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Drainage Report
QuikTrip Store 0313 – 31st & K-15, Wichita, KS



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:		QuikTrip No. 0313R, K-15 and 31st Streets	
Total Area of Project:		2.4	acres
Development Type:		Commercial	Other:
Developer Name:	QuikTrip Corporation	Contact:	Joe Kim
		Phone:	918.615.7140
Email:	jkim@quiktrip.net		
Engineer Name:	Schwab Eaton	Contact:	Anne Stephens
		Phone:	316.722.4472
Email:	astephens@schwab-eaton.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
2.0 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	
1.2	Professional Engineer's seal, signature and date on plan cover.	Yes	
1.3	Site location map, using color ortho-imagery and showing the project boundaries, a north arrow and an accurate scale.	Yes	See site plan and drainage report.
1.4	Narrative of the development type; existing conditions and proposed impacts on stormwater runoff, wetlands, riparian zones and floodplains/floodways.	Yes	See drainage report.
1.5	Discussion of off-site conditions surrounding the proposed development.	Yes	See drainage report.
1.6	Summary table of runoff calculations (pre/post development).	Yes	See drainage report.
1.7	Narrative description of the type and function of the permanent structural stormwater management facilities.	Yes	See drainage 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	
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	
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	
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	
2.1.5	Location, dimensions and elevations of existing bridges and culvert crossings.	Yes	
2.1.6	Location of existing utilities (e.g., water, sewer, gas, electric, cable, etc.) with labels and easement boundaries.	Yes	
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	
2.1.9	Land use types per NRCS nomenclature.	Yes	
2.1.10	Footprint of existing impervious areas (labeled, area given in acres).	Yes	
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	
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	

Drainage Plan Checklist		
Plan Element Description	Element Included?	Explanation/Notes
2.2 Existing Conditions Hydrology and Hydraulics Analysis		
2.2.1 Narrative of the hydrologic analysis methodology used (e.g., unit hydrograph or other approved methods).	Yes	
2.2.2 A summary table of drainage subbasin hydrologic parameters (subbasin ID, area in acres, curve number, Tc, etc.).	Yes	
2.2.3 Table of existing condition runoff curve numbers with supporting data and calculations.	Yes	
2.2.4 Table of existing condition times of concentration with supporting data and calculations.	Yes	
2.2.5 A summary table of rainfall data used in the hydrologic analysis, and a reference for the source of the data.	Yes	
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.	No	Not applicable.
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.	No	Not applicable - pre-development meeting did not require detention. 10-year and 100-year rates provided.
3.0 postdevelopment Conditions Information		
3.1 postdevelopment Conditions Drainage Map		
3.1.1 Proposed project boundary.	Yes	
3.1.2 on-site and off-site topography: NAVD 88 datum, one-foot contours with spot elevations.	Yes	
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	
3.1.4 Location and description of off-site through-drainage conveyances which are confined to an easement, dedication and/or reserve.	Yes	
3.1.5 Footprint of proposed impervious areas, including roads, parking lots, buildings and other structures.	Yes	
3.1.6 Location of proposed utilities (e.g., water, sewer, gas, electric, cable, etc.) with labels and easement boundaries.	Yes	
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	
3.1.8 Land use cover per NRCS nomenclature.	Yes	
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	
3.1.10 Proposed limits of land disturbing activity (i.e., grading limits).	Yes	
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	
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	
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	
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	
3.2.4 Location(s) of stormwater management facilities and any associated drainage easements.	Yes	
3.2.5 Proposed energy dissipaters and other channel protection devices.	No	Not required per pre-development meeting.
3.2.6 Location(s) and dimension(s) of proposed channel, bridge and culvert crossings.	No	Not applicable
3.2.7 Normal pool and 100-year pool elevations for ponds and lakes.	No	
3.2.8 Permanent concrete outfall control structure(s) for ponds.	No	N/A
3.2.9 Emergency overflow spillways and top of berm elevations for ponds and other volume/peak discharge control facilities.	No	N/A
3.2.10 Floodplains, ponds, and stormwater management facilities located in reserves.	No	N/A - Zone X
3.3 postdevelopment Conditions Hydrology & Hydraulics		

Drainage Plan Checklist			
#	Plan Element Description	Element Included?	Explanation/Notes
3.3.1	Narrative of the hydrologic analysis methodology used (e.g., unit hydrograph or other approved methods).	Yes	
3.3.2	A summary table of drainage subbasin hydrologic parameters (subbasin ID, area in acres, curve number, Tc, etc.).	Yes	
3.3.3	Table of postdevelopment condition runoff curve numbers with supporting data and calculations.	Yes	
3.3.4	Table of postdevelopment condition times of concentration with supporting data and calculations.	Yes	
3.3.5	Cross-sections and other diagrams of existing open channels, bridge and culvert sections and other hydraulic features as 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	
3.3.6	Downstream peak discharge assessment (10% Rule) results and supporting data and calculations. Provide digital copies of any computer files and models used.	No	Pre-development meeting did not require detention. 10 year and 100-year rates are provided.
3.3.7	Stage-storage-discharge or other outlet rating curves and inflow/outflow hydrographs for all ponds.	Yes	Pre-development meeting did not require.
3.3.8	Demonstrate that the pond contours on the master grading plan and the stage-storage-discharge data are consistent for all ponds.	No	N/A
3.3.9	Demonstrate that all ponds have one foot of freeboard above the 100-year, 24-hour high water level.	No	N/A
3.3.10	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.	No	N/A
3.3.11		No	N/A
3.4	Stormwater Quantity Control Sizing		
3.4.1	Hydraulic sizing calculations for all stormwater management controls.	Yes	
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	
3.4.3	Typical details (including cross-sections where applicable) for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc.	No	N/A
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	
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	
3.5.3	Water quality volume (total and by facility), with supporting data and calculations.	Yes	
3.5.4	% TSS removal value (total and by facility) with supporting data and calculation. Must be equal to or greater than 80%.	Yes	
3.5.5	Channel protection volume with supporting data and calculations.	No	Not Applicable
3.5.6	Water quality volume and channel protection volume orifice size calculations.	No	Not Applicable
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.	Yes	
4.0	Floodplains		
4.1	Reference the source of flood profile, floodplain, floodway and stream discharge information.	No	Not applicable - FEMA FIRM Map No. 20173C0368E
4.2	Delineation of rearest base flood elevations.	No	
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
4.4	Delineation of postdevelopment regulatory floodplain/floodway limits; limits to be per elevation and scaled location, with project limits shown.	No	Not applicable
4.5	Floodway data table and discharges.	No	Not applicable
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
4.7	Regulatory floodway and four natural profile models (10, 50, 100 and 500-year) for existing and postdevelopment conditions.	No	Not applicable
4.8	Floodplains and floodways located within a reserve, where necessary.	No	Not applicable

Drainage Plan Checklist			
Item #	Plan Element Description	Element Included?	Explanation/Notes
4.9	Floodplain cut and fill calculations for volume sensitive basins.	No	Not applicable
4.10	Demonstrate that floodway elevations and velocities do not increase due to construction in the floodway ("No Rise, Certification").	No	Not applicable
5.0	Federal, State and Local Permits:		
5.1	US Army Corps of Engineers regulatory program permits (Section 404 permit)	No	Not applicable
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	
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
6.0	Half Scale Preliminary Master Grading Plan		
6.1	One set of plans and associated PDF of plans.	Yes	
6.2	Professional Engineer's seal, signature and date.	Yes	
6.3	Title block including subdivision name and phase and dated revision documentation.	Yes	
6.4	Future phases shown but cross-hatched as information only.	Yes	
6.5	Scale, not greater than 1-inch = 60 feet.	Yes	
6.6	North arrow.	Yes	
6.7	Index or legend key.	Yes	
6.8	Benchmarks (minimum of 2) used for site control (NAVD 88 vertical datum).	Yes	
6.9	Existing contours of entire site with contour interval of one foot.	Yes	
6.10	Proposed contours for channels, ponds, and other permanent stormwater management facilities, with contour interval of one foot.	Yes	
6.11	Spot elevations shown to the nearest tenth of a foot for critical locations, including lot and property boundaries.	Yes	
6.12	Proposed lot and street layout.	Yes	
6.13	Locations of underground storm drains.	Yes	
6.14	Overflow locations for storms exceeding storm drain capacity, with elevations.	No	
6.15	Top elevations of storm drains at all inlets, manholes, and flow line elevations for all outfalls.	Yes	
6.16	Locations of open ditches and lakes.	Yes	
6.17	Flow direction arrows.	Yes	
6.18	Proposed flow line elevations of all open ditches at maximum 100 foot intervals, and 100-year flood elevations thereon.	No	Not applicable
6.19	Ponds: Location, bottom elevation, normal pool elevation, 100-year flood elevation, emergency overflow elevation.	No	Not applicable
6.20	Proposed top-of-curb elevations at points where drainage will be required to flow over the curb.	No	Not applicable
6.21	Platted minimum building opening elevation for each lot in table form for all lots (excluding basement floor elevations).	Yes	
6.22	Standard foundation and elevation detail for slab on grade, full basement, view-out, partial view-out and/or walk-out construction.	No	
6.23	Top of foundation elevation for each lot.	No	Not applicable
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
6.25	Indicate that all lots are above the 100-year flood elevation.	No	Not applicable
6.26	Indicate that grading around structures conforms to perimeter drainage requirements.	No	Not applicable
6.27	Indicate that backyard drainage grading conforms to backyard drainage requirements.	No	Not applicable
6.28	Adjacent subdivision lot lines, with lot labels and subdivision names.	Yes	
6.29	Boundaries and labels for all easements, rights-of-way and reserves.	Yes	
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."	No	Not applicable - By others
End of Checklist!			



QuikTrip No. 0313R
K-15 & 31st Street South
Wichita, Kansas

DRAINAGE STUDY

August 16, 2013

Revised September 10, 2013

I. INTRODUCTION:

QuikTrip Corporation, Inc. has proposed a new store and gas station at the intersection of K-15 and 31st Street South in Wichita, KS. The new project site is located on a portion of a K&R RV Park LLC. The current zoning of the site is LC – Limited Commercial District with no overlay districts.

QuikTrip has retained Schwab-Eaton to provide Drainage Private Project plans for the site. Addressing storm water management issues relative to the QuikTrip site is an integral part of such plans. Schwab Eaton has performed an analysis of the existing and proposed drainage conditions relative to the proposed site development and has prepared this study.

QuikTrip was not required by the City of Wichita to provide storm water detention for the site since it is located at the lower reaches of the surrounding watershed. Detaining water in the lower reaches could increase the risk of area flooding. Therefore, storm water detention was not designed for this project.

II. METHODOLOGY:

The intent of this study is to review the existing and proposed conditions of storm water flow through the project site in order to appropriately design a storm drainage system for the proposed store and gas station. This study follows the requirements and guidelines established by the City of Wichita, Kansas in their Stormwater Manual, Volumes 1-3. Proposed storm water management strategies are intended to manage and control storm water runoff from the project site and storm water runoff flowing to the site from adjacent watersheds. The 10-Year and 100-Year storm recurrence intervals were both considered in the design of proposed storm water structures and pipes. QuikTrip has requested that no ponding occur on proposed pavement areas in the 100-year event. Providing adequate diversions of off-site runoff from adjacent lots to the downstream storm water system was also a design consideration.

The Rational Formula Method was used in this study, based on the formula:

$Q = ciA$, where:

Q = the peak rate of discharge in cubic feet per second for the given design storm.

c = the runoff coefficient

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Land Surveyors

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i = the rainfall intensity in inches per hour for the given design storm based on the determined Time of Concentration (T_c).
 A = the watershed area in acres.

Watershed maps are included in the Appendix.

III. EXISTING CONDITIONS:

The existing site conditions are based on a topographic survey conducted by Savoy Company P.A. on February 1st, 2013. In addition, LiDAR data was used to generate information regarding the runoff from adjacent upstream development that drains through the project site. The project site currently consists of moderately wooded RV parking areas with three asphalt drives. Soil conditions appear to have a Hydrological Soil Classification "B."

See Pre-Development Drainage Map at the end of this report for a graphic depiction of the watershed areas. Two basic watersheds have been identified based on the receiving infrastructure. Watershed "A" drains to an existing 24"x80" box culvert crossing K-15 approximately 160 feet southeast of the K-15/31st Street intersection delivering a majority of site runoff across the highway. Watershed "B" is smaller portion of the site that fronts along 31st Street and drains to an inlet on the south side of 31st that is connected with a 36" dia. pipe to a 48" dia. storm sewer trunk line. The 48" trunk line runs southwest along 31st and crosses K-15 parallel to the aforementioned RCB.

The following is a summary of the drainage conditions for each watershed (including both the on-site and off-site portions).

- A. Existing Watershed "A": This watershed totals 9.5 acres (consisting of 2.2 acres on-site and 7.3 acres off-site), has a runoff coefficient of 0.51 for the 10-year and 0.59 for the 100-year, and an estimated T_c of 14 minutes. The peak discharges for each design storm are estimated to be:

$$10\text{-Year: } Q = ciA = (0.51)(5.37)(9.5) = 26.0 \text{ cfs}$$

$$100\text{-Year: } Q = ciA = (0.59)(7.57)(9.5) = 42.4 \text{ cfs}$$

- B. Existing Watershed "B": This watershed totals 0.2 acre (has no significant off-site drainage passing through), has a runoff coefficient of 0.33 for the 10-year and 0.44 for the 100-year, and an estimated T_c of 5 minutes. The peak discharges for each design storm are estimated to be:

$$10\text{-Year: } Q = ciA = (0.33)(7.41)(0.2) = 0.5 \text{ cfs}$$

$$100\text{-Year: } Q = ciA = (0.44)(10.32)(0.2) = 0.9 \text{ cfs}$$

IV: PROPOSED CONDITIONS:

See Post-Development Drainage Map at the end of this report for a graphic depiction of the watershed areas under proposed conditions. Under post-development conditions, most of the on-site drainage is redirected toward 31st Street as a part of Watershed "B". Areas east of the proposed development in existing Watershed "A" will be collected in a drainage swale and area inlet and passed through the on-site storm sewer system in Watershed "B". Therefore in the post development state this area is now part of Watershed "B" (sub area "B-9"). Off-site drainage within Watershed "A", that collects in the asphalt street adjacent to the southern border of the site will drain into a landscaped area and collect in an area inlet and be passed through the on-site storm sewer system in Watershed "B". Therefore in the post development state this area is now part of Watershed "B" (Sub-area "B-10"). As a result a majority of the existing Watershed "A" now becomes part of proposed Watershed "B" which drains to the existing storm sewer on 31st Street.

An existing access road off the north bound lanes of K-15 is being removed and a new access road is proposed approximately 100 feet northwest of the current location. Drainage from the south portion of the RV Park will pass under the proposed access through a new 23" x 14" HERCP and flow into the K-15 ditch north to the RCB as it does in the existing condition. The grading for the new access road will maintain the existing drainage boundaries. This area is identified as Sub-area "A-2"

The following is a summary of the proposed drainage conditions for each watershed:

- A. Proposed Watershed "A": This watershed will total 3.6 acres (0.3 acre on-site and 3.3 acres off-site), have a runoff coefficient of 0.56 for the 10-year and 0.64 for the 100-year, and an estimated Tc of 14 minutes. The peak discharges for each design storm are estimated to be:

$$10\text{-Year: } Q = ciA = (0.56)(5.37)(3.6) = 10.8 \text{ cfs}$$

$$100\text{-Year: } Q = ciA = (0.64)(7.57)(3.6) = 17.4 \text{ cfs}$$

- B. Proposed Watershed "B": This watershed totals 6.1 acres (has no significant off-site drainage passing through), has a runoff coefficient of 0.59 for the 10-year and 0.67 for the 100-year, and an estimated time of concentration of 16 minutes. The peak discharges from each design storm are estimated to be:

$$10\text{-Year: } Q = ciA = (0.59)(5.08)(6.1) = 18.3 \text{ cfs}$$

$$100\text{-Year: } Q = ciA = (0.67)(7.18)(6.1) = 29.3 \text{ cfs}$$

This watershed was subdivided to size the storm sewer network within the site. The Watershed Map indicates ten subareas - B1 through B10. The breakdown of the subarea hydrological characteristics may be found on watershed maps within the Drainage Private Project Plans.

V. STORMWATER QUALITY:

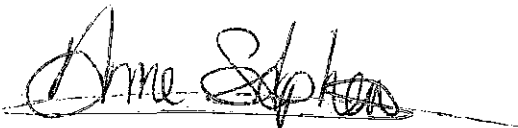
Temporary storm water quality measures (BMPs) will be installed at the site perimeter and other points of discharge to protect the surrounding drainage ways from silt and sediment discharges during site demolition, preparation and construction. Said requirements will be in accordance with City of Wichita standards and the NPDES program administered by KDHE. An NOI will be submitted to KDHE for a construction storm water permit prior to on-site disturbances.

Since essentially all of the developed impervious surfaces will be discharged at a common point, that location appears to be the optimum location for providing a permanent BMP improvement for protecting post-development storm water quality. A pre-manufactured hydrodynamic separator is proposed at that location (immediately south of the point of connection to the existing 31st Street curb inlet) to capture and retain suspended pollutants. The separator will be a KriStar FlowGard Dual-Vortex separator, Model #DVS-84S. It has effective treatment of flows up to 6.5 cfs and will handle total flows (treatment and bypass) of 40cfs.

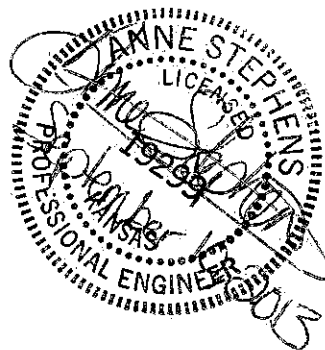
VI. SUMMARY AND CONCLUSIONS:

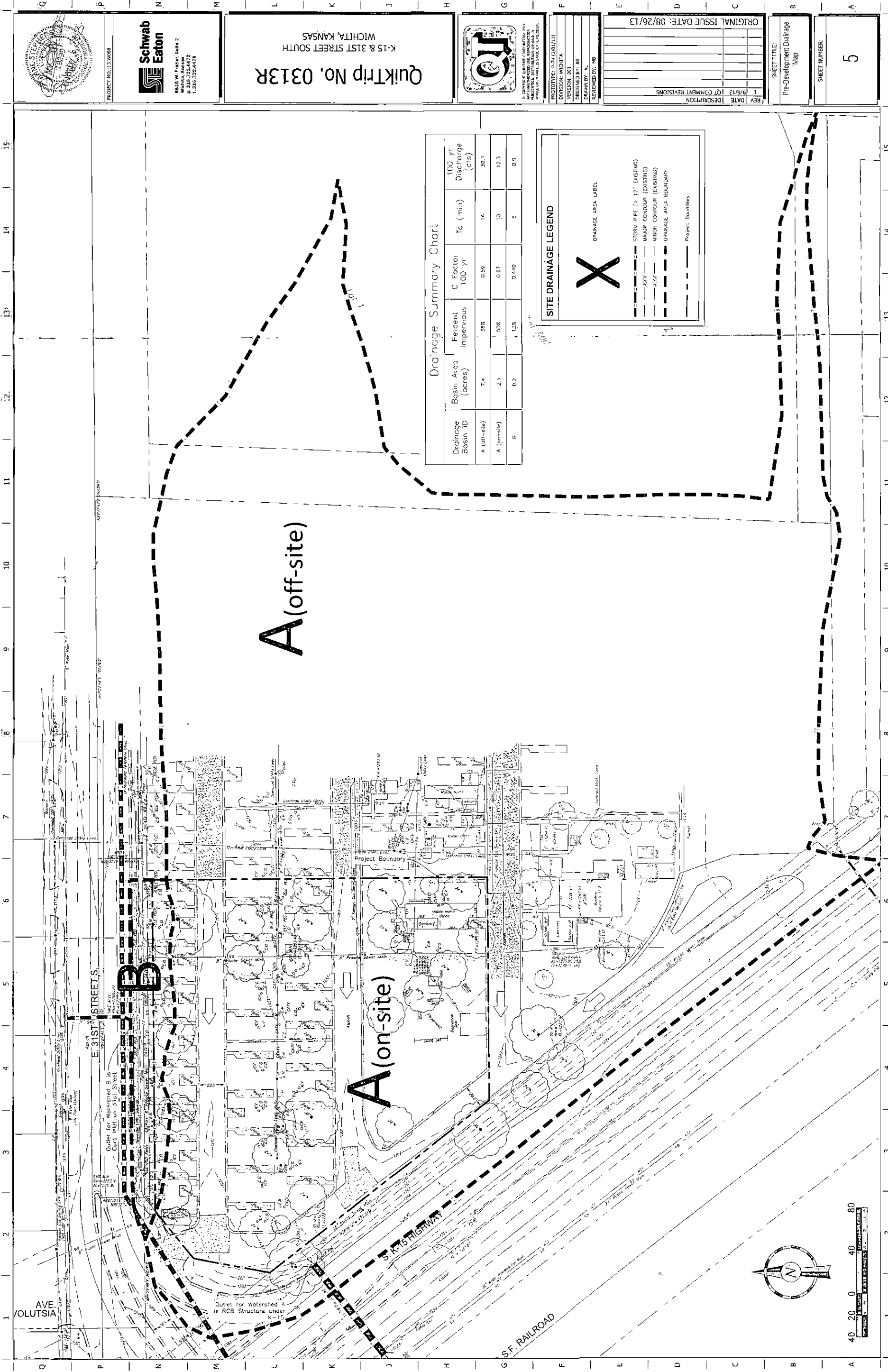
There will be a change in the watershed areas and respective discharges to the two receiving points described herein. The flows to the existing 24"x80" RCB will be reduced in the 100-year event from 42.4 cfs to 17.4 cfs. The flows to the inlet structure on 31st Street will be increased in the 100-year event from 0.9 cfs to 29.3 cfs. Schwab-Eaton does not have complete information on the capacity of the downstream system. Since the connecting pipe between the inlet and the 48" trunk line is a 36" diameter pipe, it is assumed to have a reasonable carrying capacity. The peak flows from the project site should reach the existing storm sewer well before the peak flow of the 31st Street storm sewer watershed area.

Respectfully submitted,



Anne Stephens, PE
Schwab Eaton





Drainage Summary Chart

Drainage Basin ID	Basin Area (acres)	Percent Impervious	C Factor 100 yr	Tc (min)	100 yr Discharge (cfs)
A (off-site)	7.4	36%	0.59	14	50.1
A (on-site)	2.1	50%	0.67	10	12.3
B	0.2	13%	0.440	5	0.9

SITE DRAINAGE LEGEND

X DRAINAGE AREA LABEL

- STORM PIPE (> 12" EXISTING)
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- DRAINAGE AREA BOUNDARY
- Project Boundary

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 Wichita, Kansas
 P. 318.732.4472
 F. 318.732.4475

PROJECT NO. 13W008

Quicktrip No. 0313R
 K-15 & 31ST STREET SOUTH
 WICHITA, KANSAS

2. COMPLETE QUARTER CONSTRUCTION SET
 WITH ALL NECESSARY DETAILS AND MATERIAL
 QUANTITIES. THIS SET IS FOR INFORMATION
 PURPOSES ONLY. IT IS NOT TO BE USED FOR
 CONSTRUCTION OF ANY STRUCTURE.


PROTOTYPE: P-71 (2/2011/13)
 VERSION: 001
 DIVISION: WICHITA
 DESIGNED BY: AS
 DRAWN BY: AL
 REVIEWED BY: MB

ORIGINAL ISSUE DATE: 08/26/13

REV	DATE	DESCRIPTION
1	9/9/13	1. COMMENT REVISIONS


SHEET TITLE:
 Pre-Development Drainage
 Map

SHEET NUMBER:
 5



Schwab Eaton
 8635 W. Franks, Suite 2
 Wichita, Kansas
 P: 316.722.4172
 F: 316.722.4479

QuikTrip No. 0313R
 K-15 & 31ST STREET SOUTH
 WICHITA, KANSAS



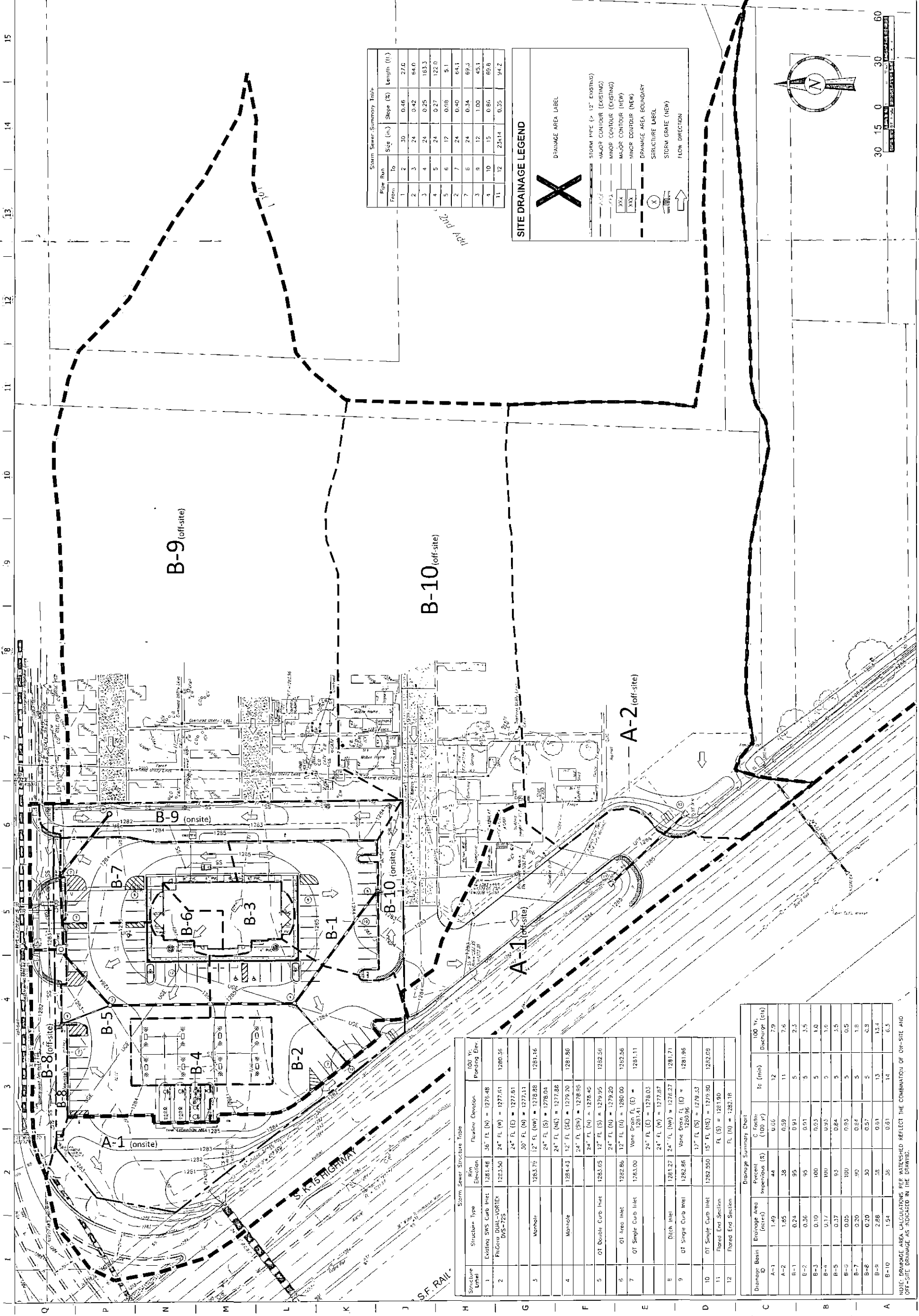
DESIGNED BY: AS
 DRAWN BY: AL
 REVIEWED BY: MS
 DIVISION: WICHITA
 VERSION: 001
 PROJECT: P-2412(01/13)

ORIGINAL ISSUE DATE: 08/26/13

REV	DATE	DESCRIPTION
1	9/6/13	10 COMMENT REVISIONS

SHEET TITLE:
POST-DEVELOPMENT DRAINAGE MAP

SHEET NUMBER:
6



Storm Sewer Summary Table

Pipe Run	From	To	Size (in)	Slope (%)	Length (ft)
1	2	30	0.46	27.6	
2	3	24	0.42	84.0	
3	4	24	0.25	183.3	
4	5	24	0.27	122.0	
5	6	12	0.08	5.1	
6	7	24	0.40	84.1	
7	8	24	0.34	69.3	
8	9	12	1.00	45.1	
9	10	15	0.86	69.6	
11	12	23.14	0.35	94.2	

SITE DRAINAGE LEGEND

- DRAINAGE AREA LABEL
- STORM PIPE (> 12" EXISTING)
- MAJOR CONTOUR (EXISTING)
- MINOR CONTOUR (EXISTING)
- MAJOR CONTOUR (NEW)
- MINOR CONTOUR (NEW)
- DRAINAGE AREA BOUNDARY
- STRUCTURE LABEL
- STORM GRATE (NEW)
- FLOW DIRECTION

Storm Sewer Structure Table

Structure Label	Structure Type	Rim Elevation	Flowline Elevation	100 Yr. Pointing Elev.
1	Existing SWS Curb Inlet	1281.48	36" FL (N) = 1276.48	1280.36
2	Fluorocarb Diam-Vortex	1283.50	24" FL (W) = 1277.61	
3	Manhole	1283.79	30" FL (N) = 1277.11	
4	Manhole	1284.43	12" FL (SE) = 1279.20	1281.86
5	01 Double Curb Inlet	1283.65	12" FL (S) = 1279.95	1282.56
6	01 Area Inlet	1282.86	12" FL (N) = 1280.00	1282.56
7	01 Single Curb Inlet	1283.00	Vane Basin FL (E) = 1281.11	
8	Ditch Inlet	1281.27	24" FL (W) = 1277.87	
9	01 Single Curb Inlet	1282.86	Vane Basin FL (E) = 1281.96	
10	01 Single Curb Inlet	1282.550	15" FL (NE) = 1279.30	1282.03
11	Flared End Section	FL (S) = 1281.90		
12	Flared End Section	FL (N) = 1282.18		

Drainage Summary Sheet

Drainage Basin ID	Drainage Area (acres)	C Factor (100 yr)	Inflow (cfs)	Time (min)	100 Yr. Drainage (cfs)
A-1	1.49	0.66	12	7.9	
A-2	1.85	0.59	11	7.6	
B-1	0.24	0.95	5	2.3	
B-2	0.36	0.91	5	3.5	
B-3	0.10	1.00	0.23	1.0	
B-4	0.17	1.00	0.45	3.6	
B-5	0.37	0.84	5	3.5	
B-6	0.05	1.00	0.05	0.5	
B-7	0.20	0.84	3	1.8	
B-8	0.20	0.57	5	6.8	
B-9	2.88	0.38	0.61	13.4	
B-10	1.94	0.61	14	6.5	

NOTE: DRAINAGE AREA CALCULATIONS REFLECT THE COMBINATION OF ON-SITE AND OFF-SITE DRAINAGE AS INDICATED IN THE DRAWING.