

BLACK & VEATCH

MEMORANDUM

Leavenworth, Kansas  
Stormwater Master Plan  
Historic Flooding Locations

B&V Project 26529.100  
B&V File K  
June 20, 1995

To: Mike McDonald

From: Jeanne Finger

The following is taken from the "Description of Scope of Services", Attachment A to the Agreement for Engineering Services:

Task 211 - Verify Historic Flooding Locations. Based on the results of the stormwater questionnaires returned, a review of existing data collected, and the information collected during meetings with the Owner's staff, the Citizen's Stormwater Committee, and other agencies, the locations of known historic flooding will be visually identified by the Engineer. This information will help to identify the areas where more detailed modeling should be performed. The Engineer will prepare a map depicting known flooding problems and the portions of the stormwater conveyance system requiring detailed evaluation.

STORMWATER QUESTIONNAIRES RETURNED  
(continuing)

REVIEW OF EXISTING DATA COLLECTED

From City of Leavenworth FEMA Flood Damage Reports, Site Listings, and Photographs, Great Flood of 1993; Report Date September 7, 1993:

MISSOURI RIVER-RELATED FLOODING:

- Riverfront Community Center; Esplanade St. & Delaware St.; flooding surrounding exterior of complex and damage throughout interior.
- Water Pollution Control; Second St. & Fivemile Creek
- Animal Control; Second St. & Fivemile Creek; flooding surrounding exterior of complex and damage throughout interior
- Leavenworth Airport; northeast of Fort Leavenworth and adjacent to Sherman Army Airfield; flooding surrounding exterior of complex and damage throughout interior; [OUT OF STUDY LIMITS]
- Riverfront Park; vicinity of waterworks, Missouri Pacific Railroad tracks, Centennial Bridge (Hwy 92), and Missouri River; debris and bank degradation due to flooding and damage to interior/exterior of buildings
- Old Parks Shop; Second St. & Fivemile Creek; flooding surrounding exterior of complex and damage throughout interior
- Fivemile Creek; north along 2nd St. and east to Missouri River; debris, siltation, and slope degradation in channel and threatened sanitary sewer manhole
- Threemile Creek; Second St. to Missouri River; debris and siltation in channel

BLACK & VEATCH

MEMORANDUM

Page 2

Leavenworth, Kansas  
Stormwater Master Plan  
Historic Flooding Locations

B&V Project 26529.100  
June 20, 1995

- Tree & Brush Disposal Site; south bank of Fivemile Creek, from Second St. to Missouri River; bank removed by flood
- 2nd Ave. & Limit St. area; traffic control barricades during flash flooding; MJH Sheet 1SW
- Water St. & Choctaw St.; clean up interior of building

FUTURE KDOT PROJECT (1998):

- 2nd Street; along street east of and north of Water Pollution Control, vicinity of Fivemile Creek; debris and degradation to road and culverts due to flooding

LOCAL FLOODING PROBLEMS TO BE ADDRESSED:

- Vilas St., 16th to 17th; 1) 16th St., south of Vilas, including Holman St. and 2) 16th St. Terr., north of Vilas St. to Thornton St.; up to 3 ft standing water in street; miserable entrance to conveyance system, no relief, filled in with RR ties; obstructed/damaged drainage tubes; MJH Sheet 3SE
- 22nd St. & Hebbelin Dr.; failed outfall of CMP, poor channel maintenance
- 22nd St. & Shawnee St.; along Shawnee St. from 22nd to 21st Sts.; failed CMP; detention/retention alternatives?
- 4200-4400 block of Valley View Rd.; northwest of intersection of Shrine Park & Muncie Rds.; lack of roadside ditches for drainage
- Fivemile Creek & 10th Ave.; bridge between Gatewood St. & Josela Ct.; slope failure at abutments; probably continued maintenance required
- Wellington Dr.; west of Tenth Ave.; debris on street due to flooding, obstructed storm sewers
- Cherokee St. west of Broadway; failing stone arch culvert; reroute flow east of old RR arch? develop jogging path along RR berm & eliminate arch? MJH Sheet 35NE
- Shrine Park Rd. north of Fivemile Creek; south of Goddard Circle; insufficient culverts; local and Missouri River flooding problem
- 4th St. Tfwy. & V.A. entrance; traffic control barricades
- 10th St. & Miami St.; traffic control barricades during flash flooding; life safety problem; influenced by sanitary sewers
- Santa Fe & 3rd St.; tributary to Fivemile Creek; traffic control barricades during flash flooding; bad cross road pipe situation
- 4th St. Tfwy. & Idaho St.; west of Frontage Rd.; traffic control barricades during flash flooding

PROBLEMS FIXED TO DATE:

- S. Esplanade, Spruce/Arch; Esplanade St., Spruce St. to Arch St.; slide area and potential failing slope along roadway

Leavenworth, Kansas  
Stormwater Master Plan  
Historic Flooding Locations

B&V Project 26529.100  
June 20, 1995

- Fivemile Creek west of Shrine Park Rd. bridge; northwest of intersection with McDonald Rd.; sanitary sewer trunk line damage by flooding; immediate problem fixed but future development will change
- Fivemile Creek east of Shrine Park Rd. bridge; southeast of intersection with Limit St.; sanitary sewer trunk line damage by flooding; immediate problem fixed but future development will change
- West of 3000 Wilson; vicinity of Idaho St. cul-de-sac; sanitary sewer trunk line damage by flooding
- City-wide; mosquito control spraying equipment and supplies
- 5th Ave. & Rees St.; failing arch culvert; designed, but not constructed
- Hughes Rd. south of State St.; south of intersection of Hughes Rd. and Limit St.; water over road due to inadequate capacity of existing CMP
- 541 Muncie Rd.; west of Hughes Rd.; subsurface road failure

FUTURE W. LEAVENWORTH TFWY PROJECT:

- 19th St. Terr. & Thornton St.; obstructed/damaged culvert

-----  
From "Report on Storm Water Drainage, Leavenworth, Kansas"; Black & Veatch Consulting Engineers; 1967; p.9:

"Excessive financial losses due to property flooding occur only along **Three Mile Creek in the central business and industrial area**. Losses in the rest of the City are not likely to be excessive due to hilly terrain."  
-----

From "Flood Insurance Study, City of Leavenworth, Kansas, Leavenworth County"; U.S. Department of Housing & Urban Development, Federal Insurance Administration; July 1977; pp. 6-9:

"Severe restrictions to flood flow have been created by the many bridges located in the flood plain **between Tenth Street and the mouth of Threemile Creek [DONE]**. In addition, a portion of the creek channel is enclosed in a box culvert located under the railroad yards **between Seventh Street and Broadway [DONE]**. Because of inadequate openings in these bridges and culvert, a cumulative aggravation of flood backwater occurs in the lower flood plain...The most critical area, even during minor floods, is in the vicinity of **Cherokee and Broadway Streets [DONE]**. At this location flood flows are impeded by a very small bridge opening forcing excess water out of banks through the developed flood plain area. Flow from this area attempting to return to the channel is further impeded by the railroad yard culvert. Both of these obstructions contribute to a very serious flooding problem in the

Leavenworth, Kansas  
 Stormwater Master Plan  
 Historic Flooding Locations

B&V Project 26529.100  
 June 20, 1995

highly developed flood plain area from Cherokee Street downstream to Sixth Street... [DONE]. There has been no major flooding to residences or businesses along the South Branch [of Threemile Creek] except near Tenth Street where the tributary joins the Main Branch... Severe restrictions have also been created by bridges across Fivemile Creek. Inadequate openings of these bridges have caused a cumulative aggravation by flood backwater in the flood plain... The flood of July 30, 1958, had Fivemile Creek flooding Shrine Park Road, Limit Street and U.S. 73 at Black Bridge... [DONE]. The flood of October 12, 1961, swept away cut brush laying in the vicinity of the sewage treatment plant at Second and Fivemile Creek.. [MISSOURI RIVER FLOODING]. On April 26, 1969, Fivemile Creek ran 10-12 inches deep across Shrine Park Road, just south of the entrance to the golf club [DONE]. Along S. Fourth Street the stream spread out for a half mile or more and at Second Street, in the vicinity of the sewage disposal plant [MISSOURI RIVER FLOODING], the creek rose to the edge of the street... The City of Leavenworth is above the flood plain of the Missouri River except for the areas where Threemile and Fivemile Creeks and other smaller right bank tributaries enter the Missouri River [MISSOURI RIVER FLOODING]. The only recorded damage to the city, caused by flooding from the Missouri River, occurred when an emergency levee failed during the April 1952 flood... The main sewers are subject to silting and other damage by flooding from the Missouri River."

-----

From "Flood Plain Information, Three Mile Creek, Leavenworth, Kansas"; prepared for the City of Leavenworth, Kansas and Kansas Water Resources Board by Corps of Engineers, U.S. Army, Kansas City District; December 1970; pp. 15-19:

Table 2. Summary of Historical Storm Rainfalls - Leavenworth, Kansas

<u>Date</u>	<u>Rainfall (inches)</u>	<u>Remarks</u>
July 6, 1904	3.33	The Creek was 15 to 20 feet above normal; stores on Cherokee flooded 5ft deep; flood extended from Shawnee St hill west of Santa Fe depot to intersection of Broadway and Shawnee St, south to Short St, east to Geiger's lumberyard; at 4th St bridge at 10pm a rise of from 15-20 ft was recorded; from 3rd St to the mouth, the flood was confined to the stream banks

## MEMORANDUM

Page 5

Leavenworth, Kansas  
 Stormwater Master Plan  
 Historic Flooding Locations

B&V Project 26529.100  
 June 20, 1995

May 27, 1915	2.12	2.05 inches recorded previous day
June 6, 1917	1.60	Cloudburst at 6:30pm; all creeks in City were out of their banks
Aug 20, 1937	4.50	Flash flooding reported on 3-mi Creek
Jul 11, 1940	3.20	Water 4 ft deep at Cherokee & Broadway; 3 Mile Ck overflowed at Broadway & Cherokee, flooding Cherokee east of Haymarket Sq and north to Delaware
Jun 19, 1942	3.20	4hr rain; region from Broadway & Cherokee to 7th St had several ft of water in stores
Jun 22, 1947	1.96	5 inches reported in western edge of basin
Jul 30, 1958	4.03	Flood Q at Cherokee & 7th St estimated at 4,300 cfs
Aug 17, 1960	3.64	
July 6, 1961	2.38	2.8 inches recorded previous day; minor damage throughout City, fallen tree limbs
Oct 13, 1961	3.50	1.9 inches recorded two day previous; bank capacity exceeded at 7pm, crested at 9pm, and receded to within bank at 11:30pm; max flood Q at 7th St estimated at 4,000 cfs
May 20, 1962	4.35	
Apr 27, 1969	2.48	Water ran over Shrine Park Rd and curb deep in downtown Leavenworth

-----

From "Flood Plain Information, Five Mile Creek, Leavenworth, Kansas"; prepared for the City of Leavenworth, Kansas and Kansas Water Resources Board by Corps of Engineers, U.S. Army, Kansas City District; June 1972; pp. 9-11:

Table 1. Summary of Historical 24-Hour Storm Rainfalls  
Leavenworth, Kansas

<u>Date</u>	<u>Rainfall</u> <u>(inches)</u>	<u>Remarks</u>
July 6, 1904	3.33	
May 27, 1915	2.12	2.05 inches recorded previous day
June 6, 1917	1.60	Cloudburst
Aug 20, 1937	4.50	Flash flooding reported on 3-Mi Creek
Jun 19, 1942	3.20	Water level at Black Bridge reached more than 1ft above the top of bridge railing
Jun 22, 1947	1.96	5 inches reported in western edge of basin
Jul 30, 1958	4.03	Water over 4th St; 5-Mi Ck spread out over Shrine Park Rd, Limit St, & US73 at Black

## MEMORANDUM

Page 6

Leavenworth, Kansas  
 Stormwater Master Plan  
 Historic Flooding Locations

B&V Project 26529.100  
 June 20, 1995

		<b>Bridge on S. 4th St.</b>
Aug 17, 1960	3.64	
July 6, 1961	2.38	2.8 inches recorded previous day
Oct 13, 1961	3.50	1.9 inches recorded two day previous
May 20, 1962	4.35	
Apr 27, 1969	2.48	5-Mi Ck spilled out of its banks running 10-12 inches deep across Shrine Park Rd south of the entrance to the golf club; Along S. 4th St the Creek spread out for a half mile or more and at 2nd St, it lapped at the edge of the street in the vicinity of the city sewage disposal plant
Sep 22, 1970	2.58	5-Mi Ck flooded the Barnwell's yard for the 4th time in 12 yrs at 2310 S. 4th St; by 6pm, creek was full & overflowing onto lawn

INFORMATION COLLECTED DURING MEETINGS WITH OWNER'S STAFF

Excerpts from notes from a meeting with Mike McDonald and Bob Patzwald on May 19, 1994:

Problems include isolated flooding, not easy to fix, due to bad inlets and topography...along Fivemile Creek, new growth and bad design and construction of storm conveyance facilities is causing problems...along Threemile Creek, some bridges are problems...main channel capacity not bad...sediment and erosion problems...4th & Evergreen...10th & Shawnee...[MISSOURI RIVER FLOODING] 20th St. Terr. & Seneca [LOCAL FLOODING]

-----

Locations and types of recommended improvements from 1967 Black & Veatch Report that have not been constructed according to City staff per 12/29/94 meeting:

- Improvements not done from sewage treatment plant to Missouri River [MISSOURI RIVER FLOODING], however channelization of Fivemile Creek was performed south of the plant, and a landfill put in on west side of re-channelized creek
- New conduit at Broadway and Cherokee [DONE]
- Replacement of channel west of Jackson and south of Spruce [AESTHETICS ONLY, NO FLOODING PROBLEM]
- Channelization in Three Mile Creek, AT&SF railway to Eleventh Street [DONE]

Leavenworth, Kansas  
Stormwater Master Plan  
Historic Flooding Locations

B&V Project 26529.100  
June 20, 1995

- Extend 4' x 4' arch at AT&SF railway at Dakota [DONE]
- New outlet for 3' x 4' arch under Cherokee at Missouri River [LOCAL FLOODING]
- Replace culvert at Cheyenne west of Second Street to railway [FUTURE METROPOLITAN PROJECT]
- Replace culvert at Newman and Quincy [DONE]
- Replace arch with culvert at Girard north of Santa Fe [LOCAL FLOODING]
- Replace culvert under railway south of Scott (Short St) [LOCAL FLOODING]

-----  
Excerpts from notes from a meeting with City staff on January 3, 1995:

Threemile Creek: 760 Cherokee St. west of Broadway [LOCAL FLOODING], need to replace old brick arch bridge/culvert...old areas of the drainage basin have flooding problems due to lack of maintenance and deterioration of structures, whereas newly developed areas of the drainage basin have flooding problems due to inadequate capacity of drainage systems.

Fivemile Creek: Old arch under 4th St. [LOCAL FLOODING] needs replacement...Shrine Park Rd. [LOCAL FLOODING] at Creek - low water crossing, impassable with high water...inlet capacity problems - possibly enlarge curb inlets.

-----  
Notes from a meeting and field visit to problem areas with City staff on June 14, 1995:

- 1815-1819 Osage St.; large drainage area, houses built on fill, inadequate conveying capacity in storm piping for current conditions contribute to storm backups, sewer backups also.
- 6th St. & Olive St.; Low spot getting drainage from west and east. Totally flooded yard during rains.
- Santa Fe St., Garland Ave. to Old Creek Court; lack of drainage tubes on south side of Santa Fe, artificial berm not keeping water from rerouted trib out of back yards, and confluence of two tributaries causes local flooding.
- 2200 Spring Garden Ave., between Santa Fe St. and Marion St.; channel has lowered 1 ft, exposed sanitary service line, water overtopped Garland in 1993 flood.
- 10th Ave. culvert north of Wellington Dr.; erosion around wingwalls, erosion in channel downstream of culvert.

Leavenworth, Kansas  
Stormwater Master Plan  
Historic Flooding Locations

B&V Project 26529.100  
June 20, 1995

- **Wellington Drive culvert at 10th Ave.;** inlet submerged and water in street upstream, but outlet flowed partially full during flooding; incoming creek can't make sharp left turn during floods - jumps to street.
- **Wallace Lane culvert;** erosion of channel banks, exposed PVC service lines, eroded toe at downstream face, debris and sharp turn in creek at upstream face.
- **905 Park Ave.;** creek diverts to tube that runs adjacent to house, ground level of house is below creek invert, inadequate drainage.
- **Shrine Park Road culvert just south of Limit St.;** OK for now, but ongoing development upstream may increase runoff beyond current capacity.
- **1210 Ohio St.;** standing water in Ohio, between Newman and west of Jackson, due to high flows going north in ditch to Ohio cross road pipe.
- **10th Ave. & Randolph;** arch culvert is smaller than upstream conduits
- **800 Kiowa, near Kickapoo;** basement at flowline of creek.

The Three-mile Creek watershed flooding problems appear to be caused primarily by lack of maintenance and inadequate capacity of stormwater conveyance facilities, whereas the Five-mile Creek watershed flooding problems appear to be due to inadequately designed inlets.

INFORMATION COLLECTED FROM CITIZEN'S STORMWATER COMMITTEE  
(continuing)

INFORMATION COLLECTED FROM AGENCIES  
(none to date)