PHASE I DRAINAGE REPORT
FOR
STREETS AT SOUTHGLENN
CENTENNIAL, COLORADO

Prepared By:

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SEMSWA Case No.

July 2021

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I. GENERAL LOCATION AND DESCRIPTION

A. Site Location

1. This Phase I Drainage Report is being prepared for Streets at SouthGlenn, located at the southwest corner of East Arapahoe Road and South University Boulevard. See Appendix for the vicinity map.
2. A parcel of land located in the northeast one-quarter of Section 26, Township 5 South, Range 68 West of the 6th principal meridian.
3. The project is within the City of Centennial and Arapahoe County at the southwest corner of the intersection of University Boulevard (100' ROW) and Arapahoe Road (100' ROW). Race Street (60' ROW) and Easter Ave (80' ROW) boarder the site on the west and south sides, respectively.
4. Developments surrounding the project include the Cherry Knolls Shopping Center commercial development and the Knolls Townhouse Association residential development to the east; the Glenn Oaks Homeowner's Association and other residential development to the south; a church, and residential development including apartments to the west; residential development to the northwest; and commercial development to the northeast.

B. Description of Property

1. The Streets at SouthGlenn is a total of 72.148-acres. This includes the entire block between East Arapahoe Road, East Easter Avenue, South Race Street and South University Boulevard, excluding the existing southeast parcel with an existing office building. This MDP Amendment is for the inclusion of the southwest parcel, Lot 2, Block 2 Filing 2 into the Master Plan and to create north and south redevelopment areas. The current zoning is Mixed Use – Planned Unit Development and will remain as is.
2. The existing ground cover is mostly impervious, consisting mainly of roof areas, asphalt and concrete parking and sidewalk areas. There is existing landscape scattered throughout the development with a park in the middle and tree lawns along the perimeter streets.
3. See Appendix B for NRSC Soil Map and Survey. The site is mainly comprised of two soils: FdB, which is a fondis silt loam belonging to soil group C, FdC, which is a fondis silt loam belonging to hydrologic soil group C.
4. Runoff from the project site is tributary to two major drainageways. The west side of the site is tributary to Upper Slaughterhouse Gulch. The east side of the site is tributary to Big Dry Creek.
5. There are no floodplains that affect this site. See Appendix for the FEMA FIRM

Panels.

6. There are no irrigation canals or ditches on site.
7. There are no significant geologic features on this site.
8. The site is an existing mixed-use development that is pedestrian oriented and includes retail, office, entertainment and multi-family. This MDP Amendment No. 8 creates two redevelopment areas: north and south. The south redevelopment area includes the old Sears building, parking area south of the Sears building and existing office building in the southwest corner of the site and is a total of 11.69-acres. The north redevelopment area includes the Macy's building and the parking area between the building and East Arapahoe Road and is a total of 8.61-acres. See Appendix for MDP site plan. The maximum residential units have been increased, the minimum retail square footage has been reduced, setbacks along East Easter Avenue and South Race Street have been revised, building heights for south and north redevelopment areas have been revised and an open space commitment has been added for the south redevelopment area. The south redevelopment area is required to provide a minimum of 25,000 square feet of contiguous public open space, passive recreation, common public squares or green areas on Lot 2, Block 1, Filing No. 3.
9. A Geotechnical Investigation was completed by GROUND Engineering Consultants, Inc, on November 21, 2005. Groundwater was not encountered during the subsurface exploration. Since then there were final Geotechnical Investigations completed for each block/building completed in 2007 and again, groundwater was not encountered during subsurface exploration.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins

1. The westerly side of the Streets at SouthGlenn drains north and west and is tributary to Upper Slaughterhouse Gulch. The "Phase B Report (Major Drainageway Planning)," dated March 1983, as prepared by WRC Engineering (Phase B Report) describes historic drainage concerns for this drainageway and includes recommendations for proposed improvements. The upper limit of the Phase B Report extends to the intersection of Downing Street and Arapahoe Road, approximately 400 feet to the west of the Streets at SouthGlenn. The report indicates that the area downstream of the Streets at SouthGlenn, along Downing Street to the Highline Canal, experiences flooding because the existing storm sewer system is inadequate for 2-year storm events. Reportedly the 15-inch storm sewer in Downing Street is connected upstream to a 24-inch and 48-inch storm sewer in Arapahoe Road. The study recommends construction of a 60-inch storm sewer

system in Downing Street to convey the 5-year storm. The storm sewer is intended to discharge into a proposed regional detention pond downstream of the Highline Canal.

In 1998 storm sewer improvements were made to the reach from Downing Street downstream to the Highline Canal. The project, "Drainage and Flood Control Improvements Upper Slaughterhouse Gulch Phase VI", consisted of installation of 54-inch diameter storm sewer consistent with the design intent of the Phase B Report. At this time Mile High Flood District (MHFD) shows that the remaining improvements are still proposed.

2. The easterly side of the Streets at SouthGlenn property drains north and east and is tributary to Big Dry Creek. The "Phase A Report Major Drainageway Planning Alternatives for Big Dry Creek," dated June 1996, as prepared by WRC Engineering (Phase A Report) describes historic drainage concerns for this drainageway and includes recommendations for proposed improvements. The highly urbanized basin described in the Phase A Report has problems with inadequate drainage capacity of bridge structures along Big Dry Creek at the University Boulevard and Arapahoe Road crossings. According to MHFD there were improvements completed on Big Dry Creek just north of the East Arapahoe Road crossing in 2004 and maintenance for Cherry Knolls Park completed in 2013.

B. Minor Drainage Basins

1. Historically the site drains into the two major drainageways as described above. Currently, there are six basins on the site that each convey stormwater to underground facilities for both water quality and detention. The stormwater flows overland to curb and gutter and into storm sewer inlets throughout the site. The underground storm sewer infrastructure then conveys the stormwater to the one of the six underground facilities.
2. The existing land use includes retail, office, entertainment and multi-family. The south redevelopment area land use will change from retail, office and parking area to multi-family and open space with associated parking for tenants. The MDP Amendment has put a stipulation on the south redevelopment area to include a minimum of 25,000 square feet (0.57-acres) of park and/or open space that will reduce the imperviousness of the overall site. The existing percent impervious for the south redevelopment area is 80.72% and the anticipated percent impervious is 71.81%. At this time, it is anticipated that the open space will be located within Basin C. There is a portion of the site, 0.52-acres, in the southwest corner that was not previously included within the Streets at SouthGlenn, Basin G, and now will be incorporated into the infrastructure of Basin C. Currently, the area designated for

the open space is mostly impervious therefore including the stormwater for Basin G into Basin C's underground infrastructure could be a trade-off. This will be further analyzed as the redevelopment is designed. The north redevelopment area land use will change from retail and parking area to additional mixed-use development. As the north redevelopment area is designed, the existing storm sewer infrastructure will be analyzed.

3. Seven Basins: A, B, C, D, E, F and G.
    i. Basins A, B and E are 10.49, 16.65 and 1.53 acres respectively. Each basin is tributary to Big Dry Creek and the underground detention systems located at design points A, B and E. A total 10-year release of 7.48 cfs is being released from Basins A and B to the existing 18-inch storm drain at the northeast corner of the site. The existing detention outlet pipe connection is to an existing curb inlet located approximately 650-feet south of Arapahoe Road in University Boulevard. The existing 18-inch pipe has a full flow capacity of 9.10 cfs. Runoff in excess capacity of the existing pipe in University are released through inlets and manholes and discharge onto University Boulevard. In the event of a runoff event exceeding the 10-year storm, runoff is conveyed overland via the private internal street system to University Boulevard and Arapahoe Road. At the low point of Basin B in the corner of the parking lot, south of the first entrance off of University Boulevard, the 100-year overflow for Basins A and B will be located. The storm water will flow over the retaining wall along University Boulevard and into the street section. At this location, the retaining wall has been constructed to convey the storm water over the wall.
    ii. Basin E is 1.53 acres and consists of an existing parking lot for the Macy's building and a portion of South York Street. The stormwater is captured by storm sewer inlets and conveyed to the underground water quality and detention facility. Basin E has a 10-year release of 1.00 cfs to Arapahoe Road though a concrete curb cut. In the event of a runoff event exceeding the 10-year storm, runoff is conveyed overland to Arapahoe Road. At the low point for Basin E, the 100-year storm event overtops the curb and is conveyed through the screen wall onto Arapahoe Road. The screen wall was constructed to accommodate this flow through it with a weir configuration.
    iii. Basins C and D are 34.23 and 3.65 acres, respectively. Each basin is tributary to Slaughterhouse Gulch and the underground detention systems located at design points C and D. The 10-year release is 11.35 cfs to the existing 18-inch storm drain at the northwest corner of the site. The existing 18-inch pipe has a full flow capacity of 8.64 cfs. Runoff in excess capacity of the existing pipe in Race Street and Arapahoe Road is released through inlets and manholes and discharged onto Arapahoe Road. In the event of a runoff

event exceeding the 10-year storm, runoff is conveyed overland via the private internal street system to Race Street and Arapahoe Road. The 100-year storm event for half of Basin C overtops the curb along Arapahoe Road inline with the two inlets for the underground detention system. This flow overtops the retaining wall at this location. The 100-year flow for the upper half of Basin C and all of Basin D is located at the low point for Basin D along Race Street. The storm water overtops the curb and is conveyed through the screen wall and over the retaining wall. The screen was constructed with a weir configuration to accommodate the flow.

iv. Basin F is 3.67 acres. The area is tributary to the existing underground detention system located at design point F. The basin has a total 10-year release of 1.4 cfs. The 10-year release from the detention facility is conveyed to the east side of the site in University Boulevard, into the existing storm system. When a runoff event exceeds the 10-year storm runoff is conveyed overland via the private internal street system to University Boulevard and Arapahoe Road.

v. Basin G is 0.52 acres and consists of an existing office building, landscape area and some parking area. Based on the south redevelopment concept this basin has a 75% impervious value per MHFD Table 6-3. Currently, this basin conveys stormwater to Race Street and Easter Avenue. In the proposed condition the stormwater from this basin will be captured on-site and conveyed to Basin C underground infrastructure. The approximate 10-year detention volume for Basin G is 0.042 acre-feet, see detention basin spreadsheet in the appendix. The required 10-year detention volume for Basin C is 2.68 acre-feet and based on the pond volume certification the existing volume of Basin C is 2.72 acre-feet. Therefore, adding Basin G will bring the required 10-year detention volume of Basin C to 2.72 acre-feet. Based on this preliminary analysis, Basin C will be able to accept the proposed flow from Basin G.

III. EXISTING STORMWATER CONVEYANCE OR STORAGE FACILITIES

A. Existing Stormwater Conveyance Facilities

1. The north and south redevelopment areas are located within four of the existing basins: A, B, C and E. The south redevelopment area will potentially impact basins A and C conveyance systems. The north redevelopment area will potentially impact basins B, C and E conveyance systems. The storm sewer infrastructure will be modified as necessary to provide proper drainage from the developed site to the nearest storm sewer inlet. When the redevelopment areas are designed, all

modifications will be shown and designed to convey the 10-year storm event.

2. As the redevelopment areas are designed, the existing conveyance systems that will be utilized will be evaluated to ensure capacity of the anticipated flow. The existing systems will be modified as needed to accommodate the stormwater.
3. Pending full design of the redevelopment areas, will determine which, if any, of the conveyance systems will be rebuilt or abandoned.

B. Existing Stormwater Storage Facilities

1. The north and south redevelopment areas are located within four of the existing basins: A, B, C and E. The south redevelopment area will utilize the underground storage facilities A and C. The north redevelopment area will utilize underground storage facilities B, C and E. The stormwater from each area shall be routed to the same basin it is currently conveyed to for water quality and detention volume purposes. The ADS water quality units intercept and treat a first flush of runoff pollutants. These units have shown to remove concentrations of contaminated particles and hydrocarbons for storm water runoff. Laboratory tests have shown an 80% TSS removal rate. Floatable debris such as oils and greases are also intercepted prior to discharging into the underground detention facilities. The existing StormTech detention systems provide storm water detention and a secondary line of defense for TSS removal. Each system utilizes an isolator rows within the system which basically creates an extended detention basin that allows water to egress through surrounding fabric while sediment is trapped within.
2. The water quality units and underground detention facility located within basin E is the only storage facility that would be modified due to the location of the infrastructure within the north redevelopment area. It is not anticipated to modify any of the other basins underground water quality or detention facilities with the redevelopments. As the north redevelopment area is designed, will determine if basin E will be modified.
3. It is not anticipated to rebuild or abandon any of the underground water quality or detention facilities.

IV. PROPOSED STORMWATER CONVEYANCE OR STORAGE FACILITIES

A. Proposed Stormwater Conveyance Facilities

1. As the redevelopment areas are designed and analyzed for grading and drainage, additional conveyance systems are likely to be required. The proposed systems will be analyzed for capacity and designed with the intent of conveying the stormwater towards the existing underground facilities within each basin.

2. There is no off-site runoff that is conveyed through this site.
3. A Drainage Map (DM) can be found in the Appendix. The DM shows the entire Streets at SouthGlenn, with the six basins and associated underground facilities. The north and south redevelopment areas are shaded to show the limits. The basin information is based on the existing conditions of the site today. A Soils Report is located in the Appendix. The site is located within two FEMA FIRM Panels, which can both be found in the Appendix.
4. Based on discussions with SEMSWA, there are known minor flooding concerns within East Arapahoe Road and South University Boulevard during the 100-year storm event. As the redeveloped areas are designed, attention will be given to the minor flooding concerns. The south redevelopment area will decrease the percent imperviousness of the area and therefore decreasing the runoff coming from the site.
5. There are no anticipated improvements to the major drainageways that this site conveys stormwater to.
6. There is an existing Operations and Maintenance Manual (O&M) for the on-site underground water quality units and detention facilities. The O&M requires continued inspections and maintenance of all underground facilities. Refer to the O&M for procedures for inspection and maintenance.

B. Proposed Stormwater Storage Facilities

1. The north and south redevelopment areas impact four of the six existing underground water quality units and underground StormTech detention facilities. These four existing systems will be adequate to serve the redevelopment areas. As the redevelopments are designed, they will be required to show conformance with the existing parameters in place.
2. The Streets at SouthGlenn's existing underground StormTech facilities provide water quality capture volume and detention volume for the 10-year storm event. The 100-year storm is conveyed overland to the outlet points for each basin.

V. WATER QUALITY ENHANCEMENT BEST MANAMGEMENT PRACTICES

A. Non-Structural BMPs

1. Within the south redevelopment area, there is a requirement for a minimum of 25,000 square feet to be provided as contiguous public open space, passive recreation, common public squares or green areas. Currently, there is very little pervious area within the south redevelopment, this will provide reduced runoff within the existing basin C. Where possible, within the redevelopment areas, there

will be measures put in place that will minimized directly connected impervious areas (MDCIA).

B. Structural BMPs

1. The existing water quality units intercept and treat a first flush of runoff pollutants. These units have shown to remove concentrations of contaminated particles and hydrocarbons for stormwater runoff. Laboratory tests have shown an 80% TSS removal rate. Floatable debris such as oils and greases are also intercepted prior to discharging into underground detention facilities. The proposed detention systems provide stormwater detention and a secondary line of defense for TSS removal. Each system utilizes an Isolator Row within the system which basically creates an extended detention basin that allows water to egress through surrounding fabric while sediment is trapped within.
2. The SouthGlenn Metropolitan District monitors the performance of each drainage facility and performs facility maintenance based on an inspection schedule and detailed product maintenance procedures provided in the O&M Manual.

C. Source Controls

1. Site operations that could potentially impact stormwater quality include oil leaking from vehicles, grass clippings clogging the inlets and removal of vegetation, use of fertilizer and vehicle maintenance are a few.
2. Site activities that can prevent or manage source controls include covering outdoor storage and handling areas, storm sewer system cleaning, landscape management to control clippings and fertilizer and street sweeping.

VI. FLOODPLAIN

A. Major Drainageway – Undesignated Floodplain

1. This site lies within Flood Zone X as seen in FEMA FIRM Maps No. 08005C0452K dated December 17, 2010 and No. 08005C0454K dated December 17, 2010.

VII. POTENTIAL PERMITTING REQUIREMENTS

No Section 404 permit is required. No endangered species are located within the site limits. Permits required for this site include a site construction, building permit, GESC permit and State stormwater permit. A floodplain development permit is not required as no development near the floodplain is anticipated.

VIII. REFERENCES

Soil Survey of Arapahoe County, Colorado, United States Department of Agriculture, Washington, DC, 2006.

Mile High Flood District, Denver, Colorado, *Urban Storm Drainage Criteria Manual, Volumes 1(updated 2018), 2 (updated 2017) & 3 (updated November 2019).*

FEMA Flood Maps, msc.fema.gov

SEMSWA Stormwater Management Manual, Updated January 2017

"Phase B Report (Major Drainageway Planning)," prepared by WRC Engineering, dated March 1983.

APPENDIX

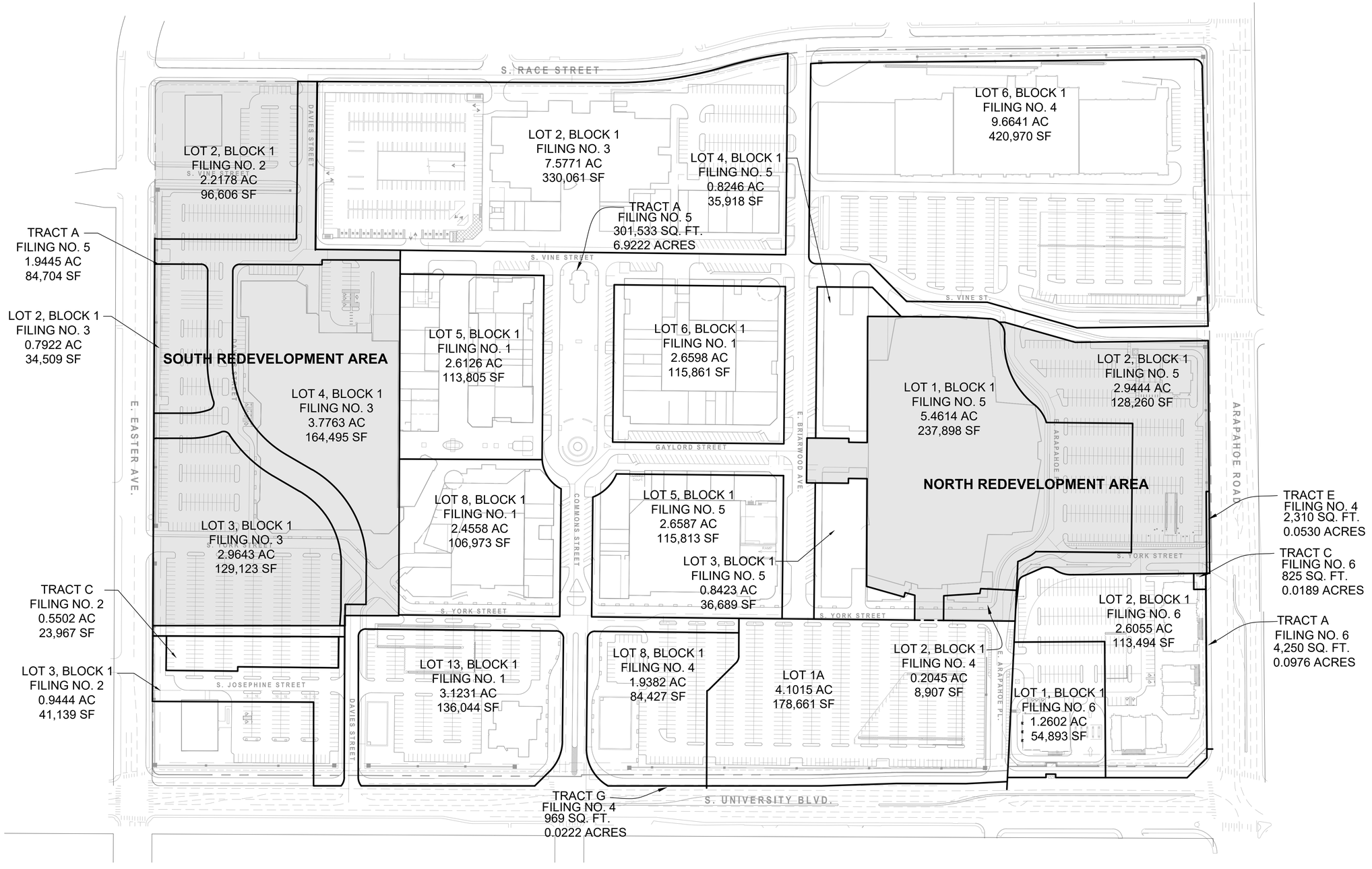
VICINITY MAP

1" = 2,000'

STREETS AT SOUTHGLENN

MASTER DEVELOPMENT PLAN
AMENDMENT NO. 8

PART OF THE NE 1/4 OF SECTION 26, TOWNSHIP 5 SOUTH, RANGE 68 WEST
OF THE SIXTH PRINCIPAL MERIDIAN,
CITY OF CENTENNIAL, ARAPAHOE COUNTY, STATE OF COLORADO



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ISSUE:

#	DATE:	DESCRIPTION:

PROJECT:
Alberta Development Partners, LLC

Southglenn MDP

DATE:	05/01/2021
DESIGNED:	BM
DRAWN:	SM
REVIEWED:	BN
FIELD BOOK NO.:	

SHEET TITLE:
REDEVELOPMENT
BLOCKING PLAN

SHEET NUMBER:
3 OF 16

PROJECT NO.: 0190862.00

STREETS AT SOUTHGLENN

MASTER DEVELOPMENT PLAN

AMENDMENT NO. 8

PART OF THE NE 1/4 OF SECTION 26, TOWNSHIP 5 SOUTH, RANGE 68 WEST
OF THE SIXTH PRINCIPAL MERIDIAN,
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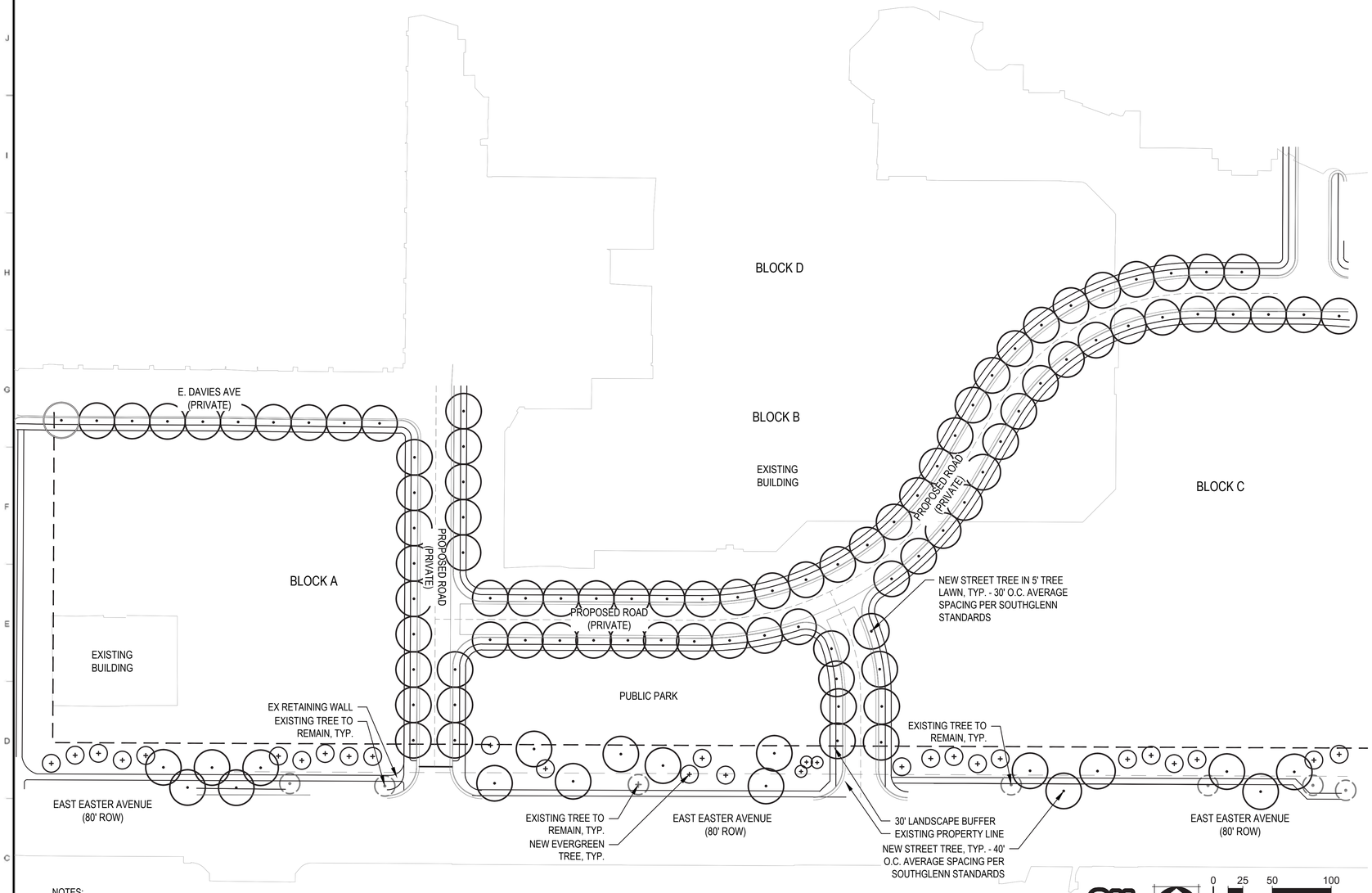

NOTES:
1) THESE PLANT MATERIALS REPRESENT THE GENERAL PALETTE INTENDED FOR THE STREETS AT SOUTHGLENN PROJECT. DUE TO THE WIDE VARIETY OF SHRUBS, GROUNDCOVERS, PERENNIALS AND ANNUALS AVAILABLE FOR USE, THIS IS NOT INTENDED TO BE A COMPLETE LIST OF MATERIALS THAT WILL BE USED AT THIS SITE.

2) LANDSCAPE SHOWN FOR OVERALL DESIGN INTENT ONLY. FINAL DESIGN LAYOUT AND PROGRAM ELEMENTS MAY BE UPDATED DURING THE CITY SITE PLAN APPROVAL PROCESS.

09.17.2020

LANDSCAPE PLANT SCHEDULE

BOTANICAL NAME	COMMON NAME
DECIDUOUS TREES	
ACER x FREEMANII 'AUTUMN BLAZE'	AUTUMN BLAZE MAPLE
CARPINUS BETULIS	PYRAIDAL HORNBEAM
CELTIS OCCIDENTALIS	WESTERN HACKBERRY
QUERCUS BICOLOR	SWAMP WHITE OAK
QUERCUS MACROCARPA	BUR OAK
QUERCUS RUBRA	NORTHERN RED OAK
QUERCUS ROBUR SPP	ENGLISH OAK
ROBINA PSEUDOACACIA	PURPLE ROBE LOCUST
SOPHORA JAPONICA	JAPANESE PAGODATREE
TILIA AMERICANA	AMERICAN LINDEN
TILIA CORDATA	LITTLELEAF LINDEN
EVERGREEN TREES	
PICEA PUNGENS	COLORADO SPRUCE
PINUS CEMBRA	SWISS STONE PINE
PINUS NIGRA	AUSTRIAN PINE
PINUS PONDEROSA	PONDEROSA PINE
PSEUTOTSUGA MENZIESII	DOUGLAS FIR
ORNAMENTAL TREES	
ACER GINNALA 'FLAME'	FLAME AMUR MAPLE
AMELANCHIER CANADENSIS	SERVICEBERRY
CRATAEGUS CRUS-GALLI 'INERMIS'	THORNLESS COCKSPUR HAWTHORN
KOEIREUTERIA PANICULATA	GOLDENRAIN TREE
MALUS SP	CRABAPPLE (VARIETY)
PYRUS CALLERYANA 'AUTUMN BLAZE'	AUTUMN BLAZE PEAR
SYRINGA RETICULATA	JAPANESE TREE LILAC
DECIDUOUS SHRUBS	
ALNUS TENUIFOLIA	THINLEAF ALDER
BERBERIS THUNBERGII	JAPANESE BARBERRY
BUDDLEJA DAVIDII NANHOENSIS	COMPACT LAVENDER BUTTERFLY BUSH
CARYOPTERIS X CLANDOENSIS 'BLUE MIST'	BLUE MIST SPIREA
CERCOCARPUS MONTANUS	MOUNTAIN MOHOGANY
CORNUS SERICEA	RED TWIG DOGWOOD
COTONEASTER DAMMERI 'CORAL BEAUTY'	CORAL BEAUTY COTONEASTER
CYTISUS PURGANS 'SPANISH GOLD'	SPANISH GOLD BROOM
CYTISUS X 'LENA'	LENA BROOM
DAPHNE X BURKWOODI 'CAROL MACKIE'	CAROL MACKIE DAPHNE
HESPERALOE PARVIFLORA	RED YUCCA
ILEX GLABRA 'COMPACTA'	COMPACT INKBERRY HOLLY
LIGUSTRUM VULGARE 'LODENSE'	LODENSE PRIVET
MAHONIA AQUIFOLIUM COMPACTA	COMPACT OREGON GRAPE HOLLY
PEROVSKIA ATRIPLICIFOLIA	RUSSIAN SAGE
PHILADELPHUS SP	MOCKORANGE
POTENTILLIA FRUTICOSA 'GOLD DROP'	GOLD DROP POTENTILLA
PRUNUS BESSEYI	WESTERN SAND CHERRY
PRUNUS X CISTENA	PURPLE LEAF PLUM
RHUS AROMATICA 'GRO-LOW'	DWARF FRAGRANT SUMAC
RIBES ALPINUM	ALPINE CURRANT
ROSA X SPP	SHRUB ROSE
SALIX PURPUREA NANA	DWARF ARCTIC WILLOW
SPIRAEA JAPONICA 'ANTHONY WATERER'	ANTHONY WATERER SPIREA
SYMPHORICARPOS ALBUS	WHITE SNOWBERRY
SYMPHORICARPOS X CHENAULT 'HANCOCK'	HANCOCK CORALBERRY
SYRINGA PATULA 'MISS KIM'	MISS KIM DWARF LILAC
SYRINGA MANZANA	DWARF LILAC
VIBURNUM LANTANA	NANNYBERRY
EVERGREEN SHRUBS	
BUXUS MICROPHYLLA 'WINTER GEM'	WINTER GEM BOXWOOD
PICEA ABIES	NORWAY SPRUCE
PICEA GLAUCA	DWARF ALBERTA SPRUCE
PINUS MUGO	MUGHO PINE
TAXUS MEDIA	YEW
THUJA OCCIDENTALIS EMERALD	EMERALD ARBORVITAE
GROUNDCOVER - PERENNIALS - ORNAMENTAL GRASSES	
ARCTOSTAPHYLOS UVA-URSI	KINNIKINNICK
ASTER SPP	ASTER
CALAMAGROSTIS ACUT. SP	FEATHER REED GRASS
CERASTIUM TOMENTOSUM	SNOW-IN-SUMMER
DIANTHUS SPP	PINKS
ERIANTHUS RAVENNAE	HARDY PAMPAS GRASS
EUONYMUS FORTUNEI	PURPLELEAF WINTERCREEPER
FESTUCA GLAUCA	FESCUE GRASS
GAZANIA	HARDY GAZANIA
HEMEROCALLIS SPP	DAYLILY
IIMPERATA CYLINDRICA 'RED BARON'	JAPANESE BLOOD GRASS
IRIS SPP	IRIS
LEUCANTHEMUM SPP	DAISY
MAHONIA REPENS	CREEPING OREGON GRAPE HOLLY
MISCANTHUS SINENSIS SP	MAIDEN GRASS
PARTHENOCISSUS QUINQUEFOLIA ENGELMANNII	VIRGINIA CREEPER
PENNISETUM SP	FOUNTAIN GRASS
PHALARIS	RIBBON GRASS
PHLOX SUBULATA	CREEPING PHLOX
RUDBECKIA	BLACK EYED SUSAN
SALVIA MAY NIGHT	MAY NIGHT SALVIA
SEDUM SPP	SEDUM
VINCA MINOR 'BOWLES'	PERIWINKLE

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NORRIS DESIGN
Planning | Landscape Architecture | Branding

PROJECT:
Alberta Development Partners, LLC

Southglenn MDP

DATE:	05/01/2021
DESIGNED:	BM
DRAWN:	SM
REVIEWED:	BN
FIELD BOOK NO.:	

SHEET TITLE:
SOUTH REDEVELOPMENT AREA CONCEPTUAL LANDSCAPE PLAN

SHEET NUMBER:
8 OF 16

PROJECT NO.: 0190862.00

STREETS AT SOUTHGLENN

MASTER DEVELOPMENT PLAN
AMENDMENT NO. 8

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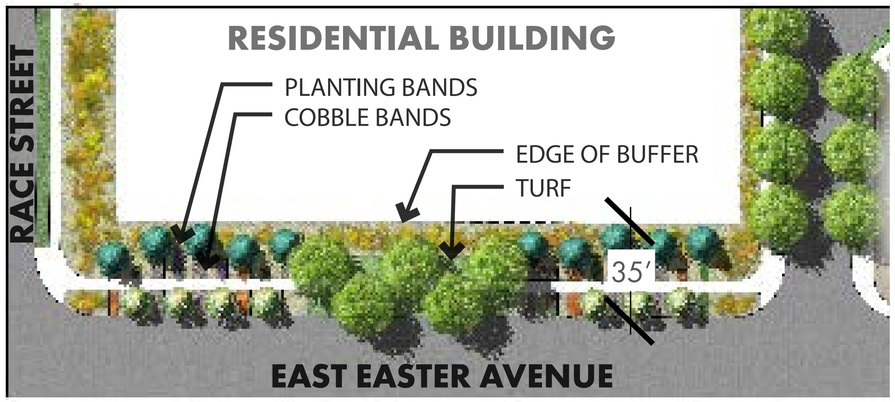
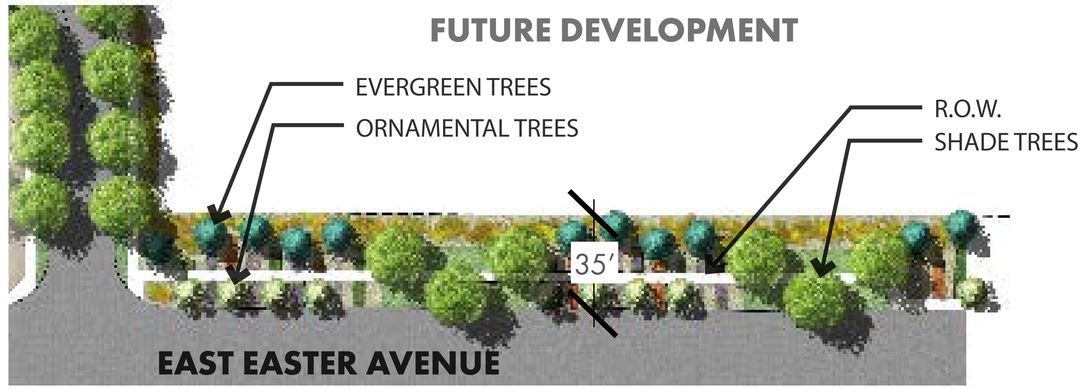


EAST STREETSCAPE



WEST STREETSCAPE

NORTH

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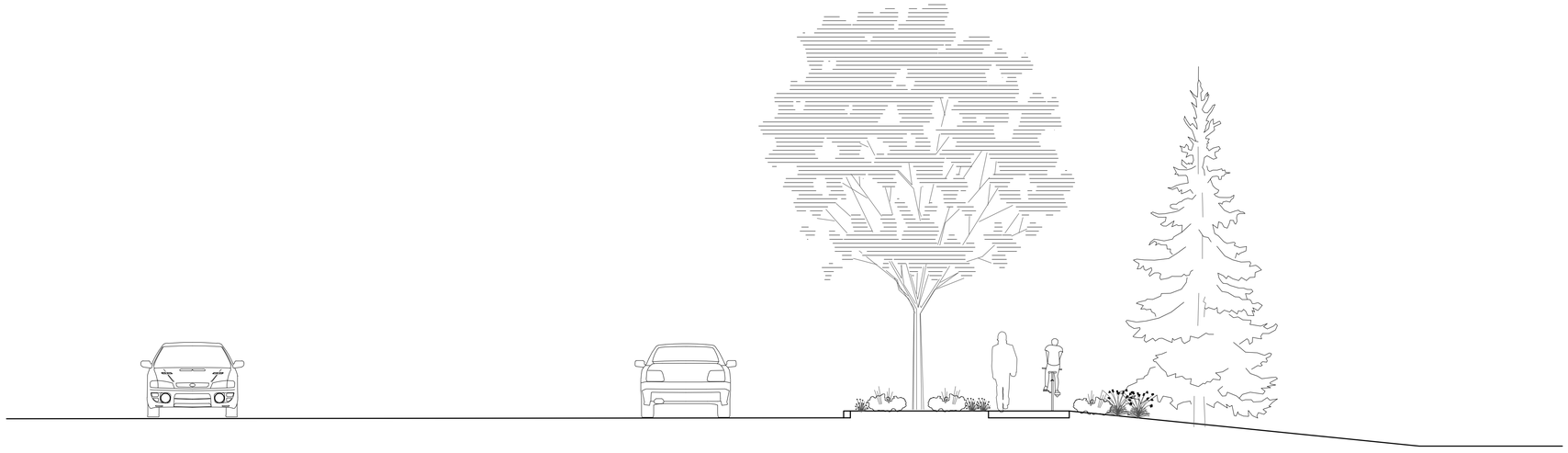
1"=30'-0" SCALE



EASTER AVENUE TYPICAL SECTION

09.17.2020

PROPOSAL FOR
STREETS OF SOUTHGLENN APTS

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NORRIS DESIGN
Planning | Landscape Architecture | Branding

PROJECT:
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MASTER DEVELOPMENT PLAN

AMENDMENT NO. 8

PART OF THE NE 1/4 OF SECTION 26, TOWNSHIP 5 SOUTH, RANGE 68 WEST
OF THE SIXTH PRINCIPAL MERIDIAN,
CITY OF CENTENNIAL, ARAPAHOE COUNTY, STATE OF COLORADO

NORTH

0 10 20 40

1"=20'-0" SCALE

STREETSCAPE CHARACTER

NATURALIZED BIOSWALE CHARACTER

NATURE PLAY CHARACTER

LANDSCAPE CHARACTER

LANDSCAPE CHARACTER

09.17.2020

Farnsworth
GROUP

5613 DTC PARKWAY, SUITE 1100
GREENWOOD VILLAGE, COLORADO 80111
(303) 692-8838 / info@f-w.com

www.f-w.com
Engineers | Architects | Surveyors | Scientists

ISSUE:

#	DATE:	DESCRIPTION:

NORRIS DESIGN
Planning | Landscape Architecture | Branding

PROJECT:
Alberta Development Partners, LLC

Southglenn MDP

DATE:	05/01/2021
DESIGNED:	BM
DRAWN:	SM
REVIEWED:	BN
FIELD BOOK NO.:	

SHEET TITLE:
SOUTH REDEVELOPMENT AREA CONCEPTUAL LANDSCAPE PLAN

SHEET NUMBER:
10 OF 16

PROJECT NO.: 0190862.00

NOTES TO USERS

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC- 3, #9202
1315 East- West Highway
Silver Spring, MD 20910- 3282

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Contact the **FEMA Map Service Center** at 1- 800- 358- 9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a *Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1- 800- 358- 9620 and its website at http://www.msc.fema.gov/.

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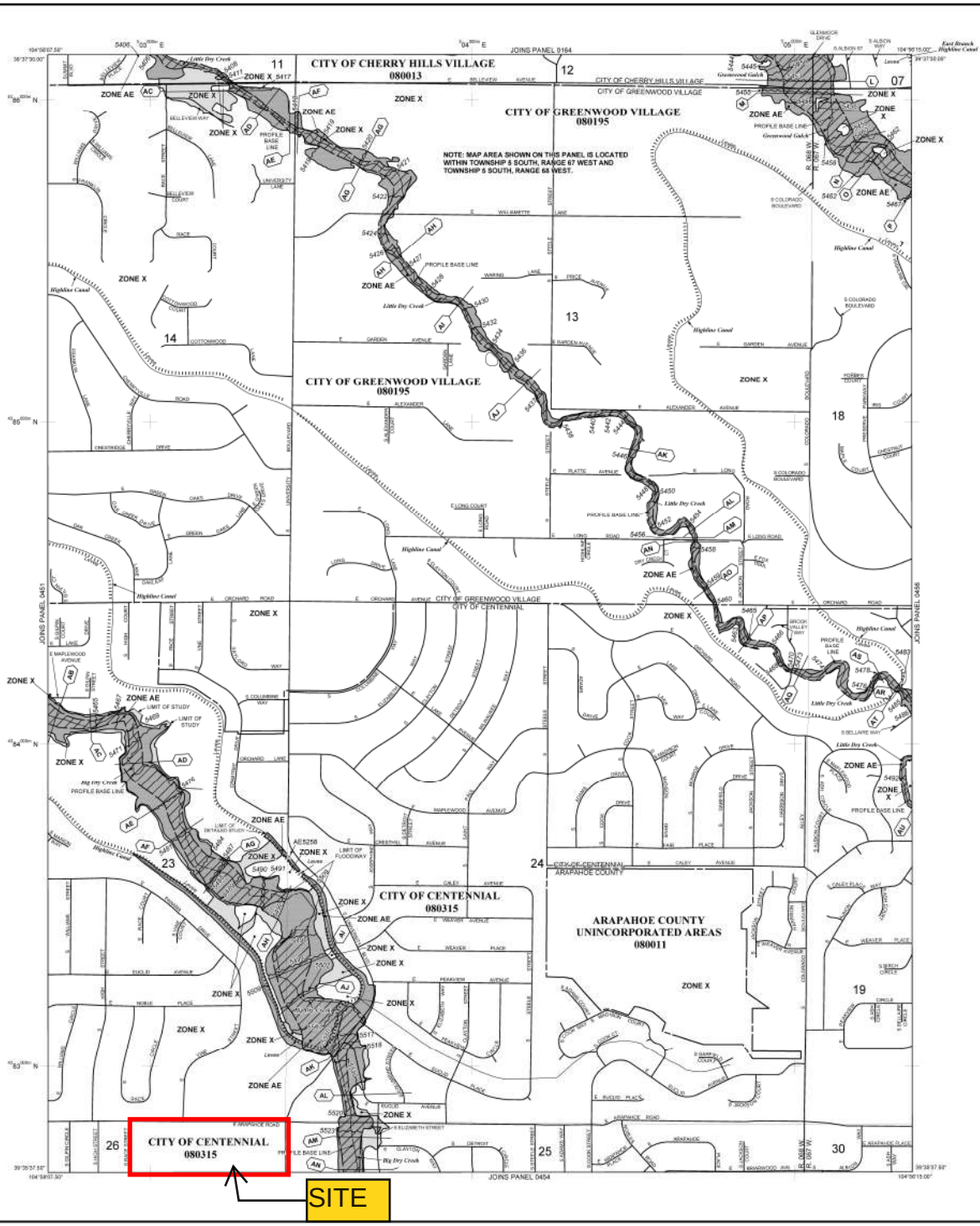

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

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ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

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A — A — Cross section line

23 — 23 — Transect line

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4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 M — 5000-foot grid ticks: New York State Plane coordinate system, east zone (FIPSZONE 3101), Transverse Mercator

DX5510 — Bench mark (see explanation in Notes to Users section of this panel)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 17, 1989

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
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MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0452K

FIRM
FLOOD INSURANCE RATE MAP
ARAPAHOE COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 452 OF 725
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ARAPAHOE COUNTY	080011	0452	K
CENTENNIAL, CITY OF	080315	0452	K
CHERRY HILLS VILLAGE, CITY OF	080013	0452	K
GREENWOOD VILLAGE, CITY OF	080195	0452	K

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MAP NUMBER
08005C0452K

MAP REVISED
DECEMBER 17, 2010

Federal Emergency Management Agency

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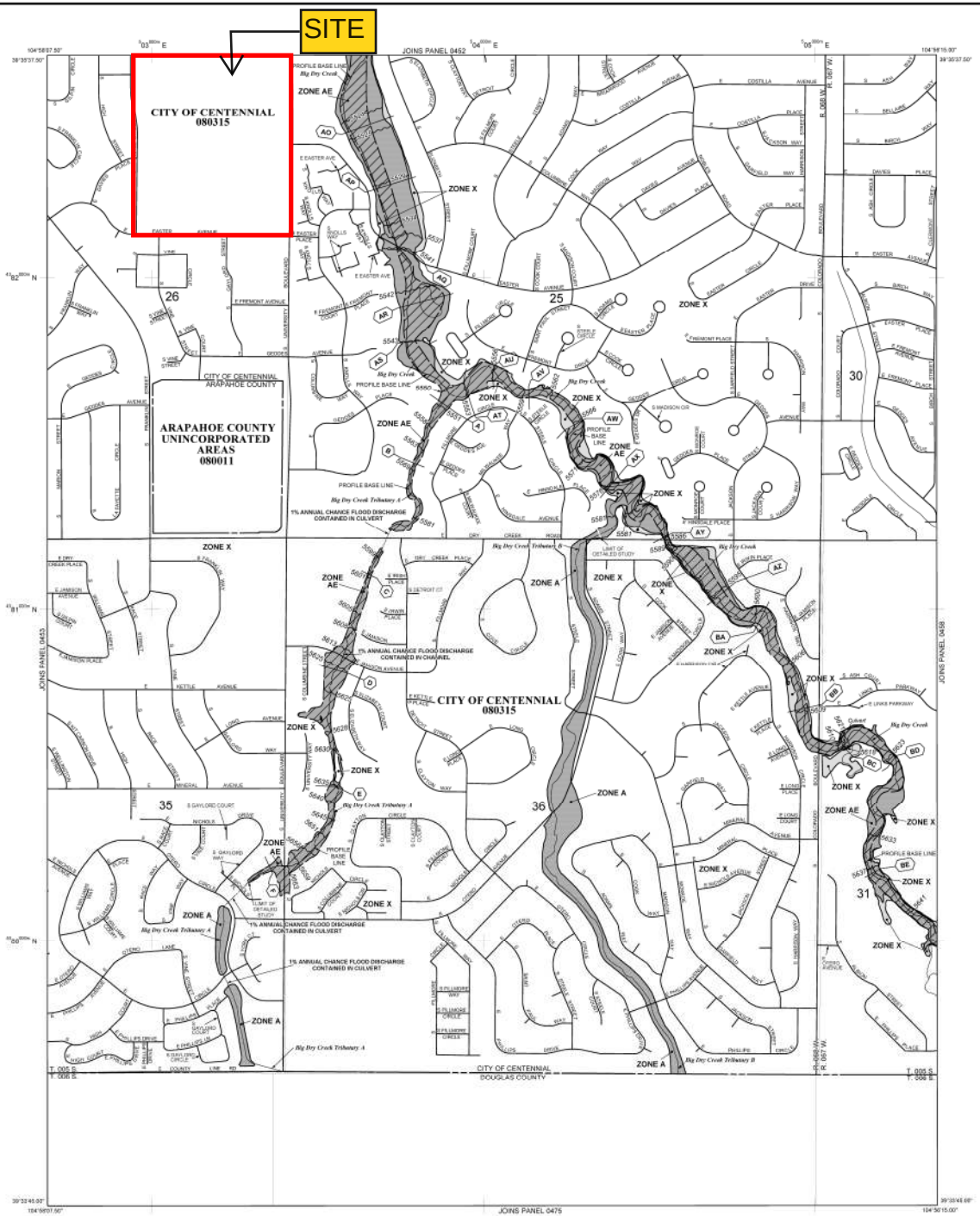

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NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0454K

FIRM
FLOOD INSURANCE RATE MAP
ARAPAHOE COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 454 OF 725
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
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CENTENNIAL, CITY OF	080315	0454	K

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MAP NUMBER
08005C0454K

MAP REVISED
DECEMBER 17, 2010

Federal Emergency Management Agency

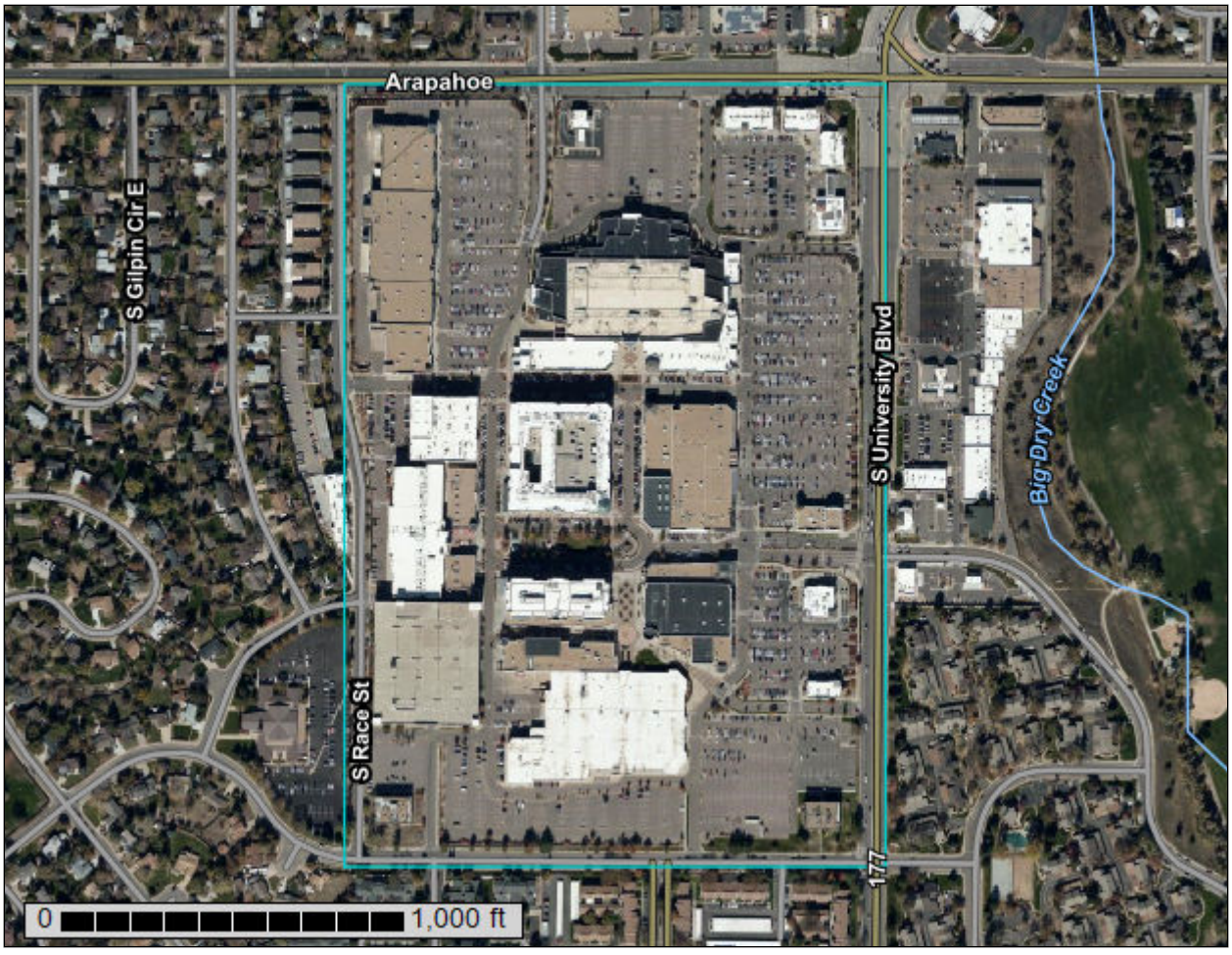
United States Department of Agriculture

NRCS

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 Arapahoe County, Colorado



April 27, 2021

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

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: 1:4,070 if printed on A portrait (8.5" x 11") 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 1:20,000.

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: Arapahoe County, Colorado
Survey Area Data: Version 16, Jun 4, 2020

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

Date(s) aerial images were photographed: Oct 20, 2018—Oct 26, 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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FdB	Fondis silt loam, 1 to 3 percent slopes	54.6	65.8%
FdC	Fondis silt loam, 3 to 5 percent slopes	28.4	34.2%
Totals for Area of Interest		**83.0**	**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.

Arapahoe County, Colorado

FdB—Fondis silt loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 34yh
Elevation: 4,700 to 6,200 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 150 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Fondis and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fondis

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty and/or loamy

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 27 inches: clay
H3 - 27 to 60 inches: clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C
Ecological site: R049XY202CO - Loamy Foothill
Hydric soil rating: No

Minor Components

Weld

Percent of map unit: 10 percent
Hydric soil rating: No

Buick

Percent of map unit: 5 percent
Hydric soil rating: No

FdC—Fondis silt loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 34yj
Elevation: 4,700 to 6,200 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 150 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Fondis and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fondis

Setting

Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy and/or silty

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 24 inches: clay
H3 - 24 to 32 inches: silty clay loam
H4 - 32 to 46 inches: loam, silt loam
H4 - 32 to 46 inches: clay loam
H5 - 46 to 84 inches:

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C
Ecological site: R049XY202CO - Loamy Foothill
Hydric soil rating: No

Minor Components

Weld

Percent of map unit: 8 percent
Hydric soil rating: No

Buick

Percent of map unit: 7 percent
Hydric soil rating: No

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Table 6-3. Recommended percentage imperviousness values

Land Use or Surface Characteristics	Percentage Imperviousness (%)
Business:	
Downtown Areas	95
Suburban Areas	75
Residential lots (lot area only)**:**	
Single-family	
2.5 acres or larger	12
0.75 – 2.5 acres	20
0.25 – 0.75 acres	30
0.25 acres or less	45
Apartments	75
Industrial:	
Light areas	80
Heavy areas	90
Parks, cemeteries	10
Playgrounds	25
Schools	55
Railroad yard areas	50
Undeveloped Areas:	
Historic flow analysis	2
Greenbelts, agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

PROJECT: Streets at SouthGlenn
PROJECT NO. 19.048
DESIGN BY: TDW
DATE: 7/9/2021

Proposed/Existing	Land Use	%Imp
	Apartments	75
	Parks	10
	Drive and Walk	90
	Landscape	2
	Roof	90

Soil Types: FdB - Fondis silt loam, 1 to 3 percent slopes
FdC - Fondis silt loam, 3 to 5 percent slopes

Hydrologic Grouping: Type C

Runoff Coefficients: $C_{C/D}$(2year) = 0.83i^1.122
$C_{C/D}$(5year) = 0.82i+.035
$C_{C/D}$(10year) = 0.74i+.132
$C_{C/D}$(100year) = 0.41i+.484

Proposed Basins (proposed conditions) **Land Use (Acres)** **Weighted Runoff Coefficient**

Basin	Total Area	Apartments	Parks	Drive and Walk	Landscape	Roof	C2	C5	C10	C100	%Imp
A	4.06	4.06	0.00	0.00	0.00	0.00	0.60	0.65	0.69	0.79	75.0
C	7.11	6.53	0.57	0.00	0.00	0.00	0.55	0.61	0.65	0.77	69.8
G	0.52	0.52	0.00	0.00	0.00	0.00	0.60	0.65	0.69	0.79	75.0

TOTAL AREA (ACRES): **11.69**
TOTAL IMPERVIOUSNESS (%): **71.81**

Historic Basins (existing conditions) **Land Use (Acres)** **Weighted Runoff Coefficient**

Basin	Total Area	Apartments	Parks	Drive and Walk	Landscape	Roof	C2	C5	C10	C100	%Imp
A	4.06	0.00	0.00	2.32	0.31	1.43	0.68	0.72	0.75	0.83	83.3
C	7.11	0.00	0.00	4.76	0.66	1.69	0.66	0.71	0.74	0.82	81.9
G	0.52	0.00	0.00	0.07	0.27	0.19	0.34	0.40	0.46	0.67	44.7

TOTAL AREA (ACRES): **11.69**
TOTAL IMPERVIOUSNESS (%): **80.72**

Calculation of Peak Runoff using Rational Method

Designer: Tiffany D. Watson
Company: Point Consulting
Date: 7/15/2021
Project: Streets at SouthGlenn
Location: University Blvd and Arapahoe Road

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Computed } t_c = t_i + t_t$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

$t_{minimum}$ = 5 (urban)
$t_{minimum}$ = 10 (non-urban)

$$\text{Selected } t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.85	1.11	1.35	1.70	2.00	2.32	3.15

	a	b	c
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
C	7.11	C	69.8	0.56	0.60	0.65	0.71	0.74	0.77	0.81
G	0.52	C	75.0	0.60	0.65	0.68	0.74	0.76	0.79	0.82

Subcatchment Name	Overland (Initial) Flow Time: Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized (Travel) Flow Time: Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)
C	10.00			0.020	2.25	500.00			0.020	20	2.83	2.95
G	10.00			0.020	2.06	150.00			0.020	20	2.83	0.88

Subcatchment Name	Time of Concentration: Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	Rainfall Intensity, I (in/hr) 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
C	5.20	17.27	5.20	2.86	3.73	4.53	5.71	6.71	7.79	10.57
G	2.94	14.16	5.00	2.89	3.76	4.58	5.77	6.78	7.87	10.68

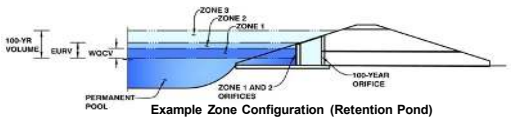
Subcatchment Name	Peak Flow, Q (cfs) 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
C	11.33	16.00	20.78	28.80	35.22	42.61	60.74
G	0.91	1.27	1.63	2.22	2.69	3.24	4.58

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Streets at SouthGlenn

Basin ID: G



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**No BMP**	
Watershed Area =	0.52	acres
Watershed Length =	160	ft
Watershed Length to Centroid =	80	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	75.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	N/A	hours
Location for 1-hr Rainfall Depths =	Centennial - Municipal Court	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Flood Control Only

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.013	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.038	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.85 in.) =	0.024	acre-feet	inches
5-yr Runoff Volume (P1 = 1.11 in.) =	0.033	acre-feet	inches
10-yr Runoff Volume (P1 = 1.35 in.) =	0.042	acre-feet	inches
25-yr Runoff Volume (P1 = 1.7 in.) =	0.057	acre-feet	inches
50-yr Runoff Volume (P1 = 2 in.) =	0.069	acre-feet	inches
100-yr Runoff Volume (P1 = 2.32 in.) =	0.083	acre-feet	inches
500-yr Runoff Volume (P1 = 3.15 in.) =	0.118	acre-feet	inches
Approximate 2-yr Detention Volume =	0.025	acre-feet	
Approximate 5-yr Detention Volume =	0.035	acre-feet	
Approximate 10-yr Detention Volume =	0.042	acre-feet	
Approximate 25-yr Detention Volume =	0.049	acre-feet	
Approximate 50-yr Detention Volume =	0.053	acre-feet	
Approximate 100-yr Detention Volume =	0.058	acre-feet	

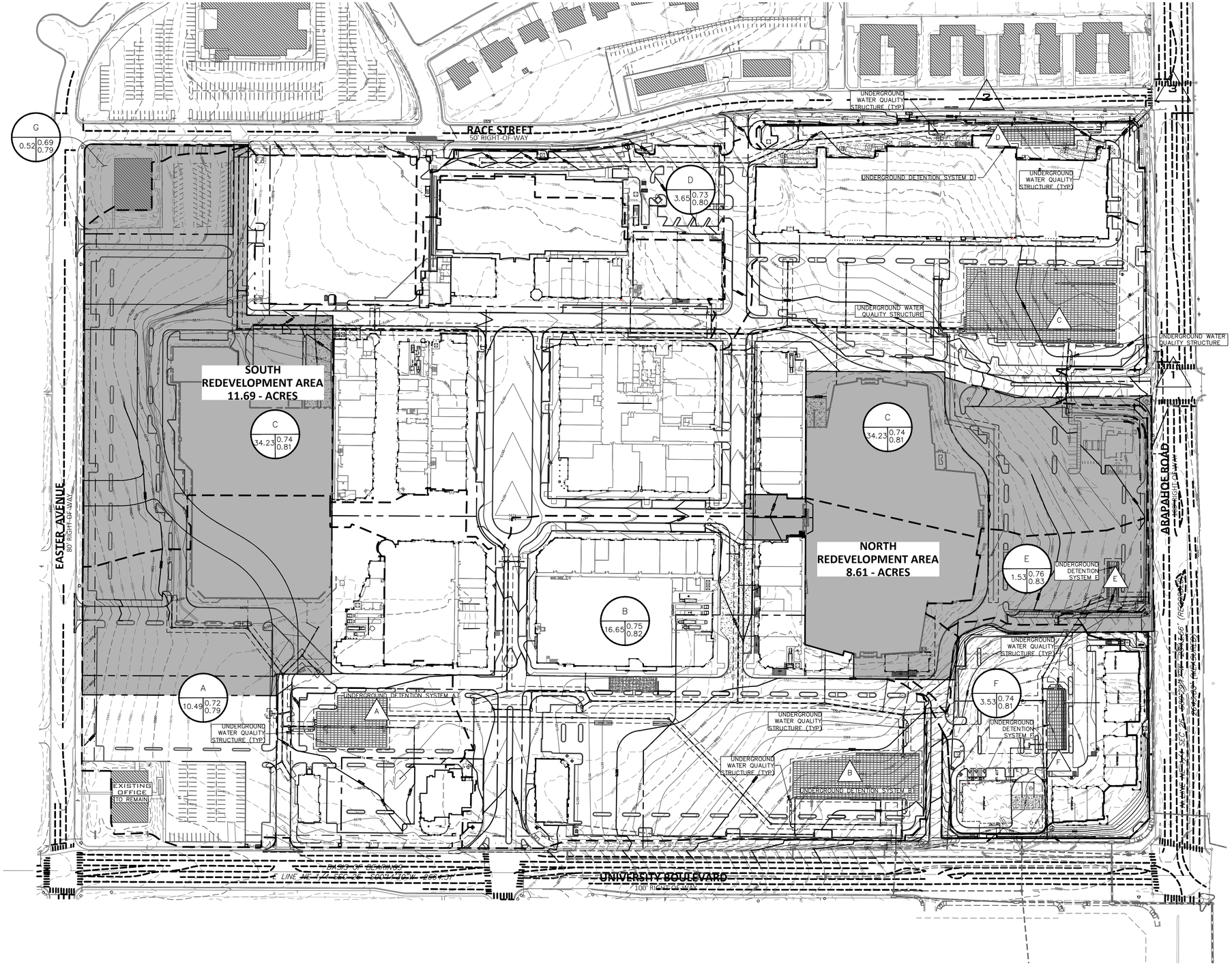
Define Zones and Basin Geometry

Select Zone 1 Storage Volume (Required) =		acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =		acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =		ft
Depth of Trickle Channel (H_{TC}) =		ft
Slope of Trickle Channel (S_{TC}) =		ft/ft
Slopes of Main Basin Sides (S_{main}) =		H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =		

Initial Surcharge Area (A_{ISV}) =		ft^2
Surcharge Volume Length (L_{ISV}) =		ft
Surcharge Volume Width (W_{ISV}) =		ft
Depth of Basin Floor (H_{FLOOR}) =		ft
Length of Basin Floor (L_{FLOOR}) =		ft
Width of Basin Floor (W_{FLOOR}) =		ft
Area of Basin Floor (A_{FLOOR}) =		ft^2
Volume of Basin Floor (V_{FLOOR}) =		ft^3
Depth of Main Basin (H_{MAIN}) =		ft
Length of Main Basin (L_{MAIN}) =		ft
Width of Main Basin (W_{MAIN}) =		ft
Area of Main Basin (A_{MAIN}) =		ft^2
Volume of Main Basin (V_{MAIN}) =		ft^3
Calculated Total Basin Volume (V_{total}) =		acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface									



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR
- 5560 EXISTING CONTOUR
- EXISTING LINE WITH MANHOLE AND INLET
- EXISTING UNDERGROUND DETENTION
- EXISTING WATER QUALITY UNIT
- EXISTING CURB AND GUTTER
- BASIN BOUNDARY
- A / B / C D — BASIN DESCRIPTION
  A - DESIGNATOR
  B - AREA
  C - 10 YEAR RUNOFF COEFFICIENT
  D - 100 YEAR RUNOFF COEFFICIENT
- E — DESIGN POINT

BENCHMARK

BENCHMARK 1 IS PART OF THE ARAPAHOE COUNTY VERTICAL CONTROL NETWORK NO. 52 (TWN: 2077-24-3; BENORGN: AC-86-12) AND IS AN ALUMINUM CAP SET AT THE BACK OF THE WALK AT THE SOUTHEAST CORNER OF PEAKVIEW AVE. AND UNIVERSITY BLVD., SET AT THE SOUTHWEST CORNER OF AN INLET BOX. INLET BOX IS AT THE EAST CURB RETURN ON PEAKVIEW, 47.8 FEET SOUTHWEST OF A FIRE HYDRANT. ELEVATION: 5511.41' (NGVD 29)

BENCHMARK 2 IS A PK NAIL 1.18' NORTH AND 1.18' EASE OF THE CENTERLINE INTERSECTION OF EAST EASTER AVENUE AND SOUTH RACE STREET. APPROXIMATELY 25' NORTH OF THE SOUTH CURB LINE FOR EAST EASTER AVENUE. ELEVATION: 5589.63' (NGVD 29).

BASIN SUMMARY

BASIN DESIGNATION	DESIGN PT DESIGNATION	AREA (ACRES)	C - 10YR	C - 100YR	% IMPERV.
A	A	10.49	0.70	0.78	84.2%
B	B	16.65	0.74	0.81	87.3%
C	C	33.04	0.74	0.81	87.5%
D	D	4.27	0.67	0.75	81.3%
E	E	1.30	0.76	0.83	89.3%
F	F	3.53	0.74	0.81	87.3%

DETENTION SUMMARY

BASIN	REQUIRED 10-YR DETENTION VOLUME (ACRE-FT)	10-YR RELEASE RATE (CFS)	EXISTING 10-YR DETENTION VOLUME (ACRE-FT)
A	0.82	3.2	0.85
B	1.35	5.0	1.42
C	2.68	9.9	2.72
D	0.32	1.3	0.38
E	0.11	0.4	0.12
F	0.28	1.06	N/A

N

100 50 0 100

SCALE 1" = 100'

POINT CONSULTING, LLC
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720-258-6836
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PLANNING
CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
LAND SURVEYING

COLORADO REGISTERED PROFESSIONAL ENGINEER TIFFANY D. WATSON 40360

PREPARED UNDER THE DIRECT SUPERVISION OF TIFFANY D. WATSON COLORADO LICENSE NO. 40360 FOR AND ON BEHALF OF POINT CONSULTING, LLC

DRAINAGE MAP

STREETS AT SOUTHGLENN

CENTENNIAL, COLORADO

DESCRIPTION	DATE
1ST SUBMITTAL	05.03.2021

DRAINAGE MAP | JOB NO. 19.048 | 1 OF 1

CHECKLIST FOR PHASE I DRAINAGE REPORT

Yes	No	N/A	Report Requirements
I. COVER SHEET			
x			A. Name of Project
x			B. Address
x			C. Owner
x			D. Developer
x			E. Engineer
x			F. Submittal date and revision dates as applicable
II. GENERAL LOCATION AND DESCRIPTION			
			A. Site Location
x			1. Site Vicinity Map
x			2. Township, Range, Section, and ¼ Section
x			3. Streets, Roadways, and Highways adjacent to the proposed development, or within the area served by the proposed drainage improvements
x			4. Names of surrounding or adjacent developments
			B. Description of Property
x			1. Area in Acres
x			2. Ground Cover, vegetation, site topography and slopes
x			3. NRCS Soils Classification Map and discussion
x			4. Major and minor drainageways
x			5. Floodplains delineated by UDFCD FHAD Studies or on FEMA FIRM Maps
x			6. Existing irrigation canals or ditches
x			7. Significant geologic features
x			8. Proposed land use & site activities
x			9. Groundwater investigations
III. DRAINAGE BASINS AND SUB-BASINS			
			A. Major Drainage Basins
x			1. On-site and Off-site major drainage basin characteristics and flow patterns and paths
x			2. Existing and proposed land uses within the basins
x			3. Reference all drainageway planning or floodplain delineation studies that affect the major drainageways, such as UDFCD FHAD Studies and Outfall System Planning Studies
x			4. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions
			B. Minor Drainage Basins
x			1. On-site and Off-site minor drainage basin characteristics and flow patterns and paths
x			2. Existing and proposed land uses within the basins
x			3. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions

CHECKLIST FOR PHASE I DRAINAGE REPORT

Yes	No	N/A	Report Requirements
IV. EXISTING STORMWATER CONVEYANCE OR STORAGE FACILITIES			
			A. Existing Stormwater Conveyance Facilities
x			1. Existing conveyance facilities that will be incorporated into the design
x			2. Existing conveyance facilities that will be incorporated into the design with modifications
x			3. Existing conveyance facilities that will be rebuilt or abandoned
			B. Existing Stormwater Storage Facilities
x			1. Existing storage facilities that will be incorporated into the design
x			2. Existing storage facilities that will be incorporated into the design with modifications
x			3. Existing storage facilities that will be rebuilt or abandoned
V. PROPOSED STORMWATER CONVEYANCE OR STORAGE FACILITIES			
			A. Proposed Stormwater Conveyance Facilities
x			1. Conceptual discussion of proposed drainage patterns and describe differences from historic patterns
x			2. Conveyance of off-site runoff
x			3. Discuss the content of any pertinent tables, charts, figures, graphs, drawings, etc. that are presented in the report
x			4. Discussion of anticipated conveyance problems and potential solutions
x			5. Discuss the anticipated major drainageway improvements
x			6. Discuss the maintenance and access aspects of the design
			B. Proposed Stormwater Storage Facilities
		x	1. Detention storage locations and conceptual outlet structure design
		x	2. Discuss anticipated storage problems and potential solutions
		x	3. Discuss the maintenance and access aspects of the design
VI. WATER QUALITY ENHANCEMENT BEST MANAGEMENT PRACTICES			
			A. Non-structural BMPs
x			1. Discussion of non-structural BMPs that will be part of the stormwater management plan
			B. Structural BMPs
x			1. Discuss structural BMPs that will be part of the stormwater management design
x			2. Discuss the operation, maintenance, and access aspects of the design
			C. Source Controls
x			1. Discuss site activities or operations that have the potential to impact water quality
x			2. Discuss source controls that may be implemented to address site activities and operations.

Yes	No	N/A	Report Requirements
VII. FLOODPLAIN			
			A. Major Drainageway – Undesignated Floodplain
x			1. Discuss floodplain issues and resources and strategy for floodplain delineation
			B. Major Drainageway – Designated Floodplain
x			1. Discuss the source of the floodplain information and level of detail (UDFCD Flood Hazard Area Delineation or FEMA Flood Insurance Rate Maps)
		x	2. Discuss the scope of floodplain modifications, if proposed, including justification of why they are necessary
		x	3. Discuss Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) requirements
		x	4. Discuss County floodplain development regulations and Floodplain Development Permit
VIII. POTENTIAL PERMITTING REQUIREMENTS			
x			Identify other potential local, State and Federal permitting requirements.
IX. REFERENCES			
x			Reference all criteria, master plans, reports, or other technical information used in development of the concepts discussed in the Drainage Report
X. APPENDICES			
x			Provide copies of all pertinent information from referenced materials

CHECKLIST FOR PHASE I DRAINAGE PLAN

Yes	No	N/A	Plan Requirements
I. OVERALL DRAINAGE PLAN			
x			A. 24” x 36” in size, 22” x 34” also acceptable when half size sets will be produced
x			B. Title block and legend
x			C. Show boundaries of entire development or project
x			D. Existing or proposed streets, roadways, or highways
x			E. Show limits of all major basins, including off-site basins where feasible
x			F. General drainage patterns and flow paths, including those entering and leaving the site
x			G. Topographic information
x			H. Identify existing stormwater management facilities, upstream, downstream, or within the site, which will provide a stormwater management function for the site
		x	I. Overlay or figure showing layout of Detailed Drainage Plan sheets
II. DETAILED DRAINAGE PLANS			
		x	A. 24” x 36” in size, 22” x 34” are acceptable plan sizes
		x	B. Title block and legend
		x	C. Scale 1”= 20’ to 1”= 100’, as required to show sufficient detail
		x	D. Existing topographic contours with a 5 foot maximum contour interval
		x	E. Existing stormwater conveyance or storage facilities
		x	F. Floodplain limits, based on available information or preliminary delineation information
		x	G. Major drainage basin boundaries
		x	H. Conceptual locations of stormwater conveyance or storage facilities, including detention ponds, water quality enhancement ponds, storm sewers, culverts, swales, etc., consistent with the proposed development plan
		x	I. Proposed flow directions
		x	J. Proposed contours, if they are available