U.S. Department of the Interior

Bureau of Land Management

October 2018

Evans McCurtain Coal Lease By Application

Environmental Assessment (DRAFT)

DOI-BLM-NM-0040-2018-0046-EA

Applicant: Evans Coal Company

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CHAPTER 1. INTRODUCTION

1.1. Introduction and Background

The Bureau of Land Management's (BLM) Oklahoma Field Office (OFO) is considering a proposal to hold a competitive lease sale for federal segregated coal reserves underlying private surface in Eastern Oklahoma. Evans Coal Company (Evans) submitted a Lease by Application (LBA) (lease number OKNM 127509) on October 20, 2011, for federal coal reserves in Haskell and Le Flore Counties, Oklahoma. The LBA tract is approximately 1,270 acres in total extent and contains a preliminary estimate of approximately 3.28 million tons of recoverable bituminous coal. The tract would be mined using underground mining (room and pillar) methods, possibly including pillar removal (retreat) mining. Map 1 (located in Appendix A; hereafter maps are referenced without referring to the appendix in which they are located) shows the tract in relation to area landmarks.

1.2. Purpose and Need

The purpose of the BLM action is to respond to the LBA submitted by Evans for up to 1,270 acres of federal segregated coal in Haskell and LeFlore counties, Oklahoma. The need for the BLM action is established by the Mineral Leasing Act of 1920 (MLA), as amended, and the Federal Land Policy and Management Act of 1976 (FLPMA). These statutes recognize that public lands shall be managed in a manner that makes them available for development of coal and other natural resources.

1.3. Decision to be Made

The BLM will decide whether to hold a competitive lease sale for the federal coal reserves within the tract, either in whole (as under Alternative B) or in part (as under Alternative C) , and if leased, under what terms, conditions, and stipulations.

1.4. Plan Conformance

The proposed LBA is in conformance with the 1994 Oklahoma Resource Management Plan (RMP) as amended (BLM 1994). The 2014 RMP Amendment (RMPA) (BLM 2014) designates this area as available for further consideration for coal leasing.

1.5. Relationship to Statutes and Regulations

The proposed LBA and associated mining activities would be processed in accordance with all applicable laws, regulations, and orders including but not limited to:

- Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Act Amendments of 1976
- Surface Mining Control and Reclamation Act of 1977 (SMCRA)
- Applicable coal leasing regulations found at 43 CFR 3400
- FLPMA of 1976 (BLM's multiple-use mandate)
- Energy Policy Act of 2005

BLM regulates coal mining operations primarily to ensure that maximum economic recovery of the coal resource is achieved (43 CFR 3480), while maintaining compliance with other applicable laws and regulations. Awarding a federal coal lease is the first step toward mining a federal coal resource. SMCRA established a nationwide system to regulate surface coal mining operations and surface effects of underground coal mining operations. Under this system, states can elect to establish their own coal regulatory program provided it meets the minimum standards set by SMCRA and is approved by the Office of Surface Mining Reclamation and Enforcement (OSMRE).

Under Section 503 of SMCRA, Oklahoma Department of Mines (ODM) developed a permanent program authorizing ODM to regulate coal mining operations on non-federal lands in the State of Oklahoma (30 CFR 936, Oklahoma Program). The term federal lands as defined in SMCRA means any land, including mineral interests, owned by the United States. The Secretary of the Interior approved Oklahoma's program in April 1982. In January 1986, by Section 523(c) of SMCRA, the Governor of Oklahoma entered into a cooperative agreement with the Secretary of the Interior authorizing ODM to regulate coal mining operations on federal lands in the State of Oklahoma.

A federal coal lease holder in Oklahoma must submit a Permit Application Package (PAP) to ODM for any proposed coal mining and reclamation operations on federal lands in Oklahoma. The proposed mining of the LBA tract would extract federal coal below privately owned surface lands. ODM reviews the PAP to ensure that it complies with permitting requirements and that the proposed coal mining operation meets the performance standards of the approved State of Oklahoma program. OSMRE, BLM, and other federal agencies, as appropriate, review the PAP (provided to them by ODM) to ensure it complies with the terms of the coal lease (which are based on the disclosures in this NEPA analysis and on previous resource management planning processes), the MLA, and other federal laws and their attendant regulations (30 CFR 944.30). If the PAP does comply, ODM issues the applicant a permit to conduct coal mining operations.

A final step is required before the permittee can begin mining coal. OSMRE prepares a mining plan decision document which the DOI Assistant Secretary for Land and Minerals Management uses to decide whether to approve, approve with conditions, or disapprove the MLA mining plan. OSMRE's recommendation contained in the mining plan decision document must be based, at a minimum, on the following:

- the PAP, including the Resource Recovery and Protection Plan (R2P2)
- information prepared in compliance with NEPA
- documentation assuring compliance with the applicable requirements of other federal laws, regulations, and executive orders
- comments and recommendations or concurrence of other federal agencies, as applicable, and the public
- the findings and recommendations of the BLM with respect to the R2P2 and other requirements of the lease and the MLA
- the findings and recommendations of ODM with respect to the PAP and the state program
- the findings and recommendations of OSMRE with respect to the requirements under Chapter VII Subchapter D, 30 CFR 746.13 (a–g)

LBA tracts are nominated for leasing by companies with an interest in acquiring a lease; however, the LBA process is, by law and regulation, an open, public, competitive sealed-bid process. If the LBA tract is offered for lease, the applicant for that tract (Evans) may or may not be the highest bidder when the lease sale is held and, therefore, may not be the successful bidder. Furthermore, if a decision is made to hold a competitive lease sale and a lease is issued, the lessee must obtain mine plan approval and a permit to conduct coal mining operations, before mining can begin on the tract. As discussed above, the PAP would undergo detailed review by state and federal agencies as part of the approval process. The detailed PAP of any successful bidder, the applicant or otherwise, would be required to conform to the stipulations and conditions attached to the lease through the land use plan and decision record that would follow the NEPA process. The conceptual plans for development described in this EA (Chapter 2) are not final plans but represent reasonably foreseeable development and standard industry operating procedure for use in analyzing the potential environmental consequences of issuing a lease for the tract.

ODM enforces the performance standards and permit requirements for reclamation during a mine's operation and has primary authority in environmental emergencies (e.g., accidental spills). OSMRE

retains oversight responsibility for this enforcement. The Mine Safety and Health Administration (MSHA) monitors and regulates all safety factors related to coal mining.

Although BLM makes the decision on whether or not to lease the LBA tract, ODM has the authority to approve or reject mining plans for coal mines. Thus, even if the tract is leased, the lessee would still need an ODM-approved mine plan before mining could begin. Additionally, MSHA requires the applicant to submit ventilation and ground control plans for approval before any mining could begin. These plans could necessitate changes in the overall mine plan. BLM's role is to ensure that maximum economic recovery is achieved within the requirements of ODM for resources such as water, wildlife, etc. and also within MSHA's safety requirements. BLM also has a responsibility to ensure that the United States receives fair market value for the leasing of the coal.

Finally, the major land use planning decision that the BLM must make concerning federal coal resources in the LBA tract is a determination of which federal coal lands are acceptable for further consideration for leasing. There are four screening procedures that the BLM uses to identify these coal lands. These screening procedures require the BLM to do the following:

1. estimate development potential of the coal lands;
2. apply the unsuitability criteria listed in 43 CFR 3461;
3. make multiple land use decisions that may eliminate federal coal deposits from consideration for leasing to protect other resource values; and
4. consult with surface owners who meet the criteria outlined in 43 CFR 3400.0-5(gg)(1) and (2).

Screens 1, 2, and 3 were completed at the land use planning level and documented in the 2014 RMPA DR and EA (BLM 2013; BLM 2014). The fourth screen, consultation with qualified surface owners, has been completed by OFO as part of the current RMP revision process. In accordance with 43 CFR 3420(4)(i), a total of approximately 16,200 letters were sent to all surface owners overlying federal segregated coal reserves within the RMP Planning Area (which includes the LBA tract and consists of Oklahoma, Kansas, and Texas) soliciting their preference for or against mining by other than underground mining techniques. In addition, qualified surface owner consent would be required for areas proposed for surface disturbance incidental to underground mining. Finally, in the event of a lease sale, qualified surface owner status would be verified by the BLM before the tract is offered for leasing.

1.6. Scope of Analysis

The scope of analysis described in this Environmental Assessment (EA) is based on the issues discussed in Section 1.8.3, Table 1-1. The scope of analysis focuses on the LBA tract and areas of surface disturbance associated with preparation of coal, waste disposal, and mine infrastructure (Map 2). It is anticipated that coal produced from the tract would be hauled to Port of Keota located on Kerr Reservoir for transportation to the end user. As a result, the Port of Keota and the reasonably foreseeable transportation route to it are also included in the scope of analysis (Map 3) on an issue-specific basis. From Kerr Reservoir, coal would be transported via barge to the confluence with the Mississippi River. Past this point, coal mined from the tract could be transported in one or more of several directions depending on coal market economics and available end users at the time of sale of mined coal. The coal contained within the tract is metallurgical grade bituminous coal and is anticipated for use in steel making. The market for metallurgical coal is international in nature and it is anticipated that coal mined from the tract could be marketed and sold across the globe including within the U.S. A summary of coal haulage and possible end users is provided in Section 2.2.4. The scope of analysis does not include coal haulage past the Port of Keota or the end use of the coal other than as it relates to Issue 1 (see Table 1-1). In the analysis of Issue 1, coal haulage to the end user based on assumed routes and end use of the coal are included despite the fact that the ultimate end user is unknown at this time. Coal haulage past the Port of Keota and end use of the coal are not included in the scope of analysis of the other issues. This is the case for the following reasons:

- the end user for coal mined from the tract has not been determined or even narrowed down to a small number of possible end users;
- because the end user is unknown it is not possible to identify specific reasonably foreseeable routes for delivery of coal mined from the tract to the end user; and
- transportation routes via river and open ocean are heavily used for transportation of numerous commodities (including coal) in the international marketplace, and the coal mined from this tract would make up less than 1% of total U.S. exports of metallurgical coal alone (e.g., excluding other commodities also exported from the U.S. and transported using similar transportation routes) (see Section 3.10 for additional discussion of the degree to which coal mined from the LBA tract would contribute to U.S. exports of metallurgical grade coal).

As a result of the items enumerated above, detailed analysis of potential issues past the Port of Keota would be largely speculative and not relevant to a reasoned choice between alternatives.

1.7. Consultation and Coordination

1.7.1. Cooperating Agency Involvement

The OSMRE and ODM are cooperating agencies in this LBA NEPA process because both agencies have special expertise and jurisdiction by law in coal mining and associated environmental effects (see Section 1.5).

1.7.2. Tribal Consultation and Section 106 Consultation under the National Historic Preservation Act

Tribal consultation for the BLM is guided by a variety of laws, Executive Orders and Memoranda, as well as case law. The OFO is committed to, has conducted and will continue to conduct Tribal consultation and NEPA scoping during the Evans McCurtain LBA process. This consultation and scoping is carried out at the government-to-government level. Tribal consultation is a separate process from public scoping, due to the unique relationship between the U.S. Government and federally recognized Tribes. The primary method of Tribal consultation is by letter..

The BLM OFO initiated Tribal consultation by letter on March 14, May 22, and May 23, 2018, and NEPA scoping on May 24, 2018, to the Tribal Leaders of the following Tribes:

- Caddo Nation
- Cherokee Nation
- Chickasaw Nation
- Choctaw Nation
- Kialegee Tribal Town
- Kiowa Nation
- Muscogee (Creek)
- Osage Nation
- Quapaw Tribe of Oklahoma
- Thlopthlocco Tribal Town
- Wichita and Affiliated Tribes

Although all Tribes listed were contacted, not all were available or expressed an interest in consulting.

The OFO carbon copied the Tribal consultation letters dated March 14, May 22, and May 23, 2018 to the appropriate Tribal Historic Preservation Offices of these tribes in order to notify them of the proposed LBA tract. In addition, the OFO has and continues to consult with these Tribal Historic Preservation Offices under NHPA. In a letter dated, May 30, 2018, the Tribes were invited to consult under Sections 101(d)(6) (54 U.S.C. 302706) and 106 of the National Historic Preservation Act (54 U.S.C. 308108) for the LBA tract. The letter provided information about the proposed LBA tract, the Section 106 process, and provided an opportunity to express concerns or issues with the proposed LBA tract under NHPA and the American Indian Religious Freedom Act. Consultation will continue as the Section 106 process under NHPA continues. The BLM will not make a final decision until the consultation process has concluded.

1.7.3. Consulting with State Historic Preservation under NHPA

The BLM initiated consultation with the Oklahoma State Historic Preservation Office (SHPO) and Oklahoma Archeological Survey (OAS) on May 30, 2018. The letter provided information about the proposed LBA tract, the Section 106 process, and provided an opportunity to express concerns or issues with the proposed LBA tract under NHPA. Consultation will continue as the Section 106 process under NHPA continues. The BLM will not make a final decision until the consultation process has concluded.

1.7.4. Section 7 Consultation under the Endangered Species Act

Consultation with the U.S. Fish and Wildlife Service (USFWS) under provisions of Section 7(a)(2) of the Endangered Species Act was completed on September 5, 2018. The OFO completed a Biological Evaluation based on an official species list provided by the USFWS's Oklahoma Ecological Services Field Office. The Biological Evaluation determined that there would be "no effect" on any federally listed species or designated critical habitat as a result of the leasing action; therefore, further consultation is not required at this time (BLM 2018). However, in the event of a lease sale, OSMRE (and ODM) may engage in additional (separate) consultation with USFWS. That consultation process would be related to coal mine permitting under SMCRA and ODM regulations and would be governed by the Biological Opinion and Conference Report issued by USFWS in 1996 (USFWS 1996).

1.8. Scoping and Issues

1.8.1. Internal Scoping

An interdisciplinary team, consisting of BLM, OSMRE, and ODM personnel, formulated issues associated with the Proposed Action during web meetings held on April 17, May 30, and June 7, 2018 as well as during a workshop held at the OFO the week of June 11-15, 2018. Additional issue identification occurred through public scoping and tribal consultation.

1.8.2. External Scoping / Public Involvement

A public scoping period began on May 28, 2018, and finished on June 12, 2018. The BLM published public notice on the BLM's national NEPA Register and in the following newspapers: *McAlester News-Capital*, *Poteau Daily News*, and *The Tulsa World*. In addition, the BLM sent a public scoping letter to 91 entities (comprised of individuals, organizations, businesses, and government agencies) with information about the Proposed Action and a request for comments within the 15-day public scoping period.

1.8.3. Issues

The issues for detailed analysis identified during scoping are summarized in Table 1-1. Impact indicators are used, in Chapter 3, to describe the affected environment for each issue and to assess the impacts for each issue as a result of the alternatives.

Table 1-1. Issues Identified for Detailed

ISSUE #	ISSUE	IMPACT INDICATOR
Issue 1	How would coal mining operations on the LBA tract and coal haulage via truck to the Port of Keota affect greenhouse gas emissions? How would coal haulage via barge from the Port of Keota and via bulk cargo ship to the end user and end-user combustion of coal affect greenhouse gas emissions?	Emissions of metric tons of CO_2 equivalents (CO_2 e)
Issue 2	How would coal mining operations on the LBA tract and coal haulage via truck to the Port of Keota affect particulate matter (PM_{10}—dust) emissions and subsequently air quality in Haskell and LeFlore counties?	Emissions of PM_{10}

Table 1-1. Issues Identified for Detailed

ISSUE #	ISSUE	IMPACT INDICATOR
Issue 3	What are the surface effects from underground mining of the LBA tract using room and pillar mining methods, possibly including pillar removal (retreat) mining?	Acres subject to potential surface effects from underground mining; Magnitude of surface effects in feet
Issue 4	How would leasing and mining the LBA tract affect surface water resources, particularly the quantity and quality of water flowing into, stored within, and discharged from Club Lake?	Acres subject to potential surface effects from underground mining; Magnitude of surface effects in feet
Issue 5	How would leasing and mining the LBA tract affect the availability and quality of local groundwater, particularly as it relates to water wells serving dwellings associated with Club Lake?	Acres subject to potential surface effects from underground mining; Magnitude of surface effects in feet
Issue 6	What economic impacts would leasing and mining the LBA tract have on the population of Haskell and LeFlore counties, Oklahoma?	Employment and wages, Dollars
Issue 7	What impacts would leasing and mining the LBA tract have on property values and associated quality of life concerns on and in the vicinity of the LBA tract and in Haskell County?	Qualitative evaluation of other resource issue effects as they relate to this issue
Issue 8	What affect would leasing and mining the LBA tract have on the production of bituminous coal within Oklahoma and on the availability of bituminous coal in the international market place?	Tons of coal

Issues evaluated and not discussed in further detail in this EA are described in Table 1-2.

Table 1-2. Issues not Included in Further Detail in the EA.

ISSUE #	ISSUE
	RATIONALE FOR NOT FURTHER DISCUSSING IN DETAIL IN THE EA*
ELM-1	**Would leasing and mining the LBA tract disproportionately and adversely affect minority, Tribal, or low-income populations, as defined in EO 12898?**
	Following guidance from the Council on Environmental Quality (CEQ) for environmental justice concerns (CEQ 1997), the most recent available demographic data were examined to determine if environmental justice populations of concern are present in the area of analysis. Initial examination of demographic data from the Headwaters Economics-Economic Profile System (EPS 2018) shows that there are no environmental justice populations of concern in the area of analysis (Haskell and LeFlore Counties, Oklahoma). Since there are no populations of concern present in the area of analysis, this issue has been dismissed from detailed analysis.
ELM-2	**How would leasing and mining the LBA tract affect visual resources on the tract?**
	According to the Oklahoma RMP (BLM 1994) the McCurtain Coal area is designated as Visual Resource Management (VRM) Class IV. VRM Class IV allows for "the level of change to the characteristic landscape (to) be high. These management activities may dominate the view and be the major focus of viewer attention." Leasing and mining the LBA tract would be in compliance with the VRM direction in the 1994 RMP. Potential changes to the viewshed would be largely associated with Club Lake and the adjacent properties which are privately owned. Any impacts to the viewshed may affect property values and quality of life for private land owners (see Section 3.9).
ELM-3	**How would leasing and mining the LBA tract affect recreation resources in the area?**
	No federal, state, or local designated recreation areas are located within the tract or along the reasonably foreseeable transportation corridor. The LBA tract is located on private surface and is closed to public access and dispersed recreation activities. Club Lake is the primary recreation amenity in the area. Potential impacts to Club Lake are discussed in detail in Sections 3.5, 3.6, 3.7, and 3.9.
ELM-4	**How would coal haulage from the surface facilities located on the LBA tract to the Port of Keota affect the Level of Service (LOS) on the reasonably foreseeable transportation corridor?**

Table 1-2. Issues not Included in Further Detail in the EA.

ISSUE #	ISSUE RATIONALE FOR NOT FURTHER DISCUSSING IN DETAIL IN THE EA*
	The reasonably foreseeable transportation corridor for coal haulage from the LBA tract to the Port of Keota includes State Highway 26 and State Highway 9. Data from the Oklahoma Department of Transportation (ODOT 2018) in 2017 indicate that average annual daily traffic (AADT) in 2017 was between approximately 830 and 3,600 on these roadways. Coal haulage is anticipated to generate approximately 30 to 60 truck round trips per day on these roadways. This represents a 2%-4% increase in AADT on these roadways and is not expected to change the LOS on these roadways. In addition, use of these roadways for coal haulage is a permitted activity. As a result of these factors detailed analysis of this issue is not provided.
ELM-5	**How would coal haulage and coal transfer at the coal loadout at Port of Keota affect water quality in Kerr Reservoir?**
	The Port of Keota is a commercial port located on the McClellan-Kerr Arkansas River Navigation System (MKARNS). Port facilities and commercial use of the MKARNS are permitted by the U.S. Army Corps of Engineers (USACE). Continuation of permitted actions (coal transfer and coal haulage using the MKARNS) need not be analyzed in detailed because decisions allowing such uses have previously been made. In addition, the tonnage of coal (200,000-400,000 tons/year) estimated to be transported using the entire MKARNS under the action alternatives is less than 2%-4% of the total tonnage of 2014 waterborne commerce using the entire MKARNS and less than 4%-7% of Oklahoma's total tonnage of 2014 waterborne commerce using the MKARNS (ODOT 2015).
ELM-6	**How would leasing and mining the LBA tract affect cultural resources associated with surface facilities as well as cultural resources in areas subject to surface effects from underground mining using room and pillar mining methods, possibly including pillar removal (retreat) mining?**
	Any cultural resource that is identified and recorded within the potential area of disturbance or LBA tract would be recorded and evaluated for the National Register of Historic Places. If any cultural resource is considered an Historic Property, and mining activities following the lease of the LBA tract would cause an Adverse Effect (as defined under NHPA) to the site, those adverse effects would be mitigated as a result of OSMRE permitting of mining activities. Currently, Section 106 of the NHPA (54 U.S.C. 306108) efforts are concentrated on the LBA submitted by Evans. If the LBA tract is leased, detailed mine plans would be submitted to the OSMRE and ODM for approval. Those plans would be reviewed again under Section 106 of the NHPA (54 U.S.C. 306108) to determine if additional surveys or consultation are required. This would be considered a separate Section 106 of the NHPA (54 U.S.C. 306108) review.
ELM-7	**How would leasing and mining the LBA tract affect Native American traditional cultural and religious concerns associated with surface facilities as well as areas subject to surface effects from the reasonably foreseeable underground mining activities?**
	Native American tribes with an interest in the area are currently being consulted regarding the presence of and potential effects to traditional cultural and religious concerns (see Section 1.7). Currently, no Native American traditional cultural and religious concerns have been identified as a result of the consultation process. However, this consultation is considered ongoing. If issues arise during this process, the BLM may need to analyze them in detail. If the LBA tract is leased, detailed mine plans would be submitted to the OSMRE and ODM for approval. Those plans would be reviewed again under Section 106 of the NHPA (54 U.S.C. 306108) to determine if additional surveys or consultation are required. This would be considered a separate Section 106 of the NHPA (54 U.S.C. 306108) review.
ELM-8	**How would leasing and mining the LBA tract affect soil resources on the tract, particularly regarding soil productivity?**
	Soil productivity related effects are not expected from leasing and mining the tract primarily because coal would be recovered via underground mining methods and surface disturbance for surface facilities would be sited in previously disturbed areas. In addition, O.A.C. 460:20-45-7 specifies topsoil and subsoil management to maintain soil productivity and other soil characteristics.
ELM-9	**How would leasing and mining the LBA tract, including construction of surface facilities, affect vegetation and the spread of non-native or invasive plants and noxious weeds?**

Table 1-2. Issues not Included in Further Detail in the EA.

ISSUE #	ISSUE
	RATIONALE FOR NOT FURTHER DISCUSSING IN DETAIL IN THE EA*
	The Oklahoma Natural Heritage Inventory (OHNI) has no occurrences of rare plant species or ecological systems of importance within the LBA tract in their database (pers. comm. with Todd Fagin, OHNI; OBS Ref. 2018-351-FED-BLM). The area proposed for surface facilities accounts for 6 % (78 acres) of the LBA tract. Pursuant to O.A.C. 460:20-31-6, a reclamation plan must be submitted with the permit application. A plan for revegetation must be included that follows the requirements listed in O.A.C. 460:20-45-43, and meets the requirements of state and federal seed, poisonous and noxious plant, and introduced species laws and regulations. In addition, compliance with the Oklahoma Noxious Weed Law and Rules (O.A.C. 35:30-34) is required. As a result of the aforementioned factors, analysis of this issue in detail is not necessary to make a reasoned choice between alternatives.
ELM-10	**What impacts would leasing and mining the LBA tract have on paleontological resources anticipated to be present in the geological formations containing the target coal seam within the tract?**
	The LBA tract is within the McAlester, Hartshorne, Atoka, and Savanna Formations comprising mostly shale, sandstone, and coal. These formations are assigned Potential Fossil Yield Classification (PFYC) ratings of 2 or 3. These areas are generally sedimentary geologic units where fossil content varies in scientific significance, abundance, and predictable occurrence (BLM 2016). These particular formations, extending over an area approximately 660,400 acres in eastern Oklahoma, contain predominantly common marine invertebrate fossils. Under the Proposed Action, coal and rock material potentially containing fossils would be removed from the tract on up to 1,270 acres (0.2 % of the extent of the formations). Potential effects to fossil resources in the area anticipated for surface facilities are not a concern because this area has already been disturbed from previous surface mining activity in the area. Further, measures described in Section 2.2.5 would result in data recovery of any paleontological resources of scientific interest removed from the tract during mining activities. Due to these design features, the formations' PFYC classifications, and the limited area of mining activity relative to the area of the formations and the types of fossils that may be found in these formations, this issue is not carried forward for further analysis.
ELM-11	**How would leasing and mining the LBA tract affect floodplains associated with surface water features on the tract?**
	The Federal Emergency Management Agency (FEMA) has not mapped or designated 100-year floodplains in Haskell County, Oklahoma. As a result there are no FEMA data on the presence or absence of 100-year floodplains on the portion of the tract that falls within Haskell County. FEMA has mapped and designated 100-year floodplains in LeFlore County, including the portion of the tract that falls within LeFlore County. FEMA mapping indicates that the portion of the tract that falls within LeFlore County does not contain mapped, designated 100-year floodplains. In addition, by extrapolation the portion of the tract that falls within Haskell County that is contiguous with LeFlore County is not anticipated to contain 100-year floodplains for the following reasons: 1) limited water courses expected to support 100-year floodplains on this portion of the tract, and 2) the fact that no mapped, designated 100-year floodplains occur in the portion of LeFlore County adjacent to the portion of the tract that falls within Haskell County.
ELM-12	**What are the impacts to federally-listed species from construction of surface facilities and mining operations associated with leasing and mining the LBA tract?**
	Based on the species list received from the USFWS IPaC website on June 11, 2018, there are eight species that could occur within or adjacent to the LBA tract. Of those species, the least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), scaleshell mussel (*Leptodea leptodon*), and winged mapleleaf (*Quadrula fragosa*) do not have suitable habitat within the area that would be impacted by operations associated with leasing and mining the LBA tract (BLM 2018). American burying beetle (*Nicrophorus americanus*) may be present within the LBA tract. Surface disturbing activities on 78 acres could potentially impact individuals, however, CLS-4 (see Table 2-1) would be attached to the lease and prohibits any surface disturbing activities that would result in unacceptable impacts on the species and requires coordination/consultation with USFWS at the permitting stage. Suitable summer roosting habitat for Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) also exists within the area anticipated for surface disturbance. The nearest recorded summer location of Indiana bat in recent years has been in eastern Sequoya County, over 30 miles from the tract (personal communication with USFWS Tulsa Ecological Services Field Office). The nearest hibernaculum is over 30 miles from the LBA tract. Impacts to Indiana bat as a result of implementing the Surface Mining Control and Reclamation Act, including the leasing and mining of coal were addressed in the 1996 Biological Opinion and Conference Report issued by USFWS to OSMRE (USFWS 1996). Under the requirements of the incidental take statement, USFWS in coordination with OSMRE developed a Protection and Enhancement Plan for the Indiana bat (USFWS et al, 2009) that provides a process to ensure coal-mining related activities do not result in unacceptable impacts on the species. USFWS determined that implementation of these measures would also satisfy Section 7 Consultation for coal-mining related actions of other federal agencies (USFWS et al, 2009). These regulatory mechanisms ensure that there would

Table 1-2. Issues not Included in Further Detail in the EA.

ISSUE #	ISSUE RATIONALE FOR NOT FURTHER DISCUSSING IN DETAIL IN THE EA*
	be no significant impacts to Indiana bats from leasing and mining the LBA tract. Impacts to northern long-eared bats that are incidental to otherwise lawful activities were analyzed in the Programmatic Biological Opinion for the northern long-eared bat 4(d) rule (USFWS 2016). Federal agencies may rely on the BO to fulfill their project-specific section 7(a)(2) responsibilities under the framework specified in the BO. Based on this framework, leasing and mining the LBA tract would not result in prohibited incidental take of northern long-eared bat. Based on this information, the Biological Evaluation for the Evans McCurtain Coal Lease by Application determined that leasing and mining the LBA tract would have "no effect" on any federally listed species. Additional detailed analysis of this issue is unnecessary to make a reasoned choice between alternatives.
ELM-13	**How would leasing and mining the LBA tract, including construction and operation of surface facilities and coal haulage via truck from the tract to the Port of Keota, affect migratory birds?**
	The LBA tract is within the North American Bird Conservation Initiative (NABCI) Bird Conservation Region (BCR) 25 (West Gulf Coastal Plain/Ouachitas). There are 28 migratory bird species of conservation concern listed for BCR 25 (USFWS 2008). The USGS's Breeding Bird Survey Route nearest the LBA tract is the Pocola Route which has documented 105 breeding bird species (USGS 2018), 14 of which are listed as birds of conservation concern for BCR 25. Out of the 14 birds of conservation concern, six species have potential breeding habitat in the area proposed for surface facilities. Those species are: American kestrel (*Falco sparverius*), chuck-will's-widow (*Antrostomus carolinensis*), loggerhead shrike (*Lanius ludovicianus*), Bewick's wren (*Thryomanes bewickii*), painted bunting (*Passerina ciris*), and orchard oriole (*Icterus spurius*). Migratory bird design features described in Table 2-1 would be attached to the lease and require protections for nesting migratory birds. Additionally, Kerr Reservoir contains potential bald eagle nesting habitat. Truck and barge activity is already present in the area. Due to design feature requirements described in Table 2-1 and existing activity at the port area additional detailed analysis associated with this issue is not necessary to make a reasoned choice between alternatives.
ELM-14	**What impacts would leasing and mining the LBA tract have on general wildlife?**
	Leasing and mining the LBA tract would result in the removal or modification of approximately 78 acres (6% of the tract) of potential wildlife habitat for surface facilities associated with underground mining. This area has been previously disturbed by surface mining activities though substantial revegetation has occurred. As a result, the area provides some habitat benefits for wildlife. Construction activities would increase the risk of mortality to less mobile species (e.g., turtles, small rodents, and snakes) however, more mobile species would move away from the area during construction and mining. Coal haulage outside of the surface facilities area would occur on established roads where wildlife is accustomed to vehicle traffic. Further, O.A.C. 460:20-45-35 provides protections for wildlife. As a result of these factors, additional, detailed analysis is not necessary to make a reasoned choice between alternatives.
ELM-15	**How would leasing and mining the LBA tract affect National Wetlands Inventory (NWI) mapped wetlands present on the tract?**
	There are approximately 85 acres of NWI mapped wetlands present on the LBA tract. Only 12 acres occur in areas where surface facilities are anticipated. These 12 acres are the site of an old strip pit that has filled with water. A jurisdictional determination on the part of the USACE would occur at the time of mine permitting in the event that the tract is leased. Further, CLS-3 and O.A.C. 460:20-45-35(f) require measures to avoid disturbance to, enhance where practicable, restore, or replace wetlands and riparian vegetation. As a result of these circumstances detailed analysis of this issue is not provided.
ELM-16	**How would leasing and mining the LBA tract affect coal bed methane (CBM) and oil and gas development on and in the immediate vicinity of the tract?**
	Conflicts between CBM development and coal mining can exist because CBM is vented as part of the mining process (for both surface and underground mining). There are several CBM wells in the area that could be affected by mining the LBA tract. These wells would most likely lose their gas pressures due to the ventilation system of the mine and would be rendered unusable. Additionally, according to MSHA regulations at 30 CFR 75.1700, the mine would be required to maintain a 150 foot radius from the well bore of unplugged and active wells extending into and through the coal seam. This issue is not carried forward for detailed analysis because the state and federal rules and regulations do not prohibit mining and well drilling activities to take place simultaneously.

* Supporting documentation for these statements is included in the administrative record.

CHAPTER 2. ALTERNATIVES

2.1. Alternative A – No Action

Under the No Action Alternative, the LBA tract would not be offered for competitive leasing and the federal coal resources within the tract would not be mined. If the BLM chooses the No Action Alternative another LBA could be submitted for the tract in the future at which time it may be necessary for the BLM to complete a separate NEPA process. A choice of No Action would not affect mining activities or plans on an adjacent federal coal lease to the west (OKNM 108097) nor would it affect mining activities or plans related to private coal to the north (Map 4).

2.2. Alternative B – Proposed Action Alternative

Under the Proposed Action Alternative, the BLM would hold a competitive lease sale for the LBA tract, subject to standard and special lease stipulations developed for the tract. Under the Proposed Action approximately 3.28 million tons of recoverable coal would be leased. A decision to lease the tract would not provide the successful bidder with the authorization to engage in mining activities. However, mining is a logical extension of leasing the federal coal reserves in the tract. As a result, reasonably foreseeable mine operations are described below. The description of reasonably foreseeable mine operations are based on the applicant's (Evans) conceptual plans and standard industry operating procedures. If a bidder other than Evans successfully acquires the lease this successful bidder's plans may differ from the reasonably foreseeable plans provided below. Likewise, if Evans acquires the lease their detailed mine plans may differ from the conceptual plans described below. In either situation, additional NEPA analysis may be required to address substantive differences (if any) between these conceptual mine plans and the detailed mine plans that would be provided for permitting. The relationship between leasing by application and permitting is summarized in Section 1.5.

2.2.1. Location and Overview

The LBA tract encompasses approximately 1,270 privately owned surface acres one mile northeast of McCurtain, Oklahoma (Map 1). A legal description of the tract is provided in Appendix B. There are 33 surface owners including Evans, which owns approximately 136 acres (10.7%) of the 1,270 surface acres making up the tract. The tract contains an estimated 3.28 million tons of federally owned recoverable coal reserves.

2.2.2. Reasonably Foreseeable Mine Operations

Evans proposes to develop a portal site to access the coal reserves in an unmined plug of an outcrop of the coal seam in the southeast portion of the tract. The plug is located at the bottom of an old strip pit that is now a pond. The plug is approximately 400 feet wide and would be entered by three to five large lined entries driven down dip to the main body of the coal reserves behind old highwalls left from previous surface mining activities in the area. Approximately 30 acre-feet of water would be required annually for dust suppression underground, coal washing, and dust suppression at the surface facilities. A portion of the aforementioned old strip pit would be reshaped to the east to supply this water. Disposal of mining and processing waste and other surface facilities would be in and surrounding the un-reclaimed pits both east and west of the portal site on property owned by Evans (Map 2). A total of approximately 78 acres of disturbance would be required for surface facilities.

Coal would be mined using continuous miner units. All coal production would be processed through a preparation plant located at the surface facilities owned by Evans. The approximate location of the preparation plant is provided in Map 2.

As coal is extracted from the mining face by the continuous miner, it is placed on shuttle cars which then travel back to the belt feeder to be placed onto the conveyor belts for transport out of the mine. When the

limit is reached for the continuous miner, it is moved to another area for mining. Roof bolters go into the area previously occupied by the miner to provide ceiling support for the area. Whereas Evans does not propose pillar recovery (retreat mining), it is a standard industry operating procedure in mines in Oklahoma and elsewhere. Subsequently, pillar recovery is considered a viable option for coal extraction from this tract. When retreating, some pillars would be removed on a case-by-case basis according to the mine's approved ground control plan. Planned subsidence may occur in accordance with approved plans. Mine workings would be ventilated through the mine portals using high horsepower fans.

Following mining, some coal reserves would be left intact within the LBA tract. This would be determined by the mine plan, approved ground control plan, and on a case-by-case basis depending on any challenges encountered during the mining process. Possible reasons to leave intact coal reserves include the following: 1) presence of adverse ground conditions, such as faulting or bad roof conditions; 2) need for retention of the coal to provide support for "bleeder" entries (entries surrounding an area being mined or which has been mined out and needs to be supported to allow continued ventilation); 3) need for barrier pillars to protect mains and sub-mains from ground pressures resulting from mining; and 4) MSHA safety requirements.

2.2.3. Annual Production, Estimated Employment Requirements, Operating Hours, and Life of Mine on the LBA Tract

Evans estimates the tonnage produced to range from 200,000 to 400,000 per year depending on coal market conditions. Based on annual production estimates the life of mining on the LBA tract under the Proposed Action is anticipated to be approximately eight to 16 years. Operating hours are anticipated to be 10 to 20 hours per day (one to two 10-hour shifts per day), five days per week. However, it is possible that operating hours could extend up to 24 hours per day, seven days per week depending on coal market conditions. At maximum production (approximately 400,000 tons per year), approximately 81 workers would be required to conduct mining operations. At the lower end of production (approximately 200,000 tons per year) approximately 43 workers would be required to conduct mining operations.

2.2.4. Reasonably Foreseeable Coal Haulage and Possible End Users

From the preparation plant located on surface owned by Evans, coal would be transported by 25-ton truck to a barge facility at Port of Keota on Kerr Reservoir. Approximately 30 to 60 truck round trips per day between the preparation plant and the barge facility would be required to meet the estimated annual production rate of 200,000 to 400,000 tons per year. The reasonably foreseeable transportation route from the surface facilities to Port of Keota is as follows (and depicted in Map 3):

- south on County Road 1264 to County Road E1270,
- west on County Road E1270 to N45 Road,
- south on N45 Road to E1275 Road,
- west on E1275 Road to State Highway 26,
- north on State Highway 26 to State Highway 9,
- west on State Highway 9 to N4520 Road,
- north on N4520 Road to the Port of Keota on Kerr Reservoir.

Evans owns a port just south of the Port of Keota. From Kerr Reservoir, coal would be transported via barge to the confluence with the Mississippi River. Past this point, coal mined from the tract could be transported in one or more of several directions depending on coal market economics and available end users at the time of sale of mined coal. The coal contained within the tract is metallurgical grade bituminous coal, and is anticipated for use in steel making. According to the Energy Information Administration (EIA) (EIA 2017) metallurgical coal accounted for more than half (57%) of total U.S. coal exports in 2017. In 2017 Brazil, Japan, Ukraine, Canada, India, and South Korea were the top six countries for importing metallurgical coal from the U.S. These countries accounted for more than half of

all metallurgical exports in 2017. In addition, U.S.-based steel making facilities occur in several locations in the 48 contiguous states, with the largest concentration east of the Mississippi River. The market for metallurgical coal is international in nature, and it is anticipated that coal mined from the tract could be marketed and sold across the globe including within the U.S. The scope of the coal haulage related analysis is further explained in Section 1.6.

2.2.5. Regulatory Compliance, Coal Lease Stipulations, and Design Features

There are certain permits, approvals, and regulatory compliance, mitigation, and monitoring measures that would be required under the Proposed Action. These are related to 1) compliance with existing state and federal rules and regulations with respect to coal mining and 2) coal lease stipulations.

ODM regulations require coal mines to collect extensive baseline information and to implement extensive monitoring programs and mitigation measures. Monitoring programs and mitigation measures that are required by regulation are considered to be part of the Proposed Action. If BLM issues a lease, an approved PAP for mining operations on the tract would be required before mining operations could be conducted. The major mitigation and monitoring measures that are required by state or federal regulation are listed in Table 2-1. These measures would be implemented and they have been incorporated into the analysis. In addition, the BLM made Coal Lease Stipulation (CLS) decisions through previous resource management planning processes (BLM 1994, BLM 2014). These CLSs would be applied in the lease contract following issuance of the Decision Record (DR). The CLSs identified in Table 2-1 have likewise been incorporated into the analysis. Design features are environmental protection measures, actions, or practices that may be applied to the Proposed Action in addition to existing regulatory requirements and CLSs. One design feature is included in Table 2-1.

Table 2-1. Regulatory Compliance, Coal Lease Stipulations, and Design Features

AIR RESOURCES	
Federal and state requirements	• Implement an air pollution control plan in accordance with O.A.C. 460:20-31-19. • Implement a plan for fugitive dust control in accordance with O.A.C. 460:20-45-34. • Implement steps to ensure compliance with the Clean Air Act in accordance with O.A.C. 460:20-27-10(b)(9) and 20-31-6(b)(9).
CLSs	• None
COAL RESOURCES	
Federal and state requirements	• Achieve maximum economic recovery of the coal in the tract in accordance with 43 CFR 3480. • Achieve maximum utilization and conservation of the coal in accordance with O.A.C. 460:20-45-17(a).
CLSs	• None
CULTURAL RESOURCES	
Federal and state requirements	• Compliance with the requirements of the National Historic Preservation Act of 1966, as amended. • Describe and identify the nature of cultural historic and archaeological resources listed or eligible for listing on the National Register of Historic Places as part of the permit application process in accordance with O.A.C. 460:20-29-5.

Table 2-1. Regulatory Compliance, Coal Lease Stipulations, and Design Features

CLSs	• CLS-5 – Cultural Resources: Before undertaking any activities that may disturb the surface of the leased lands, the lessee shall conduct a cultural resource intensive field inventory in a manner specific by the Authorized Officer of the BLM or of the surface-managing agency, if different, on portions of the mine-plan area and adjacent areas, or exploration area, that may be adversely affected by lease-related activities and that were not previously inventoried at such a level of intensity. The inventory shall be conducted by a qualified professional cultural resource specialist (i.e., archaeologist, historian, historical architect, as appropriate) approved by the Authorized Officer of the surface-managing agency (BLM, if the surface is privately owned), and a report of the inventory and recommendations for protecting any cultural resources identified shall be submitted to the Assistant Director of the Midcontinent Region of the OSMRE, the Authorized Officer of the BLM, if activities are associated with coal exploration outside an approved mining permit area (hereinafter called Authorized Officer), and the Authorized Officer of the surface-managing agency, if different. The lessee shall undertake measures, in accordance with instructions from the Assistant Director or Authorized Officer, to protect cultural resources on the leased lands. The lessee shall not commence the surface-disturbing until permission to proceed is given by the Assistant Director or Authorized Officer. The lessee shall protect all cultural resource properties within the lease area from lease-related activities until cultural resource mitigation measures can be implemented as part of the approved mining and reclamation or exploration plan. The cost of conducting the inventory, preparing reports, and carrying out mitigation measures shall be borne by the lessee. If cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the Assistant Director or Authorized Officer, or the Authorized Officer of the surface-managing agency, if the Assistant Director is not available. The lessee shall not disturb such resources except as may be subsequently authorized by the Assistant Director or Authorized Officer. Within two working days of notification, the Assistant Director or Authorized Officer will evaluate or have evaluated any cultural resources discovered and will determine if any action may be required to protect or preserve such discoveries. The cost of data recovery for cultural resources discovered during lease operations shall be borne by the surface-managing agency unless otherwise specified by the Authorized Officer of the BLM or of the surface-managing agency, if different. All cultural resources shall remain under the jurisdiction of the United States until ownership is determined under applicable law.
HAZARDOUS AND SOLID WASTE AND COAL MINE WASTE	
Federal and state requirements	• Management and disposal of hazardous and solid wastes in accordance with O.A.C. 460:20-45-33. • Management and disposal of coal mine waste in accordance with O.A.C. 460:20-45-29 through 32.
CLSs	• None
NOISE	
Federal and state requirements	• Implement measures to avoid and reduce adverse noise impacts from blasting in accordance with O.A.C. 460:20-45-20(c).
CLSs	• None.
PALEONTOLOGICAL RESOURCES	
Federal and state requirements	• Compliance with the Paleontological Resources Preservation Act of 2009. • Suspend all activities in the vicinity of paleontological resources discovered as a result of mining operations under the lease until notified by the BLM Authorized Officer. Protect such resources from damage or looting.
CLSs	• None.
SOCIOECONOMIC RESOURCES	
Federal and state requirements	• The successful bidder shall pay royalties to the federal government at a rate of 12.5%. • Allowance for room and pillar mining under occupied buildings, structures, roads, bridges, and wells, subject to surface owner consent for subsidence in accordance with O.A.C. 460:20-45-47(a)(2).
CLSs	• CLS-2 – Dwellings: The coal lessee will consult with the owners of occupied dwellings and maintain or, with the owner's written consent, adjust the designated 300-foot buffer zone.
SOIL RESOURCES	
Federal and state requirements	• Management of topsoil and subsoil in accordance with O.A.C. 460:20-45-7.
CLSs	• None.
THREATENED AND ENDANGERED SPECIES	
Federal and state requirements	• Provide for protections for endangered and threatened species in accordance with O.A.C. 460:20-45-35. • Compliance with the requirements of the Endangered Species Act of 1973.

Table 2-1. Regulatory Compliance, Coal Lease Stipulations, and Design Features

CLSs	• CLS-4 – American Burying Beetle Protection: The lessee will not conduct surface-disturbing lease activities that will result in unacceptable impacts on the American burying beetle, a federally listed endangered species. The lessee may be required to arrange for a qualified biologist to conduct field surveys, which could result in beetle removal and transplant efforts. Such transplant efforts must be accomplished no more than one year before surface-disturbing activities are to begin. Survey requirements, transplant efforts, and ESA coordination/consultation will be cooperatively accomplished with the USFWS. This stipulation would be attached to federal coal leases that occur in Bryan, Cherokee, Haskell, Latimer, LeFlore, Muskogee, Pittsburg, Sequoya, and Tulsa counties.
VEGETATION RESOURCES	
Federal and state requirements	• Achieve revegetation according to the approved postmining land use and in accordance with O.A.C. 460:20-45-43 through 46. • Prevent and reduce the risk of introduction and spread of noxious weeds in accordance with the Oklahoma Noxious Weed Law and Rules, O.A.C. 35:30-34.
CLSs	• None.
WATER RESOURCES	
Federal and state requirements	• Implement steps in compliance with the Clean Water Act in accordance with O.A.C. 460:20-27-10(b)(9) and 20-31-6(b)(9). • Implement measures related to hydrological balance in compliance with O.A.C. 460:20-45-8 through 16. • Prohibition on mining under and within 50 feet of the dam that forms Club Lake (Oklahoma Water Resources Board, Chapter 25, Dams and Reservoirs, O.A.C. 785:25-3-9). • Allowance for mining under Club Lake outside of the dam and within 50 feet of the dam subject to MHSA regulations (30 CFR 75.1716-1 through 4, 30 CFR 75.1717) requiring that MSHA be notified prior to such mining possibly resulting in additional requirements imposed by MSHA. • Prohibition on subsidence under bodies of water with a total volume greater than 20 acre-feet (Club Lake contains approximately 250 acre-feet of water) consistent with O.A.C. 460:20-43-47(d)(3) and 20-45-47(d)(3). • Allowance for room and pillar mining under occupied buildings, structures, roads, bridges, and wells, subject to surface owner consent for subsidence in accordance with O.A.C. 460:20-45-47(a)(2). • Development and implementation of a subsidence control plan in accordance with O.A.C. 460:20-43-47.
CLSs	• None.
WETLANDS	
Federal and state requirements	• Compliance with Executive Order 11990 – Protection of Wetlands of May 24, 1977. • Avoid disturbances to, enhance where practicable, restore, or replace, wetlands and riparian vegetation along rivers and streams and bordering ponds and lakes in accordance with O.A.C. 460:20-45-35(f).
CLSs	• CLS-3 – Wetland Protection: All or portions of the lands under this lease contain wetland and/or riparian areas. The lessee will not conduct surface disturbing activities on these areas without the specific waiver, in writing, of the Authorized Officer after consulting with ODM, OSMRE, and U.S. Army Corps of Engineers (USACE). Impacts or disturbance to wetlands and riparian habitats that occur on the lease, must be avoided, minimized, or compensated. The mitigation goal will be no net loss of in-kind habitats. The mitigation shall be developed in cooperation with appropriate state and federal agencies. The wetland/riparian stipulation is mandated by Executive Order 11990 – Protection of Wetlands of May 24, 1977.
WILDLIFE	
Federal and state requirements	• Provide for protections for fish and wildlife, including bald and golden eagles, in accordance with O.A.C. 460:20-45-35.
CLS	• None
Design feature	• To meet the BLM's responsibilities to protect migratory bird habitat per the Migratory Bird Treaty Act (MBTA) of 1918 if surface disturbing activities occur during the period of March 1 and July 30, surveys for ground and tree nesting birds will be conducted by an entity approved by the Field Office. If active nests are encountered surface disturbing activities will be delayed until the nesting activities are complete. Concurrence by the USFWS Oklahoma Ecological Services Office will be required for compliance.

2.3. Alternative C – Reduced Tract Acreage

Under Alternative C, the BLM would hold a competitive lease sale for a 940-acre LBA tract (Map 5), subject to standard and special lease stipulations developed for the tract (a legal description of the tract

under this alternative is provided in Appendix B). Consistent with the purpose and need described in Section 1.2, the intent of Alternative C is to resolve in whole or in part issues associated with potential effects to Club Lake and to dwellings on the margin of Club Lake. These issues (Issues 3, 4, 5, and 7) are enumerated in Table 1-1 and analyzed in Sections 3.5, 3.6, 3.7, and 3.9.

Reasonably foreseeable mine operations, annual production, operating hours, estimated employment requirements, coal haulage and possible end users, and regulatory compliance, CLSs, and design features would be the same as under the Proposed Action (except where they are not applicable because of the configuration of the tract under Alternative C). Because the tract acreage is reduced under Alternative C the total available recoverable coal is also reduced. Under Alternative C, approximately 2.59 million tons of recoverable coal would be leased. Based on anticipated annual production of 200,000 to 400,000 tons of coal this equates to an estimated mine life of approximately six to 12 years.

2.4. Summary Comparison of Alternatives

Table 2-2 provides a summary comparison of the alternatives considered in detail in the analysis. This table is presented to give a concise summary of the alternatives in a comparative form.

Table 2-2. Summary comparison of alternatives.

	ALTERNATIVE A: NO ACTION	ALTERNATIVE B: PROPOSED ACTION	ALTERNATIVE C: REDUCED TRACT ACREAGE
Approximate Tract Acreage	1,270	1,270	940
Recoverable Coal Reserves (Short Tons)	0	3,276,000	2,592,000
Projected Annual Coal Production (Short Tons)	0	200,000-400,000	200,000-400,000
Projected Mining Methods	N/A	Room and pillar, possibly to include pillar removal (retreat) mining	Room and pillar, possibly to include pillar removal (retreat) mining
Projected Life of Mining on LBA Tract (Years)	0	8-16	6-12
Projected Disturbance for Surface Facilities (e.g., preparation plant, mine waste disposal, etc.) (acres)	0	78	78
Projected Annual Water Use for Dust Suppression and Wash Plant (acre-feet)	0	30	30
Normal Operating Hours (Hours/Days)	0	10-20 hours/5 days per week; possibly up to 24/7	10-20 hours/5 days per week; possibly up to 24/7
Projected Employment Requirements (number of workers)	0	43-81	43-81
Projected truck traffic (truck round-trips per day between the tract and the Port of Keota)	0	30-60	30-60

2.5. Alternatives Considered but Dismissed from Detailed Analysis

This analysis considers in detail the No Action Alternative (Alternative A), the Proposed Action Alternative (Alternative B), and a reduced tract acreage alternative that excludes Club Lake and the dwellings surrounding Club Lake from the tract (Alternative C). Additional alternatives were not considered because the existing range of alternatives addresses the alternative-driving issues (particularly Issue 4 and Issue 7) described in Table 1-1.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

3.1. Introduction

This chapter describes the existing conditions relevant to the issues presented in Table 1-1 and discloses the potential direct, indirect and cumulative impacts of the No Action Alternative (Alternative A), Proposed Action Alternative (Alternative B), and Reduced Tract Acreage Alternative (Alternative C) on those issues. No additional mitigation measures were identified as necessary following the analysis of each issue and therefore no discussion of mitigation or residual impacts is provided below.

3.2. Cumulative Actions

Table 3-1 provides a listing of past, present, and reasonably foreseeable future actions (RFFAs) incorporated into the analysis. Cumulative impacts are disclosed within the analysis of each issue.

Table 3-1. Past, Present, and RFFAs incorporated into the analysis.

Issue # [1]	Geographic and Temporal Scope	Past Action	Present Actions	RFFAs
Issue 1	State; National; Global/ Duration of mining of federal coal	Current State, National, and Global emissions estimates from all sources	Current State, National, and Global emissions estimates from all sources	Continuation of ongoing activities contributing to GHG emissions
Issue 2	Oklahoma; Haskell and LeFlore counties/Duration of mining of federal coal	Not applicable because not currently contributing to emissions within the geographic scope of analysis	Oklahoma and Haskell and LeFlore County emissions inventory for PM_{10}	Liberty 8 LBA; Permitted mine operations at federal lease OKNM 108097; Private tract north of the LBA tract; Pollyanna 8 operations; continuation of current emissions
Issue 3	LBA tract (OKNM 127509), private coal tract to north of LBA tract, federal lease tract OKNM 108097 to west of LBA tract /30 years	Not applicable because underground mining operations have not occurred. Past mining activity in the area has been surface mining.	Not applicable because there are no current activities with potential for surface effects from subsidence.	Permitted mine operations at federal lease OKNM 108097; Private tract to the north of the LBA tract
Issue 4	Drainage basin between Kerr Reservoir and OKNM 108097 federal least tract, LBA tract, and private coal tract to north of LBA tract/30 years	Creation of Club Lake; Presence of old mine spoil that water feeding Club Lake has over time been in contact with; Past mining activity	Continuation of past actions.	Permitted mine operations at federal lease OKNM 108097; Private tract to the north of the LBA tract
Issue 5	OKNM 108097 federal lease, LBA tract, private coal north of LBA tract, and land north and west bordered by Sans Bois Creek and Kerr Reservoir/30 years	Creation of Club Lake; Presence of old mine spoil that water feeding Club Lake has over time been in contact with; Past mining activity	Continuation of past actions.	Permitted mine operations at federal lease OKNM 108097; Private tract to the north of the LBA tract
Issue 6	Haskell and LeFlore counties/Duration of mining of federal coal	Historical context leading to present state of economic activity as described from available data	Continuation of past actions.	Continuation of present actions; Permitted operations at federal lease OKNM 108097; Private tract north of LBA tract; Liberty 8 lease tract; Pollyanna Mine operations
Issue 7	Haskell County and a one-mile buffer around the LBA tract /Duration of mining of federal coal	Historical context leading to present quality of life as described from available data	Continuation of past actions.	Continuation of present actions; Permitted operations at federal lease OKNM 108097; Private tract north of LBA tract; Liberty 8 lease tract
Issue 8	Oklahoma/Duration of mining of federal coal	Past coal mining operations in Oklahoma	Continuation of past actions.	Continuation of present actions; Permitted mine operations at federal lease OKNM 108097; Private tract to north of LBA tract; Liberty 8 lease tract

Table 3-1. Past, Present, and RFFAs incorporated into the analysis.

Issue #[1]	Geographic and Temporal Scope	Past Action	Present Actions	RFFAs

[1] Issues are enumerated in Section 1.8.3, Table 1-1.

3.3. Issue 1: How would coal mining operations on the LBA tract and coal haulage via truck to the Port of Keota affect greenhouse gas emissions? How would coal haulage via barge from the Port of Keota and via bulk cargo ship to the end user and end-user combustion of coal affect greenhouse gas emissions?

The geographic scopes of analysis associated with this issue are the State of Oklahoma, the U.S., and the globe. These geographic scales are used in this analysis to provide multiple levels of context associated with greenhouse gas (GHG) emissions as a result of leasing and mining the LBA tract, coal haulage, and end-user combustion of coal. In addition, the effects of GHG emissions are global in nature. The temporal scope of analysis is the life of mining on the LBA tract. This temporal scope was chosen because leasing and mining the LBA tract would no longer contribute to GHG emissions after mining of the LBA tract is completed.

3.3.1. Affected Environment

Numerous activities— fossil fuel development, large wildfires, activities using combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity, to name a few— contribute to GHG emissions (especially CO_2 and CH_4) and to climate change. Current estimated emissions of GHGs, expressed as CO_2e, are presented in Table 3-2 for the State of Oklahoma, the U.S., and the globe.

Table 3-2. Inventory baseline data for GHG emissions at global, national, and state levels

Source	Million Metric Tons of CO_2E	% of Global emissions
Global GHG Emissions[1]	48,257	100
U.S. GHG Emissions[2]	6,511	13
Oklahoma GHG Emissions from Large Facilities[3]	60	0.12

[1] 2013 data (World Resources Institute 2018).

[2] Reporting year is for 2017 data, does not account for land sequestration (EPA 2018).

[3] Does not include all emission sources. Includes emissions from large emitters >25,000 MT CO_2e/Year) which is estimated to represent about 85-90% of U.S. total emissions (EPA 2018b)

Social Cost of Carbon:

A protocol to estimate what is referenced as the "social cost of carbon" (SCC) associated with GHG emissions was developed by a federal Interagency Working Group (IWG), to assist agencies in addressing Executive Order (EO) 12866, which requires federal agencies to assess the cost and the benefits of proposed regulations as part of their regulatory impact analyses. The SCC is an estimate of the economic damages associated with an increase in carbon dioxide emissions and is intended to be used as part of a cost-benefit analysis for proposed rules. As explained in the Executive Summary of the 2010 SCC Technical Support Document "the purpose of the [SCC] estimates…is to allow agencies to incorporate the social benefits of reducing carbon dioxide (CO_2) emissions into cost-benefit analyses of regulatory actions that have small, or 'marginal,' impacts on cumulative global emissions." Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 February 2010 (withdrawn by EO13783). While the SCC protocol was created to meet the requirements for regulatory impact analyses during rulemakings, there have been requests by public commenters or project applicants to expand the use of SCC estimates to project-level NEPA analyses.

The decision was made not to expand the use of the SCC protocol for the Evans McCurtain Coal LBA EA for a number of reasons. Most notably, this action is not a rulemaking for which the SCC protocol was originally developed. Second, on March 28, 2017, the President issued Executive Order 13783 which, among other actions, withdrew the Technical Support Documents upon which the protocol was based and disbanded the earlier Interagency Working Group on Social Cost of Greenhouse Gases. The Order further directed agencies to ensure that estimates of the social cost of greenhouse gases used in regulatory analyses "are based on the best available science and economics" and are consistent with the guidance contained in OMB Circular A-4, "including with respect to the consideration of domestic versus international impacts and the consideration of appropriate discount rates" [E.O. 13783, Section 5(c)]. In compliance with OMB Circular A-4, interim protocols have been developed for use in the rulemaking context. However, the Circular does not apply to project decisions, so there is no Executive Order requirement to apply the SCC protocol to project decisions.

Further, the NEPA does not require a cost-benefit analysis (40 CFR § 1502.23), although NEPA does require consideration of "effects" that include "economic" and "social" effects. 40 CFR 1508.8(b). Without a complete monetary cost-benefit analysis, which would include the social benefits of the Proposed Action to society as a whole and other potential positive benefits, inclusion solely of an SCC cost analysis would be unbalanced, potentially inaccurate, and not useful in facilitating an authorized officer's decision. Any increased economic activity, in terms of revenue, employment, labor income, total value added, and output, that is expected to occur with the Proposed Action is simply an economic impact, rather than an economic benefit, inasmuch as such impacts might be viewed by another person as negative or undesirable impacts due to potential increase in local population, competition for jobs, and concerns that changes in population would change the quality of the local community. Economic impact is distinct from "economic benefit" as defined in economic theory and methodology, and the socioeconomic impact analysis required under NEPA is distinct from cost-benefit analysis, which is not required.

Finally, the SCC protocol does not measure the actual incremental impacts of a project on the environment and does not include all damages or benefits from carbon emissions. The SCC protocol estimates economic damages associated with an increase in carbon dioxide emissions – typically expressed as a one metric ton increase in a single year – and includes, but is not limited to, potential changes in net agricultural productivity, human health, and property damages from increased flood risk over hundreds of years. The estimate is developed by aggregating results "across models, over time, across regions and impact categories, and across 150,000 scenarios" (Rose et al. 2014). The dollar cost figure arrived at based on the SCC calculation represents the value of damages avoided if, ultimately, there is no increase in carbon emissions. But the dollar cost figure is generated in a range and provides little benefit in assisting the authorized officer's decision for project level analyses. For example, in a recent environmental impact statement, OSMRE estimated that the selected alternative had a cumulative SCC ranging from approximately $4.2 billion to $22.1 billion depending on dollar value and the discount rate used. The cumulative SCC for the no action alternative ranged from $2.0 billion to $10.7 billion. Given the uncertainties associated with assigning a specific and accurate SCC resulting from 2.8 additional years of operation under the mining plan modification, and that the SCC protocol and similar models were developed to estimate impacts of regulations over long time frames, this EA quantifies direct and indirect GHG emissions and evaluates these emissions in the context of State, U.S., and global GHG emission inventories as discussed in Section 3.3.2 of the EA.

To summarize, this EA does not undertake an analysis of SCC because 1) it is not engaged in a rulemaking for which the protocol was originally developed; 2) the IWG, technical supporting documents, and associated guidance have been withdrawn; 3) NEPA does not require cost-benefit analysis; and 4) the full social benefits of coal-fired energy production have not been monetized, and quantifying only the costs of GHG emissions but not the benefits would yield information that is both potentially inaccurate and not useful.

3.3.2. Environmental Impacts

GHG emissions were estimated in this analysis for four primary activities: (1) mine-site GHG emissions (electricity use, fuel consumption, and methane released from coal), (2) coal haulage GHG emissions via truck (fuel combustion of heavy-duty diesel vehicles), (3) barge and bulk carbo shipping GHG emissions, and (4) end-use coal combustion (industrial coking) GHG emissions. For each primary activity, annual and total emissions were calculated and converted to metric tons (MT) of carbon dioxide equivalents (CO_2e) using global warming potential (GWP) factors of 1 (carbon dioxide – CO_2), 25 (methane – CH_4), and 298 (nitrous oxide – N_2O) (EPA 2018). These calculations relied on the following: data presented in Evans' application package, responses from Evans to BLM requests for information, information provided by Oklahoma Department of Environmental Quality (ODEQ), and information from existing similar mine operations.

3.3.2.1. *Impacts of Alternative A – No Action Alternative*

Under the No Action Alternative, the BLM would not lease the coal contained within the LBA tract. As a result, federal coal deposits would remain in the ground and no mining activity associated with the LBA tract would occur. Because no mining activity associated with the LBA tract would occur under this alternative there would likewise be no GHG emissions.

3.3.2.2. *Impacts of Alternative B – Proposed Action Alternative*

Under the Proposed Action, the BLM would lease the coal contained within the LBA tract and the coal would be mined using room and pillar mining methods, possibly including pillar removal (retreat) mining. An estimated 3.28 million tons of recoverable coal are present on the tract. At a production rate of 200,000 to 400,000 tons of coal per year this equates to a mine life of approximately eight to 16 years. It is anticipated that for delivery to market coal mined from the tract would be hauled via truck to the Port of Keota and then shipped via barge to the confluence with the Mississippi River. Past this point, coal mined from the tract could be transported in one or more of several directions depending on coal market economics and available end users at the time of sale of mined coal. Specific end-users are not identified at this time. Based on available data this analysis assumes Brazil and India are possible final destinations for the coal. These locations represent the farthest (India) and nearest (Brazil) international markets. Estimated GHG emissions under the Proposed Action are discussed below according to the four primary activities previously identified. Table 3-3 provides a summary of emissions by primary activity and in total and compares these emissions to State of Oklahoma, U.S., and global GHG emissions. GHG emissions from mine construction and reclamation are not inventoried or reported in this analysis because they are not anticipated to be significant. Based on an anticipated construction timeframe of approximately three months, GHG emissions as a result of construction are anticipated to be less than 1% of the emissions reported below. Reclamation activities are likewise anticipated to be less than 1% of the emissions reported below because these activities involve less heavy equipment than both construction and mine operations and because reclamation includes revegetation resulting in some carbon sequestration.

Mine-site GHG Emissions:

Electricity Use and Fuel Consumption: Most of the heavier equipment used to mine coal from the tract would be underground, electrically powered, and associated with the direct recovery of coal. In addition, an above-ground processing and wash plant is expected to be operated by electricity. Diesel-powered surface equipment is normally used to load coal into over-the-road transports. Electricity consumption from a similar mine-site was used to estimate electricity and fuel consumption and adjusted to account for any differences in expected operations at the LBA tract (BLM 2017. To estimate GHG emissions, both

electricity and fuel consumption numbers use a conservative estimate of annual coal recovery of 400,000 tons per year. An emission factor of 10.21 kg CO_2/gallon of fuel was applied for equipment powered by diesel engines. For electricity usage, total output emission factors for the electricity market region were applied (EPA 2014). An estimate of mine-site GHG emissions, inclusive of electricity use and fuel consumption, is provided in Table 3-3.

Methane Released from Coal Mining: As a result of coal extraction, methane trapped in the coal seam is released. The amount of methane present varies with the geologic setting of the coal bed. The average methane content of Hartshorne coal at depths of 500 to 1,000 feet is 432 standard cubic feet per ton of coal (Iannacchione and Puglio 1979). It is assumed that all methane from the recovered coal would be liberated, and only a small portion of methane in the coal left in place would be liberated. From the coal left in place, methane would seep out of natural fractures—cleats and joints—and new fractures caused by mining activity. Methane production from in-place coal would be a fraction of that generated from an equal volume of coal removed from the seam and transported to the surface. Based on knowledge of the coal seam, a factor of 25% was used to calculate methane released by coal left in place.

To determine total and annual GHG emissions, the quantity of methane released from the mined coal (3.28 million short tons) and the quantity of the coal left in place (3.02 million short tons) was multiplied by the U.S. Bureau of Mines emission factor of 348 standard cubic feet of gas/short ton of coal. This calculated gas volume was input into the EPA *Coal Mine Methane Units Converter t*o give emissions in metric tons of CH_4 and finally converted to CO_2e (EPA 2018c). An estimate of mine-site GHG emissions, inclusive of methane released from coal mining, is provided in Table 3-3.

Coal Haulage GHG Emissions via Truck:

Coal from the LBA tract would be trucked to the Port of Keota for further shipment to market. Round-trip distance between the mine site and the Port of Keota is approximately 21 miles. To account for fuel stops and travel variabilities 10% is added. Given an average fuel economy of 4-miles per gallon and 25-ton capacity, a total of 94,874 gallons of diesel fuel would be consumed annually in coal haulage when applying an annual coal recovery rate of 400,000 tons. Emission factors of 10.21 kg/gallon, 0.0051 g/mile, and 0.0048 g/mile for CO_2, CH_4, and N_2O, respectively, were applied to convert fuel use to GHG emissions (EPA 2014). Using the estimated total recoverable coal value of 3.28 million short tons, calculated GHG emissions as a result of truck haulage combustion are estimated in Table 3-3.

Barge and Bulk Cargo Shipping GHG Emissions:

From the Port of Keota, coal leased and mined from the tract would be sent to various markets using barge and bulk cargo ship transportation through the Port at New Orleans. The estimated distance from the Port of Keota to the Port at New Orleans is 750 nautical miles (nm). From the Port at New Orleans, the exact locations of end-users are unknown because specific end-users are not identified at this time. Based on available data (EIA 2018 this analysis assumes Brazil and India are possible final destinations for the coal. These locations represent the farthest (India) and nearest (Brazil) international markets. The estimated distances from the Port at New Orleans to the Port at Rio de Janeiro, Brazil and from the Port at New Orleans to the Port at Chennai, India are 5,125 and 10,520 nm, respectively. Emission factors of 0.042 kg/ton-mile, 0.0004 kg/ton-mile, and 0.0027 kg/ton-mile for CO_2, CH_4, and N_2O, respectively, were applied to convert distance traveled and fuel use to GHG emissions (EPA 2014). Using the estimated total recoverable coal value of 3.28 million short tons, calculated GHG emissions as a result of barge and bulk cargo shipping are estimated in Table 3-3.

End-use Coal Combustion:

To calculate GHGs emissions from the end-use combustion of coal leased and mined from the LBA tract, it is assumed that the combustion is complete. Calculations use emission factors of 2,468 kg/short ton, 289 g/short ton, and 42 g/short ton for CO_2, CH_4, and N_2O, respectively (EPA 2014). Using the estimated

total recoverable coal value of 3.28 million short tons, calculated GHG emissions as a result of end-use combustion of coal are estimated in Table 3-3.

Summary:

Table 3-3 provides total projected GHG emissions resulting from implementation of the Proposed Action. The Proposed Action would add a net amount of 9.9 to 10.6 million metric tons of CO_2e to the atmosphere depending on the final destination of the coal. Leasing and mining the LBA tract would contribute well under 1% to state, national, and global emissions. Because bulk cargo shipping and end-use combustion would not occur directly in the U.S., these emissions are only compared to global emissions and not compared to state and national emissions.

Table 3-3. Emissions of CO_2e resulting from Alternative B and C compared to Oklahoma, national, and global emissions.

Source	MT of Total CO_2E [1]	MT of annual[2] CO_2E	% of Total CO_2E Emissions (Brazil destination)	% of Total CO_2E Emissions (India destination)	% of annual Oklahoma Emissions	% of annual National Emissions	% of annual Global Emissions
Alternative B: Proposed Action							
Mine-site	896,076	128,006	9.07	8.43	0.21	0.0020	0.0003
Truck Haulage	7,727	1,104	0.08	0.07	0.0018	<0.0001	<0.0001
Barge to New Orleans Port	105,195	15,028	1.06	0.99	0.0250	0.0002	<0.0001
Cargo Shipping (Brazil)	718,836	102,691	7.28	---	---	---	0.0002
Cargo Shipping (India)	1,475,542	210,791	---	13.87	---	---	0.0004
End-use (Industrial Coking)	8,149,840	1,164,263	82.51	76.62	---	---	0.0024
Total (Brazil)	8.9 million	1.4 million	100	---	---	---	0.0029
Total (India)	9.6 million	1.5 million	---	100	---	---	0.0031
Alternative C: Reduced Tract Acreage							
Mine-site	767,186	153,433	9.86	9.16	0.2557	0.0024	0.0003
Truck Haulage	6,073	1,215	0.08	0.07	0.0020	<0.0001	<0.0001
Barge to New Orleans Port	82,686	16,537	1.06	0.99	0.0276	0.0003	<0.0001
Cargo Shipping (Brazil)	565,019	113,004	7.26	---	---	---	0.0002
Cargo Shipping (India)	1,159,805	231,961	---	13.85	----	---	0.0005
End-use (Industrial Coking)	6,355,952	1,281,187	81.71	75.91	---	---	0.0027
Total (Brazil)	7.8 million	1.4 million	100	---	---	---	0.0032
Total (India)	8.4 million	1.5 million	---	100	---	---	0.0035

[1] For the entire Proposed Action.

[2] Under the Proposed Action the LBA tract would take approximately 8-16 years to mine. Under Alternative C the LBA tract would take approximately 6-12 years to mine. MT of annual CO_2e represents emissions annualized over 8-and 6-year periods, respectively. To estimate 16- and 12-year mine-outs; half this value.

--- Value not appropriate for this level of analysis or comparison.

Climate change is a global process that is impacted by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from the Proposed Action cannot be translated into effects on climate change globally or in the area of this site-specific action. It is currently not feasible to predict with certainty the net impacts from the Proposed Action on global or regional climate. The Air Resources Technical Report for Oil and Gas Development (ARTR) for New Mexico, Oklahoma, Texas, and Kansas (BLM 2017b) gives an in-depth discussion of the relationship between GHGs and climate change. The

report states that "Climate change is a global process that is impacted by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from a proposed land management action cannot be translated into effects on climate change globally or in the area of any site-specific action." (BLM 2017b, 29).

3.3.2.3. *Impacts of Alternative C – Reduced Tract Acreage*

Under Alternative C, the BLM would lease the coal contained within the LBA tract as reconfigured to exclude Club Lake and the dwellings surrounding Club Lake. An estimated 2.59 million tons of recoverable coal are present on the tract under this alternative. At an annual production rate of 200,000 to 400,000 tons of coal per year this equates to a mine life of approximately six to 12 years. Mining methods and elements of coal haulage would be the same under this alternative as under the Proposed Action. As a result, the qualitative nature of impacts under Alternative C are the same as under the Proposed Action. However, estimated GHG emissions would be reduced under Alternative C because the total estimated recoverable coal and the mine life would be reduced compared to the Proposed Action. Table 3-3 reports mine-site GHG emissions, coal haulage GHG emissions via truck, barge and bulk cargo shipping GHG emissions, and end-use coal combustion GHG emissions under Alternative C. Alternative C would add a net amount of 7.8 to 8.4 million metric tons of CO_2e to the atmosphere depending on the final destination of the coal. Leasing and mining the LBA tract under Alternative C would contribute well under 1% to state, national, and global emissions.

3.3.2.4. *Cumulative Impacts of the Alternatives*

As described in Section 3.3.1, past and ongoing GHG emissions and resultant climate changes are a result of numerous activities, including fossil fuel development, large wildfires, activities using combustion engines, and changes to the natural carbon cycle. Global GHG emissions are estimated at 48,257 million metric tons of CO_2e whereas U.S. and State of Oklahoma emissions are estimated at 6,511 and 60 million metric tons of CO_2e, respectively.

RFFAs consist largely of the continuation of past and ongoing activities contributing to GHG emissions and climate changes. Emissions from these activities are likely to continue into the future at similar rates to current estimates, though emissions on a global scale may decrease to some degree over time as a result of implementation of international agreements intended to result in a decrease in global GHG emissions.

Implementation of the Proposed Action or Alternative C would contribute, incrementally, to GHG emissions from ongoing and reasonably foreseeable future actions roughly in proportion to the estimates provided in Table 3-3. If international agreements are successful in reducing global GHG emissions implementation of the Proposed Action or Alternative C would make up a slightly larger percentage of global GHG emissions. However, this contribution to global GHG emissions would still be a fraction of a percent, which does not translate into effects on climate change globally. The total cumulative effect on GHG emissions and climate change would be similar to that described in Section 3.3.2.2.

3.4. Issue 2: How would coal mining operations on the LBA tract and coal haulage via truck to the Port of Keota affect particulate matter (PM_{10}—dust) emissions and subsequently air quality in Haskell and LeFlore counties?

The geographic scopes of analysis associated with this issue are the State of Oklahoma and Haskell and LeFlore counties. These geographic scales are used in this analysis to provide multiple levels of context associated with PM_{10} emissions as a result of leasing and mining the LBA tract and coal haulage to the Port of Keota. The temporal scope of analysis is the life of mining on the LBA tract. This temporal scope was chosen because leasing and mining the LBA tract would no longer contribute to PM_{10} emissions within the spatial scope of analysis after mining of the LBA tract is completed. No sources (such as

stationary engines) would be present that emit other criteria pollutants at levels requiring reporting, therefore they are not analyzed further.

3.4.1. Affected Environment

Table 3-4 presents baseline PM_{10} emissions in the State of Oklahoma and Haskell and LeFlore counties based on the 2013 reporting year. These data are obtained from EPA's National Emissions Inventory (NEI) database (EPA 2018d). All sources of PM_{10} emissions are not reported here. However, the most substantial sources are provided. Total PM_{10} emissions for the State of Oklahoma are more than 100 times and 45 times greater than Haskell County and LeFlore County PM_{10} emissions, respectively. The most substantial sources of PM_{10} emissions in the State of Oklahoma and in Haskell and LeFlore counties are agriculture (crops and livestock dust) and dust from unpaved roads. These emissions make up more than half of all PM_{10} emissions reported in this analysis for the State of Oklahoma, Haskell County, and LeFlore County.

Table 3-4. Baseline PM_{10} emissions at state and county levels (EPA 2018d).

SOURCE	OKLAHOMA (ANNUAL TONS / % OF TOTAL)	HASKELL COUNTY (ANNUAL TONS / % OF TOTAL)	LEFLORE COUNTY (ANNUAL TONS / % OF TOTAL)
Industrial Processes [1]	7,104 / 2%	53 / 1%	72 / 1%
Mining Sector	5,650 / 1%	203 / 5%	403 / 4%
Electrical Generation-Coal	3,907 / 1%	0 / 0%	300 / 3%
Agriculture (crops and livestock dust)	199,471 / 44%	1,289 / 30%	2,304 / 24%
Agricultural Field Burning	8,452 / 2%	90 / 2%	112 / 1%
Prescribed Fire	31,598 / 7%	479 / 11%	1,238 / 13%
Wildfire	16,808 / 4%	900 / 21%	206 / 2%
Residential Wood Burning	1,292 / >1%	8 / >1%	29 / >1%
Waste Disposal	4,076 / 1%	20 / >1%	75 / 1%
Dust-Paved Roads	16,520 / 4%	43 / 1%	255 / 3%
Dust-Unpaved Roads	159,209 / 35%	1,240 / 29%	4,487 / 47%
Total	454,087 / 100%	4,325 / 100%	9,481 / 100%

[1] Mining sector emissions are provided as a separate item.

The Oklahoma Department of Environmental Quality (ODEQ), Air Quality Division (AQD), monitors PM_{10} concentrations at six sites in Oklahoma. The closest site to the LBA tract is at Muskogee (Muskogee County). In 2017, the maximum 24-hour average PM_{10} concentration at the Muskogee monitoring station was approximately 130 ug/m^3 (AQD 2018). The 24-hour PM_{10} standard is 150 ug/m^3. Based on these and other monitoring data, AQD has determined that Haskell and LeFlore Counties are both in attainment of PM_{10} standards (AQD 2018).

3.4.2. Environmental Impacts

3.4.2.1. *Impacts of Alternative A – No Action Alternative*

Under the No Action Alternative, the BLM would not lease the coal contained within the LBA tract. As a result, federal coal deposits would remain in the ground and no mining activity associated with the LBA tract would occur. Because no mining activity associated with the LBA tract would occur under this alternative there would likewise be no PM_{10} emissions.

3.4.2.2. *Impacts of Alternative B – Proposed Action Alternative*

Under the Proposed Action, the BLM would lease the coal contained within the LBA tract and the coal would be mined using room and pillar mining methods, possibly including pillar removal (retreat)

mining. An estimated 3.28 million tons of recoverable coal are present on the tract. At a production rate of 200,000 to 400,000 tons of coal per year this equates to a mine life of approximately eight to 16 years. Surface facilities in support of underground mining operations would occupy approximately 78 acres in the southeast corner of the tract. Coal mined from the tract would be hauled via truck to the Port of Keota for eventual delivery to market.

Particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) is the pollutant of concern as a result of this activity. This analysis estimates PM_{10} emissions for an annual coal production rate of 400,000 tons (the upper end of estimated annual coal production). PM_{10} emissions from mine ventilation, above ground material handling (equipment items and transfers), wash plant processing, wind-blown dust from stockpiles, and fugitive dust on unpaved roads are estimated. In accordance with O.A.C. 252:100-8, PM_{10} emissions from road dust and wind-blown dust from stockpiles are not added to a facility's Potential-to-Emit (PTE) when deciding if a source operates as a minor source of criteria pollutants or HAPs. All equipment at the mine is expected to be powered by electricity with the exception of the non-road mobile equipment and the loaders which would be diesel-fueled. Emissions from non-road mobile equipment are regulated under 40 CFR 89, and regulatory mechanisms are in place to ensure emissions from these sources are limited to established air quality thresholds. It is anticipated that a diesel storage tank (too small to be subject to NSPS Subpart Kb and with a vapor pressure below 1.5 psia) would be at the mine site to fuel the non-road on-site equipment. PM_{10} emissions from construction and reclamation activities are not included in the discussion below or in the data reported in Table 3-5. This is because these activities are essentially one time activities (not annual activities) and would occur over a few to several months. A more in-depth discussion of emission calculations based on source of emissions is included below.

Mine Ventilation: PM_{10} emissions from mine ventilation were calculated based on emission rates from MSHA and AP-42 (1.0 mg/m3-PM_{10}, EPA 2006), and an average ventilation rate of 384,390 cubic feet per minute. The average ventilation flow rate was based on adsorption isopleths that depend on mine depth (847 feet) and coal production. These emission calculations assume that there would not be controls in place for vented PM_{10} emissions. PM_{10} emissions from mine ventilation are reported in Table 3-5.

Above Ground Material Handling: PM_{10} emission factors from AP-42 (EPA 2006, Sections 11.9 and 13.2) were used to generate emission estimates of PM_{10} for various above ground material handling activities. Operations of throughput during different handling phases are scaled to represent a similar operation at a coal mine in LeFlore County (BLM 2017). Above ground material handling includes activities such as conveyor transfer points, screening, drop operations and truck-loading operations as well as wash plant operations. PM_{10} emissions from above ground material handling and wash plant operations are reported in Table 3-5. The factor for wind erosion of open storage piles is taken from the Emission Inventory Improvement Program (EIIP 2001). The factor used is 17,060 lbs/acre/year. For one acre of storage, this factor yields 8.53 Tons per Year (TPY) of PM_{10} emissions.

Onsite and Offsite PM_{10} from Unpaved Roads: PM_{10} emissions from vehicle-travel on unpaved roads are estimated using AP-42 (EPA 2006, Section 13.2.2.) methodology and include approximately 0.28 miles within the mine-site, 2.95 miles outside the mine-site and another 0.19 miles of travel near the Port of Keota, totaling 3.43 miles of unpaved roads. The percent of silt content of unpaved surface material taken from AP-42 is 8.4 %. (EPA 2006). The emission factor equation estimates particulate emissions from re-suspended road surface material. This does not include emissions from vehicle engines. The average payload of the vehicles on the unpaved road is estimated at 25 tons. Total annual round trips are estimated at approximately 16,000 using an annual coal recovery rate of 400,000 tons. Total uncontrolled PM_{10} emissions from truck traffic on unpaved roads is 153.75 TPY. However, based on regulatory requirements it is assumed that reasonable precautions would be taken to minimize fugitive dust emissions from haul roads. As a result, an 80% emission control is applied to unpaved roads, reducing PM_{10} emissions on un-paved roads to 30.75 TPY. This value is the total between onsite unpaved roads (2.57 TPY) and offsite unpaved roads (28.18) reported in Table 3-5.

Table 3-5. PM_{10} Emissions from the Proposed Action and Alternative C compared with Oklahoma Emissions (percent calculations provided here are based on data reported in Table 3-4).

SOURCE	ANNUAL PM_{10} (TONS)	% OF OKLAHOMA PM_{10} EMISSIONS	% OF HASKELL COUNTY PM_{10} EMISSIONS [1]	% OF LEFLORE COUNTY PM_{10} EMISSIONS [1]
Onsite Equipment and Activities [2]	48.92	0.011	1.13	0.84
Onsite Fugitive Dust on Unpaved Roads [3]	2.57	0.001	0.06	0.03
Offsite Fugitive Dust on Unpaved Roads [3]	28.18	0.006	0.65	0.29
Total PM_{10} Emissions [4]	79.67	0.018	1.84	0.81

[1] Percentages are calculated as if all emissions would occur in each county.

[2] Includes 6.33 TPY from mine ventilation PM_{10}, 27.88 TPY of above-ground material handling PM_{10}, 6.18 TPY of PM_{10} from wash plant processing emissions, and 8.53 TPY of wind-blown dust from stockpiles assuming a one acre stockpile.

[3] An 80-percent emission control reduction has been taken for PM10 dust on unpaved roads.

[4] Project emissions include onsite equipment and activities as noted in 1, wind-blown stockpiles and onsite and fugitive dust on unpaved roads. Although fugitive emissions from wind-blown stockpiles and fugitive dust on unpaved roads is not considered for purposes of minor source permitting.

Calculations reported in Table 3-5 indicate that leasing and mining the LBA tract would contribute under 1% to State of Oklahoma and LeFlore County emissions of PM_{10} and just under 2% to Haskell County emissions of PM_{10}. This incremental increase in PM_{10} emissions is not expected to change air quality on a state or county scale. However, coal haulage on un-paved roads near the LBA tract may result in localized increases of PM_{10} emissions that could be an intermittent nuisance to residents near and users of unpaved haul roads.

3.4.2.3. *Impacts of Alternative C – Reduced Tract Acreage*

Under Alternative C, the BLM would lease the coal contained within the LBA tract as reconfigured to exclude Club Lake and the dwellings surrounding Club Lake. An estimated 2.59 million tons of recoverable coal are present on the tract under this alternative. At an annual production rate of 200,000 to 400,000 tons of coal this equates to a mine life of approximately six to 12 years. Mining methods and elements of coal haulage would be the same under this alternative as under the Proposed Action. As a result, on an annual basis the impacts under Alternative C would be the same as under the Proposed Action. However, the life of mining of the LBA tract under Alternative C would be two to four years shorter than under the Proposed Action.

3.4.2.4. *Cumulative Impacts of the Alternatives*

Current sources of PM_{10} emissions in the State of Oklahoma and Haskell and LeFlore Counties are reported in Section 3.4.1. The most substantial sources of PM_{10} emissions in the State of Oklahoma and in Haskell and LeFlore Counties are agriculture (crops and livestock dust) and dust from unpaved roads. These emissions make up more than half of all PM_{10} emissions reported in this analysis for these areas.

RFFAs include the continuation of existing sources of PM_{10} emissions in addition to the following actions:

- permitted mine operations at federal lease tract OKNM 108097,
- development of the private coal tract to the north of the LBA tract,
- mining at Farrell-Cooper Mining Company's Liberty Mine near Stigler, Oklahoma, and
- mining at GCI's Pollyanna mine near Spiro, Oklahoma.

Production rates and specific mining methods for these actions, as well as when they would be mined, are not completely known at this time. However, assuming that they would be mined concurrently with the LBA tract they could contribute to PM_{10} emissions within the spatial scope of analysis. Also, assuming that mining methods would be similar to those anticipated for mining the LBA tract these RFFAs would contribute to PM_{10} emissions within the spatial scope of analysis in a similar fashion to that which is reported in Section 3.4.2.2.

Leasing and mining the LBA tract under the Proposed Action or Alternative C would incrementally contribute to PM_{10} emissions within the spatial scope of analysis on top of emissions from ongoing and reasonably foreseeable future actions. Based on the analysis in Section 3.4.2.2 this incremental contribution to PM_{10} emissions is expected to be less than 1%. There are currently no non-attainment areas in the State of Oklahoma for criteria air pollutants, including PM_{10}. When added to ongoing and reasonably foreseeable future actions, leasing and mining the LBA tract would not increase PM_{10} emissions beyond the attainment threshold.

3.5. Issue 3: What are the surface effects from underground mining of the LBA tract using room and pillar mining methods, possibly including pillar removal (retreat) mining?

The geographic scope of analysis associated with this issue is the LBA tract (OKNM 127509), a private coal tract to the north of the LBA tract, and the McCurtain lease tract (OKNM 108097) to the west of the LBA tract (Map 4). This area was chosen as the geographic scope of analysis because it is the total contiguous area of potential surface effects from underground mining activities including the LBA tract. The temporal scope of analysis is approximately 30-plus years. Although mining the LBA tract is expected to take approximately 8-16 years under the Proposed Action, surface effects as a result of underground mining can occur after mining operations cease. Additionally, mining of the three contiguous coal tracts that make up the geographic scope of analysis are anticipated to occur over the 30 year timeframe.

Mining the LBA tract using room and pillar methods, possibly including pillar removal (retreat) mining, could result in subsidence, a surface effect of concern in this analysis. Subsidence is a process characterized by downward displacement of surface material caused by natural phenomena such as removal of underground fluids, natural consolidation, or dissolution of underground minerals, or by man-made activity such as underground mining.

3.5.1. Affected Environment

The Hartshorne coal seam is the target coal seam within the LBA tract. It outcrops on the southeast side of the spatial scope of analysis and then dips to the north and west across the spatial scope of analysis. As a result, the coal seam is deeper to the north and west and shallower to the south and east. There are approximately 200 feet of overburden on the southeast portion of the tract and approximately 700 feet of overburden on the northwest portion of the tract. Based on available data, across the entire spatial scope of analysis the coal seam is deepest on the northwest portion of the OKNM 108097 lease tract (approximately 1,300 feet) and shallowest (approximately 200 feet) on the southeast portion of the LBA tract (OKNM 127509). There are no available overburden thickness data for the private coal tract to the north of the LBA tract but based on trends it appears that the coal would continue to have greater overburden to the north. Based on available data, the average thickness of the coal seam across the tract and across the spatial scope of analysis is approximately 42 inches.

The Hartshorne coal seam is overlain by the McAlester Formation of the Pennsylvanian System. This formation includes several thin sandstone units separated by thick mudrock sections of the McCurtain Shale and other unnamed shale members (OSMRE 2013, page 8). Rock units of the McAlester Formation make up the overburden which is a component of the spatial scope of analysis.

Coal mining, dating back as far as approximately 1969 (and reclaimed in 1971), has historically occurred on the southern flank of the spatial scope of analysis, including in the area in the southeast portion of the LBA tract. To date this has been primarily limited to surface mining activity (including auger mining) in locations where the Hartshorne coal seam outcrops or is near the surface (within approximately 100 feet). Previous mining in the immediate area has not included underground mining and, as a result, the surface of the area overlying the spatial scope of analysis has not been affected by underground mining activity.

3.5.2. Environmental Impacts

3.5.2.1. *Impacts of Alternative A – No Action Alternative*

Under the No Action Alternative, the BLM would not lease the coal contained within the LBA tract. As a result, federal coal deposits would remain in the ground and there would be no potential for surface effects from underground mining of the LBA tract.

3.5.2.2. *Impacts of Alternative B – Proposed Action Alternative*

Under the Proposed Action, the BLM would lease the coal contained within the LBA tract and the coal would be mined using room and pillar mining methods, possibly including pillar removal (retreat) mining. The LBA tract under this alternative spans an area approximately 1,270 acres in extent with an average coal seam thickness of approximately 42 inches. The amount and degree of surface effects from room and pillar mining, possibly including retreat mining, depends upon several factors, including the following: the number and size of the pillars left in place to support the roof, geologic conditions in the overburden, overburden thickness, and the thickness of the coal seam being removed.

In general terms, room and pillar mining on the LBA tract without retreat mining may result in some degree of subsidence taking place over long periods of time (decades or longer) as the remaining pillars slowly collapse until the pillars reach a point of stability when they no longer move. This gradual subsidence, if it occurs, may not have any surface expressions at all. In areas where overburden is relatively shallow (e.g., 200 feet) subsidence is more likely to occur over time and is more likely to result in surface expressions than in areas where overburden is relatively thick (e.g., 700 feet). As indicated above, the McAlester Formation of the Pennsylvanian System makes up the overburden across the tract. This formation includes several thin sandstone units separated by thick mudrock sections of the McCurtain Shale and other unnamed shale members (OSMRE 2013, page 8). Shale has a tendency to bend rather than fracture and can therefore accommodate a level of stress that would fracture more brittle rocks.

As indicated above, typical room and pillar mining precludes the near term effects of subsidence (and may not result in surface expressions at all). However, planned retreat mining, if it occurs, allows for localized specific areas to be subsided and for there to be surface expressions of subsidence. Retreat mining, if it occurs, is more likely to result in subsidence and surface expressions from subsidence because retreat mining results in pillar removal which effectively reduces the total area of pillars left in place to support the roof following mining. If subsidence occurs it would occur in areas of pillar extraction. Surface expressions from subsidence could be up to approximately half of the mining height. Total mining height on the tract is anticipated to be no more than approximately six feet, meaning that the total downward displacement of surface material would be no greater than approximately three feet. This downward displacement of surface material would be gradual and would take place over an area a few hundred feet in extent and centered on the area(s) above which pillar extraction occurs. Subsidence would appear essentially like an elongated bell shaped curve. Subsidence following retreat mining would take place within a few months of the retreat mining process and could take several years to finalize (i.e., reach a point of stability). Further, based on regulatory requirements discussed below and in Table 2-1, the effects from subsidence would be engineered for specific locations over the life of mining on the tract.

Ultimately, surface effects from underground mining of the LBA tract using room and pillar mining methods, possibly including pillar removal (retreat) mining are anticipated to be limited as a result of following the requirements in Table 2-1 (listed under Water Resources).

In addition, the following underground coal mining practice guidance is standard industry operating procedure and highly likely to be implemented to conduct mining activities on the LBA tract:

- following mine design guidance consistent with Kentucky Reclamation Advisory Memorandum (RAM) 107 to prevent surface subsidence.
- protection of surface structures in accordance with the 1966 Pennsylvania Law reducing the number of pillars that could be retreat mined.
- retention of barrier pillars, approximately 200 feet wide, between mining panels to prevent ground movement.

Due to the aforementioned requirements and guidance, non-inhabited areas and areas not containing structures, roads, bridges, wells, and surface water features are more suitable for retreat mining than inhabited areas and areas containing the aforementioned features. As a result, large pastures, forested areas, and similar locations are more likely to experience surface effects from underground mining. Table 3-6 below provides an estimate of acreages (including associated areas) where mining would not be allowed and where retreat mining is unlikely to occur based on the requirements listed above and enumerated in Table 2-1. Acres where retreat mining may occur, if it is pursued by the successful bidder, are also provided in Table 3-6.

Table 3-6. Estimate of acreages (including associated areas) where mining would not be allowed and where retreat mining is unlikely to occur based on the items listed in Table 2-1.

ALTERNATIVE	APPROXIMATE TOTAL LBA TRACT ACRES	APPROXIMATE ACRES WHERE UNDERGROUND MINING WOULD NOT OCCUR	APPROXIMATE ACRES WHERE RETREAT MINING IS UNLIKELY TO OCCUR	APPROXIMATE ACRES WHERE RETREAT MINING MAY OCCUR
Alternative A	1,270 [1]	1,270 [2]	1,270 [2]	0 [2]
Alternative B	1,270	60 (Club Lake Dam and 50 foot dam buffer)	270 (Club Lake – 70; Stream Buffer Rule applicable areas – 100; Structures – 100)	940
Alternative C [3]	940	10 (Club Lake Dam – 10) [4]	200 (Stream Buffer Rule applicable areas – 100; Structures – 100)	730

[1] This acreage reflects the total LBA tract acreage, however under the No Action Alternative the tract would not be leased or mined.

[2] No underground mining method would be used to mine the tract under this alternative because the tract would not be leased.

[3] Under Alternative C the tract is reconfigured to exclude Club Lake and the dwellings around Club Lake. As a result, the total acreage of the tract is smaller than under the Proposed Action. In addition, the total acreage where underground mining would not occur to comply with applicable requirements is smaller than the Proposed Action because these areas have been removed from the tract altogether under this alternative.

[4] Due to the ownership of the Club Lake parcel, the buffer zone around the dam itself may be partially outside the ownership boundary.

3.5.2.3. *Impacts of Alternative C – Reduced Tract Acreage*

Under Alternative C the BLM would lease the coal contained within the tract as reconfigured to exclude Club Lake and the dwellings surrounding Club Lake. Under this alternative, the tract would be mined using room and pillar mining methods, possibly including pillar removal (retreat) mining. The tract under this alternative spans an area approximately 940 acres in extent. The qualitative nature of impacts under Alternative C would be the same as the Proposed Action because the same mining methods would be used to extract coal from the tract. However, the areal extent of the tract under this alternative is 330 acres smaller than under the Proposed Action. In addition, whereas subsidence is not anticipated under Club Lake under the Proposed Action as a result of the need to comply with applicable requirements listed above and in Table 2-1, there is no possibility (even remotely) that subsidence under Club Lake would occur under this alternative. This is because no underground mining under Club Lake and the dwellings surrounding Club Lake would occur under Alternative C.

3.5.2.4. *Cumulative Impacts of the Alternatives*

Past mining activity within the spatial scope of analysis has not included the employment of underground mining methods. As a result, there are no existing surface effects from underground mining in this area. In addition, there are no ongoing underground mining activities occurring within the spatial scope of analysis at the present moment.

RFFAs within the spatial scope of analysis consist of anticipated underground (room and pillar) mining on the OKNM 108097 federal lease tract (approximately 2,380 acres) to the west of the LBA tract and the private coal tract (approximately 2,300 acres) to the north of the LBA tract (Map 4). Surface effects from mining these tracts using room and pillar mining methods, possibly to include pillar removal (retreat) mining, would be approximately the same as those described above for the action alternatives. This is because the target coal seam in these tracts is the same as the LBA tract, these mining activities are subject to the same regulatory requirements as mining on the LBA tract, and the mining method on these tracts is the same as that which would be employed to mine the LBA tract.

Leasing and mining the LBA tract under the Proposed Action or Alternative C would result in an additional 1,270 acres or 940 acres, respectively, of underground mining activity on top of the 4,680 acres of reasonably foreseeable future underground mining activity represented by anticipated mining on the OKNM 108097 federal lease tract and on the private coal tract. Implementation of the Proposed Action or Alternative C would result in a cumulative total contiguous area of underground mining activity of 5,950 acres (under the Proposed Action) or 5,620 acres (under Alternative C), respectively. The cumulative surface effects of mining these areas using room and pillar mining methods, possibly including pillar removal (retreat) mining, would be the same as those described above for the action alternatives for reasons articulated in the previous paragraph.

3.6. Issue 4: How would leasing and mining the LBA tract affect surface water resources, particularly the quantity and quality of water flowing into, stored within, and discharged from Club Lake?

The geographic scope of analysis associated with this issue is the drainage basin between Kerr Reservoir and the OKNM 108097 federal least tract, the LBA tract, and the private coal tract to the north of the LBA tract (Map 6). This spatial scope of analysis was chosen because it includes the area of contiguous underground mining activity residing in one drainage basin. The temporal scope of analysis is 30-plus years. This timeframe was chosen because effects associated with this issue would extend at least this far into the future and mining activity on the LBA tract and coal tracts adjacent to the LBA tract would occur over this timeframe.

3.6.1. Affected Environment

Geology controls the topography of the area, and topography controls the pattern of surface water drainage. This part of Oklahoma is in the Arkoma geologic basin where bedrock has been folded into a series of east-trending synclines and anticlines. Sandstone forms ridges while intervening valleys have developed in more erodible, thicker beds of shale (Slack 1983). Two ridges run northeast–southwest across the LBA tract and into the adjacent lease (OKNM 108097). Elevations of the LBA tract range from about 500 feet to about 700 feet above mean sea level. The other component of the spatial scope of analysis—land overlying private coal to the north then extending on to the inundated reach of Sans Bois Creek which forms a southern arm of Robert S. Kerr Reservoir—tends to have lower relief except for the ridges of Seven Devils Mountain.

The dominant surface water feature on the LBA tract is the approximately 50-acre Club Lake. Club Lake is behind an earthen dam constructed across an unnamed stream in about 1940. A prominent ridge is just north of Club Lake. About 200 feet south of the lake, beyond a strip of undisturbed stream valley, is

abandoned mine ground. A watercourse along the edge of this mined ground collects runoff from spoil and conveys it to a point downstream from Club Lake dam. The only other impoundment of substantial size on the LBA tract is an 11-acre water-filled abandoned mine pit at the southeast corner of the tract. This water body receives surface runoff from a miles-long band of un-reclaimed mined ground along the base of Campground Spring Mountain.

Club Lake valley and the adjacent lease tract (OKNM 108097) drain to the southwest. The first named stream that captures this runoff is Mule Creek. Mule Creek is a tributary of Sans Bois Creek which empties into the 50,000-acre Kerr Reservoir. Kerr Reservoir is part of the McClellan-Kerr Arkansas River Navigation System. While Mule Creek has no designated beneficial uses, the Oklahoma Water Resources Board has assigned the following beneficial uses to Sans Bois Creek: public and private water supply, warm water aquatic community, agriculture, industrial and municipal process and cooling water, primary body contact recreation, and aesthetics. The 9-mile reach of Sans Bois Creek from its confluence with Mule Creek to Kerr Reservoir is impaired by low dissolved oxygen, pathogenic bacteria, and pH; another 10.8-mile reach of Sans Bois Creek upstream from Mule Creek is impaired by low dissolved oxygen, pathogenic bacteria, sulfate, and total dissolved solids (EPA 2010). Oklahoma has not developed total maximum daily load limits for these two impaired reaches of Sans Bois Creek.

Unlike the southern portion of the LBA tract which directs water to the southwest, the next valley north of the lake sends surface water to the northeast then north to Kerr Reservoir. Surface runoff from most of the LBA tract and land to the north is conveyed directly to the reservoir by unnamed watercourses.

Farrell-Cooper Mining Company, the permittee who plans to recover adjacent leased federal coal (lease tract OKNM 108097) by underground methods, has collected water information for their Permit 4285F. Some of this information came from single sampling events at water-filled abandoned mine pits. Farrell-Cooper Mining Company continues to regularly collect data from established monitoring stations for both surface water and groundwater. A few Farrell-Cooper Mining Company monitoring stations are in the LBA tract or close by. For example, the company collects Club Lake water from two points. The closest monitored impoundment to the lake is a 4-acre pond about 1,300 feet to the southeast. Station SWMP-6 is at this pond which is at the site of an abandoned wash plant and coal waste storage area. Laboratory measurements show that Club Lake has sodium-bicarbonate type water. Water from SWMP-6 is a magnesium-bicarbonate type. Mann-Whitney comparison of medians test for seven water-quality characteristics—pH, acidity, alkalinity, total iron, total manganese, sulfate, and total dissolved solids—found that only total iron was statistically different between Club Lake water and SWMP-6 water at a 95 percent confidence level. Median concentration of total iron was higher at SWMP-6 (0.76 mg/L versus 0.26 mg/L for Club Lake). The U.S. EPA national recommended criteria for the non-priority pollutant iron are 0.3 mg/L for drinking water and 1.0 mg/L (dissolved iron) for aquatic life.

3.6.2. Environmental Impacts

3.6.2.1. *Impacts of Alternative A – No Action Alternative*

Under the No Action Alternative, the BLM would not lease the coal contained within the LBA tract. As a result, there would be no possibility for surface drainage patterns across the LBA tract to change from the existing state as a function of mining and the quantity and quality of Club Lake water would remain as they are.

3.6.2.2. *Impacts of Alternative B – Proposed Action Alternative*

Under the Proposed Action, the BLM would lease the coal contained within the LBA tract and the coal would be mined using room and pillar mining methods, possibly including pillar removal (retreat) mining. The LBA tract under this alternative spans an area approximately 1,270 acres in extent. Section

3.5 discusses mine subsidence related effects. Mine subsidence, if it occurs, may affect surface water resources.

Modern room and pillar mining uses a set of features called panels. Each panel may be some 1,500 feet long and 600 feet wide and is mostly surrounded by broad barrier pillars of coal. Within a panel, coal is removed in a checkerboard pattern, leaving about half of the coal in place to support the mine roof long into the future. With no subsidence, the land surface above panels would show no effect from underground mining and water movement across that surface would be unaffected.

Pillar recovery (retreat) mining within a panel typically leads to planned subsidence. Subsidence is "planned" to the extent that the timing, magnitude, and location of the event can be known with some degree of confidence. Pillar recovery leads to rapid (a few to several months) collapse of the mine roof. Roof collapse is expressed by a predicable drop in elevation of the land surface above the retreat-mined panel. Barrier pillars remain intact so that the land surface above barrier pillars does not subside. As discussed in Section 3.5.2.2, surface expressions from subsidence could be up to approximately half of the mining height. Total mining height on the tract is anticipated to be no more than approximately six feet, meaning that the total downward displacement of surface material would be no greater than approximately three feet. This downward displacement of surface material would be gradual and would take place over an area a few hundred feet in extent and centered on the area(s) above which pillar extraction occurs.

The effect on surface water from planned subsidence for a room and pillar operation is dependent on the pre-mine topography. Flat land would subside in a series of long rectangular or elongated bell shaped shallow depressions separated from one another by strips of non-subsided land above barrier pillars. Irregular or hilly topography (such as that present on a portion of the LBA tract) tends to mask subsidence features.

Surface depressions collect overland runoff. During wetter times of the year, temporary ponding might occur in subsided areas, leaving the land unsuitable for grazing. On the other hand, excess water held in subsidence features could benefit vegetation during dry times of the year. Soils of the LBA tract and surrounding area are well drained to moderately well drained (NRCS).

The same on-line soil survey that was queried for drainage class was also queried for depth to water table. Subsurface water varies from 31 centimeters (12 inches) to greater than 200 centimeters (79 inches) below ground across the LBA tract and neighboring OKNM 108097 lease and private coal tracts. The water table is mostly at the greater of these depths. Where the water table is shallow, however, the three feet of subsidence that might be expected for the LBA tract could create seasonally ponded areas.

Subsidence, by suddenly increasing slopes along the edges of panels, could cause increased erosion. The area over which this might occur is small relative to the size of the subsidence feature above a panel. Surface runoff across subsided flat ground would not carry sediment far (inches to a few feet) as a result.

All ground disturbed to support the underground operation would be within an area permitted by ODM as a surface mine. A mine disturbance area would include the site of the mine office, bath house, equipment yard, mine portal, coal stock pile, coal preparation plant, and coal waste disposal pit. Under this surface mine permit, runoff from disturbed ground must pass through a sediment pond before being discharged to a receiving stream. A preparation plant needs water to wash impurities from coal. This water would come from an impoundment because local groundwater is unlikely to be present in sufficient quantity to supply an industrial operation and maintain the water level during that mining operation. Preparation plants are typically "no discharge" facilities, meaning that they recirculate wash water.

Discharge from the 11-acre impoundment that would be developed for the mine portal presently goes to Club Lake. Flow into this old mine pit would have to be diverted to drain the pit. Diverted water would probably still flow to Club Lake. In that case, Club Lake would continue to receive the same volume of

water as it does now. Even without water from the portal area, the lake presumably has a sufficient drainage basin of undisturbed ground to maintain a stable water level. The evidence for this is that Club Lake existed before the Hartshorne coal seam was surface mined along its outcrop south of the lake. Subsidence within the Club Lake drainage basin, if it were to occur, would not substantially change the area that contributes overland flow to the lake. Consequently, the amount of water running into the lake would not change.

Club Lake itself could be directly affected by mining operations conducted about 300 feet underneath the lake. Layers of shale, siltstone, and sandstone are between the lake bottom and the room and pillar mine void. These rocks, in their undisturbed state, have limited capacity to transmit water vertically. Nevertheless, some mine seepage through intact roof rock is possible, but the rate of flow through the lake bottom would probably have no noticeable effect on the volume of Club Lake. Pollyanna 8 Mine, a room and pillar operation in LeFlore County along (but not under) the Poteau River, recovers Hartshorne coal from a geologic setting similar to the one at the LBA tract. Underground workings at Pollyanna 8 are essentially dry.

The risk of water loss from Club Lake to the mine workings increases with the occurrence of planned subsidence from pillar recovery (retreat) mining. Subsidence causes stress in the overlying rocks. Some rocks are brittle and break under stress and others bend (e.g., shales) but remain intact. Shale is a major component of rock under the lake, as elsewhere on the LBA tract, and it tends to bend rather than fracture in response to stress from subsidence. Nevertheless, should fractures extend up to the lake bottom creating flow paths, a substantial volume of water could enter the mine. Lake level would drop if more water is lost to the mine than can be supplied by the lake's drainage basin. A change in the volume of water stored in Club Lake could be long term. That change would reduce flow in the stream below the dam as well. These effects are more a theoretical possibility than a possible reality based on regulatory requirements for coal recovery under Club Lake as discussed in Section 3.5.2.2 and listed in Table 2-1.

Another aspect of subsidence, other than fracture-caused loss of water to underlying mine workings, would affect the volume of water stored in Club Lake. All or a portion of the lake bottom could drop about 3 feet. The storage capacity of Club Lake would increase as water level drops. Lake level is controlled by the elevation of the principle spillway on the 25-foot-tall dam. State regulations prohibit mining under dams (see Section 3.5.2.2 and Table 2-1), so that structure would not subside. The four-square-mile drainage basin of Club Lake is adequate to fill a volume of 640 acre-feet using a value for Haskell County of four acres of basin for each acre-foot of storage (NRCS 1997). Club Lake, filled up to the principal spillway, contains 618 acre-feet of water (ACOE 2018). The drainage basin is large enough to supply an additional 22 acre-feet. However, a uniform three feet of subsidence across the lake bed would increase lake volume by more than 22 acre-feet. This would permanently drop the water level below the principal spillway, and there would be no discharge from Club Lake. Much of the flow in the stream below the dam would cease. These effects are more a theoretical possibility than a possible reality based on regulatory requirements for coal recovery under Club Lake as discussed in Section 3.5.2.2 and listed in Table 2-1.

Surface water in contact with mine development waste and coal processing waste can pick up chemical constituents of those materials. Mine development waste has two components. First there would be fractured, weathered highwall rock excavated where portals for the LBA tract would be driven into the coal bed. The other component of mine development waste would be overlying or underlying rock that routinely must be removed with the coal to give enough space to operate underground mine equipment. Earth material coming out of the mine would be about half coal and half waste rock. Coal processing waste would be the finer-grained material washed from the coal at the preparation plant. The acid-forming sulfide mineral pyrite, if present, tends to be concentrated in coal processing waste.

Both mine deployment waste and coal processing waste would be deposited in a portion of the drained mine pit that has the portals. Until waste fills up to the rim of the pit, there would be no surface runoff

from the waste. Eventually, however, the pit would be filled and mounding of the waste would begin. At the end of its useful life, the waste deposit would be reclaimed in a manner that would reduce infiltration while providing an adequately thick cover of earth material that would be suitable to permanently sustain vegetation.

Surface water monitoring associated with Permit 4285F can indicate how mining the adjacent LBA tract might affect surface water quality there. For example, previous surface mining at the site of federal lease tract OKNM 108097 created a coal processing waste bank where material from the now abandoned wash plant was piled against a hill side. At least some runoff from that partially tree-covered waste bank drains into a nearby abandoned mine pit. That alkaline pit water was tested in support of the Permit 4285F application and found to have low concentrations of sulfate, iron, and manganese, and dissolved solids.

In addition to the impoundment at the abandoned coal processing site, the applicant for Permit 4285F also tested water one time from six other pits in old mine spoil. Taken together, all seven impoundments were alkaline (pH 7.34–9.24; median = 7.76) and had mostly low suspended solids (3–74 mg/L; median = 15 mg/L). Other measured concentrations were iron (0.3–21.6 mg/L; median = 2.61 mg/L), manganese (0.06–1.91 mg/L; median = 1.24), sulfate (43–850 mg/L; median = 250 mg/L), and total dissolved solids (93–930 mg/L; median = 494 mg/L). Alkalinity always exceeded acidity.

Statistically (comparison-of-medians test; 95% confidence level), abandoned pit water was significantly different from Club Lake water for all eight tested characteristics except pH and alkalinity. Constituent concentrations were higher in pit water. When compared to stream water on Permit 4285F, however, pit water had no statistically different concentrations except for iron which was significantly higher in pit water.

The geology on the LBA tract is the same as at the adjacent federal lease OKNM 108097. The quality of surface water in contact with earth material disturbed by operations at the LBA tract or in contact with mine development waste and coal processing waste from that operation would probably resemble prevailing conditions as monitored at federal lease OKNM 108097.

3.6.2.3. *Impacts of Alternative C – Reduced Tract Acreage*

Under Alternative C the BLM would lease the coal contained within the tract as reconfigured to exclude Club Lake and the dwellings surrounding Club Lake. Under this alternative, the tract would be mined using room and pillar mining methods, possibly including pillar removal (retreat) mining. The tract under this alternative spans an area approximately 940 acres in extent. By excluding the coal under Club Lake from the lease tract, the elevation and topography of the lake bottom would not change from its present state because there would be no possibility (even remotely) of subsidence. Furthermore, there would be no mine void below the lake that might possibly drain water from the lake. Mining operations conducted under Alternative C would preserve the integrity of Club Lake but otherwise affect surface water across the LBA tract in the same way as mining operations conducted under the Proposed Action.

3.6.2.4. *Cumulative Impacts of the Alternatives*

The present state of surface water features within the spatial scope of analysis is essentially a result of the area's natural topography, land uses (largely pasture and forested open space with some scattered dwellings), and past and present actions, particularly past surface mining operations and the creation of Club Lake in the 1940s. These effects are described in Section 3.6.1.

RFFAs within the spatial scope of analysis include Farrell-Cooper Mining Company's permitted mining operations on federal lease tract OKNM 108097 and mining operations on the private coal tract to the north of the LBA tract. Surface water related effects associated with mining operations on these tracts (totaling approximately 4,680 acres) are expected to be approximately the same as the effects described for the action alternatives. This is because the target coal seam in these tracts is the same as the LBA tract,

these mining activities are subject to the same regulatory requirements as mining on the LBA tract, and the mining method on these tracts is the same as that which would be employed to mine the LBA tract. However, mining operations on adjacent tracts have no potential to affect surface water quality or quantity in Club Lake because these operations would occur outside the Club Lake surface-water basin.

Leasing and mining the LBA tract under the Proposed Action or Alternative C would result in an additional 1,270 acres or 940 acres, respectively, of underground mining activity on top of the 4,680 acres of reasonably foreseeable future underground mining activity represented by anticipated mining on the OKNM 108097 federal lease tract and on the private coal tract. Implementation of the Proposed Action or Alternative C would result in a cumulative total contiguous area of underground mining activity of 5,950 acres (under the Proposed Action) or 5,620 acres (under Alternative C), respectively. The cumulative surface water effects of mining these areas using room and pillar mining methods, possibly including pillar removal (retreat) mining, would be the same as those described above for the action alternatives for reasons articulated in the previous paragraph. However, mining on the LBA tract would be the only mining-related potential influence on the surface waters in Club Lake.

3.7. Issue 5: How would leasing and mining the LBA tract affect the availability and quality of local groundwater, particularly as it relates to water wells serving dwellings associated with Club Lake?

The geographic scope of analysis associated with this issue is the OKNM 108097 federal least tract, the LBA tract, the private coal tract to the north of the LBA tract, and land to the north and west bordered by Sans Bois Creek and Kerr Reservoir, two water bodies that could intercept the local groundwater flow system (Map 7). This spatial scope of analysis was chosen because it includes the area of contiguous underground mining activity residing in one drainage basin. The temporal scope of analysis is 30-plus years. This timeframe was chosen because effects associated with this issue would extend at least this far into the future, and mining activity on the LBA tract and coal tracts adjacent to the LBA tract would occur over this timeframe.

3.7.1. Affected Environment

An Oklahoma Water Resources Board report identifies Haskell County as being within the Pennsylvanian Minor Groundwater Basin, an area characterized by Pennsylvanian-age sequences of predominately shale and siltstone that have been folded into northeast to east trending synclines and anticlines (Wilkins 1997). Basin rocks at the LBA tract include the Hartshorne Formation—here capped by the Hartshorne coal (Iannacchione and Puglio 1979)—and the overlying McAlester Formation. Groundwater in the near-surface weathered zone is unconfined, but bedrock water, principally moving through bedding planes and partings within shale, is confined (Marcher 1987). Basin-wide, groundwater recharge is mostly from precipitation falling directly on the area. On average, fresh water in the basin can be found down to a depth of 400 feet; below 400 feet, groundwater is saline (Wilkins 1997).

Locally, tilted beds exposed along the old highwall of the LBA tract offer enhanced avenues for water entry and movement. Highwalls mark the extent of surface mining and may border water-filled final-cut pits or be in contact with saturated mine spoil. Precipitation more easily infiltrates, and is better transmitted by, the fragmented rock that is mine spoil than would be the case for intact bedrock.

Groundwater within the spatial scope of analysis occurs in three settings: (1) undisturbed soils and underlying weathered rock that support a water table, (2) spoil banks of surface-mined areas that have a water table, and (3) bedrock that has confined layers with suitable properties to hold and transmit useable quantities of water. Measured hydraulic conductivity of six adjacent Permit 4285F monitoring wells ranged from 10^{-8} cm/sec (comparable to an impervious clay) to 10^{-4} cm/sec (comparable to a silt, sandy silt, or clayey sand material). Only one well tested at the low end of the range: the other hydraulic conductivities varied from 10^{-5} cm/sec to 10^{-4} cm/sec. Tested well yields ranged from 0.002 gal/min to

0.05 gal/min with all but one of the wells producing more than 0.01 gal/min. These values are very low. For context, the U.S. Department of Housing and Urban Development Handbook 4150.2 considers a well yield of 3 to 5 gal/min for older wells and a rate of 5 gal/min for new wells to be acceptable.

Private wells drilled into bedrock around Club Lake tap a local aquifer (or aquifers) of some limited but unknown areal extent. An aquifer is a saturated subsurface rock or sediment body that is sufficiently permeable to yield economic quantities of water to wells or springs. The Permit 4285F PAP does not give yield data for private wells within or near this permit boundary, but those wells in use are supplying adequate volumes of water for the owners.

Farrell-Cooper Mining Company's Permit 4285F allows the company to extract Hartshorne coal by underground mining methods from federal lease OKNM 108097. Although ODM issued Permit 4285F in 2012, no mining has yet occurred on this tract. Farrell-Cooper Mining Company's operations plan calls for draining a final-cut impoundment, cutting back a section of the highwall to expose a non-weathered rock face, and excavating portals into the coal bed. Pumps have not been able to drain the pit to date. Periodic pumping had a noticeable effect on a nearby stock pond constructed in spoil. Water level in that pond returned to normal when pit pumping stopped. This behavior demonstrates that spoil produced some 40 years ago by the surface mining along the outcrop of the Hartshorne coal can transmit substantial volumes of water.

Farrell-Cooper Mining Company, as part of the permitting process, chemically tested about 134 feet of cored rock from one borehole near where their mine portal is planned. ODM requires overburden testing to check for potentially acid-forming or other toxic characteristics. That tested overburden does not have the potential to form acid as the rock breaks down in the presence of water and oxygen. However, samples taken from three shale layers (two in the overburden deeper than 82 feet and one just under the coal bed) tested high for sodium. Excessive sodium in rocks that become spoil is primarily of concern in revegetating mined ground.

Groundwater records for the ongoing monitoring program associated with Farrell-Cooper Mining Company's Permit 4285F exist for six wells. Three of the monitoring wells are shallow (40 feet) and three are deep (160 to 175 feet). Shallow monitoring wells are screened in shale or shaly sandstone; deep wells are screened across the Hartshorne coal bed. Additionally, Farrell-Cooper Mining Company collected one sample from each of three private wells at Club Lake. Farrell-Cooper Mining Company's 2010 water-user survey for the Permit 4285F PAP identified several wells at Club Lake residences. Only three well owners agreed to have the company test their water. Depths of these three wells ranged from 50 to 65 feet with water reported to be produced from shale.

Table 3-7 summarizes 12 chemical characteristics of groundwater applicable to the LBA tract. Residential groundwater and monitoring well water (shallow and deep) are similar in that each is a sodium-bicarbonate type water. However, statistically significant differences in individual water characteristics appear when making comparisons between water sources. Statistical analysis of groundwater consisted of three sets of comparisons of medians (Mann-Whiney test): (1) residential well water versus shallow monitoring well water, (2) residential well water versus deep monitoring well water, and (3) shallow monitoring well water versus deep monitoring well water. Table 3-7 lists only those differences that are statistically significant at the 95% confidence level. The ability of the Mann-Whitney test to reject the null hypothesis (what is assumed to be true about the system under study— here it would be no difference in median values for a given constituent between water sources) is compromised because there were so few data for residential well water (see Table 3-7).

Table 3-7. Summary of groundwater data for three residential wells at Club Lake, three shallow (40 feet) monitoring wells and three deep (160 to 175 feet) monitoring wells (mg/L, milligram per liter; N, number of samples; TDS, total dissolved solids).

		Residential well water			Shallow monitoring well water			Deep monitoring well water		
Constituent	Units	N	Range	Median	N	Range	Median	N	Range	Median
pH	standard units	3	6.3–7.3	6.5	55	6.4–8.8	7.6	54	6.7–11.7	8.7
Acidity	mg/L as CaCO3	3	2–60	40	55	2–120	10	54	2–80	6
Alkalinity	mg/L as CaCO3	3	60–360	200.0	55	20–420	280	54	30–1380	308
Total iron	mg/L	3	1.08–2.52	2.41	55	0.05–9.88	0.82	54	0.04–291.2	0.76
Total manganese	mg/L	3	0.16–1.35	0.22	55	0.003–2.06	0.20	54	0.005–168.0	0.04
Sulfate	mg/L	3	81–260	90	53	2–100	9.5	53	0.3–22,000	70
Chloride	mg/L	3	15–15	15	12	4.0–42.5	10.75	11	2.5–25.0	7
Calcium	mg/L	3	24–56	24	12	20–80	50	12	4–24	8
Magnesium	mg/L	3	8.4–37.0	12	12	8–34	25.5	11	0.4–3,400	1.2
Sodium	mg/L	3	32.0–210.0	37	12	42–120	64.5	11	240–31,000	410
Potassium	mg/L	3	1.0–1.4	1.2	12	1.0–3.2	1.25	11	1–7,200	1.8
TDS	mg/L	3	220–797	225	55	108–499	405	54	208–65,000	594

A U.S. Geological Survey study of water resources of abandoned mine ground near the town of McCurtain found groundwater in the area to be alkaline (median pH 7.2 to 7.6) and of a sodium-sulfate type (Slack 1983). These findings came from four wells drilled 45- to 160-feet deep into spoil piles, one well drilled 41 feet into undisturbed ground, and one preexisting 113-foot well. The U.S. Geological Survey tested groundwater for an extensive list of constituents and properties including trace metals such as arsenic, mercury, lead, and selenium, among others. Slack (1983) reported that except for dissolved solids, iron, manganese, and sulfate, constituent concentrations generally did not exceed drinking-water limits.

3.7.2. Environmental Impacts

3.7.2.1. *Impacts of Alternative A – No Action Alternative*

Under the No Action Alternative, the BLM would not lease the coal contained within the LBA tract. As a result, movement, quality, and availability of groundwater across the LBA tract would not change from the existing state as a function of mining.

3.7.2.2. *Impacts of Alternative B – Proposed Action Alternative*

Under the Proposed Action, the BLM would lease the coal contained within the LBA tract and the coal would be mined using room and pillar mining methods, possibly including pillar removal (retreat) mining. The LBA tract under this alternative spans an area approximately 1,270 acres in extent. Section 3.5 discusses mine subsidence related effects. Underground mining, with or without subsidence (if it occurs) may affect groundwater resources. Surface operations to support underground mining may also affect groundwater resources.

Opening a stable void underground carries a risk of draining an overlying aquifer if a hydraulic connection naturally exists from void to aquifer. Aquifers of the LBA tract, if they are typical of such features found in the Pennsylvanian Minor Groundwater Basin, rely on water flow along horizontal partings within shale beds and bedding-plane separations. Vertical water transporting capacity of the shale, siltstone, and interbedded shale and sandstone overburden, as logged at holes drilled at the adjacent

federal lease tract OKNM 108097, are anticipated to be low on the LBA tract. Shale and shale-rich beds act as confining units relative to vertical water movement through a body of rock. The thicker the confining beds, the less likely there will be vertical water flow.

Subsidence is an event that could create a vertical pathway necessary to drain an overlying aquifer. Pillars of coal that have lost volume to secondary coal recovery or pillar removal (retreat) mining soon crumble. Pillar failure leads to mine roof collapse. The mine void becomes filled with rubble and fractures extend beyond the rubble zone into the overlying rocks. Shale, by its tendency to bend, can accommodate a level of stress that would fracture more brittle rocks. Consequently, shale beds tend to inhibit the upward extension of fractures.

Even if subsidence-generated vertical fractures do not intercept an overlying aquifer, groundwater in subsided wells would be affected. Subsidence widens bedding plane separations and shale partings. Initially water level in an affected well drops as water moves out of the well to fill the newly created volume. This decline in water level would probably be transient because the aquifer would still be recharged by horizontal water flow, but now that flow would be through an enhanced system of the bedding plane separations and partings.

A groundwater-quality aspect of the Proposed Action involves surface operations that support an underground mine at the LBA tract. Chief among these would be activity at the coal preparation plant and work done to dispose of mine development waste and coal processing waste. The preparation plant and waste disposal site would be near the mine portal, presently the site of an 11-acre impoundment about 3,800 feet east of Club Lake. Part of the drained pit could be filled with mine waste. Some of that waste would be rock excavated from the exposed pit highwall, a one-time input to the disposal pit. Rock from above or below the coal bed, or from both locations, on the other hand, would be brought out of the mine on a continuing basis to ensure that underground workings have enough head space for the mining equipment. Limited overburden testing done on federal lease OKNM 108097 suggests that the rock produced with the coal could be sodic in its disposal setting depending on how much is innocuous roof rock and how much is sodium-rich floor rock.

The other input to the disposal area would be coal processing waste. This material often has acid-generating potential because it concentrates iron sulfide minerals washed from the coal. A state-issued mining permit would require the permittee to isolate these potentially toxic materials from the groundwater system. To that end, earth materials with very low permeability could be used to line disposal areas. Similar earthen material could be a component of a 4-foot-thick cap over the refuse. The upper portion of the refuse would be tested and, if found to be potentially acidic, neutralized with agricultural limestone or if sodic, treated with ground gypsum before it is capped and a soil/rooting layer is put in place to support an approved postmining land use.

Another process that helps preserve existing groundwater quality is addressed in Oklahoma mining regulations. The state requires mine entries to be sealed when underground mining operations are complete (O.A.C. 460:20-45-6). Sealed entries reduce the possibility that groundwater or surface water that had been in contact with mine waste would spread into undisturbed bedrock where it might eventually reach a well. If groundwater quality is not preserved, then replacement may be necessary. Oklahoma coal regulations require the permittee to replace drinking, domestic, or residential water supply that has been contaminated, diminished, or interrupted by underground mining activities (O.A.C. 460:20-45-8(j)).

A mine permittee would have to regularly test water produced from monitoring wells. Ground-water testing would continue throughout the mining and reclamation phases until the state releases the permittee from final reclamation liability and returns the bond.

Approximately 30 acre-feet of water would be used annually for dust suppression and coal washing. Water for these uses is likely to be supplied from local impoundments. These water bodies are in mine spoil or are water-filled final-cut impoundments left over from old unregulated surface-mining operations. Abandoned impoundments receive water from surface runoff and groundwater flow out of old mine spoil. A continuous belt of mine spoil extends for miles along the subcrop of the Hartshorne coal bed. Given the large volume of spoil that could potentially supply water to on-site impoundments, 30 acre-feet of annual water use is unlikely to noticeably change groundwater availability in either bedrock wells or other wells that might have a more direct hydrologic connection to saturated mine spoils.

3.7.2.3. *Impacts of Alternative C – Reduced Tract Acreage*

Under Alternative C the BLM would lease the coal contained within the tract as reconfigured to exclude Club Lake and the dwellings surrounding Club Lake. Under this alternative, the tract would be mined using room and pillar mining methods, possibly including pillar removal (retreat) mining. The tract under this alternative spans an area approximately 940 acres in extent. Under this alternative, federal coal under Club Lake would remain un-mined, so there would be no mine void, either open or rubble-filled, into which the aquifer (or aquifers) tapped by Club Lake wells might drain. The hydrogeologic setting is such that aquifers beneath the LBA tract and adjacent land are probably isolated. Consequently underground mining outside the Club Lake area is unlikely to affect Club Lake wells. Mining operations conducted under Alternative C would otherwise affect groundwater across the LBA tract and adjacent areas in the same way as mining operations conducted under the Proposed Action.

3.7.2.4. *Cumulative Impacts of the Alternatives*

The present state of groundwater resources within the spatial scope of analysis is essentially a result of the area's surface soil characteristics, underlying geology, and past and present actions, particularly past surface mining operations. These effects are described in Section 3.7.1.

RFFAs within the spatial scope of analysis include Farrell-Cooper Mining Company's permitted mining operations on federal lease tract OKNM 108097 and mining operations on the private coal tract to the north of the LBA tract. Groundwater related effects associated with mining operations on these tracts (totaling approximately 4,680 acres) are expected to be approximately the same as the effects described for the action alternatives. This is because the target coal seam in these tracts is the same as the LBA tract, these mining activities are subject to the same regulatory requirements as mining on the LBA tract, and the mining method on these tracts is the same as that which would be employed to mine the LBA tract. However, mining operations on adjacent tracts have no potential to effect groundwater quality or quantity around Club Lake because these operations would not occur under or in close proximity to Club Lake.

Leasing and mining the LBA tract under the Proposed Action or Alternative C would result in an additional 1,270 acres or 940 acres, respectively, of underground mining activity on top of the 4,680 acres of reasonably foreseeable future underground mining activity represented by anticipated mining on the OKNM 108097 federal lease tract and on the private coal tract. Implementation of the Proposed Action or Alternative C would result in a cumulative total contiguous area of underground mining activity of 5,950 acres (under the Proposed Action) or 5,620 acres (under Alternative C), respectively. However, because the hydrogeologic setting in the area is such that aquifers beneath the LBA tract and adjacent land are probably isolated, mining on the LBA tract would not contribute, incrementally, to groundwater related effects associated with mining adjacent tracts.

3.8. Issue 6: What economic impacts would leasing and mining the LBA tract have on the population of Haskell and LeFlore counties, Oklahoma?

The LBA tract lies on the county line between Le Flore and Haskell counties, with roughly the western two thirds of the tract in Haskell County, and the eastern third in Le Flore County. This two county area is

the area of analysis for this issue because it contains the LBA tract and the reasonably foreseeable coal haulage route and transshipping point. This two county area is the most likely source of locally contracted labor and services, as well as the area most likely to experience direct and indirect economic effects from leasing and mining the tract. The temporal scope of analysis is the life of coal mining operations on the LBA tract because economic impacts of leasing and mining the tract would last no longer than the life of mining on the tract. The majority of demographic, income, and socioeconomic profile data used in this analysis are from the Economic Profile System-Human Dimensions Toolkit (EPS). The EPS is a publically available, online, social and economic data portal, which uses data from multiple other sources such as the U.S. Census Bureau, the Bureau of Labor Statistics, and the American Community Survey, to generate social and economic profiles of selected areas within the U.S.

3.8.1. Affected Environment

Coal development in Oklahoma began in approximately 1873 and has persisted, intermittently, since that time (Oklahoma Historical Society 2018). Average annual coal production in Oklahoma between 2010 and 2016 was 970,032 tons (ODM 2018). During that six year reporting period, Oklahoma coal production trended downward from a production high of 1,174,572 tons in 2011 to 670,610 tons in 2016 (ODM 2018b). Five mines produced coal in Oklahoma in 2016 (ODM 2018). These mines are located in Craig, Haskell, Le Flore, and Okmulgee counties (ODM 2018). BLM leases of federally owned coal deposits in Oklahoma account for approximately 400,000 tons of coal mined in Oklahoma annually. The general area of southeastern Oklahoma was historically surface mined for coal. The LBA tract contains a reclaimed surface mining area. Remnants of the earlier surface mining events on the tract are visible on aerial photography.

Le Flore and Haskell counties, Oklahoma, are primarily rural and agricultural, and both exhibit a relatively low population density. The two counties are below the state average for both per capita and household income levels. Table 3-8 provides demographic information for each county including population figures, major employment sectors, average per capita income, and median household income.

Table 3-8. Demographic information for Haskell and LeFlore counties, Oklahoma.

	HASKELL COUNTY	LEFLORE COUNTY
County Population (2016)	12,577 people	49,885 people
Largest Population Center	Stigler (2,700 people)	Poteau (8,700 people)
Major Employment Sectors	Government Services, Education, Health Care, Agriculture	Agriculture, Forestry (includes mining), Construction, Education, Health Care, Light Manufacturing
Average Per Capita Income (2016 $)	$18,735 [1]	$19,138 [1]
Median Household Income (2016 $)	$36,067 [2]	$37,548 [2]

[1] For comparison, the average per capita income level for the state of Oklahoma is $25,628 in 2016 dollars.

[2] For comparison, the median household income level for the state of Oklahoma is $48,038 in 2016 dollars.

3.8.2. Environmental Impacts

Mining the LBA tract under the Proposed Action or Alternative C would require personnel, material, and services. Surface facilities would be constructed to facilitate underground mining of the coal deposit. Specialized and general labor would be required for construction, production, and haulage of mined coal. Some employees would be hired locally, having immediate impacts on local economies. As mine operations begin after the initial construction phase, specialized personnel would be obtained either locally from nearby mining operations, or would be hired non-locally and brought into the area of analysis. Given the current lack of underground mining in the immediate area, BLM estimates that roughly 60% of skilled positions (e.g., miner operator, scoop operator, bolters, etc.) would have to be brought in from other operations, at least initially. Other skilled positions (e.g., electricians and

mechanics) may be available locally, as would laborers and truck operators. During mining operations as described in Chapter 2, it is also assumed that some supplies and contract services would be obtained from the area of analysis, resulting in indirect and induced contributions to local economies. Ultimately, the execution of mining operations under either action alternative would have economic impacts in Haskell and LeFlore counties through all phases of operation.

3.8.2.1. *Impacts of Alternative A – No Action Alternative*

Under the No Action Alternative, the BLM would not lease the coal contained within the LBA tract. As a result, federal coal deposits would remain in the ground and there would be no potential for economic effects associated with the tract.

3.8.2.2. *Impacts of Alternative B – Proposed Action Alternative*

Under the Proposed Action, the BLM would lease the coal contained within the LBA tract and the coal would be mined using room and pillar mining methods, possibly including pillar removal (retreat) mining. Mining the tract would require the construction of surface facilities. Construction of these facilities is estimated to take a crew of 40 people roughly three months to complete. After completion of the surface facilities, extraction of coal deposits would begin.

An estimated 3.28 million tons of recoverable coal are present on the tract. At an annual production rate of 200,000 to 400,000 tons of coal per year this equates to a mine life of approximately eight to 16 years. At the low end of the range (200,000 tons per year), labor estimates are for one 10 hour shift per day, five days per week, employing 43 people, including administrative and managerial staff, underground crew, surface crew, and truck drivers for hauling the extracted coal from the mine to the Port of Keota. At the high end of the range (400,000 tons per year), it is estimated that the mine would have to run two 10 hour shifts per day, requiring a total of 81 employees per two-shift day, five days a week. Based on the pay scales of other coal mines currently operating in southeastern Oklahoma, the BLM conservatively estimates hourly wages to range from 16 to 20 $/hour for non-supervisory personnel. These employment numbers and wage data were used as the basis for modelling economic impacts to local communities. The BLM uses IMPLAN as the economic modelling tool to analyze the estimated economic impacts from proposed actions.

A range of average individual compensation was calculated using a basic overhead rate of 45% for the lower end, and using an annualized labor income figure from IMPLAN as the upper limit. These estimates of annual compensation per employee for the Proposed Action ranged from $45,178/year to $83,238/year. Per capita income levels in the area of analysis are approximately 34%-37% lower than the per capita income for Oklahoma. Table 3-9 illustrates the average per capita incomes for the area of analysis and the estimated average annual income (lower end) of a mine employee, based on previously stated assumptions. It is clear that even conservatively low estimates of income levels for the Proposed Action would result in positive economic impacts in the area of analysis.

Table 3-9. Comparison of average per capita income with estimated annual compensation for LBA tract workers.

	LE FLORE CO. (2016$)	HASKELL CO. (2016$)	OKLAHOMA (2016$)	LBA TRACT ESTIMATE [1]
Per capita income (2016$)	$19,138	$18,735	$25,628	$45,178

[1] Estimated average annual individual mine employee income before taxes, additional compensation, and proprietor expenses (2018$).

In addition to direct compensation paid to employees, which are considered direct impacts to the local economy, economists also estimate indirect and induced economic effects. These are effects that result from personal and business spending in the area of analysis that can be attributed to implementation of the Proposed Action. Table 3-10 provides the IMPLAN model estimates of direct, indirect, and induced economic effects for the Proposed Action. The IMPLAN results are estimates only, and are based on the

number of employees and life of mine figures presented earlier. The IMPLAN model, however, annualizes dollar outputs for the estimated life of the mine under the Proposed Action, and adds proprietor income, overhead, and other variables to income levels. These estimates should not be taken as fact, but viewed as potential inputs to the local economy from implementation of the Proposed Action.

Table 3-10. Estimates of LBA tract economic impacts on area of analysis, IMPLAN (2015 data), Le Flore and Haskell counties (combined model).

ANNUAL OPERATING IMPACTS (2018$) - 200,000 TONS/YEAR				
IMPACT TYPE	**EMPLOYMENT**	**LABOR INCOME**	**VALUE ADDED**	**OUTPUT**
Direct Effect	43	$3,581,182	$16,276,796	$34,198,399
Indirect Effect [1]	29.2	$1,423,207	$2,815,679	$5,360,355
Induced Effect [2]	16.8	$492,399	$1,031,239	$1,994,802
Total Effect	89	$5,496,788	$20,123,714	$41,553,556
ANNUAL OPERATING IMPACTS (2018$) - 400,000 TONS/YEAR				
IMPACT TYPE	**EMPLOYMENT**	**LABOR INCOME**	**VALUE ADDED**	**OUTPUT**
Direct Effect	81	$6,745,947	$30,660,942	$64,420,246
Indirect Effect [1]	55	$2,680,926	$5,303,954	$10,097,414
Induced Effect [2]	31.7	$927,542	$1,942,566	$3,757,649
Total Effect	167.7	$10,354,415	$37,907,462	$78,275,309

[1] Indirect Effects: measure economic activity generated in sectors within the county that support (i.e., with supply goods and services) the mine.

[2] Induced Effects: measure the economic activity generated in sectors within the county due to employees (both at the coal mine and in the indirect sectors) spending their income (on things like food and housing).

The development of the Proposed Action would result in positive economic impacts to the area of analysis for the life of the mining on the LBA tract. Direct, indirect, and induced economic impacts could be anticipated to increase per capita and household income levels in the area of analysis. It can be reasonably anticipated that increased income levels and resulting increased tax revenues may improve the general quality of life in the area of analysis.

3.8.2.3. *Impacts of Alternative C – Reduced Tract Acreage*

The economic impacts of Alternative C would be the same as Alternative B because annual production from the LBA tract is anticipated to be the same under both alternatives. However, the life of mining on the LBA tract would be less under Alternative C because fewer tons of recoverable coal (2.59 million tons versus 3.28 million tons) would be leased under this alternative. This would result in a shorter duration of economic contributions to local economies. The life of mining on the LBA tract under Alternative C would be 6-12 years, compared to 8-16 years for Alternative B. Under Alternative C, annualized economic impacts to Haskell and Le Flore counties would be positive, but for a shorter length of time, relative to Alternative B.

3.8.2.4. *Cumulative Impacts of the Alternatives*

Haskell and LeFlore counties are primarily rural and agricultural in nature. As described in Section 3.8.1, major employment sectors in both counties include agriculture, health care, and education. In Haskell County government services is also a major employment sector. Likewise, in LeFlore County, forestry (including mining), construction, and light manufacturing are also major employment sectors. Average per capita and median household incomes in both counties are well below values for the state of Oklahoma as a whole (Table 3-8).

RFFAs expected to contribute to economic effects in Haskell and LeFlore counties include the following:

- continuation of economic activities currently operating within the economy of each county,
- permitted mine operations at federal lease tract OKNM 108097,
- development of the private coal tract to the north of the LBA tract,
- mining at Farrell-Cooper Mining Company's Liberty Mine near Stigler, Oklahoma, and
- mining at GCI's Pollyanna mine near Spiro, Oklahoma.

The continuation of economic activities currently operating within the economy of each county is expected to contribute to ongoing economic effects as described in Section 3.8.1. Assuming that mining activities occur concurrently rather than consecutively, reasonably foreseeable future mining operations enumerated above are expected to collectively create positive economic effects (employment, wages, indirect and induced effects) similar to those described in Section 3.8.2. Likewise, assuming that mining of the LBA tract under either action alternative (if it is leased) occurs concurrently with the aforementioned reasonably foreseeable future mining operations the effects of leasing and mining the LBA tract described in Section 3.8.2 would be additive to the effects of RFFAs. In general, the development of the Proposed Action or Alternative C, in combination with RFFAs, would result in positive economic impacts to the area of analysis for the life of the mining on the LBA tract.

3.9. Issue 7: What impacts would leasing and mining the LBA tract have on property values and associated quality of life concerns on and in the vicinity of the LBA tract and in Haskell County?

Haskell County encompasses one of two components of the area of analysis for this issue. Haskell County was chosen as one component of the area of analysis because the bulk of mining operations on the LBA tract would occur in Haskell County and because the reasonably foreseeable coal haulage route occurs in Haskell County. The second component of the area of analysis for this issue is the LBA tract and a one-mile buffer around the LBA tract (Map 8). This component of the area of analysis was chosen because it is the mostly likely to experience changes in property values and quality of life as a result of leasing and mining the LBA tract. The temporal scope of analysis associated with this issue is the life of coal mining operations on the LBA tract. This timeframe was chosen because impacts associated with this issue would cease upon completion of mining operations on the LBA tract.

For this analysis, a definition of "quality of life" has been adapted from Greenwood, (n.d.): "a feeling of well-being, fulfillment, or satisfaction resulting from factors in the external environment." This definition was chosen because of the general lack of data available on quality of life issues for the area of analysis, and the explicit focus on external environmental factors. External environmental factors can be more readily and consistently recognized by observers than can more subjective variables based on individual perception. There are many ways of defining "quality of life". The number of variables that may contribute to any individual's assessment of "quality of life" is subjective and, in many instances, relative to a specific action (Barcaccia 2013).

3.9.1. Affected Environment

Median property values in Haskell County, Oklahoma are estimated at $85,500 (Data USA 2018). Based on a brief review of real estate advertised for sale on Zillow.com (accessed on July 29, 2018), asking prices for real estate currently available range from as little as approximately $4,500 (for a small lot/land with a small dwelling on it) near McCurtain to as much as $1,482,000 (for a large lot/land with a small dwelling on it) near Lequire. There are no available formal quality of life survey data for Haskell County. However, based on a cursory review of real estate descriptions provided for real estate advertised on Zillow.com quality of life factors include proximity to recreational opportunities such as boating, fishing, and hunting, and the presence and availability of water bodies, forested landscapes, and rolling hills. As with many rural areas, this analysis assumes that clean air and water, natural quiet, and a general lack of congestion on area roads (see Table 1-2) are also important aspects of quality of life in Haskell County.

The basic socioeconomic and demographic characteristics of Haskell County are described in Section 3.8.1.

There are several dwellings on the LBA tract, particularly surrounding Club Lake. Club Lake is a reservoir fed by a spring upslope and to the east of the lake itself. Club Lake may have originally been established to provide water for the historic surface mining in the area in the mid to late-1940s, but its origins are unclear. Club Lake is a members-only residential and recreational enterprise. Members of the Club Lake community have seasonal or year-round residences on or near the shores of the lake, and use the lake and its environs for recreational pursuits such as fishing, boating, and swimming. Additionally, the residences in the Club Lake community incorporate the lake as a vital part of the viewshed for each property, and the presence of the lake has served as a focal point for the community which has grown around this water feature. The majority of property owners around the lake rely on personal water wells for residential water. The Club Lake community is located in the southwestern quarter of the LBA tract, in Haskell County. There are no available data on property values for properties surrounding Club Lake.

3.9.2. Environmental Impacts

3.9.2.1. *Impacts of Alternative A – No Action Alternative*

Under the No Action Alternative, the BLM would not lease the coal contained within the LBA tract. As a result, federal coal deposits would remain in the ground and there would be no potential for property value or quality of life effects associated with the tract.

3.9.2.2. *Impacts of Alternative B – Proposed Action Alternative*

Under the Proposed Action, the BLM would lease the coal contained within the LBA tract and the coal would be mined using room and pillar mining methods, possibly including pillar removal (retreat) mining. An estimated 3.28 million tons of recoverable coal are present on the 1,270-acre tract. At an annual production rate of 200,000 to 400,000 tons of coal this equates to a mine life of approximately eight to 16 years. Coal mined from the tract would be hauled via truck to the Port of Keota for eventual delivery to market. The reasonably foreseeable coal haulage route is described in Section 2.2.4. The effects of leasing and mining the LBA tract with respect to property values and quality of life concerns are inextricably linked with the effects of leasing and mining the LBA tract with respect to the other issues. As a result, in Table 3-11 this analysis primarily summarizes the main conclusions from the analyses of the other issues and applies those conclusions in the analysis of impacts to property values and quality of life concerns. Additional, supporting analysis is also provided below Table 3-11.

Table 3-11. Summary of conclusions from analysis of other issues and application to the Issue 7 analysis.

ISSUE ANALYSIS CONCLUSIONS	ISSUE 7: PROPERTY VALUE EFFECTS BASED ON ANALYSIS CONCLUSIONS OF OTHER ISSUES	ISSUE 7: QUALITY OF LIFE EFFECTS BASED ON ANALYSIS CONCLUSIONS OF OTHER ISSUES
Issue 1: Less than a 1% increase in Oklahoma, U.S., and global GHG emissions as a result of implementation of either the Proposed Action or Alternative C.	There is no known mechanism by which an increase in GHG emissions of less than 1% in the context of Oklahoma, U.S., and global emissions would result in changes in property values and/or quality of life in the area of analysis.	
Issue 2: Estimated 0.02%, 1.8%, and 0.81% increase in PM_{10} emissions in Oklahoma, Haskell County, and LeFlore County, respectively. Haskell and LeFlore counties would continue to be in attainment of PM_{10} standards.	In the context of Oklahoma, Haskell County, and LeFlore County an increase in PM_{10} emissions is unlikely to result in changes in property values or in quality of life, particularly given that these areas would continue to be in attainment of PM_{10} standards. On the other hand, localized (i.e., prior to wide spread dispersion or settling) and persistent emissions from mining operations and coal haulage near properties may result in a decline in property values and quality of life for these residents during the life of mining of the LBA tract (8-16 years under the Proposed Action; 6-12 years under Alternative C).	

Table 3-11. Summary of conclusions from analysis of other issues and application to the Issue 7 analysis.

ISSUE ANALYSIS CONCLUSIONS	ISSUE 7: PROPERTY VALUE EFFECTS BASED ON ANALYSIS CONCLUSIONS OF OTHER ISSUES	ISSUE 7: QUALITY OF LIFE EFFECTS BASED ON ANALYSIS CONCLUSIONS OF OTHER ISSUES
Issue 3: Under the Proposed Action regulatory mechanisms would prevent a situation in which subsidence would be permitted under Club Lake and other sensitive areas (e.g., other surface waters, wells, structures). Planned subsidence is most likely to occur in forested areas, pastures, and similar locations. Under Alternative C there is no possibility, even remotely, that subsidence could occur as a function of mining under Club Lake and the dwellings surrounding Club Lake because this portion of the tract is removed under Alternative C. Areas of the tract that are configured the same under both action alternatives would be subject to the same effects.	Under the Proposed Action, regulatory mechanisms would prevent a situation where subsidence would be permitted under Club Lake and other sensitive areas on the LBA tract. However, these mechanisms may not alter perceptions concerning underground mining's possible surface effects in these sensitive areas. As a result, mining under Club Lake and other sensitive areas may still result in a decrease in property values for properties on the LBA tract even if subsidence would not occur. In addition, planned subsidence is a possibility outside of sensitive areas on the tract. These properties may decrease in value as a result of planned subsidence even in the absence of surface water features, wells, structures, etc. Under Alternative C there is no possibility, even remotely, of subsidence under Club Lake and the dwellings surrounding Club Lake. As a result the perception related potential influences on property values are unlikely to be a factor under Alternative C in the Club Lake area. On other portions of the tract that are configured the same under Alternative C as under the Proposed Action these perception related and possible subsidence related influences on property values would be the same between the two alternatives.	Under either action alternative subsidence is not an anticipated outcome under Club Lake and other sensitive areas on the tract. As a result, effects associated with Issue 3 are unlikely to have an influence on the quality of life of individuals residing on and using these portions of the LBA tract's surface. Planned subsidence outside of sensitive areas on the tract may result in a decrease in quality of life for owners/users of these areas, particularly if planned subsidence were to result in a change in the way these lands can be used and the positive attributes they provide to owners/users.
Issue 4: Material damage to the water flowing into, stored within, and discharging from Club Lake is not anticipated as a result of regulatory mechanisms preventing this outcome.	The property value and quality of life related effects associated with Issue 4 would be the same as the property value and quality of life related effects associated with Issue 3. This is because the primary mechanisms for effects between these issues are the same.	
Issue 5: Material damage to groundwater resources, particularly concerning groundwater in wells on the tract (especially wells serving dwellings surrounding Club Lake) is not anticipated as a result of regulatory mechanisms preventing this outcome.	The property value and quality of life related effects associated with Issues 5 would be the same as the property value and quality of life related effects associated with Issue 3 and Issue 4. This is because the primary mechanisms for effects between these issues are the same.	
Issue 6: Leasing and mining the LBA tract would result in a positive direct, indirect, and induced economic effect in Haskell and LeFlore counties.	While positive direct, indirect, and induced economic effects are likely to increase the buying power of residents in the area of analysis these effects would not translate directly to changes in the value of property.	Positive direct, indirect, and induced economic effects are likely to increase the quality of life for residents in the area of analysis. These effects would persist for 8-16 and 6-12 years under the Proposed Action and Alternative C, respectively.
Issue 8: Leasing and mining the LBA tract would result in a 27% to 34% increase in bituminous coal production in Oklahoma for the life of mining of the LBA tract under either action alternative.	An increase in bituminous coal production in Oklahoma, in and of itself, cannot be shown to impact property values and/or quality of life concerns in the area of analysis. Changes in property values and quality of life concerns, would depend on site specific effects of mining operations.	

Surface effects from subsidence as a result of underground mining activity is one of the primary drivers of concern associated with possible changes in property values and quality of life. Subsidence associated

with mining and other activities has been found to have generally neutral or negative impacts on property values (Yoo and Frederick 2017; Bennett 2013). Other studies have shown that mining and related issues, such as subsidence and ground water loss, often engender negative perceptions of mining activities, which result in lower property prices near mining operations (Kern et. al 2002; USGS 1983; Williams 2011). Given the variable and changing nature of real property markets in the area of analysis, it is difficult to provide predictions of specific changes in property values, other than to say such changes would most likely be negative, neutral, or positive, based on research from similar situations elsewhere. Conversations between residents of the Club Lake community and BLM staff indicate that the residential corporation members around Club Lake are concerned about continued use and appearance of the lake itself for purposes of aesthetics and setting, as well as water wells that serve the residences. Mining activity that might reduce water quality and quantity in the lake or in residential wells near the lake, would probably negatively impact property values and quality of life in the area.

Coal haulage on the reasonably foreseeable coal haulage route (see Section 2.2.4) is another primary driver of concern associated with possible changes in property values and quality of life. Coal haulage is anticipated to generate approximately 30 to 60 truck round trips per day on these roadways for eight to 16 years. This increased traffic may introduce higher levels of noise, dust, and traffic congestion, relative to current conditions. Examination of aerial photography of the LBA tract, as well as photographs taken during a field reconnaissance visit to the area of analysis, show some residences within 20-40 feet of County Road 1275. County Road 1275 is the primary access to residences along the south shore of Club Lake, and is currently unpaved. The introduction of 25-ton coal trucks to a section of County Road 1275, which is relatively narrow, could have negative impacts to the quality of life of local residents. Several external environmental quality of life variables that may be impacted by coal haulage, include the following:

- Open space, not occupied by buildings or other artificial structures,
- natural surroundings, including greenery and animal presence and sounds (birds, small mammals),
- level of human caused noise
- air quality, particularly PM_{10} (dust) emissions, for residents in the area of analysis,
- water quality for residents in the area of analysis, and
- ease of access to properties

The degree of impact to any of these variables for a specific property or individual would depend on a wide range of factors, including (but not limited to) full or part time residency, uses of the property, distance from the coal haulage route, density of natural vegetation on and around the property, distance from current neighbors, and distance to the Club Lake shore. Dust can be mitigated in a number of ways, including paving County Road 1275, or using some other means of dust control, such as water. Intrusive levels of noise can be mitigated through limiting times and days of truck usage, or by the erection of sound barriers. The proximity of some residences to County Road 1275 would decrease the effectiveness of sound barriers. Traffic congestion can be mitigated through control of times of haulage, and also by widening haulage routes, or by constructing passing areas or "turn outs" along haulage routes. Another possibility is the selection or construction of a different haulage route that would avoid the Club Lake community altogether. The acceptability and feasibility of any mitigation measures would have to be determined by negotiation between the successful bidder and local residents, prior to commencement of mine operations.

3.9.2.3. *Impacts of Alternative C – Reduced Tract Acreage*

Under Alternative C, the BLM would lease the coal contained within the LBA tract as reconfigured to exclude Club Lake and the dwellings surrounding Club Lake. An estimated 2.59 million tons of recoverable coal are present on the 940-acre tract under this alternative. At an annual production rate of 200,000 to 400,000 tons of coal per year this equates to a mine life of approximately six to 12 years.

Mining methods and elements of coal haulage would be the same under this alternative as under the Proposed Action. The property value and quality of life related impacts of Alternative C would be the same as those discussed in the analysis of impacts of the Proposed Action. The discussion above, particularly in Table 3-11, accounts for the differences between the action alternatives.

3.9.2.4. *Cumulative Impacts of the Alternatives*

Haskell County is primarily rural and agricultural in nature. As described in Section 3.9.1, median property values in Haskell County are estimated at $85,000 (Data USA 2018) with currently advertised real estate asking prices ranging widely, from as little as approximately $4,500 to as much as nearly $1.5 million. Property values on the tract, particularly around Club Lake, are unknown. Based on available information, external factors currently influencing the quality of life of residents in Haskell County and around Club Lake include clean air and water, natural quiet, lack of congestion on area roads, the presence of open spaces including pastures and forested landscapes and rolling hills, and opportunities for boating, fishing, and hunting.

RFFAs that may influence property values and quality of life concerns in the area of analysis include the following:

- continuation of activities currently operating within Haskell County,
- permitted mine operations at federal lease tract OKNM 108097,
- development of the private coal tract to the north of the LBA tract, and
- mining at Farrell-Cooper Mining Company's Liberty Mine near Stigler, Oklahoma.

The continuation of activities currently operating within Haskell County is expected to contribute to ongoing property value and quality of life effects as described in Section 3.9.1. Assuming that mining activities occur concurrently rather than consecutively, reasonably foreseeable future mining operations enumerated above are expected to contribute to impacts on property values and quality of life concerns similar to those described in Section 3.9.2. However, there would be no relationship between the effects of mining at the Liberty 8 Mine and Club Lake because the Liberty 8 Mine is not located in proximity to Club Lake.

Assuming that mining of the LBA tract under either action alternative (if it is leased) occurs concurrently with the aforementioned reasonably foreseeable future mining operations, the effects of leasing and mining the LBA tract described in Section 3.9.2 would be additive to the effects of RFFAs. This is particularly true for the RFFAs that are contiguous with the LBA tract (permitted mine operations at OKNM 108097 and the private coal tract to the north of the LBA tract).

3.10. Issue 8: What affect would leasing and mining the LBA tract have on the production of bituminous coal within Oklahoma and on the availability of bituminous coal in the international market place?

The geographic and temporal scopes of analysis are the State of Oklahoma and the reasonably foreseeable production lifespan of mining on the LBA tract (approximately 6-16 years depending on the annual rate of production and the alternative), respectively. The State of Oklahoma was chosen as the geographic scope of analysis because the primary reasonably foreseeable environmental and socioeconomic effects of leasing and mining coal from the LBA tract are largely confined to the State of Oklahoma. The production lifespan of mining on the LBA tract was chosen as the temporal scope of analysis because mining of the LBA tract would not contribute to coal production within Oklahoma past this timeframe. U.S. exports of bituminous coal and worldwide bituminous coal production are also provided as points of context in the analysis.

3.10.1. Affected Environment

Coal production in Oklahoma began in the first half of the 1870s and has persisted, intermittently, since that time (Oklahoma Historical Society 2018). In 2017 there were seven active coal mines operating in the State of Oklahoma. These mines produced a total of approximately 634,452 tons of coal that year (ODM 2018). All of these mines produce bituminous coal. Bituminous coal has industrial production uses for steel (metallurgy), cement, and lime. Electrical power generation is also a possible use of this coal, though it is generally not preferred. Average annual coal production in Oklahoma between 2010 and 2017 was 928,085 tons while total coal production over this timeframe was 7,424,677 tons (ODM 2018). Table 3-12 reports total annual coal production in the State of Oklahoma for the years 2010-2017 as well as total and average annual coal production over this time period. In 2017, the U.S. exported approximately 55,300,000 tons of metallurgical grade bituminous coal from all U.S. coal mines (EIA 2018). In 2016, an estimated one billion tons of metallurgical grade bituminous coal were produced worldwide (International Energy Agency [IEA] 2017).

Table 3-12: 2010-2016 Oklahoma Coal Production (tons).

YEAR	ANNUAL TONNAGE
2010	978,842
2011	1,174,572
2012	1,075,070
2013	1,167,208
2014	927,064
2015	796,859
2016	670,610
2017	634,452
Total Oklahoma Coal Production (2010-2017)	7,424,677
Average Oklahoma Coal Production (2010-2017)	928,085

Sources: ODM 2018

3.10.2. Environmental Impacts

3.10.2.1. *Impacts of Alternative A – No Action Alternative*

Under the No Action Alternative, the BLM would not lease the coal contained within the LBA tract. As a result, federal coal deposits would remain in the ground and coal contained within the tract would not contribute to Oklahoma's bituminous coal production. Further, the coal contained within the tract would not contribute to the availability of bituminous coal in the international market place

3.10.2.2. *Impacts of Alternative B – Proposed Action Alternative*

Under the Proposed Action, the LBA tract would be leased and underground mining methods would be used to produce an estimated 200,000-400,000 tons of bituminous (metallurgical) coal annually. Total recoverable coal from the LBA tract under the Proposed Action is estimated to be 3,276,000 tons which, depending on the level of annual production, translates to approximately 8-16 years of mining activity associated with the LBA tract. Leasing and mining the LBA tract under the Proposed Action would increase the annual production of bituminous (metallurgical) coal in Oklahoma and in the international marketplace by approximately 21%-43% and between 0.019% and 0.037%, respectively. This contribution of 200,000-400,000 tons to the annual production of bituminous coal in Oklahoma and to the annual production of bituminous coal in the international marketplace would be sustained for the estimated 8-16 year life of mining on the LBA tract under this alternative. All coal produced in Oklahoma in 2016 was bituminous coal. Whereas, not all bituminous coal produced is used for metallurgical purposes, production of bituminous coal from the LBA tract has been identified by Evans as a source for

metallurgical use. Table 3-13 depicts the reasonably foreseeable effects of leasing and mining the LBA tract on metallurgical coal production in Oklahoma, the United States, and worldwide.

Table 3-13: Effect of Leasing and Mining LBA Tract

LBA TRACT LEASING & MINING PRODUCTION METRICS	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Annual Production (short tons)	0	200,000-400,000	200,000-400,000
Life of Mining of LBA Tract (years)	0	8-16	6-12
Total Recoverable Coal (short tons)	3,276,000	3,276,000	2,592,000
% OK Annual Increase (based on average annual production for the years 2010-2016)	0	21%-43%	21%-43%
% U.S. Export Annual Increase (Metallurgical Coal)	0	0.36%-0.72%	0.36%-0.72%
% Global Annual Increase (Metallurgical Coal)	0	0.019 %-0.037%	0.019 %-0.037%

Sources: EIA 2018, EIA 2016, EIA 2017, IEA 2017

3.10.2.3. *Impacts of Alternative C – Reduced Tract Acreage*

Under Alternative C, the LBA tract would be leased and underground mining methods would be used to produce an estimated 200,000-400,000 tons of bituminous (metallurgical) coal annually. Total recoverable coal from the LBA tract under Alternative C is estimated to be 2,592,000 tons which, depending on the level of annual production, translates to approximately 6-12 years of mining activity associated with the LBA tract as configured under this alternative. On an annual basis the effects of Alternative C would be the same as Alternative B, because annual production from the LBA tract is anticipated to remain constant over the production life of the LBA tract regardless of the alternative (Table 3-13). However, because there is less total available recoverable coal under Alternative C, the production life of the LBA tract would decrease by 2-4 years compared with the Proposed Action.

3.10.2.4. *Cumulative Impacts of the Alternatives*

As described in the affected environment (Section 3.10.1), coal production in Oklahoma began in the first half of the 1870s (Oklahoma Historical Society 2018). Average annual coal production in Oklahoma between 2010 and 2017 was 928,085 tons while total coal production over this timeframe was 7,424,677 tons (ODM 2018). The U.S. exported approximately 55,300,000 tons of metallurgical grade bituminous coal from all U.S. coal mines in 2017 (EIA 2018). The IEA estimates that, in 2016, approximately one billion tons of metallurgical grade bituminous coal were produced worldwide (IEA 2017).

Reasonably foreseeable additional bituminous coal production in Oklahoma is anticipated during the life of mining of the LBA tract. This reasonably foreseeable mining activity is associated with the following tracts:

- Liberty 8,
- Farrell-Cooper Mining Company's permitted mining operations on federal coal lease OKNM 108097 adjacent to the LBA tract,
- the private tract to the north of the LBA tract, and
- four of the five operational coal mines as of 2016 (One of the operational mines in 2016 is at Liberty. Liberty 8 represents the continuation of this mining activity).

Assuming that average annual production of 928,085 tons for the years 2010-2017 continues into the foreseeable future and that annual production at Liberty 8, mining operations associated with OKNM 108097, and mining operations on the private tract to the north of the LBA tract are comparable to anticipated annual average coal production on the LBA tract (200,000-400,000 tons), it is estimated that annual coal production as a result of reasonably foreseeable additional bituminous coal production in Oklahoma would be approximately 1,528,085 to 2,128,085 tons. This production level equates to a 65%-129% increase over the average annual coal production for the years 2010-2017.

Leasing and mining the LBA tract under the Proposed Action is estimated to contribute 200,000-400,000 tons annually for 8-16 years. This annual production level represents a 13%-26% incremental increase over current average annual (2010-2017) and reasonably foreseeable annual bituminous coal production forecasts for Oklahoma. Annual bituminous coal production in Oklahoma, including current bituminous coal production operations, reasonably foreseeable bituminous coal production operations, and the LBA tract production is forecast to be between approximately 1,728,085 and 2,528,085 tons.

The cumulative effects of Alternative C would be the same as Alternative B on an annual basis because annual production from the LBA tract is anticipated to remain constant over the production life of the LBA tract regardless of the alternative. However, because total recoverable coal would be less under Alternative C (3.28 million tons versus 2.59 million tons), the production life of the LBA tract would decrease by approximately 2-4-years. The life of mining on the LBA tract under Alternative C would be approximately 6-12 years.

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CHAPTER 5. REFERENCES

ACOE (U.S. Army Corps of Engineers). 2018. U.S. Army Corps of Engineers, 2016 National Inventory of Dams. Available at: http://nid.usace.army.mil/cm_apex/f?p=838:12. Accessed Sept. 19, 2018.

AQD (Air Quality Division). 2018. Air Data Report 2017. Available at: http://www.deq.state.ok.us/aqdnew/airreport2017/intro.html. Accessed on 8/27/2018.

Barcaccia, Barbara. 2013. “Quality Of Life: Everyone Wants It, but What Is It?" *Forbes/ Education*.

Bennett, Ashley. 2013. The Impact of Hydraulic Fracturing on Housing Values in Weld County, Colorado: A Hedonic Analysis. Master’s Thesis, Department of Agricultural and Resource Economics, Colorado State University, Ft. Collins.

BLM (Bureau of Land Management). 1994. Oklahoma Resource Management Plan Record of Decision and Plan. BLM-NM-PT-94-0002-4410. January 1994.

BLM. 2013. Draft Resource Management Plan Amendment and Environmental Assessment for Federal Coal Leases in Haskell and LeFlore Counties, Oklahoma. DOI-BLM-NM-040-2013-038.

BLM. 2014. Resource Management Plan Amendment and Decision Record for Federal Coal Leases in Haskell and LeFlore Counties, Oklahoma. February 2014.

BLM. 2016. Instructional Memorandum: Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands. IM 2016-124. July 8, 2016.

BLM. 2017. Pollyanna 8 Coal Lease Modification Environmental Assessment. DOI-BLM-NM-0040-2018-0001-EA. November 2017.

BLM. 2017b. Air Resources Technical Report for Oil and Gas Development, New Mexico, Oklahoma, Texas, and Kansas. March 2017.

BLM. 2018. Biological Evaluation for Evans McCurtain Coal Lease by Application, Haskell/LeFlore Counties, Oklahoma. Signed September 5, 2018.

CEQ (Council on Environmental Quality). 1997. Environmental Justice: Guidance under the National Environmental Policy Act. December 10, 1997.

Data USA. 2018. Haskell County profile. Available at: https://datausa.io/profile/geo/haskell-county-ok/. Accessed on July 29, 2018.

EIA (Energy Information Administration). Total 2016 U.S. Metallurgical Coal Export. Available at: https://www.eia.gov/coal/production/quarterly/pdf/t11p01p1.pdf. Accessed on 8/27/2018.

EIA. 2018. Table 11. U.S. Metallurgical Coal Exports. Available at: https://www.eia.gov/coal/production/quarterly/pdf/t11p01p1.pdf. Accessed on 9/13/2018.

EIIP (Emission Inventory Improvement Program). 2001. Vol. II, Chapter 14: Uncontrolled Emission Factor Listing for Criteria Air Pollutants. July 2001. Emission Inventory Improvement Program, Research Triangle Park, North Carolina.

EPA (US Environmental Protection Agency), Office of Air Quality Planning and Standards, Office of Air and Radiation. 2006. AP-42 Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources. 5th ed. Research Triangle Park (NC): U.S. Environmental Protection Agency. [updated November 2006]

EPA. 2010. Waterbody Report for Sans Bois Creek. Available at: http://ofmpub.epa.gov/tmdl/attains_waterbody.control?p_list_id=OK220200040010_40&p_cycle=&p_report_type=. Accessed on June 14, 2018.

EPA. 2014. Emission Factors for Greenhouse Gas Inventories. Available at: https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf.

EPA. 2018. Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2016. EPA 430-R-18-003. April 2018. Available at: https://www.epa.gov/sites/production/files/2018-01/documents/2018_complete_report.pdf. Accessed on 9/13/2018.

EPA. 2018b. Facility Level Information on Greenhouse Gasses Tool (FLIGHT). Available at: [updated August 19, 2018] Accessed on 6/15/2018

EPA. 2018c. Coal Mine Methane Units Converter. Available at: https://www.epa.gov/cmop/units-converter. [updated September 15, 2017] Accessed on 7/29/2018

EPA. 2018d. 2014 National Emissions Inventory Data. Available at: https://www.epa.gov/air-emissions-inventories. [updated September 29, 2017] Accessed on 7/29/2018.

EPS (Economic Profile System). 2018. Headwaters Economics. Economic Profile System. Available at: https://headwaterseconomics.org/tools/economic-profile-system/.

Greenwood, Daphne (n.d.) Local Indicators of Quality of Life: A Preliminary Look at the Pikes Peak Region. Center for Colorado Policy Studies.

Iannacchione, A. T. and D. G. Puglio. 1979. Methane Content and Geology of the Hartshorne Coalbed in Haskell and Le Flore Co., Ok. Bureau of Mines Report of Investigations/1979. RI 84.7.

IEA (International Energy Agency). 2017. Coal Information: Overview. Available at: https://www.iea.org/publications/freepublications/publication/CoalInformation2017Overview.pdf Accessed on 6/25/2018.

Kern, Jeffrey R., David Falkenstern, and Ronald W. Stingelin. 2002. Effects of Longwall Mining on Real Property Value and the Tax Base of Greene and Washington Counties, Pennsylvania.

Marcher, Melvin V., DeRoy L. Bergman, Larry L. Slack, Stephen P. Blumer, and Robert L. Goemaat. 1987. Hydrology of Area 41, Western Region, Interior Coal Province, Oklahoma and Arkansas: U.S. Geological Survey, Water-Resources Investigations, Open File Report 84-129.

NRCS (Natural Resources Conservation Service). 1997. Agriculture Handbook 590. Ponds—Planning, Design, Construction. Available at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_030362.pdf. Issued June 1982. Revised November 1997. Accessed on September 19, 2018.

NRCS. Web Soil Survey, Available at: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed on June 19, 2018.

Oklahoma Historical Society. 2018. Available at: http://www.okhistory.org/publications/enc/entry.php?entry=CO001. Accessed on July 30, 2018.

ODM (Oklahoma Department of Mines). 2018. http://mines.ok.gov/Websites/mines1/images/Annual%20Reports/AnnualReport2017.pdf. Accessed on September 13, 2018.

ODM. 2018b. Available at: http://mines.ok.gov/annual-reports. Accessed September 12, 2018.

ODOT (Oklahoma Department of Transportation). 2018. Available at: http://www.okladot.state.ok.us/maps/aadt/2017/31_Haskell.pdf. Accessed on July 18, 2018.

ODOT. 2015. Inland Waterway Fact Sheet. Available at: http://www.okladot.state.ok.us/waterway/pdfs/ODOT_WW_FACT_SHEET.pdf.

OSMRE (Office of Surface Mining Reclamation and Enforcement). 2013. Environmental Assessment McCurtain Underground Mine Haskell County, Oklahoma Farrell-Cooper Mining Company Federal Coal Lease OKNM 108097. ODM Permit 4285F. January 2013.

Rose, S., Turner, D., Blanford, G., Bistline, J., de la Chesnaye, F., and Wilson, T. (2014b). Understanding the Social Cost of Carbon: A Technical Assessment. Report 3002004657. Palo Alto, CA: Electric Power Research Institute.

Slack, Larry J. 1983. Hydrology of an Abandoned Coal-Mining Area near McCurtain, Haskell County, Oklahoma: U.S. Geological Survey, Water-Resources Investigations Report 83-4202.

USFWS. (U.S. Fish and Wildlife Service). 1996. Biological Opinion and Conference Report. Surface Coal Mining Regulatory Program Under the Surface Mining Control and Reclamation Act of 1977. P.L. 95-87.

USFWS. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. November 2008.

USFWS, Interstate Mining Compact Commission, OSMRE. 2009. Range-wide Indiana Bat Protection and Enhancement Plan Guidelines. July 2009.

USFWS. 2016. Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions. USFWS, Midwestern Region. January 5, 2016.

USGS. 1983. Subsidence from Underground Mining: Environmental Analysis and Planning Considerations. Geological Survey Circular 876. U.S. Government Printing Office, Washington DC.

USGS. 2018. North American Breeding Bird Survey: BBS database online. USGS Patuxent Wildlife Research Center. Laurel, MD. [updated 3/27/2018; cited 6/12/2018]. Available from: https://www.pwrc.usgs.gov/BBS/PublicDataInterface/index.cfm

Wilkins, Kent. 1997. Hydrogeologic Report of the Pennsylvanian Minor Groundwater Basin and the Ashland Isolated Terrace Groundwater Basin in Coal, Pittsburg and Haskell Counties. Oklahoma Water Resources Board, Water Management Division.

Williams, Austin Merrell, (2011) The Impact of Surface Coal Mining on Residential Property Values: A Hedonic Price Analysis. University of Tennessee Honors Thesis Projects. http://trace.tennessee.edu/utk_chanhonoproj/1414.

World Resources Institute. 2018. Available at: https://www.climatewatchdata.org/ghg-emissions?source=31&version=1. Accessed on 6/15/2018.

Yoo, James, and Thomas Frederick. 2017. The varying impact of land subsidence and earth fissures on residential property values in Maricopa County – a quantile regression approach, International Journal of Urban Sciences, 21:2, 204-216.

APPENDIX A: MAPS

Map 1. Evans McCurtain LBA tract (OKNM 127509) in relation to area landmarks.

Map 2. Areas of surface disturbance associated with preparation of coal, waste disposal, and mine infrastructure.

Map 3. Evans McCurtain LBA tract, Port of Keota, and the reasonably foreseeable transportation route to Port of Keota

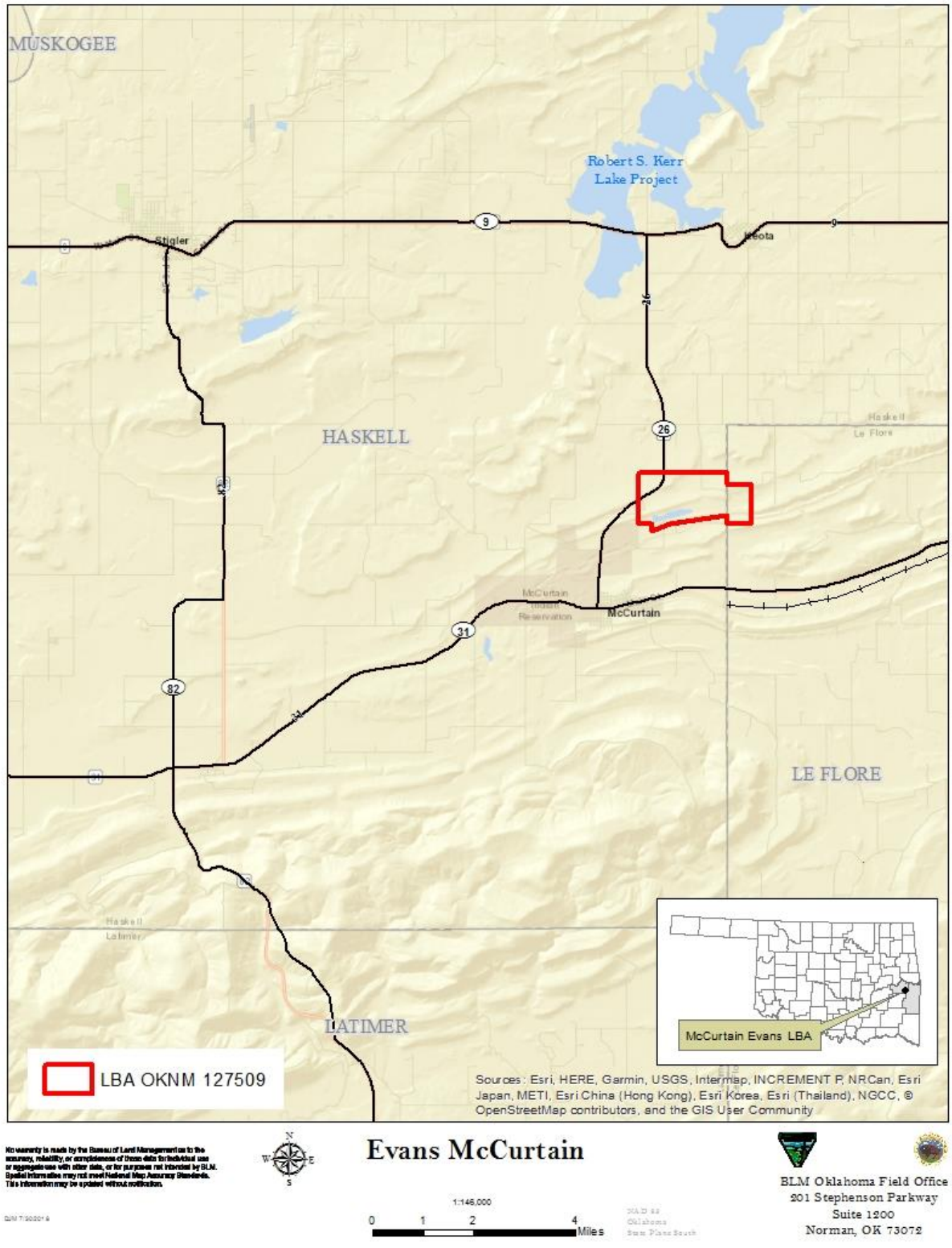
Map 4. Evans McCurtain LBA tract in relation to adjacent federal coal lease tract to the west (OKNM 108097) and private coal tract to the north.

Map 5. Evans McCurtain LBA tract configuration under Alternative C.

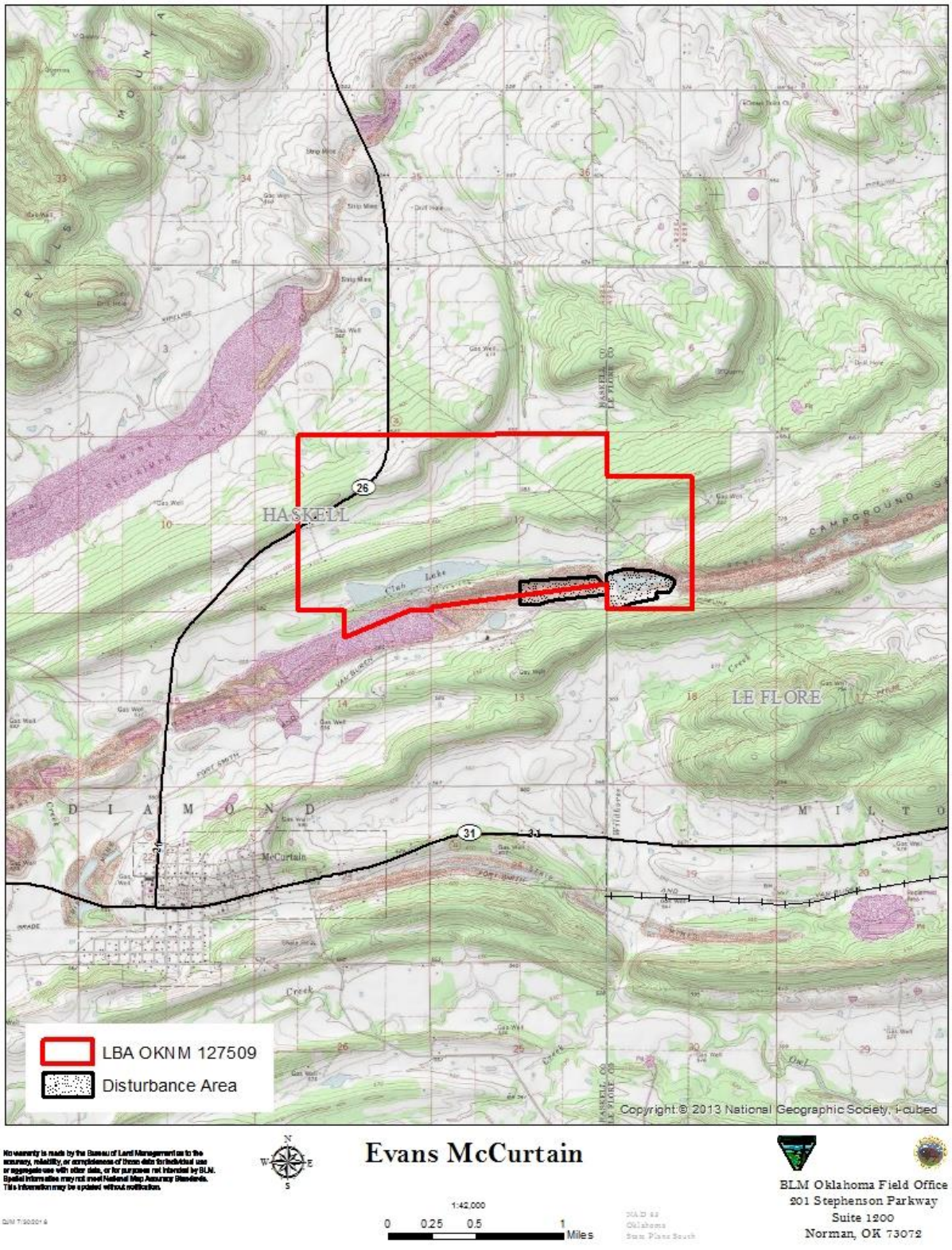
Map 6. Drainage basin between Kerr Reservoir and the OKNM 108097 federal least tract, the Evans McCurtain LBA tract, and the private coal tract to the north of the LBA tract.

Map 7. OKNM 108097 federal least tract, LBA tract, the private coal tract to the north of the LBA tract, and land to the north and west bordered by Sans Bois Creek and Kerr Reservoir.

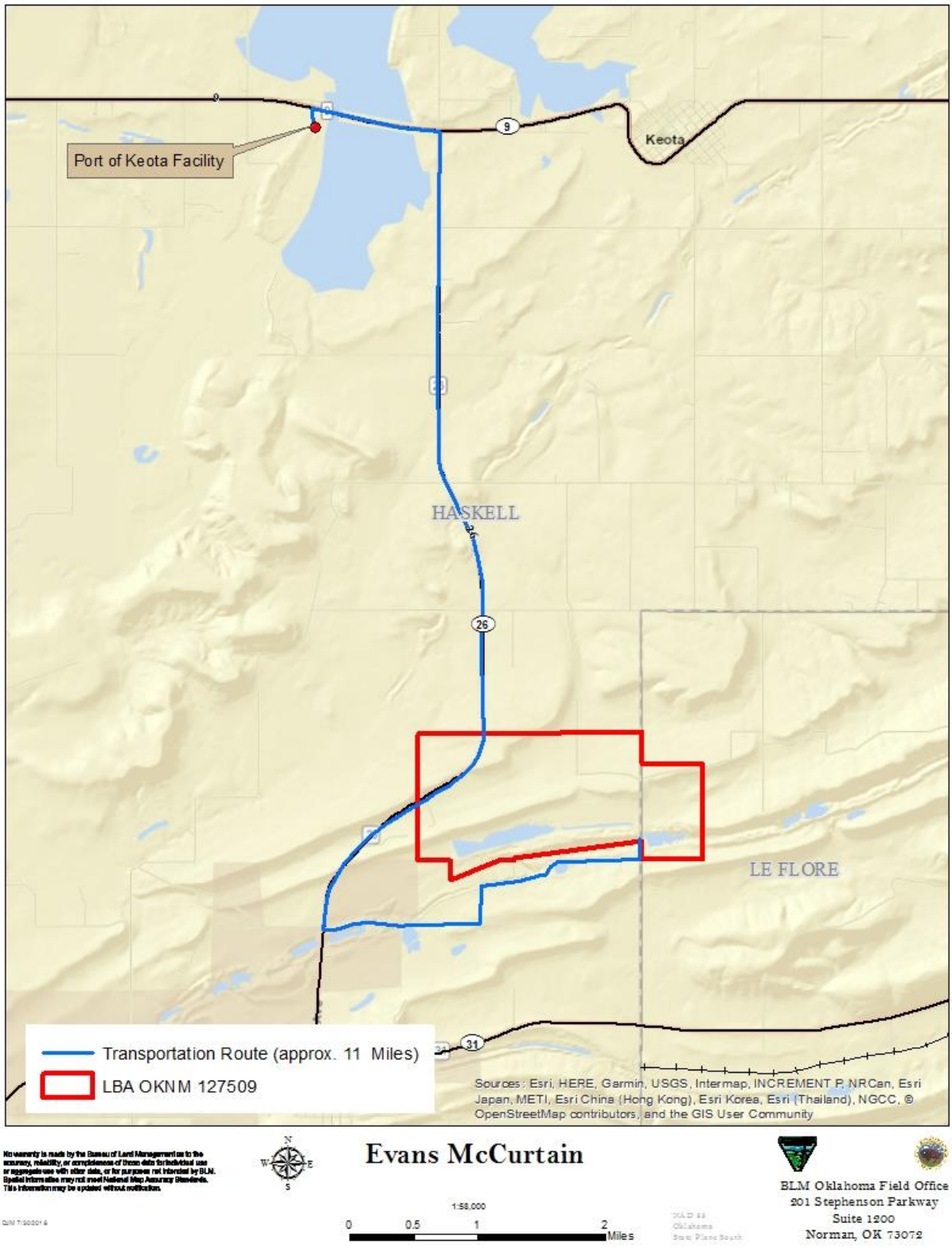
Map 8. LBA tract and a one-mile buffer around the LBA tract.



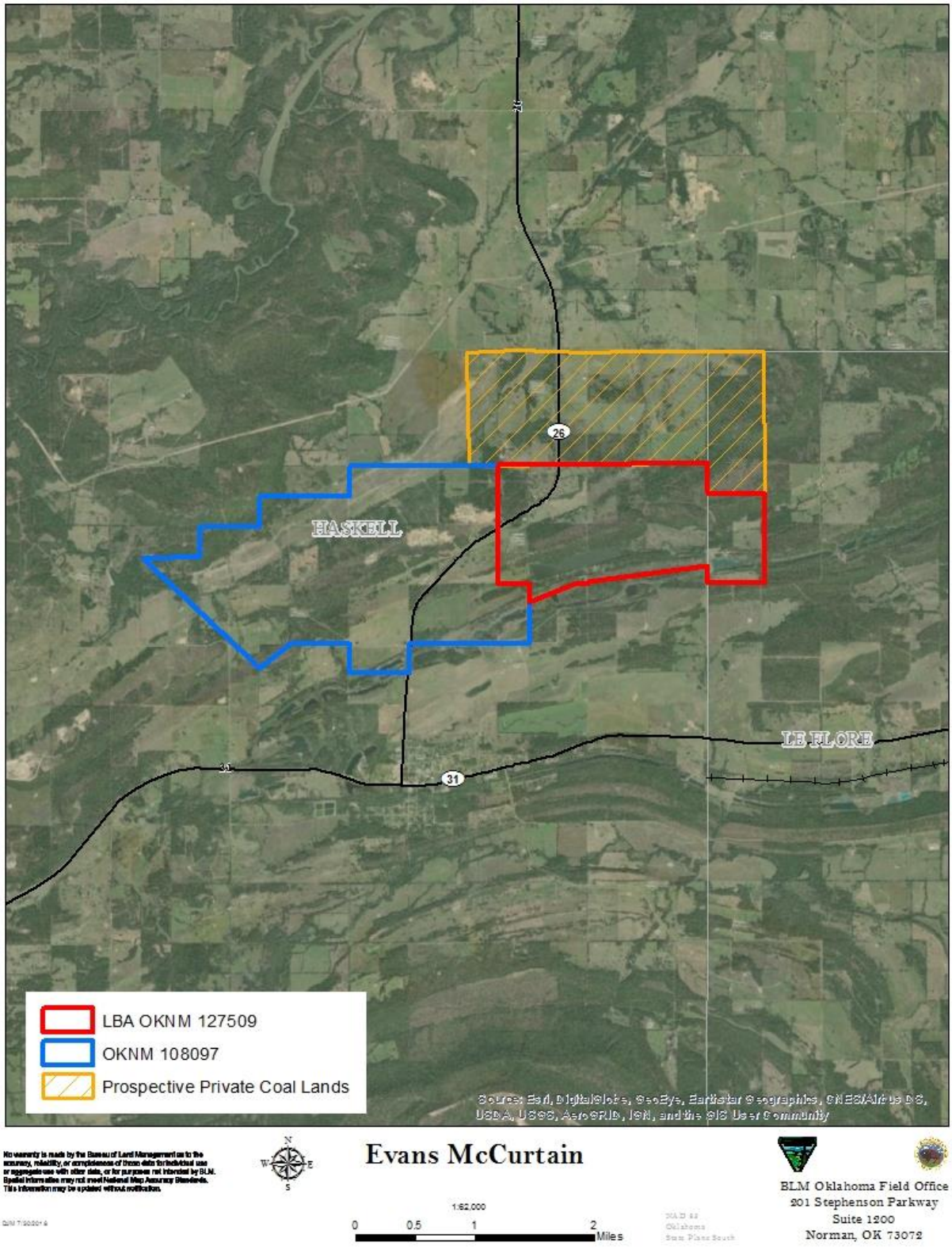
Map 1. Evans McCurtain LBA tract (OKNM 127509) in relation to area landmarks.



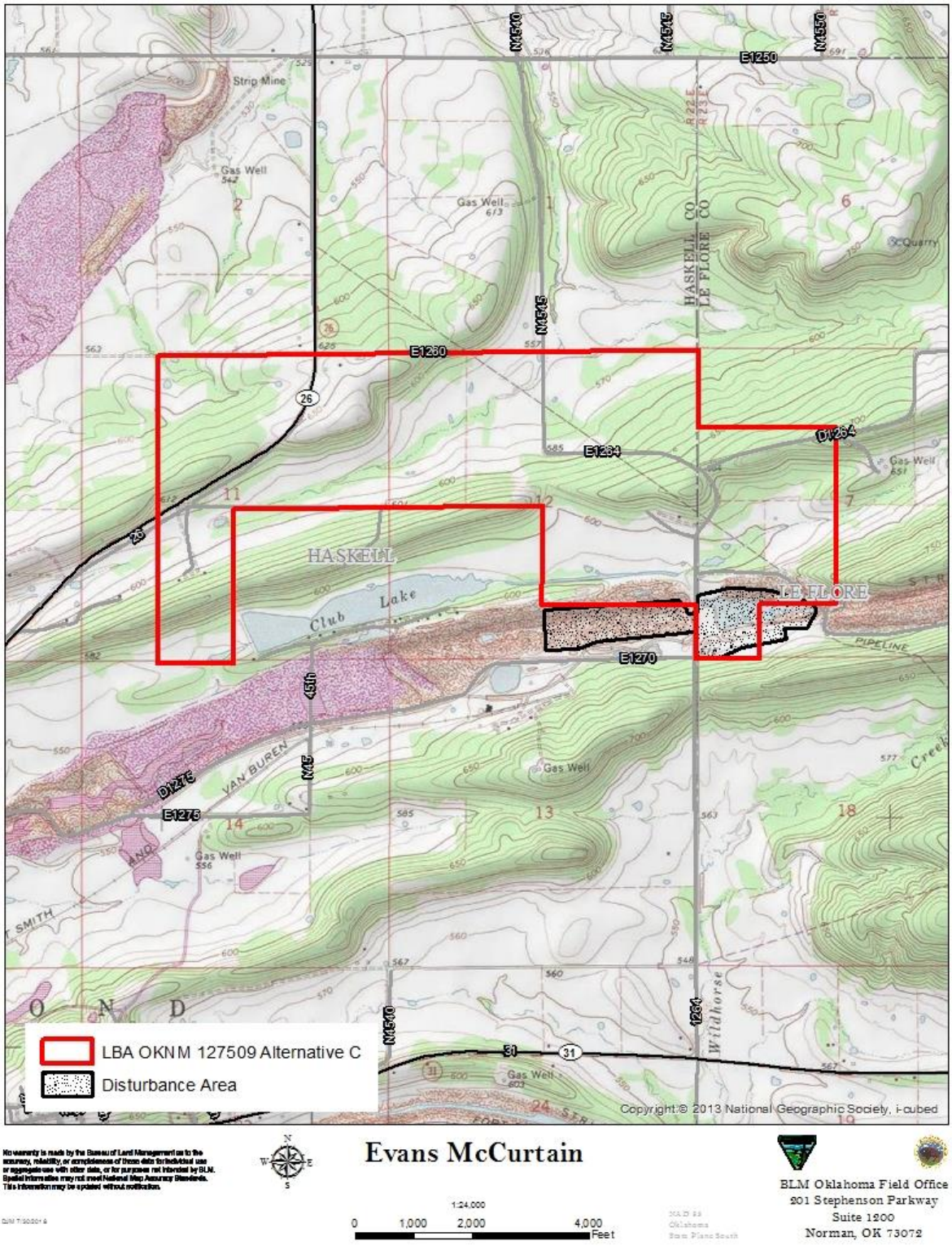
Map 2. Areas of surface disturbance associated with preparation of coal, waste disposal, and mine infrastructure.



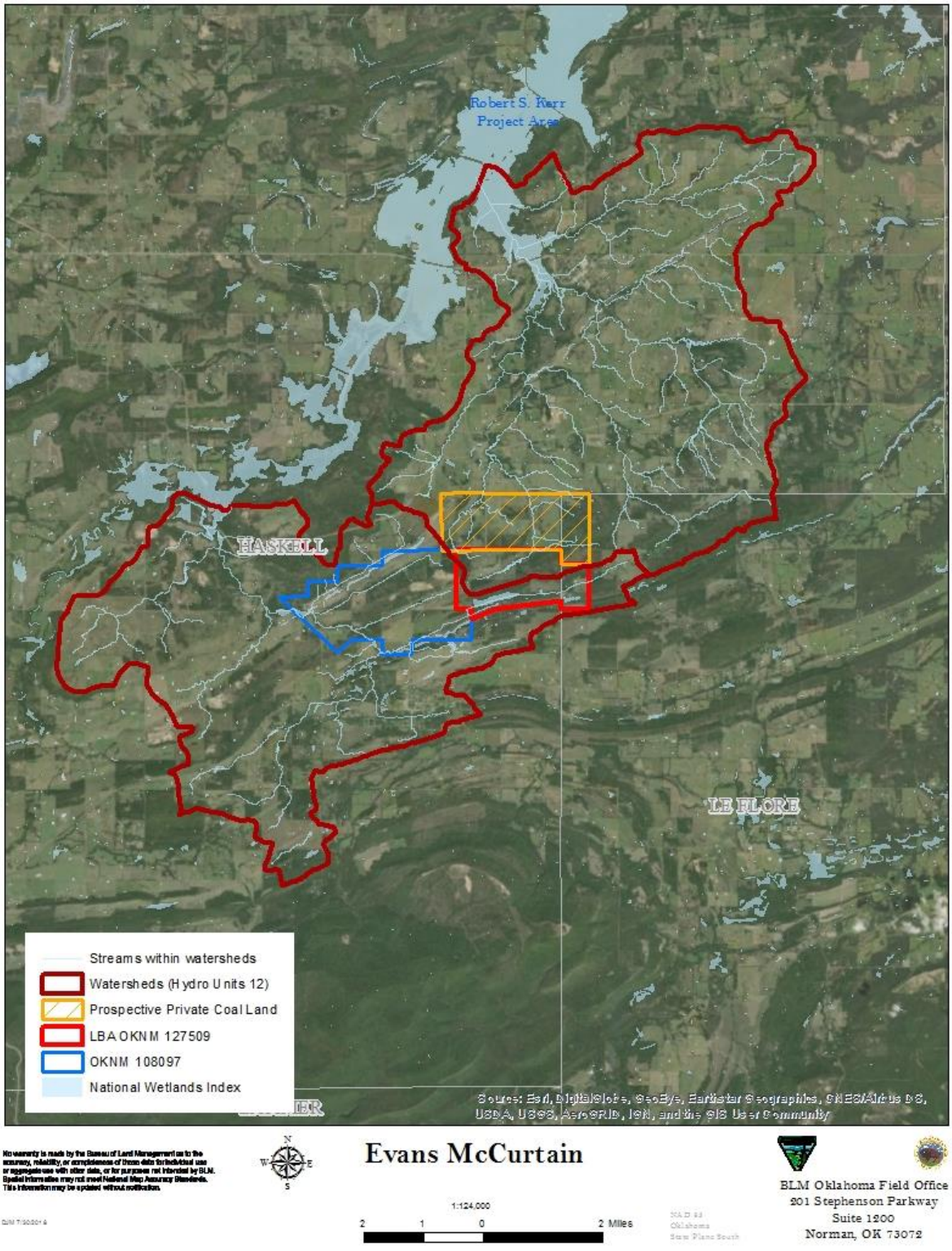
Map 3. Evans McCurtain LBA tract, Port of Keota, and the reasonably foreseeable transportation route to Port of Keota.



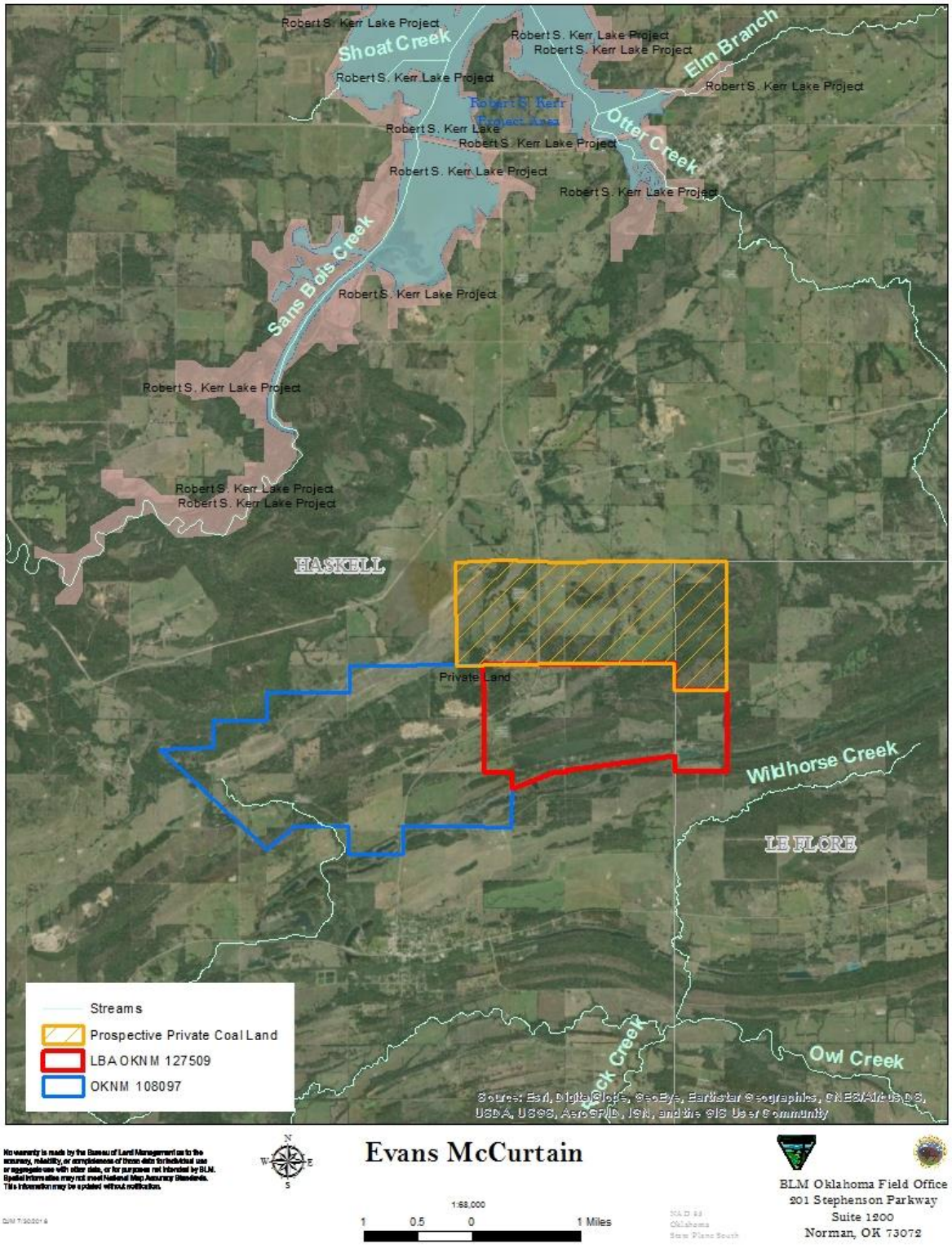
Map 4. Evans McCurtain LBA tract in relation to adjacent federal coal lease tract to the west (OKNM 108097) and private coal tract to the north.



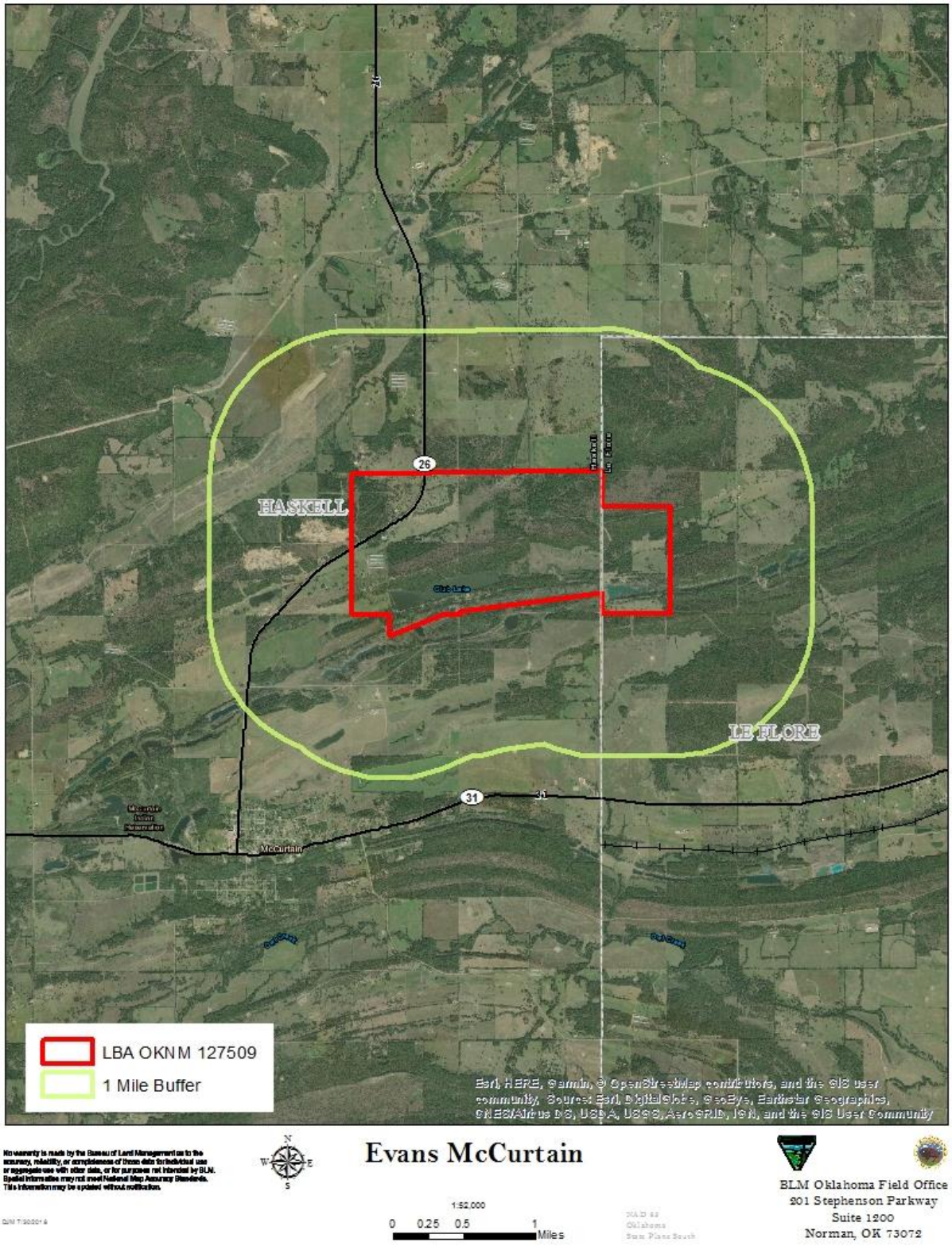
Map 5. Evans McCurtain LBA tract configuration under Alternative C.



Map 6. Drainage basin between Kerr Reservoir and the OKNM 108097 federal least tract, the Evans McCurtain LBA tract, and the private coal tract to the north of the LBA tract.



Map 7. OKNM 108097 federal least tract, LBA tract, the private coal tract to the north of the LBA tract, and land to the north and west bordered by Sans Bois Creek and Kerr Reservoir.



Map 8. LBA tract and a one-mile buffer around the LBA tract.

APPENDIX B: LEGAL DESCRIPTIONS

Alternative B

Indian Meridian, Oklahoma

T. 8 N., R. 22 E.,

sec. 11, E1/2W1/2, and E1/2;

sec. 12, NE1/4NE1/4, SE1/4NE1/4, NE1/4 SE1/4, NW1/4, W1/2NE1/4, N1/2SW1/4, NW1/4SE1/4; and

a tract of land described as follows: beginning at the southwest corner of Section 12, T. 8 N., R. 22 E., thence 111.61 feet N. 0 degrees 1 minute W., along the west side of said section to point of beginning. Thence 5,326.57 feet N. 80 degrees 45 minutes 30 seconds E., to a point on the east line of said section, thence 579.46 feet N. along the east line of said section, thence 1,316.39 feet S. 89 degrees 24 minutes 44 second W., to a point on the west line of the NE quarter of the SE quarter of said section, thence 182.04 feet S. 0 degrees 4 minutes 31 seconds E., along the west line of the NE quarter of the SE quarter of said section to the SW corner of the NE quarter of the SE quarter of said section, thence 1,316.13 feet S. 89 degrees 33 minutes W., along the north line of the SW quarter of the SE quarter to the NW corner of the SW quarter of the SE quarter of said section, thence 2,625.69 feet S. 89 degrees 33 minutes W., along the north lines of the SE quarter of the SW quarter and the SW quarter of the SW quarter to the NW corner of the SW quarter of the SW quarter of said section, thence 1,208.39 feet S. 0 degrees 1 minute E., along the west line of said section to the point of beginning.

sec. 14, a tract of land described as follows: beginning at the NE corner of Section 14, T. 8 N., R. 22 E., thence 682.72 feet S. 89 degrees 40 minutes W., along the north line of said section to the point of beginning. Thence 1,946.72 feet S. 89 degrees 40 minutes W., along the north line of said section to the N quarter corner, thence 794.04 feet S. 0 degrees 1 minute 8 seconds W., along the west line of the NE quarter of said section, thence 2,106.95 feet N. 67 degrees 31 minutes 38 seconds E., to the point of beginning.

T. 8 N., R. 23 E.,

sec. 7, lots 2 thru 4, SE1/4NW1/4, E1/2SW1/4.

The areas described aggregate 1,300.62 acres.

Alternative C

Indian Meridian, Oklahoma

T. 8 N., R. 22 E.,

sec. 11, NE1/4, E1/2NW1/4, and E1/2SW1/4;

sec. 12, N1/2, N1/2SE1/4, N1/2NE1/4SW1/4SE1/4, N1/2NW1/4SW1/4SE1/4, N1/2NE1/4SE1/4SE1/4, and N1/2NW1/4SE1/4SE1/4;

T. 8 N., R. 23 E.,

sec. 7, lots 2 thru 4, SE1/4NW1/4, NE1/4SW1/4, and N1/2SE1/4SW1/4.

The areas described aggregate 940.62 acres.