Drainage Report

Tyler Pointe Addition

To Wichita, Sedgwick County, Kansas

November 2012

kemiller engineering

516 S. Market
Wichita, Kansas 67202
(316) 264-0242

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Tab 1

Drainage Plan Submittal Checklist
Drainage Report
Preliminary Plat
Aerial Photograph/Location Map
USGS map with area highlighted

City of Wichita/Sedgwick County
Subdivision Drainage Plan Checklist

Submit completed forms to:
City of Wichita Public Works & Utilities, 455 N. Main 8th Floor, Wichita KS 67202; or
Sedgwick County Stormwater Management, 1144 S. Seneca, Wichita KS 67213.

Project Name:	Tyler Pointe Addition				
Total Area of Project:	23.31 **acres**				
Development Type:	LC	**Other:**			
Developer Name:	Occidental Mgmt.	**Contact:**	8111 E 23rd St. N	**Phone:**	(316) 262-3331
Email:					
Engineer Name:	Gyanendra (Guy) Pokhrel	**Contact:**	516 S Market	**Phone:**	(316)264 0242
Email:	guy@kemiller.com				

Directions:

(1) Fill-out this checklist completely and include it with the Drainage Plan submittal. This checklist should be included in the bound copy, behind the cover sheet for the submittal. Incomplete Drainage Plans and checklists will not be accepted.

*(2) Indicate whether a plan element is included or not included in the submittal by choosing "**Yes**" or "**No**" from the dropdown list in the **"Element Included?**" column. The question must be answered for every plan element for this checklist to be considered complete. An explanation must be provided for all **"No"** answers.*

Drainage Plan Checklist

#	Plan Element Description	Element Included?	Explanation/Notes
1.0	**General**		
1.1	Digital copy of drainage plan, including preliminary Master Grading Plan, preliminary plat and proposed plat, in PDF format and one half size, bound, paper copy.	Yes	Tab 6 of report
1.2	Professional Engineer's seal, signature and date on plan cover.	Yes	Cover page of report.
1.3	Site location map, using color ortho-imagery and showing the project boundaries, a north arrow and an accurate scale.	Yes	Tab 1: aerial/location Map.
1.4	Narrative of the development type, existing conditions and proposed impacts on stormwater runoff, wetlands, riparian zones and floodplains/floodways.	Yes	Tab 1: report. Tab 2: existing drainage map shows the existing site condition.
1.5	Discussion of off-site conditions surrounding the proposed development.	Yes	Tab 1: report and Tab 2: existing drainage map.
1.6	Summary table of runoff calculations (pre/post development).	Yes	Tab 2: existing drainage map.
1.7	Narrative description of the type and function of the permanent structural stormwater management facilities.	Yes	Tab 1: report
2.0	**Existing Conditions Information**		
2.1	**Existing Conditions Drainage Map**		
2.1.1	On-site and off-site topography: NAVD 88 datum, one-foot contours with spot elevations	Yes	Tab 2: existing drainage plan. (Topography in relation to NAVD 88 datum)
2.1.2	On-site and off-site drainage features, including perennial and intermittent streams (with names labeled), conveyance systems such as open channels, ditches, swales and areas of overland flow. Flow direction must be indicated by arrows.	Yes	Tab 2: as labeled in existing drainage map.
2.1.3	Storm sewer system components, including storm drains, inlets, catch basins, gutters, manholes, headwalls, pipes and culverts. Material and size must be noted for all pipes and culverts.	Yes	Tab 2: as labeled in existing drainage map.
2.1.4	Location and boundaries of natural features such as wetlands, lakes, ponds with the normal water elevation noted, rock outcroppings, wooded areas and tree rows.	Yes	Tab 2: as shown in existing drainage map.
2.1.5	Location, dimensions and elevations of existing bridges and culvert crossings.	Yes	Tab 2: as shown in existing drainage map.
2.1.6	Location of existing utilities (e.g., water, sewer, gas, electric, cable, etc.) with labels and easement boundaries.	Yes	Tab 2: as shown in existing drainage map.
2.1.7	Groundwater elevations, if applicable.	No	Not applicable.
2.1.8	Delineation of predominant soil based on USDA soil surveys and/or on-site soil borings; indicate NRCS soil name and Hydrologic Soil Group for undisturbed surface soils.	Yes	Tab 1 report. Tab 2: existing drainage map.
2.1.9	Land use types per NRCS nomenclature.	No	Not applicable as the land is already developed.
2.1.10	Footprint of existing impervious areas (labeled, area given in acres).	No	Not applicable. All of the site is covered by grass.
2.1.11	Internal drainage subbasin boundaries used for hydrologic calculations (labeled with ID, total area in acres, impervious area in acres and curve number).	Yes	Tab 2 : existing drainage map.
2.1.12	Time of concentration flow paths. Indicate and label each segment separately (i.e., overland flow, shallow concentrated, channel1, channel2, etc.). For each segment, provide the appropriate data to calculate Tc (e.g., length, slope, cover type, paved/unpaved, roughness parameters, geometric properties, etc.)	Yes	Tab 2: existing drainage plan. Undeveloped Tc calculation is shown in existing drainage map with flow paths with existing flow condition.
2.2	**Existing Conditions Hydrology and Hydraulics Analysis**		

Drainage Plan Checklist			
#	Plan Element Description	Element Included?	Explanation/Notes
2.2.1	Narrative of the hydrologic analysis methodology used (e.g., unit hydrograph or other approved methods).	Yes	Tab 2: existing drainage map.
2.2.2	A summary table of drainage subbasin hydrologic parameters (subbasin ID, area in acres, curve number, Tc, etc.).	Yes	Tab 2: existing drainage map.
2.2.3	Table of existing condition runoff curve numbers with supporting data and calculations.	Yes	Tab 2: existing drainage map.
2.2.4	Table of existing condition times of concentration with supporting data and calculations.	Yes	Tab 2: existing drainage map.
2.2.5	A summary table of rainfall data used in the hydrologic analysis, and a reference for the source of the data.	Yes	Tab 2: existing drainage map.
2.2.6	Cross-sections and other diagrams of existing open channels, bridge and culvert sections and other hydraulic features as required to illustrate the basis for hydraulic analysis.	Yes	Tab 2: existing drainage map.
2.2.7	Hydrologic and hydraulic analyses for runoff rates, volumes, velocities and elevations. Provide supporting data not specified above and identify assumptions. Include detailed calculations for the 2, 5, 10, 25 & 100-year, 24-hour storm events. Provide results in a tabular form. Provide digital copies of any computer files and models used.	Yes	Hydrologic analysis for existing condition is included in existing drainage map. Supporting data, assumed conditions and calculations can be found in drainage plan.
3.0	**postdevelopment Conditions Information**		
3.1	**postdevelopment Conditions Drainage Map**		
3.1.1	Proposed project boundary.	Yes	Tab 3: Proposed drainage plan.
3.1.2	on-site and off-site topography: NAVD 88 datum, one-foot contours with spot elevations.	Yes	Tab 3: Proposed drainage plan/preliminary plat
3.1.3	Existing on-site and off-site drainage features that are to remain after development, including perennial and intermittent streams (with names labeled), conveyance systems such as open channels, ditches, swales and areas of overland flow. Flow direction must be indicated by arrows.	Yes	Tab 3: Proposed drainage plan.
3.1.4	Location and description of off-site through-drainage conveyances which are confined to an easement, dedication and/or reserve.	No	Tab 3: Proposed drainage plan.
3.1.5	Footprint of proposed impervious areas, including roads, parking lots, buildings and other structures.	Yes	Tab 3: Proposed drainage plan.
3.1.6	Location of proposed utilities (e.g., water, sewer, gas, electric, cable, etc.) with labels and easement boundaries.	Yes	Tab 3: Proposed drainage plan.
3.1.7	Delineation of predominant soils, based on anticipated soil textures and NRCS guidelines if different from predevelopment soil conditions; indicate NRCS soil name and Hydrologic Soil Group for surface soils.	Yes	HSG for surface soil based on City of Wichita soil group map is included in proposed drainage plan/report.
3.1.8	Land use cover per NRCS nomenclature.	No	Not applicable as the land is already developed.
3.1.9	Internal drainage subbasin boundaries used for hydrologic calculations (labeled with ID, total area in acres, impervious area in acres and curve number).	Yes	Tab 3: Proposed drainage plan.
3.1.10	Proposed limits of land disturbing activity (i.e., grading limits).	Yes	Tab 3: Proposed drainage plan.
3.1.11	Time of concentration flow paths. Indicate and label each segment separately (i.e., overland flow, shallow concentrated, channel1, channel2, etc.). For each segment, provide the appropriate data to calculate Tc (e.g., length, slope, cover type, paved/unpaved, roughness parameters, geometric properties, etc.).	Yes	Developed drainage plan. Proposed Tc calculation is shown in proposed drainage plan with flow paths as indicated by flow arrows.
3.2	**Proposed Conveyances Map**		
3.2.1	on-site and off-site drainage features, including perennial and intermittent streams (with names labeled), proposed conveyance systems (such as open channels, ditches, swales and areas of overland flow, including backyard drainage). Flow direction must be indicated by arrows.	Yes	Tab 3: Proposed drainage plan.
3.2.2	Storm sewer system components, including storm drains, inlets, catchbasins, gutters, manholes, headwalls, pipes and culverts. Material and size must be noted for all pipes and culverts.	Yes	Tab 3: Proposed drainage plan.
3.2.3	For any subbasin or drainage area > 40 acres, show that the stormwater flow is confined to an open channel with required side benches and freeboard, or conformance to applicable policy and design requirements if partially enclosed.	No	Not applicable as the site is less than 40 acre.
3.2.4	Location(s) of stormwater management facilities and any associated drainage easements.	No	Tab 3: Proposed drainage plan.
3.2.5	Proposed energy dissipaters and other channel protection devices.	No	Not applicable as no channel protection devices needed.
3.2.6	Location(s) and dimension(s) of proposed channel, bridge and culvert crossings.	Yes	Typical section/x sections are shown in drainage plan.
3.2.7	Normal pool and 100-year pool elevations for ponds and lakes.	No	Tab 3: Proposed drainage plan.
3.2.8	Permanent concrete outfall control structure(s) for ponds.	No	Tab 3: Proposed drainage plan.
3.2.9	Emergency overflow spillways and top of berm elevations for ponds and other volume/peak discharge control facilities.	No	Tab 3: Proposed drainage plan.
3.2.10	Floodplains, ponds, and stormwater management facilities located in reserves.	No	Tab 3: Proposed drainage plan.
3.3	**postdevelopment Conditions Hydrology & Hydraulics**		
3.3.1	Narrative of the hydrologic analysis methodology used (e.g., unit hydrograph or other approved methods).	Yes	Report/Proposed drainage plan.

Drainage Plan Checklist			
#	Plan Element Description	Element Included?	Explanation/Notes
3.3.2	A summary table of drainage subbasin hydrologic parameters (subbasin ID, area in acres, curve number, Tc, etc.).	Yes	Tab 3: Proposed drainage plan.
3.3.3	Table of postdevelopment condition runoff curve numbers with supporting data and calculations.	Yes	Tab 3: Proposed drainage plan.
3.3.4	Table of postdevelopment condition times of concentration with supporting data and calculations.	Yes	Tab 3: Proposed drainage plan.
3.3.5	Cross-sections and other diagrams of existing open channels, bridge and culvert sections and other hydraulic features as	Yes	Tab 3: Proposed drainage plan.
3.3.6	Hydrologic and hydraulic analyses for runoff rates, volumes, velocities and elevations. Provide supporting data not specified above and identify assumptions. Include detailed calculations for the 2, 5, 10, 25 & 100-year, 24-hour storm events. Provide results in a tabular form. Provide digital copies of any computer files and models used.	Yes	Tab 3: Proposed drainage plan.
3.3.7	Downstream peak discharge assessment (10% Rule) results and supporting data and calculations. Provide digital copies of any computer files and models used.	Yes	Not applicable as the post peak equals to existing peak.
3.3.8	Stage-storage-discharge or other outlet rating curves and inflow/outflow hydrographs for all ponds.	No	Tab 3: Hydrologic analysis.
3.3.9	Demonstrate that the pond contours on the master grading plan and the stage-storage-discharge data are consistent for all ponds.	No	Tab 3: Proposed drainage plan.
3.3.10	Demonstrate that all ponds have one foot of freeboard above the 100-year, 24-hour high water level.	No	Tab 3: Proposed drainage plan.
3.3.11	Demonstrate that runoff from the proposed project site is discharged in the same manner as prior to development, using level spreaders, energy dissipaters, other devices or grading as required, or identify an appropriate flowage easement.	Yes	Tab 3: Proposed drainage plan. The detail of outlet structure is included in drainage plan.
3.4	**Stormwater Quantity Control Sizing**		
3.4.1	Hydraulic sizing calculations for all stormwater management controls.	Yes	Tab 3: Hydrologic analysis, proposed drainage plan.
3.4.2	Table(s) listing all stormwater management controls. Present the types, sizes, elevations, flows, velocities and depths for each control, as applicable. Verify that velocities are self-cleaning and non-erosive.	Yes	Tab 3: Hydrologic analysis, proposed drainage plan.
3.4.3	Typical details (including cross-sections where applicable) for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc.	Yes	Tab 3: Hydrologic analysis, proposed drainage plan.
3.5	**Stormwater Quality Management Facilities**		
3.5.1	Table(s) listing all stormwater management facilities. Present the description, % TSS removal value, water quality volume handled, contributing drainage area in acres and contributing impervious area in acres.	Yes	Tab 3: Proposed drainage plan.
3.5.2	Indicate the responsible party for maintenance, as shown in the plat text (i.e., Home Owners Association, Lot Owners Association, property owner, etc.).	Yes	Tab 3: Proposed drainage plan, preliminary plat
3.5.3	Water quality volume (total and by facility), with supporting data and calculations.	Yes	Tab 3: Proposed drainage plan.
3.5.4	% TSS removal value (total and by facility) with supporting data and calculation. Must be equal to or greater than 80%.	Yes	Tab 3: Proposed drainage plan.
3.5.5	Channel protection volume with supporting data and calculations.	No	Tab 3: Proposed drainage plan.
3.5.6	Water quality volume and channel protection volume orifice size calculations.	No	Tab 3: Hydrologic analysis, proposed drainage plan.
3.5.7	Other calculations required for each stormwater management facility as specified in the Wichita/Sedgwick County Stormwater Manual.	No	Not applicable.
3.5.8	Typical details (including cross-sections where applicable) for outlet structures, embankments, internal grading, forebays and other siltation prefilters, filtration/infiltration media, vegetation, check dams, operational controls, etc.	No	Tab 3: Proposed drainage plan.
4.0	**Floodplains**		
4.1	Reference the source of flood profile, floodplain, floodway and stream discharge information.	Yes	Site is not in floodplain and the FIRM Panel # is referenced in drainage plan.
4.2	Delineation of nearest base flood elevations.	No	The 100 yr WS is marked in drainage plan.
4.3	Delineation of predevelopment regulatory floodplain/floodway limits using FEMA's current GIS database; limits to be per elevation and scaled location.	No	Not applicable for this site.
4.4	Delineation of postdevelopment regulatory floodplain/floodway limits; limits to be per elevation and scaled location, with project limits shown.	No	Not applicable for this site.
4.5	Floodway data table and discharges.	No	Not applicable for this site.
4.6	Hydrologic and hydraulic study information for local floodplain analysis, unnumbered Zone A elevation determinations and floodplain map revisions or required permits.	No	Not applicable for this site.
4.7	Regulatory floodway and four natural profile models (10, 50, 100 and 500-year) for existing and postdevelopment conditions.	No	Not applicable for this site.
4.8	Floodplains and floodways located within a reserve, where necessary.	No	Tab 3: Proposed drainage plan.
4.9	Floodplain cut and fill calculations for volume sensitive basins.	No	Not applicable for this site.

Drainage Plan Checklist			
#	Plan Element Description	Element Included?	Explanation/Notes
4.10	Demonstrate that floodway elevations and velocities do not increase due to construction in the floodway ("No Rise Certification").	No	Not applicable for this site.
5.0	**Federal, State and Local Permits**		
5.1	US Army Corps of Engineers regulatory program permits (Section 404 permit)	No	Not applicable for this site.
5.2	Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Floodplain Fill, Levee, Water Appropriations, Dam Safety permit, etc.).	No	Not applicable for this site.
5.3	FEMA letters of map change/revision - LOMA, LOMR, LOMR-f, CLOMR, etc.; shall be included and approved when project modifies the limits of the floodplain/floodway.	No	Not applicable for this site.
6.0	**Half Scale Preliminary Master Grading Plan**		
6.1	One set of plans and associated PDF of plans.	Yes	Grading will follow the flow arrows shown in proposed drainage plan.
6.2	Professional Engineer's seal, signature and date.	Yes	Seal is included in cover page of report.
6.3	Title block including subdivision name and phase and dated revision documentation.	Yes	Cover page of report.
6.4	Future phases shown but cross-hatched as information only.	No	Not applicable for this site.
6.5	Scale, not greater than 1-inch = 60 feet.	No	Not applicable.
6.6	North arrow.	Yes	Sown on all the plans.
6.7	Index or legend key.	No	Not applicable.
6.8	Benchmarks (minimum of 2) used for site control (NAVD 88 vertical datum).	Yes	Proposed Drainage Plan
6.9	Existing contours of entire site with contour interval of one foot.	Yes	Proposed Drainage Plan
6.10	Proposed contours for channels, ponds, and other permanent stormwater management facilities, with contour interval of one foot.	Yes	Proposed Drainage Plan
6.11	Spot elevations shown to the nearest tenth of a foot for critical locations, including lot and property boundaries.	No	Not applicable.
6.12	Proposed lot and street layout.	No	Not applicable.
6.13	Locations of underground storm drains.	Yes	Existing storm sewers are shown in drainage plan.
6.14	Overflow locations for storms exceeding storm drain capacity, with elevations.	Yes	Indicated by flow arrows.
6.15	Top elevations of storm drains at all inlets, manholes, and flow line elevations for all outfalls.	Yes	Proposed Drainage Plan
6.16	Locations of open ditches and lakes.	Yes	Proposed Drainage Plan
6.17	Flow direction arrows.	Yes	Proposed Drainage Plan
6.18	Proposed flow line elevations of all open ditches at maximum 100 foot intervals, and 100-year flood elevations thereon.	Yes	Proposed Drainage Plan
6.19	Ponds: Location, bottom elevation, normal pool elevation, 100-year flood elevation, emergency overflow elevation.	Yes	Proposed Drainage Plan
6.20	Proposed top-of-curb elevations at points where drainage will be required to flow over the curb.	No	Not applicable for this site.
6.21	Platted minimum building opening elevation for each lot, in table form for all lots (excluding basement floor elevations).	No	Not applicable for this site.
6.22	Standard foundation and elevation detail for slab on grade, full basement, view-out, partial view-out and/or walk-out construction.	No	Not applicable for this site.
6.23	Top of foundation elevation for each lot.	No	Not applicable for this site.
6.24	Notation for builders for each lot as to the type of structure that may be constructed and the view-out, walk-out or pad elevation, as applicable.	No	Not applicable for this site.
6.25	Indicate that all lots are above the 100-year flood elevation.	Yes	Proposed Drainage Plan
6.26	Indicate that grading around structures conforms to perimeter drainage requirements.	No	Not applicable for this site.
6.27	Indicate that backyard drainage grading conforms to backyard drainage requirements.	No	Not applicable for this site.
6.28	Adjacent subdivision lot lines, with lot labels and subdivision names.	Yes	Preliminary plat/ Proposed drainage plan.
6.29	Boundaries and labels for all easements, rights-of-way and reserves.	Yes	Preliminary/final plat.
6.30	Statement on proposed final plat: "*A drainage plan has been developed for the subdivision and all drainage easements, rights-of-way, or reserves shall remain at the established grades and remain unobstructed to allow for the conveyance of stormwater.*"	Yes	Included in final plat.
End of Checklist			

Drainage Report
Tyler Pointe Addition

Introduction

The subject property is located on southeast corner of 13th St. N and Tyler Road. Currently the tract of land is owned by Northwest High School. The land is open and covered by grass. The tract of the land for proposed development is 23.31 acres. The tract of land is zoned as single family residential (SF-5). The propose use of the land is to develop into commercial area with buildings, parking and detention basin.

Existing Conditions

The site is served by city of Wichita utilities. The site is open and covered by grass. There is an existing grass channel that runs through the property. The channel receives offsite runoff from about 96.4 acres of drainage basin north of 13th St and west of school building. The entire tract of development drains to the channel. The grass channel starts at south of 13th St and continues south. The grass channel drains to the east of Tyler with the help of curvets at Tyler and drains to the Cowskin Creek. The existing condition indicates that the subject property drains to the southeast at an average land slope of 1.6% before getting in to the channel. The average longitudinal slope of the channel is 0.37%. The soils are of Type C. There is a 60" RCP culvert under NW Stadium Road before runoff the channel crosses Tyler Road.

There is existing 36" RCP that drains to the channel from school site. Existing drainage pattern indicates that all of the subject property is part of the drainage basin of channel that runs through the property. The north offsite drainage basin comprises of residential and commercials land. There are existing storm sewers north of 13th St. to collect runoff. There are no other outfall in to the existing channel from the north offsite basin except 5'X7' RC box structure under 13th St.

According to the FIRM, the subject property is not in the designated floodplain. The nearest 100-yr defined floodplain (Zone A) is about 1/2 miles west of the property, as indicated on the attached FIRM panel in tab 4.

The attached plat with topography and existing drainage map show existing features including contours, utilities, and proposed easements. The existing drainage map, as attached in tab 2. The attached map also shows the current flow pattern and peak flow calculations.

Proposed Improvements

The proposed improvement is to develop into a commercial area which will include multiple buildings, parking and detention basin for flood protection. A small area in

detention basin will be wet for water quality. The proposed site in developed condition will be maintained its drainage to the channel or detention basin. The existing channel will be rerouted to fit the site plan. The proposed drainage plan shows the layout of building, parking, rerouted channel and detention basin. There will be internal storm sewers in develop condition to collect the runoff from the site to the channel or basin. The detention basin and outlet structure are designed to handle the onsite detention and to offsite flow rate.

Attached proposed drainage plan illustrates the drainage patterns, flow rates, assumed condition and change of peak flow from the existing to developed condition.

Best management practices for erosion control will include ditch checks in the proposed channels, inlet protection at all inlets, silt fence where applicable, and sediment ponds within the detention basins. The erosion control plan will have to evolve as the site develops.

Site Hydrological Analysis

Existing and proposed site runoff calculations have been modeled using the SCS Curve Number (CN) method for Type II rainfall. The Values for Curve Number (CN) and Rainfall Intensity were established using the *City of Wichita/Sedgwick County Stormwater Manual.* Existing times of concentration were calculated from existing ground conditions and can be found in tab 2. Proposed times of concentration have been modeled using the proposed site runoff and accounting for the use of storm sewers and channels to route the runoff.

Hydraulic Model

An analysis of hydraulic characteristics for basin outlet structure and grass channel is conducted and the results are attached in hydrological section of Tab 3. A hydraulic model for internal storm sewer system will be required as the site evolves.

Future Development

Future addition of more impervious area or expansion site requires analysis of detention basin and outlet structure.

Not to scale

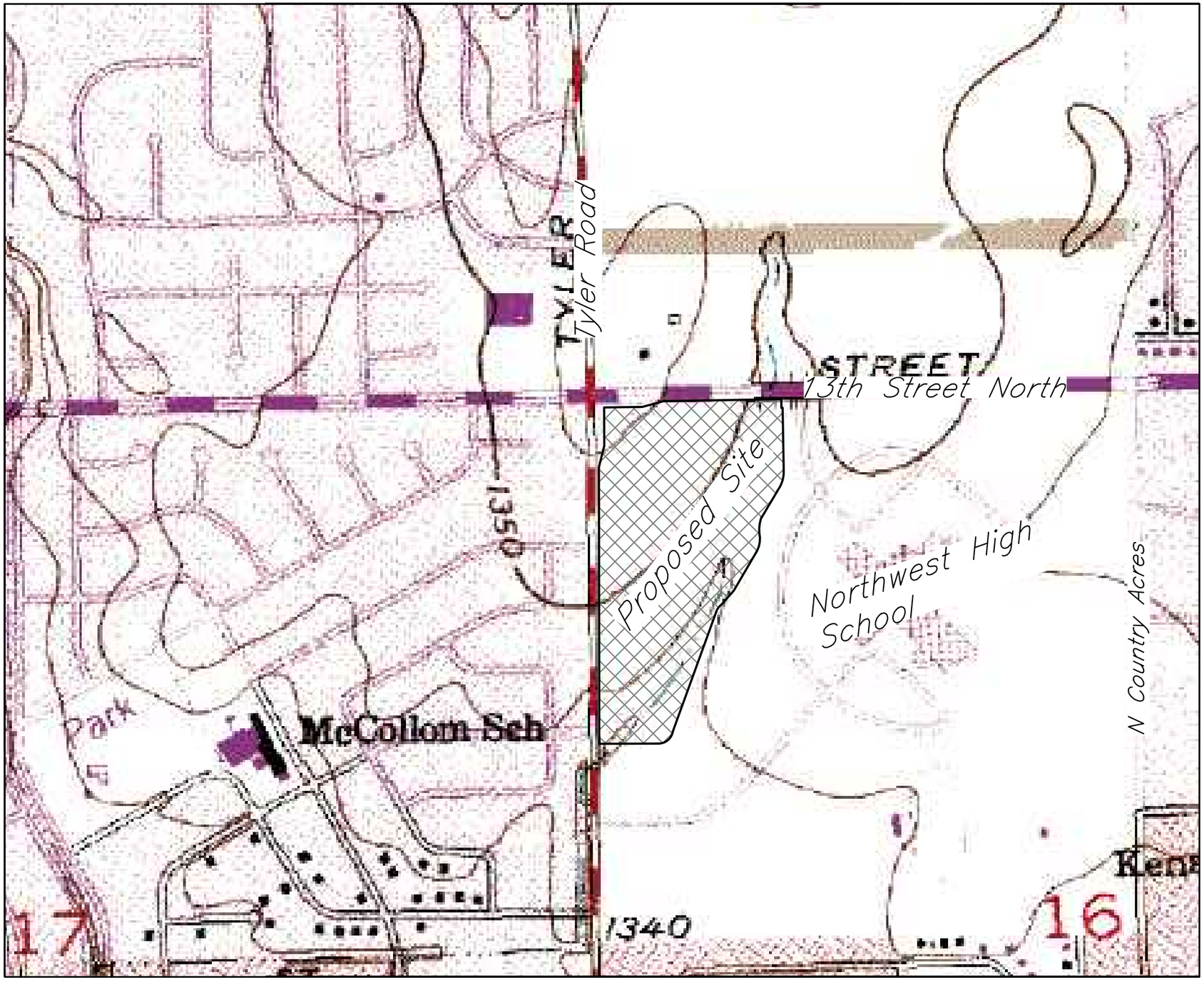
Tyler Pointe Addition

Aerial Map

Wichita, Kansas

kemiller engineering
510 S. Market, Wichita, KS 67202 (316)264-0242

PROJECT NUMBER			
KEM NO. 12092	FILE	DATE 10/2012	SHEET 1.0
DESIGN GP	DRAWN GP	REVISED	



Not to scale

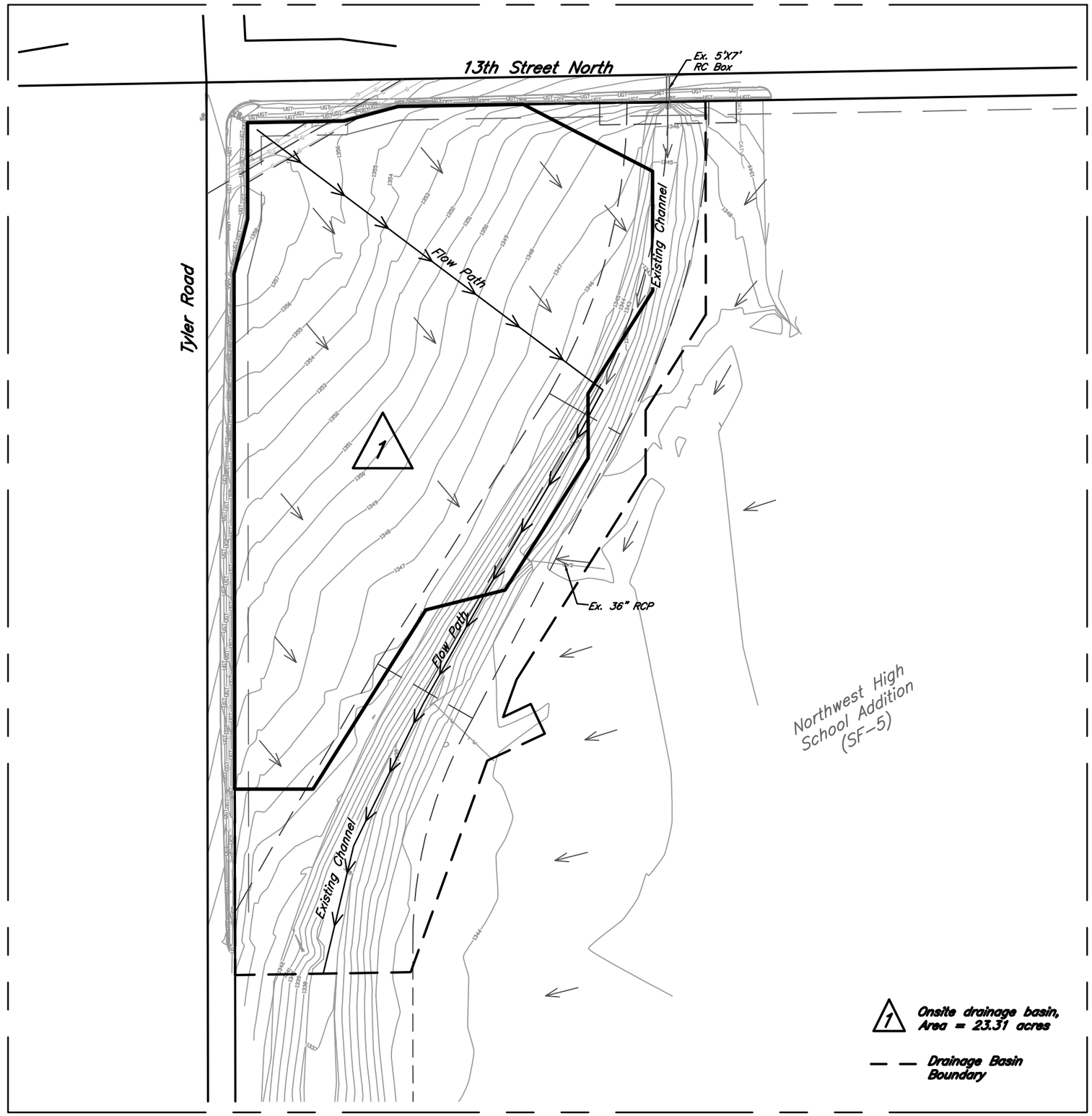
Tyler Pointe Addition
USGS MAP
Wichita, Kansas

kemiller engineering
316 S. Market, Wichita, KS 67202 (316)264-0242

PROJECT NUMBER			
KEM NO. 12092	FILE	DATE 10/2012	SHEET 1.0
DESIGN GP	DRAWN GP	REVISED	

Tab 2:

Existing Drainage Map



Existing/Undeveloped Site

Total Site Area= 23.31 Acres
Impervious Area= 0.00 Acres
Soil Group C
Undisturbed area, CN=80

Existing Tc Calculation:
Flow Length=1981 ft,
Sheet flow,
Flow length=150 ft, Average slope of ground 1.6%
Tc1=14.2 min
Shallow concentrated flow,
Flow length=600 ft, Average slope of ground 1.6%
Tc2=5.3 min
Channel flow,
Flow length=1231ft, Average longitudinal slope 0.28%
Tc3=4.5 min
Total Tc=24.0 min

Existing Drainage Calculations

Area #	Acres	Tc min	24-hr rainfall depth (inches) 2-yr	5-yr	10-yr	25-yr	100-yr	Curve Number (CN)	Existing Q, cfs Q2	Q5	Q10	Q25	Q100	Remark
On Site(1)	23.31	24	3.50	4.50	5.20	6.10	7.80	80	37.07	56.16	70.00	88.09	122.72	Onsite runoff in existing condition

1 **Onsite drainage basin, Area = 23.31 acres**

Drainage Basin Boundary

100 0 50 100 200 400
(IN FEET)
1 inch = 100 ft.

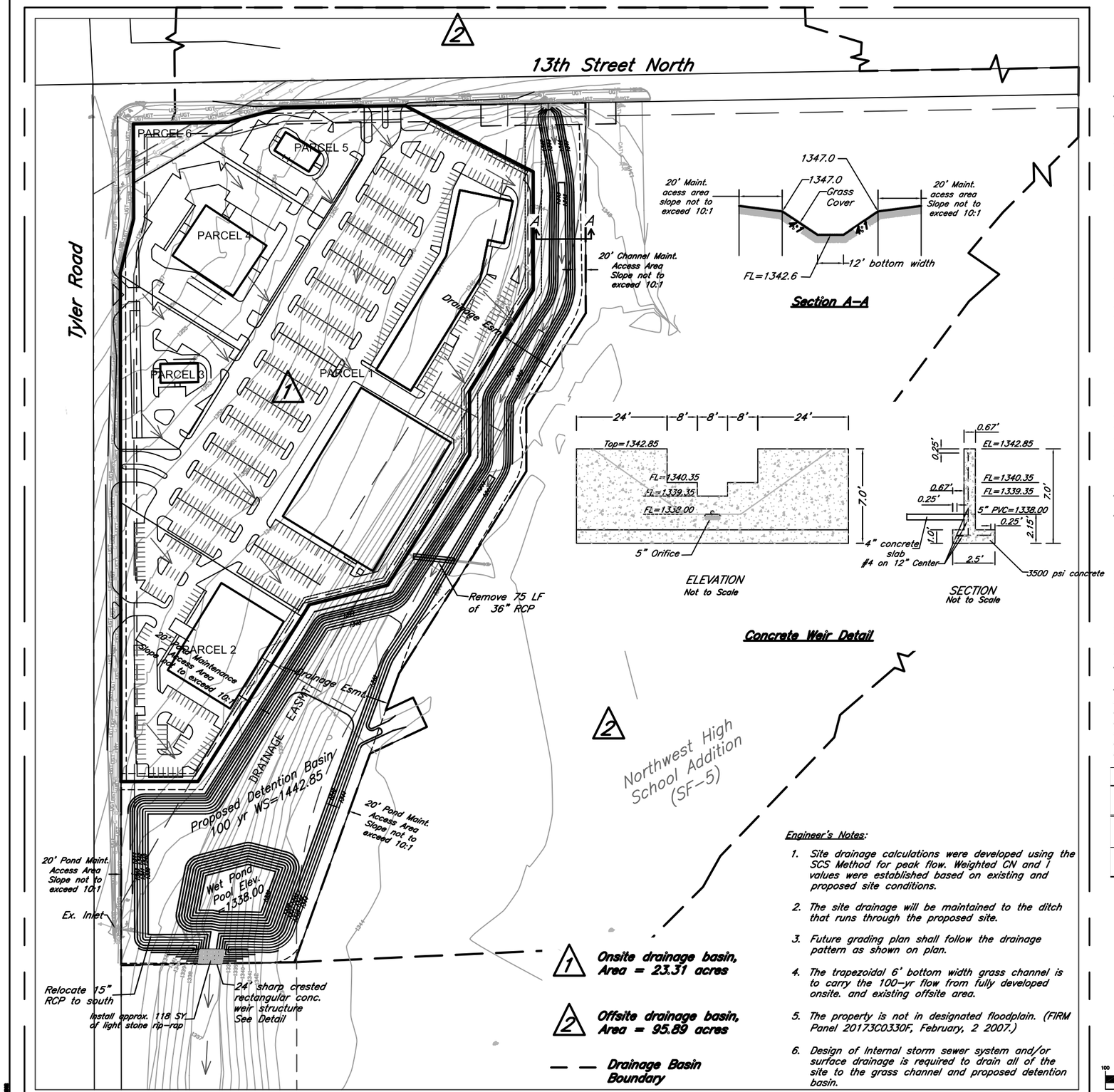
Tyler Pointe Addition
Existing Drainage Map
Wichita, Kansas

kemiller engineering
516 S. Market, Wichita, KS 67202 (316)264-0242

PROJECT NUMBER			
KEM NO. 12098	FILE	DATE 10/2012	SHEET 1.0
DESIGN GP	DRAWN GP	REVISED	

Tab 3:

Proposed Drainage Plan
Hydrological/Hydraulic Analysis



Section A–A

ELEVATION
Not to Scale

SECTION
Not to Scale

Concrete Weir Detail

Engineer's Notes:

1. Site drainage calculations were developed using the SCS Method for peak flow. Weighted CN and I values were established based on existing and proposed site conditions.
2. The site drainage will be maintained to the ditch that runs through the proposed site.
3. Future grading plan shall follow the drainage pattern as shown on plan.
4. The trapezoidal 6' bottom width grass channel is to carry the 100–yr flow from fully developed onsite. and existing offsite area.
5. The property is not in designated floodplain. (FIRM Panel 20173C0330F, February, 2 2007.)
6. Design of Internal storm sewer system and/or surface drainage is required to drain all of the site to the grass channel and proposed detention basin.

Project Narrative:
The site is located on the southeast corner of 13th St. N and Tyler Road. The site is undeveloped and covered by grass. There is an existing grass channel runs through the property. Approximately 96 acres of offsite area(north of 13th St.) drains to the channel. The proposed use of land is to develop in to a commercial site which will include buildings, parking and detention basin. All of the proposed site drains to the channel and will continue to follow in develop condition. The flood detention, TSS removal and channel protection detention will be achieved in proposed basin as shown in plan.

Water Quality and TSS Removal

Water Quality Volume (WQv)

Calculation for water quality volume (WQv=P*Rv*A/12)				Soil Group 'C'		
85th percentile storm event (1.2 inches),P =	1.2	inches		Calulation of Rv		
Total area, A =	23.31	acres			Coeff.	Area
Rainfall Coeff, Rv, =	0.649	cf		Coeff for undisturbed area,R_{VU}=	0.04	0.00
Required Vol. for Water Quality =	**1.51**	ac-ft		Coeff for turf cover,disturbed,R_{VT}=	0.22	9.61
				Coeff for impervious area, R_{VI}=	0.95	13.70
				Weighted, Rv =	**0.649**	

Stage Storage for Retention Portion of Basin

Contour Elev (ft)	Area (sq ft)	Stage Volume (cu	Cumulative Vol (sq ft)	Cumulative Vol (ac-ft)
1330	9580			
1331	11652	10616	10616	0.24
1332	13919	12786	23401.5	0.54
1333	16364	15142	38543	0.88
1334	18972	17668	56211	1.29
1335	21738	20355	76566	1.76
1336	24661	23200	99765.5	2.29
1337	27741	26201	125966.5	2.89
1338	30977	29359	155325.5	3.57

Water Quality Peak Flow Calculation

Area=	23.31	acres
WQv=	0.779	inches
Pond and Swamp Factor, Fp=	0.700	
Calculated CN=	95.55	
S=	0.466	inches
Ia=	0.093	inches
Ia/P=	0.078	
qu	700.0	cfs/sq.mi/in
Water quality peak flow	**13.90**	**cfs**

Water quality volume is treated in retention portion of the proposed basin with pool elevation of 1338. Available storage>WQv.

Channel Protection

Channel protection volume for entire basin (1) is detained in basin located south of proposed development along the channel. The required extended detention is archived by 5" orifice located at an elevation of 1338.0 on the wall of proposed weir structure. The weir structure will drains the access runoff. Detention time for CPv= 24.08 hrs (centroid–centroid)

Channel Protection Volume Calculation

Drainage Basin	Acres	Developed: 24 hr 1 yr Storm	Developed: Curve Number (CN)	Developed: S	Developed: Runoff Volume inches	Existing: 24 hr 1 yr Storm	Existing: Curve Number (CN)	Existing: S	Existing: Runoff Volume inches
1	23.31	2.80	92	0.870	**1.97**	2.80	80	2.500	**1.10**

Flood Control (2–, 5–, 10–, 25– and 100–yr)

DEVELOPED CONDITION:
Onsite Area, A1 = 23.31 acres (including pond and channel area)
Offsite Area, A2 = 95.89 acres (Drainage area north of 13th St.+ Part of school area)
Hydrological Soil Group = C
Onsite CN=92 (calculated based on proposed improvement), TC=15 min
Offsite CN=92 (calculated using existing land use), TC=41.9 min

DEVELOPED SITE

DRAINAGE AREA	ACRES	Tc min	CN	Q2	Q5	Q10	Q25	Q100	REMARKS
On-site (1)	23.31	15	92	73.54	98.80	116.38	138.85	180.99	Commercial Area
Off-site (2)	95.89	42	92	171.52	231.57	273.39	326.90	427.28	Resedential+Commercial+ School Area

OUTFLOW

DRAINAGE AREA	ACRES	Q2	Q5	Q10	Q25	Q100	REMARKS
Off-site (1+2)	119.2	146.03	212.57	257.46	313.36	416.89	Total area drainaing to basin

100 0 50 100 200 400
(IN FEET)
1 inch = 100 ft.

Tyler Pointe Addition
Proposed Drainage Plan
Wichita, Kansas

kemiller engineering
816 S. Market, Wichita, KS 67202 (316)264-0342

PROJECT NUMBER

KEM NO. 12098	FILE	DATE 10/2012	SHEET 1.0
DESIGN GP	DRAWN GP	REVISED	

Stage Storage Summary for detention basin
(2-, 5-, 10-, 25-, 100-yr 24 hr storm)

Summary for Pond P1: South Pond

Inflow Area = 119.200 ac, Inflow Depth = 2.64" for 2-yr 24 hr event
Inflow = 191.02 cfs @ 12.33 hrs, Volume= 26.192 af
Outflow = 143.22 cfs @ 12.61 hrs, Volume= 26.129 af, Atten= 25%, Lag= 17.1 min
Primary = 143.22 cfs @ 12.61 hrs, Volume= 26.129 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 1,341.44' @ 12.61 hrs Surf.Area= 148,073 sf Storage= 373,164 cf

Plug-Flow detention time= 288.7 min calculated for 26.107 af (100% of inflow)
Center-of-Mass det. time= 291.4 min (1,111.2 - 819.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,338.00'	811,506 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,338.00	30,977	0	0
1,339.00	98,182	64,580	64,580
1,340.00	125,610	111,896	176,476
1,341.00	140,613	133,112	309,587
1,342.00	157,551	149,082	458,669
1,343.00	176,533	167,042	625,711
1,344.00	195,057	185,795	811,506

Device	Routing	Invert	Outlet Devices
#1	Primary	1,338.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	1,339.35'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.6' Crest Height
#3	Primary	1,340.35'	**16.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.6' Crest Height

Primary OutFlow Max=142.72 cfs @ 12.61 hrs HW=1,341.44' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 1.18 cfs @ 8.65 fps)
- **2=Sharp-Crested Rectangular Weir** (Weir Controls 80.06 cfs @ 5.06 fps)
- **3=Sharp-Crested Rectangular Weir** (Weir Controls 61.48 cfs @ 3.58 fps)

Summary for Pond P1: South Pond

Inflow Area = 119.200 ac, Inflow Depth = 3.60" for 5-yr 24 hr event
Inflow = 257.94 cfs @ 12.32 hrs, Volume= 35.780 af
Outflow = 209.57 cfs @ 12.56 hrs, Volume= 35.717 af, Atten= 19%, Lag= 14.4 min
Primary = 209.57 cfs @ 12.56 hrs, Volume= 35.717 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 1,341.86' @ 12.56 hrs Surf.Area= 155,230 sf Storage= 437,239 cf

Plug-Flow detention time= 230.6 min calculated for 35.717 af (100% of inflow)
Center-of-Mass det. time= 229.3 min (1,040.5 - 811.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,338.00'	811,506 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,338.00	30,977	0	0
1,339.00	98,182	64,580	64,580
1,340.00	125,610	111,896	176,476
1,341.00	140,613	133,112	309,587
1,342.00	157,551	149,082	458,669
1,343.00	176,533	167,042	625,711
1,344.00	195,057	185,795	811,506

Device	Routing	Invert	Outlet Devices
#1	Primary	1,338.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	1,339.35'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.6' Crest Height
#3	Primary	1,340.35'	**16.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.6' Crest Height

Primary OutFlow Max=208.08 cfs @ 12.56 hrs HW=1,341.85' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 1.25 cfs @ 9.19 fps)
- **2=Sharp-Crested Rectangular Weir** (Weir Controls 105.44 cfs @ 5.61 fps)
- **3=Sharp-Crested Rectangular Weir** (Weir Controls 101.39 cfs @ 4.29 fps)

Summary for Pond P1: South Pond

Inflow Area = 119.200 ac, Inflow Depth = 4.28" for 10-yr 24 hr event
Inflow = 304.57 cfs @ 12.32 hrs, Volume= 42.562 af
Outflow = 254.35 cfs @ 12.54 hrs, Volume= 42.498 af, Atten= 16%, Lag= 13.4 min
Primary = 254.35 cfs @ 12.54 hrs, Volume= 42.498 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 1,342.12' @ 12.54 hrs Surf.Area= 159,803 sf Storage= 477,495 cf

Plug-Flow detention time= 202.6 min calculated for 42.498 af (100% of inflow)
Center-of-Mass det. time= 201.6 min (1,008.1 - 806.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,338.00'	811,506 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,338.00	30,977	0	0
1,339.00	98,182	64,580	64,580
1,340.00	125,610	111,896	176,476
1,341.00	140,613	133,112	309,587
1,342.00	157,551	149,082	458,669
1,343.00	176,533	167,042	625,711
1,344.00	195,057	185,795	811,506

Device	Routing	Invert	Outlet Devices
#1	Primary	1,338.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	1,339.35'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.6' Crest Height
#3	Primary	1,340.35'	**16.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.6' Crest Height

Primary OutFlow Max=252.23 cfs @ 12.54 hrs HW=1,342.11' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 1.30 cfs @ 9.51 fps)
- **2=Sharp-Crested Rectangular Weir** (Weir Controls 121.93 cfs @ 5.94 fps)
- **3=Sharp-Crested Rectangular Weir** (Weir Controls 129.00 cfs @ 4.69 fps)

Summary for Pond P1: South Pond

Inflow Area = 119.200 ac, Inflow Depth = 5.17" for 25-yr 24 hr event
Inflow = 364.23 cfs @ 12.32 hrs, Volume= 51.333 af
Outflow = 310.12 cfs @ 12.53 hrs, Volume= 51.269 af, Atten= 15%, Lag= 12.7 min
Primary = 310.12 cfs @ 12.53 hrs, Volume= 51.269 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 1,342.41' @ 12.53 hrs Surf.Area= 165,403 sf Storage= 525,462 cf

Plug-Flow detention time= 172.6 min calculated for 51.227 af (100% of inflow)
Center-of-Mass det. time= 175.8 min (977.5 - 801.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,338.00'	811,506 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,338.00	30,977	0	0
1,339.00	98,182	64,580	64,580
1,340.00	125,610	111,896	176,476
1,341.00	140,613	133,112	309,587
1,342.00	157,551	149,082	458,669
1,343.00	176,533	167,042	625,711
1,344.00	195,057	185,795	811,506

Device	Routing	Invert	Outlet Devices
#1	Primary	1,338.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	1,339.35'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.6' Crest Height
#3	Primary	1,340.35'	**16.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.6' Crest Height

Primary OutFlow Max=308.00 cfs @ 12.53 hrs HW=1,342.40' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 1.34 cfs @ 9.86 fps)
- **2=Sharp-Crested Rectangular Weir** (Weir Controls 142.25 cfs @ 6.31 fps)
- **3=Sharp-Crested Rectangular Weir** (Weir Controls 164.41 cfs @ 5.14 fps)

Summary for Pond P1: South Pond

Inflow Area = 119.200 ac, Inflow Depth = 6.85" for 100-yr 24 hr event
Inflow = 476.14 cfs @ 12.31 hrs, Volume= 67.999 af
Outflow = 413.32 cfs @ 12.51 hrs, Volume= 67.934 af, Atten= 13%, Lag= 12.0 min
Primary = 413.32 cfs @ 12.51 hrs, Volume= 67.934 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 1,342.91' @ 12.51 hrs Surf.Area= 174,827 sf Storage= 609,924 cf

Plug-Flow detention time= 140.5 min calculated for 67.878 af (100% of inflow)
Center-of-Mass det. time= 143.8 min (938.4 - 794.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,338.00'	811,506 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,338.00	30,977	0	0
1,339.00	98,182	64,580	64,580
1,340.00	125,610	111,896	176,476
1,341.00	140,613	133,112	309,587
1,342.00	157,551	149,082	458,669
1,343.00	176,533	167,042	625,711
1,344.00	195,057	185,795	811,506

Device	Routing	Invert	Outlet Devices
#1	Primary	1,338.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	1,339.35'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.6' Crest Height
#3	Primary	1,340.35'	**16.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.6' Crest Height

Primary OutFlow Max=411.67 cfs @ 12.51 hrs HW=1,342.90' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 1.42 cfs @ 10.43 fps)
- **2=Sharp-Crested Rectangular Weir** (Weir Controls 178.88 cfs @ 6.91 fps)
- **3=Sharp-Crested Rectangular Weir** (Weir Controls 231.37 cfs @ 5.85 fps)

Channel Report
(Designed Storm=100 yr)

Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Monday, Oct 22 2012

<Name>

Trapezoidal

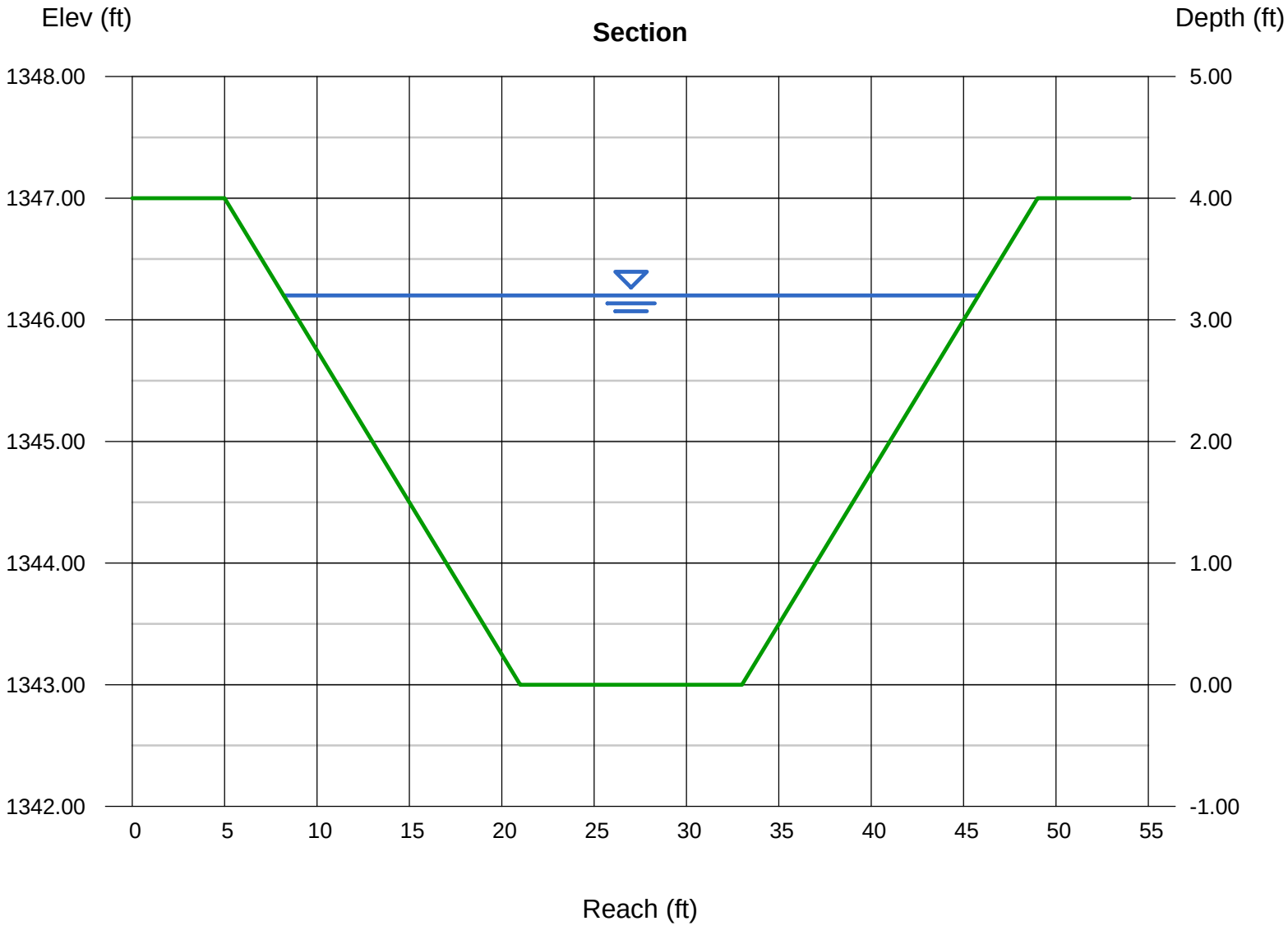
Bottom Width (ft)	=	12.00
Side Slopes (z:1)	=	4.00, 4.00
Total Depth (ft)	=	4.00
Invert Elev (ft)	=	1343.00
Slope (%)	=	0.38
N-Value	=	0.035

Calculations

Compute by:		Q vs Depth
No. Increments	=	50

Highlighted

Depth (ft)	=	3.20
Q (cfs)	=	337.15
Area (sqft)	=	79.36
Velocity (ft/s)	=	4.25
Wetted Perim (ft)	=	38.39
Crit Depth, Yc (ft)	=	2.20
Top Width (ft)	=	37.60
EGL (ft)	=	3.48



Depth	Q	Area	Veloc	Wp	Yc	TopWidth	Energy
(ft)	(cfs)	(sqft)	(ft/s)	(ft)	(ft)	(ft)	(ft)
0.08	0.470	0.986	0.48	12.66	0.01	12.64	0.08
0.16	1.506	2.022	0.74	13.32	0.04	13.28	0.17
0.24	2.988	3.110	0.96	13.98	0.08	13.92	0.25
0.32	4.874	4.250	1.15	14.64	0.13	14.56	0.34
0.40	7.144	5.440	1.31	15.30	0.17	15.20	0.43
0.48	9.784	6.682	1.46	15.96	0.22	15.84	0.51
0.56	12.79	7.974	1.60	16.62	0.27	16.48	0.60
0.64	16.16	9.318	1.73	17.28	0.32	17.12	0.69
0.72	19.88	10.71	1.86	17.94	0.37	17.76	0.77
0.80	23.97	12.16	1.97	18.60	0.42	18.40	0.86
0.88	28.42	13.66	2.08	19.26	0.48	19.04	0.95
0.96	33.24	15.21	2.19	19.92	0.53	19.68	1.03
1.04	38.43	16.81	2.29	20.58	0.58	20.32	1.12
1.12	43.99	18.46	2.38	21.24	0.64	20.96	1.21
1.20	49.94	20.16	2.48	21.90	0.69	21.60	1.30
1.28	56.26	21.91	2.57	22.56	0.75	22.24	1.38
1.36	62.97	23.72	2.65	23.21	0.81	22.88	1.47
1.44	70.08	25.57	2.74	23.87	0.86	23.52	1.56
1.52	77.58	27.48	2.82	24.53	0.92	24.16	1.64
1.60	85.49	29.44	2.90	25.19	0.98	24.80	1.73
1.68	93.80	31.45	2.98	25.85	1.04	25.44	1.82
1.76	102.5	33.51	3.06	26.51	1.09	26.08	1.91
1.84	111.7	35.62	3.14	27.17	1.15	26.72	1.99
1.92	121.3	37.79	3.21	27.83	1.21	27.36	2.08
2.00	131.3	40.00	3.28	28.49	1.27	28.00	2.17
2.08	141.7	42.27	3.35	29.15	1.33	28.64	2.25
2.16	152.6	44.58	3.42	29.81	1.39	29.28	2.34
2.24	163.9	46.95	3.49	30.47	1.45	29.92	2.43
2.32	175.7	49.37	3.56	31.13	1.51	30.56	2.52
2.40	188.0	51.84	3.63	31.79	1.57	31.20	2.60
2.48	200.7	54.36	3.69	32.45	1.64	31.84	2.69
2.56	213.9	56.93	3.76	33.11	1.70	32.48	2.78
2.64	227.6	59.56	3.82	33.77	1.76	33.12	2.87
2.72	241.7	62.23	3.88	34.43	1.82	33.76	2.95
2.80	256.4	64.96	3.95	35.09	1.88	34.40	3.04
2.88	271.5	67.74	4.01	35.75	1.94	35.04	3.13
2.96	287.2	70.57	4.07	36.41	2.01	35.68	3.22

Depth	Q	Area	Veloc	Wp	Yc	TopWidth	Energy
(ft)	(cfs)	(sqft)	(ft/s)	(ft)	(ft)	(ft)	(ft)
3.04	303.3	73.45	4.13	37.07	2.07	36.32	3.31
3.12	320.0	76.38	4.19	37.73	2.13	36.96	3.39
3.20	337.1	79.36	4.25	38.39	2.20	37.60	3.48
3.28	354.8	82.39	4.31	39.05	2.26	38.24	3.57
3.36	373.1	85.48	4.36	39.71	2.32	38.88	3.66
3.44	391.8	88.61	4.42	40.37	2.38	39.52	3.74
3.52	411.1	91.80	4.48	41.03	2.45	40.16	3.83
3.60	431.0	95.04	4.53	41.69	2.51	40.80	3.92
3.68	451.4	98.33	4.59	42.35	2.58	41.44	4.01
3.76	472.4	101.7	4.65	43.01	2.64	42.08	4.10
3.84	493.9	105.1	4.70	43.67	2.70	42.72	4.18
3.92	516.0	108.5	4.76	44.33	2.77	43.36	4.27
4.00	538.6	112.0	4.81	44.98	2.83	44.00	4.36

Tab 4:

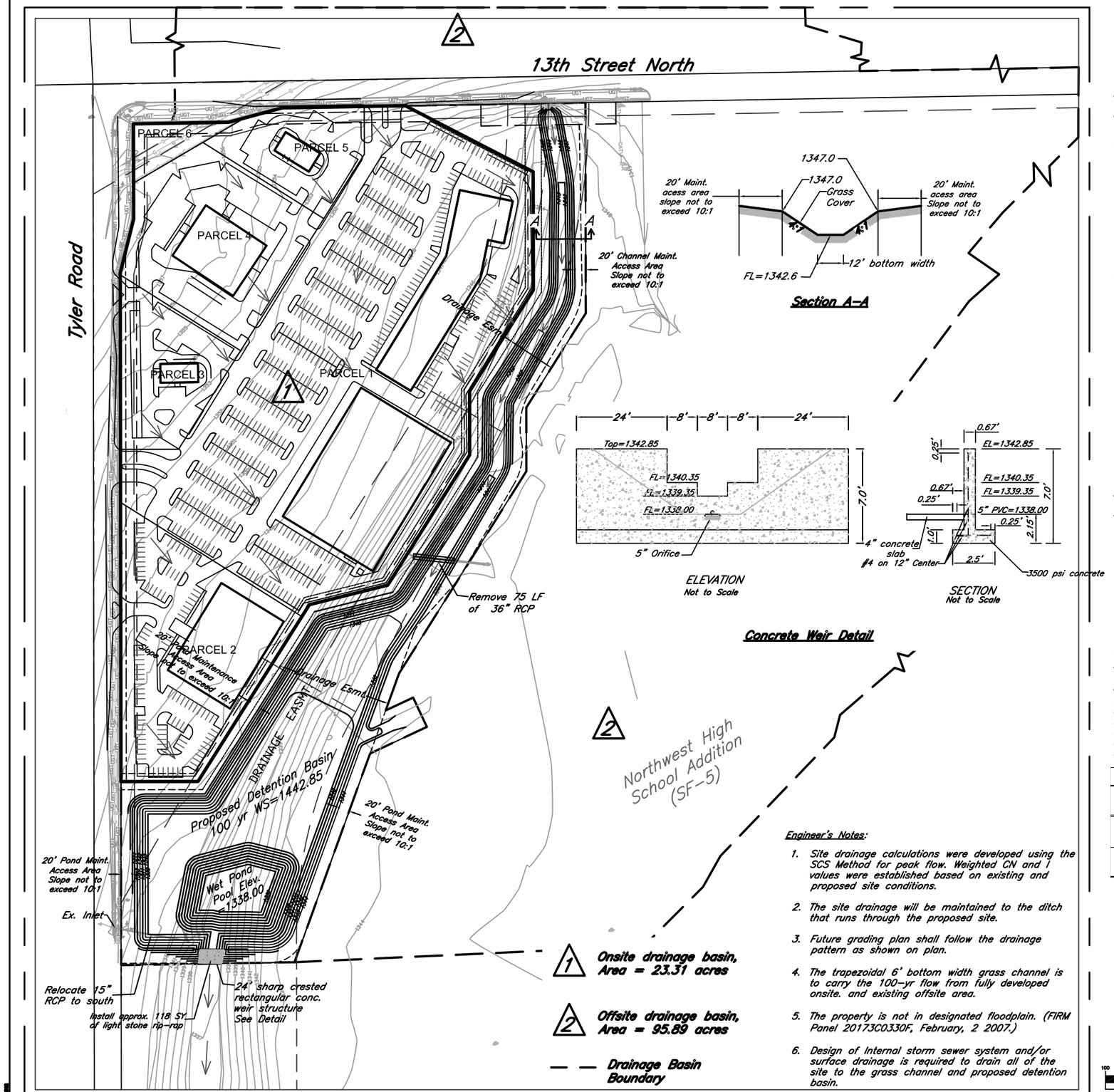
FIRM Panel

Tab 5:

Not applicable

Tab 6:

Proposed Drainage Plan
Electronic copies of report



Section A–A

ELEVATION
Not to Scale

SECTION
Not to Scale

Concrete Weir Detail

Engineer's Notes:

1. Site drainage calculations were developed using the SCS Method for peak flow. Weighted CN and I values were established based on existing and proposed site conditions.
2. The site drainage will be maintained to the ditch that runs through the proposed site.
3. Future grading plan shall follow the drainage pattern as shown on plan.
4. The trapezoidal 6' bottom width grass channel is to carry the 100–yr flow from fully developed onsite. and existing offsite area.
5. The property is not in designated floodplain. (FIRM Panel 20173C0330F, February, 2 2007.)
6. Design of Internal storm sewer system and/or surface drainage is required to drain all of the site to the grass channel and proposed detention basin.

Project Narrative:
The site is located on the southeast corner of 13th St. N and Tyler Road. The site is undeveloped and covered by grass. There is an existing grass channel runs through the property. Approximately 96 acres of offsite area(north of 13th St.) drains to the channel. The proposed use of land is to develop in to a commercial site which will include buildings, parking and detention basin. All of the proposed site drains to the channel and will continue to follow in develop condition. The flood detention, TSS removal and channel protection detention will be achieved in proposed basin as shown in plan.

Water Quality and TSS Removal

Water Quality Volume (WQv)

Calculation for water quality volume (WQv=P*Rv*A/12)				Soil Group 'C'		
85th percentile storm event (1.2 inches),P =	1.2	inches		Calulation of Rv		
Total area, A =	23.31	acres			Coeff.	Area
Rainfall Coeff, Rv, =	0.649	cf		Coeff for undisturbed area,R_{VU}=	0.04	0.00
Required Vol. for Water Quality =	**1.51**	ac-ft		Coeff for turf cover,disturbed,R_{VT}=	0.22	9.61
				Coeff for impervious area, R_{VI}=	0.95	13.70
				Weighted, Rv =	**0.649**	

Stage Storage for Retention Portion of Basin

Contour Elev (ft)	Area (sq ft)	Stage Volume (cu	Cumulative Vol (sq ft)	Cumulative Vol (ac-ft)
1330	9580			
1331	11652	10616	10616	0.24
1332	13919	12786	23401.5	0.54
1333	16364	15142	38543	0.88
1334	18972	17668	56211	1.29
1335	21738	20355	76566	1.76
1336	24661	23200	99765.5	2.29
1337	27741	26201	125966.5	2.89
1338	30977	29359	155325.5	3.57

Water Quality Peak Flow Calculation

Area=	23.31	acres
WQv=	0.779	inches
Pond and Swamp Factor, Fp=	0.700	
Calculated CN=	95.55	
S=	0.466	inches
Ia=	0.093	inches
Ia/P=	0.078	
qu	700.0	cfs/sq.mi/in
Water quality peak flow	**13.90**	**cfs**

Water quality volume is treated in retention portion of the proposed basin with pool elevation of 1338. Available storage>WQv.

Channel Protection

Channel protection volume for entire basin (1) is detained in basin located south of proposed development along the channel. The required extended detention is archived by 5" orifice located at an elevation of 1338.0 on the wall of proposed weir structure. The weir structure will drains the access runoff. Detention time for CPv= 24.08 hrs (centroid–centroid)

Channel Protection Volume Calculation

Drainage Basin	Acres	Developed: 24 hr 1 yr Storm	Developed: Curve Number (CN)	Developed: S	Developed: Runoff Volume inches	Existing: 24 hr 1 yr Storm	Existing: Curve Number (CN)	Existing: S	Existing: Runoff Volume inches
1	23.31	2.80	92	0.870	**1.97**	2.80	80	2.500	**1.10**

Flood Control (2–, 5–, 10–, 25– and 100–yr)

DEVELOPED CONDITION:
Onsite Area, A1 = 23.31 acres (including pond and channel area)
Offsite Area, A2 = 95.89 acres (Drainage area north of 13th St.+ Part of school area)
Hydrological Soil Group = C
Onsite CN=92 (calculated based on proposed improvement), TC=15 min
Offsite CN=92 (calculated using existing land use), TC=41.9 min

DEVELOPED SITE

DRAINAGE AREA	ACRES	Tc min	CN	Q2	Q5	Q10	Q25	Q100	REMARKS
On-site (1)	23.31	15	92	73.54	98.80	116.38	138.85	180.99	Commercial Area
Off-site (2)	95.89	42	92	171.52	231.57	273.39	326.90	427.28	Resedential+Commercial+ School Area

OUTFLOW

DRAINAGE AREA	ACRES	Q2	Q5	Q10	Q25	Q100	REMARKS
Off-site (1+2)	119.2	146.03	212.57	257.46	313.36	416.89	Total area drainaing to basin

100 0 50 100 200 400
(IN FEET)
1 inch = 100 ft.

Tyler Pointe Addition
Proposed Drainage Plan
Wichita, Kansas

kemiller engineering
816 S. Market, Wichita, KS 67202 (316)264-0342

PROJECT NUMBER

KEM NO. 12098	FILE	DATE 10/2012	SHEET 1.0
DESIGN GP	DRAWN GP	REVISED	