Draft Environmental Assessment

City of Bixby, OK

90th East Avenue Drainage Project

HMGP-DR-1823-OK Project #8

Tulsa County, OK

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Federal Emergency Management Agency
Department of Homeland Security
500 C Street, SW
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APE	Area of Potential Effects
BMP	Best Management Practice
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CWA	Clean Water Act
dBA	decibels on the A-rated scale
DNL	Day-Night Average Sound Level
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
HMGP	Hazard Mitigation Grant Program
IPaC	Information, Planning and Conservation System
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NWP	Nationwide Permit
O_3	ozone
OAS	Oklahoma Archeological Survey
ODEQ	Oklahoma Department of Environmental Quality
OSHA	Occupational Safety and Health Administration
OWRB	Oklahoma Water Resources Board
Pb	lead
$PM_{2.5}$	particulate matter less than 2.5 microns

PM_{10}	particulate matter less than 10 microns
RCB	reinforced concrete box
RCP	reinforced concrete pipe
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SWPPP	Stormwater Pollution Prevention Plan
T&E	threatened and endangered
THPO	Tribal Historic Preservation Officer
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WOUS	Waters of the United States

SECTION ONE INTRODUCTION

The City of Bixby, OK, experiences flooding problems along 90th East Avenue due to insufficient roadway heights and culvert capacities along an intermittent tributary to Fry Creek. During rain events exceeding 1 inch, the tributary floods – completely inundating 90th East Avenue and overtopping 89th East Avenue and East 113th Street. Residential dwellings and sanitary sewer crossings in this area are affected by floodwaters to varying degrees depending on the amount of precipitation.

During flooding events, many area motorists who use 90th East Avenue to access main arterial streets are cut off. Seven residences become completely inaccessible during flood events; residents must wait for the waters to recede to leave or return to their properties. Emergency vehicles are unable to access these homes in a timely manner during flood events because of road closures.

The City of Bixby has requested funding from the Federal Emergency Management Agency (FEMA) under its Hazard Mitigation Grant Program (HMGP) to construct a detention facility, upgrade culvert conveyance capacity to the 100-year flow, elevate existing roadways above the 100-year flood level, construct/update seven sanitary sewer encasements/drop structures, construct an energy dissipation area, and stabilize stream banks.

In accordance with 44 Code of Federal Regulations (CFR), Part 10, FEMA has prepared this Environmental Assessment (EA) to meet the requirements of the National Environmental Policy Act of 1969 (NEPA) and the President's Council on Environmental Quality (CEQ) regulations to implement NEPA (40 CFR Parts 1500-1508). FEMA is required to consider potential environmental impacts before funding or approving actions and projects. The purpose of this EA is to analyze the potential environmental impacts of the proposed 90th East Avenue Drainage Project. FEMA will use the findings in this EA to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

The City of Bixby is located 25 miles southeast of Keystone Lake and approximately 73 miles northeast of Oklahoma City in southeastern Tulsa County, OK. The project area is comprised of suburban dwellings and lawns, interspersed with small areas of trees. See Appendix A, Figures 1 and 2 for the location of the proposed project.

SECTION TWO PURPOSE AND NEED

During rain events exceeding 1 inch, streets and properties in the City of Bixby are flooded due to insufficient roadway heights and culvert capacities. Floodwaters overtop and inundate roadways, causing unsafe driving conditions and temporary road closures, which isolate seven residences. Residents must wait for the waters to recede to leave or regain access to their property. Emergency vehicles are unable to access these homes in a timely manner during flood events. Cars may be swept off the road, stranding motorists and possibly causing emergency response situations. This is a repetitive problem posing continuing risks to public health and safety. Each year, the Bixby Fire Department responds to an average of 10 flood-related calls in the project area. According to the Bixby Fire Chief, the estimated cost per run is $2,213.60 for a total of $110,680 in the past 5 years. Flood events also contribute to the weakening of sanitary sewer crossings and lines within the project area, increasing the potential for sewer line failures.

The purpose of the proposed project is to mitigate roadway flooding, prevent flood-related road closures and recurring damage to sanitary sewer systems, and reduce flooding risk to residential structures within the project area. The proposed project is needed to reduce risks to public safety and reduce the economic burden on the City of Bixby for emergency services to the project area during heavy rain events.

Through HMGP, FEMA provides grants to states and local governments to implement long-term hazard mitigation measures. The purpose of HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act

SECTION THREE ALTERNATIVES

This section describes the alternatives that were considered in addressing the purpose and need stated in Section 2. Two alternatives are evaluated in this EA: the No Action Alternative (Alternative 1), and the Proposed Action Alternative (Alternative 2), which is the construction of the proposed project.

3.1 ALTERNATIVE 1: NO ACTION

Under the No Action Alternative, the City of Bixby would not construct the proposed project. During heavy rain events, flooding would continue to cause overtopping and inundation of roadways and recurring damages to the sanitary sewer lines. The City would continue operating as it currently does during heavy precipitation events by closing off access to 90th East Avenue and activating emergency services. Recurring flooding would continue to put public health and safety at risk and require time and funding for emergency response personnel and equipment.

3.2 ALTERNATIVE 2: CONSTRUCT BIXBY 90TH EAST AVENUE DRAINAGE PROJECT (PROPOSED ACTION)

Under the Proposed Action Alternative, the City of Bixby would use FEMA funding in conjunction with City funding to develop drainage system enhancements and flood control structures to address the recurring flooding in the project area. Specific project components include:

- Construct a 1.6-acre water detention facility adjacent to 90th East Avenue.
- Create a 0.11-acre energy dissipation area by widening the channel overbank at the East 113th Street culvert outflow.
- Elevate 90th East Avenue and portions of both 89th East Avenue and East 113th Street above the 100-year flood event.
- Replace an existing 36-inch reinforced concrete pipe (RCP) culvert with a triple 8-foot x 6-foot reinforced concrete box (RCB) culvert at the basin outlet on the East 113th Street bridge.
- Replace an existing 42-inch RCP culvert with a triple 8-foot x 6-foot RCB culvert at the basin inlet on the 89th East Avenue bridge.
- Replace/upgrade sanitary sewer lines and create seven sanitary sewer encasements/drop structures.
- Stabilize approximately 175 total linear feet of stream bank within the sewer line right-of-way between all sanitary sewer drop structures.
- Acquire (from willing sellers) and demolish two residences (11270 south 90th East Avenue and 11310 south 91st East Avenue) and remove any associated landscaping or paving.

Figure 2 in Appendix A shows the proposed project components; photographs of the project area are provided in Appendix B.

To construct the proposed 1.6-acre detention facility, the City would acquire and demolish the residence 11270 90th East Avenue. The City would acquire and demolish a second residence, 11310 91st East Avenue, to construct the proposed 0.11-acre energy dissipation area via channel overbank widening downstream of the upgraded East 113th Street culvert. Both acquisitions are voluntary.

All soils removed to construct the detention facility and the energy dissipation area would be used to elevate the surrounding roadways above the 100-year flood level. Soil would be transported directly to the roadway sections to be elevated, with no stockpiling or storage of soil needed.

The stream banks would be excavated to widen the waterway in the two areas where existing RCPs would be removed (89th East Avenue and East 113th Street). The excess soils from bank excavations would be used to elevate adjacent roadways.

Seven sewer line encasements/drop structure locations and areas of stream bank stabilization are proposed, along with the removal and replacement of 5 existing driveway aprons and segments of driveways along the east side of 90th East Avenue. Each encasement would double as a weir (small overflow dam), re-establishing the original channel flow line on the upstream side, with a stabilized drop on the downstream side to help prevent channel bed erosion below the existing sanitary sewer lines.

SECTION FOUR AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

This section describes the potential impacts of the No Action and Proposed Action Alternatives. Where potential impacts exist, conditions or mitigation measures to offset these impacts are provided. A summary table is provided in Section 4.7.

4.1 PHYSICAL RESOURCES

4.1.1 Geology and Soils

According to the Oklahoma Geological Survey, the project area is in the Cherokee Platform geologic province and the Claremore Cuesta Plains geomorphic province of Oklahoma. Elevation of the project area varies from 620 to 650 feet above mean sea level (USGS 2011.

According to the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the project area contains soils classified as Tullahassee fine sandy loam, which consists of poorly drained loamy alluvium, and Okay loam. Slopes in the project area are typically between 1 to 5 percent.

The Farmland Protection Policy Act (FPPA) states that Federal agencies must "minimize the extent to which Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses…" The resources protected by the FPPA include prime and unique farmland. These lands are categorized by the USDA/NRCS based on underlying soil mapping units. Okay loam is classified as a prime farmland soil (USDA/NRCS 2011); however, the land use in the project area is suburban dwellings and developments, with no farming or agricultural operations. A letter requesting project review was sent to the USDA on January 18, 2012. A letter from USDA/NRCS dated January 30, 2012, stated that the project would cause no adverse impact on prime farmland (Appendix C).

No Action Alternative – Under the No Action Alternative, no demolition or construction would occur, and there would be no effect on geology or soils.

Proposed Action Alternative – Under the Proposed Action Alternative, no impacts on prime farmland soils are anticipated since the project area is in urban use.

Excavation activities will not be deep enough to affect underlying geologic resources, because excavation depths for both the detention pond and the energy dissipation area will not go below the channel level. The detention pond will have a maximum excavation depth of 7 feet with an average excavation depth of 4 feet. The energy dissipation area will have both a maximum and average excavation depth of 4.5 feet. Soils within the project area have been previously disturbed from land clearing and residential development. However, minor, short-term impacts on soils would occur from ground disturbances including excavations, stream bank stabilization, grading and use of heavy equipment during demolition of the acquired structures, and site preparation. Long-term, minor impacts on approximately1.6 acres of soils would occur from removal of soils to create the proposed detention facility and energy dissipation area.

The City of Bixby would be required to prepare a Storm Water Pollution Prevention Plan (SWPPP) and obtain a National Pollutant Discharge Elimination System (NPDES) permit prior to construction. Implementation of appropriate Best Management Practices (BMPs) such as use of silt fences and revegetation of disturbed soils, as described in the SWPPP and required for the NPDES permit, would help minimize erosion and site runoff. Excavated soil, waste materials,

and debris will be managed and disposed of in accordance with applicable local, state, and federal regulations in an approved manner and location. If contaminated materials are discovered during the construction activities, the work must cease until the appropriate procedures can be implemented and permits obtained. The City of Bixby shall handle, manage, and dispose of petroleum products, hazardous materials, and toxic waste in accordance to the requirements and to the satisfaction of the governing local, state, and federal agencies.

4.1.2 Air Quality

The Clean Air Act (CAA) requires that States adopt ambient air quality standards. The standards have been established to protect the public and environment from potentially harmful amounts of pollutants. Under the CAA, the U.S. Environmental Protection Agency (EPA) establishes primary and secondary air quality standards. Primary air quality standards protect the public health, including the health of "sensitive populations, such as people with asthma, children, and older adults." Secondary air quality standards protect public welfare by promoting ecosystem health, and preventing decreased visibility and damage to crops and buildings. The EPA has set National Ambient Air Quality Standards (NAAQS) to define the maximum permissible concentrations for the following six criteria pollutants: ozone (O_3), particulate matter 2.5 microns or 10 microns or less ($PM_{2.5}$, PM_{10}), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and lead (Pb). The Oklahoma Department of Environmental Quality (ODEQ) has established air quality monitoring stations to measure the criteria pollutants in ambient air. According to the EPA, Oklahoma is in attainment for all NAAQS (EPA 2011a).

A letter requesting project review was sent to the ODEQ on January 18, 2012. A response letter dated January 30, 2012, from the ODEQ stated that they have no comments or objections to the project and included a list of environmental recommendations to be considered during project construction (Appendix C).

No Action Alternative – Under the No Action Alternative, no construction would occur and there would be no effect on air quality.

Proposed Action Alternative – Under the Proposed Action Alternative, no long-term impacts on air quality would occur. Short-term, minor impacts on air quality may occur during construction from fugitive dust and vehicle and equipment emissions. To reduce these impacts, the construction contractor(s) would be required to implement dust control BMPs such as watering down construction areas when necessary. Emissions from fuel-burning internal combustion engines (e.g., heavy equipment and earthmoving machinery) could temporarily increase the levels of some of the criteria pollutants, including CO, NO_2, O_3, PM_{10}, and non-criteria pollutants such as volatile organic compounds. To reduce the emission of criteria pollutants, fuel-burning equipment running times would be kept to a minimum and engines would be properly maintained.

4.2 WATER RESOURCES

4.2.1 Surface Water

Surface water includes lakes, streams, springs, rivers, seas, and oceans. The project area contains a single surface water feature, an intermittent tributary to Fry Creek that extends north-south through the center of the project area, eventually feeding into Haikey Creek and then the

Arkansas River. The project area is approximately 2.7 miles northeast of the Arkansas River and 1.3 miles west of Haikey Creek (USGS 2011). Stormwater runoff from the project area drains into the intermittent tributary to Fry Creek from 90th East Avenue, 89th East Avenue, East 113th Street, and neighboring residential areas. Fry Creek is not listed as an impaired waterway.

No Action Alternative – Under the No Action Alternative, no construction would occur and there would be no direct impacts to surface waters. Water quality in the intermittent tributary to Fry Creek and downstream surface waters would continue to be at risk from potential releases of sewage if sewer lines are damaged by flooding.

Proposed Action Alternative – The intermittent tributary to Fry Creek would be directly affected by in-channel work for reconstruction of sanitary sewer line crossings, removal and replacement of culverts, and stream bank restoration.

The new sewer line crossings would double as weirs that would help maintain the original channel flow line on the upstream side of the crossings and help prevent channel bed erosion below the crossings by constructing a stabilized drop on the downstream side. The work would require the construction of temporary coffer dams to route the water around the excavation operations; therefore, dewatering activities are not planned. Removal and replacement of existing culverts and grading activities for construction of the energy dissipation basin would require work in the stream bank which could cause a temporary increase in suspended sediments in the water.

Minor short-term impacts on offsite surface waters may occur due to transport of sediment from disturbed soils by stormwater runoff during construction. To reduce impacts, the City of Bixby would implement appropriate erosion and sediment control BMPs, such as installing silt fences and revegetating bare soils. The City would also be required to prepare a SWPPP and obtain an NPDES permit prior to construction.

4.2.2 Groundwater

The project area is located between two major aquifers for the State of Oklahoma: the Ozark Plateaus Aquifer System to the east and the Ada-Vamoosa Aquifer to the west. In Oklahoma, the Ozark Plateaus Aquifer system and Ada-Vamoosa Aquifer provide groundwater to all or parts of the counties in which they are located. The U.S. Geological Survey (USGS) also notes the importance of aquifers is elevated in the western sections of Oklahoma where there are less prevalent surface water sources to draw from. According to the Oklahoma Water Resources Board (OWRB) Groundwater Database, groundwater levels recorded at an active well site near the project area averaged 16.83 feet below the ground surface (OWRB 2011).

No Action Alternative – Under the No Action Alternative, no construction would occur and there would be no impacts on groundwater.

Proposed Action Alternative – Under the Proposed Action Alternative, no impacts on groundwater are anticipated because excavation depths for both the detention pond and the energy dissipation area will not be deep enough to affect groundwater, because excavations will not go below the channel level. The detention pond will have a maximum excavation depth of 7 feet with an average excavation depth of 4 feet. The energy dissipation area will have both a maximum and average excavation depth of 4.5 feet.

4.2.3 Waters of the U.S. Including Wetlands

The Clean Water Act (CWA), as amended in 1977, established the basic framework for regulating discharges of pollutants into the Waters of the United States (WOUS).

The U.S. Army Corps of Engineers (USACE) regulates the discharge of dredged or fill material into WOUS, including wetlands, pursuant to Section 404 of the CWA. Executive Order (EO) 11990 (Protection of Wetlands) requires Federal agencies to avoid, to the extent possible, adverse impacts to wetlands. Wetlands are delineated based on an area meeting three criteria: hydric soils, hydrophytic vegetation, and hydrologic indicators. The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), USGS National Map Viewer, and the USDA/NRCS online Web Soil Survey maps of the project area were reviewed to determine the potential for wetlands and other WOUS to exist within the project area.

The NWI map shows that the project area contains no wetlands (USFWS 2011a). The USGS National Map Viewer (USGS 2011) and NRCS online Web Soil Survey (USDA/NRCS 2009) depict the tributary to Fry Creek as an intermittent waterway; therefore, the tributary is considered a WOUS under the jurisdiction of the USACE.

No Action Alternative – Under the No Action Alternative, no construction would occur and there would be no direct impacts to surface waters. Water quality in the intermittent tributary to Fry Creek would continue to be at risk from potential releases of sewage if sewer lines are damaged by flooding.

Proposed Action Alternative – Under the Proposed Action Alternative, sanitary sewer line crossing reconstruction would require work within the drainage channel; sewer lines would double as a weir, re-establishing the original channel flow line on the upstream side with a stabilized drop on the downstream side to help prevent channel bed erosion below the existing sanitary sewer lines. The work would require the construction of temporary coffer dams to route the water around the excavation operations associated with the sanitary sewer crossings; no dewatering activities are planned. Removal and replacement of existing culverts would require stream bank widening and cause temporary increases in sediment that is disturbed in the channel substrate. Construction of the energy dissipation area would require regrading of the stream bank. Temporary sedimentation would occur downstream during construction and installation of project elements. The City of Bixby would be required to prepare a SWPPP and obtain an NPDES permit prior to construction. Implementation of appropriate BMPs, as described in the SWPPP and required for the NPDES permit, would help minimize site runoff.

The proposed project was originally authorized under Nationwide Permit (NWP) 14. On January 30, 2012, a letter was sent to the USACE, noting that two project elements have been added since the original project was submitted to the USACE for review: creating a 0.11-acre energy dissipation basin and removing stream restoration previously proposed outside of the sewer line right-of-way. Neither of these modifications causes the proposed project to be ineligible for NWP 14, which applies to linear transportation crossings of wetlands or WOUS and expires on March 18, 2012. The work to construct projects authorized by NWP 14 must be completed or under contract by that date or the project may not proceed until the NWP is reissued by the USACE. As of March 12, 2012, the City of Bixby is under contract to commence work on the project (Cottle, pers. comm.); therefore, the project is authorized under the current NWP 14. Prior to the start of work, the City will provide preconstruction notification to the USACE as required under NWP 14 and will comply with all applicable permit conditions. The City must

also maintain documentation of compliance with the NWP and any exemption from requirements; otherwise, an individual permit must be obtained from USACE prior to construction. Appendix C contains correspondence regarding USACE permitting.

4.2.4 Floodplains

EO 11988 (Floodplain Management) requires Federal agencies to avoid direct or indirect support of development within the 100-year floodplain whenever there is a practicable alternative. FEMA uses Flood Insurance Rate Maps (FIRMs) to identify the regulatory 100-year floodplain for the National Flood Insurance Program. Consistent with EO 11988, FIRMs were examined during the preparation of this EA. The project area is within Zone AE of the 100-year floodplains (FEMA 1989, Map Panels 40143C0369K and 40143C0432K, revised August 3, 2009). EO 11988 also requires an eight-step planning process for projects that may result in potential impacts on floodplains to identify alternatives and/or mitigation measures to minimize impacts. A letter requesting project review was sent to the OWRB on January 18, 2012. In a response dated January 31, 2012, OWRB stated that the local floodplain administrator should be contacted (Appendix C). A letter requesting project review was sent to the Bixby Floodplain Administrator on February 6, 2012, who responded on the same date noting full support of the project (Appendix C).

No Action Alternative – Under the No Action Alternative, no construction would occur and the floodplain would continue to be adversely affected by the inadequate conveyance of flood flows; roadways are being overtopped and there is insufficient area available to dissipate the flood waters quickly.

Proposed Action Alternative – Under the Proposed Action Alternative, no adverse impacts on the floodplain would occur. Construction of the detention facility would provide long-term beneficial impacts because it would store floodwaters and allow them to dissipate more slowly. The project would reduce the risk of flooding for the project area. Project activities including demolishing pre-FIRM structures and raising roadways would take place inside the 100-year floodplain. The City would follow all applicable local floodplain ordinances and FEMA requirements as stated in 44 CFR 60.3. An engineering analysis estimating impacts would be prepared, and a no-rise certification Letter of Map Revision would be prepared. Excess fill removed during culvert replacement and stream bank restoration activities would be used to raise the roadway above the Base Flood Elevation. The Proposed Action Alternative would not encourage development within the floodplain, but would remove two existing structures from the floodplain. In accordance with EO 11988, FEMA's Eight-Step Planning Process for Floodplains was completed to identify, minimize, and mitigate floodplain impacts (Appendix D).

The City of Bixby must coordinate with the local floodplain administrator and obtain required permits prior to initiating work. All coordination pertaining to these activities and applicant compliance with any conditions should be documented and copies forwarded to the state and FEMA for inclusion in the permanent project files.

The City of Bixby must prepare and provide Public Notice issued 15 days prior to the start of construction of any final decision where proposed floodplain or wetland project is the only practicable alternative.

4.3 BIOLOGICAL RESOURCES

The Endangered Species Act (ESA) of 1973 provides a program for the conservation of threatened and endangered plants and animals and their habitats. Section 7 of the ESA requires Federal agencies, in consultation with the USFWS and/or National Marine Fisheries Service, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The ESA also prohibits any action that causes an unauthorized "taking" of any listed species of endangered fish or wildlife.

The USFWS lists the following federally threatened and endangered (T&E) species for Tulsa County through the Information, Planning and Conservation System (IPaC):

Common Name	Scientific Name	Federal Status
Piping Plover	*Charadrius melodus*	T
Least Tern	*Sterna antillarum*	E
Whooping Crane	*Grus americana*	E
American Burying Beetle	*Nicrophorus americanus*	E
Source: USFWS 2011b; T = Threatened, E = Endangered		

Both the Piping Plover and the Least Tern use sparsely vegetated sandy beach areas along major rivers and coastal watersheds. The Whooping Crane requires freshwater wetlands, and coastal brackish wetlands in the winter months. The American burying beetle typically is found in tall grass prairies, woodlands, and forests. No habitat for these species exists within the project area.

According to the USFWS Migratory Bird Program (USFWS 2011c), the State of Oklahoma is within the Central Flyway, where lands may provide resting, feeding, and breeding grounds for migratory birds, especially flocking species. The project area is urbanized and has little potential to provide habitat for migratory birds.

According to the Oklahoma Department of Wildlife Conservation, no state-listed species occur in Tulsa County (ODWC 2012).

No Action Alternative – Under the No Action Alternative, there would be no impacts on biological resources, including Federal and State protected species.

Proposed Action Alternative – Under the Proposed Action Alternative, ground disturbance would occur during the construction of the detention basin and energy dissipation area, and during stream bank restoration. Approximately 2 acres of vegetation (lawns, landscape plantings, and scattered trees) would be removed during construction of the detention basin and energy dissipation areas. Upon completion of construction activities the area would be revegetated utilizing a native seed mix.

Letters requesting project review were sent to both USFWS and ODWC on January 18, 2012. As requested by USFWS, URS submitted information to the USFWS online project review system, which yielded a determination of "no effect" on any listed species due to lack of suitable habitat within the project area. USFWS responded on March 13, 2012, that no concurrence is needed for

the determination of "no effect" (Appendix C). No response from ODWC has been received to date. Because no state-protected species are listed in Tulsa County and more than 30 days have elapsed since the request for project review, it can be assumed that ODWC has no concerns with the project.

FEMA has determined that the proposed project will have no effect on threatened and endangered species or migratory birds.

4.4 CULTURAL RESOURCES

The National Historic Preservation Act (NHPA) of 1966, (PL 89-665; 16 USC 470 et seq.) as amended, outlines Federal policy to protect historic properties and promote historic preservation in cooperation with States, Tribal Governments, local governments, and other consulting parties. The NHPA established the National Register of Historic Places (NRHP) and designated the State Historic Preservation Office (SHPO) as the entity responsible for administering State-level programs. The NHPA also created the Advisory Council on Historic Preservation, the Federal agency responsible for overseeing Section 106 of the NHPA process and its implementing regulations (36 CFR 800) and providing commentary on Federal activities, programs, and policies that affect historic properties.

Section 106 of the NHPA outlines the procedures for Federal agencies to follow to take into account the effect of their actions on historic properties. The Section 106 process applies to a Federal undertaking that has the potential to affect historic properties, defined in the NHPA as those properties (archaeological sites, standing structures, or other historic resources) that are listed in or eligible for listing in the NRHP. Although buildings and archaeological sites are most readily recognizable as historic properties, a diverse range of resources are listed in the NRHP, including roads, landscapes, and vehicles. Under Section 106, Federal agencies are responsible for identifying historic properties within the Area of Potential Effects (APE) for an undertaking, assessing the effects of the undertaking on those historic properties, if present, and considering ways to avoid, minimize, and mitigate any adverse effects of its undertaking on historic properties; it is the primary regulatory framework that is used in the NEPA process to determine impacts on cultural resources. The APE is the geographic area within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist.

A URS Architectural Historian and a URS Archaeologist, both qualified under the Secretary of the Interior's Professional Qualification Standards (36 CFR Part 61) in the disciplines of history/architectural history and archaeology, respectively, conducted a desktop assessment of the project's potential to affect historic properties within the APE.

The above ground APE includes the project area encompassing the locations of all the proposed work to account for direct effects, and an approximate 200-foot buffer around the project area to assess indirect effects (Appendix A). The project area is a built-out 1970s-era, medium-density suburban development characterized by many two-story residences, scattered mature trees, and curvilinear roads; all of which combine to create viewsheds of limited distance. The archaeological APE is defined as the area of anticipated ground disturbance, including areas where utilities would be relocated.

The desktop analysis of the project area revealed that no above ground historic properties are apparent within the APE and the project site is not located within or near a NRHP-listed

property. The NRHP Focus database includes no listings for Bixby, Oklahoma. The Oklahoma Historical Society's (SHPO) listing of architectural surveys in the state does not include an architectural survey of Bixby and the SHPO does not list Bixby as one of Oklahoma's Certified Local Governments. There is no indication of a local historic district or historic landmark program on the City's website, and there are no listings for Historic American Buildings Survey or Historic American Engineering Record properties in Bixby. The residential buildings located at 11270 90th East Avenue and 11310 91st East Avenue were constructed in 1970 and are not NRHP-eligible.

FEMA has determined that no historic properties are present within the aboveground APE.

Based on the desktop review of the project area, there appears to be a low potential for archaeological historic properties to occur in the archaeological APE. The project area exhibits a high level of previous disturbance and an archaeological field inspection is not considered necessary for this project. FEMA has determined there is a low potential for the presence of archaeological historic properties in the project's archaeological APE.

In January 2012, FEMA initiated Section 106 consultation with the SHPO, the Oklahoma Archaeological Society (OAS), the Muscogee Creek Nation, and the Osage Nation with letters dated January 17, 2012, describing the proposed project and seeking each consulting party's response to its determination of effect (Appendix C).

No Action Alternative – Under the No Action Alternative, no construction would occur and no historic properties would be affected.

Proposed Action Alternative – Under the Proposed Action Alternative, no impacts on archeological or cultural resources are anticipated. FEMA has made a determination of 'No Historic Properties Affected.' In a letter dated March 2, 2012, the SHPO concurred with FEMA's determination (Appendix C). In a response letter dated January 24, 2012, the OAS stated that no archaeological sites are listed for the project area and no archaeological materials are likely to be encountered. The OAS specified that an archaeological field inspection would not be necessary. In the event that archeological deposits, including any Native American pottery, stone tools, bones, or human remains, are uncovered, the project shall be halted and the City of Bixby shall stop all work immediately in the vicinity of the discovery and take all reasonable measures to avoid or minimize harm to the finds. All archeological findings will be secured by the City of Bixby, and access to the sensitive area will be restricted by the City of Bixby. The applicant will inform FEMA immediately, and FEMA will consult with the OAS and SHPO. Work in sensitive areas shall not resume until consultation is completed and until FEMA determines that the appropriate measures have been taken to ensure complete project compliance with the NHPA and its implementing regulations. Neither of the Tribes responded within the 30-day review period; therefore, their concurrence with FEMA's determination is assumed.

4.5 SOCIOECONOMIC RESOURCES

4.5.1 Socioeconomics

The City of Bixby is located in northeastern Oklahoma in Tulsa County, just south of the City of Tulsa. According to the U.S. Census Bureau (USCB) American Fact Finder, the total population of Bixby in 2010 was estimated to be 20,884 persons (USCB 2010).

According to the Bixby Fire Chief, the Bixby Fire Department responds to an average of 10 calls in the project area each year. The estimated cost per run is $2,213.60, equating to a total estimated cost of $110,680 over the past 5 years (Appendix C). In addition, when fire department and road crews are forced to close roadways in the project area due to flooding, commuters and local businesses are adversely affected. Commuters are forced to detour, costing them time and money while delaying their arrival times to work; therefore, local businesses have fewer customers.

No Action Alternative – Under the No Action Alternative, minor adverse impacts on socioeconomic resources would continue to occur. The City would continue to spend an estimated $2,213.60 per run, 10 times a year, for flood-related emergency response calls in the project area. Commuters and local businesses would continue to incur costs and lose revenue due to flooding in the project area.

Proposed Action Alternative – Under the Proposed Action Alternative, impacts on socioeconomic resources would be minor. Temporary jobs may be created during the construction period. Long-term beneficial impacts would occur because personnel and equipment costs associated with emergency response calls from flooding would decrease and main roads would be kept open, allowing access to local businesses.

4.5.2 Environmental Justice

EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) mandates that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Socioeconomic and demographic data for the project area were reviewed to determine if a disproportionate number of minority or low-income persons have the potential to be adversely affected by the proposed project.

	City of Bixby	Tulsa County	State of Oklahoma
Total Population (2010)	19,519	585,419	3,610,073
Annual median household income	$68,742	$45,264	$41,861
% Households below poverty level	2.7	14.8	16.4
% Minority population	10.6	25.5	24.6
% Hispanic (may be of any race)	4.8	9.5	7.5
% of population over 65	11.5	12.0	13.3
Source: USCB 2010, 2011			

Minorities represented 10.6 percent, 25.5 percent, and 24.6 percent, respectively, of the City of Bixby, Tulsa County, and the State of Oklahoma populations. The following table shows the specific racial composition of the City of Bixby, Tulsa County, and the State of Oklahoma. The City of Bixby has a higher median household income and a lower percentage of low-income

populations than Tulsa County and the State of Oklahoma. The dominant ethnicity for the City of Bixby is white (89.4 percent of the population).

Ethnicity	City of Bixby	Tulsa County	State of Oklahoma
% White	89.4	74.5	75.4
% Hispanic or Latino	4.8	9.5	7.5
% Black or African American	0.7	10.6	7.3
% American Indian or Native Alaskan	2.5	4.0	6.6
% Asian	2.4	1.9	1.6
% Native Hawaiian or Other Pacific Islander	—	0.1	0.1
Source: USCB 2009, 2011; Note: "—" represents zero or rounds to zero			

No Action Alternative – Under the No Action Alternative, no action would be taken to alleviate flooding problems in the project area. There would be no disproportionate impacts on minority or low-income populations; all populations would continue to be adversely affected by flooding.

Proposed Action Alternative – Under the Proposed Action Alternative, no disproportionate impacts on minority or low-income populations would occur. All residents and travelers using the project roads would benefit from fewer road closures due to flooding.

4.6 HAZARDOUS MATERIALS

Hazardous substances are defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes that pose a substantial present or potential hazard to human health and the environment. Hazardous substances are primarily generated by industries, hospitals, research facilities, and the government. Improper management and disposal of hazardous substances can lead to pollution of groundwater or other drinking water supplies, and the contamination of surface water and soil. The primary Federal regulations for the management and disposal of hazardous substances are the Comprehensive Environmental Response, Compensation and Liability Act and the Resource Conservation and Recovery Act.

The EPA Enviromapper was reviewed and showed no known sources of hazardous materials in or adjacent to the project area (EPA 2011b).

No Action Alternative – Under the No Action Alternative, no construction would occur and there would be no impacts on hazardous materials or waste.

Proposed Action Alternative – Under the Proposed Action Alternative, no hazardous materials or waste impacts are anticipated to be encountered within the project area. If contaminated materials are discovered during the construction activities, the work must cease until the appropriate procedures can be implemented and permits obtained. The City of Bixby shall handle, manage, and dispose of petroleum products, hazardous materials, and toxic waste in accordance to the requirements and to the satisfaction of the governing local, state, and federal agencies.

4.7 NOISE

Noise is generally defined as unwanted sound. Sound is most commonly measured in decibels on the A-weighted scale (dBA), which is the scale most similar to the range of sounds that the human ear can hear. The Day-Night Average Sound Level (DNL) is an average measure of sound. The DNL descriptor is accepted by Federal agencies as a standard for estimating sound impacts and establishing guidelines for compatible land uses. EPA guidelines, and those of many other Federal agencies, state that outdoor sound levels in excess of 55 dBA DNL are "normally unacceptable" for noise-sensitive land uses such as residences, schools, or hospitals. The project area is primarily a residential neighborhood with typical noises coming from vehicles, dogs, and human voices.

No Action Alternative – Under the No Action Alternative, no construction would occur and there would be no changes to noise levels in the project area.

Proposed Action Alternative – Under the Proposed Action Alternative, short-term minor increases in noise levels are anticipated, primarily from the operation of heavy equipment during demolition and construction. To mitigate these temporary noise impacts, construction activities would take place during normal business hours and equipment and machinery used at the proposed project site would meet all local, State, and Federal noise regulations.

4.8 TRANSPORTATION

There are three roadways within the project area: 90th East Avenue, 89th East Avenue and East 113th Street. These streets provide access to arterial streets for residents and commuters in the project area.

No Action Alternative – Under the No Action Alternative, the existing flooding and closure of roadways in the project area during heavy rains would continue, resulting in long-term adverse impacts on transportation.

Proposed Action Alternative – Under the Proposed Action Alternative, impacts on transportation would be minor. A short-term increase in construction traffic on roadways in and adjacent to the project area would result in slower traffic flow during construction activities. Temporary road closures are also anticipated during construction for roadway elevation and replacement of culverts. Safety BMPs such as appropriate signage and placement of barriers would be implemented prior to construction activities to alert pedestrians and motorists of ongoing activities.

4.9 PUBLIC HEALTH AND SAFETY

EO 13045 (Protection of Children) requires Federal agencies to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. Safety and security issues considered in this EA include the health and safety of area residents and the public at-large, and the protection of personnel involved in the activities related to the proposed construction of the project. The project area consists of residential dwellings and their associated private lots with interspersed clusters of trees. There is no publicly available space and activities are restricted to private residential uses.

No Action Alternative – Under the No Action Alternative, no construction would occur. Dangerous flooding of residences and roadways would continue to occur during heavy rain

events. Flooding poses risks to motorists (potential entrapment in flood waters), residents (flooding of homes and limiting access), and emergency responders.

Proposed Action Alternative – Under the Proposed Action Alternative, construction activities could present safety risks to those performing the activities and to the general public, including children living in adjacent residences. Risks could occur if residents wander onto the construction site and gain access to operating machinery or onsite materials. To minimize risks to local residents and the public, appropriate safety BMPs such as signage and barriers would be placed around the project area to prohibit public access to the construction/demolition area. All construction activities would be performed by qualified personnel trained in the proper use of the appropriate equipment, including all appropriate safety precautions. All activities would be conducted in a safe manner in accordance with the standards specified in the Occupational Safety and Health Administration (OSHA) regulations. The construction contractor would be responsible for adhering to the Oklahoma One-Call Law.

4.10 SUMMARY

The following table summarizes the potential impacts of the Proposed Action Alternative and conditions or mitigation measures to offset those impacts.

Affected Environment	Impacts	Mitigation
Geology and Soils	No impacts on geology are anticipated. Minor, short-term impacts on soils would occur during site preparation and construction. Long-term, minor impacts on approximately 1.71 acres of soils would occur from creation of the proposed detention facility and energy dissipation area. No impacts on prime farmlands would occur.	The City of Bixby would prepare a SWPPP and obtain an NPDES permit prior to construction. Implementation of appropriate erosion and sediment control BMPs would be required during construction. Excavated soil, waste materials, and debris will be managed and disposed of in accordance with applicable local, state, and federal regulations in an approved manner and location. If contaminated materials are discovered during the construction activities, the work must cease until the appropriate procedures can be implemented and permits obtained. The City of Bixby shall handle, manage, and dispose of petroleum products, hazardous materials, and toxic waste in accordance to the requirements and to the satisfaction of the governing local, state, and federal agencies.

Affected Environment	Impacts	Mitigation
Air Quality	Minor, short-term impacts on air quality would occur during the construction period.	Construction contractors would be required to implement dust control BMPs such as watering down construction areas when necessary. Fuel-burning equipment running times would be kept to a minimum and engines would be properly maintained.
Surface Water	Minor, short-term impacts on offsite surface waters may occur due to transport of sediment from disturbed soils by stormwater runoff during construction.	The City would prepare a SWPPP and obtain an NPDES permit prior to construction. Appropriate BMPs, such as installing silt fences and revegetating bare soils would be implemented.
Groundwater	No impacts on groundwater are anticipated.	None.
Waters of the U.S. including Wetlands	Minor, short-term impacts on offsite surface waters and wetlands may occur due to transport of sediment from disturbed soils by stormwater runoff during construction.	Appropriate BMPs would be implemented to minimize soil erosion and reduce sediment transport to offsite surface waters and wetland areas. NWP #14 applies to this project for culvert improvements at roadway crossings of the tributary to Fry Creek. The City of Bixby will provide preconstruction notification to the USACE as required under the NWP. The City of Bixby must maintain documentation of compliance with the NWP, exemption from requirements, or obtain individual permits from USACE prior to construction. The City of Bixby must comply with all applicable permit conditions.

Affected Environment	Impacts	Mitigation
Floodplains	No adverse impacts on floodplains are anticipated. Construction of the detention facility would provide long-term beneficial impacts by storing floodwaters and allowing them to dissipate more slowly.	FEMA's Eight-Step Planning Process for Floodplains was completed to identify, minimize, and mitigate floodplain impacts (Appendix D). The City of Bixby must coordinate with the local floodplain administrator and obtain required permits prior to initiating work. All coordination pertaining to these activities and applicant compliance with any conditions should be documented and copies forwarded to the state and FEMA for inclusion in the permanent project files.
Biological Resources	Approximately 2 acres of vegetation (lawns, landscape plantings, and scattered trees) would be removed for construction of the detention basin and energy dissipation areas. Upon completion of construction activities the area would be revegetated utilizing a native seed mix. No impacts on federally or state protected species are anticipated.	None.
Cultural Resources	No impacts on cultural resources are anticipated.	In the event that archeological deposits, including any Native American pottery, stone tools, bones, or human remains, are uncovered, the project shall be halted and the City of Bixby shall stop all work immediately in the vicinity of the discovery and take all reasonable measures to avoid or minimize harm to the finds. All archeological findings will be secured by the City of Bixby, and access to the sensitive area will be restricted by the City of Bixby. The applicant will inform FEMA immediately, and FEMA will consult with the OAS and SHPO. Work in sensitive areas shall not resume until consultation is completed and until FEMA determines that the appropriate measures have been taken to ensure complete project compliance with the NHPA and its implementing regulations.

Affected Environment	Impacts	Mitigation
Socioeconomics	Minor socioeconomic impacts are anticipated. Temporary jobs may be created during the construction period. Long-term beneficial impacts would occur because personnel and equipment costs associated with emergency response calls from flooding would decrease and main roads would be kept open, allowing access to local businesses.	None.
Environmental Justice	No disproportionately high or adverse effect on minority or low-income populations is anticipated. All populations would benefit from the proposed project.	None.
Hazardous Materials	No hazardous materials or waste impacts are anticipated.	If contaminated materials are discovered during the construction activities, the work must cease until the appropriate procedures can be implemented and permits obtained. The City of Bixby shall handle, manage, and dispose of petroleum products, hazardous materials, and toxic waste in accordance to the requirements and to the satisfaction of the governing local, state, and federal agencies.
Noise	Short-term impacts on noise levels would occur in the project area during the construction period.	Construction would take place during normal business hours and equipment would meet all local, State, and Federal noise regulations.
Transportation	Short-term, minor increases in the volume of construction traffic and temporary road closures would result in slower traffic flow during construction activities.	Appropriate signage and barriers would be in place prior to construction activities to alert pedestrians and motorists of project activities.
Public Health and Safety	Minor, short-term safety risks would occur during construction for those performing the activities and the general public, including children living in adjacent residences.	Appropriate signage and barriers would be placed around the project area to prohibit public access to the project area. All construction activities would be performed by qualified personnel and in accordance with OSHA regulations. The construction contractor would be responsible for adhering to the Oklahoma One-Call Law.

SECTION FIVE CUMULATIVE IMPACTS

According to CEQ regulations, cumulative impacts represent the “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).” In accordance with NEPA and to the extent reasonable and practical, this EA considered the combined effect of the Proposed Action Alternative and other actions occurring or proposed in the vicinity of the project area.

Other local construction projects and the proposed project may have a cumulative temporary impact on local air quality by increasing criteria pollutants during construction activities and on water quality from sedimentation during construction. No other cumulative effects are anticipated.

SECTION SIX PUBLIC INVOLVEMENT

FEMA is the lead Federal agency for conducting the NEPA compliance process for the proposed 90th East Avenue Drainage Project. It is the goal of the lead agency to expedite the preparation and review of NEPA documents and to be responsive to the needs of the community and the purpose and need of the proposed action while meeting the intent of NEPA and complying with all NEPA provisions.

The City of Bixby will notify the public of the availability of the draft EA through publication of a public notice in the local newspaper of record. The draft EA will be made available for public review at a physical location in the project area and on FEMA's web site (www.fema.gov). FEMA will conduct a 30-day public comment period commencing on the initial date of publication of the public notice. FEMA will consider and respond to all public comments in the Final EA. If no substantive comments are received, the Draft EA will become final and a FONSI will be issued for the project.

SECTION SEVEN AGENCY COORDINATION

As part of the development of this EA, the following Federal and State resource protection agencies were contacted. Responses received to date are included in Appendix C.

- U.S. Fish and Wildlife Service, Division of Ecological Services Field Office
- U.S. Department of Agriculture, Natural Resources Conservation Service
- Regulatory Office, Department of the Army Corps of Engineers
- Oklahoma Department of Transportation
- Oklahoma SHPO
- Oklahoma THPO, Muscogee Creek Nation
- Oklahoma THPO, Osage Nation
- Oklahoma Archeological Survey
- Oklahoma Department of Wildlife Conservation
- Oklahoma Department of Environmental Quality
- Oklahoma Water Resources Board
- National Flood Insurance Program – State Coordinator
- City of Bixby Floodplain Administrator

In accordance with applicable local, State, and Federal regulations, the City of Bixby would be responsible for acquiring any necessary permits prior to commencing construction at the project area.

SECTION EIGHT REFERENCES

Cottle, Jared, P.E. 2012. Bixby City Engineer. Personal communication with Brad Burford of URS. March 14.

Federal Emergency Management Agency (FEMA). 1989. *Flood Insurance Rate Map, Tulsa County, Oklahoma and Incorporated Areas. Community Panel Numbers 40143C0369K and 40143C0432K*. http://www.msc.fema.gov. Revised August 3, 2009. Accessed December 19, 2011.

Oklahoma Department of Wildlife Conservation (ODWC). 2012. http://www.wildlifedepartment.com/wildlifemgmt/endangered/State_Listed_by_County.pdf. Accessed March 12, 2012.

Oklahoma Water Resources Board (OWRB). 2011. Groundwater Level Monitoring Page. http://www.owrb.ok.gov/wd/search/display_graph.php?well_ids=32929. Last modified December 13, 2011. Accessed December 28, 2011.

U.S. Census Bureau (USCB). 2010. 2010 American Community Survey: Oklahoma. http://factfinder2.census.gov. Accessed December 19, 2011.

USCB. 2011. *American FactFinder. 2010 Census Demographic Profiles Data, Bixby City, Tulsa County, and State of Oklahoma.* http://2010.census.gov/2010census/popmap/. Last modified May 26, 2011. Accessed December 19, 2011.

U.S. Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS). 2009. *Web Soil Survey*. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Last Modified April 12, 2011. Accessed December 29, 2011.

USDA/NRCS. 2011. *Farmland Protection Policy Act*. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/FarmlandProtectionPolicyAct. Accessed December, 2011.

U.S. Environmental Protection Agency (EPA). 2011a. The Green Book Nonattainment Areas for Criteria Pollutants. http://www.epa.gov/oar/oaqps/greenbk/index.html.. Last Modified August 30, 2011. Accessed January 6, 2012.

EPA. 2011b. *EnviroMapper for Envirofacts.* http://www.epa.gov/emefdata/em4ef.html?ve=12,35.94322967529297,-95.88529205322265&pText=Bixby,OK. Accessed January 6, 2012.

U.S. Fish and Wildlife Service (USFWS). 2011a. *National Wetland Inventory*. http://www.fws.gov/wetlands/Data/Mapper.html. Last modified October 6, 2011. Accessed January 6, 2012.

USFWS. 2011b. *U.S. Fish and Wildlife Service, IPaC mapping system.* http://ecos.fws.gov/ipac/wizard/trustResourceList!prepare.action. Last Modified September 31, 2012. Accessed January 31, 2012.

USFWS. 2011c. *U.S. Fish and Wildlife Service, Migratory Bird Program.* http://www.fws.gov/migratorybirds/ Flyways.html. Last modified May 20, 2011. Accessed January 6, 2012.

U.S. Geological Survey (USGS). 2011. National Map Viewer. http://viewer.nationalmap.gov/viewer/. Last modified November 7, 2011. Accessed December 2011.

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Appendix A
Figures

Appendix B
Photograph Log

Appendix C
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Appendix D

Eight-Step Planning Process for Floodplains and Wetlands