LEE'S SUMMIT
MISSOURI

DESIGN AND CONSTRUCTION MANUAL DESIGN MODIFICATION REQUEST

PROJECT NAME: The Retreat at Hook Farms 2nd Plat

PREMISE ADDRESS: 2020 SW Hook Road, Lee's Summit, MO 64082

PERMIT NUMBER: _____

OWNER'S NAME: Hunt Midwest Real Estate Development, Inc.

TO: The City Engineer

In accordance with the Lee's Summit Design and Construction Manual (DCM) Section 1002.A, I wish to apply for a modification to one or more specification (s). The following articulates my request for your review and action. (NOTE: Cite specific code sections and engineering justification and drawings.)
5605.3 Stream Preservation and Buffer Zones- we are requesting a waiver/modification to this section to encroach on the prescribed stream buffer widths in specific areas as identified on the attached exhibit. An encroachment is requested to remove all stream buffer requirements/easements from limits of single-family lots. The area that is being requested to be modified out of the required stream buffer limits has been previously used for agricultural purposes and has been disturbed by row crop operations.

SUBMITTED BY:
NAME: Julie Sellers ( ) OWNER (x) OWNER'S AGENT
ADDRESS: 1301 Burlington, Suite 100 Tel.# (816) 361.1177
CITY, STATE, ZIP: North Kansas City, MO 64116
Email: jsellers@olsson.com SIGNATURE: Julie Sellers

FORWARDING MANAGER: _____RECOMMENDATION ( ) APPROVAL ( ) DENIAL

SIGNATURE:_____ DATE:_____

GEORGE BINGER III, P.E. – CITY ENGINEER: ( ) APPROVED ( ) DENIED

SIGNATURE:_____ DATE:_____

COMMENTS_____

_____

_____

A COPY MUST BE ATTACHED TO THE APPROVED PLANS

City of Lee's Summit, MO
Development Services
220 SE Green Street
Lee's Summit, MO 64063

Re: The Retreat at Hook Farms Second Plat-Stream Buffer Variance Request

To Whom it Concerns:

This letter is to support the stream buffer waiver request on The Retreat at Hook Farms Second Plat project to reduce the required buffer width.

Per APWA Section 5605.3 Stream Preservation and Buffer Zones, the required stream buffer width is based on total contributing drainage basin size, which results in a 100-foot-wide setback zone for this project. The purpose of the stream setback is to ensure there is sufficient space for a stream to meander in a natural manner and protect the adjacent environment. Section 5605.3.B.4 also mentioned how dense areas of native vegetation shall be maintained and how the 25 feet closest to the top of bank is the critical limits.

The stream buffer setbacks encroach on lots 186-191 of The Retreat at Hook Farms Second Plat. The city has requested an easement be placed over the stream buffer limits. From review of historic site imagery and site visits, this area has been under agricultural use for many years. Agricultural uses routinely disturb areas which prevents the growth of mature riparian vegetation. Due to the no active stream buffer existing in this area, we are requesting the setback zone be adjusted to remove the lot area and follow the rear lot lines.

Along with the above, it has been found that placing stream buffer requirements/easement on individual homeowner lots is not an ideal way of protecting the stream. Individual homeowners typically want fenced yards, mowed grasses, and other backyard improvements which go against stream buffer protection measures.

While this request is asking to remove stream buffer setback zones, per the enclosed exhibit, this is limited to an approximate maximum setback distance of 35 feet, resulting in a total area of 0.378 acres. Areas outside of the shown disturbed limits, will maintain required setback distances and existing vegetation around the creek.

We are requesting the city approve with waiver/modification request to allow the final stream buffer setback to be reduced where it encroaches on lots, as shown in the attached exhibit. Should you have any questions about this request please reach out to us at jsellers@olsson.com or 816.442.6044.

Sincerely,

Julie Sellers, PE
Senior Engineer

1301 Burlington Street / Suite 100 / North Kansas City, MO 64116
O 816.361.1177 / olsson.com

City of Lee's Summit, MO
220 SE Green Street
Lee's Summit, MO 64063

STATE OF MISSOURI
JULIE ELAINE SELLERS
NUMBER PE-2017000367
4/6/2022
PROFESSIONAL ENGINEER

April 5, 2022

Re: The Retreat at Hook Farms Second Plat – PL2021165
Stream Assessment Design Memorandum

This memorandum for the waiver request on The Retreat at Hook Farms Second Plat to reduce the final stream buffer limits in the area of Lots 186-191 for the site.

To support the waiver request Olsson has performed a Stream Assessment to demonstrate that the reduction in stream buffer limits will not adversely affect the natural condition of the existing stream. The stream assessment was performed in accordance with Section 5605 of the APWA KC Metro Design Criteria and Specifications. Information for the steam assessment was based on field survey data and field site visits by Olsson.

Section 5605.4a Plan-Form Analysis
The existing stream information and the plan-form analysis have performed and included in the attachments of this memo. The Plan-Form Ratio lies within the typical range with the exception of meander length/full bank width.

The ratio for the meander length/full bank width falling out of typical range appears to be a result of shorter wavelengths caused by concentrated discharge through the culvert crossing Hook Road and the convergence of two streams, both outside of the area of this waiver request.

Based on the plan-form analysis, general steam corridor limits have been shown on the Stream Assessment Plans. The stream corridor limits show that the proposed development will not interfere with the natural meandering of the stream.

STREAM PLAN-FORM DATA	
Sinuosuity Channel	2200.00
Valley Length	1930.00
Sinuosuity Channel Length/Valley Length	1.14
Average Bank Full Width (Wb)	35.74
Average Rc (Rc)	158.35
Rc/Wb	4.43
Average Pool/Riffle Spacing	183.92
Riffle Spacing/Wb	5.15
Average Wavelength	196.29
Wavelength/Wb	5.49
Average Meander Amplitude	34.00
Meander Length/Wb	7.33

Section 5605.4b – Energy Management

Regarding the flow in the stream, an analysis was made of the pre and post development peak runoff values for the site with the Hook Farms Preliminary Stormwater Drainage Report. In this drainage report run off impacts from the Hook Farms development to the existing stream conditions was compared in Table 11 and 12, see table and image excerpts below. From the tables you can see that the proposed development does not negatively impact the flows in the existing channel.

Table 11. Free Release Analysis Point of Interest Peak Flow Rates.

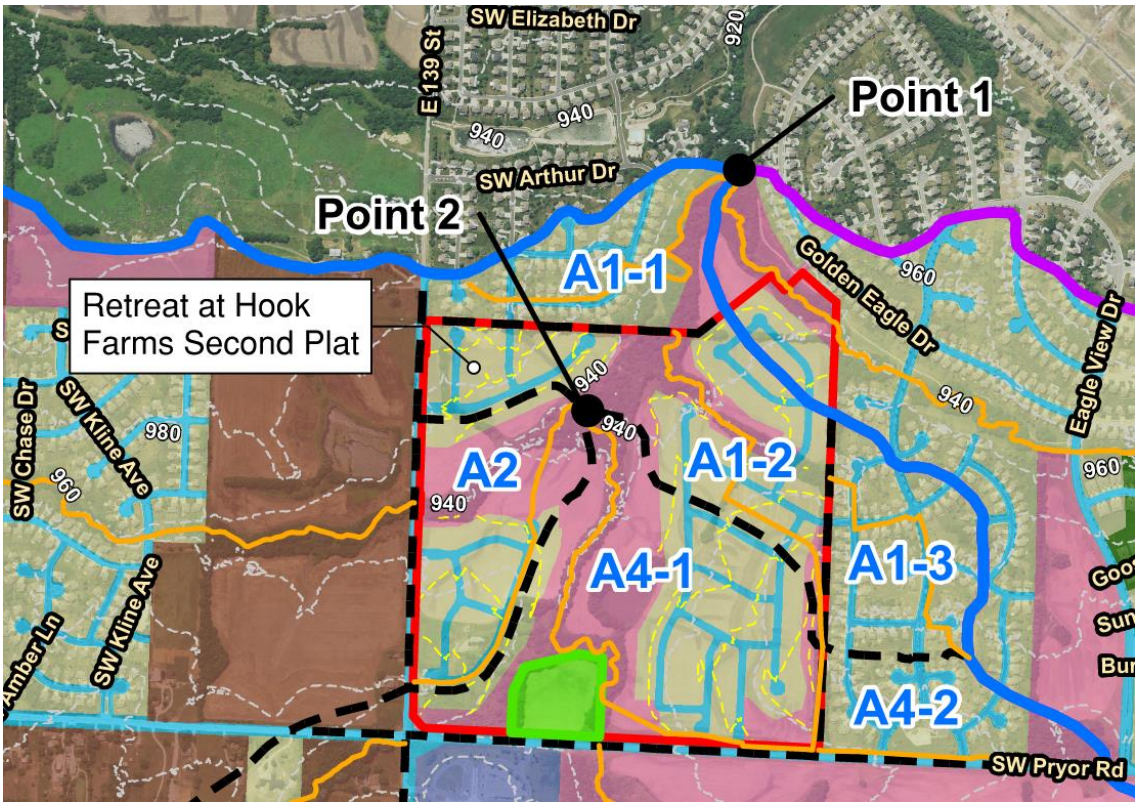
Point of Interest	Q_2 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
Point 1	2,193	4,188	7,098
Point 2	1,790	3,428	5,793

*Q = Flow Rate, *cfs = cubic feet per second

Table 12. Free Release Analysis vs. Existing Conditions.

Point of Interest	ΔQ_2 (cfs)	ΔQ_2 %	ΔQ_{10} (cfs)	ΔQ_{10} %	ΔQ_{100} (cfs)	ΔQ_{100} %
Point 1	-29	-1.31	-71	-1.67	-131	-1.81
Point 2	-20	-1.10	-46	-1.32	-85	-1.45

*ΔQ = Change in Flow Rate, *cfs = cubic feet per second



An analysis was then performed on the pre and post construction flows in the stream itself. Per the approved Hook Farms Preliminary Stormwater Report, detention for the Hook Farms development was waived, however water quality basins are constructed to help mitigate impacts to the stream in frequent smaller rainfall events. With the development of The Retreat at Hook Farms Second Plat, grading and storm sewer installation are impacting final drainage areas. The net change in these flow rates were used to calculate the post construction flow rates for the stream..

To evaluate the hydraulic grade line (HGL) and energy grade line (EGL) the existing and proposed flows were evaluated at the three cross sections identified in the Plan Form Analysis. This information was used to calculate the HGL's and EGL's for the indicated storm at each cross section. The analysis indicates minimal variations in the HGL's and EGL's with a maximum 3.5-inch rise in the 2-Year Storm HGL at Section 18+00. As the stream exits the north property line HGL's of existing vs proposed are matching for the entire range of storm events.

RETREAT AT HOOK FARMS SECOND PLAT
TABLE 1 - PRE AND POST CONSTRUCTION HYDRAULIC AND ENERGY GRADE LINES IN STREAM

		2-Year				10-Year				25-Year				100-Year			
Sta	Cond	Q	HGL	V	EGL	Q	HGL	V	EGL	Q	HGL	V	EGL	Q	HGL	V	EGL
		cfs	ft	fps	ft	cfs	ft	fps	ft	cfs	ft	fps	ft	cfs	ft	fps	ft
18+00	Pre	585.60	939.85	3.92	940.09	875.57	941.13	4.11	941.39	1045.54	941.48	4.18	941.72	1628.18	942.02	4.78	942.37
	Post	596.97	940.14	3.93	940.14	892.57	941.17	4.11	941.43	1065.83	941.48	4.19	941.75	1659.78	942.07	4.82	942.40
	Delta (ft)		0.29		0.05		0.04		0.04		0.00		0.03		0.05		0.03
22+00	Pre	592.76	938.25	4.17	938.52	886.99	938.83	4.56	939.15	1059.49	939.08	4.79	939.44	1650.17	939.74	5.07	940.14
	Post	593.14	938.25	4.17	938.52	887.55	938.83	5.70	939.15	1060.15	939.08	4.79	939.44	1651.21	939.74	5.07	940.14
	Delta (ft)		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
27+00	Pre	1212.03	936.75	5.13	937.16	1842.45	937.50	5.86	938.03	2213.49	937.83	6.26	938.44	3458.55	938.75	7.22	939.56
	Post	1203.03	936.73	5.13	937.14	1828.77	937.49	5.84	938.02	2197.05	937.82	6.23	938.42	3432.86	938.73	7.21	939.54
	Delta (ft)		-0.02		-0.02		-0.01		-0.01		-0.01		-0.02		-0.02		-0.02

Section 5605.4c – Sediment Transport Continuity

An analysis was performed to calculate the applied shear stress on the channel surface of the stream, based on the pre and post development peak flows calculated previously, the results are shown in Table 2. As with the HGL analysis, the variance in applied shear stress is minimal. Pre construction and post development shear stress values were compared. The percentage increase or decrease is shown in Table 3. The post development applied shear stress was also compared to critical shear stress for the bed material, this ratio is shown in Table 4. It indicates the bed material is stable at points of interest for this assessment.

RETREAT AT HOOK FARMS SECOND PLAT
PRE AND POST CONSTRUCTION SHEAR STRESS ANALYSIS IN STREAM
(SEDIMENT TRANSPORT)

TABLE 2 - AVERAGE APPLIED SHEAR STRESS

Storm Event		10-Year				25-Year				100-Year			
Sta	Cond	Q	R	S	To	Q	R	S	To	Q	R	S	To
		cfs	ft2/ft	ft/ft	psf	cfs	ft2/ft	ft/ft	psf	cfs	ft2/ft	ft/ft	psf
18+00	Pre	875.57	2.13	0.005	0.66	1045.54	1.80	0.005	0.56	1628.18	1.94	0.005	0.61
	Post	892.57	2.07	0.005	0.64	1065.83	1.77	0.005	0.55	1659.78	1.95	0.005	0.61
22+00	Pre	886.99	1.81	0.004	0.45	1059.49	1.83	0.004	0.46	1650.17	1.62	0.004	0.40
	Post	887.55	1.81	0.004	0.45	1060.15	1.83	0.004	0.46	1651.21	1.62	0.004	0.40
27+00	Pre	1842.45	2.61	0.003	0.49	2213.49	2.82	0.002	0.35	3458.55	3.23	0.002	0.40
	Post	1828.77	2.61	0.003	0.49	2197.05	2.82	0.002	0.35	3432.86	3.21	0.002	0.40

TABLE 3 - PRE VS POST APPLIED STRESS

Sta	10-Yr	25-Yr	100-Yr
18+00	-2.8%	-2.1%	0.7%
22+00	0.0%	0.0%	0.0%
27+00	-0.3%	-0.1%	-0.5%

TABLE 4 - RATIO To vs Tc (POST CONSTRUCTUION)

Sta	Channel Material	Tc	10-Yr	25-Yr	100-Yr
18+00	Cobbles and shingles	1.100	0.59	0.50	0.55
22+00	Cobbles and shingles	1.100	0.41	0.42	0.37
27+00	Silts to Cobbles	0.800	0.61	0.44	0.50

In conclusion, the purpose of the stream setback is to ensure there is sufficient space for the stream to meander in a natural manner. The Plan-Form Analysis demonstrates that the proposed development will not interfere with the natural movement of the stream channel. The HGL and shear stress analysis also demonstrate minimal impact. In addition, the proposed development will also not cause any channel constrictions within the flow level of the 100-year storm.

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Sinuosuity Channel Length/Valley Length	1.14
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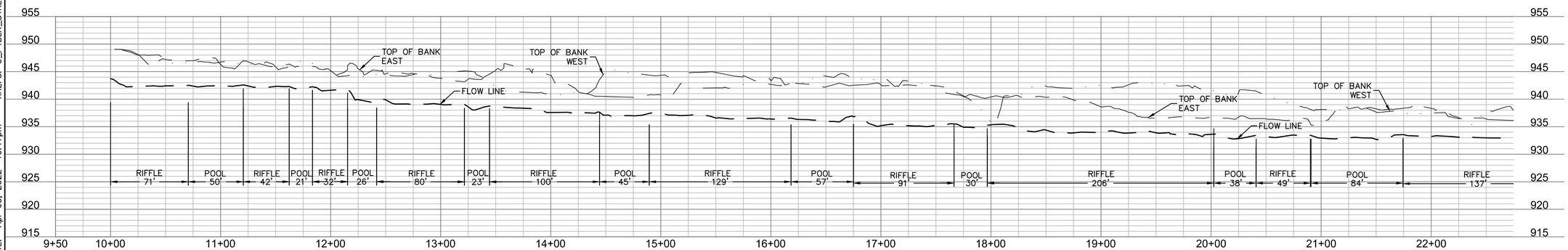
Wavelength/Wb	5.49
Average Meander Amplitude	34.00
Meander Length/Wb	7.33

SW HOOK ROAD
SW HEARTLAND ROAD
SW HEARTLAND ROAD
V DRIVE
TRACT I
PROPOSED STREAM BUFFER LIMITS
EXISTING STREAM BUFFER LIMITS
EXISTING CULVERT OUTFALL
EXISTING SWALE OUTFALL
TOP OF BANK WEST
TOP OF BANK EAST
CENTER LINE OF STREAM
CENTER LINE OF STREAM VALLEY
GENERAL STREAM CORRIDOR LIMITS BASED ON PLAN-FORM DATA
SECTION AT 18+00
EXISTING SWALE OUTFALL
SECTION AT 22+00
EXISTING STREAM MERGER POINT
RADIUS OF CURVATURE
THE RETREAT AT HOOK FARMS 1ST PLAT
SCALE IN FEET



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USER: jsellers

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FAX 816.361.1888
www.olsson.com

REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION	BY

STREAMWAY CENTERLINE PROFILE
NATURAL CHANNEL ASSESSMENT

THE RETREAT AT HOOK FARMS
SECOND PLAT

LEE'S SUMMIT, MO

2022

drawn by:	J.E.S.
checked by:	J.E.S
designed by:	J.E.S.
QA/QC by:	J.E.S.
project no.:	A19-4059
date:	

SHEET 1

STREAM PLAN-FORM DATA	
Sinuosity Channel	2200.00
Valley Length	1930.00
Sinuosity Channel Length/Valley Length	1.14
Average Bank Full Width (Wb)	35.74
Average Rc (Rc)	158.35
Rc/Wb	4.43
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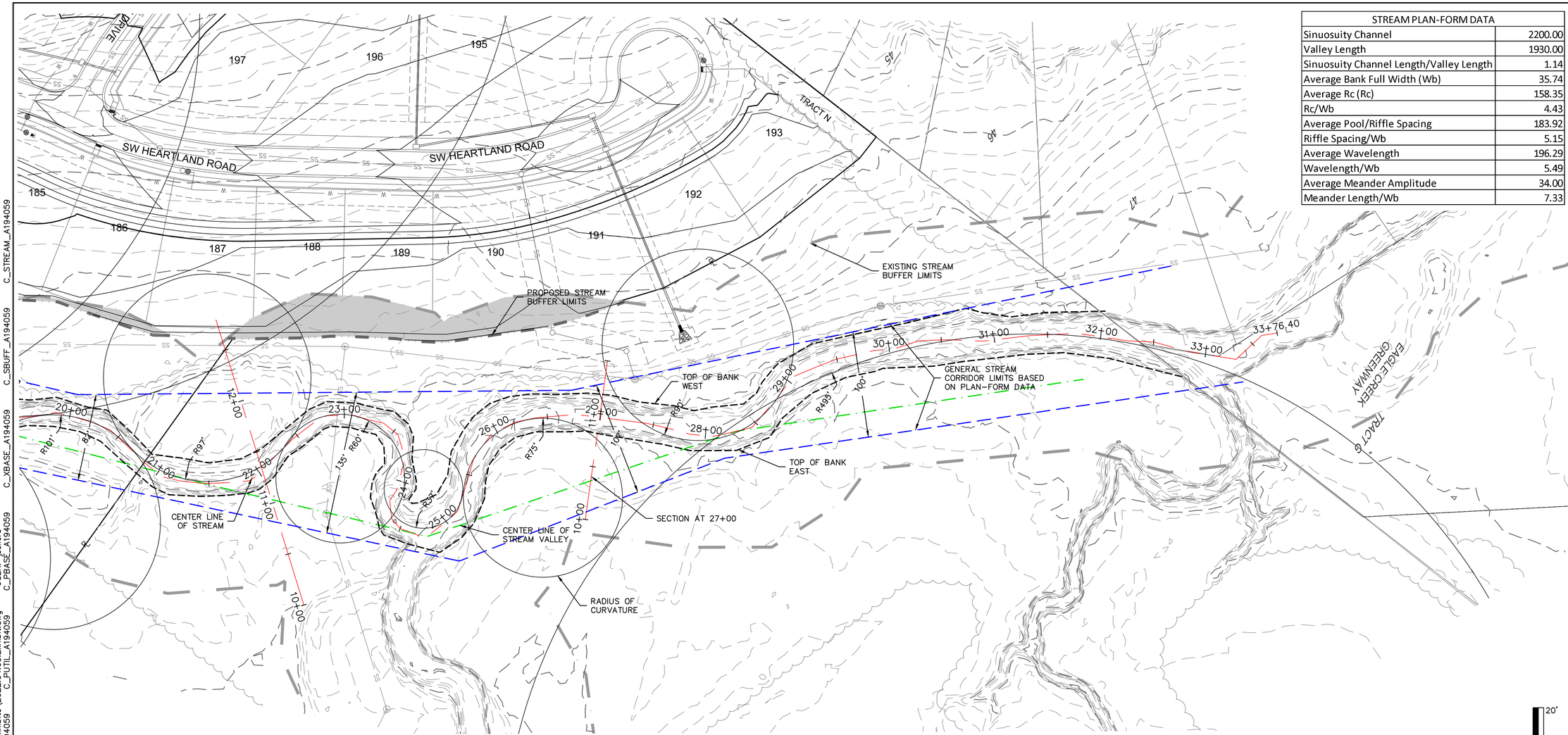

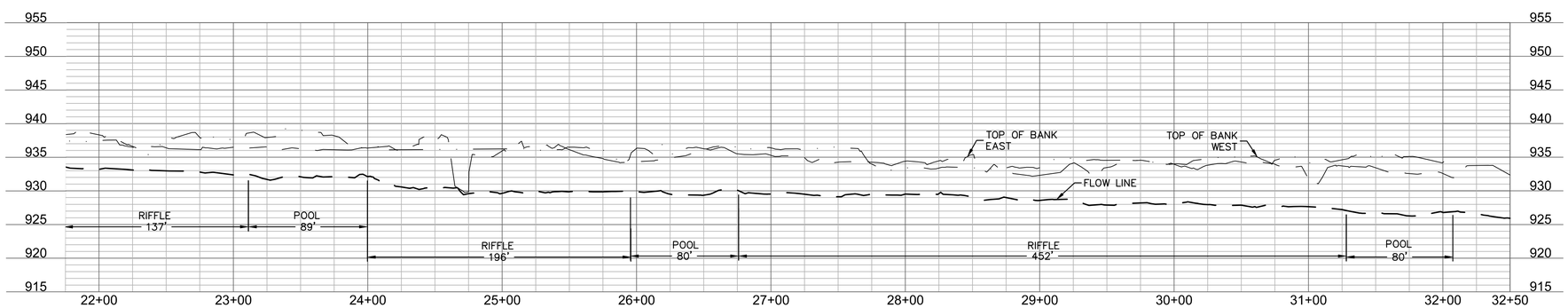

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REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION	BY

STREAMWAY CENTERLINE PROFILE
NATURAL CHANNEL ASSESSMENT

THE RETREAT AT HOOK FARMS
SECOND PLAT

LEE'S SUMMIT, MO

2022

drawn by: J.E.S.
checked by: J.E.S
designed by: J.E.S.
QA/QC by: J.E.S.
project no.: A19-4059
date:

SHEET
2

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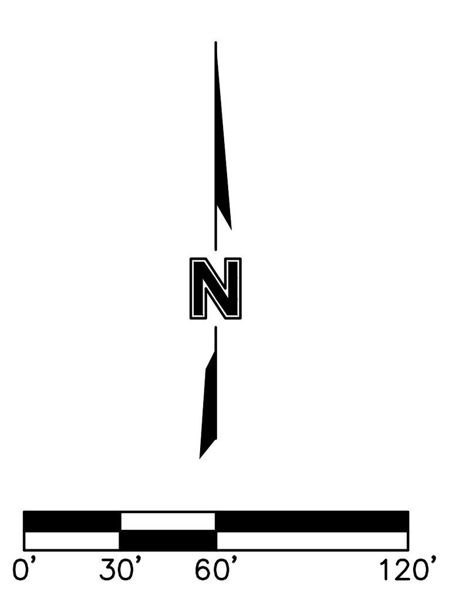
USER: jsellers

LEGEND	
——P——	PROPERTY BOUNDARY
– – – – –	EDGES OF EXISTING STREAM
——— (green)	EXISTING STREAM BUFFER OUTER EDGE
– – – (red)	PROPOSED STREAM BUFFER OUTER EDGE

STREAM BUFFER ZONE CALCULATIONS PRE-DEVELOPMENT AND PROPOSED DISTURBANCE		
(hatched)	EXISTING STREAM BUFFER ZONE TO REMAIN	N/A
(solid black)	DISTURBED STREAM BUFFER ZONE	0.378 AC.
(+ pattern)	ADDITIONAL STREAM BUFFER GRANTED	0.400 AC.



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REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	08-26-2021	REVISED PER CITY COMMENTS	
2	10-29-2021	REVISED PER CITY COMMENTS	

REVISIONS

STREAM BUFFER PLAN
SITE GRADING & SITE DISTURBANCE PLANS

THE RETREAT AT HOOK FARMS
SECOND PLAT

LEE'S SUMMIT, MO

2021

drawn by:	B.M.W./A.A.
checked by:	B.M.W.
designed by:	B.M.W./A.A.
QA/QC by:	J.E.S.
project no.:	A19-4059
date:	05-05-2021

SHEET
C500

RETREAT AT HOOK FARMS SECOND PLAT
TABLE 1 - PRE AND POST CONSTRUCTION HYDRAULIC AND ENERGY GRADE LINES IN STREAM

		2-Year				10-Year				25-Year				100-Year			
Sta	Cond	Q	HGL	V	EGL	Q	HGL	V	EGL	Q	HGL	V	EGL	Q	HGL	V	EGL
		cfs	ft	fps	ft	cfs	ft	fps	ft	cfs	ft	fps	ft	cfs	ft	fps	ft
18+00	Pre	585.60	939.85	3.92	940.09	875.57	941.13	4.11	941.39	1045.54	941.48	4.18	941.72	1628.18	942.02	4.78	942.37
	Post	596.97	940.14	3.93	940.14	892.57	941.17	4.11	941.43	1065.83	941.48	4.19	941.75	1659.78	942.07	4.82	942.40
	Delta (ft)		0.29		0.05		0.04		0.04		0.00		0.03		0.05		0.03
22+00	Pre	592.76	938.25	4.17	938.52	886.99	938.83	4.56	939.15	1059.49	939.08	4.79	939.44	1650.17	939.74	5.07	940.14
	Post	593.14	938.25	4.17	938.52	887.55	938.83	5.70	939.15	1060.15	939.08	4.79	939.44	1651.21	939.74	5.07	940.14
	Delta (ft)		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
27+00	Pre	1212.03	936.75	5.13	937.16	1842.45	937.50	5.86	938.03	2213.49	937.83	6.26	938.44	3458.55	938.75	7.22	939.56
	Post	1203.03	936.73	5.13	937.14	1828.77	937.49	5.84	938.02	2197.05	937.82	6.23	938.42	3432.86	938.73	7.21	939.54
	Delta (ft)		-0.02		-0.02		-0.01		-0.01		-0.01		-0.02		-0.02		-0.02

RETREAT AT HOOK FARMS SECOND PLAT
PRE AND POST CONSTRUCTION SHEAR STRESS ANALYSIS IN STREAM
(SEDIMENT TRANSPORT)

TABLE 2 - AVERAGE APPLIED SHEAR STRESS													
Storm Event		10-Year				25-Year				100-Year			
Sta	Cond	Q	R	S	To	Q	R	S	To	Q	R	S	To
		cfs	ft2/ft	ft/ft	psf	cfs	ft2/ft	ft/ft	psf	cfs	ft2/ft	ft/ft	psf
18+00	Pre	875.57	2.13	0.005	0.66	1045.54	1.80	0.005	0.56	1628.18	1.94	0.005	0.61
	Post	892.57	2.07	0.005	0.64	1065.83	1.77	0.005	0.55	1659.78	1.95	0.005	0.61
22+00	Pre	886.99	1.81	0.004	0.45	1059.49	1.83	0.004	0.46	1650.17	1.62	0.004	0.40
	Post	887.55	1.81	0.004	0.45	1060.15	1.83	0.004	0.46	1651.21	1.62	0.004	0.40
27+00	Pre	1842.45	2.61	0.003	0.49	2213.49	2.82	0.002	0.35	3458.55	3.23	0.002	0.40
	Post	1828.77	2.61	0.003	0.49	2197.05	2.82	0.002	0.35	3432.86	3.21	0.002	0.40

TABLE 3 - PRE VS POST APPLIED STRESS			
Sta	10-Yr	25-Yr	100-Yr
18+00	-2.8%	-2.1%	0.7%
22+00	0.0%	0.0%	0.0%
27+00	-0.3%	-0.1%	-0.5%

TABLE 4 - RATIO To vs Tc (POST CONSTRUCTUION)					
Sta	Channel Material	Tc	10-Yr	25-Yr	100-Yr
18+00	Cobbles and shingles	1.100	0.59	0.50	0.55
22+00	Cobbles and shingles	1.100	0.41	0.42	0.37
27+00	Silts to Cobbles	0.800	0.61	0.44	0.50

Project: The Retreat at Hook Farms Second Plat

Stream Name and Location: TRIBUTARY of MOUSE CREEK LEE'S SUMMIT MO

Evaluated by: _____ Firm: OLSSON Date: MARCH 2022

Table 5605-4: Channel Condition Scoring Matrix
(adapted from Johnson, et al 1999)

Stability Indicator	Good (1)	Fair (2)	Poor (3)	Score (S)	Weight (W)	Rating S*W= (R)
Bank soil texture and coherence	cohesive materials, clay (CL), silty clay (CL-ML), massive limestone, continuous concrete, clay loam (ML-CL), silty clay loam (ML-CL), thinly bed limestone	sandy clay (SC), sandy loam (SM), fractured thinly bedded limestone	non-cohesive materials, shale in bank, (SM), (SP), (SW), (GC), (GM), (GP), (GW)	1	0.6	0.6
Average bank slope angle	slopes ≤ 2:1 on one or occasionally both banks	slopes up to1.7:1 (60˚) common on one or both banks	bank slopes over 60˚ on one or both banks	2	0.6	1.2
Average bank height	less than 6 feet	greater than 6 and less than 15 feet	greater than 15 feet	2	0.8	1.6
Vegetative bank protection	wide to medium band of woody vegetation with 70-90% plant density and cover. Majority are hardwood, deciduous trees with well-developed understory layer, minimal root exposure	narrow bank of woody vegetation, poor species diversity, 50-70% plant density, most vegetation on top of bank and not extending onto bank slope, some trees leaning over bank, root exposure common	thin or no band of woody vegetation, poor health, monoculture, many trees leaning over bank, extensive root exposure, turf grass to edge of bank	2	0.8	1.6
Bank cutting	little to some evident along channel bends and at prominent constrictions, some raw banks up to 4 foot	Significant and frequent. Cut banks 4 feet high. Root mat overhangs common.	Almost continuous cut banks, some over 4 feet high. Undercut trees with sod-rootmat overhangs common. Bank failures frequent	2	0.4	0.8
Mass wasting	little to some evidence of slight or infrequent mass wasting, past events healed over with vegetation. Channel width relatively uniform with only slight scalloping	Evidence of frequent and significant mass wasting events. Indications that higher flows aggravated undercutting and bank wasting. Channel width irregular with bank scalloping evident	Frequent and extensive mass wasting evident. Tension cracks, massive undercutting and bank slumping are considerable. Highly irregular channel width.	1	0.8	0.8

Table 5605-4: Channel Condition Scoring Matrix

(adapted from Johnson, et al 1999)

Stability Indicator	Good (1)	Fair (2)	Poor (3)	Score (S)	Weight (W)	Rating S*W= (R)
Bar development	narrow relative to stream width at low flow, well-consolidated, vegetated and composed of coarse bed material to slight recent growth of bar as indicated by absence of vegetation on part of bar	Bar widths wide relative to stream width with freshly deposited sand to small cobbles with sparse vegetation	Bar widths greater than ½ the stream width at low flow. Bars are composed of extensive deposits of finer bed material with little vegetation	2	0.6	1.2
Debris jam potential	slight – small amounts of debris in channel. Small jams could form	moderate – noticeable debris of all sizes present	significant – moderate to heavy accumulations of debris apparent	2	0.2	0.4
Obstructions, flow deflectors (walls, bluffs) and sediment traps	negligible to few or small obstructions present causing secondary currents and minor bank and bottom erosion but no major influence on meander bend	moderately frequent and occasionally unstable obstructions, noticeable erosion of channel. Considerable sediment accumulation behind obstructions	frequent and unstable causing continual shift of sediment and flow	1	0.2	0.2
Channel bed material consolidation and armoring	massive competent to thinly bed limestone, continuous concrete, hard clay, moderately consolidated with some overlapping. Assorted sizes of particles, tightly packed and overlapped, possibly imbricated. Small % of particles < 4mm	shale in bed, soft silty clay, little consolidation of particles, no apparent overlap, moderate % of particles < 4mm	silt, weathered, thinly bedded, fractured shale, high slaking potential, very poorly consolidated, high % of material < 4mm	1	0.8	0.8
Sinuosity	1.2 ≤ Sinuosity ≤ 1.4	1.1<Sinuosity <1.2	Sinuosity <1.1	2	0.8	1.6
Ratio of radius of curvature to channel width	3 ≤ Rc/Wb ≤ 5	2 < Rc/Wb < 3, 5 < Rc/Wb < 7	2 < Rc /Wb, Rc /Wb > 7	1	0.8	0.8
Ratio of pool-riffle spacing to channel width at elevation of 2-year flow	4 ≤ Length/Wb < 8	3 ≤ Length/Wb < 4, 8 < Length/Wb ≤ 9	3 < Length/Wb, Length/Wb > 9, unless long pool or run because of geologic influence	1	0.8	0.8
Percentage of channel constriction	< 25%	26-50%	> 50%	1	0.8	0.8
Sediment movement	little to no loose sediment	scour and/or deposition, some loose sediment	near continuous scour and/or deposition and/or loose sediment	1	0.8	0.8

TOTAL 14.0