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engineers
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ENGINEERING REPORT

Neal Street Area
Drainage Improvements

PREPARED FOR:

City of Lebanon Engineering Department

PREPARED BY:

Neel-Schaffer, Inc.

MICHAEL R. PHILLIPS
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
NO. 109471
STATE OF TENNESSEE

August 1, 2011

210 25th Avenue North • Suite 800 • Nashville, TN 37203 • 615.383.8420 • Fax 615.383.9984

Introduction

It has been reported that several homes on Neal Street suffered flood damages during the May 2010 flood. Flood waters from Bartons Creek rose to a level that damaged several properties in the area. Damages were primarily incurred in garages, crawl spaces, and HVAC units.

Field Review

The field review began on Hickory Ridge Road. Water collected from the east flows through a composite cross drain at Hickory Ridge Road and Dawson Lane. The cross drain consists of a round 10-inch corrugated metal pipe (CMP) and a 12-inch by 16-inch elliptical CMP. The runoff then flows westward in an improved roadside ditch on the south side of Hickory Ridge Road to Bartons Creek. Local runoff from the area immediately north of Hickory Ridge Road is collected in a shallow roadside ditch which flows westward. A number of driveway culverts pass the runoff on the north side of Hickory Ridge Road westward to Haynes Street. A 12-inch CMP cross drain under Haynes Street conveys the water to the west toward Bartons Creek.

Runoff from the area from Dawson Lane west, and north and south of Center Street is collected in shallow roadside ditches along Center Street. The ditches drain to the west to the intersection of Neal Street and Center Street. 12-inch CMP cross drains are located at Haynes Street and at Sloan Street. Numerous driveway culverts are also present, with diameters ranging from 6-inches to 12-inches and with a variety of materials. The cross drain at the intersection of Neal and Center Streets consists of two 14-inch by 18-inch elliptical CMPs with masonry headwalls. This cross drain conveys runoff under Neal Street to a graded ditch. The ditch flows west to Bartons Creek.

The area north of Center Street, west of Dawson Lane, and adjacent to West Street drains to a cross drain at the intersection of Neal Street and West Street via a series of shallow roadside ditches. Two cross drains at the intersection of West Street and Sloan Street convey runoff from east to west. The cross drain on the north side of West Street is a 12” CMP, and the cross drain on the south side of West Street is a 12” plastic pipe. Another 12” CMP cross drain is located at the intersection of West Street and Haynes Street. The cross drain at the intersection of Neal Street and West Street serves as the main outfall for the roadside ditches, and consists of a 12-inch by 21-inch elliptical CMP next to a 13-inch by 16-inch elliptical CMP. This cross drain discharges into a shallow graded ditch that drains westward to Bartons Creek. Numerous driveway culverts are located in the roadside ditches. The driveway culverts vary in diameter from 9-inches to 12-inches. Pipe materials include steel pipe, plastic pipe, and reinforced concrete pipe (RCP).

The northern portion of the review area is located north of West Street, south of West Spring Street, and between Dawson Lane and Clearview Drive. This area drains to a shallow graded ditch located between West Street and West Spring Street. Runoff is collected by a series of roadside ditches with numerous driveway culverts. As in the previous areas, the driveway culverts vary in size and type. The main drainage ditch begins at Dawson Lane and flows west to

Bartons Creek. West of Sloan Street to Bartons Creek, residential fences extend across the ditch. The fences tend to collect debris and reduce the capacity of the ditch.

Watershed Description

The watershed covers an area of approximately 26.4 acres (0.04 square miles), and extends from Bartons Creek east to Keaton Street. Three areas of interest were identified:

- The outfall at the intersection of Neal and West Streets;
- The outfall of the drainage ditch north of West Street and south of Westmeade Drive; and
- The outfall at the intersection of Neal and Center Streets.

Sub-basins for the watershed were delineated to provide an estimation of the storm water runoff. The sub-basin boundaries were estimated based on the 5-foot interval topographic mapping provided by the City, and from information obtained during the field review.

The hydrologic model used in this analysis is HEC-HMS, developed by the U.S. Army Corps of Engineers. The Soil Conservation Service (SCS) method was used to compute storm water runoff for various frequency recurrence intervals. The SCS procedure is based on land use, soil data, and other topographic features which together are used to estimate the runoff potential (known as the Runoff Curve Number) at each area of interest.

Land use within the watershed was determined from aerial photography and information gathered during the field review. Residential development is the primary land use throughout the watershed. Hydrologic Soil Group data was obtained from the NRCS. Runoff Curve Numbers within the watershed range from 82 to 86, which reflects the degree of urbanization within the watershed. A summary of the hydrologic parameters is presented on Figure 1.

Analysis and Recommendations

The known flooding issues are located near the outfall at Neal and West Streets. The houses located at 302 and 304 Neal Street and 1111 West Street received structural flooding during the May 2010 event. The house at 303 Neal Street received nuisance flooding at the same time. There are no known flooding issues associated with the other two outfalls. Therefore the analysis of drainage improvement options was focused on the drainage infrastructure at the intersection of Neal and West Streets.

Storm water runoff from approximately 6.1 acres of residential area is collected in drainage ditches adjacent to West Street. The runoff collected by the ditches discharges to a cross drain under Neal Street. The cross drain in turn discharges to a man-made drainage ditch running west to Bartons Creek. The existing cross drain under Neal Street consists of a 12-inch by 21-inch elliptical CMP next to a 13-inch by 16-inch elliptical CMP. The ditch running west from Neal Street to Bartons Creek is approximately 17-feet wide at the top and 2-feet deep.

During the technical analysis, it was determined that capacity of the drainage ditch west of Neal Street is dependant on the water depth in Bartons Creek. It should be noted that the houses with flooding issues are located in a FEMA-defined Zone AE floodplain (i.e. 100-year floodplain) of

Bartons Creek (blue shaded area on Figure 1). During the field review, the lack of topographic relief between Neal Street and Bartons Creek was noted and documented.

Neal Street is inundated by flood waters from Bartons Creek during major flooding events. Information obtained from the Federal Emergency Management Agency (FEMA), included as Appendix B, is summarized in the following table. The roadway surface elevation was obtained from 5-foot interval topographic mapping provided by the City.

Comparison of Bartons Creek Flooding Elevations to Neal Street Elevation

Return Period	Bartons Creek Flood Elevation (ft)	Neal Street Elevation (ft)	Flooding Depth at Neal Street (ft)
10-year	521.9	522.2	0.0
50-year	523.1	522.2	0.9
100-year	524.2	522.2	2.0

During local rainfall events occurring at times when Bartons Creek is at normal flow depth, the drainage ditch between Neal Street and Bartons Creek has adequate capacity. However, the capacity of the drainage ditch decreases as the water in Bartons Creek increases in depth. This was the case during the flooding that occurred in May 2010. The culverts under Neal Street, however ("Neal Street Outfall" on Figure 1), are severely undersized, which causes the road to be overtopped by the local 2-year storm.

Structural Drainage Improvements

The technical analysis focused on alternatives to improve the local drainage characteristics associated with the Neal Street cross drain. Three alternatives were considered, with each alternative including an improved downstream ditch and cross drain. The cross drain at Neal Street has very little vertical relief relative to the roadway surface. This makes the improvement of the cross drain problematic. In order to increase the capacity of the cross drain, it would be necessary to install larger pipes. To accommodate the larger pipes, the roadway surface would need to be significantly raised. Additionally, the possibility of improving the downstream drainage ditch was also evaluated. An improved ditch would increase the efficiency of the cross drain during local rainfall events.

Installing the larger pipes and raising the road elevation may be possible from an engineering perspective. However, the technical analysis indicates that the higher roadway elevation would actually increase the water depth upstream of the culvert during larger storms (see red numbers in table below). The drainage improvement alternatives and the impacts each would have on flooding depths upstream of Neal Street are presented in the following tables.

Structural Drainage Improvement Alternatives

	Ditch Improvements	Cross Drain Improvements	Approximate Road Elevation Increase (inches)
Alternative 1	7-foot bottom width 3:1 side slopes	3 – 14" x 23" Elliptical RCP's	7
Alternative 2	7-foot bottom width 3:1 side slopes	3 – 15" RCP's	7 – 3/8
Alternative 3	7-foot bottom width 3:1 side slopes	2 – 19" x 30" Elliptical RCP's	12 – 1/2

Structural Drainage Improvement Alternatives
Changes to Upstream Flooding Elevations

Return Period	Stormwater Discharge (cfs)	Alternative 1 Change to Upstream Flooding Depth (ft)	Alternative 2 Change to Upstream Flooding Depth (ft)	Alternative 3 Change to Upstream Flooding Depth (ft)
2	19	-0.58	-0.01	-0.51
5	25	-0.31	**0.48**	-0.3
10	30	-0.02	**0.5**	-0.13
25	37	**0.38**	**0.51**	**0.13**
50	43	**0.42**	**0.52**	**0.41**
100	49	**0.43**	**0.52**	**0.73**

In addition to the alternatives shown above, the possibility of increasing the capacity of the existing cross drain using multiple small diameter pipes was considered. It was determined that the installation of more than three pipes would be spatially problematic and would not be hydraulically efficient.

It should be noted that none of the alternatives would mitigate the known flooding issues downstream of the Neal Street cross drain. As discussed previously, those flooding issues are caused by Bartons Creek, and not by local rainfall events. Therefore none of the above structural alternatives are considered feasible due to the increases in the upstream flooding depths, cost of installation, and lack of flood damage mitigation. It is recommended that the City improve local drainage in the area by focusing on the maintenance issues discussed in the following section.

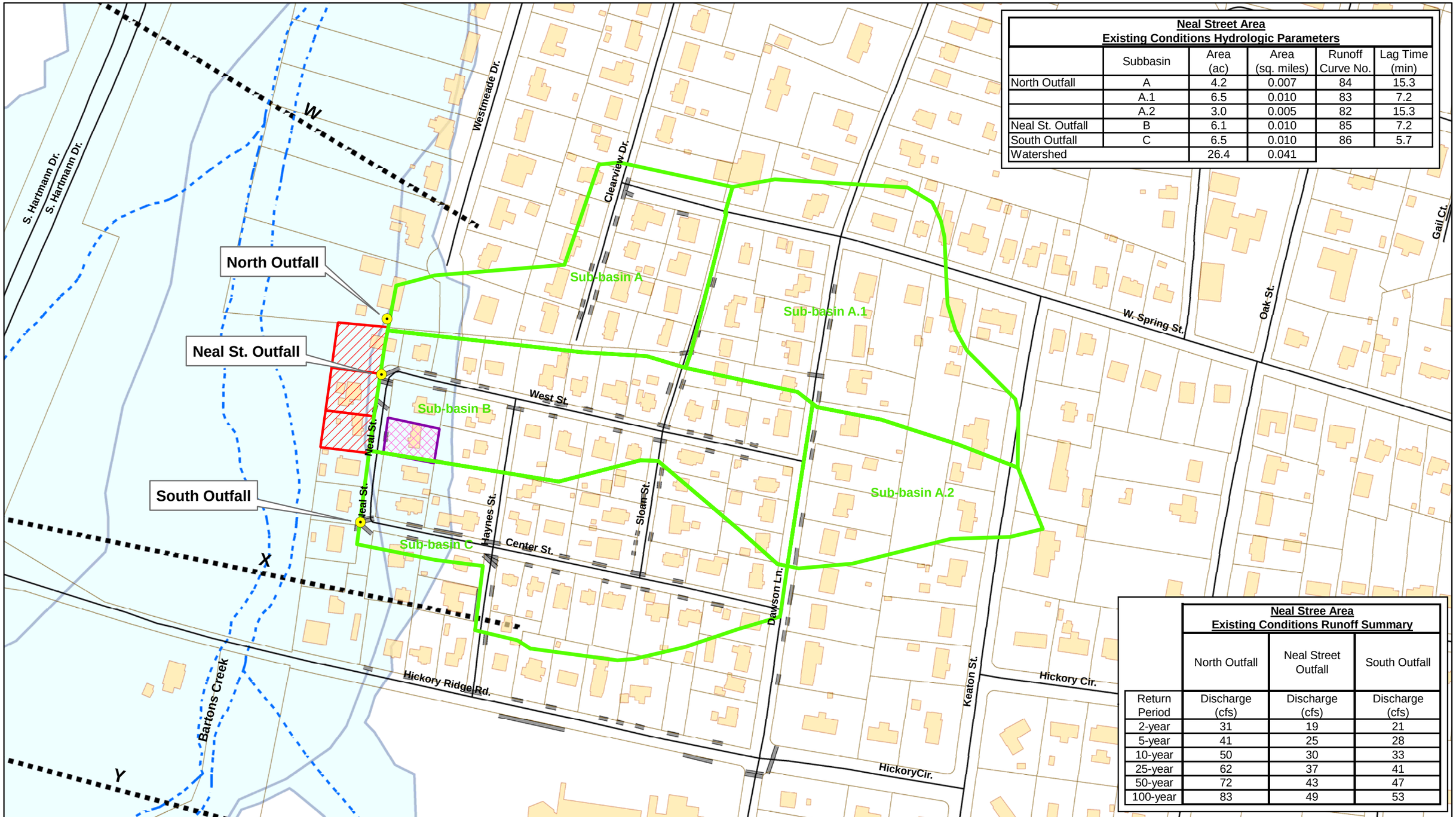
Routine Maintenance

Numerous routine maintenance issues were found throughout the study area during the field reconnaissance. Examples of required maintenance items include removing sediment buildup from culvert inlets, removing excess vegetation and debris from culvert inlets, and repairing damaged culvert end sections. While correcting these deficiencies will not solve flooding problems, it is critical to correct them sooner, rather than later, so that the drainage system can function as designed and conditions do not worsen, leading to possible flooding problems in the future. In addition, it is important to note that areas identified as requiring remediation should be regularly scheduled for maintenance by City crews to prevent future buildup of debris and sediment. A map showing locations identified as requiring maintenance is included as Figure 2. In addition, a document containing captioned photographs of each maintenance location is included as Appendix A, with locations and orientations of each photograph indicated with red arrows on Figure 2. A preliminary cost estimate for the proposed maintenance items is shown below:

Infrastructure Maintenance Items (See Figure 3)	**Preliminary Estimated Project Cost**
1. Debris/sediment removal from cross drain ends at 7 locations (Items 1, 2, 3, 4, 9, 11 and 12 shown in Appendix A)	$ 2,800.00
2. Debris/sediment removal from driveway culvert ends at 64 locations (representative samples shown in Appendix A - Items 13 through 19)	$ 12,800.00
3. Cross drain end repair at 3 locations (Items 5, 6 and 7)	$ 2,100.00
4. Debris/sediment removal from ditches at 24 locations (representative samples shown in Appendix A - Items 13 through 19) – 5,910 L.F.	$ 29,550.00
Total Maintenance Cost	**$ 47,250.00**

The infrastructure maintenance items discussed above and shown in Figure 2 can be performed by City crews immediately.

It should be noted that no field survey data was available for this study. Elevations were estimated based on the 5-foot interval topographic mapping provided by the City, and from information obtained during the field reconnaissance. Therefore, evaluation of the proposed improvements included in this study should be regarded as conceptual.



Neal Street Area
Existing Conditions Hydrologic Parameters

	Subbasin	Area (ac)	Area (sq. miles)	Runoff Curve No.	Lag Time (min)
North Outfall	A	4.2	0.007	84	15.3
	A.1	6.5	0.010	83	7.2
	A.2	3.0	0.005	82	15.3
Neal St. Outfall	B	6.1	0.010	85	7.2
South Outfall	C	6.5	0.010	86	5.7
Watershed		26.4	0.041		

Neal Stree Area
Existing Conditions Runoff Summary

Return Period	North Outfall Discharge (cfs)	Neal Street Outfall Discharge (cfs)	South Outfall Discharge (cfs)
2-year	31	19	21
5-year	41	25	28
10-year	50	30	33
25-year	62	37	41
50-year	72	43	47
100-year	83	49	53

Legend

Known Flooding Issues
- Nuisance Flooding
- Structural Flooding
- Sub-basins
- Parcels

FEMA Flood Zones
- Zone A
- Zone AE
- FIS Cross Sections

- Streets/Roads
- Streams
- Culverts

City of Lebanon Drainage Analysis
Neal Street Area
Drainage Improvements

N W E S

1 inch equals 200 feet

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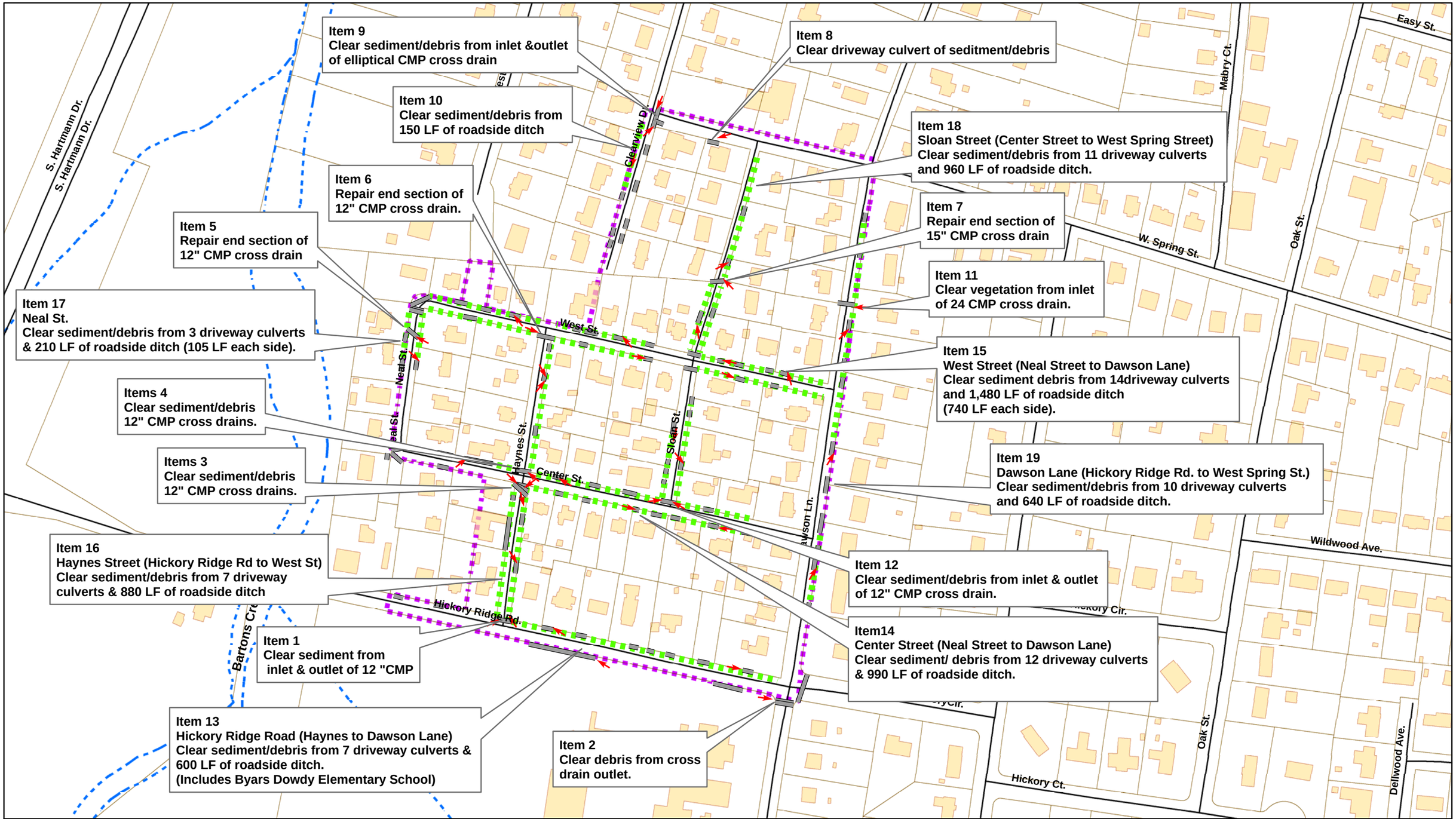
Existing Conditions Hydrology

Figure 1



Legend

- Parcels
- Area of Field Reconnaissance
- Culverts
- Streets/Roads
- Streams
- Stream/Ditch Maintenance Locations
- Directional Photo Log

City of Lebanon Drainage Analysis
Neal Street Area
Drainage Improvements

N W E S

1 inch equals 200 feet

NEEL-SCHAFFER
Solutions you can build upon

Infrastructure Maintenance Locations

Figure 2

APPENDIX A

Routine Maintenance Location Photographs

Item 1 – Hickory Ridge Rd. and Haynes St. cross drain. Clear sediment from inlet and outlet of 12" CMP.

Inlet. Picture 2472

Outlet. Picture 2473

Item 2 – Hickory Ridge Rd. and Dawson Ln. cross drain. Clear debris from cross drain outlet. Picture 2494.

Item 3 – Haynes St. and Center St. Cross Drain. Clear sediment and debris from both ends of 12" CMP cross drains.

Outlet. Picture 2527.

Inlet. Picture 2528.

Item 4 – Haynes St. and Center St. Cross Drain. Clear sediment and debris from both ends of 12" CMP cross drain. Picture 2529. Typical of inlet and outlet.

Item 5 – Neal St. Repair end section of 12" CMP cross drain. Picture 2565.

Item 6 – West St. and Haynes St. Repair end section of 12" CMP cross drain. Picture 2595.

Item 7 – Sloan St. between West St. and West Spring St. Repair end section of 15" CMP cross drain. Picture 2623.

Item 8 – 200 Sloan St. Clear driveway culvert of sediment and debris. Note that driveway is adjacent to West Spring Street. Picture 2633.

Item 9 – Clearview Dr. and West Spring St. Clear sediment and debris from inlet and outlet of elliptical CMP cross drain.

Inlet. Picture 2636.

Outlet. Picture 2639.

Item 10 –Clearview Dr. Clear sediment and debris from 150 LF of roadside ditch. Picture 2642.

Item 11 – 211 Dawson Drive. Clear vegetation from inlet of 24" CMP cross drain. Picture 2683.

Item 12– Center Street and Sloan Street. Clear sediment and debris from inlet and outlet of 12" CMP cross drain.

Inlet. Picture 2719.

Outlet. Picture 2718.

Item 13 – Hickory Ridge Road (Haynes to Dawson Lane)
Clear sediment and debris from 7 driveway culverts and 600 LF of roadside ditch.

906 Hickory Ridge Rd. at Byars Dowdy Elementary School. Clear sediment and debris the inlet of 15" CMP. Picture 2490.

410 Dawson Lane (culvert is located on north side of Hickory Ridge Rd.) Representative example of a driveway culvert choked with sediment. Picture 2502.

Item 13 – continued.

1005 Hickory Ridge Road. Representative example road side ditch with debris. Picture 2516.

Item 14 – Center Street (Neal Street to Dawson Lane)
Clear sediment and debris from 12 driveway culverts and 990 LF of roadside ditch.

1009 Center Street. Representative example of a culvert choked with sediment. Picture 2375.

1002 Center Street. Representative example of a driveway culverts choked with sediment. Picture 2725.

Item 14 – continued.

902 Center Street. Representative example of a driveway culverts choked with sediment. Picture 2390.

310 Haynes St. (culvert is adjacent to Center St). Clear sediment and debris from 1 driveway culvert and 50 LF of roadside ditch. Picture 2537.

Item 15 – West Street (Neal Street to Dawson Lane)
Clear sediment and debris from 14 driveway culverts and 1,480 LF of roadside ditch (740 LF each side).

1103 West St. Representative example of a driveway culvert choked with sediment. Picture 2592.

1005 West Street. Representative photo of clogged driveway culvert and required ditch maintenance. Picture 2605.

Item 15 – continued.

1004 West Street. Representative photo of clogged driveway culvert. Picture 2610.

905 West Street looking west. Representative example roadside ditch require clean-out. Picture 2702.

Item 15 – continued.

301 Sloan Street (driveway culvert on West Street). Representative example of a driveway culvert choked with sediment. Picture 2699.

214 Dawson Lane (driveway culvert on West Street). Representative example of a driveway culvert choked with sediment. Picture 2693.

Item 16 – Haynes Street (Hickory Ridge Rd. to West St.)
Clear sediment and debris from 7 driveway culverts and 880 LF of roadside ditch.

407 Haynes St. Representative example of a driveway culvert choked with sediment. Picture 2519.

1010 Center St. (ditch is adjacent to Haynes St.). Representative example roadside ditch with brush and debris. Picture 2523.

Item 16 – continued.

1008 West St. (driveway is on Haynes St.). Representative example of a driveway culvert choked with sediment. Picture 2661.

1008 West St. (driveway is on Haynes St.). Representative example of a driveway culvert choked with sediment. Picture 2660.

Item 17 – Neal St. Clear sediment and debris from 3 driveway culverts and 210 LF of roadside ditch (105 LF each side). Representative example. Picture 2561.

Item 18 – Sloan Street (Center Street to West Spring Street)
Clear sediment and debris from 11 driveway culverts and 960 LF of roadside ditch.

304 Sloan Street. Representative picture of roadside ditch and culverts requiring clean out.. Picture 2711.

305 Sloan Street. Representative photo of clogged driveway culvert. Picture 2713.

1003 West Street (driveway is located on Sloan Street). Representative photo of clogged driveway culvert and required ditch maintenance. Picture 2617.

205 Sloan Street. Representative photo of clogged driveway culvert. Picture 2626.

Item 19 – Dawson Lane (Hickory Ridge Rd. to West Spring St.)
Clear sediment and debris from 10 driveway culverts and 640 LF of roadside ditch.

405 Dawson Lane. Representative example of a driveway culvert choked with sediment. Picture 2665.

303 Dawson Lane. Representative example of a driveway culvert choked with sediment. Picture 2673.

Item 19 – continued

211 Dawson Lane. Representative example debris in ditch. Picture 2679.

APPENDIX B

FEMA Letter of Map Revision
Bartons Creek
(Approved February 19, 2009)

06e-070-01

Federal Emergency Management Agency

Washington, D.C. 20472

September 29, 2008

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Donald W. Fox
Mayor, City of Lebanon
200 North Castle Heights Avenue, Suite 100
Lebanon, TN 37087

IN REPLY REFER TO:
Case No.: 08-04-4560P
Community Name: City of Lebanon, TN
Community No.: 470208
Effective Date of
This Revision: **February 19, 2009**

Dear Mayor Fox:

The Flood Insurance Study report and Flood Insurance Rate Map for your community have been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Atlanta, Georgia, at (770) 220-5400, or the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Dahlia Kasperski

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

For: William R. Blanton Jr., CFM, Chief
Engineering Management Branch
Mitigation Directorate

List of Enclosures:

Letter of Map Revision Determination Document
Annotated Flood Insurance Rate Map
Annotated Flood Insurance Study Report

cc: Mr. V. W. Chuck Boyett, P.E.
City Engineer
Engineering Department
City of Lebanon

Mr. Daniel D. Smith, P.E.
Civil-Site Design Group, PLLC

ble-0fc-01

Federal Emergency Management Agency

Washington, D.C. 20472

September 29, 2008

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Mayor, City of Lebanon
200 North Castle Heights Avenue, Suite 100
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Engineering Management Branch
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City Engineer
Engineering Department
City of Lebanon

Mr. Daniel D. Smith, P.E.
Civil-Site Design Group, PLLC

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Lebanon Wilson County Tennessee	NO PROJECT	HYDRAULIC ANALYSIS FLOODWAY NEW TOPOGRAPHIC DATA BASE MAP CHANGE
	COMMUNITY NO.: 470208		
IDENTIFIER	South Hartmann Drive	APPROXIMATE LATITUDE & LONGITUDE: 36.204, -86.323 SOURCE: Precision Mapping Streets DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO 47189C0179 D DATE: February 20, 2008	DATE OF EFFECTIVE FLOOD INSURANCE STUDY REPORT February 20, 2008 PROFILE(S) 3P FLOODWAY DATA TABLE 5

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map, *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Bartons Creek - from approximately 300 feet upstream of West Main Street to approximately 100 feet downstream of Leeville Pike

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Bartons Creek	Zone AE	Zone AE	YES	YES
	Floodway	Floodway	YES	YES
	BFEs*	BFEs	YES	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Dahlia Kasperski

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

112553 10 3 1 08044560 102-I-A-C

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448). 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance flood discharges computed in the FIS report for your community without considering subsequent changes in watershed characteristics that could increase flood discharges. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State law have been obtained. State or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip

Dahlia Kasperski

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Mr. Brad Loar
Director, Mitigation Division
Federal Emergency Management Agency, Region IV
Koger Center - Rutgers Building
3003 Chamblee Tucker Road
Atlanta, GA 30341
(770) 220-5400

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Dahlia Kasperski

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

PUBLIC NOTIFICATION

FLOODING SOURCE	LOCATION OF REFERENCED ELEVATION	BFE (FEET NAVD 88)		MAP PANEL NUMBER(S)
		EFFECTIVE	REVISED	
Bartons Creek	Approximately 300 feet upstream of Hickory Ridge Road	527	528	47189C0179 D
	Approximately 1,700 feet upstream of Hickory Ridge Road	529	530	47189C0179 D

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised BFEs presented in this LOMR may be changed.

A notice of changes will be published in the *Federal Register*. A short notice also will be published in your local newspaper on or about the dates listed below. Please refer to FEMA's website at https://www.floodmaps.fema.gov/fhm/Scripts/bfe_main.asp for a more detailed description of proposed BFE changes, which will be posted within a week of the date of this letter.

LOCAL NEWSPAPER Name: *Wilson Post*
Dates: 10/15/2008 10/22/2008

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

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Engineering Management Branch
Mitigation Directorate

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Bartons Creek								
A	3.11	217	2,525	7.8	455.4	449.8 [2]	450.8	1.0
B	3.67	409	4,367	4.5	455.4	454.7 [2]	455.5	0.8
C	4.19	367	3,678	5.3	457.3	457.3	457.7	0.4
D	4.74	555	4,094	4.8	461.2	461.2	462.1	0.9
E	5.18	616	4,201	4.7	464.8	464.8	465.7	0.9
F	5.60	496	2,870	6.8	469.8	469.8	470.7	0.9
G	6.08	624	4,291	4.6	476.0	476.0	477.0	1.0
H	6.78	892	5,775	3.4	481 .4	481.4	482.4	1.0
I	7.32	742	6,421	3.0	485.9	485.9	486.9	1.0
J	8.03	1321	7,966	1.9	489.9	489.9	490.8	0.9
K	8.44	410	2,167	6.9	491.3	491.3	492.2	0.9
L	8.88	1020	4,490	3.4	498.4	498.4	498.7	0.3
M	9.45	788	3,802	4.0	502.3	502.3	503.1	0.8
N	9.98	372	3,117	4.8	508.6	508.6	509.3	0.7
O	10.45	763	5,590	2.7	511.0	511.0	511.9	0.9
P	10.86	743	5,374	2.8	512.3	512.3	513.2	0.9
Q	11.29	900	6,098	1.4	513.3	513.3	514.1	0.8
R	11 .40	484	2,907	2.9	513.5	513.5	514.3	0.8
S	11.47	281	3,053	2.7	514.7	514.7	515.4	0.7
T	11.70	274	2,418	3.4	514.8	514.8	515.7	0.9
U	11.82	258	1,661	5.0	515.5	515.5	516.3	0.8
V	12.24	165	1,379	6.0	520.1	520.1	521.0	0.9
W	12.48	455	2,778	3.0	523.2	523.2	523.7	0.5
X	12.67	640	2,727	3.0	525.1	525.1	525.7	0.6

REVISED DATA

[1] Mile above mouth

2 Elevation computed without consideration of backwater effects

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY
WILSON COUNTY, TN
AND INCORPORATED AREAS

REVISED TO
REFLECT LOMR
EFFECTIVE: February 19, 2009

FLOODWAY DATA

BARTONS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Bartons Creek (continued)								
Y	12.77	750	3,624	2.3	527.8	527.8	528.2	0.4
Z	13.03	590	1,588	5.2	529.7	529.7	530.5	0.8
AA	13.38	885	2,568	3.2	536.0	536.0	536.5	0.5
AB	13.59	115	1,175	7.1	538.0	538.0	539.0	1.0
AC	14.98	328	1,110	7.5	556.5	556.5	557.5	1.0

REVISED DATA

[1] Miles above mouth

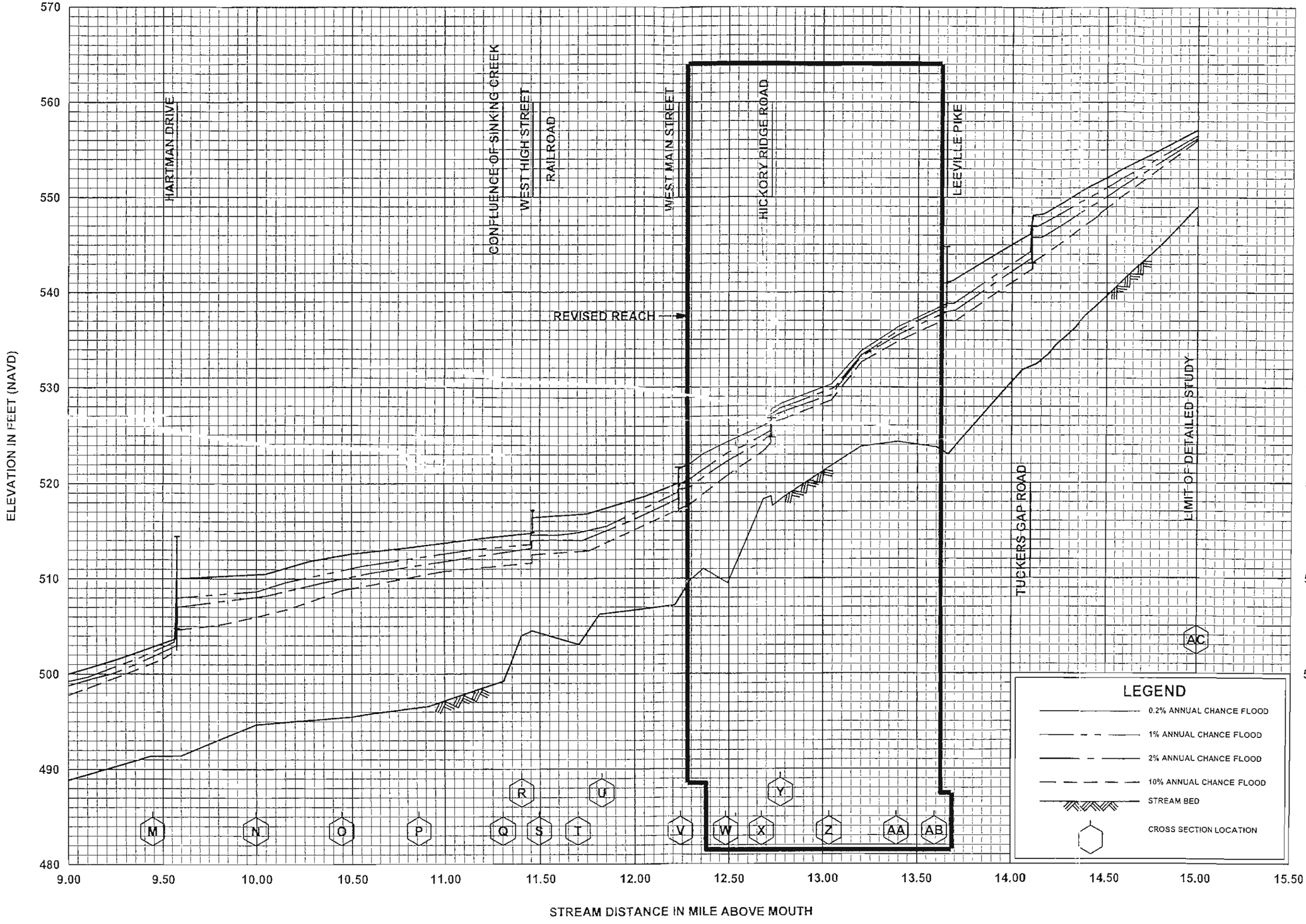
TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY
WILSON COUNTY, TN
AND INCORPORATED AREAS

REVISED TO REFLECT LOMR EFFECTIVE: February 19, 2009

FLOODWAY DATA

BARTONS CREEK



FLOOD PROFILES

BARTONS CREEK

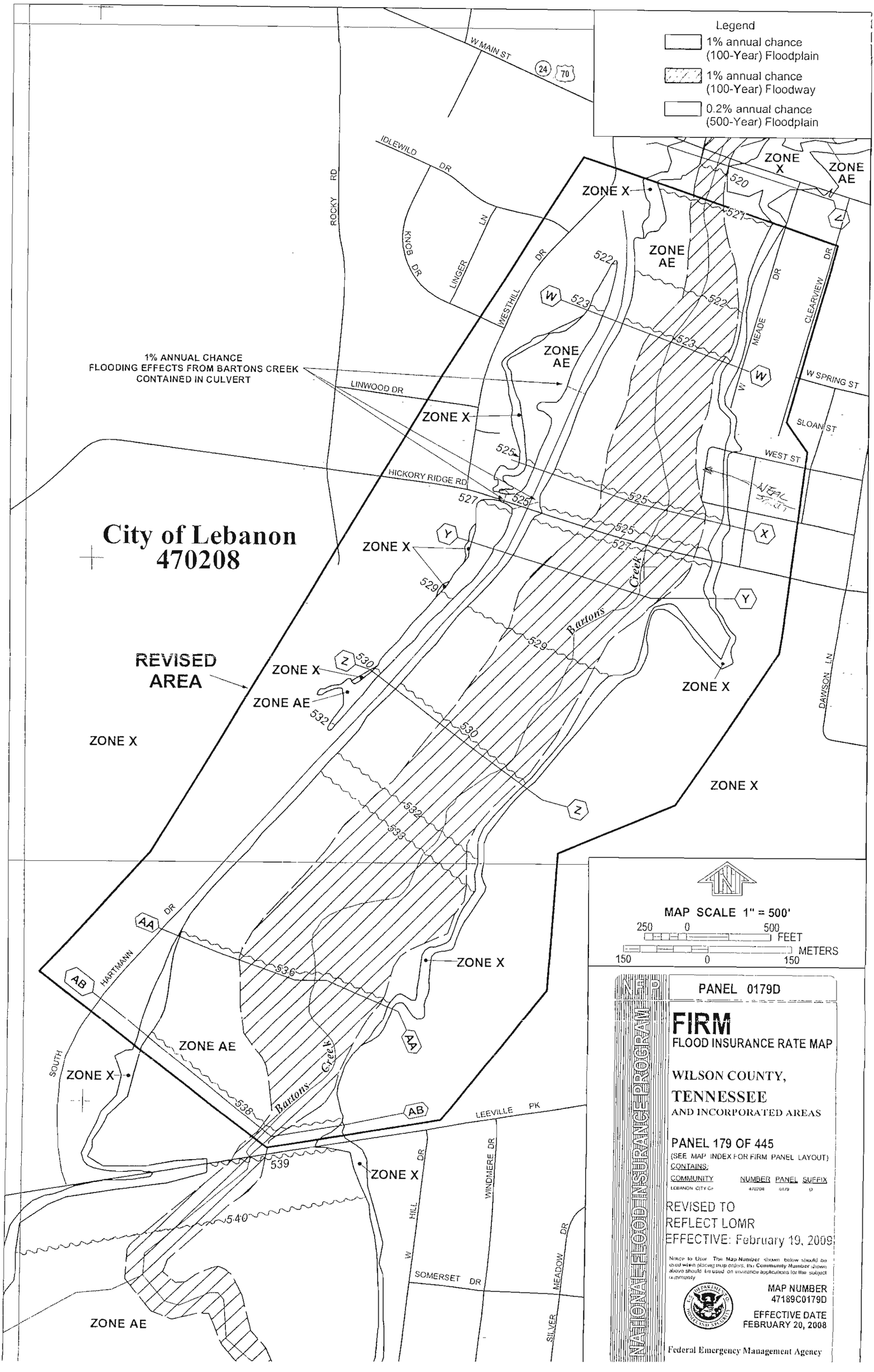
REVISED TO REFLECT LOMR
EFFECTIVE: February 19, 2009

FEDERAL EMERGENCY MANAGEMENT AGENCY

WILSON COUNTY, TN

AND INCORPORATED AREAS

03P


Legend
1% annual chance (100-Year) Floodplain
1% annual chance (100-Year) Floodway
0.2% annual chance (500-Year) Floodplain
City of Lebanon
470208
REVISED AREA
1% ANNUAL CHANCE FLOODING EFFECTS FROM BARTONS CREEK CONTAINED IN CULVERT
ZONE X
ZONE AE
W MAIN ST
IDLEWILD DR
ROCKY RD
KNOB DR
LINGER LN
WESTHILL DR
LINWOOD DR
HICKORY RIDGE RD
MEADE DR
CLEARVIEW DR
W SPRING ST
SLOAN ST
WEST ST
DAWSON LN
Barton's Creek
HARTMANN DR
SOUTH
LEEVILLE PK
WINDMERE DR
HILL DR
SOMERSET DR
SILVER MEADOW DR
520
522
523
525
527
529
530
532
533
536
538
539
540
MAP SCALE 1" = 500'
250 0 500 FEET
150 0 150 METERS
PANEL 0179D
FIRM
FLOOD INSURANCE RATE MAP
WILSON COUNTY,
TENNESSEE
AND INCORPORATED AREAS
PANEL 179 OF 445
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
LEBANON, CITY OF 470208 0179 D
REVISED TO REFLECT LOMR EFFECTIVE: February 19, 2009
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
47189C0179D
EFFECTIVE DATE
FEBRUARY 20, 2008
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM