



April 9, 2018

Martha Grafton
Land Protection Division
Department of Environmental Quality
P.O. Box 1677
Oklahoma City, OK 73101-1677

RE: Muskogee Power Plant Inactive CCR Surface Impoundment
Design and Operating Criteria Documentation

Ms. Grafton:

Oklahoma Gas & Electric (OG&E) is submitting this documentation in accordance with 40 CFR 257.100(e)(3)(i), (iv), and (v); 40 CFR 257.100(e)(4)(ii), and the Oklahoma Administrative Code (OAC) 252:517-15-5(b)(3)(A), (D), and (E), and 252:517-5(b)4(B) for the OG&E CCR inactive surface impoundment. This documentation shall be posted on the OG&E web site in accordance with 40 CFR 257.107.

This submittal includes the complete documentation of the impoundment liner type, a history of the construction of the inactive surface impoundment, an initial hazard potential classification, structural stability, and safety factor assessments, and the initial inflow design flood control system plan.

If you have any questions concerning this report please contact me by either my office (405-553-3349) or cell phone (405-708-9964).

Sincerely,

A handwritten signature in black ink, appearing to read 'Tad Dow', is written over a light blue horizontal line.

Tad Dow
Staff Envirochemist

Enclosures

**Design and Operating Criteria Documentation
For Inactive CCR Impoundment at Muskogee Power Plant**



FACILITY LOCATION:

5501 Three Forks Road
Ft. Gibson, OK 74434



Revision 0
Date: April 9, 2018

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1.0 BACKGROUND

The development of this document has been prepared to provide the design and operating criteria documentation in accordance with 40 CFR 257.100(e)(3)(i), (iv), and (v); 40 CFR 257.100(e)(4)(ii), and the Oklahoma Administrative Code (OAC) 252:517-15-5(b)(3)(A), (D), and (E), and 252:517-5(b)4(B) for the Oklahoma Gas & Electric's (OG&E) Coal Combustion Residual (CCR) inactive impoundment located at the Muskogee Power Plant (MK), see Figure 1-1. Specifically, this document will provide the following:

- Complete the documentation of impoundment liner type in accordance with 40 CFR 257.71(a) and (b), and OAC 252:517-11-2(a) and(b);
- Compile a history of construction for the inactive impoundment in accordance with 40 CFR 257.73(b) and (c), and OAC 252:517-11-4(b) and (c);
- Complete the initial hazard potential classification, structural stability, and safety factor assessments in accordance with 40 CFR 257.73(a)(2), (b), (d), (e), and (f), and OAC 252:517-11-4(a)(2), (b), (d), (e), and (f); and,
- Prepare the initial inflow design flood control system plan in accordance with 40 CFR 257.82(c), and OAC 252:517-13-3(a).



Figure 1-1 Location Map

2.0 IMPOUNDMENT LINER TYPE

The following section provides the documentation of the impoundment liner type in accordance with 40 CFR 257.71(a) and (b), and OAC 252:517-11-2(a) and (b). The existing impoundment contains a 6-inch soil and bentonite liner (42% bentonite mixed with on-site soil) overlain with 6 inches of cement stabilized aggregate on both the side slopes and pond bottom. In addition to this liner system, the pond bottom contains 12 inches of untreated crushed stone overlain with a 6-inch crushed stone treated base (hydrated lime stabilized) as shown in Figure 2-1.

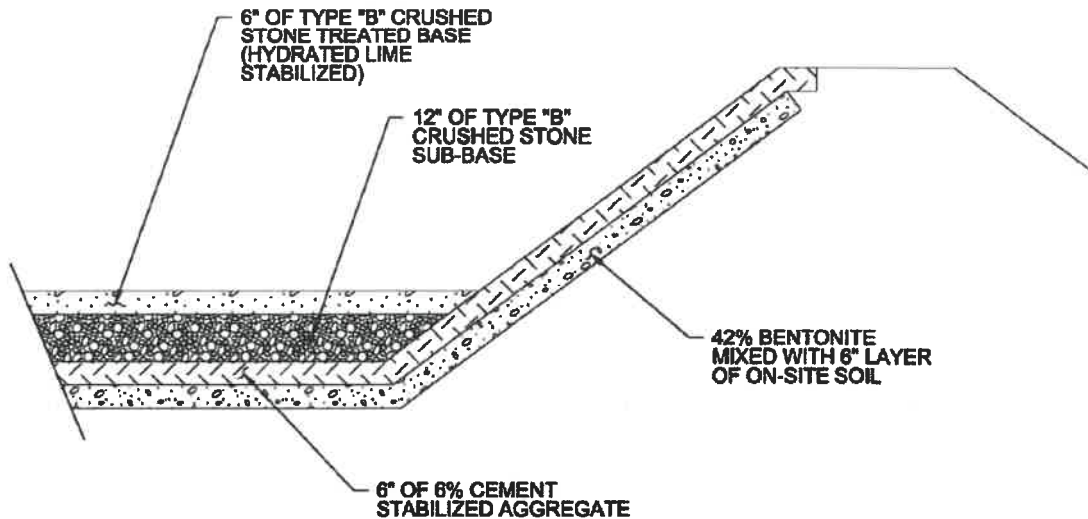


Figure 2-1 Liner Type

3.0 HISTORY OF CONSTRUCTION

The history of construction for the OG&E MK inactive CCR impoundment has been prepared in accordance with 40 CFR 257.73(c)(1) and OAC 252:517-11-4(c). These regulatory citations acknowledge that preparing and documenting the construction history of a CCR surface impoundment should be compiled "to the extent feasible." In the April 17, 2015 Federal Register (80 FR 21380), EPA acknowledges that the construction history of a CCR surface impoundment may be unknown or lost, and intends for the facility to provide information on the history of construction only to the extent that such information is reasonably and readily available. Due to the age of the facility and access to historical records, this section only provides the factual relevant design and construction information that is currently available.

OG&E is the owner of the MK inactive CCR impoundment that is located in Fort Gibson, Oklahoma (see Figure 3-1). The CCR inactive impoundment has previously been identified in the past as "Impoundment F01" within the OG&E Oklahoma Department of Environmental Quality (ODEQ) Oklahoma Pollution Discharge Elimination System (OPDES) permit OK0034657 or referred also as the Emergency Ash Basin within OG&E facility construction documents.

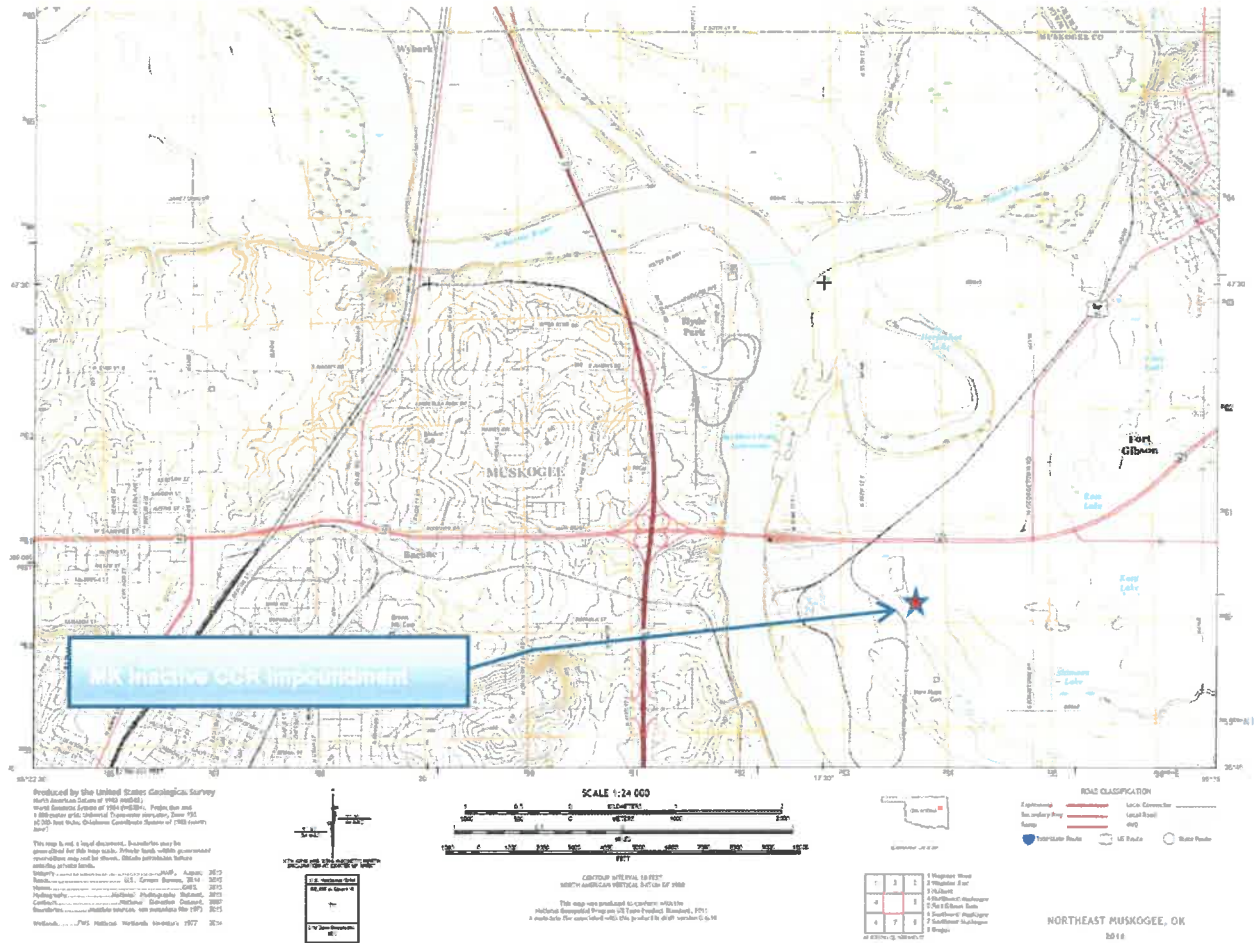


Figure 3-1, USGS 15-minute Quadrangle Map

Construction of the OG&E MK Power Plant Units 4 and 5 was completed in 1977 and 1978, while Unit 6 was completed in 1984. These three units burn low-sulfur Wyoming coal which generate CCR materials and all of these units had previously discharged incidental CCR bottom ash into the inactive impoundment. The MK inactive CCR impoundment ceased receiving bottom ash from these units on October 14, 2015 when the discharge piping to the pond was disconnected from the plant, and OG&E subsequently filed a Notice of Intent to initiate closure of the inactive impoundment on December 10, 2015. The MK inactive CCR impoundment was originally designed as an emergency ash basin which was utilized as a backup to the onsite bottom ash dewatering bin system.

Since the CCR inactive impoundment has not received CCR material since October 14, 2015, the inactive impoundment is now only receiving direct rainfall within the impounded area. The rainfall accumulates towards the southwest corner of the impoundment and drains into an existing concrete sump. The accumulated rainwater is then pumped and recycled into the ash recycle system for beneficial use. The CCR inactive impoundment is located within the sub watershed

upstream of Horseshoe Lake-Arkansas River watershed which consists of 14,283 acres, as identified from the Oklahoma Water Resources Board (OWRB) Surface Water Data (Hydrologic Unit Code 111101020307). The estimated sub-watershed area immediately upstream of the CCR inactive impoundment area is 1,868 acres.

The history of construction information presented in this section is obtained from archived construction drawings (Attachment 1) for the CCR inactive impoundment. The construction drawings for the inactive impoundment were initially prepared in 1972, and subsequently revised in 1977. The construction drawings indicate the bottom contour elevation as 502 feet mean sea level (msl) and the top of the earthen embankment is listed as 516 feet msl. The embankments of the inactive impoundment are constructed of soil and bentonite overlain with cement stabilized aggregate. The inactive impoundment does not contain any instrumentation for monitoring.

The 16.5 acre inactive impoundment is estimated to contain 82,000 cubic yards of CCR material with a majority of this material generally confined to the northwest portion of the impoundment. The inactive impoundment does not contain a spillway or diversion structure other than the water recycle pump located in the southwest corner. There has been no history of structural instability of the CCR inactive impoundment.

4.0 ASSESSMENT OF HAZARD POTENTIAL CLASSIFICATION

Hazard potential classification can be based on the potential impact to its surroundings following an embankment failure or a mis-operation which is an unscheduled release. The OWRB dam classification (Hazard-Potential Classification Guidelines for Dams in Oklahoma, OWRB May 2014) is based on the potential impact a dam failure or unscheduled release would have on downstream areas or at locations remote from the dam. OWRB's hazard-potential classification assigned to a dam is based on consideration of the effects of a failure of the dam or through operational failures during both normal and flood flow conditions. In addition to direct impacts on the potential loss of human life, the hazard-potential classification also takes into consideration the impacts on habitable structures, such as residences, businesses, and other occupied structures and roadways in the dam breach inundation area.

For purposes of hazard potential classification, the population at risk is the primary factor differentiating between a significant and high hazard-potential dam. This is correlated to the number of individuals who may be present within the dam breach inundation area below a dam and are therefore at risk in the event of a dam failure. Dams assigned the high hazard-potential classification are those where failure will probably cause loss of human life. Dams assigned the significant hazard-potential classification are those dams where failure would result in no probable loss of human life but can cause economic loss or disruption of lifeline facilities. Dams assigned the low hazard-potential classification are those dams where failure would result in no probable loss of human life and low economic and/or environmental losses, and the losses are primarily limited to the impoundment owner's property.

OG&E's hazard potential classification assessment for the inactive CCR impoundment included a review of archived construction drawings and documentation. Engineering judgement was essentially a major factor in the hazard potential classification assessment.

4.1 Hazard Potential Classification

The following hazard potential classification has been prepared in accordance with 40 CFR 257.73 and OAC 252:517-11-4(a)(2). The OG&E property surrounds the immediate perimeter of the inactive CCR impoundment as shown in Attachment 1. The conclusions from the hazard potential classification assessment for the inactive CCR impoundment include the following:

- Loss of Human life is not expected in the event of a mis-operation or failure;
- Economic and environmental losses would be minimal and mostly limited to OG&E's property; and,
- Downstream areas are predominantly undeveloped, rural and/or agricultural land.

The potential impact following an embankment failure or a mis-operation of the inactive CCR impoundment would be mostly limited to OG&E's property. Based on the above conclusions and engineering judgement, the inactive CCR impoundment is classified as low hazard potential.

5.0 INITIAL SAFETY FACTOR ASSESSMENT

The initial safety factor assessment for the MK inactive CCR impoundment has been performed in accordance with 40 CFR 257.73(e) and OAC 252:517-11-4(e). The 16.5 acre inactive CCR surface impoundment has been disconnected from plant process systems and ceased operating on October 14, 2015. The inactive impoundment contains approximately 82,000 CY of CCR material within the perimeter embankment. This embankment was originally designed in 1972 to have interior slopes of 3H:1V and a Crest elevation of 516 feet msl. The original design drawing notes that the impoundment bottom contour to be 502 feet msl. The CCR impoundment is currently only receiving direct rainfall within the impounded area. The rainfall accumulated within the impoundment is drained towards an existing concrete sump located in the southwest corner and is then pumped in to the ash recycle system for beneficial use. Based upon these current operations, the inactive CCR impoundment is not subject to long term maximum storage and maximum surcharge conditions. The embankments are constructed of soil and bentonite overlain with cement stabilized aggregate which is not susceptible to liquefaction. Therefore the embankment slope stability for maximum surcharge, seismic stability and liquefaction safety factors were not evaluated.

6.0 INFLOW DESIGN FLOOD CONTROL

The MK inactive CCR impoundment initial inflow design flood control assessment has been prepared in accordance with 40 CFR 257.82(c) and OAC 252:517-13-3(a). The CCR Rule inflow design flood control requirement is based on the hazard potential classification of the CCR surface impoundment. The inflow design flood for a low hazard potential classification is determined using a 100-year flood event. The 100-year flood elevation listed in the FEMA Flood Insurance Rate Map (FIRM 40101C0120F, Attachment 2) for the MK inactive CCR impoundment location is 515 feet msl. The embankment of the inactive impoundment is designed to have a crest elevation of 516 feet msl. The concrete outlet structure with a slide gate is located on the southwest corner of the impoundment is used for recycling water into the bottom ash recycling system. Since the CCR impoundment is only receiving direct rainfall within the impounded area, there are no off-site rainfall runoff sources that contribute to the rainfall collected within the impoundment. The rainfall runoff collected within the impoundment is pumped into the ash recycle system for beneficial use and the water level is being kept as low as possible until closure can be completed. The inactive CCR impoundment crest elevation is 1-foot higher than the 100 year flood elevation.

7.0 STATEMENT OF CERTIFICATION

I hereby certify, as a Professional Engineer in the State of Oklahoma, that the information in this document was assembled under my direct supervisory control. I certify that to the best of my knowledge and belief, the information presented in this document are correct.



Suraj A. Balan, P.E.

4/9/2018

Date

Oklahoma Certificate of Authorization Number: 159





Attachment 1

Construction Drawings



Attachment 2
FEMA Flood Insurance Rate Map

Printed Program at 1:500=635-6620.



MAP SCALE 1" = 1000'

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0120F

FIRM
FLOOD INSURANCE RATE MAP
MUSKOGEE COUNTY
OKLAHOMA
AND INCORPORATED AREAS

PANEL 120 OF 600
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	NUMBER	PANEL	SUFFIX
COMMUNITY	400725	0720	F
FORT GIBSON, TOWN OF	400725	0720	F
MUSKOGEE CITY OF	400811	0720	F
MUSKOGEE COUNTY	400811	0720	F

Note: (1) This Map Number refers to the Flood Insurance Rate Map (FIRM) which is used to determine flood insurance rates. (2) This Map Number refers to the Flood Insurance Study (FIS) which provides the basis for the FIRM. (3) This Map Number refers to the Flood Insurance Study (FIS) which provides the basis for the FIRM. (4) This Map Number refers to the Flood Insurance Study (FIS) which provides the basis for the FIRM.

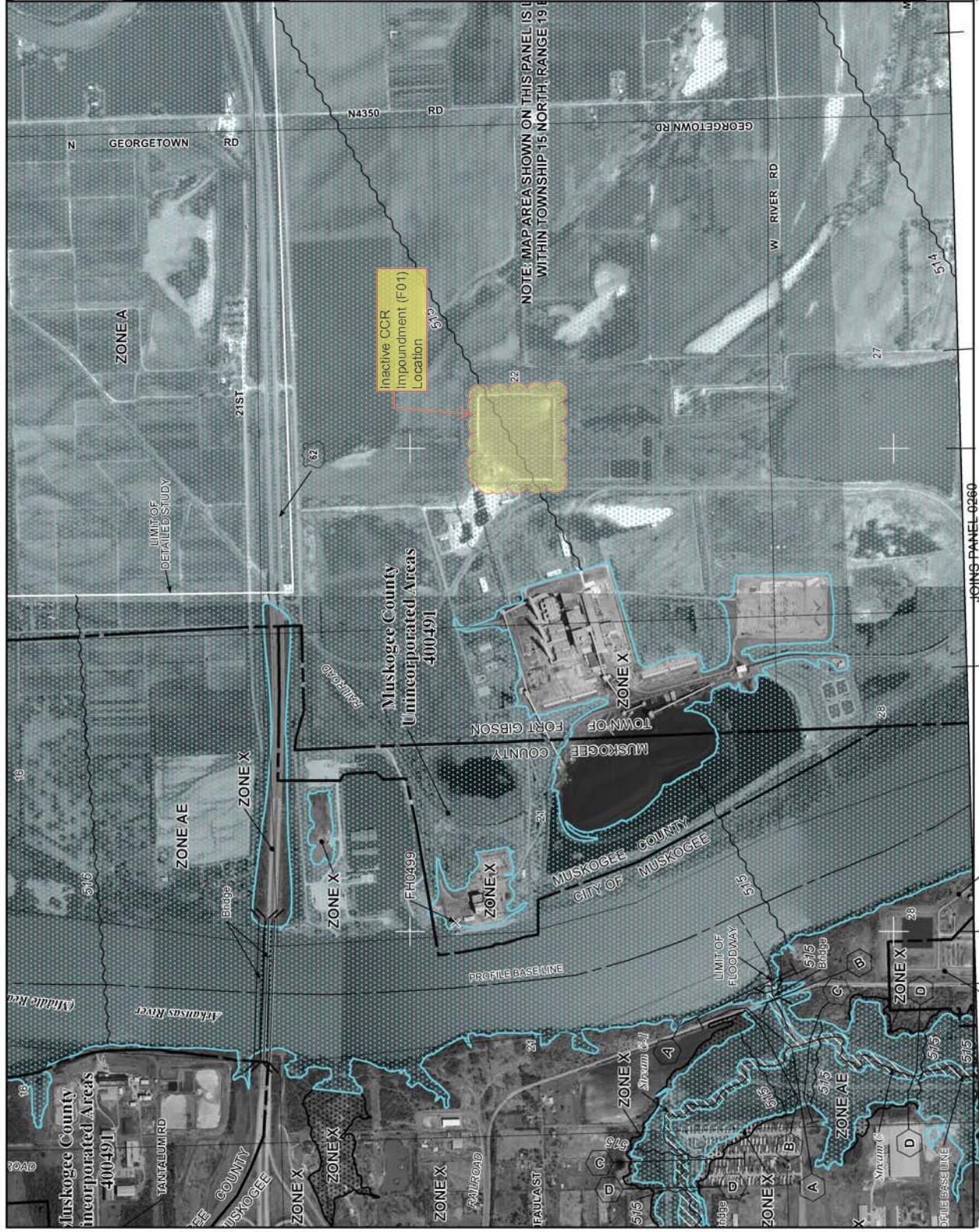
MAP NUMBER
40101C0120F

MAP REVISED
FEBRUARY 4, 2011

Federal Emergency Management Agency

Note:
OG&E completed a project in 2015 to regrade berms around the waste water ponds, sanitary sewage lagoons, and the coal pond at the MK Site.
The FEMA FIRM was not updated to reflect the regraded berms.

This is an official copy of a portion of the above referenced flood map. It was extracted using the Flood On-Line. This map does not include changes to the flood insurance rate map from the Community Number shown above. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.fema.gov



JOINING PANEL 0260