
HSG A (%)	--	--	--	--	100%	100%	--	100%	--			
HSG B (%)	--	--	--	--	0%	0%	--	0%	--			
HSG C/D (%)	--	--	--	--	0%	0%	--	0%	--			
Average Slope of RPA (ft/ft)	--	--	--	--	0.050	--	--	--	--			
UIA:RPA Interface Width (ft)	--	--	--	--	160.00	--	--	--	--			

CALCULATED RUNOFF RESULTS

Area ID	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9			
UIA:RPA Area (ft^2)	--	--	--	--	15,682	--	--	--	--			
L / W Ratio	--	--	--	--	0.61	--	--	--	--			
UIA / Area	--	--	--	--	0.7222	--	--	--	--			
Runoff (in)	0.34	0.34	0.34	0.34	0.00	0.00	0.34	0.00	0.34			
Runoff (ft^3)	160	111	358	197	0	0	37	0	86			
Runoff Reduction (ft^3)	0	0	0	0	321	447	0	351	0			

CALCULATED WQCV RESULTS

Area ID	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9			
WQCV (ft^3)	230	160	514	284	461	0	53	0	124			
WQCV Reduction (ft^3)	70	48	156	86	461	0	16	0	38			
WQCV Reduction (%)	30%	30%	30%	30%	100%	0%	30%	0%	30%			
Untreated WQCV (ft^3)	160	111	358	197	0	0	37	0	86			

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

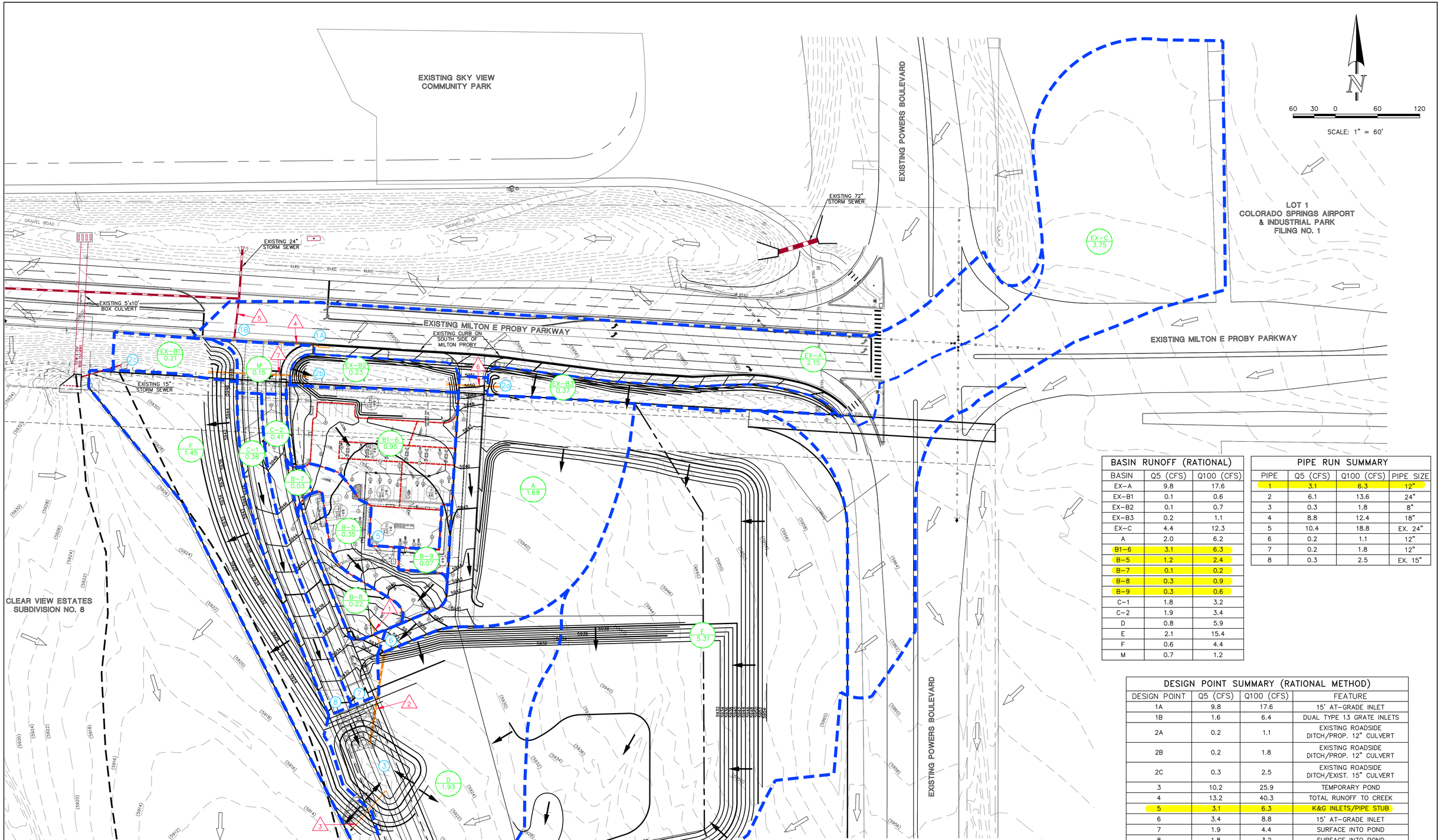
Downstream Design Point ID	A	EX CI	OFFSITE									
DCIA (ft^2)	29,185	4,356	0									
UIA (ft^2)	0	11,326	0									
RPA (ft^2)	0	4,356	0									
SPA (ft^2)	0	9,583	12,197									
Total Area (ft^2)	29,185	29,621	12,197									
Total Impervious Area (ft^2)	29,185	15,682	0									
WQCV (ft^3)	1,188	638	0									
WQCV Reduction (ft^3)	361	515	0									
WQCV Reduction (%)	30%	81%	0%									
Untreated WQCV (ft^3)	827	123	0									

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	71,003
Total Impervious Area (ft^2)	44,867
WQCV (ft^3)	1,826
WQCV Reduction (ft^3)	876
WQCV Reduction (%)	48%
Untreated WQCV (ft^3)	950

APPENDIX E

Runoff Basin Maps



BASIN RUNOFF (RATIONAL)		
BASIN	Q5 (CFS)	Q100 (CFS)
EX-A	9.8	17.6
EX-B1	0.1	0.6
EX-B2	0.1	0.7
EX-B3	0.2	1.1
EX-C	4.4	12.3
A	2.0	6.2
B1-6	3.1	6.3
B-5	1.2	2.4
B-7	0.1	0.2
B-8	0.3	0.9
B-9	0.3	0.6
C-1	1.8	3.2
C-2	1.9	3.4
D	0.8	5.9
E	2.1	15.4
F	0.6	4.4
M	0.7	1.2

PIPE RUN SUMMARY			
PIPE	Q5 (CFS)	Q100 (CFS)	PIPE SIZE
1	3.1	6.3	12"
2	6.1	13.6	24"
3	0.3	1.8	8"
4	8.8	12.4	18"
5	10.4	18.8	EX. 24"
6	0.2	1.1	12"
7	0.2	1.8	12"
8	0.3	2.5	EX. 15"

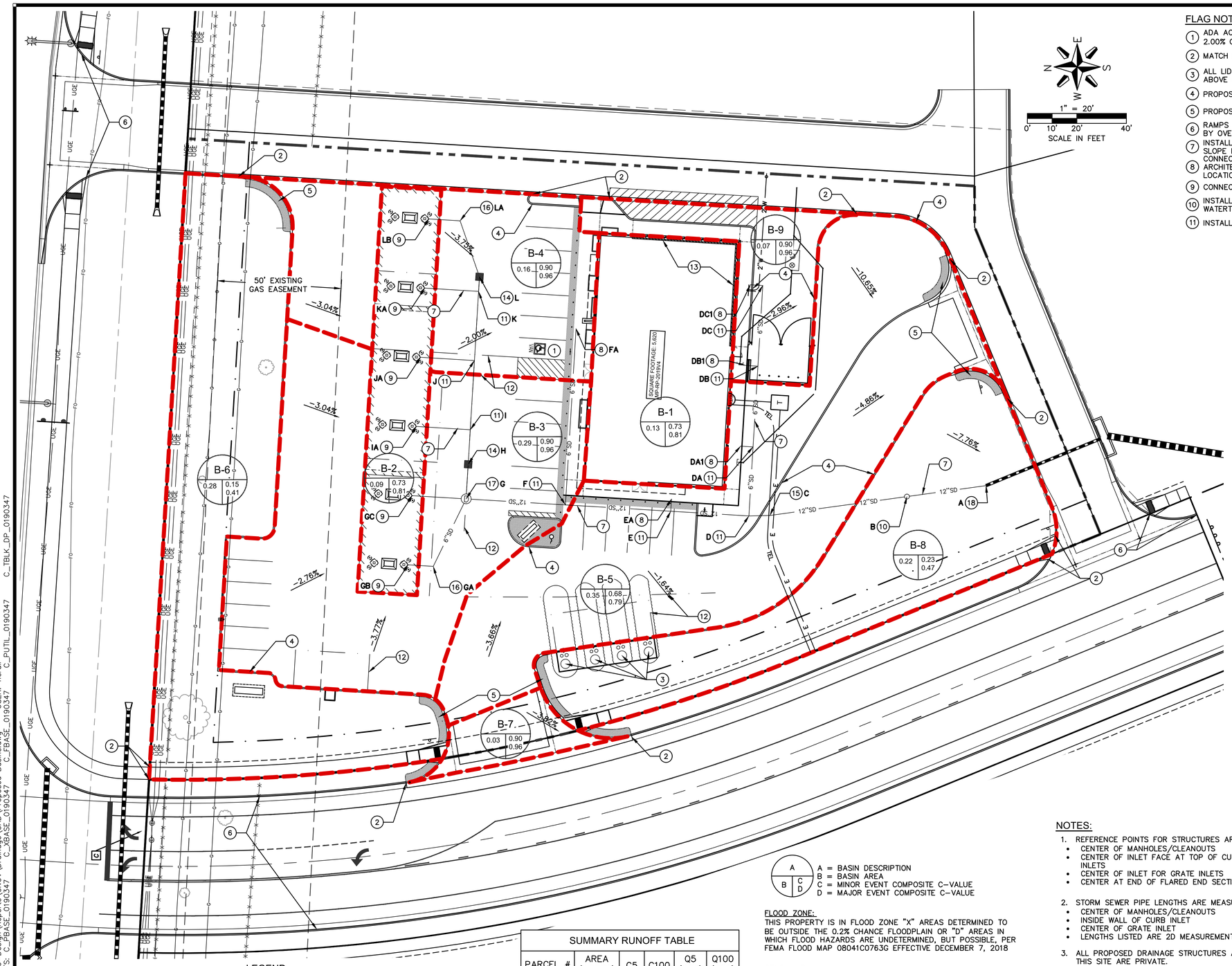
DESIGN POINT SUMMARY (RATIONAL METHOD)			
DESIGN POINT	Q5 (CFS)	Q100 (CFS)	FEATURE
1A	9.8	17.6	15' AT-GRADE INLET
1B	1.6	6.4	DUAL TYPE 13 GRATE INLETS
2A	0.2	1.1	EXISTING ROADSIDE DITCH/PROP. 12" CULVERT
2B	0.2	1.8	EXISTING ROADSIDE DITCH/PROP. 12" CULVERT
2C	0.3	2.5	EXISTING ROADSIDE DITCH/EXIST. 15" CULVERT
3	10.2	25.9	TEMPORARY POND
4	13.2	40.3	TOTAL RUNOFF TO CREEK
5	3.1	6.3	K&G INLETS/PIPE STUB
6	3.4	8.8	15' AT-GRADE INLET
7	1.9	4.4	SURFACE INTO POND
8	1.8	3.2	SURFACE INTO POND
9	5.7	22.9	SURFACE BYPASSING TEMPORARY POND

CLASSIC CONSULTING
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799(Fax)

AIRPORT SPECTRUM SUBDIVISION
FILING NO. 1
FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS MAP

DESIGNED BY	MAL	SCALE		DATE	07/29/19
DRAWN BY	MAL	(H) 1"= 60'		SHEET 2	OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	2429.10

N:\2429\DRAWINGS\DEVELOPMENT\FDR-K&G-POND-DEVELOP.dwg, 8/11/2019 7:27:00 PM, 1:1



FLAG NOTES:

1. ADA ACCESSIBLE STALL & AISLE (NOT TO EXCEED 2.00% GRADE IN ANY DIRECTION)
2. MATCH EXISTING GRADE (CONTRACTOR TO VERIFY)
3. ALL LIDS FOR UNDERGROUND TANKS TO BE 1" ABOVE FINISHED GRADE
4. PROPOSED 6" INTEGRAL CURB
5. PROPOSED ROLLOVER CURB
6. RAMPS AND CURB & GUTTER TO BE INSTALLED BY OVERALL DEVELOPER
7. INSTALL STORM SEWER PIPE; LENGTH, SIZE, AND SLOPE PER TABLE
8. CONNECT TO BUILDING DOWNSPOUT, SEE ARCHITECTURAL PLANS FOR DOWNSPOUT LOCATIONS
9. CONNECT TO CANOPY DOWNSPOUT
10. INSTALL STORM SEWER WYE AND CLEANOUT WITH WATERTIGHT LID
11. INSTALL 6" ADS INSERTA TEE
12. PROPOSED BREAK IN GRADE
13. EXPOSED FOUNDATION
14. INSTALL 12" ADS STORM SEWER INLET w/ 2'x2' TRAFFIC RATED HIGH FLOW GRATE
15. INSTALL 11.25° BEND
16. INSTALL 22.5° BEND
17. INSTALL TYPE II MANHOLE PER CITY STANDARD DETAIL
18. REMOVE PLUG, INSTALL 12" 11.25° PVC BEND & CONNECT TO EXISTING STUB, BY OVERALL DEVELOPER AND WILL CARRY ALL STORM WATER TO SUBDIVISION DETENTION AND WATER QUALITY POND.

STORM PIPE TABLE

NAME	SIZE	LENGTH	SLOPE
A–B	12"	32.28'	8.99%
B–C	12"	55.82'	9.49%
C–D	12"	8.50'	5.71%
D–DA	6"	27.93'	5.00%
D–E	12"	31.62'	0.99%
DA–DA1	6"	5.00'	42.14%
DA–DB	6"	32.66'	5.00%
DB–DB1	6"	5.00'	9.48%
DB–DC	6"	32.66'	0.98%
DC–DC1	6"	5.00'	0.50%
E–EA	6"	4.89'	65.43%
E–F	12"	42.60'	1.00%
F–FA	6"	71.29'	3.86%
F–G	12"	40.19'	1.00%
G–GA	6"	30.31'	5.44%
G–GC	6"	21.79'	8.58%
G–H	12"	14.00'	2.00%
GA–GB	6"	10.19'	6.00%
H–I	12"	14.00'	2.00%
I–IA	6"	21.79'	5.74%
I–J	10"	28.00'	2.30%
J–JA	6"	21.79'	4.50%
J–K	10"	28.00'	2.00%
K–KA	6"	21.79'	1.70%
K–L	10"	5.87'	2.00%
L–LA	6"	23.96'	1.00%
LA–LB	6"	12.62'	3.98%

STORM STRUCTURE TABLE

ID	NORTHING EASTING	RIM/GROUND/ TOC ELEV.*	INVERT IN	INVERT OUT
A	N:1345754.65 E:3221356.83		12" (N)=5931.00	
B	N:1345786.63 E:3221352.41	5940.28	12" (N)=5933.90	12" (S)=5933.90
C	N:1345841.92 E:3221344.76		12" (N)=5939.20	12" (S)=5939.20
D	N:1345850.42 E:3221344.58		12" (N)=5939.69 6" (E)=5940.19	12" (S)=5939.69
DA	N:1345848.74 E:3221372.46		6" (E)=5941.58 6" (N)=5941.58	6" (W)=5941.58
DA1	N:1345853.73 E:3221372.76			6" (S)=5943.69
DB	N:1345846.78 E:3221405.06		6" (E)=5943.22 6" (N)=5943.22	6" (W)=5943.22
DB1	N:1345851.77 E:3221405.36			6" (S)=5943.69
DC	N:1345844.81 E:3221437.67		6" (N)=5943.54	6" (W)=5943.54
DC1	N:1345849.80 E:3221437.97			6" (S)=5943.56
E	N:1345881.98 E:3221346.48		12" (N)=5940.00 6" (E)=5940.50	12" (S)=5940.00
EA	N:1345881.69 E:3221351.36			6" (W)=5943.70
F	N:1345924.50 E:3221349.04		12" (N)=5940.43 6" (E)=5940.93	12" (S)=5940.43
FA	N:1345920.22 E:3221420.20			6" (W)=5943.68
G	N:1345964.62 E:3221351.46	5944.86	6" (N)=5941.33 6" (NW)=5941.33 12" (E)=5940.83	12" (S)=5940.83
GA	N:1345977.88 E:3221324.21		6" (N)=5942.98	6" (SE)=5942.98
GB	N:1345988.06 E:3221324.82			6" (S)=5943.59
GC	N:1345986.37 E:3221352.77			6" (S)=5943.20
H	N:1345963.78 E:3221365.43	5944.72	12" (E)=5941.11	12" (W)=5941.11
I	N:1345962.94 E:3221379.41		10" (E)=5941.47 6" (N)=5941.89	12" (W)=5941.39
IA	N:1345984.69 E:3221380.72			6" (S)=5943.14
J	N:1345961.25 E:3221407.36		6" (N)=5942.45 10" (E)=5942.12	10" (W)=5942.12
JA	N:1345983.01 E:3221408.67			6" (S)=5943.43
K	N:1345959.57 E:3221435.31		6" (N)=5943.01 10" (E)=5942.68	10" (W)=5942.68
KA	N:1345981.32 E:3221436.62			6" (S)=5943.38
L	N:1345959.22 E:3221441.16	5944.73	6" (E)=5943.13	10" (W)=5942.79
LA	N:1345967.04 E:3221463.81		6" (N)=5943.37	6" (W)=5943.37
LB	N:1345979.64 E:3221464.57			6" (S)=5943.87

LEGEND

- PROPERTY BOUNDARY
- PROPOSED INTEGRAL CURB
- PROPOSED CURB AND GUTTER
- EXISTING CURB AND GUTTER
- ADA ACCESSIBLE ROUTE
- PROPOSED SETBACK LINE
- SIGHT TRIANGLE
- PROPOSED RETAINING WALL
- STAMPED CONCRETE PAVEMENT
- STORM SEWER STRUCTURE
- PROPOSED TRANSFORMER
- PARKING COUNT
- PROPOSED BOLLARD
- CONTROL POINT
- FIRE HYDRANT
- LIGHT POLE
- GUY WIRE
- POWER POLE
- WATER VALVE
- VEGETATION
- GAS METER
- TRAFFIC SIGNAL ARM
- FIBER OPTIC MANHOLE
- SANITARY SEWER STRUCTURE
- GREASE INTERCEPTOR LID
- SIGN

A = BASIN DESCRIPTION
B = BASIN AREA
C = MINOR EVENT COMPOSITE C–VALUE
D = MAJOR EVENT COMPOSITE C–VALUE

SUMMARY RUNOFF TABLE

PARCEL #	AREA (ACRES)	C5	C100	Q5 (CFS)	Q100 (CFS)
B–1	0.13	0.73	0.81	0.43	0.96
B–2	0.09	0.73	0.81	0.30	0.67
B–3	0.29	0.90	0.96	1.08	2.50
B–4	0.16	0.90	0.96	0.60	1.40
B–5	0.35	0.68	0.79	0.97	2.57
B–6	0.28	0.15	0.41	0.09	1.04
B–7	0.03	0.90	0.96	0.10	0.24
B–8	0.22	0.23	0.47	0.15	0.92
B–9	0.07	0.90	0.96	0.28	0.65

FLOOD ZONE:
THIS PROPERTY IS IN FLOOD ZONE "X" AREAS DETERMINED TO BE OUTSIDE THE 0.2% CHANCE FLOODPLAIN OR "D" AREAS IN WHICH FLOOD HAZARDS ARE UNDETERMINED, BUT POSSIBLE, PER FEMA FLOOD MAP 08041C0763G EFFECTIVE DECEMBER 7, 2018

BENCHMARK:
BM1: SET #5 REBAR W/ RED PLASTIC CAP ON NORTH SIDE OF MILTON E PROBY PARKWAY, APPROXIMATELY 953 FEET WEST OF MIDDLE OF POWERS BOULEVARD, 3 FEET SOUTH OF SOUTH EDGE OF CONCRETE SIDEWALK AND 95 FEET NORTHWESTERLY OF NORTHWEST CORNER OF CONCRETE GRATE INLET. ELEVATION= 5957.94'

BM2: SET #5 REBAR W/RED PLASTIC CAP ON NORTH SIDE OF MILTON E PROBY PARKWAY, APPROXIMATELY 520 FEET WEST OF MIDDLE OF POWERS BOULEVARD, 7 FEET NORTH OF NORTH EDGE OF CONCRETE SIDEWALK AND 46 FEET EAST OF A FIBER OPTIC VAULT . ELEVATION= 5960.11'

BM3: SET #5 REBAR W/ RED PLASTIC CAP ON SOUTH SIDE OF MILTON E PROBY PARKWAY, APPROXIMATELY 794 FEET WEST OF MIDDLE OF POWERS BOULEVARD, 54 FEET SOUTH OF SOUTH BACK OF CURB OF MILTON E PROBY AND 138 FEET EASTERLY OF MIDPOINT BETWEEN TWO ELECTRIC MANHOLES. ELEVATION= 5945.46'

NOTES:

1. REFERENCE POINTS FOR STRUCTURES ARE AS FOLLOWS:
   - CENTER OF MANHOLES/CLEANOUTS
   - CENTER OF INLET FACE AT TOP OF CURB FOR CURB INLETS
   - CENTER OF INLET FOR GRATE INLETS
   - CENTER AT END OF FLARED END SECTION
2. STORM SEWER PIPE LENGTHS ARE MEASURED AS FOLLOWS:
   - CENTER OF MANHOLES/CLEANOUTS
   - INSIDE WALL OF CURB INLET
   - CENTER OF GRATE INLET
   - LENGTHS LISTED ARE 2D MEASUREMENTS
3. ALL PROPOSED DRAINAGE STRUCTURES AND PIPES ON THIS SITE ARE PRIVATE.
4. ALL PROPOSED PIPES ARE HDPE.
5. ALL PRIVATE TO PUBLIC STORM SEWER CONNECTIONS MUST INSPECTED BY AN ENGINEERING DEVELOPMENT REVIEW INSPECTOR.

NOTE:

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEES THAT THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN–SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED, ALTHOUGH THE SURVEYOR DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. THIS INCLUDES PRIVATE AND PUBLIC UTILITIES.

811 Know what's **below.** **Call** before you dig.
CALL 811 SEVENTY-TWO HOURS PRIOR TO DIGGING, GRADING OR EXCAVATING FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

olsson
1880 Fall River Dr Suite 200
Loveland, CO 80538
TEL 970.461.7733
www.olsson.com

THIS DOCUMENT HAS BEEN RELEASED BY OLSSON FOR REVIEW BY REGULATORY AGENCIES AND OTHER PROFESSIONALS, AND IS SUBJECT TO CHANGE. THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION.

Kum & Go
1459 Grand Avenue
Des Moines, Iowa
50309
P: 515-226-0128
F: 515-223-9873

#0661 - COLORADO SPRINGS, CO
POWERS BLVD & MILTON PROBY PKWY
DEVELOPED RUNOFF

KG PROJECT TEAM:
RDR: KELLIE WISBROCK
SDM: RYAN HALDER
CPM: PERRY DEPHILLIPS

REVISIONS

△	DATE:	REVISION DESCRIPTION

DATE: 08/14/2019

SHEET NUMBER:
1 OF 1

DWG: F:\2019\0001-0500\019-0347\40-Design\Reports\GNCV\Drainage\CAD\Proposed Basins.dwg USER: hcrall
DATE: Aug 14, 2019 8:52am XREFS: C_PBASE_0190347 C_XBASE_0190347 C_FBASE_0190347 C_PUTIL_0190347 C_TBLK_DP_0190347

APPENDIX F

Engineers Probable Opinion of Cost

Engineer's Opinion of Probable Cost

Firm Name: **Olsson**
Completed By: Hannah Crail
Plans Dated: Drainage Report dated 2019-08-09
Notes:

KUM & GO #661
Colorado Springs, CO

OPINION OF PROBABLE COST

STAGE **FINAL**

Drainage

CATEGORY	QUANTITY	UNIT	UNIT PRICE		CURRENT TOTAL
22500 TOTAL					$0.00
STORMWATER					
6" Pipe - HDPE	289	**LF**	$20.00	**$/LF**	$5,780.00
10" Pipe - HDPE	51	**LF**	$30.00	**$/LF**	$1,530.00
12" Pipe - HDPE	213	**LF**	$34.00	**$/LF**	$7,242.00
Storm Inlet Structures (ADS Basin)	2	**EA**	$3,500.00	**$/EA**	$7,000.00
48" Storm Manhole	1	**EA**	$3,500.00	**$/EA**	$3,500.00
4" Cleanout	1	**EA**	$250.00	**$/EA**	$250.00
Connect to Existing Structure	1	**EA**	$1,000.00	**$/EA**	$1,000.00
SUBTOTAL					$26,302.00
Contingency	10%				$2,630.20

Total without Contigency	**$26,302**
Site Development Contigency	**$2,630**
Project Grand Total	**$28,932**

KUM & GO #661
LOT 1, AIRPORT SPECTRUM FILING NO. 1

Colorado Springs, Colorado
August 2019

Olsson Project No. 019-0347