



**DRAINAGE REPORT
FOR**

**DUSTIN GRAHAM
223 McCULLOUGH, LLC**

PROJECT:

**DUPLEX AT
223 McCULLOUGH STREET
NORMAN, OK**

Sept. 16, 2019
Revised Oct. 2, 2019



Oct. 2, 2019



Review and Acceptance of plans by the City Engineer does not release the Consulting Engineer from his professional responsibility to meet the planning and design objectives of the project as required by good engineering practice and the City of Norman Standards and Specifications



10/3/19

Date

[Signature]
Reviewed by City Engineer

HISTORIC DATA

The total area used for historic conditions is 0.17 acres. The existing flow route is north east to the north east corner of the site. Reference Historic Flow Rate Calculations sheet and Exhibit C3 for



CIVIL ENGINEERING □ LAND PLANNING



OK CERTIFICATE OF AUTHORIZATION 7901
113 SPRUCE AVE. □ YUKON, OK 73099

405.210.3169 □ terry@tlp-associates.com



details. The property description is: Lots 23, 24 and the West 4' of Lot 25, Block 2, of the STATE UNIVERSITY ADDITION to the City of Norman, Cleveland County, Oklahoma. Reference Exhibit C1. The calculated Historic Q100 is 0.79 c.f.s.

DEVELOPED DATA

The developed site has been divided into two (2) Basins. Each basin releases water at different locations.

BASIN A

Basin "A" is the north 0.132 acres will drain to the north and east. The existing asphalt alley will convey all storm water to the east. The calculated Q100 for the basin is 1.05 c.f.s. The building roof drains will be directed to drain over a grassed area for an average length of 35 then onto the proposed concrete parking area. The parking area has a maximum slope of 1.00%.

BASIN B

Basin "B" is the south 0.042 acres and drains south to McCoullough Street. The calculated Q100 for the basin is 0.36 c.f.s.

SUMMARY

The historic impervious area for this project is 1315 s.f., and the proposed impervious area is 4835 s.f. for an increase of 4835 s.f.

The difference from the Historic Q100 and Developed Q100 is an additional 0.62 c.f.s. This added stormwater flow will be draining east within the existing alley to a ditch on the west side of the railroad, then it drains along the railroad to the south to an existing 15" culvert that drains under Boyd Street. This additional 0.62 c.f.s. will create no impact to properties within this area.

Respectfully submitted:

Darin Teeman, P.E.



Oct. 2, 2019



RUNOFF CALCULATION BY RATIONAL METHOD

FILE 223 McCULLOUGH
PROJECT NO 2019-116
BY TLP
DATE 9-15-19
SHEET NO 1 OF 1
SUBJECT HISTORIC FLOW RATES

Project Location: 223 McCULLOUGH, NORMAN, OK
Drainage Area: HISTORIC CONDITIONS
Structure Number: N/A

Area: 0.17 Acres (0.00 Sq. Mi.) Avg. Slope: 0.0044 % (ft/mi.)

WEIGHTED RUNOFF COEFFICIENT:

Land Use:	Area (Ac)	% Total Area	C	Lo	K Factor
Landscaped	0.00	0.00%	0.50	0.0	0.775
Undeveloped	0.00	0.00%	0.30	0.0	0.775
Cultivated	0.00	0.00%	0.50	0.0	0.775
Commercial	0.00	0.00%	0.90	0.0	0.445
Residential	0.17	100.00%	0.50	140.0	0.511
Paved	0.00	0.00%	0.95	0.0	0.372

Weighted C: 0.50

Weighted K Factor: 0.511

TIME OF CONCENTRATION:

Time Overland:

Length of Overland Flow, L: 140.00
Change in Elevation: 0.62 ft
Overland Average Slope, S: 0.0044 ft/ft
Overland K Factor (K): 0.5110
Overland Time of Concentration, $T_c = K(L^{0.37}) / S^{0.20}$

Time in System:

Total Time Overland: 9.41 min. Total Time in System: min.
Total TC: 9.41 min.

RAINFALL INTENSITY:

$$I = A / (B + T_c)^E$$

Where: $I_{10c} = 9.31$ Intensity of rainfall (inches / hour)
A, B, and E = Intensity, Frequency and Duration (I-F-D) Equation
Parameters; shown below in Table 1-1.
 $T_c =$ Time of Concentration unique to the sub-basin

Table 1-1

Frequency (Year)	Parameters					
	2 year	5 year	10 year	25 year	50 year	100 year
A	56.43	72	82	95	108	120
B	11.5	15	15	15	15	15
E	0.81	0.8	0.8	0.8	0.8	0.8

HISTORIC PEAK DISCHARGE:

	C	I (in/hr)	A (Ac)	
$Q_{100} =$	0.50	9.31	0.17	0.79 cfs
$Q_{50} =$	0.50	8.38	0.17	0.71 cfs
$Q_{25} =$	0.50	7.37	0.17	0.63 cfs
$Q_{10} =$	0.50	6.36	0.17	0.54 cfs
$Q_5 =$	0.50	5.59	0.17	0.47 cfs
$Q_2 =$	0.50	4.81	0.17	0.41 cfs

RUNOFF CALCULATION BY RATIONAL METHOD

FILE 223 McCULLOUGH
PROJECT NO 2019-116
BY TLP
DATE 09-15-19
SHEET NO 1 OF 2
SUBJECT DEVELOPED

Project Location: 223 McCULLOUGH, NORMAN, OK
Drainage Area: BASIN A
Structure Number: N/A

Area: 0.132 Acres (0.00 Sq. Mi.) Avg. Slope: 0.0100 % (ft/mi.)

WEIGHTED RUNOFF COEFFICIENT:

Land Use:	Area (Ac)	% Total Area	C	Lo	K Factor
Landscaped	0.044	33.33%	0.50	49.0	0.775
Undeveloped	0.000	0.00%	0.30	0.0	0.775
Cultivated	0.000	0.00%	0.50	0.0	0.775
Commercial	0.000	0.00%	0.90	0.0	0.445
Residential	0.000	0.00%	0.50	0.0	0.511
Paved	0.088	66.67%	0.95	65.0	0.372

Weighted C: 0.80

Weighted K Factor: 0.545

TIME OF CONCENTRATION:

Time Overland:

Length of Overland Flow, L: 114.00
Change in Elevation: 0.00 ft
Overland Average Slope, S: 0.0164 ft/ft
Overland K Factor (K): 0.5452
Overland Time of Concentration, $T_c = K(L^{0.3}) / S^{0.42}$

Time in System:

Total Time Overland: 7.16 min. Total Time in System: min.
Total TC: 7.16 min.

RAINFALL INTENSITY:

$$I = A / (B + T_c)^E$$

Where: $I_{100} = 10.06$ Intensity of rainfall (inches / hour)
A, B, and E = Intensity, Frequency and Duration (I-F-D) Equation
Parameters; shown below in Table 1-1.
 $T_c =$ Time of Concentration unique to the sub-basin

Table 1-1

Frequency (Year)	Parameters					
	2 year	5 year	10 year	25 year	50 year	100 year
A	56.43	72	82	95	108	120
B	11.5	15	15	15	15	15
E	0.81	0.8	0.8	0.8	0.8	0.8

HISTORIC PEAK DISCHARGE:

	C	I (in/hr)	A (Ac)	
$Q_{100} =$	0.80	10.06	0.13	1.06 cfs
$Q_{50} =$	0.80	9.06	0.13	0.96 cfs
$Q_{25} =$	0.80	7.97	0.13	0.84 cfs
$Q_{10} =$	0.80	6.88	0.13	0.73 cfs
$Q_5 =$	0.80	6.04	0.13	0.64 cfs
$Q_2 =$	0.80	5.27	0.13	0.56 cfs

RUNOFF CALCULATION BY RATIONAL METHOD

FILE 223 McCULLOUGH
PROJECT NO 2019-116
BY TLP
DATE 09-15-19
SHEET NO 2 OF 2
SUBJECT DEVELOPED

Project Location: 223 McCULLOUGH, NORMAN, OK

Drainage Area: BASIN B

Structure Number: N/A

Area: 0.042 Acres (0.00 Sq. Mi.) Avg. Slope: 0.0100 % (ft/mi.)

WEIGHTED RUNOFF COEFFICIENT:

Land Use:	Area (Ac)	% Total Area	C	Lo	K Factor
Landscaped	0.016	37.86%	0.50	10.0	0.775
Undeveloped	0.000	0.00%	0.30	0.0	0.775
Cultivated	0.000	0.00%	0.50	0.0	0.775
Commercial	0.000	0.00%	0.90	0.0	0.445
Residential	0.000	0.00%	0.50	0.0	0.511
Paved	0.026	61.90%	0.95	43.0	0.372

Weighted C: 0.78

Weighted K Factor: 0.448

TIME OF CONCENTRATION:

Time Overland:

Length of Overland Flow, L: 53.00
Change in Elevation: 0.00 ft
Overland Average Slope, S: 0.0150 ft/ft
Overland K Factor (K): 0.4480
Overland Time of Concentration, $T_c = K(L^{0.37}) / S^{0.20}$

Time in System:

Total Time Overland: 5.00 min. Total Time in System: min.
Total TC: 5.00 min.

RAINFALL INTENSITY:

$$I = A / (B + T_c)^E$$

$I_{50} = 9.83$ $I_{25} = 8.65$
 $I_{10} = 7.46$ $I_5 = 6.55$
 $I_2 = 5.83$

Where: $I_{10c} = 10.92$ Intensity of rainfall (inches / hour)
A, B, and E = Intensity, Frequency and Duration (I-F-D) Equation
Parameters; shown below in Table 1-1.
 T_c = Time of Concentration unique to the sub-basin

Table 1-1

Frequency (Year)	Parameters					
	2 year	5 year	10 year	25 year	50 year	100 year
A	56.43	72	82	95	108	120
B	11.5	15	15	15	15	15
E	0.81	0.8	0.8	0.8	0.8	0.8

HISTORIC PEAK DISCHARGE:

	C	I (in/hr)	A (Ac)	
$Q_{100} =$	0.78	10.92	0.04	0.36 cfs
$Q_{50} =$	0.78	9.83	0.04	0.32 cfs
$Q_{25} =$	0.78	8.65	0.04	0.28 cfs
$Q_{10} =$	0.78	7.46	0.04	0.24 cfs
$Q_5 =$	0.78	6.55	0.04	0.21 cfs
$Q_2 =$	0.78	5.83	0.04	0.19 cfs

Legal Description

Lots 23, 24, & the W 4' of Lot 25 in Block 2,
of THE STATE UNIVERSITY ADDITION to
Norman, Cleveland County, OK



Lot Area: 7,560 SF (.17 AC MOL)

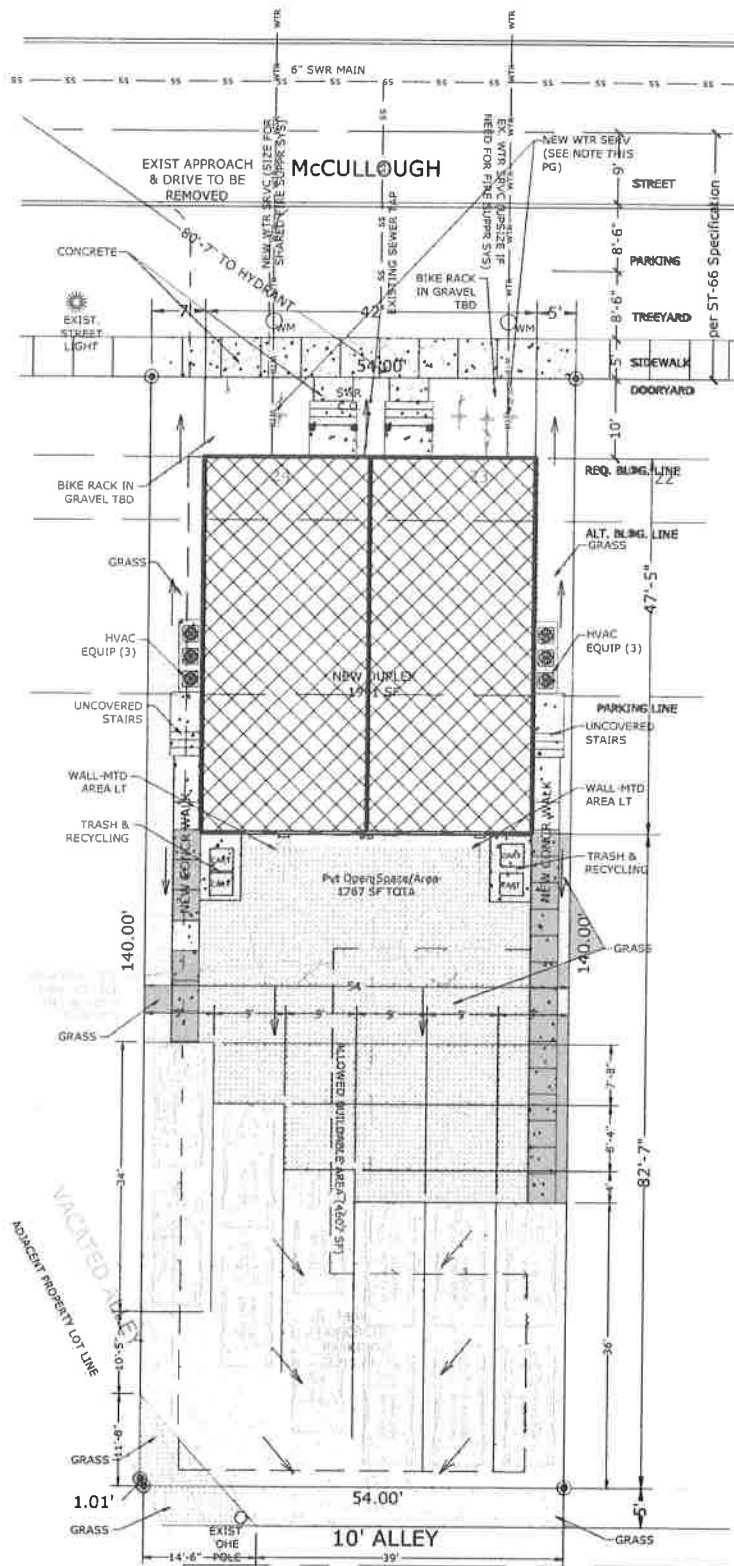
Allowed Buildable Area: 4,607 SF
Req Pvt Open Space (25%): 1,152 SF

Provided:
Pvt Open Space/Area (Ground): 1,767 SF
Pvt Open Space/Area (Balconies): 0 SF (0%)
Pvt Open Space/Area (Total): 1,767 SF

Allowed Pervious Area (35%): 2,646 SF

Imperv Area (House): 1,991 SF
Imperv Area (Walks/Pads): 646 SF
Imperv Area (Parking): 2,221 SF
Tot Imperv Area: 4,858 SF (64.3%)

Provided Pervious Area: 2,702 SF (35.7%)



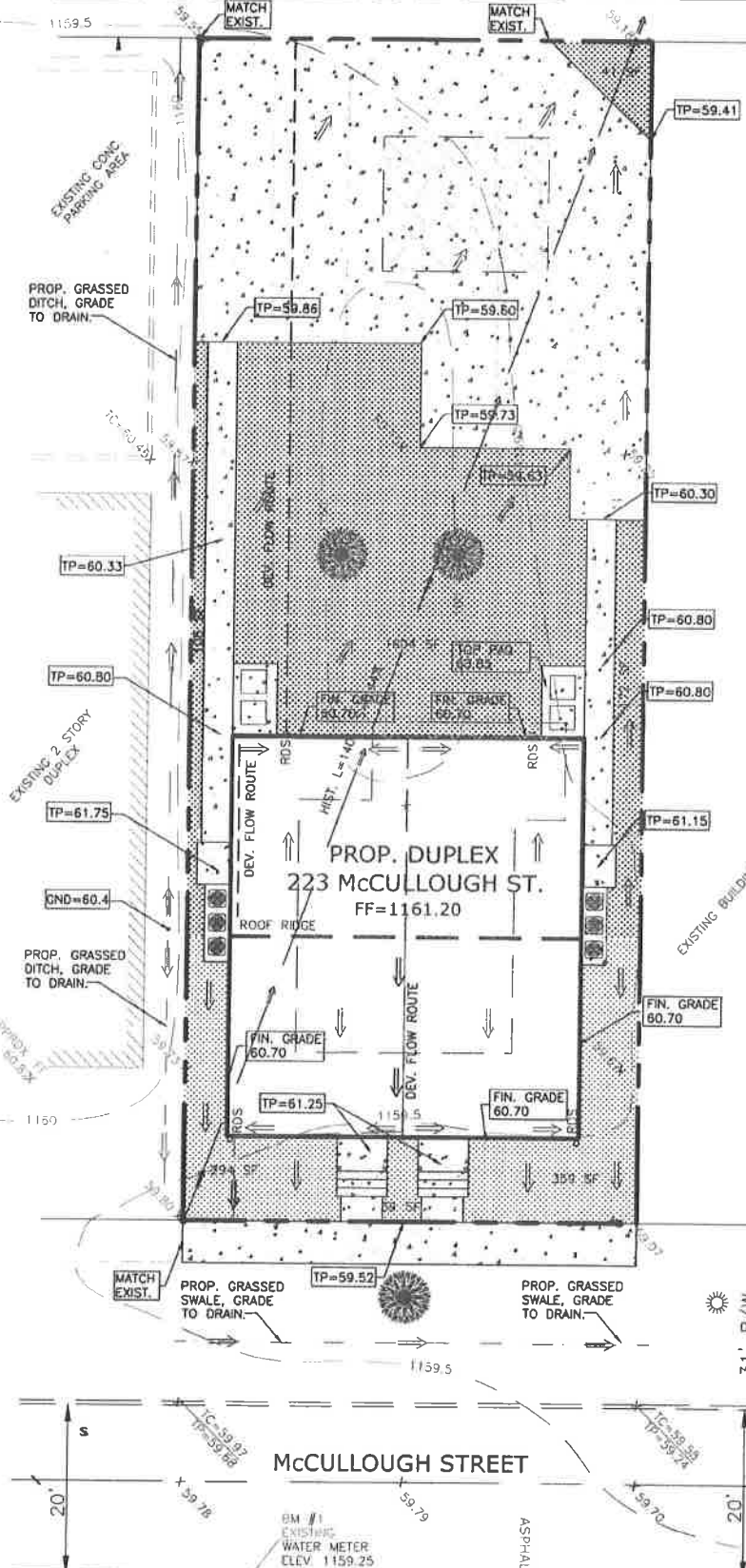
*** Metered water services to be sized for shared domestic / fire suppression system. Sizing per calculations by fire suppression contractor & subject to city permit approval. Each line to have Rapid Shutoff Valve (RSV-1 or sim.) ***

Revision		
No.	Revision/Issue	Date
Prepared by: Dan Baumann 8536 NW 118th St Oklahoma City, OK 73162 (405) 361-3063 MBL (800) 594-0967 FAX		
Project Name: New Duplex 223 McCulloch Norman, OK		
Site Plan	C1	
9/6/2019		
1"=15'		
ARCH B (11" x 17")		

ALLEY

LEGEND

- EXISTING SPOT ELEVATION
- PROP. SOLID SLAB SOD
- PROP. CONCRETE PAVEMENT
- PROP. SPOT ELEVATION
- PROP. FLOW ARROW
- PROP. TREE
- PROP. ROOF DOWN SPOUT



0' 20'
SCALE: 1" = 20'



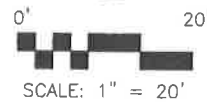
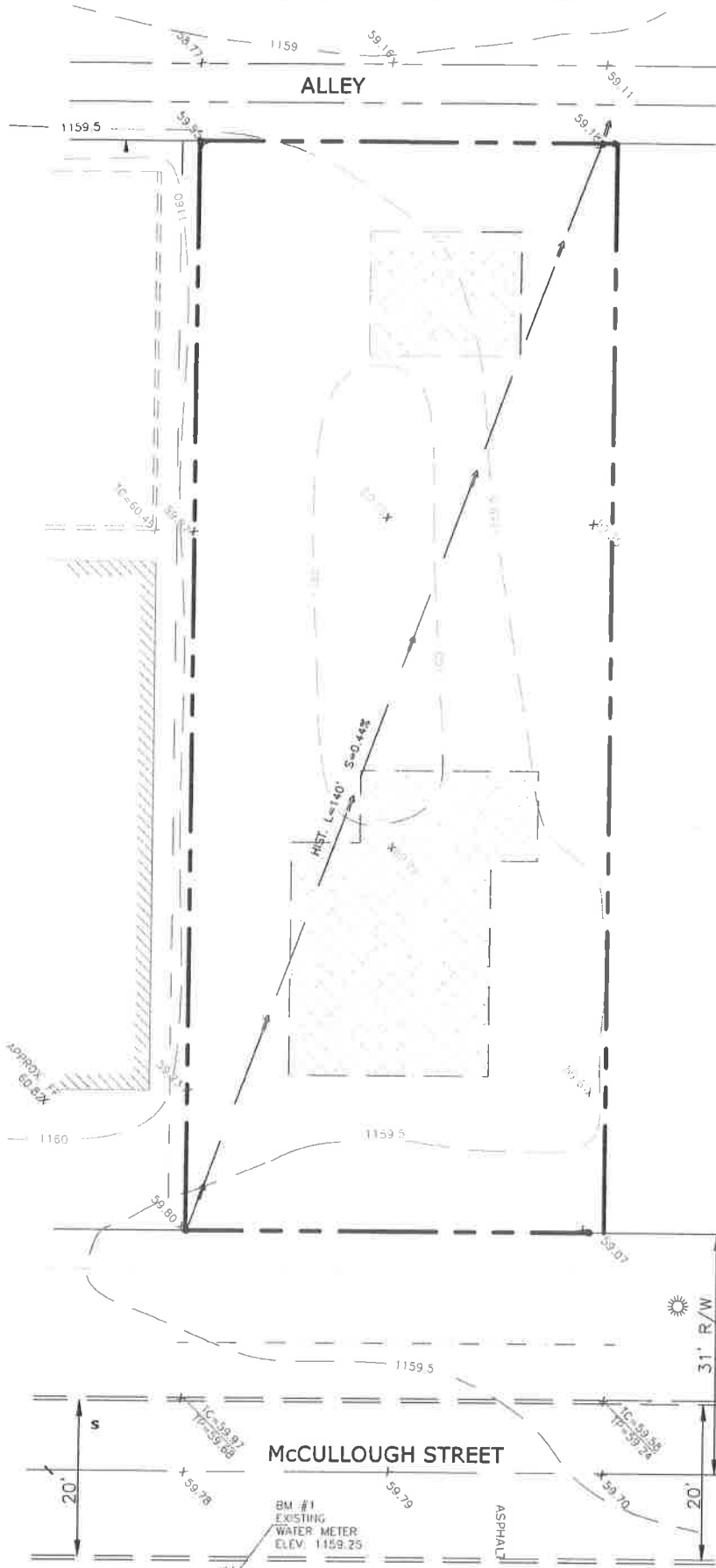
9-16-19

TLP ASSOCIATES, INC. CIVIL ENGINEERING LAND PLANNING 113 Spruce Ave. Yukon, OK 73099 C: 405.210.3169 EM: terry@tlp-associates.com CA NO. 7901 CA Expires 6-30-2021		
REVISION		
NO.	DESCRIPTION	DATE
PROJECT NO.: 2019-116 DATE: 9-3-19 BY/APPROVED: TLP/TEEMAN SCALE: 1" = 20'		
NEW DUPLEX 223 McCULLOUGH ST. NORMAN, OK 73069		
SITE GRADING PLAN		
EXHIBIT C2		

ALLEY

LEGEND

- EXISTING SPOT ELEVATION
- PROP. SOLID SLAB SOD
- PROP. CONCRETE PAVEMENT
- PROP. SPOT ELEVATION
- PROP. FLOW ARROW
- PROP. TREE
- PROP. ROOF DOWN SPOUT

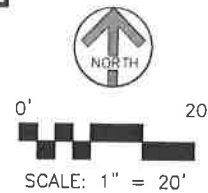
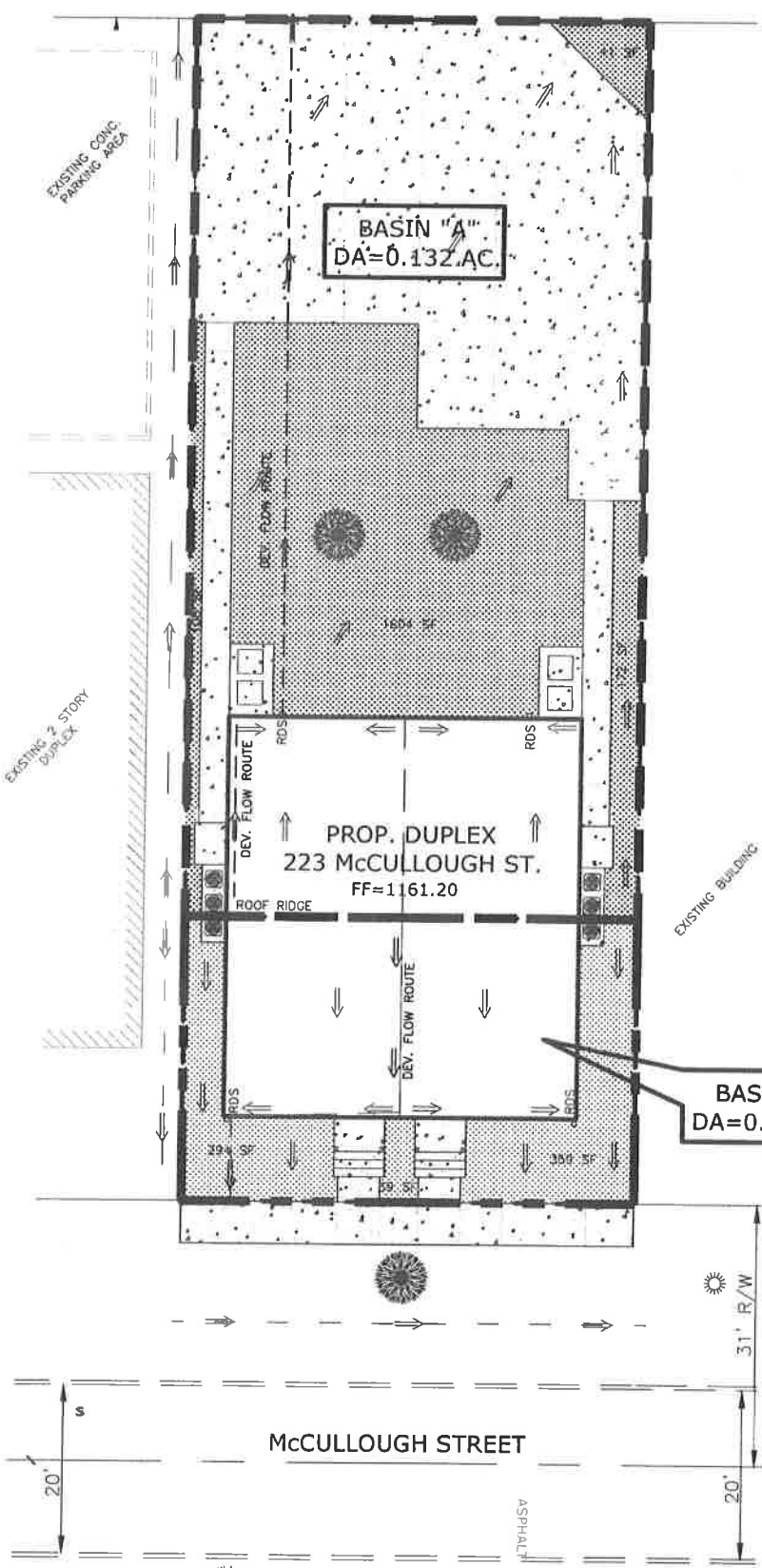


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REVISION		
NO.	DESCRIPTION	DATE
1		
2		
3		
4		
5		
PROJECT NO.: 2019-116 DATE: 9-3-19 BY/APPROVED: TLP/TEEMAN SCALE: 1" = 20'		
NEW DUPLEX 223 McCULLOUGH ST. NORMAN, OK 73069		
HISTORIC CONDITIONS		
EXHIBIT C3		

ALLEY

LEGEND

- EXISTING SPOT ELEVATION
- PROP. SOLID SLAB SOD
- PROP. CONCRETE PAVEMENT
- PROP. SPOT ELEVATION
- PROP. FLOW ARROW
- PROP. TREE
- PROP. ROOF DOWN SPOUT



TLP ASSOCIATES, INC. CIVIL ENGINEERING LAND PLANNING 113 Spruce Ave. Yukon, OK 73099 C: 405.210.3189 EM: larry@tlp-associates.com CA NO. 7901 CA Expires 6-30-2021								
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PROJECT NO.: 2019-116 DATE: 9-3-19 BY/APPROVED: TLP/TEEMAN SCALE: 1" = 20'								
NEW DUPLEX 223 McCULLOUGH ST. NORMAN, OK 73069								
DEVELOPED CONDITIONS								
EXHIBIT C4								

McCULLOUGH STREET