STORM WATER DRAINAGE REPORT

SUMMIT AVENUE

BLOCK 2, LOWE'S ADDITION

LEE'S SUMMIT, MISSOURI

PREPARED FOR

GEORGE AND PEGGY NIE

PREPARED BY

HG CONSULT, INC.

June 18, 2019

6/18/19

TABLE OF CONTENTS

3. Project Overview

The proposed project is a 2 lot, 0.71 acre residential subdivision developed in central part of Lee's Summit, Jackson County, Missouri. This is a subdivision with development on all four sides. There have been reports by neighbors of previous flooding in this area due to poor drainage conveyance. The existing storm water flows to this site from the south in a northerly direction. There are two major existing drainage areas for this project. Drainage Area 1, located south of the site drains in a north direction to the south property line of Lot 2 through a residential subdivision zoned for multi-family and to an existing field inlet at the Gambrel Center. This area is 6.55 acres (total drainage area) in size. Drainage Area 2 drains in a north direction from the south side of Lot 2 north and through Lot 1 and Lot 2 by sheet flow. This area is 4.13 acres in size (See Drainage Map). Drainage Area 1 drains entirely to the existing field inlet. Drainage Area 2 drains entirely through Lot 1 and Lot 2 towards the existing field inlet.

4. Drainage Assessment of the Project Site

After development the proposed grading and drainage swales will divert all storm water into a swale on the west side of Lots 1 and 2 and then on to the existing Field Inlet along the east side of 2nd Street. All drainage remains the same as existing conditions and is directed to the Field Inlet by proposed swales which enters the public storm sewer system at this point.

Existing Condition Curve Number Calculations

Type	Area (ac)	CN
DA-1	6.55	77
DA-2	4.13	77

Curve Numbers are based on the SCS/NRSCS TR-55 Chart for various site conditions. Time of concentration was considered using TR-55; however, due to the small size of the drainage basin and the amount of impervious area on the site that will just be conveying sheet flow, a time of concentration of 5 minutes was assumed. This is the minimum time of concentration per APWA 5600.

The existing and proposed drainage areas are 6.55 acres and flows to the same single point of interest where the existing field inlet is located. Manning's trapezoidal formula for channel calculations was used to determine the volume of storm water that the swale could hold with a 5' flat bottom swale. The total flow generated by the Drainage Area 2 can be carried in the swale. The Drainage Area generates 33.72 cfs and the swale has a capacity of 39.71 cfs (See SUMMIT AVE Manning Formula Trapezoidal Channel Calculator FOR 5' SWALE). Therefore, no off-site drainage will be bypassing the proposed swale. The field inlet (with a 5' wide x 6" high opening)has a capacity of 61.78 cfs (See SUMMIT AVE Manning Formula Trapezoidal Channel Calculator FOR FIELD INLET) in a sump condition with 0.5 feet of head.

Discharge rates for Existing Condition

Drainage Area	Area (ac)	Q10 (cfs)	Q100 (cfs)
DA-1	6.55	33.72	57.43
DA-2	4.13	21.26	36.21

5. Temporary Erosion and Sediment Control

During construction, it will be necessary to control erosion and sediment from the site during storms with in the construction timeframe. To insure that sediment does not enter the existing storm system, perimeter containment is controlled by silt fence installation and inlet protection. To keep construction traffic from tracking mud onto the adjacent city street, a stabilized rock construction entrance will need to be installed. These erosion control devices, and their maintenance throughout the construction timeframe, are required by ordinance and the details for them are referenced by the City's Design and Construction Manual.

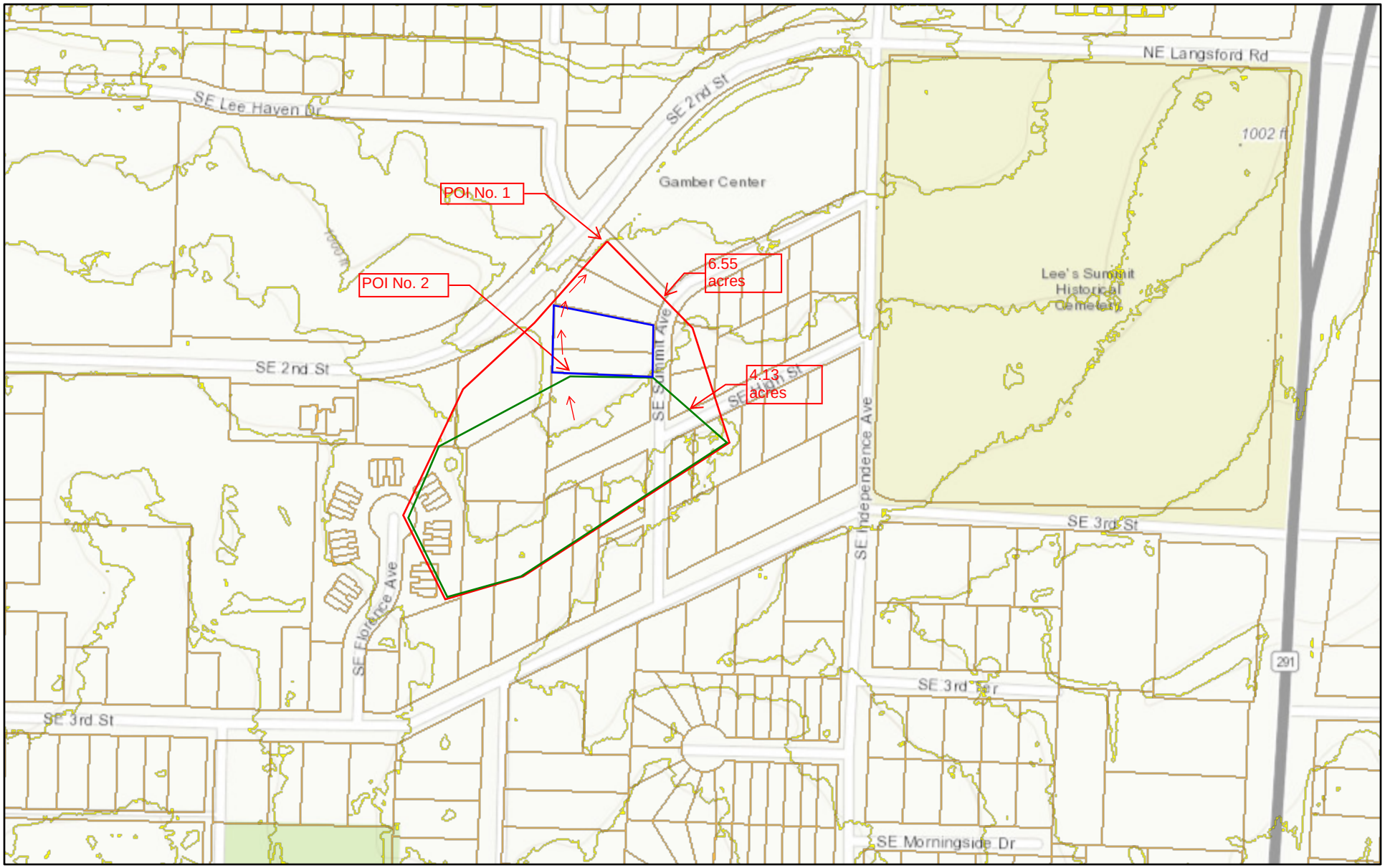
6. Conclusion

The proposed project is a proposed residential subdivision. The report has been prepared to evaluate the storm water discharge. Even though there is an increase in impervious coverage due to the 2 houses, it has been shown that with the majority of this changed coverage is directed by the swales to the field inlet and therefore very minimal impact or increase in sheet flow to downstream areas.

7. Design Calculations and Exhibits

See the attached for drainage area calculations, flows and swale sizing for the project.

Summit Ave. Project



6/10/2019, 5:14:35 PM

1:4,514

0 0.03 0.06 0.12 mi

0 0.05 0.1 0.19 km

Contours (10 ft) Tax Parcels Condo

Tax Parcel

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS,

Jackson County, MO GIS Dept

Free Online Manning Formula Trapezoidal Channel Calculator

>> Drop your fears at the door; love is spoken here. <<

Manning Formula Uniform Trapezoidal Channel Flow at Given Slope and Depth

Can you help me translate, program, or host these calculators? (../contact.php) [Hide this request]

SUMMIT AVENUE

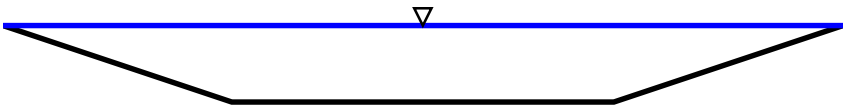
5' WIDE FLAT BOTTOM DITCH

Set units: m | mm | ft | in

Bottom width	5	ft
Side slope 1 (horiz./vert.)	3	
Side slope 2 (horiz./vert.)	3	
Manning roughness, n ? (http://www.engineeringtoolbox.com/mannings-roughness-d_799.html)	0.018	
Channel slope	0.02 rise/run	
Flow depth	1	ft
Bend Angle? (/riprap-bend-angle.png) (for riprap sizing)	0	
Stone specific gravity (2.65)		

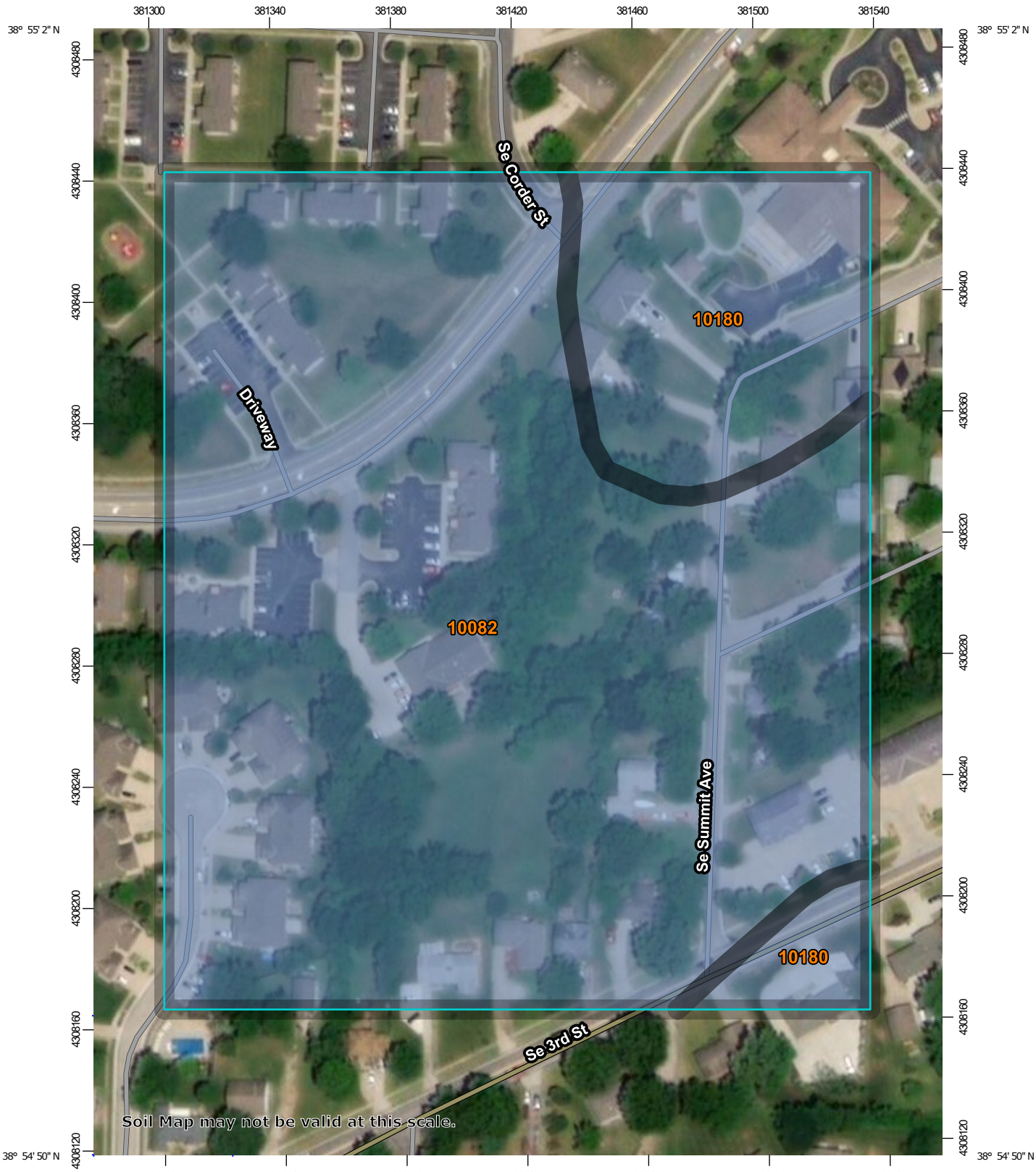
Results

Flow area	8.00	ft^2
Wetted perimeter	11.32	ft
Hydraulic radius	0.71	ft
Velocity, v	9.26	ft/sec
Flow, Q	74.08	cfs
Velocity head, h_v	1.33	ft
Top width, T	11.00	ft
Froude number, F	1.91	
Shear stress (tractive force), tau	0.88	psf
Implied design ? riprap size based on n	0.01	ft
Required bottom angular riprap size, D50, Maricopa County	0.19	ft
Required side slope 1 angular riprap size, D50, Maricopa County	0.19	ft
Required side slope 2 angular riprap size, D50, Maricopa County	0.19	ft
Required angular riprap size, D50, per Maynord, Ruff, and Abt (1989)	NaN	ft
Required angular riprap size, D50, per Searcy (1967)	0.58	ft



Please give us your valued words of suggestion or praise. Did this free calculator exceed your expectations in every way? (../contact.php) [Hide this request]

AASHTO Group Classification (Surface)—Jackson County, Missouri
(SUMMIT AVENUE DRAINAGE AREA)



Map Scale: 1:1,810 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A-1
- A-1-a
- A-1-b
- A-2
- A-2-4
- A-2-5
- A-2-6
- A-2-7
- A-3
- A-4
- A-5
- A-6
- A-7
- A-7-5
- A-7-6
- A-8
- Not rated or not available

Soil Rating Lines

- A-1
- A-1-a
- A-1-b
- A-2
- A-2-4
- A-2-5
- A-2-6
- A-2-7
- A-3
- A-4
- A-5
- A-6
- A-7
- A-7-5
- A-7-6
- A-8
- Not rated or not available

Soil Rating Points

- A-1
- A-1-a
- A-1-b
- A-2
- A-2-4
- A-2-5
- A-2-6
- A-2-7
- A-3
- A-4
- A-5
- A-6
- A-7
- A-7-5
- A-7-6
- A-8
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 19, Sep 13, 2018

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

Date(s) aerial images were photographed: Jun 11, 2017—Sep 22, 2017

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

AASHTO Group Classification (Surface)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	A-6	13.2	82.6%
10180	Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes	A-6	2.8	17.4%
Totals for Area of Interest			**16.0**	**100.0%**

Description

AASHTO group classification is a system that classifies soils specifically for geotechnical engineering purposes that are related to highway and airfield construction. It is based on particle-size distribution and Atterberg limits, such as liquid limit and plasticity index. This classification system is covered in AASHTO Standard No. M 145-82. The classification is based on that portion of the soil that is smaller than 3 inches in diameter.

The AASHTO classification system has two general classifications: (i) granular materials having 35 percent or less, by weight, particles smaller than 0.074 mm in diameter and (ii) silt-clay materials having more than 35 percent, by weight, particles smaller than 0.074 mm in diameter. These two divisions are further subdivided into seven main group classifications, plus eight subgroups, for a total of fifteen for mineral soils. Another class for organic soils is used.

For each soil horizon in the database one or more AASHTO Group Classifications may be listed. One is marked as the representative or most commonly occurring. The representative classification is shown here for the surface layer of the soil.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Events for Subcatchment 1S: OVERALL DRAINAGE

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	3.00	12.57	0.530	0.97
2-Year	3.50	16.88	0.712	1.31
5-Year	4.60	27.00	1.152	2.11
10-Year	5.30	33.72	1.451	2.66
25-Year	6.20	42.53	1.851	3.39
50-Year	6.90	49.46	2.170	3.98
100-Year	**7.70**	**57.43**	**2.543**	**4.66**

Events for Subcatchment 2S: (new Subcat)

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	3.00	7.92	0.334	0.97
2-Year	3.50	10.64	0.449	1.31
5-Year	4.60	17.03	0.726	2.11
10-Year	5.30	21.26	0.915	2.66
25-Year	6.20	26.81	1.167	3.39
50-Year	6.90	31.18	1.368	3.98
100-Year	**7.70**	**36.21**	**1.604**	**4.66**

INDEX
CIVIL SUBMITTAL

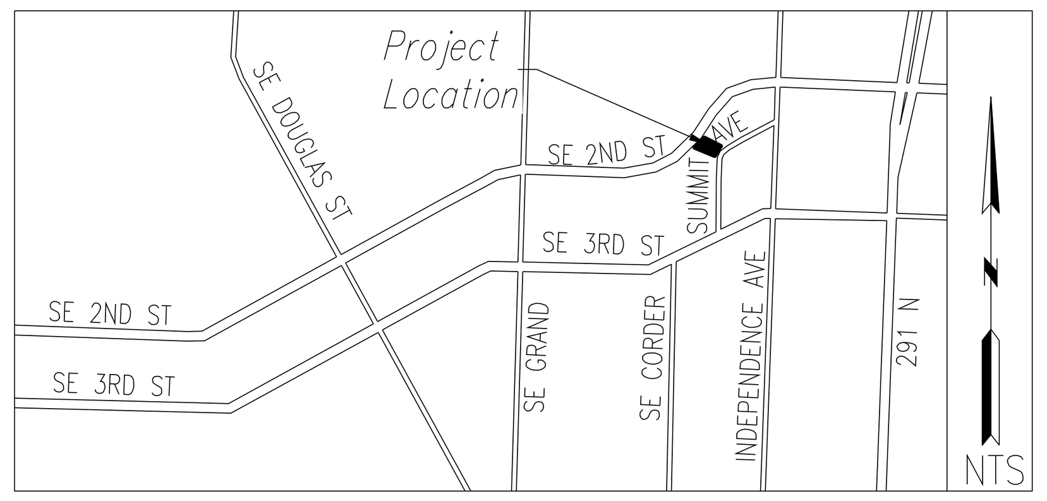
SUMMIT AVENUE ADDITION, LOTS 1 AND 2

REPLAT OF LOWES ADDITION, LOTS 18-22, BLOCK 2

LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

PRELIMINARY DEVELOPMENT PLAN

VICINITY MAP



LEGAL DESCRIPTION OF RECORD:

All of Lots 18, 19, 20, 21 and 22, Block 2, Lowe's Addition, a subdivision in Lee's Summit, Jackson County, Missouri, according to the recorded plat thereof.

SURVEYORS DESCRIPTION:

All of Lots 18, 19, 20, 21 and 22, Block 2, Lowe's Addition, a subdivision in Lee's Summit, Jackson County, Missouri, according to the recorded plat thereof, more particularly described as;
Beginning at the Southwest corner of said Lot 22, said point also being on the East line of Lot 3, Westbrooke Business Center, a subdivision of record in said city; thence South 87 degrees 58 minutes 32 seconds East, along the South line of said Lot 22, a distance of 210.51 feet, to the Southeast corner of said Lot 22; thence North 02 degrees 01 minutes 28 seconds East, along the East line of said Lots 22, 21, 20 & 19, a distance of 89.89 feet; thence continuing along the East line of said Lots 19 & 18, along a curve to the right (said curve having a radius of 166.90 feet) and arc distance of 34.55 feet, to the Northeast corner of said Lot 18, said point also being the Southeast corner of Lot 17A of the Replat of Lowe's Addition, Lots 15, 16 & 17, a subdivision of record in said city; thence North 75 degrees 59 minutes 44 seconds West, along the North line of said Lot 18, said line also being the South line of said Lot 17A, a distance of 218.39 feet, to the Northwest corner of said Lot 18, said point also being the Southwest corner of said Lot 17A, said point also being on the East line of said Lot 3, Westbrooke Business Center; thence South 02 degrees 10 minutes 22 seconds West, along the West line of said Lots 18, 19, 20, 21 & 22, said line also being the East line of said Lot 3, a distance of 169.52 feet, to the Point of Beginning.

SITE INFORMATION:

PROPERTY DESCRIPTION: LOTS 18-21, BLOCK 2 LOWES ADDITION
(PROPOSED SUMMIT AVENUE ADDITION, LOTS 1 AND 2)
SITE ADDRESS: 114 AND 200 SE SUMMIT AVENUE
ZONED: RP2
PROPERTY AREA: 31,007.9 SF (0.71 ACRES)
NUMBER OF LOTS: 2
BUILDING AREA/UNIT: 1242 SF (GFA)
DENSITY: 0.355/AC
ANTICIPATED USE: DUPLEX (SHOWN) OR SINGLE FAMILY
ANTICIPATED CONSTRUCTION: FALL 2019 (PENDING SALE OF LOTS)

NOTES:

BUILDING AREA AND DENSITY INDICATED IS BASED ON THE FOOTPRINT SHOWN. THIS MAY VARY BASED ON THE ACTUAL FOOTPRINT AND BUILDING PLAN SUBMITTED FOR BUILDING PERMIT BY BUILDER.

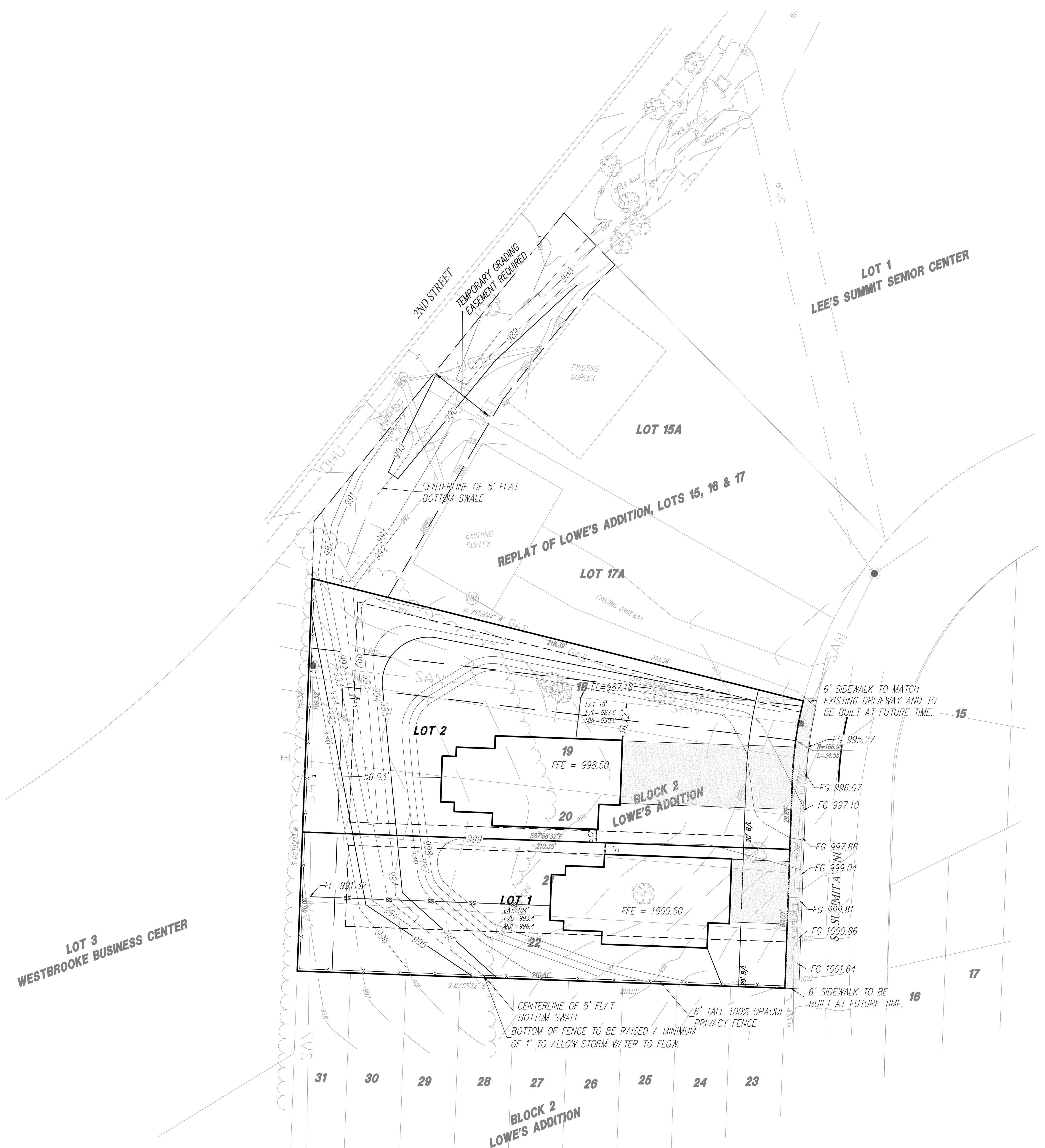
CONTRACTORS TO LIMIT THE DISTURBED AREA OF THE LOTS FOR BUILDING FOOTPRINT AND GRADING AROUND IT AS SHOWN. THE WESTERN PORTION OF THE LOTS, TO THE EXTENT POSSIBLE, TO BE LEFT UNDISTURBED.

SLAB/FINISH FLOOR ELEVATIONS ARE SURROUNDING GRADES SHALL BE ADHERED TO WHEN PLOT PLANS FOR BUILDING PERMIT ARE PREPARED BY BUILDER.

A FIVE (5) FOOT WIDE SIDEWALK IS TO BE BUILT FROM THE EDGE OF THE EXISTING PAVEMENT AS SHOWN WITH EACH BUILDING PERMIT AT A FUTURE TIME.

EACH HOUSE ROOF DRAINAGE TO BE PIPED TO DISCHARGE TO THE WEST DRAINAGE SWALE.

SINGLE FAMILY HOUSE FOOTPRINT SHOWN IS FOR POTENTIAL LAYOUT ONLY. ACTUAL FOOTPRINT TO BE PROVIDED AT PERMIT STAGE PER PLOTPLAN PREPARED.



811 Know what's below. Call before you dig.

PLANS PREPARED FOR
GEORGE AND PEGGY NIE
30 NE SHOREVIEW DRIVE
LEE'S SUMMIT, MO 64064
CONTACT - PEGGY NIE
816-547-6408

PLANS PREPARED BY
HG CONSULT
11010 HASKELL ST. #210,
KANSAS CITY, KS 66109
CONTACT: KEVIN STERRETT
816-703-7098

NO.	BY	CK/APP	REVISION	DATE

R. KEVIN STERRETT MO E-26440
6/13/19

HG Consult Inc engineers planners
CORPORATE LICENSE No. E2010005873

PRELIMINARY DEVELOPMENT PLAN

SUMMIT AVENUE ADDITION, LOTS 1 AND 2 (REPLAT OF LOWE'S ADDITION LOTS 18, 19, 20, 21 & 22, BLOCK 2)
LEE'S SUMMIT - JACKSON COUNTY - MISSOURI

X-REF NO. XXXXXX
DRAWING NO. 18038
DATE MARCH 14, 2019
JOB NO. 18038

1 SHEET OF 2