Preliminary Stormwater Management Plan

prepared for

Shadow Glen Mixed Use Community Olathe, KS

Prepared: January 5, 2024 Revised: February 23, 2024 Revised: February 28, 2024

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EXECUTIVE SUMMARY

We are submitting the Shadow Glen Mixed Use Community project for Preliminary development plan approval and this Preliminary Storm Water Management Study in support of the application. This report has been prepared to address permitting requirements and provides Preliminary design calculations of the required storm water detention and BMP facilities. We have modeled existing site conditions as they existed at the time this report was prepared.

The site is a proposed mixed-use development that will consist of a 300-unit apartment complex, 11 brownstone townhomes, and 3 commercial buildings on an existing land description of woods in good condition, and grass in fair condition. Detention is not being proposed as site release points R#2, and R3# drainage areas have been decreased in size. Detention within R#1 contributes to a rise in peak flow of the Cedar Creek Tributary H Floodplain due to the peak of the Shadow Glen Mixed Use Community site's detained release rate matching the timing of the peak of Cedar Creek. Therefore, no site detention is being proposed. A required Level of Service of 6.3 was required and a proposed Level of Service of 6.3 was obtained onsite using native vegetation, and hydrodynamic separators that treat the direct runoff.

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1.0 GENERAL INFORMATION

The proposed mixed-use development with associated infrastructure is in Section 05, Township 13, and Range 23, at the intersection of Shadow Ridge Drive and Valley Parkway in Olathe, Johnson County, Kansas (ref. Location Map Figure 1). The 14.4acre site is proposed to be developed as a combination of a 300-unit apartment complex, 11 brownstone townhomes, and 3 commercial buildings.

1.1 OBJECTIVE

The intent of this report is to provide information pertaining to the existing and proposed watershed, identify and address downstream drainage issues, meet the required detention requirements, meet the level of service requirements, and address permitting requirements. This study provides the Preliminary design calculations for the development of the facility and associated infrastructure.

1.2 METHODOLOGY

Section 5600 – Storm Drainage Systems and Facilities of the Standard Specifications and Design Criteria of the Kansas City Metropolitan Chapter of the American Public Works Association and The Manual of Best Management Practices for Stormwater Quality, published by the Mid-America Regional Council and the American Public Works Association have been utilized in the preparation of this document and the analysis of the watersheds. Watersheds for the site were defined according to soil cover and type, tributary area, and runoff times of concentration. Soil cover was determined from inspection of the site and aerial photography. A soil survey for the project area was obtained from the NRCS website and was utilized in determining soil type, and can be found in Appendix A. Watershed size was determined from both aerial topography and topographical survey, and by the proposed grading plan. Times of concentration were compiled according to *NRCS TR-55 Urban Hydrology for Small Watersheds (1986)* methodology for sheet flow, shallow concentrated flow, and channel flow. Travel times for channel flows were determined using the length and velocity of the open channel. *HydroCAD version 10.0* was used to model the runoff. All storm events were modeled using SCS 24 hour Type II distributions and were modeled for the 1-year, 10-year, and 100-year storm events.

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2.0 EXISTING CONDITIONS ANALYSIS

This project is positioned with all runoff being directed to three release points releasing into Cedar Creek Tributary H. There are no improved channels or storm sewer systems on the property, but public utilities run along the surrounding streets of the property. Current runoff on the property is conveyed by sheet, shallow and channel flow.

2.1 TRIBUTARY AREAS

The existing tributaries are provided in Appendix B. The site release points have been identified as Release Points 1, and 2. These designations correspond with the watershed model located in Appendix B.

2.2 CURVE NUMBER AND TIME OF CONCENTRATION

The existing curve numbers and time of concentrations for each sub-area have been established based on the procedures outlined in *NRCS TR-55 Urban Hydrology for Small Watersheds (1986)*. Existing curve numbers were based upon aerial photography, site inspection, and the soil types present on site. A composite curve number for each sub-area was determined. An existing cover of woods in good condition and grass in fair condition was found on site. Hydrologic soil group D was present on site. A current aerial photograph can be found in Appendix A, as well as a copy of the NRCS soils report generated from the NRCS Web Soil Survey. Sheet 1 "Existing Drainage Map" depicts the existing cover conditions. Table 2.1 & 2.2 below summarize the curve numbers for each of the sub-areas.

Time of concentration flow paths were based upon sheet flow, shallow concentrated flow, and channel flow conditions. Sheet flow lengths were limited to 150 feet, or where a grade break occurred. Flow was then considered shallow concentrated flow until a channel was visible either from the USGS topographic map or the aerial photograph, and then from that point was considered channel flow determined by the length of the channel and the velocity of flow. Table 2.1 & 2.2 below summarize the time of concentration for each sub-area.

EXISTING CONDITIONS INPUT DATA										
Sub-basin	AREA (ACRES) CN =77 (WOODS, GOOD)	AREA (ACRES) CN =84 (GRASS, FAIR)	Tc (min)	Composite CN						
EX DA #1	6.8	1.69	25.5	78						
EX DA#2	1.27	2.38	26.1	82						
EX DA#3	2.23		23.8	77						

Table 2.1 Existing Runoff Input Conditions

Table 2.2 Existing Runoff Output Conditions

HYDROCAD EXISTING OUTPUT										
Sub basin	Area	CN	Тс	1 year (efc)	10-year	100-year				
Sub-basin	(ac.)	CN	(min)	I-year (CIS)	(cfs)	(cfs)				
EX DA #1	8.49	78	25.5	8.86	24.86	42.89				
EX DA#2	3.65	82	26.1	4.71	11.85	19.60				
EX DA#3	2.23	77	23.8	2.29	6.61	11.52				

2.3 EXISTING FLOW RATES

Existing flow rates were determined for the 1-year, 10-year, and 100-year design storms. Detailed routing calculations can be found in Appendix B.

2.4 AGENCY REVIEW

Permitting requirements of the following agencies were reviewed as part of the existing conditions analysis.

2.4.1 Corps of Engineers Review

The National Wetland Inventory Map was reviewed and did not indicate any wetlands on the proposed development site. Therefore, Corps review for this project is not anticipated.

2.4.2 FEMA Requirements

There is not a FEMA identified floodplain located on the proposed property per Flood Insurance Rate Map Panel No. 20091C0046G. Therefore, no FEMA requirements associated with this project are required. Please see the attached FEMA Firmette in Appendix A.

2.4.3 Kansas Department of Water Resources

The watersheds within this development are below the 640 acres requirement at which point the Division of Water Resources (DWR) would review any proposed work, therefore, no permits are required from DWR for this project.

2.4.4 Kansas Department of Health and Environment

All land disturbance activities will be permitted in accordance with the City of Olathe specifications as well as the Kansas Water Pollution Control General Permit under the National Pollution Discharge Elimination System (NPDES). NPDES and NOI Applications will be made with the future permitting of the site in compliance with local, state and federal guidelines.

* * * * *

3.0 PROPOSED CONDITIONS ANALYSIS

With the proposed development, the site will maintain the three watersheds. Detention is not being proposed as site release points R#2, and R3# drainage areas have been decreased in size. Detention within R#1 contributes to a rise in peak flow of the Cedar Creek Tributary H Floodplain due to the peak of the Shadow Glen Mixed Use Community site's detained release rate matching the timing of the peak of Cedar Creek. Therefore, no site detention is being proposed.

All components of the basins and enclosed storm sewer systems will meet or exceed the specifications provided in *Section 5600 – Storm Drainage Systems & Facilities* of the *Standard Specifications and Design Criteria* compiled by the Kansas City Metropolitan Chapter of the American Public Works Association and the City of Olathe Technical Specifications.

3.1 TRIBUTARY AREAS

The proposed tributaries are provided in Appendix B. The site release points remained unchanged from the existing condition. These designations correspond with the watershed model located in Appendix B.

3.2 CURVE NUMBER AND TIME OF CONCENTRATION

The proposed curve numbers and time of concentrations for each sub-area have been established based on the procedures outlined in *NRCS TR-55 Urban Hydrology for Small Watersheds (1986)*. Proposed curve numbers were based upon aerial photography, site inspection, and the soil types present on site. A composite curve number for each sub-area was determined. Cover types for the proposed condition were Urban Commercial, grass in good condition, as well as a portion of the site that was preserved woods in good condition. Hydrologic soil group D was found on site. Therefore, HSG D was used throughout the site in the proposed condition. The proposed cover conditions are shown in appendix B. Table 3-1 & 3-2 below summarize the curve numbers for each of the sub-areas.

Times of concentration were established in a similar manner as the existing conditions. Shallow concentrated flow lengths were shortened and considered paved. Detailed calculations of the composite curve numbers and times of concentration can be found in Appendix B. Sheet 2 "Proposed Drainage Map" shows the proposed flow paths utilized in the time of concentration calculations.

PROPOSED CONDITIONS INPUT DATA										
		AREA (ACRES)	AREA (ACRES)							
Sub-basin	AREA (ACRES) $CN = 77$	CN =84 (GRASS,	CN = 95 (URBAN	Tc (min)	Composite CN					
	(WOODS, GOOD)	GOOD)	COMMERCIAL)							
DA #1	3		8.36	5	90					
DA#2	0.1	0.49	0.69	5	88					
DA#3	1.73			23.8	77					

 Table 3.1 Proposed Runoff Input Conditions

Table 3.1	Proposed	Runoff	Input	Conditions

HYDROCAD PROPOSED OUTPUT										
Sub-basin	Area (ac.)	CN	Tc (min)	1-year (cfs)	10-year (cfs)	100-year (cfs)				
DA #1	11.36	6 90 5		39.40	80.90	123.53				
DA#2	1.28	88	5	4.12	8.80	13.64				
DA#3	1.73	77	23.8	1.77	5.12	8.94				

3.3 PROPOSED FLOW RATES

Proposed flow rates were determined for the 1-year, 10-year, and 100-year design storms. Detailed routing calculations can be found in Appendix B.

3.4 DETENTION ANALYSIS

Drainage areas 2 and 3 have been decreased in size to limit runoff conditions to less than existing to the east and to the south. To analyze Drainage Area #1 one conceptual detention basin was modeled to determine the impact on the downstream floodplain, with proposed release rates held to existing rates. To determine the impact of the onsite detention, the watershed was modeled per the 2008 Schlagel & Associates Lower Cedar Creek Flood Study Drainage map, included in Appendix B. This allowed for the timing of the site peak discharge rate to be compared to the timing of the peak flow of the full watershed with and without detention. The results are shown in Table 3.2 below

SITE RELEASE INFORMATION (NO DETENTION)										
	1-ye	ar (cfs)	10-	-year (cfs)	100-year (cfs)					
	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED				
R#1	8.86	39.40	24.86	80.90	42.89	123.53				
R#2	4.71	4.12	11.85	8.80	19.6	13.64				
R#3	2.29	1.77	6.61	5.12	11.52	8.94				
OVERALL R#1	1684.83	1684.11	2805.44	2802.54	3680.2	3674.61				
	SITE	RELEASE INF	ORMATION	I (DETENTION)						
	1-ye	ar (cfs)	10-	-year (cfs)	100-year (cfs)					
	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED				
R#1	8.86	6.10	24.86	18.45	42.89	35.70				
R#2	4.71	4.12	11.85	8.80	19.6	13.64				
R#3	2.29	1.77	6.61	5.12	11.52	8.94				
OVERALL R#1	1684.83	1687.37	2805.44	2806.52	3680.2	3681.45				

Table 3.2 Site Release Information (No Detention and Detention)

As shown in Table 3.2, by providing detention within R#1 the site release flows are greater at the overall release point #1. Therefore, we are not proposing to provide detention for this site.

3.5 LEVEL OF SERVICE ANALYSIS

In accordance with the City of Olathe's Stormwater Quality Ordinance and Title 17 requirements, a detailed Level of Service analysis has been completed for this project. The analysis includes establishing a composite SCS Curve Number (CN) for both existing and proposed conditions, establishing a required Level Of Service (LOS), and implementing necessary Best Management Practice (BMP) structures to sufficiently treat the runoff from the site. The analysis was completed for the entire revised preliminary plat at full build out which includes all three phases of Shadow Glen Mixed Use Community. The following discussion summarizes the methods used in completing worksheets #1 and #2 of the BMP Manual. Detailed water quality calculations are provided in Appendix A.

3.5.1 Worksheet #1

The existing ground cover type was classified as Woods in good condition, and grass in fair condition with the site being predominately classified as HSG D soils. This resulted in a weighted CN of 79. The proposed cover types were classified according to the proposed development plan. This resulted in a weighted CN of 88, which equates to a required LOS of 6.3 for the fully developed condition. The completed Worksheet #1 is shown on the following page.

ENTIRE SIT	F										
WORKSHE	ET 1: REC		EVEL OF S	ERVICE							
Project:	SHADOW	GLEN A	PARTMEN	TS	WOR	K BY:	JAH				
Location:					DA	TE:	1/5/2023				
Check one:	Undew	eloped	Х	Developed							
1. Runoff	Curve Nur	nber									
A. Predeve	lopment	CN									
	Cover Des	cription			Soil HSG	CN	Area (ac.)	CN x Area			
	WOODS	GOOD				77	10.3	793 1			
	GRASS F	AIR			D	84	4.07	341.88			
		1	1	1		Totals [.]	14.37	1135			
						Totalo.	14.07	1100			
	Area-Wei	ghted CN	= total proc	luct/total area =				79	(round to intege	er)	
B. Post De	velopme	nt CN									
		orintion				CN					
						CN 77	Alea (ac.)	271 01			
	COMMER	CIAL & B	USINESS			95	9.05	859 75			
	GRASS G	GOOD			D	80	0.49	39.2			
						Totals:	14.37	1271			
	¹ Postdev	elopment	CN is one	HSG higher for	all cover typ	es except	preserved vegeta	ation,			
	absent	document	ation show	ng how postdev	elopment s	oil structu	re will be preserv	ed.			
	A		- 44441					00	(national tables)	-)	
	Area-wei		– total proc	iuci/iolai alea -				00	(round to intege	:r <i>)</i>	
C. Level o	f Service	(LS) Calc	ulation				Change in CN	LS	Change in CN	LS	
		,					1	4.3	14	6.8	
	Predevelo	pment CN	i:		79		2	4.7	15	6.9	
							3	5	16	7	
	Postdevel	opment C	N:		88		4	5.3	17	7.1	
							5	5.7	18	7.2	
	Difference	:			9		6	6	19	7.3	
	LS Requir	ed (see s	cale at rich	t)·	63		/ 8	6.2	20	7.4	
	Lo nequi	54 (365 5)	sais at righ	· /·	0.3		Q	63	22	7.5	
							10	6.4	23	7.8	
							11	6.5	24	7.9	
	Sour	ce: U.S. [Department	of Agriculture,	Natural Res	ourse	12	6.6	25	8	
	Conse	rvation Se	rvice. Urba	n Hydrology for	SmallWate	rsheds,	13	6.7	25+	8	
		Tec	hnical Rele	ase 55 (TR-55).	1986.						

3.5.2 Worksheet #2

Cedar Creek development as a whole has historically incorporated many of the concepts identified in the BMP manual as beneficial to water quality and takes advantage of existing regional water quality features. The natural draws and channels and steep topography have been incorporated into the master plan of the development and remain as preserved native vegetation and natural conveyance features. For this site 4.83 acres (34%) of the site will consist of preserved wooded natural vegetation. This in correlation with Hydrodynamic Separators at the western storm sewer discharge points account for the required level of service of 6.3.

ENTIRE SI	ΓE								
WORKSHE	ET 2: DEV	ELOP M	TIAGTION	PACKAGE(S)	THAT MEE	THE RQU	IRED LS		
Project:	SHADOW	GLEN A	PARTMEN	TS	WOR	K BY:	JAH		
Location:					DA	TE:	1/5/2023		
1. Require	ed LS						6.3		
2. Propose	d BMP Op	tion Pac	kage No.	1					
							Area x VR		
STF						VR from	Total		
Reference					Treatment	Table 2 or	Treatment		
#	Cover/BM	P Descrip	otion		Area	Table 3	Area		
	NATIVE*				4.83	9.50	3.19		
	HDS #1*				5.5	5.25	2.01		
	HDS #2*				3.05	5.25	1.11		
	BYPASS				0.99	0.00	0.00		
*SIGN ADD	S ADDITIC	NAL 0.28	5 VR	Total:	14.37	LS:	6.3		
MEETS RE	QUIRED L	S (YES/N	0)?	YES					
MEETS REQUIRED LS (YES/NO)? YES									

* * * * *

4.0 SUMMARY AND RECOMMENDATIONS

The proposed development of this 14.4 acre tract of land within the City of Olathe by Oddo Development has incorporated water quality and water quantity controls. Detention is not being proposed as site drainage areas have been decreased and the larger drainage area as shown that detention contributes to a rise in the Lower Cedar Creek Floodplain. This is due to the peak of Shadow Glen Mixed Use Community site detained release rate matching the peak of the Lower Cedar Creek therefore contributing to an overall increase in the overall runoff rate.

Additionally, the site is required to meet the City's stormwater quality ordinance. To meet this requirement, it was determined that a post-construction level of service of 6.3 is required. Onsite treatment of stormwater obtains a level of service of 6.3 by utilizing the preserved native vegetation as well as Hydrodynamic Separators at the western storm sewer discharge points.

* * * *