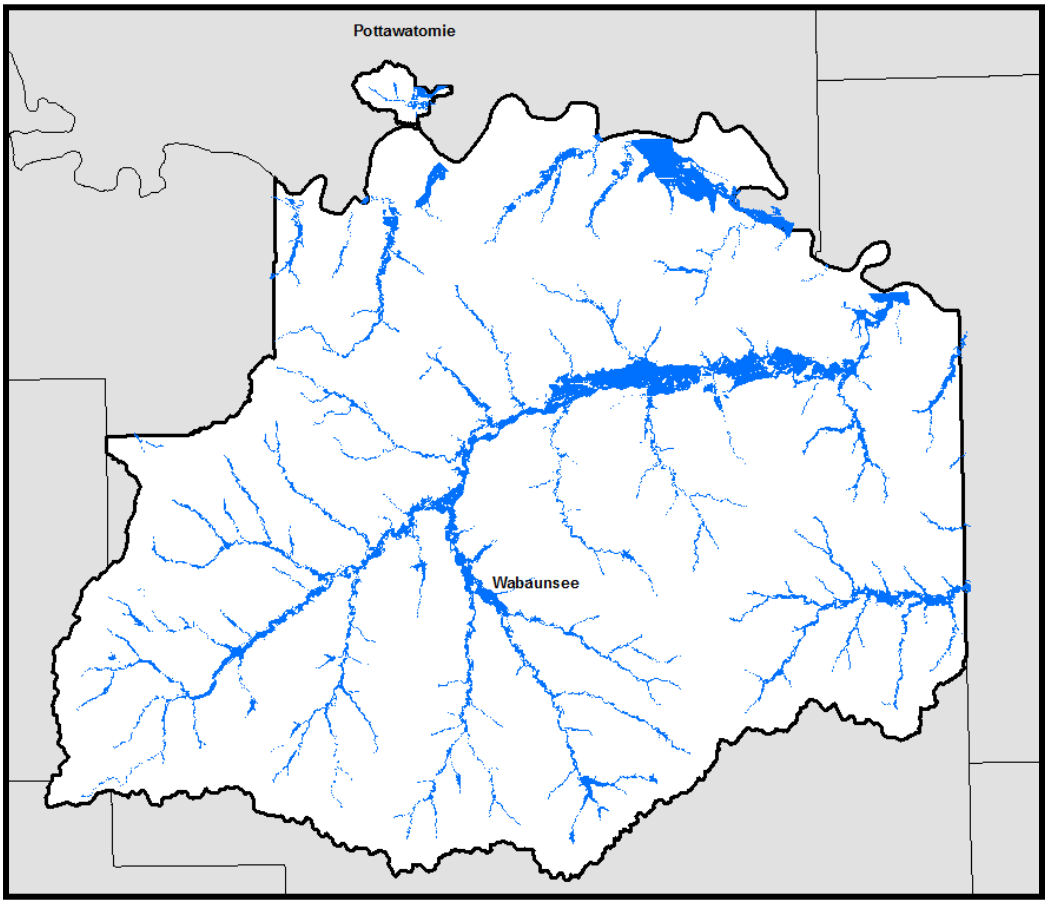
HYDRAULIC REPORT

MIDDLE KANSAS WATERSHED

(WITHIN WABAUNSEE COUNTY AND THE CITY OF WAMEGO IN POTTAWATOMIE COUNTY)



UNDER CONTRACT WITH:

KANSAS DEPARTMENT OF AGRICULTURE

Division of Water Resources

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INTRODUCTION

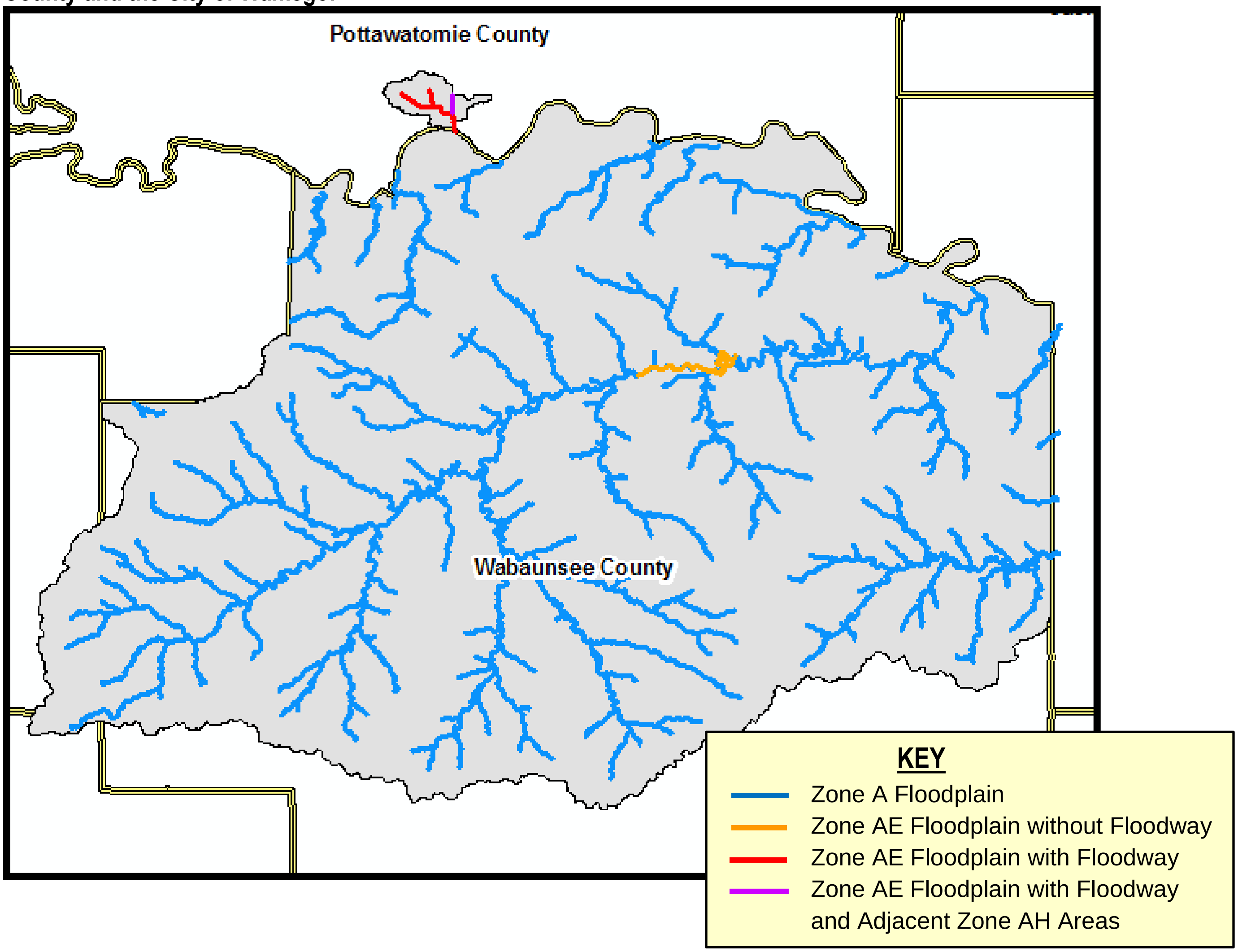
This report presents the hydraulic analyses for the detailed Zone AE designated streams that lie within the City of Wamego in Pottawatomie County, and the enhanced Zone AE designated streams and approximate Zone A designated streams in Wabaunsee County that lie within the Middle Kansas Watershed (HUC8 10270102). This project consisted of new hydrologic and hydraulic studies using current watershed characteristics and new detailed topography for approximately 4.4 miles of streams modeled by detailed methods, resulting in updated Zone AE floodplains with a floodway (including adjacent Zone AH floodplains); approximately 6.6 miles of streams modeled by enhanced methods, including rainfall-runoff model hydrology and field measured structures, resulting in updated Zone AE floodplains without a floodway; and approximately 571.2 miles of streams studied by approximate methods, resulting in updated Zone A floodplains. It should be noted that Mulberry Creek Tributary 1; which was described in the Middle Kansas Watershed Hydrology Report (Reference 2) as being modeled by enhanced methods, resulting in updated Zone AE floodplains without a floodway; is not included in this hydraulic study because the stream is overtaken by the floodplain from Mill Creek. In addition, the portion of Mill Creek that is designated as enhanced Zone AE area is larger than what was described in the Middle Kansas Watershed Hydrology Report (Reference 2). A summary of the streams that were studied is shown in Table 1. A figure that shows the flood zone designation for each stream is shown in Figure 1.

A portion of the Kansas River lies within Wabaunsee County, within the Middle Kansas Watershed. However, the Kansas River was not included in this hydraulic analysis. A request to perform detailed hydrologic and hydraulic analysis of the portion of the Kansas River within Pottawatomie and Wabaunsee Counties was submitted to FEMA for approval, with data development to be done next year, during the FY 2017 round of funding. Therefore, no work will be done on the Kansas River until that time, when the entire Kansas River will be completed as a detailed study. On the current effective maps, the portion of the Kansas River in Pottawatomie County is a Zone AE floodplain and the portion of the Kansas River in Wabaunsee County is a Zone A floodplain.

Table 1 : Summary of Methods

Study Area/Flooding Source	Zone	Stream Miles	Hydraulic Method
East Unnamed Creek	AE with floodway	3.0	Steady-State HEC-RAS
East Unnamed Creek Tributary 1	AE with floodway and adjacent AH areas	0.7	Unsteady-State 1D/2D HEC-RAS
East Unnamed Creek Tributary 2	AE with floodway	0.7	Steady-State HEC-RAS
Mill Creek	AE without floodway	6.6	Steady-State HEC-RAS
Various Zone A Streams	A	571.2	Steady-State HEC-RAS
Total	-	**582.2**	-

Figure 1- Flood Zone Designation for Each Stream in the Middle Kansas Watershed, within Wabaunsee County and the City of Wamego.



A hydrologic study was performed to develop peak discharges for the 10%, 4%, 2%, 1%, 1%-, 1%+ and 0.2% annual chance storm events. The peak discharges computed during the hydrologic analyses were used in developing the hydraulic analyses for the streams within this study.

The extents of the Zone A studies include those streams currently designated by FEMA, plus the conveyances with drainage areas equal to or greater than 1-square mile of drainage area. A detailed adjustment of the stream network relative to aerial photography and LiDAR was completed to ensure proper streamline alignment and extent.

The current effective Flood Insurance Study (FIS) Report for Pottawatomie County and the City of Wamego is dated March 16, 2015. There is no current FIS Report for Wabaunsee County.

Detailed Hydraulic Analysis

The detailed hydraulic studies included the use of steady state and unsteady-state HEC-RAS analysis. The unsteady-state HEC-RAS analysis included 1-dimensional and 2-dimensional areas. The following discussion describes the general hydraulic methods used for all detailed studies. More specific details regarding each study are provided in the succeeding sub-sections. The defined streams were studied using the hydraulic computer model HEC-RAS version 5.0.3 (Reference 1), developed by the U.S. Army Corps of Engineers. Discharge values developed during the hydrologic analysis phase of this project were used in the hydraulic studies. Details for the hydrologic development can be found in the Middle Kansas Watershed Hydrology Report (Reference 2).

Initial modeling for the hydraulic analyses was performed using Amec Foster Wheelers's Automated Floodplain Generator (AFG) tool, which is an interface developed by Amec Foster Wheeler for the preparation of hydraulic models. With this tool, the user can define the spacing of the cross sections and the desired width of the cross-sections for each stream. Hydraulic cross sections are placed using these parameters along with the best available topography. To develop the cross-section geometry, 1-meter LiDAR data obtained through the Kansas Data Access and Support Center (DASC) was used. For each stream, cross-sections were then adjusted using engineering judgement to achieve the most appropriate spacing, width, and location deemed necessary for the detailed study. The cross-sections were also extended as necessary to uphold the bounding polygon principle during floodplain development, thus ensuring that the plotted floodplain was completely contained. In many cases this was a trial-and-error process that involved manually editing the cross-sections several times to get the best combination of spacing and section width.

Field surveys were conducted for the streams included in the detailed hydraulic models. Field notes consisting of structure dimensions, road elevations, channel geometry, and structure material (i.e. corrugated metal pipe, concrete box culvert, etc), were used in conjunction with basic survey data in order to accurately represent the structures within the HEC-RAS models.

Manning's n roughness coefficients were assigned to the channel sections and overbanks using engineering judgment, which included utilization of the most recent aerial photography available and field reconnaissance. The Manning's n values used in each model are specified in later sub-sections of the report. Bank stations were evaluated and placed based on elevation data and aerial interpretation. Blocked obstructions and ineffective flow areas were placed using engineering judgement; which included utilization of the most recent aerial photography, LiDAR data, and plotted floodplains; to provide an accurate representation of the flow area for each cross section.

Flood profiles were computed within HEC-RAS for the 10%, 4%, 2%, 1%, 1% Minus, 1% Plus, and 0.2% annual chance flood events for the detailed studies. The flood profiles were plotted using FEMA's RASPLOT software (Reference 4) for the detailed Zone AE streams. It should be noted that, in some instances, draw-downs less than 0.5 feet were present. Attempts were made to resolve all draw-downs by using reasonable engineering methods to alter the hydraulics. When attempts were determined to be unsuccessful, draw-downs were resolved on the printed profiles by projecting the downstream water surface elevation upstream until it crossed the original profile. It should be noted that calibration data was not available for East Unnamed Creek, East Unnamed Creek Tributary 1, or East Unnamed Creek Tributary 2.

Floodways were developed for the detailed Zone AE designated streams using equal reduction of conveyance on opposite sides of the stream, where possible, while allowing a maximum surcharge of 1.0 ft. Per FEMA's guidance, floodways were not determined for Static Zone AE or Zone AH areas.

East Unnamed Creek

The East Unnamed Creek steady state HEC-RAS model was developed to model approximately 3.0 miles of East Unnamed Creek, extending from its confluence with the Kansas River to approximately 125 feet upstream of Say Road. The Manning's n values used in the channel sections ranged from 0.035 to 0.045. The Manning's n values used in the overbanks ranged from 0.015 to 0.12. Near structures, contraction and expansion coefficients were set at 0.3 and 0.5, respectively. The downstream boundary condition (starting water surface elevation) was based on normal depth calculations. A floodway was developed.

East Unnamed Creek Tributary 2

The East Unnamed Creek Tributary 2 steady state HEC-RAS model was developed to model approximately 0.7 miles of East Unnamed Creek Tributary 2, extending from its confluence with East Unnamed Creek to approximately 820 feet upstream of Say Road. The Manning's n value used in the channel sections was 0.045. The Manning's n values used in the overbanks ranged from 0.015 to 0.12. Near structures, contraction and expansion coefficients were set at 0.3 and 0.5, respectively. The downstream boundary condition (starting water surface elevation) was based on normal depth calculations. A floodway was developed.

East Unnamed Creek Tributary 1

An unsteady state HEC-RAS model was developed to model approximately 0.7 miles of East Unnamed Creek Tributary 1, extending from its confluence with East Unnamed Creek to Old Post Road. The area west of Walsh Road/Balderson Boulevard was modeled as a 1-dimensional area, resulting in a Zone AE floodplain. The area east of Walsh Road/Balderson Boulevard, both north and south of US Highway 24, was modeled as a 2-dimensional area, resulting in a Zone AH floodplain. Lateral weirs were utilized to represent flow going between the 1D and 2D areas.

To accurately model East Unnamed Creek Tributary 1 using unsteady state modeling, the portion of East Unnamed Creek that is downstream of its confluence with East Unnamed Creek Tributary 1 was also included in the unsteady state model. It should be noted that the floodplains generated in the steady state model for the downstream portion of East Unnamed Creek will be used in the floodplain maps, as they are slightly more conservative. The flow in East Unnamed Creek Tributary 1 flows over Walsh Road/Balderson Boulevard, to the east, and spreads two-dimensionally, resulting in lateral inflow and outflow conditions. The unsteady-state methodology provided the best means to accurately compute water surface elevations for this area. Hydrographs generated from the PC-SWMM model that was developed for the East Unnamed Creek Watershed were utilized in the HEC-RAS model to accurately represent the inflow at the upstream boundary of the detailed study area, as well as the inflow experienced along the length of East Unnamed

Creek Tributary 1 and East Unnamed Creek that are within the detailed study area, which includes runoff from the 2D areas as well.

1-Dimensional Modeling

1-Dimensional (1D) HEC-RAS modeling was performed in the areas where flow has primarily one flow path, and where floodway development was necessary to meet the needs of the community; which are the areas west of Walsh Road/Balderson Boulevard. Lateral weirs were used as appropriate, allowing water to flow into and out of the two-dimensional areas; thus, properly depicting the tailwater conditions and various overflow scenarios. The geometry for the lateral weirs was derived from the LiDAR topography.

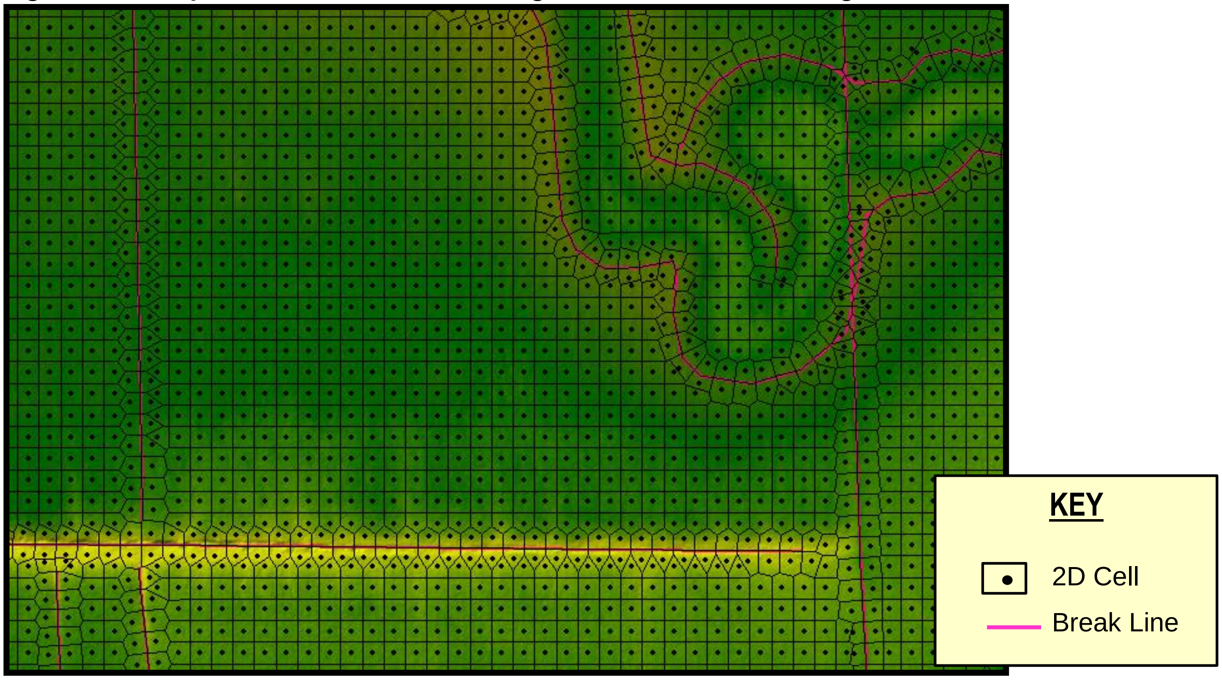
2-Dimensional Modeling

2-Dimensional (2D) HEC-RAS modeling was performed in the areas where flow takes multiple flow paths, having varying water surface elevations and velocities in multiple directions; which are the areas east of Walsh Road/Balderson Boulevard. For these situations, the methodology for 2D modeling more effectively represents the flow conditions and results in a more accurate floodplain as it utilizes the underlying terrain within the area to develop flood maps.

Using HEC-RAS 5.0.3, a computational mesh was developed with the 2D areas, which consists of mini "storage areas". The elevation-volume relationship for each cell is based on the details of the underlying terrain. Each cell face acts as a detailed cross section, which is based on the underlying terrain below the line that represents the cell face. This process allows for water to move between cells based on the details of the terrain, represented by the cell's elevation-volume relationship as well as the hydraulic properties of the cell faces. The Diffuse Wave computation method was chosen for all 2D areas modeled as the floodplains were generally shallow in depth. Computational stability of the 2D model is obtained by balancing the cell area, computational time-step, and flow velocity factors. The computational time-step was set appropriately to achieve reasonable model stability and suitable parameters for the Diffuse Wave equations.

The 2D areas were generally comprised of 50 foot by 50 foot cells, and then manually manipulated to account for proper conveyance of flow through the cell faces. Break lines were used to represent locations that control flow, control the direction of flow, or is a barrier to flow. As an example, break lines were used to represent drainage ditches, lateral flow locations, and other natural high embankments. Mesh generation/realignment tools were then used to align the cell faces along the break lines. Generally, cell faces were adjusted to be perpendicular to flow or to be along the crest of overflow locations. The storage of each 2D cell was computed using the LiDAR topography. Figure 2 shows an example of break line use during 2D modeling.

Figure 2: Example of Break Line Use during 2-Dimensional Modeling



Each 2D cell area was assigned a Manning's n roughness coefficient to account for surface roughness affects. A land use shapefile was developed using a combination of data from the national Land Cover Dataset (NLCD) website (Reference 5) and aerial photography. A Manning's n roughness coefficient was then assigned to each land use type. Drainage ditches, roads, and other specific features were separated in the land use shapefile as well. HEC-RAS utilizes the land use shapefile to generate spatially varying roughness coefficients within the model.

The Manning's n value used in the channel sections of the 1D area was 0.045. The Manning's n values used in the overbanks of the 1D area ranged from 0.015 to 0.12. Contraction and expansion coefficients were not used in the model, as they are handled with the momentum equation through pressure force differences.

Culverts were placed in the lateral weirs and internal boundary conditions of the 2D area based on field surveys that were conducted. Field notes consisting of structure dimensions and structure material (i.e. corrugated metal pipe, concrete box culvert, etc), were used in conjunction with basic survey data in order to accurately represent the structures within the HEC-RAS model.

A floodway was generated for the Zone AE designated area of East Unnamed Creek Tributary 1. This was done by creating a plan for the floodway that uses the same unsteady flow data as the 1% annual chance storm event. Unsteady encroachment stations were added to the model. The water surface elevations when using the unsteady encroachments were then compared to the water surface elevations for the 1% annual chance storm event to ensure that the surcharge at each cross section was between 0.0 and 1.0 foot. It is anticipated that there will not be significant development within the Zone AH flood hazard area, which falls in line with typical practice.

ENHANCED HYDRAULIC ANALYSIS

The defined enhanced Zone AE designated stream, Mill Creek, was studied using the hydraulic computer model HEC-RAS version 5.0.3 (Reference 1), developed by the U.S. Army Corps of Engineers. Discharge values developed during the hydrologic analysis phase of this project were used in the hydraulic studies. Details for the hydrologic development can be found in the Middle Kansas Watershed Hydrology Report (Reference 2). The enhanced Zone AE area for Mill Creek includes approximately 6.6 miles, extending from approximately 11,720 feet downstream of the Union Pacific Railroad, east of Paxico, KS, to approximately 4,980 feet upstream of Interstate 70, west of Paxico, KS. A networked steady-state HEC-RAS model was developed to model the entire extent of Mill Creek, including the enhanced Zone AE area and Zone A area; the portion of South Branch Mill Creek that is downstream of its confluence with East Branch Mill Creek; and the portion of West Branch Mill Creek that is downstream of its confluence with Illinois Creek.

Initial modeling for the hydraulic analyses was performed using HEC-GeoRAS (Reference 3), a Geographic Information Systems (GIS) interface developed by HEC for the preparation of hydraulic models. With the tool, the user can define the spacing of the cross sections and the desired width of the cross-sections for each stream. Hydraulic cross sections are placed using these parameters along with the best available topography. To develop the cross-section geometry, 1-meter LiDAR data obtained through the Kansas Data Access and Support Center (DASC) was used. For each stream, cross-sections were then adjusted using engineering judgement to achieve the most appropriate spacing, width, and location deemed necessary for the detailed study. The cross-sections were also extended as necessary to uphold the bounding polygon principle during floodplain development, thus ensuring that the plotted floodplain was completely contained. In many cases this was a trial-and-error process that involved manually editing the cross-sections several times to get the best combination of spacing and section width.

Manning's n roughness coefficients were assigned to the channel sections and overbanks using engineering judgment, which included utilization of the most recent aerial photography available and field reconnaissance. The Manning's n value used in the channel sections of the Mill Creek model was 0.035. The Manning's n values used in the overbanks of the Mill Creek model ranged from 0.03 to 0.12. The downstream boundary condition (starting water surface elevation) was based on normal depth calculations. Bank stations were evaluated and placed based on elevation data and aerial interpretation. Blocked obstructions and ineffective flow areas were placed using engineering judgement; which included utilization of the most recent aerial photography, LiDAR data, and plotted floodplains; to provide an accurate representation of the flow area for each cross section.

Field surveys were conducted for the portion of Mill Creek within the enhanced Zone AE area. Field notes consisting of structure dimensions, channel geometry, and structure material (i.e. corrugated metal pipe, concrete box culvert, etc), were used in conjunction with basic survey data to accurately represent the structures within the HEC-RAS model. Near structures, contraction and expansion coefficients were set at 0.3 and 0.5, respectively.

Flood profiles were computed within HEC-RAS for the 10%, 4%, 2%, 1%, 1% Minus, 1% Plus, and 0.2% annual chance flood events. The flood profiles were plotted using FEMA's RASPLOT software (Reference 4) for the enhanced Zone AE area of Mill Creek. It should be noted that, in some instances, draw-downs less than 0.5 feet were present. Attempts were made to resolve all draw-downs by using reasonable engineering methods to alter the hydraulics. When attempts were determined to be unsuccessful, draw-downs were resolved on the printed profiles by projecting the downstream water surface elevation upstream until it crossed the original profile. Floodways were not developed for the enhanced Zone AE designated area.

USGS gage station 06888500 is located on Mill Creek, south of Newbury Avenue in Paxico, Kansas. The water surface elevation results from the HEC-RAS model were compared to the water surface elevations reflected at the gage during applicable storm events. The water surface elevation results at the associated location in the model closely aligned to the elevations reflected at the gage, when comparing peak flow in the model to the measured streamflow at the gage. For example, in 1992 the peak streamflow at the gage was 38,500 cfs, which is slightly above the peak flow for the 10% annual chance storm at the associated cross section in the model, which is 37,020 cfs. The water surface elevation reflected at the gage for the 1992 event was 992.67 feet, which is slightly above the water surface elevation at the associated cross section in the HEC-RAS model for the 10% annual chance flood event, which is 992.46 ft. The comparisons made provide added confidence in the accuracy of the HEC-RAS model.

APPROXIMATE HYDRAULIC ANALYSIS

The defined approximate Zone A streams were studied using the hydraulic computer model HEC-RAS version 5.0.3 (Reference 1), developed by the U.S. Army Corps of Engineers. Discharge values developed during the hydrologic analysis phase of this project were used in the hydraulic studies. Details for the hydrologic development can be found in the Middle Kansas Watershed Hydrology Report (Reference 2).

AMEC's First Order Approximates (FOA) tool was used to assist in the development of the geometries and resulting floodplains for the Zone A designated streams. The user can define the spacing of the cross sections and the desired width of the cross-sections for each stream. Hydraulic cross sections are placed using these parameters along with the best available topography. To develop the cross-section geometry, 1-meter LiDAR data obtained through the Kansas Data Access and Support Center (DASC) was used. The spacing, width, and location of cross-sections were then adjusted, as needed. The bounding polygon principle must be observed during floodplain development; therefore, the cross-sections were extended, as necessary, to ensure that the plotted floodplain was completely contained. In many cases this was a trial-and-error process that involved manually editing the cross-sections several times to get the best combination of spacing and section width.

Hydraulic structures were not included in the approximate hydraulic models per industry standards.

Manning's n-values were assigned based on aerial photography. In general, the Manning's n-values ranged from 0.035 to 0.045 in the channel sections and 0.03 to 0.12 in the overbanks. Contraction and expansion coefficients were set at 0.1 and 0.3, respectively. The downstream boundary condition (starting water surface elevation) for the majority of the streams was based on normal depth calculations. The downstream boundary conditions for the upstream portions of West

Branch Mill Creek and South Branch Mill Creek were set to the known water surface elevations from the networked model that was completed for Mill Creek and the downstream portions of South Branch Mill Creek and West Branch Mill Creek. Bank stations were evaluated and placed based on aerial interpretation and LiDAR imagery. Ineffective flow areas were placed using engineering judgement; which included utilization of the most recent aerial photography, LiDAR data, and plotted floodplains; to provide an accurate representation of the flow area for each cross section.

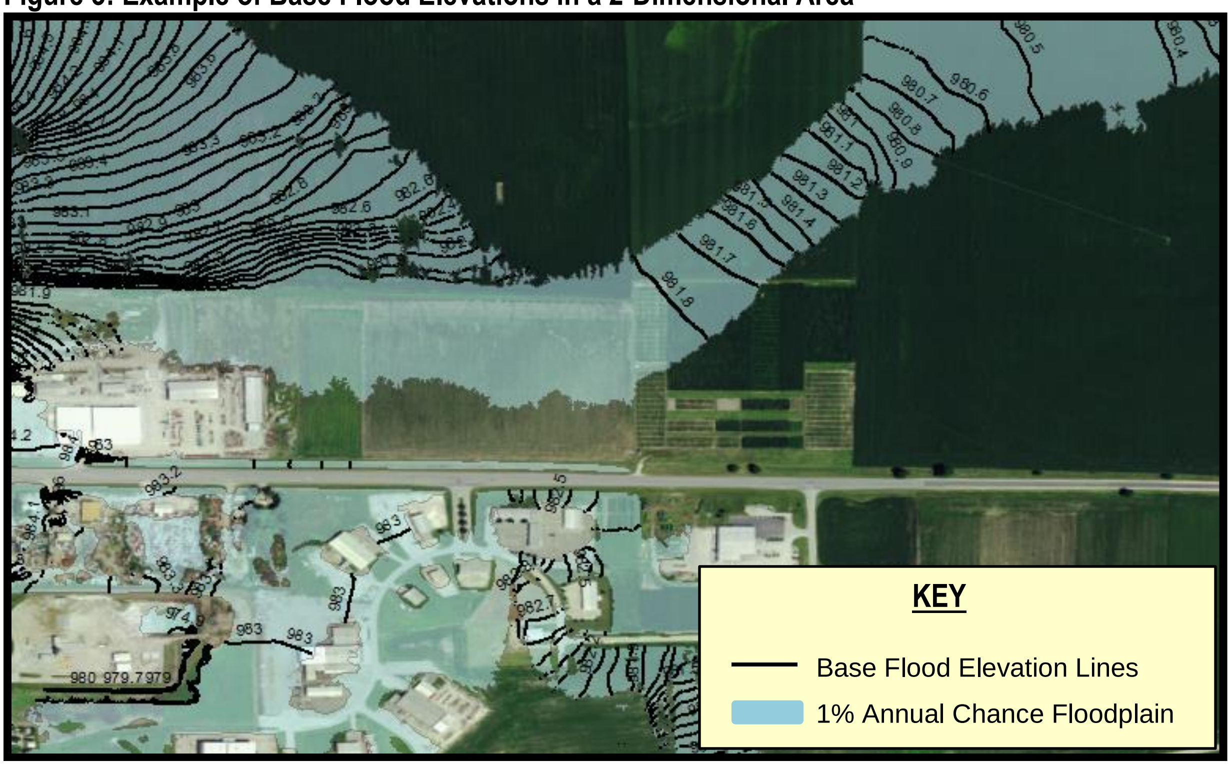
Flood profiles were computed within HEC-RAS for the 10%, 4%, 2%, 1%, 1% Minus, 1% Plus, and 0.2% annual chance flood events.

Hydraulic Results

The resulting 1% and 0.2% annual chance floodplain elevations produced by the HEC-RAS models were plotted on the digital terrain produced from 1-meter, NAVD 88 vertical datum, LiDAR data for all streams modeled.

Base Flood Elevations (BFE) were developed for the Zone AH areas by using GIS processes. Contour GIS processes were utilized to effectively derive representative spatial BFE lines. Please note that for the 2D areas, BFE's will vary greatly and will be dependent on the hydraulic results of each cell location. Therefore, BFE's in the 2D areas will spatially fluctuate horizontally across the floodplain boundary, based on the hydraulic results. An example of this is shown in Figure 3.

Figure 3: Example of Base Flood Elevations in a 2-Dimensional Area



Cross sections will be placed on the floodplain maps for the Zone AE areas, and will include the regulatory water surface elevation for the 1% annual chance flood event to the nearest tenth of a foot. Therefore, BFEs may be unnecessary for the Zone AE areas, and have not been generated at this time.

Profiles have been developed for the detailed and enhanced Zone AE designated streams; containing the 10%, 4%, 2%, 1%, 1% Plus, and 0.2% annual chance events. Profiles were not developed for those areas designated as Zone AH.

Floodways were plotted for the detailed Zone AE designated areas in accordance with FEMA Guidelines and Specifications. Encroachment stations developed from the HEC-RAS models were used in floodway development, assuming a surcharge between 0.0 and 1.0 foot. Floodway data tables were created for each detailed Zone AE designated stream, and contains the floodway data taken from the HEC-RAS models.

As explained previously, a request to perform detailed hydrologic and hydraulic analysis of the portion of the Kansas River within Pottawatomie and Wabaunsee Counties was submitted to FEMA for approval, with data development to be done during the fiscal year 2017 round of funding. Once the Kansas River modeling is completed, an evaluation of the tie-ins with the Kansas River will be done for the effected streams in this analysis.

COMPARISONS TO CURRENT EFFECTIVE MAPPING

East Unnamed Creek, East Unnamed Creek Tributary 1, and East Unnamed Creek Tributary 2 are currently mapped as Zone AE flood zones on the effective maps for the City of Wamego, which is located in Pottawatomie County. The hydraulic analyses for these streams was completed in 1979 using the USGS E-431 Step backwater computer program and USACE HEC-RAS Version 2.2. Effective SFHAs were then re-delineated in September 2000 using USGS 10m DEM or USGS 2m LiDAR DEM, depending on availability. The floodplains resulting from the new hydraulic analysis for East Unnamed Creek, East Unnamed Creek Tributary 1, and East Unnamed Creek Tributary 2 are generally smaller than the current effective floodplains. The most significant changes occur at the downstream end of East Unnamed Creek Tributary 2, upstream of Lilac Lane along East Unnamed Creek, south of the baseball fields near 8th Street (southwest of the East Unnamed Creek Tributary 1 confluence), and the Zone AH area that is located north of US Highway 24 and east of Walsh Road. The area south of US Highway 24 and east of Balderson Boulevard was not previously mapped; therefore, floodplain is being added in this area. The 1% annual chance water surface elevations from this hydraulic analysis are generally lower than the current effective BFEs, ranging from approximately 4 feet lower to approximately 0.5 foot higher. A comparison of the 1% annual chance water surface elevations from this hydraulic analysis to the current effective maps at a few locations along each stream is shown in Table 2.

Significant changes have occurred to the streams and nearby areas since the previous hydraulic modeling was completed. In addition, current topography information and modeling techniques are much more advanced than when the previous hydraulic modeling was done. A PC-SWMM model was completed to generate the most accurate flows as possible for use in the hydraulic models. Detailed hydraulic modeling techniques were used, including field survey information for the channel and hydraulic structure geometry. In addition, two-dimensional modeling was utilized for East Unnamed Creek Tributary 1 to adequately represent inflow and outflow conditions to the stream. Therefore, we are confident in the accuracy of the floodplains produced from the new hydrologic and hydraulic analyses performed.

Table 2 : Comparison of 1% Annual Chance Water Surface Elevations		
Location	1% Annual Chance Water Surface Elevation feet (NAVD88)	
	Current Effective Maps	Amec FW
East Unnamed Creek		
Approximately 155 feet upstream of 6th Street	981.0	980.0
Approximately 90 feet upstream of East Unnamed Creek Tributary 2 Confluence	987.0	986.2
Just upstream of Kansas Highway 99	999.0	998.0
Approximately 40 feet downstream of Lilac Lane	1008.0	1004.9
Approximately 430 feet upstream of Kaw Valley Road	1017.0	1016.6
Approximately 475 feet downstream of Say Road	1041.0	1041.4
East Unnamed Creek Tributary 1		
Approximately 175 feet upstream of US Highway 24	988.0	985.7
Just downstream of Spencer Street	990.0	989.0
East Unnamed Creek Tributary 2		
Approximately 780 feet upstream of Confluence with East Unnamed Creek	1004.0	1003.4
Just downstream of Graves Road	1010.0	1007.9

A floodway has been added to the upstream end of East Unnamed Creek, the upstream end of East Unnamed Creek Tributary 2, and to the entire length of East Unnamed Creek Tributary 1. Floodways were not previously located in these areas. The new floodway for East Unnamed Creek is generally smaller than the current effective floodway, especially near the confluence with East Unnamed Creek Tributary 2. The exception is near the confluence with East Unnamed Creek Tributary 1, where the new floodway is larger than the current effective floodway on the north side of the stream. The new floodway for East Unnamed Creek Tributary 2 is slightly larger than the current effective floodway between Say Road and Graves Road, but is very similar to the current effective floodway downstream of Graves Road.

The 1% annual chance floodplain for the enhanced Zone AE area of Mill Creek at Paxico is slightly larger than the current effective 1% annual chance floodplain, particularly at the northeast side of town. The majority of the Zone A floodplains, including the Zone A areas of Mill Creek, are smaller than the current effective 1% annual chance floodplains.

Disclaimer: As mapping tasks are completed, the potential for minor changes to the information submitted in the hydrology submission and within this report may become necessary. The data provided in this submission and report may not be completely representative of the hydraulics used to produce the final map product. Therefore, this report and the hydraulics submission should be considered as draft. This submission should be considered a complete step in progress but not necessarily the final product since the post preliminary process is not yet completed and the floodplain maps are not yet effective.

REFERENCES

(1) U.S. Army Corps of Engineers, Hydrologic Engineering Center, 2016, HEC-RAS River Analysis System, Version 5.0.3, Davis, California, September 2016.

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(6) Federal Emergency Management Agency, Flood Insurance Study for Pottawatomie County, Kansas and Incorporated Areas, March 2015.