APPENDIX E: SANITARY SEWER DESIGN GUIDANCE

E.1 – KDHE Sanitary Sewer Extension Permit with City Details

E.2 – KDHE Checklist for Sewer Extension Plan Review

E.3 – City of Lawrence Design Flow Example (Area Method)

Kansas
Department of Health and Environment

STATE OF KANSAS
DIVISION OF ENVIRONMENT
APPLICATION FOR SEWER EXTENSION PERMIT

The applicant hereby requests a permit for extension of sanitary sewers in compliance with the requirements of K.S.A. 65-165 and K.S.A. 65-166. Plans and specifications submitted must comply with the Kansas Department of Health and Environment, Division of Environment, "Minimum Standards of Design for Water Pollution Control Facilities."

APPLICANT DATA

1. PROJECT NAME
   Name of Project (as it appears on plans)

2. City of Lawrence, Kansas
   Name of Applicant (Governmental Unit)

3. M - K S 3 1 - I O 0 1
   Kansas Water Pollution Control Permit Number for the Wastewater Treatment Facility which will treat the flow from this sewer extension.

4. Municipal Services and Operations Department, City of Lawrence, Kansas
   Name the engineer or engineering firm responsible for inspection of this extension.

In making application for a sewer extension permit, I hereby certify that continuous engineering observation of the construction of the proposed improvement, including building connections, shall be provided in accordance with Kansas Department of Health and Environment Regulation 28-16-55.

Signature: _____
Authorized Official

Print Name: City PM Name

Title: City PM Title

Mailing Address: City of Lawrence - MSO
P.O. Box 708
Lawrence, KS 66044

E-Mail Address: City PM Email Address

DESIGN ENGINEER DATA

1. PROJECT NAME
Name of Project (as it appears on plans)

2. Engineers estimate of construction cost PROJECT COST

3. What are the conditions and capacity of the existing sewer system downstream of this sewer extension?

a. What is the present average daily flow at the wastewater treatment facility? 10.1 MGD MGD

CIRCLE YES OR NO

b. Do the downstream sewer lines presently convey the peak flow without inducing backup into buildings or bypass to the environment? YES NO

c. Can the downstream receiving sewers convey the additional peak design flow generated after completion of this sewer extension without backup into buildings or bypassing to the environment? YES NO

d. If the answer to either of the above questions is NO, what steps are being taken to eliminate or prevent bypass or service line backup conditions?

_____
_____
_____ Attach additional pages if necessary.

4. What are the design flows for this sewer extension?
(Include a copy of the calculations for flow and list the following values)
Average daily ##### MGD Peak ##### MGD

5. If wastewater pumping facilities are included in the project, provide with this application the following: system curve, pump curve and total head calculations and planned control elevations i.e. pumps off, low level on, high level on, and alarm level.

The information contained above is accurate to the best of my knowledge.

Signature: _____
Kansas Licensed Engineer

Print Name: _____

Address: _____

_____

_____

E-Mail Address: _____

P.E. Stamp/Date/Signature

Checklist for Sewer Extension Plan Review

Project name: PROJECT NAME

City: Lawrence, Kansas **Project #:** Project # **Date:** DATE

Flow Check

Project ADF: #### mgd/Current ***{A}*** Average Daily Flow at WWTP/F 10.1 ***{B}***

Design Flow @ WWTP/F: 12.5 mgd ***{C}***

____ WWTF has capacity for added flow (***{A}*** + ***{B}*** < ***{C}***)

____ WWTF has valid NPDES permit (effective date: 8/1/2019)

____ Flow to correct WWTP

Facility Short Name: Kansas River Wastewater Treatment Facility NPDES KS0038644

Quick checks

____ Stamp & Seal on every plan sheet & cover sheet submitted OR a digital signature on cover sheet

____ Site map

____ North arrow and scale on every page necessary

____ Benchmarks stated

Stamps/Signatures/Officiality

____ Application is filled out correctly (i.e. correct NPDES number, signed in correct boxes)

____ PE Stamp on application

____ City Official signature on application

____ Appropriate specifications stated on transmittal letter, plans, or provided

Cross section/Pipe details

____ Easements/Right of ways

____ Connected to existing downstream sewer system

____ In/Out flow directions on manholes

____ In/Out flow elevations on manholes

____ Sanitary Sewer materials identified

____ Slope between each manhole is correct

____ Plan = profile MH

____ Cover depth > 30in (2.5ft)

____ Water/Sewer separation

____ Drop manholes

Misc.

____ Approved details on detail sheet

____ Access to manholes (opening >22in)

____ Cleanout distance not >150 ft from manhole

____ Collars on pipes

____ Trench plugs

____ Identify 100-year flood plain

____ Other: _____

External Reviewer Signature: _____

KDHE Reviewer Signature: _____

Design Document Downloads

- City of Lawrence Flow Calculators and Templates
  - lawrenceks.org/mso/development/

Design Flow Example:

Develop the design sanitary sewer flow rate for a development with the following characteristics:

Land Use:

10 ac medium density residential

6 ac office/multi family

4 ac office/commercial

Solution:

Step 1: Input the land use acreages into column A of the Land Use sheet as shown.

Step 2: Input the density into column E of the Land Use sheet as shown.

Step 3: Input the bounding values from the Design Table for developed acreage in column B of the Design Flow sheet as shown.

Step 4: Read the design flow as calculated in column N of the Design Flow Sheet as shown.

DEVELOPMENT LAND USE INPUT

Input Area Zoned Acres	Calculated Percent Zone as Decimal	Zone Type	Land Use Description	Input Density units/acre	Given Equivalent capita/unit	Calculated Equivalent capita/acre	Calculated Equivalent capita	Given Capita Usage gal/capita/day	Calculated Average WWP gal/acre/day	Given Infiltration gal/acre/day	Given Inflow Coeff K
0	0.00	1	Very Low Density Res	1.0	2.3	2.3	0	100	230	500	0.0035
0	0.00	2	Low Density Res	4.0	2.3	9.2	0	100	920	500	0.0035
10	0.50	3	Medium Density Res	12.0	2.3	27.6	276	100	2760	500	0.0035
6	0.30	4	Office//Multi Family	12.0	2.3	27.6	166	100	2760	200	0.0030
4	0.20	5	Office/Commercial	2.0	3.0	6.0	24	100	600	200	0.0030
0	0.00	6	Heavy Industry	1.0	25.0	25.0	0	100	2500	200	0.0030
0	0.00	7	Public	1.0	7.0	7.0	0	100	700	0	0.0005
0	0.00	8	Agriculture/Park	1.0	1.0	1.0	0	100	100	0	0.0005
20	1.00	Calculated Weighted Averages		10.0	2.4	23.3	466	100	2328	350	0.0033

DEVELOPMENT DESIGN FLOW CALCULATION

	Developed Factor	Tc 10 Yr i (minutes)	WWP Inflow (in/hr)	Peak WWP Infiltration Peaking Factor	Calculated Design Flow (cfs)	Calculated Design Flow (cfs)	Calculated ADF (cfs)	Inflow + Peak WWP + Infiltration = Calculated Peaking Equivalent Design Flow (cfs)	Calculated Design Flow/ADF (mgd)	Calculated (mgd)	Calculated Peaking Factor	Calculated (cfs)	Calculated (cfs)	Calculated (mgd)
		Population	(acres)											
Lesser value from Design Table	10.00	66.6	2.58	2.00	0.084	0.072	0.005	0.161	0.104	0.023	4.48	233	72	
Results for Development	**20.00**	69.1	2.58	1.95	0.168	0.141	0.011	0.319	0.206	0.047	4.43	466	143	
Higher value from Design Table	25.00	70.4	2.58	1.93	0.210	0.174	0.014	0.397	0.257	0.058	4.41	582	178	

Lawrence Design Data From 2003 Wastewater Master Plan			
Developed Acres	**Tc minutes**	**10 Yr "i" in/hr**	**WWP Peaking Factor**
1	62.1	2.58	2.17
10	66.6	2.58	2.00
25	70.4	2.58	1.93
50	74.7	2.58	1.88
75	78.1	2.16	1.85
100	80.9	2.16	1.83
250	93.0	1.89	1.76
500	106.6	1.69	1.71
750	117.1	1.69	1.68
1000	126.0	1.54	1.66
1250	133.7	1.54	1.64
1500	140.8	1.40	1.63
1750	147.3	1.40	1.62
2000	153.3	1.30	1.61
2500	164.3	1.30	1.59
3000	174.2	1.21	1.58
4000	191.9	1.13	1.56
5000	207.5	1.13	1.54
7000	234.5	1.00	1.52
7500	240.6	0.90	1.51
10000	268.6	0.90	1.49
50000	526.4	0.53	1.37