

# FIREPOINT ADDITION DRAINAGE PLAN

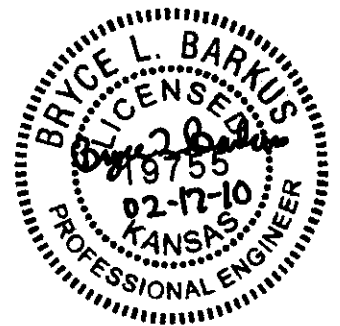


CITY OF  
WICHITA

Presented to:  
City of Wichita, Kansas

Prepared by:  
Ameritrack West, Inc.

Date:  
February 17, 2010





CITY OF  
WICHITA

Adopted: February 23, 2007

### Public Works, Engineering Division Final Drainage Plan Submittal Checklist

Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_  
 Subdivision Name: Firepoint Addition Location: E 1/2, S32, T26S, R2E  
 Total Land Area Of Ownership: 26.25 Acres  
 Type: \_\_\_\_\_ Residential  Commercial \_\_\_\_\_ Industrial \_\_\_\_\_ Recreation \_\_\_\_\_ Municipal \_\_\_\_\_ Other \_\_\_\_\_  
 Applicant: Webb Road, LLC Contact: Christian Ableh Phone #: 634-2600  
 Engineer: Amertrack West, Inc. Contact: Bryce Barkus, P.E. Phone #: 778-2215

Please check the appropriate box:

I = Included; NA = Non-Applicable; R= Required prior to development  
(If "NA" is checked, an explanation must be entered)

Tab 1. Project Narrative	Applicant		Explanation / Location in Plan	Engr	
	I	NA		I	NA
A. Site Location Map, using USGS Map	<input checked="" type="checkbox"/>		"Supplemental Info"		
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	<input checked="" type="checkbox"/>		"Description"		
C. Discussion of offsite conditions	<input checked="" type="checkbox"/>		"Description"		
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series		<input checked="" type="checkbox"/>	No Detention Provided Onsite		
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design	<input checked="" type="checkbox"/>		"Description"		
F. Copy of the plat	<input checked="" type="checkbox"/>		"Supplemental Info"		
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)	<input checked="" type="checkbox"/>		Existing Contours, flow arrows, street grades and typical road section are either shown on "Drainage Map" or in "Supplemental"		
H. Professional Engineer seal, signature and date on cover of report	<input checked="" type="checkbox"/>				
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover	<input checked="" type="checkbox"/>				

Tab 2. Existing Conditions Runoff Calculations	Applicant		Explanation / Location in Plan	Engr	
	I	NA		I	NA
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)	<input checked="" type="checkbox"/>		"Supplemental Info"		
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)	<input checked="" type="checkbox"/>		"Description"		
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)	<input checked="" type="checkbox"/>		"Drainage Map"		
D. Total Site Area and Total Impervious Area (acres)	<input checked="" type="checkbox"/>		"Drainage map" and "Description"		
E. Benchmarks used for site control	<input checked="" type="checkbox"/>		"Drainage Map"		
F. Streams, creeks, and waterway labeled	<input checked="" type="checkbox"/>		"Drainage Map"		
G. Predominant soils from USDA soil surveys, and/or on site soil borings	<input checked="" type="checkbox"/>		"Supplemental Info"		
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted	<input checked="" type="checkbox"/>		"Drainage Map"		
I. Location of existing roads, buildings, parking lots and other impervious areas.	<input checked="" type="checkbox"/>		"Drainage Map"		



J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements	X		"Drainage Map"		
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	X		"Drainage map"		
L. Flow paths	X		"Drainage map"		
M. Location and dimensions of existing channels, bridges or culvert crossings	X		"Drainage map"		
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration	X		"Hydrology"		
O. Assumed pre-developed runoff curve numbers	X		"Hydrology"		
P. Existing time of concentrations used in calculations	X		"Hydrology"		
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site	X		"Description" and "Hydraulics"		
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)	X		"Description" and "Hydraulics"		
S. Cross-section data for open channels	X		"Drainage map"		
T. Ground water elevations, if applicable		X	No Ground Water Issues Expected		

Tab 3. Post-Development Hydrologic Analysis	Applicant		Explanation / Location in Plan	Engr	
	I	NA		I	NA
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)	X		"Hydrology" and "Hydraulics"		
B. Proposed time of concentrations used in calculations	X		"Hydrology"		
C. Assumed post-developed runoff curve numbers	X		"Hydrology"		
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)		X	No Detention Provided On Site		
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	X		"Hydraulics"		
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities		X	No Detention Provided on site		
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary	X		"Hydrology" and "Hydraulics"		
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)	X		"Hydraulics"		
I. Design water surface elevations and normal pool elevation for ponds.	X		"Drainage Map"		
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.		X	Will be determined later		
K. Proposed limits of clearing and grading	X		"Drainage Map"		
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.		X	Will be determined later		
M. Location of existing and proposed utilities (e.g., water, sewer) and easements		X	Existing is shown		
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow		X	Existing is shown		
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings	X		"Drainage Map"		



P. Preliminary selection and location of stormwater controls		x	Will be determined later		
Q. Emergency overflow structure's flow path		x	No Detention Provided		
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)		x	No Detention Provided		
S. The 100-year 24-hour HWL delineated on the plan for detention pond		x	No Detention Provided		
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds		x	Not needed		
U. Stormwater Management Facilities located within a Reserve		x	No Detention Provided		
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)		x	No Detention Provided		
W. Off-site drainage easements or agreements required, where necessary		x	Not needed		

Tab 4. Floodplain Submittal	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Provide source of flood profile		x	Copy of FIRM in "Supplemental Info"		
B. Nearest base flood elevations		x			
C. Delineation of pre-developed regulatory floodplain/floodway limits		x			
D. Delineation of post-developed regulatory floodplain and floodway limits		x			
E. Floodplain boundary determination per elevation (project limits shown)		x			
F. Provide source of floodway data table and discharges		x			
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits		x			
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions		x			
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)		x			
J. Flood plains and floodways located within a Reserve, where necessary		x			

Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	Applicant			Engr	
	I/R	NA	Explanation / Location in Plan	I/R	NA
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)		x	Not needed		
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		x	Not needed		
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.		x	Not needed		
D. Kansas Department of Transportation		x	Not needed		
E. Sedgwick County Right-of-way Permit		x	Not needed		

Description

# FIREPOINT ADDITION DRAINAGE PLAN

## GENERAL

The Firepoint Addition is a 26.25 acre commercial subdivision located directly northeast of K-96 between Rock Road and Webb Road in the City of Wichita in Sedgwick County, Kansas. The site lies in the East Half of Section 32, Township 26 South, Range 2 East of the Sixth Principal Meridian. The property was originally platted as part of the Mediterranean Addition. The property is bounded by 34<sup>th</sup> Street and Comotara Industrial Park to the north, a detention pond and commercial property to the west, K-96 to the south and southwest, and commercial property on the east. The development of this property will have no additional impact to storm water above what has already been accounted for with the Mediterranean Plaza Addition improvements. The two existing detention ponds were sized to detain the runoff from this property.

The Rational Method was used to calculate the runoff values from each basin for existing and proposed conditions. HY8 and Microstation Geopak were used to size the culverts and storm sewer, respectively. The 5-Year Storm Event was used to size the storm sewer lines and inlets. Fifteen minutes was used as the minimum time of concentration. See the "Hydrology" and "Hydraulics" sections for more detailed information on the basin runoff, culverts and storm sewer calculations.

This property is being platted into three commercial lots. Due to the nature of this type of development, determining the locations of site features, such as buildings, paving, landscaping and storm sewer, is difficult at this point in the development process. Therefore, we have only made assumptions as to the percent of impervious area and proposed slopes. We sized the storm sewer at Toben Street to accommodate additional runoff from the lots with the intent that additional storm sewer inlets and piping will be extended. The City will be able to review the individual lot development plans prior to building permits being issued.

No new on-site detention is proposed for this property since the two existing detention ponds are sized to accommodate the development on this site.

Any time grading work is to be performed on this property, Best Management Practices shall be used to help protect from erosion. Silt fence,

ditch checks, inlet protections, construction entrances and back of curb protection are among the BMPs to be used on this site.

### **EXISTING CONDITIONS**

The site generally drains to the southeast or to the southwest to two existing detention ponds. The property is almost entirely short grass pasture, with a wooded area along the west property line. The site soils are primarily Rosehill silty clay with 1-3 percent slopes which is a Hydrologic Soil Group D soil. An USDA soil survey map is included in the "Supplemental Info" section.

The entirety of the property lies within a FEMA defined Zone X according to the February 2, 2007 maps. A copy of the FIRMette is attached in the "Supplemental Info" section.

The basin crests outlined in the Mediterranean Addition Drainage Plan were maintained. Approximately 64.6 acres drain into an existing ditch on the property from the north through an existing 8'x4' RCB under 34<sup>th</sup> Street. Another 1.7 acres drain onto the property from the north from the Comotara Industrial Park, and an additional 27.2 acres drain into the existing drainage channel that runs along the east and southeast of the property from commercial properties to the east. The existing impervious area on the property is approximately 0.45 acres.

We reviewed the original Mediterranean Plaza Addition drainage plan which was provided to us by the City of Wichita. From these documents, we were able to determine the HW100 elevations in the ponds which are labeled on the drainage map.

### **PROPOSED CONDITIONS**

Basin A consists of the western half of Toben Street adjacent to Lot 1, Block A of the Firepoint Addition. Basin A will drain along the curb and gutter of Toben Street to a proposed curb inlet (Node 300, see "Drainage Map") where water will be taken via RCB to the detention pond directly west of the project site. Approximately 0.99 acres of developed commercial area drains west into Basin A via a 36" PVC pipe collected at a curb inlet (Node 310) and then into the open ditch and RCB that services Basins B & C. Basin A has an area of approximately 0.41 acres will be impervious after improvements.

Basin B consists of the eastern half of Toben Street adjacent to Lot 1, Block A of the Firepoint Addition. Basin B will drain along the curb and gutter of Toben Street to a proposed curb inlet (Node 290) where water will be taken via

RCB to the detention pond directly west of the project site. Basin B has an area of approximately 0.41 acres for which all will be impervious after improvements.

Basin C consists of Lot 1, Block A of the Firepoint Addition. Basin C will drain west towards an open ditch currently existing on the property and will then drain into the RCB that is accommodating Basins A & B, after which it will drain into the detention pond directly west of the project site. Approximately 64.6 acres of developed commercial area drain south into the open ditch in Basin C via an 8' x 4' RCB under 34<sup>th</sup> Street. Basin C has an area of approximately 5.58 acres. Assuming 85% impervious area after improvements, Basin C will have an impervious area of 4.74 acres.

Basin D consists of the western half of Toben Street adjacent to Lot 2, Block A of the Firepoint Addition (see "Drainage Map"). Basin D will drain along the curb and gutter of Toben Street to a proposed curb inlet (Node 200) where water will be taken via RCP to the detention pond directly west of the project site. Basin D has an area of approximately 0.80 acres for which all will be impervious after improvements.

Basin E consists of the eastern half of Toben Street adjacent to Lot 2, Block A of the Firepoint Addition. Basin E will drain along the curb and gutter of Toben Street to a proposed curb inlet (Node 210) where water will be taken via RCP to the detention pond directly west of the project site. Basin E has an area of approximately 0.77 acres for which all will be impervious after improvements.

Basin F consists of approximately the western half of Lot 2, Block A of the Firepoint Addition. Basin F will drain southwest into a drop inlet (Node 220) where it will be taken via the RCP servicing Basins D & E to the detention pond directly west of the project site. Approximately 0.60 acres areas of developed commercial area drain into Basin F from the Comotara Industrial Park on the north. Basin F has an area of approximately 7.83 acres. Assuming 85% impervious area after improvements, Basin F will have an impervious area of 6.66 acres.

Basin G consists of approximately the northwest third of Lot 1, Block B of the Firepoint Addition (see "Drainage Map"). Basin G drains southwest into the ditch along K-96. Basin G has an area of 0.25 acres. Assuming 85% impervious area after improvements, Basin G will have an impervious area of 0.21 acres.

Basin H consists of approximately the southeast two thirds of Lot 1, Block B of the Firepoint Addition. Basin H drains to the southwest into the ditch along K-96. Basin H has an area of 0.60 acres. Assuming 85% impervious area after improvements, Basin F will have an impervious area of 0.51 acres.

Basin I consists of the southern half of Toben Street adjacent to Lot 2, Block A of the Firepoint Addition. Basin I will drain east via curb and gutter along Toben Street to a curb inlet (Node 110) where it will be taken via RCP to the detention pond southeast of the property. Basin I has an area of approximately 0.37 acres for which all will be impervious after improvements.

Basin J consists of the northern half of Toben Street adjacent to Lot 2, Block A of the Firepoint Addition. Basin J drains east via curb and gutter along Toben Street to a curb inlet (Node 100) where it will be taken via RCP to the detention pond southeast of the property. Basin J has an area of approximately 0.39 acres for which all will be impervious after improvements.

Basin K consists of the portion of Lot 2, Block A of the Firepoint Addition (see "Drainage Map"). Basin K drains south-southeast to a proposed drop inlet where it is taken via RCP to the detention pond southeast of the property. Basin K has an area of approximately 2.93 acres. Assuming 85% impervious area after improvements, Basin K will have an impervious area of 2.49 acres.

Basin L consists of the portion of Lot 2, Block A of the Firepoint Addition that lies east of the basin crest delineating Basins K & L. Basin L drains south-southeast to the drainage channel that runs along the east and southeast of the property. From there, water is taken through an existing 2-60"x38" HERCP under Toben Street to the detention pond that lies south east of the property. Basin L has an area of approximately 5.93 acres. Assuming 85% impervious are after improvements, Basin L will have an impervious area of 2.49 acres.

Hydrology

**BASIN A**

Total Area  Acres

Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.41	0.41

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.41
Future	100%	0%	0%	0%	0%	0%
Acres	0.41	0.00	0.00	0.00	0.00	0.00

Existing 35 ft  
 Slope 7.00 %  
 Waterflow Desc short grass pasture  
 Avg Velocity 1.33 ft/sec  
 Tc 0.01 hours

Future 400 ft  
 Slope 1.00 %  
 Waterflow Desc pavement  
 Avg Velocity 3.00 ft/sec  
 Tc 0.04 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.41	0.84
5	0.56	4.62	0.41	1.06
10	0.61	5.21	0.41	1.30
25	0.64	6.06	0.41	1.59
50	0.67	6.73	0.41	1.85
100	0.70	7.40	0.41	2.12

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.41	1.06
5	0.69	4.62	0.41	1.31
10	0.73	5.21	0.41	1.56
25	0.75	6.06	0.41	1.86
50	0.77	6.73	0.41	2.12
100	0.80	7.40	0.41	2.43

**BASIN B**

Total Area 0.41 Acres

Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.41	0.41

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.41
Future	100%	0%	0%	0%	0%	0%
Acres	0.41	0.00	0.00	0.00	0.00	0.00

Length of Flow Slope Waterflow Desc Avg Velocity Tc	Existing		Future	
	Value	Unit	Value	Unit
	35	ft	400	ft
	7.00	%	1.00	%
	short grass pasture		pavement	
	1.33	ft/sec	3.00	ft/sec
	0.01	hours	0.04	hours

15 min <= Tc <= 24 hrs

Ameritrack West, Inc.  
 12469 SW 15th Street, P.O. Box 9  
 Benton, KS 67017

**FIREPOINT ADDITION**  
 Hydrology

Prepared by: JGF  
 2/17/2010

**Runoff Coefficients \* Soil Group D**

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

**Existing Conditions**

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.41	0.84
5	0.56	4.62	0.41	1.06
10	0.61	5.21	0.41	1.30
25	0.64	6.06	0.41	1.59
50	0.67	6.73	0.41	1.85
100	0.70	7.40	0.41	2.12

**Future Conditions**

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.41	1.06
5	0.69	4.62	0.41	1.31
10	0.73	5.21	0.41	1.56
25	0.75	6.06	0.41	1.86
50	0.77	6.73	0.41	2.12
100	0.80	7.40	0.41	2.43

**BASIN C**

Total Area 5.58 Acres Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	5.58	5.58

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	5.58
Future	100%	0%	0%	0%	0%	0%
Acres	5.58	0.00	0.00	0.00	0.00	0.00

Length of Flow Slope Waterflow Desc Avg Velocity Tc	Existing		Future	
	Value	Unit	Value	Unit
Length of Flow	700	ft	700	ft
Slope	2.00	%	1.00	%
Waterflow Desc	short grass pasture		pavement	
Avg Velocity	0.45	ft/sec	2.00	ft/sec
Tc	0.43	hours	0.10	hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	2.87	5.58	8.65
5	0.56	3.57	5.58	11.16
10	0.61	4.07	5.58	13.85
25	0.64	4.79	5.58	17.11
50	0.67	5.35	5.58	20.00
100	0.70	5.90	5.58	23.05

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	5.58	14.42
5	0.69	4.62	5.58	17.79
10	0.73	5.21	5.58	21.22
25	0.75	6.06	5.58	25.36
50	0.77	6.73	5.58	28.92
100	0.80	7.40	5.58	33.03

**FIREPOINT ADDITION**  
 Hydrology

**BASIN D**

Total Area 0.80 Acres

Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.80	0.80

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.80
Future	100%	0%	0%	0%	0%	0%
Acres	0.80	0.00	0.00	0.00	0.00	0.00

Length of Flow Slope Waterflow Desc Avg Velocity Tc	Existing		Future	
		35 ft	700 ft	
	2.00 %	1.00 %		
	short grass pasture	pavement		
	0.45 ft/sec	3.00 ft/sec		
	0.02 hours	0.06 hours		
				15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.80	1.64
5	0.56	4.62	0.80	2.07
10	0.61	5.21	0.80	2.54
25	0.64	6.06	0.80	3.10
50	0.67	6.73	0.80	3.61
100	0.70	7.40	0.80	4.14

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.80	2.07
5	0.69	4.62	0.80	2.55
10	0.73	5.21	0.80	3.04
25	0.75	6.06	0.80	3.64
50	0.77	6.73	0.80	4.15
100	0.80	7.40	0.80	4.74

**BASIN E**

Total Area 0.77 Acres Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.77	0.77

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.77
Future	100%	0%	0%	0%	0%	0%
Acres	0.77	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	35 ft	700 ft
Slope	2.00 %	1.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.45 ft/sec	3.00 ft/sec
Tc	0.02 hours	0.06 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.77	1.58
5	0.56	4.62	0.77	1.99
10	0.61	5.21	0.77	2.45
25	0.64	6.06	0.77	2.99
50	0.67	6.73	0.77	3.47
100	0.70	7.40	0.77	3.99

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.77	1.99
5	0.69	4.62	0.77	2.45
10	0.73	5.21	0.77	2.93
25	0.75	6.06	0.77	3.50
50	0.77	6.73	0.77	3.99
100	0.80	7.40	0.77	4.56

**BASIN F**

Total Area 7.83 Acres

Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	7.83	7.83

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	7.83
Future	100%	0%	0%	0%	0%	0%
Acres	7.83	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	830 ft	830 ft
Slope	2.50 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.53 ft/sec	2.00 ft/sec
Tc	0.44 hours	0.12 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	2.87	7.83	12.13
5	0.56	3.57	7.83	15.65
10	0.61	4.07	7.83	19.44
25	0.64	4.79	7.83	24.00
50	0.67	5.35	7.83	28.07
100	0.70	5.90	7.83	32.34

Future Conditions \*

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	7.83	20.23
5	0.69	4.62	7.83	24.96
10	0.73	5.21	7.83	29.78
25	0.75	6.06	7.83	35.59
50	0.77	6.73	7.83	40.58
100	0.80	7.40	7.83	46.35

**BASING**

Total Area 0.25 Acres

Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.25	0.25

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.25
Future	100%	0%	0%	0%	0%	0%
Acres	0.25	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	70 ft	70 ft
Slope	3.50 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.69 ft/sec	2.00 ft/sec
Tc	0.03 hours	0.01 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

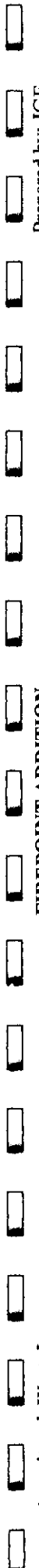
Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.25	0.51
5	0.56	4.62	0.25	0.65
10	0.61	5.21	0.25	0.79
25	0.64	6.06	0.25	0.97
50	0.67	6.73	0.25	1.13
100	0.70	7.40	0.25	1.30

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.25	0.65
5	0.69	4.62	0.25	0.80
10	0.73	5.21	0.25	0.95
25	0.75	6.06	0.25	1.14
50	0.77	6.73	0.25	1.30
100	0.80	7.40	0.25	1.48



Prepared by: JGF  
2/17/2010

**FIREPOINT ADDITION**  
Hydrology

Ameritrack West, Inc.  
12469 SW 15th Street, P.O. Box 9  
Benton, KS 67017

**BASIN H**

Manual Input

Total Area 0.60 Acres

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.60	0.60

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.60
Future	100%	0%	0%	0%	0%	0%
Acres	0.60	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	170 ft	170 ft
Slope	3.50 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.69 ft/sec	2.00 ft/sec
Tc	0.07 hours	0.02 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.60	1.23
5	0.56	4.62	0.60	1.55
10	0.61	5.21	0.60	1.91
25	0.64	6.06	0.60	2.33
50	0.67	6.73	0.60	2.71
100	0.70	7.40	0.60	3.11

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.60	1.55
5	0.69	4.62	0.60	1.91
10	0.73	5.21	0.60	2.28
25	0.75	6.06	0.60	2.73
50	0.77	6.73	0.60	3.11
100	0.80	7.40	0.60	3.55

**BASIN J**

Total Area 0.37 Acres Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.37	0.37

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.37
Future	100%	0%	0%	0%	0%	0%
Acres	0.37	0.00	0.00	0.00	0.00	0.00

Length of Flow	Existing	Future
Slope	35 ft 3.00 %	470 ft 1.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.60 ft/sec	3.00 ft/sec
Tc	0.02 hours	0.04 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.37	0.76
5	0.56	4.62	0.37	0.96
10	0.61	5.21	0.37	1.18
25	0.64	6.06	0.37	1.44
50	0.67	6.73	0.37	1.67
100	0.70	7.40	0.37	1.92

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.37	0.96
5	0.69	4.62	0.37	1.18
10	0.73	5.21	0.37	1.41
25	0.75	6.06	0.37	1.68
50	0.77	6.73	0.37	1.92
100	0.80	7.40	0.37	2.19

**BASIN J**

Total Area 0.39 Acres Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.39	0.39

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.39
Future	100%	0%	0%	0%	0%	0%
Acres	0.39	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	35 ft	500 ft
Slope	3.00%	2.00%
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.60 ft/sec	3.00 ft/sec
Tc	0.02 hours	0.05 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.39	0.80
5	0.56	4.62	0.39	1.01
10	0.61	5.21	0.39	1.24
25	0.64	6.06	0.39	1.51
50	0.67	6.73	0.39	1.76
100	0.70	7.40	0.39	2.02

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.39	1.01
5	0.69	4.62	0.39	1.24
10	0.73	5.21	0.39	1.48
25	0.75	6.06	0.39	1.77
50	0.77	6.73	0.39	2.02
100	0.80	7.40	0.39	2.31

**BASIN K**

Total Area 2.93 Acres

Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	2.93	2.93

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	2.93
Future	100%	0%	0%	0%	0%	0%
Acres	2.93	0.00	0.00	0.00	0.00	0.00

Length of Flow Slope Waterflow Desc Avg Velocity Tc	Existing		Future	
	Value	Description	Value	Description
	650 ft	short grass pasture	650 ft	pavement
	3.00 %		2.00 %	
	0.60 ft/sec		2.00 ft/sec	
	0.30 hours		0.09 hours	
				15 min <= Tc <= 24 hrs

Ameritrack West, Inc.  
 12469 SW 15th Street, P.O. Box 9  
 Benton, KS 67017

**FIREPOINT ADDITION**  
 Hydrology

Prepared by: JGF  
 2/17/2010

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

**Existing Conditions**

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.48	2.93	5.51
5	0.56	4.26	2.93	6.99
10	0.61	4.82	2.93	8.61
25	0.64	5.63	2.93	10.56
50	0.67	6.26	2.93	12.29
100	0.70	6.88	2.93	14.11

**Future Conditions**

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	2.93	7.57
5	0.69	4.62	2.93	9.34
10	0.73	5.21	2.93	11.14
25	0.75	6.06	2.93	13.32
50	0.77	6.73	2.93	15.18
100	0.80	7.40	2.93	17.35

**BASIN L**

Total Area 5.93 Acres

Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	5.93	5.93

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	5.93
Future	100%	0%	0%	0%	0%	0%
Acres	5.93	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	830 ft	830 ft
Slope	3.00 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.60 ft/sec	2.00 ft/sec
Tc	0.38 hours	0.12 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.07	5.93	9.83
5	0.56	3.80	5.93	12.62
10	0.61	4.32	5.93	15.63
25	0.64	5.07	5.93	19.24
50	0.67	5.65	5.93	22.45
100	0.70	6.23	5.93	25.86

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	5.93	15.32
5	0.69	4.62	5.93	18.90
10	0.73	5.21	5.93	22.55
25	0.75	6.06	5.93	26.95
50	0.77	6.73	5.93	30.73
100	0.80	7.40	5.93	35.11

**Off-site 1** Small area to the west of Basin A

Total Area 0.99 Acres

Manual Input

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.99	0.99

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	100%	0%	0%	0%	0%	0%
Acres	0.99	0.00	0.00	0.00	0.00	0.00
Future	100%	0%	0%	0%	0%	0%
Acres	0.99	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	235 ft	235 ft
Slope	2.00 %	2.00 %
Waterflow Desc	pavement	pavement
Avg Velocity	2.00 ft/sec	2.00 ft/sec
Tc	0.03 hours	0.03 hours

15 min <= Tc <= 24 hrs

**Runoff Coefficients \* Soil Group D**

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

**Existing Conditions**

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.99	2.56
5	0.69	4.62	0.99	3.16
10	0.73	5.21	0.99	3.77
25	0.75	6.06	0.99	4.50
50	0.77	6.73	0.99	5.13
100	0.80	7.40	0.99	5.86

**Future Conditions**

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.99	2.56
5	0.69	4.62	0.99	3.16
10	0.73	5.21	0.99	3.77
25	0.75	6.06	0.99	4.50
50	0.77	6.73	0.99	5.13
100	0.80	7.40	0.99	5.86

**Off-site 2** Large area to the north of Basin C Manual Input

Total Area 64.60 Acres

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	64.60	64.60

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	100%	0%	0%	0%	0%	0%
Acres	64.60	0.00	0.00	0.00	0.00	0.00
Future	100%	0%	0%	0%	0%	0%
Acres	64.60	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	1500 ft	1500 ft
Slope	2.00 %	2.00 %
Waterflow Desc	pavement	pavement
Avg Velocity	2.00 ft/sec	2.00 ft/sec
Tc	0.21 hours	0.21 hours

15 min <= Tc <= 24 hrs

**Runoff Coefficients \* Soil Group D**

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

**Existing Conditions**

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	64.60	166.93
5	0.69	4.62	64.60	205.93
10	0.73	5.21	64.60	245.69
25	0.75	6.06	64.60	293.61
50	0.77	6.73	64.60	334.76
100	0.80	7.40	64.60	382.43

**Future Conditions**

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	64.60	166.93
5	0.69	4.62	64.60	205.93
10	0.73	5.21	64.60	245.69
25	0.75	6.06	64.60	293.61
50	0.77	6.73	64.60	334.76
100	0.80	7.40	64.60	382.43

**FIREPOINT ADDITION**  
 Hydrology

**Off-site 3** Small area north of Basin F Manual Input

Total Area		0.60 Acres				
Soil Group	A	B	C	D	Total	
	(% of Total Area)	(% of Total Area)	(% of Total Area)	(% of Total Area)	(% of Total Area)	
Existing	0%	0%	0%	100%	100%	
Acres	0.00	0.00	0.00	0.60	0.60	
Land Use	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
	(% of Total Area)	(% of Total Area)	(% of Total Area)	(% of Total Area)	(% of Total Area)	(% of Total Area)
Existing	100%	0%	0%	0%	0%	0%
Acres	0.60	0.00	0.00	0.00	0.00	0.00
Future	100%	0%	0%	0%	0%	0%
Acres	0.60	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	125 ft	125 ft
Slope	2.00 %	2.00 %
Waterflow Desc	pavement	pavement
Avg Velocity	2.00 ft/sec	2.00 ft/sec
Tc	0.02 hours	0.02 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.60	1.55
5	0.69	4.62	0.60	1.91
10	0.73	5.21	0.60	2.28
25	0.75	6.06	0.60	2.73
50	0.77	6.73	0.60	3.11
100	0.80	7.40	0.60	3.55

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.60	1.55
5	0.69	4.62	0.60	1.91
10	0.73	5.21	0.60	2.28
25	0.75	6.06	0.60	2.73
50	0.77	6.73	0.60	3.11
100	0.80	7.40	0.60	3.55

**Off-site 4** Small area north of Basin K Manual Input

**Total Area** 1.12 Acres

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
<b>Acres</b>	0.00	0.00	0.00	1.12	1.12

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
<b>Existing</b>	100%	0%	0%	0%	0%	0%
<b>Acres</b>	1.12	0.00	0.00	0.00	0.00	0.00
<b>Future</b>	100%	0%	0%	0%	0%	0%
<b>Acres</b>	1.12	0.00	0.00	0.00	0.00	0.00

	Existing	Future
<b>Length of Flow</b>	125 ft	125 ft
<b>Slope</b>	2.00 %	2.00 %
<b>Waterflow Desc</b>	pavement	pavement
<b>Avg Velocity</b>	2.00 ft/sec	2.00 ft/sec
<b>Tc</b>	0.02 hours	0.02 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	1.12	2.89
5	0.69	4.62	1.12	3.57
10	0.73	5.21	1.12	4.26
25	0.75	6.06	1.12	5.09
50	0.77	6.73	1.12	5.80
100	0.80	7.40	1.12	6.63

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	1.12	2.89
5	0.69	4.62	1.12	3.57
10	0.73	5.21	1.12	4.26
25	0.75	6.06	1.12	5.09
50	0.77	6.73	1.12	5.80
100	0.80	7.40	1.12	6.63

Ameritrack West, Inc.  
 12469 SW 15th Street, P.O. Box 9  
 Benton, KS 67017

**FIREPOINT ADDITION**  
 Hydrology

Prepared by: JGF  
 2/17/2010

**Off-site 5** Area east of Basin K Manual Input  
 Total Area 27.15 Acres

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0.00	0.00	0.00	27.15	100%
Acres	0.00	0.00	0.00	27.15	27.15

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	100%	0%	0%	0%	0%	0%
Acres	27.15	0.00	0.00	0.00	0.00	0.00
Future	100%	0%	0%	0%	0%	0%
Acres	27.15	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	1100 ft	1100
Slope	2.00 %	2.00 %
Waterflow Desc	pavement	pavement
Avg Velocity	2.00 ft/sec	2.00 ft/sec
Tc	0.15 hours	0.15 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients \* Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	27.15	70.16
5	0.69	4.62	27.15	86.55
10	0.73	5.21	27.15	103.26
25	0.75	6.06	27.15	123.40
50	0.77	6.73	27.15	140.69
100	0.80	7.40	27.15	160.73

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	27.15	70.16
5	0.69	4.62	27.15	86.55
10	0.73	5.21	27.15	103.26
25	0.75	6.06	27.15	123.40
50	0.77	6.73	27.15	140.69
100	0.80	7.40	27.15	160.73

Hydraulics

Ameritrack West, Inc.  
12469 SW 15th Street, P.O. Box 9  
Benton, KS 67017

FIREPOINT ADDITION  
Hydraulics  
Inlets

Prepared by: BLB  
2/17/2010

**Curb Inlets**

Node	Qin	Qmax (L=5')	Qmax (L=10')	Use L=
100	1.18	11	22	5
110	1.24	11	22	5
200	2.55	11	22	5
210	2.45	11	22	5
290	1.31	11	22	5
300	1.31	11	22	5
310	3.16	11	22	5

**Area Inlets**

Basin	Node	Q100	Size	Perimeter	Ponding Depth
K*	120	17.35	2'x2'	8	0.81
F*	220	46.35	2'x2'	8	1.55

\* Each of these locations are shown as area inlets but actually will be a series of pipe and inlets for which the limits are unknown at this time

Ameritrack West, Inc.  
12469 SW 15th Street, P.O. Box 9  
Benton, KS 67017

FIREPOINT ADDITION  
Hydraulics  
SWS Line #1

Prepared by: BLB  
2/17/2010

ID	Type	Elevation	Junction Loss	Discharge	Cumulative Q	Freeboard	Min Invert Elevation
SWS90	Outlet	1416.00	0.13	0.00	0.00	0.00	1410.46
SWS100	Curb	1416.78	0.11	1.18	11.76	3.96	1411.41
SWS110	Curb	1416.78	0.03	1.24	10.58	3.46	1411.75
SWS120	Grate	1417.00	0.43	9.34	9.34	2.89	1412.00

Ameritrack West, Inc.  
 12469 SW 15th Street, P. O. Box 9  
 Benton, KS 67017

**FIREPOINT ADDITION**  
 Hydraulics  
 SWS Line #1

Prepared by: BLB  
 2/17/2010

ID	US Node	DS Node	Rise	Actual Length	Manning's N	Slope	Discharge	Capacity	Velocity	HGL US	HGL DS	US Junction Loss	Invert US	Invert DS	US Freeboard
L1	SWS100	SWS90	1.50	29.96	0.012	3.06	11.76	21.40	11.71	1412.82	1411.39	0.11	1411.41	1410.46	3.96
L2	SWS110	SWS100	1.50	45.00	0.012	0.51	10.58	8.72	6.14	1413.32	1412.82	0.03	1411.75	1411.51	3.46
L3	SWS120	SWS110	1.50	31.00	0.012	0.45	9.34	8.20	5.42	1414.11	1413.32	0.43	1412.00	1411.85	2.89

Ameritrack West, Inc.  
12469 SW 15th Street, P.O. Box 9  
Benton, KS 67017

FIREPOINT ADDITION  
Hydraulics  
SWS Line #2

Prepared by: BLB  
2/17/2010

ID	Type	Elevation	Junction Loss	Discharge	Cumulative Q	Freeboard	Min Invert Elevation
SWS190	Outlet	1409.70	0.13	0.00	0.00	0.00	1406.70
SWS200	Curb	1414.66	0.01	2.55	29.96	4.89	1406.86
SWS210	Curb	1414.66	0.03	2.45	27.41	4.83	1407.09
SWS220	Grate	1417.25	0.24	24.96	24.96	7.17	1407.30

Ameritrack West, Inc.  
 12469 SW 15th Street, P.O. Box 9  
 Benton, KS 67017

FIREPOINT ADDITION  
 Hydraulics  
 SWS Line #2

Prepared by: BLB  
 2/17/2010

ID	US Node	DS Node	Rise	Actual Length	Manning's N	Slope	Discharge	Capacity	Velocity	HGL US	HGL DS	US Junction Loss	Invert US	Invert DS	US Freeboard
L4	SWS200	SWS190	3.00	36.94	0.012	0.42	29.96	50.38	7.06	1409.77	1409.70	0.01	1406.86	1406.70	4.89
L5	SWS210	SWS200	3.00	45.00	0.012	0.49	27.41	54.21	7.24	1409.83	1409.77	0.03	1407.09	1406.86	4.83
L6	SWS220	SWS210	3.00	22.51	0.012	0.44	24.96	51.59	6.83	1410.09	1409.83	0.24	1407.30	1407.19	7.17

Ameritrack West, Inc.  
12469 SW 15th Street, P.O. Box 9  
Benton, KS 67017

FIREPOINT ADDITION  
Hydraulics  
SWS Line #3

Prepared by: BLB  
2/17/2010

ID	Type	Elevation	Junction Loss	Discharge	Cumulative Q	Freeboard	Min Invert Elevation
SWS280	Outlet	1412.75	0.13	0.00	0.00	0.00	1405.50
SWS290	Curb	1418.25	1.76	1.31	213.09	3.89	1409.80
SWS291	Other	1417.00	0.64	205.93	205.93	1.92	1410.00
SWS300	Curb	1418.25	0.00	1.31	5.85	3.88	1409.90
SWS310	Curb	1418.25	0.09	4.54	4.54	3.87	1413.36

Ameritrack West, Inc.  
 12469 SW 15th Street, P.O. Box 9  
 Benton, KS 67017

FIREPOINT ADDITION  
 Hydraulics  
 SWS Line #3

Prepared by: BLB  
 2/17/2010

ID	US Node	DS Node	Rise	Actual Length	Manning's N	Slope	Discharge	Capacity	Velocity	HGL US	HGL DS	US Junction Loss	Invert US	Invert DS	US Freeboard
L7	SWS290	SWS280	4.00	407.16	0.012	1.05	213.09	636.94	14.72	1414.36	1407.34	1.76	1409.80	1405.50	3.89
L8	SWS291	SWS290	4.00	39.43	0.012	0.49	205.93	435.78	11.24	1415.08	1414.36	0.64	1410.00	1409.80	1.92
L9	SWS300	SWS290	3.00	44.99	0.012	0.21	5.85	35.75	3.51	1414.37	1414.36	0.00	1409.90	1409.80	3.88
L10	SWS310	SWS300	3.00	25.69	0.012	12.02	4.54	269.43	13.62	1414.38	1414.37	0.09	1413.36	1410.00	3.87

CURRENT DATE: 02-16-2010  
 CURRENT TIME: 22:06:16

FILE DATE: 02-16-2010  
 FILE NAME: CULVERT

*Approx. 113' Extension of Existing 8'x6' RCB*

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 6.1

C U L V N O.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET					
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE	
1	1410.00	1405.50	445.02	1 RCB	8.00	6.00	.012	CONVENTIONAL	
2									
3									
4									
5									
6									

SUMMARY OF CULVERT FLOWS (cfs) FILE: CULVERT DATE: 02-16-2010

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1410.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1411.36	38.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.16	76.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.82	114.7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1413.44	153.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1414.00	191.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1414.20	205.9	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1415.02	267.7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1415.51	305.9	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1416.00	344.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1416.50	382.4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CULVERT DATE: 02-16-2010

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1410.00	0.000	0.00	0.00	0.00
1411.36	0.000	38.24	0.00	0.00
1412.16	0.000	76.48	0.00	0.00
1412.82	0.000	114.72	0.00	0.00
1413.44	0.000	152.96	0.00	0.00
1414.00	0.000	191.20	0.00	0.00
1414.20	0.000	205.90	0.00	0.00
1415.02	0.000	267.68	0.00	0.00
1415.51	0.000	305.92	0.00	0.00
1416.00	0.000	344.16	0.00	0.00
1416.50	0.000	382.40	0.00	0.00

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000

CURRENT DATE: 02-16-2010  
CURRENT TIME: 22:06:16

FILE DATE: 02-16-2010  
FILE NAME: CULVERT

PERFORMANCE CURVE FOR CULVERT 1 - 1( 8.00 (ft) BY 6.00 (ft)) RCB

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)	
0.00	1410.00	0.00	0.00	0-NF	0.00	0.00	0.00	1.50	0.00	0.00	
38.24	1411.36	1.36	1.36	1-S2n	0.59	0.89	0.49	1.50	9.68	0.00	
76.48	1412.16	2.16	2.16	1-S2n	0.90	1.42	0.82	1.50	11.67	0.00	
114.72	1412.82	2.82	2.82	1-S2n	1.21	1.86	1.21	1.50	11.83	0.00	
152.96	1413.44	3.44	3.44	1-S2n	1.45	2.25	1.47	1.50	12.99	0.00	
191.20	1414.00	4.00	4.00	1-S2n	1.70	2.61	1.61	1.50	14.81	0.00	
205.90	1414.21	4.21	4.21	1-S2n	1.79	2.75	1.81	1.50	14.20	0.00	
267.68	1415.02	5.02	5.02	1-S2n	2.14	3.27	2.18	1.50	15.34	0.00	
305.92	1415.51	5.51	5.51	1-S2n	2.36	3.58	2.41	1.50	15.90	0.00	
344.16	1416.00	6.00	6.00	5-S2n	2.56	3.87	2.63	1.50	16.37	0.00	
382.40	1416.50	6.50	6.50	5-S2n	2.76	4.15	2.84	1.50	16.84	0.00	
El. inlet face invert					1410.00 ft	El. outlet invert					1405.50 ft
El. inlet throat invert					0.00 ft	El. inlet crest					0.00 ft

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION 0.00 ft  
 INLET ELEVATION 1410.00 ft  
 OUTLET STATION 445.00 ft  
 OUTLET ELEVATION 1405.50 ft  
 NUMBER OF BARRELS 1  
 SLOPE (V/H) 0.0101  
 CULVERT LENGTH ALONG SLOPE 445.02 ft

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE BOX  
 BARREL SPAN 8.00 ft  
 BARREL RISE 6.00 ft  
 BARREL MATERIAL CONCRETE  
 BARREL MANNING'S n 0.012  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL SQUARE EDGE (30-75 DEG. FLARE)  
 INLET DEPRESSION NONE

CURRENT DATE: 02-16-2010  
CURRENT TIME: 22:06:16

FILE DATE: 02-16-2010  
FILE NAME: CULVERT

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TAILWATER

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CONSTANT WATER SURFACE ELEVATION  
1407.00

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ROADWAY OVERTOPPING DATA

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ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	41.00 ft
CREST LENGTH	200.00 ft
OVERTOPPING CREST ELEVATION	1418.25 ft

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CURRENT DATE: 02-16-2010  
 CURRENT TIME: 22:12:02

FILE DATE: 02-16-2010  
 FILE NAME: CULVERT

*Existing Structure @ SE corner of Lot 1, Block A*

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 6.1

C U L V E R T N O.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1410.00	1409.90	70.00	2 RCPE	5.00	3.17	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: CULVERT DATE: 02-16-2010

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1410.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1411.12	19.6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1411.63	39.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.05	58.7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.43	78.3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.78	97.9	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.91	105.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1413.43	137.1	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1413.74	156.6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1414.07	176.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1414.42	195.8	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CULVERT DATE: 02-16-2010

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1410.00	0.000	0.00	0.00	0.00
1411.12	0.000	19.58	0.00	0.00
1411.63	0.000	39.16	0.00	0.00
1412.05	0.000	58.74	0.00	0.00
1412.43	0.000	78.32	0.00	0.00
1412.78	0.000	97.90	0.00	0.00
1412.91	0.000	105.50	0.00	0.00
1413.43	0.000	137.06	0.00	0.00
1413.74	0.000	156.64	0.00	0.00
1414.07	0.000	176.22	0.00	0.00
1414.42	0.000	195.80	0.00	0.00

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000



CURRENT DATE: 02-16-2010  
CURRENT TIME: 22:12:02

FILE DATE: 02-16-2010  
FILE NAME: CULVERT

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TAILWATER

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CONSTANT WATER SURFACE ELEVATION  
1409.50

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ROADWAY OVERTOPPING DATA

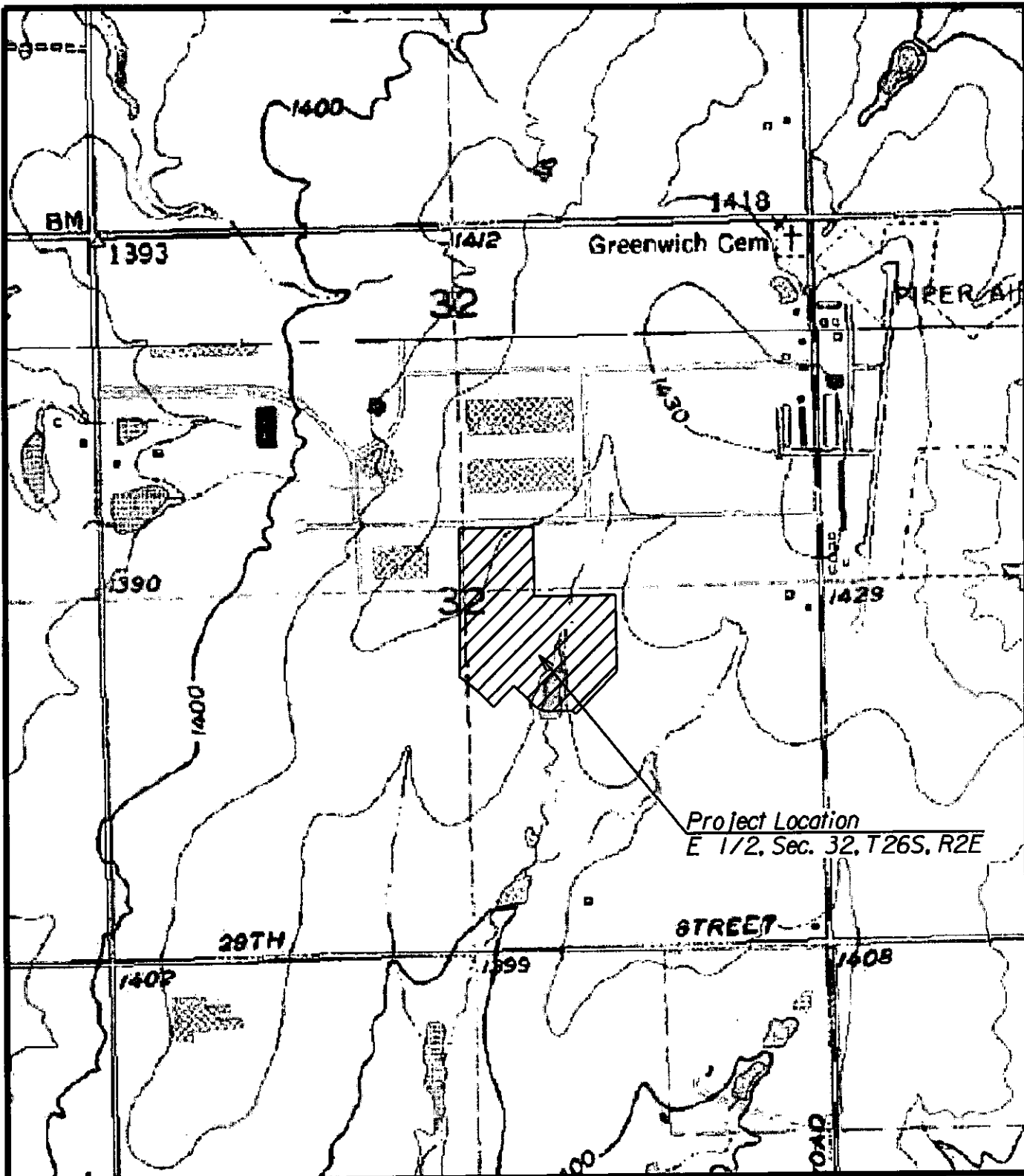
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ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	41.00 ft
CREST LENGTH	200.00 ft
OVERTOPPING CREST ELEVATION	1416.00 ft

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Supplemental  
Info



*Project Location*  
 E 1/2, Sec. 32, T26S, R2E



AMERITRACK WEST, INC.  
 12469 SW 15th Benton, KS 67017  
 O: 316-778-2215 F: 316-778-1204

USGS VICINITY MAP

FIREPOINT ADDITION  
 WICHITA, KANSAS

Project No.  
 463



# FIREPOINT ADDITION

Ameritrack West, Inc.

- City Limit Boundaries
- Property Parcels
- Parks
- Airports
- City Limits
- Small Cities
- Sedgwick County
- Wichita



Every reasonable effort has been made to assure the accuracy of the maps and associated data provided herein. This information is provided with the understanding that the data are susceptible to a degree of error, and conclusions drawn from such information are the responsibility of the reader. The City of Wichita makes no warranty, representation or guaranty as to the content, accuracy, timeliness or completeness of any of the data provided herein. Some data provided here and used for the preparation of these maps has been obtained from public records not created or maintained by the City of Wichita. The City of Wichita shall assume no liability for any decisions made or actions taken or not taken by the reader in reliance upon any information or data furnished hereunder. The user should consult with the appropriate departmental staff member, e.g. Planning, Parks & Recreation, etc. to confirm the accuracy of information appearing in the visual presentations accessible through these web pages.



MAP SCALE 1" = 500'



PANEL 0376E

# FIRM FLOOD INSURANCE RATE MAP SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS

PANEL 376 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY  
WICHITA, CITY OF

NUMBER PANEL SUFFIX  
200328 0376 E

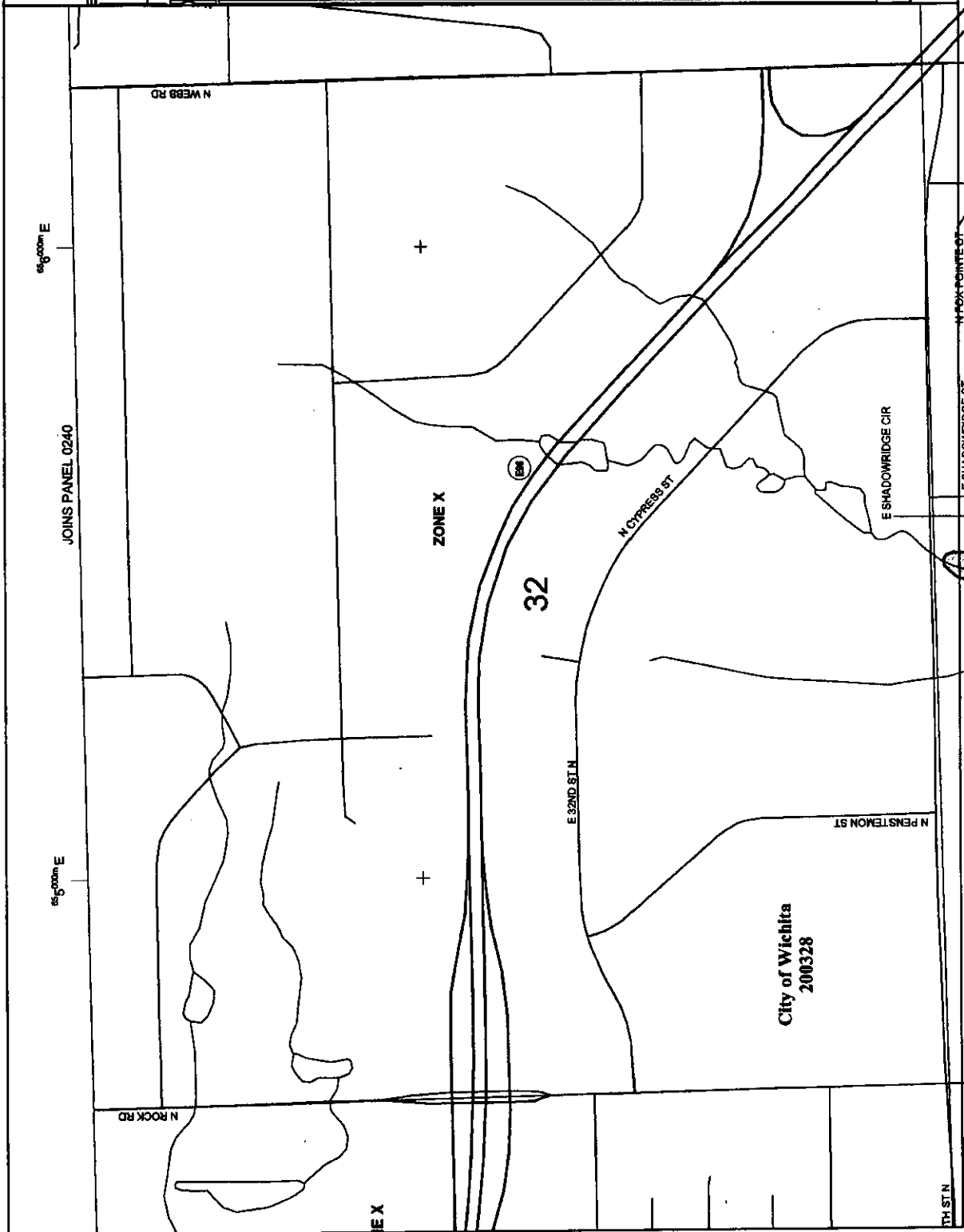
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER  
20173C0376E

EFFECTIVE DATE  
FEBRUARY 2, 2007  
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-ALT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the map. For the most current information on the status of the National Flood Insurance Program flood maps, check the FEMA Flood Map Sites at [www.nfwf.com](http://www.nfwf.com).





Contact Us | Download Soils Data | Archived Soil Surveys | Soil Survey Status | Glossary | Preferences | Logout | Help

Area of Interest (AOI) | Soil Map | Soil Data Explorer | Shopping Cart (Free) | Printable Version | Add to Shopping Cart

View Soil Information By Use: [All Uses]

Intro to Soils | Suitabilities and Limitations for Use | Soil Properties and Qualities | Ecological Site Assessment | Soil Reports

Map - Hydrologic Soil Group

Search

Properties and Qualities Ratings [Open All] [Close All]

Soil Chemical Properties

Soil Erosion Factors

Soil Physical Properties

Soil Qualities and Features

AASHTO Group Classification (Surface)

Depth to a Selected Soil Restrictive Layer

Depth to Any Soil Restrictive Layer

Drainage Class

Frost Action

Frost-Free Days

Hydrologic Soil Group

View Options

Map [checked]

Table [checked]

Description of Rating [checked]

Rating Options [checked]

Detailed Description

Advanced Options

Aggregation Method [Dominant Condition]

Component Percent Cutoff

Tie-break Rule [Lower]

[Higher]

View Rating

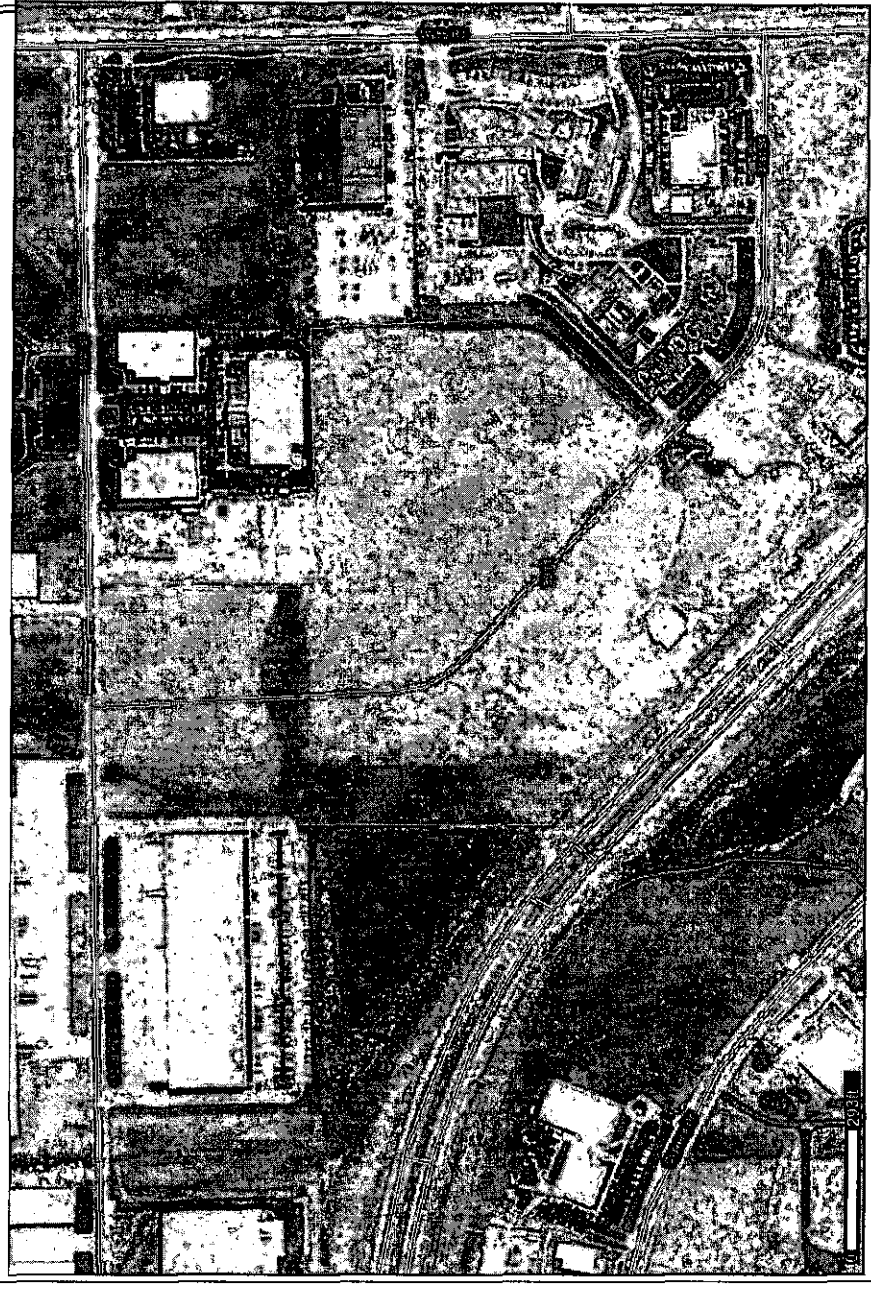
Map Unit Name

Parent Material Name

Representative Slope

Unified Soil Classification (Surface)

Water Features



Warning: Soil Ratings Map may not be valid at this scale.

Tables - Hydrologic Soil Group - Summary By Map Unit

Summary by Map Unit — Sedgewick County, Kansas			
Map unit symbol	Map unit name	Rating	Percent of AOI
3911	Rosehill silty clay, 1 to 3 percent slopes	D	100.0%
<b>Totals for Area of Interest</b>		<b>30.6</b>	<b>100.0%</b>

Description — Hydrologic Soil Group
<p>Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.</p> <p>The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:</p> <p>Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.</p> <p>Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.</p> <p>Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.</p> <p>Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.</p> <p>If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.</p>
<p><b>Rating Options — Hydrologic Soil Group</b></p> <p><b>Aggregation Method:</b> Dominant Condition</p> <p><b>Component Percent Cutoff:</b> None Specified</p> <p><b>Tie-break Rule:</b> Lower</p>

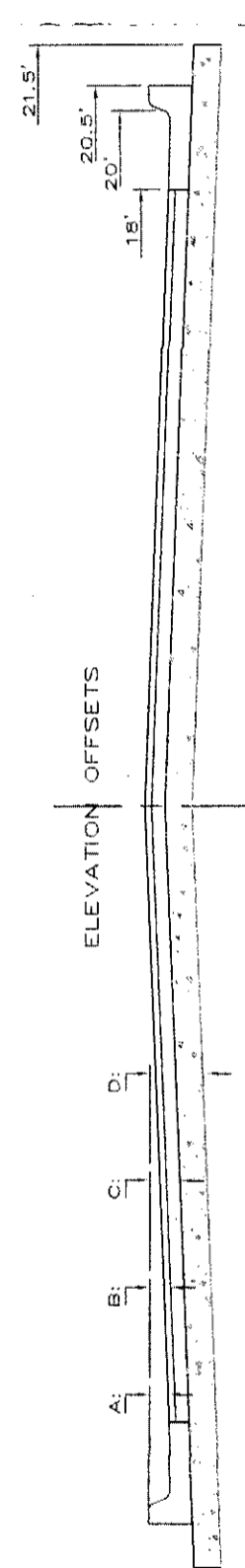
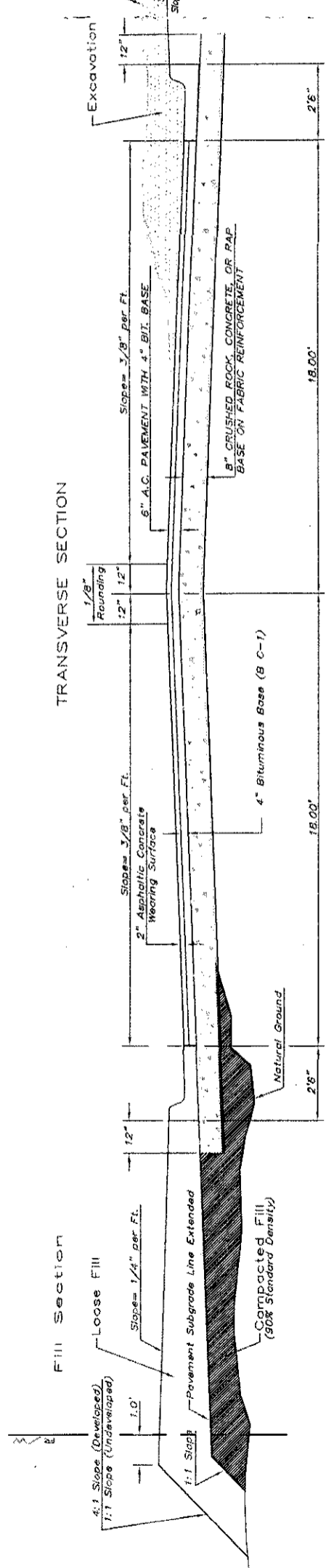
RAINFALL INTENSITY TABLE

SEDGWICK COUNTY  
KANSAS

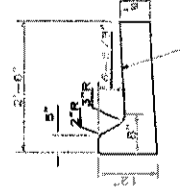
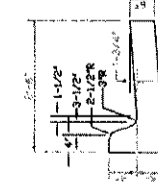
THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES  
IN INCHES PER HOUR.

DURATION, HR:MIN	RETURN PERIOD						
	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:05	4.91	5.64	6.64	7.38	8.48	9.34	10.20
0:06	4.62	5.34	6.33	7.07	8.15	9.00	9.84
0:07	4.38	5.09	6.08	6.80	7.86	8.69	9.52
0:08	4.17	4.87	5.85	6.56	7.60	8.41	9.22
0:09	4.00	4.68	5.63	6.33	7.34	8.14	8.93
0:10	3.84	4.50	5.43	6.11	7.10	7.87	8.64
0:11	3.70	4.34	5.25	5.90	6.86	7.61	8.36
0:12	3.56	4.19	5.07	5.71	6.64	7.36	8.09
0:13	3.44	4.05	4.91	5.53	6.43	7.14	7.84
0:14	3.33	3.92	4.76	5.36	6.24	6.92	7.61
0:15	3.22	3.80	4.62	5.21	6.06	6.73	7.40
0:16	3.12	3.69	4.49	5.07	5.91	6.56	7.21
0:17	3.03	3.58	4.37	4.94	5.76	6.40	7.04
0:18	2.94	3.48	4.26	4.82	5.63	6.26	6.88
0:19	2.85	3.39	4.16	4.71	5.50	6.12	6.74
0:20	2.77	3.30	4.06	4.60	5.38	5.99	6.60
0:21	2.70	3.22	3.97	4.50	5.27	5.87	6.47
0:22	2.63	3.14	3.88	4.41	5.17	5.76	6.35
0:23	2.56	3.07	3.80	4.32	5.07	5.65	6.23
0:24	2.50	3.00	3.72	4.23	4.97	5.54	6.12
0:25	2.44	2.93	3.64	4.15	4.88	5.44	6.01
0:26	2.38	2.87	3.57	4.07	4.79	5.35	5.90
0:27	2.33	2.81	3.50	4.00	4.70	5.26	5.80
0:28	2.27	2.75	3.44	3.92	4.62	5.17	5.71
0:29	2.23	2.69	3.37	3.86	4.54	5.08	5.61
0:30	2.18	2.64	3.31	3.79	4.47	4.99	5.52
0:31	2.14	2.59	3.26	3.72	4.39	4.91	5.43
0:32	2.09	2.54	3.20	3.66	4.32	4.83	5.34
0:33	2.05	2.50	3.14	3.60	4.25	4.76	5.26
0:34	2.02	2.45	3.09	3.54	4.18	4.68	5.18
0:35	1.98	2.41	3.04	3.48	4.12	4.61	5.10
0:36	1.94	2.37	2.99	3.43	4.05	4.54	5.02
0:37	1.91	2.33	2.94	3.38	3.99	4.47	4.95
0:38	1.88	2.29	2.90	3.32	3.93	4.40	4.87
0:39	1.85	2.25	2.85	3.27	3.87	4.34	4.80
0:40	1.82	2.22	2.81	3.23	3.82	4.28	4.73
0:41	1.79	2.18	2.77	3.18	3.76	4.22	4.67
0:42	1.76	2.15	2.73	3.13	3.71	4.16	4.60
0:43	1.73	2.12	2.69	3.09	3.66	4.10	4.54
0:44	1.71	2.09	2.65	3.05	3.61	4.04	4.48
0:45	1.68	2.06	2.62	3.01	3.56	3.99	4.42

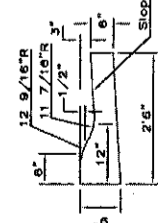
# TYPICAL 41' B-B PAVEMENT DETAILS



STATE CURB  
MODIFIED TYPE I  
COMBINED CURB & GUTTER



COMBINED CURB & GUTTER

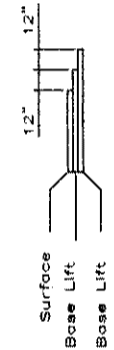


COMBINED ROLL-TYPE CURB & GUTTER

	0'	2'	4'	6'	8'	10'	12'	14'	16'	18'	20'	20.5'	21.5'
A: Top of Curbs to Top of Surface Lift	-05	-01	0.05	0.11	0.18	0.24	0.30	0.36	0.43	0.48	-	-	-
B: Top of Curbs to Top of Upper Base Lift	0.11	0.16	0.22	0.28	0.34	0.40	0.47	0.53	0.59	0.65	-	-	-
C: Top of Curbs to Top of C. R. Subgrade	0.44	0.48	0.55	0.61	0.67	0.73	0.80	0.86	0.92	0.98	1.05	1.06	1.07

### General Notes

FABRIC BASE REINFORCEMENT SHALL BE B X 1100 GEORGRID AS MANUFACTURED BY TENSAR CORPORATION OR APPROVED EQUAL. FABRIC BASE REINFORCEMENT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. CRUSHED ROCK SHALL BE 1 1/2\"/>



TRANSVERSE JOINTS

Transverse construction joints shall be constructed in flexible base pavements at locations where pavement joints existing in the base pavement are shown by the detail. The joint shall be constructed in the base for Square Yards of ASPHALTIC CONCRETE (2\"/>

**CITY OF WICHITA**  
PUBLIC WORKS  
ENGINEERING

**41' PAVEMENT**  
**6" ASPHALTIC CONCRETE**  
**W/ CRUSHED ROCK BASE**

JAMES L. ARMOUR, P.E., L.S.

PROJECT NUMBER	DATE	SCALE
XXX-XXXX	XXXXXX	MM/YY

CITY ENGINEER'S OFFICE  
CITY OF WICHITA  
1000 W. WASHINGTON ST., 3RD FLOOR  
WICHITA, KS 67202-1000  
(316) 266-2121 Fax

DESIGNED BY	CHECKED BY	DATE
ABC	DEF	X OF X

