This report can be viewed in its entirety at:

http://www.epa.gov/superfund/sites/fiveyear/f05-06007.pdf

3.0 Background

This section describes the physical setting of the site, including a description of the land use, resource use, and environmental setting. This section also describes the history of contamination associated with the site, the initial response actions taken at the site, and the basis for each of the initial response
actions. Remedial actions performed subsequent to the initial response actions for each of the OUs defined for the site are described in Section 4.

3.1 Physical Characteristics

The Tar Creek Superfund site is located in Ottawa County, Oklahoma, in the far northeastern corner of the state (see Figure 1 for a site map). The Tar Creek site has no distinct boundaries, but it includes the Oklahoma portion of the Tri-State Mining District along with other areas in Ottawa County where mining waste has come to be located. The Tri-State Mining District is located in the border region of Kansas, Missouri, and Oklahoma. The Picher Field was the Oklahoma portion of the Tri-State Mining District centered on the town of Picher, Oklahoma. Extensive lead and zinc mining took place in the Picher Field between the early 1900's and the 1970's. The Tar Creek site is about 40 square miles in size. The principal communities within the mining area include Picher, Quapaw, Cardin, Commerce, and North Miami. The contamination at the site resulted from past mining activities. The Cherokee County and Oronogo-Duenweg Superfund sites comprise the Kansas and Missouri portions of the Tri-State Mining District respectively (EPA, 1994).

Tar Creek and its primary tributary Lytle Creek comprise the principal drainage system within the Picher Field. Tar Creek is characterized as a small ephemeral stream with standing pools. The headwaters of Tar Creek are located in Cherokee County, Kansas (located north of Ottawa County on the Kansas-Oklahoma border). Tar Creek then flows southward through the Picher Field between the towns of Picher and Cardin, to the east of Commerce and Miami, and it then flows to its confluence with the Neosho River. Tar Creek and Lytle Creek drain approximately 53 square miles. Other principal drainage features near the site in Ottawa County include the Neosho River (located south of the site), the Spring River (located east of the site), and Grand Lake (located in southern Ottawa County) (EPA, 1994).

The Picher Field (including most of the Tar Creek site) is located on the eastern edge of the Central Lowland Provinces. Eastern portions of the site are located in the Ozark Plateau. The Central Lowland Province is a nearly flat, treeless prairie. The Ozark Plateau is a broad, low structure dome centered in southwestern Missouri and northwestern Arkansas. The natural land surface at the site is mostly flat and gently slopes to the south towards the Neosho River, to the east towards the Spring River, and to the west towards Elm Creek. However, much of the land surface has been modified by the mining activities. There are numerous large tailings piles, composed of primarily limestone and chert, present on the land surface. In addition, numerous collapsed structures from subsidence and cave-ins of mine shafts are also present on the land surface (EPA, 1984).

Contaminated ground water at the site occurs within the Boone Formation (also known as the Boone Aquifer). The Boone Formation is composed primarily of limestone, dolomite, and chert, with lesser amounts of sandstone and shale. Lead and zinc ore were mined from various members of the Boone Formation. Within the mining area, water quality within the Boone Aquifer is poor due to acidity and high dissolved metals concentrations. The Boone Aquifer is not used as a primary source of drinking water at the site. However, information (primarily well completion depths) from water well databases maintained by the Oklahoma Water Resources Board (OWRB) and Oklahoma Department of Environmental Quality (ODEQ) indicates that some domestic wells at the site may be completed within the Boone Aquifer. Outside of the mining district, the Boone Aquifer is used as a primary
drinking water source. In areas where the Boone Formation outcrops at the surface, the aquifer is unconfined. Where the Boone Formation is overlain by confining strata, the aquifer is confined. At the Tar Creek site, the Boone Aquifer is confined. In the southern portion of the site, the potentiometric surface within the aquifer exceeds the land surface elevation. This results in artesian conditions, and ground water discharges from abandoned wells, boreholes, mine shafts, and collapse structures. This ground water is acidic and contains high metals concentrations, and hence it is referred to as acid mine drainage. This discharge then flows into Tar Creek (EPA, 1994).

Also of interest at the site is the Roubidoux Aquifer. The Roubidoux aquifer is composed of cherty limestone with several sand sequences near its base. The Roubidoux Aquifer lies beneath the Boone Aquifer, and the two are separated by 410 feet to 520 feet of limestone and shale of the Chattanooga Group, the Jefferson City Dolomite, and the Cotter Dolomite. These units act as an aquitard and restrict ground water flow between the Boone Aquifer and Roubidoux Aquifers. The Roubidoux Aquifer is a major source of drinking water in the area of the site (EPA, 1994). The cities of Picher, Quapaw, Cardin, Commerce, Miami (located south of the site), and several rural water districts obtain their water supplies from the Roubidoux Aquifer (EPA, 1984).

3.2 Land and Resource Use

Land ownership at the site can be classified as private or Indian-owned. Under an 1833 treaty, the United States set aside the Quapaw Reserve, located in Ottawa County, Oklahoma, consisting of approximately 12,600 acres of land. A majority of these lands are individually owned allotted lands with ‘restrictions against alienation.’ These lands are managed under the supervision of the United States Bureau of Indian Affairs (BIA) (BIA, 2005).

Due to the size of the site, land use is varied. The site encompasses residential, commercial, and industrial areas within the towns, while most of the land use outside of the towns is agricultural (EPA, 1997). Approximately 19,500 people live in the mining area or close proximity to the mining area (EPA, 2004). Tar Creek flows approximately through the center of the site, and it discharges into the Neosho River south of the site. The Neosho River discharges into Grand Lake in southern Ottawa County. Ground water under the site is found within both the Boone Aquifer and Roubidoux Aquifers. The Boone Aquifer at the site is not currently used as a drinking water supply, but there are some private wells completed within the Boone Aquifer. The Roubidoux Aquifer is regionally used as a water supply (EPA, 1994).

3.3 History of Contamination

Lead and zinc mining activities first began at the site in the early 1900’s. During the early mining period, most mining was conducted by small operators on 20 to 40 acre tracts. Each operator conducted their own mining, drilling, and milling activities (EPA, 1984). Mining activities occurred within a 50 to 150 thick ore bearing zone within the Boone Formation. The maximum depth of mining was approximately 385 feet below ground surface. Mining was accomplished using room and pillar techniques. To remove the ore, large rooms, some with ceilings as high as 100 feet, were connected by horizontal tunnels known as drifts. Pillars were left within the rooms to support the ceilings (EPA, 1994). The lead and zinc ores were milled locally and generally sent to locations outside of Ottawa County for smelting (the small smelter that operated in Hockerville is an exception)[SEE BELOW].
Rapid expansion of mining activities occurred during the 1920’s, and mining activities reached their peak around 1925. Each mine holding usually had its own mill. During the 1930’s, large central mills came into operation, and most mining operations ceased operating their own mills. During the peak of mining activities, 130,410 tons of lead and 749,254 tons of zinc were produced annually. Large scale underground mining activities ended in 1958 (Brown and Root, 1997). Smaller mining operations continued in the Picher Field through the 1960’s, and all mining activities at the site ceased in the 1970’s (EPA, 2000b).

Zinc smelting operations were not known to have occurred in the Tar Creek area. Lead smelting of the material mined in the Tar Creek area was dominated by the Eagle-Picher Company, which operated a smelter in nearby Joplin, Missouri. However, the Ontario Smelting Company did operate a lead smelter near Hockerville, Oklahoma. Ontario Smelting Company operated this smelter from 1918 until 1924. The smelter was then purchased by the Eagle-Picher Company, who operated the smelter until the early 1930’s, when the smelting operations ceased. There were no other smelting operations known to have occurred in the Tar Creek area (USACE, 2002).

Ground water infiltration into the mines was a continual problem. This ground water inflow was controlled through the use of pumps (EPA, 1984). When mining operations ceased, it is estimated that underground cavities with a volume of 100,000 acre-feet (161,000,000 cubic yards) had been created. In addition, approximately 100,000 exploratory boreholes were located within the Picher Field, mostly in Oklahoma. 1,064 mine shafts existed within the Oklahoma portion of the mining district. In addition, numerous water wells, used for milling operations, were abandoned (EPA, 2000b).

During the active mining period, large scale pumping had created a large cone of depression, effectively dewatering the Boone Aquifer in the mining area. Exposed sulfide minerals, primarily marcasite and pyrite (both iron sulfide), were oxidized by exposure to the moist air in the mines. When mining activities ceased, pumping was also ceased, and the abandoned mines began to flood. The oxidized sulfide minerals were now much more soluble in water. As the mines filled with ground water, the oxidized sulfide minerals began to dissolve, generating acid mine water. The acid mine water then reacted with the surrounding rock, and many of the metals present began to leach from the rock into the ground water. As a result, the acid mine water contained high concentrations of zinc, lead, cadmium, sulfate, and iron (EPA, 1994).

In addition to the acid mine water, the mining activities at the site resulted in the accumulation on the ground surface of mining wastes. Large volume tailings piles (known locally as ‘chat’), some as high as 200 feet, were left at the site. Many of the tailings piles are still present across the site, mostly around the towns of Picher and Cardin. In addition, numerous abandoned flotation ponds that have been filled with fine sediments are also present at the site (EPA, 2000b).

Three general types of mining wastes are present at the site. ‘Development’ rock is large diameter (4” to 2”) rock that was generated during the opening of mine shafts or drifts. Development rock generally poses no contamination problem. ‘Chat’ is mine tailings from the milling process. Chat contains a mixture of gravel (typically 3/8” in diameter) and finer-grained materials. ‘Fines’ are the fine-grained sediments collected in the flotation ponds (EPA, 2000b).

The chat piles at the site contain approximately 67 million tons of waste. The chat has historically been used as a source material for the concrete and asphalt industries and as a gravel source. Other
uses of the chat have included railroad ballast, sandblasting and sandbag sand, roadway, driveway, alleyway, and parking lot aggregate, general fill material in residential areas, and impact absorbing material in playgrounds. Sales of chat have been a significant source of income in the local area. Based on estimates of historical aerial photographs, less than 50 percent of the original volume of chat remains in the area. The fines were collected into flotation ponds as part of the gravity separation milling process. Most of the ponds have since evaporated and are now dry. Based on examinations of historical maps, aerial photographs using a Geographic Information System (GIS), it was estimated that the flotation ponds and chat piles currently cover an approximately 1,444 acres at the site (EPA, 1997, and EPA, 2000b).

3.4 Initial Response

By 1979, the abandoned mines had become completely flooded due to ground water infiltration and due to surface water inflow into the abandoned mine shaft openings. In low-lying areas along the southern portion of the site (near Commerce), the potentiometric surface exceeded the ground surface. This resulted in the surface discharge of acid mine water from abandoned boreholes and mine shafts (EPA, 2000b). This surface discharge then emptied into Tar Creek. As a result, most of the downstream biota in Tar Creek were killed. The bottom of the creek became stained red due to ferric hydroxide deposition, and red stains appeared on bridge abutments and cliffs in the Neosho River downstream of its confluence with Tar Creek (EPA, 1994).

In 1980, the Governor of Oklahoma established the Tar Creek Task Force to investigate the effects of the acid mine drainage. The Task Force was composed of various local, state, and federal agencies. The Oklahoma Water Resources Board (OWRB) was appointed as the lead state agency. The initial investigations were conducted by the Task Force in 1980 and 1981. The conclusions from the Tar Creek Task Force’s studies included the following:

- There were no significant health risks associated with the air pathway at the Tar Creek site;
- The Neosho River, Spring River, and Grand Lake could be used as a raw water source for public water supplies;
- The fish from areas sampled in these water bodies were safe for consumption; and,
- Most of the metals present in the acid mine water were precipitated out of the water and into the sediments in Tar Creek prior to its confluence with the Neosho River. The sediments in Tar Creek provided a long-term sink for metals that effectively removed them from most biological processes, and the sediments did not pose a health risk. Other than aesthetic alteration at the confluence of Tar Creek and the Neosho River, there was no impact on the Neosho River from the acid mine drainage in Tar Creek.

The Task Force identified the primary threat at the site as the potential for contamination of the Roubidoux Aquifer (EPA, 1994).

The EPA proposed the Tar Creek site to the NPL in July 1981, based on information from the Task Force’s investigations. The NPL is the list, compiled by EPA, of uncontrolled hazardous substance releases in the United States that are priorities for long-term remedial evaluation and response. On June 16, 1982, the EPA provided funding through a Cooperative Assistance Agreement with the Oklahoma State Department of Health (OSDH) to conduct a Remedial Investigation/Feasibility Study
(RI/FS) at the site. The OSDH was the overall lead agency at the site for the State of Oklahoma. The OWRB, under an interagency agreement with the OSDH, conducted the RI/FS for the site. The site was listed on the NPL on September 8, 1983. The EPA signed a ROD for the site on June 6, 1984 (EPA, 1994). The remedy selected and implemented under the ROD is discussed in Section 4.

In 1994, the EPA conducted the first five-year review of the Tar Creek site. While conducting this five-year review, the Indian Health Service in Miami, Oklahoma, notified the EPA by letter of elevated blood lead levels in children routinely tested as part of their participation in the United States Department of Agriculture’s (USDA) Women, Infant, and Children (WIC) program. The letter stated that 34% of the 192 children tested had blood lead levels above 10 micrograms per deciliter (μg/dl), which is the level above which the Centers for Disease Control (CDC) considers to be elevated in children. The letter stated that although location did not appear to be a factor, a majority of the children did live within 5 miles of a chat pile (IHS, 1994). Also, EPA Region 7 had been conducting investigations of the Cherokee County (Kansas), and the Oronogo-Duenweg (Missouri) Superfund sites. Data obtained from EPA Region 7’s investigations indicated that mine wastes (including chat piles) represented an unacceptable risk to human health and the environment (EPA, 1994).

In the summary portion of the first five-year review, EPA stated that the studies conducted for the 1984 ROD did not include a risk assessment. Risk assessment guidance had not been developed at the time the 1984 ROD was signed, and the primary emphasis at the Tar Creek site was on ground water and surface water impacts related to the acid mine water. The first five-year review recommended that a second OU be designated at the site for the mining wastes. It was also recommended that studies be undertaken to determine the impacts of the chat piles and flotation ponds on human health and the environment. The studies were to include blood lead studies, environmental sampling of high access areas (HAAs) (HAAs are areas frequented or likely to be frequented by young children such as schools, playgrounds, day cares, etc.), mapping of all mine wastes, classification of surface mine wastes through environmental sampling and testing, sampling of leachate from mine wastes, and sampling of airborne particulates near mine wastes (EPA, 1994). As a result of the five-year review recommendations, surface and ground water contamination at the site became OU1, and impacts related to the mining waste, including HAAs and residential properties, became OU2 (EPA, 2000b).

EPA addressed HAAs and residential areas of OU2 first. From August 1994 through July 1995, the EPA conducted sampling through its removal program (the removal program is, generally speaking, the part of the Superfund program generally responsible for conducting emergency and early response activities) to determine the nature and extent of the contamination in residential areas of the site. The Phase I sampling addressed HAAs, and the Phase II sampling took place at residences that were inhabited or potentially inhabited by children. Twenty-eight HAAs and 2,070 residential properties were sampled as part of the site assessment. The data were used to complete the Baseline Human Health Risk Assessment (BHHRA) and Residential RI Reports. The BHHRA concluded that lead in soil was the primary contaminant of concern and that ingestion of contaminated soil was the only exposure pathway that posed a significant risk to human health. These activities led the EPA to conclude that the lead contaminated soil in residential areas posed an imminent and substantial endangerment to human health (EPA, 2000b).

Due to the concerns related to exposures to lead contaminated soil, the EPA issued an action memorandum on August 15, 1995, that authorized removal response actions at HAAs at the site.
The removal response action began in September 1995 and was completed in December 1995. The removal response action for the HAAs was known as the Phase I removal action. The Phase I removal action was conducted by EPA through its Emergency Response Cleanup Services (ERCS) contractor, Reidel Environmental Services, and by its Superfund Technical Assessment and Response Team (START) contractor, Ecology and Environment, Inc. (Washington Group International, 2002).

The removal response action involved the excavation of lead and/or cadmium contaminated surface soils with concentrations exceeding 500 parts per million (ppm) and 100 ppm respectively from 0 to 12 inches in depth and 1,000 ppm lead and/or 100 ppm cadmium from 12 to 18 inches. This means that in areas where the lead concentration exceeded 500 ppm from 0 to 12 inches and/or the cadmium concentration exceeded 100 ppm, the soil was excavated. When the lead concentration exceeded 1,000 ppm and/or the cadmium concentration exceeded 100 ppm in the 12 to 18 inch interval, then soil from that interval was also excavated. On large properties where unauthorized excavation could be controlled, such as parks and schools, the criteria were modified to 500 ppm lead and/or 100 ppm cadmium from 0 to 12 inches in depth (the 12 to 18 inch increment was dropped). When contamination remained above the cleanup levels below 18 inches, a barrier (orange construction fence material) was place in the bottom of the excavation as a warning that contamination remained below the barrier. Each excavation was then backfilled with clean soil. Seventeen of the 28 HAAs that were evaluated required a response action (EPA, 2000b).

The EPA issued an action memorandum on March 21, 1996 that authorized a removal response action at residences at the site (EPA, 2000b). This removal response action was known as the Phase II removal action, and it included both residential properties and HAAs. The EPA signed an Interagency Agreement (IAG) with the United States Army Corps of Engineers (USACE) to conduct the Phase II removal action. The USACE contracted with Morrison Knudson Corporation (MK, which has since changed its corporate name to Washington Group International, Inc.) to complete the work (USACE, 2002).

This removal action was conducted in a similar manner to the HAAs, except that a cleanup level of 500 ppm for lead was chosen. This cleanup level was based on the BHHRA and EPA Region 6 experience at other lead cleanup sites. Approximately 2,070 residential homes in Picher, Cardin, Quapaw, Commerce, and North Miami were evaluated. The second five-year review stated that approximately 65% of these properties contained lead above 500 ppm in soil in at least one part of the yard. The Phase II removal response activities were conducted from June 1996 until December 1997. The following criteria were used to prioritize the properties:

- Top priority was given to homes with children less than 6 years of age who had blood lead levels in excess of 10 µg/dl, and where the soil lead concentrations had been determined to be a significant contributor to elevated blood lead levels; and,
- The next highest priority was given to homes where the soil lead concentration exceeded 1,500 ppm (EPA, 2000b).

During the Phase I (HAAs) and Phase II (residential properties) removal response actions, remediation was performed at 20 HAAs, one commercial property (used by the EPA, USACE, and their various contractors for on-site support facilities), and 227 residential properties. Approximately
84,417 cubic yards of soil were removed from these properties during the removal actions (E&E, 2000, USACE, 2002, and Washington Group International, 2002).

In September 1998, the Quapaw Tribe of Oklahoma requested assistance from the EPA to conduct response activities at an abandoned office complex located in Cardin, Oklahoma. The land was owned by the Quapaw tribe, and had been leased by Eagle-Picher Industries, Inc. from 1945 until 1981. A drum containing residual cyanide had been discovered in one of the site buildings during work conducted in 1998. EPA performed evaluations of the atmosphere inside this building and determined that no cyanide above background levels were present (EPA, 2000a).

In March 1999, the Inter-Tribal Environmental Council (ITEC) conducted a site reconnaissance of the property in advance of the completion of an RI/FS being conducted by the ITEC and Quapaw Tribe for the EPA. During this site reconnaissance, 120 containers of laboratory chemicals were discovered at the site. The EPA conducted a Hazardous Characterization, again at the request of the ITEC, in May and June 1999. These chemicals were inventoried, categorized, segregated, and overpacked in preparation of future disposal by the BIA. The BIA informed the EPA that it did not have the funding or expertise to remove the chemicals from the site (EPA, 2000a).

On March 2, 2000, an action memorandum was issued by EPA approving a time-critical removal action at the Eagle-Picher Office Complex – Abandoned Mining Chemicals. This portion of the site was designated OU3. The action memorandum determined that the chemicals posed an imminent and substantial endangerment to the public health or welfare or the environment. This determination was made on the basis that the containers in which the chemicals were stored had to be placed outside, where they were exposed to the elements. The EPA was concerned that eventually the containers would deteriorate, releasing the chemicals into the environment (EPA, 2000a).

On March 28, 2000, the emergency removal action was conducted. The laboratory chemicals were removed from the site and transported to facilities appropriate for their disposal. The EPA was unable to dispose of some low-level, radioactive uranyl acetate. The EPA remobilized to the site on May 23, 2000. This material was removed from the site and transported to an offsite location for treatment and disposal (EPA, 2000c, and EPA 2000d). The EPA determined that no further action was required in relation to OU3 (EPA, 2004).

3.5 Basis for Taking Action

The purpose of the response actions conducted at the Tar Creek site was to protect public health and welfare and the environment from releases or threatened releases of hazardous substances from the site. Discharges of acid mine water from the abandoned mines to surface water and possible direct migration to the underlying Roubidoux Aquifer threatened human health and the environment. In addition, exposure to lead contamination in residential soils was determined to be associated with human health risks higher than the acceptable range. The primary threats that the Tar Creek site posed to public health and safety were: potential contamination of water supply wells completed in the Roubidoux Aquifer from acid mine water; possible direct dermal contact with acid mine water where ground water discharges at the surface; severe ecological impacts to Tar Creek as a result of the acid mine water discharges; and oral ingestion of lead contaminated soils (EPA, 1984, and EPA, 1997).
Tar Creek Superfund Site: By The Numbers...

30 million acres ceded to the U.S. Government by the Quapaw Tribe in 1818 treaty.

51,000 acres reserved for the Quapaw Tribe in northeast Indian Territory in 1833 treaty.

1891- year during which the first ore discoveries occurred in Ottawa County.

230 ore mills built or under construction by 1918 in the Picher Mining Field.

20,000 residents in the Picher area during the peak of mining operations.

181 million tons of crude ore mined in Ottawa County.

8.88 million tons of zinc concentrate were produced from milling crude ore at Picher.

60% of the world’s zinc mining occurred at the Picher Mining Field during the late 1920’s.

1.69 million tons of lead concentrate were produced from milling crude ore at Picher.

13 million gallons of water pumped daily from mine workings prior to 1970.

1970- year during which the mine dewatering pumps at the Picher Mining Field were shut off.

1979- year during which the first acid mine water discharges were reported in Commerce, OK.

32 billion gallons of water fill the mine workings at the Picher Mining Field.

1981- year during which the site was added to EPA’s National Priorities List (NPL) of Superfund sites.

26,000 acres contained within the site boundaries for Operable Unit 4 (OU-4).

50% of the Quapaw Reservation Land by Treaty is within the OU-4 site boundaries.

197,323 cubic yards of development rock in 189 piles cover 21.3 acres on the site.

31.2 million cubic yards of coarse tailings/chat in 83 piles cover 767 acres on the site.

5.7 million cubic yards of chat remains at the largest tailings pile- the Sooner Pile.

400 foot tall chat pile, the Central Mill Pile, was the largest mine tailings pile in the world.
200 foot tall chat piles remain within the site today.

6.71 million cubic yards of tailings at 243 chat pile bases cover 2,079 acres on the site.

9.16 million cubic yards of fine mill tailings in 63 tailings ponds cover 820 acres on the site.

3.55 million cubic yards of fine mill tailings remain at the 168 acre Central Mill tailings pond.

1.36 million cubic yards of soil with lead concentrations greater than 500 mg lead per kg soil cover 1,162 acres on the site.

25 gallons per minute typical yield from the shallow Boone aquifer.

300 gallons per minute maximum yield in highly brecciated portions of the Boone aquifer.

10.2 billion gallons of water discharged from upper Boone to surface streams each year.

1,064 mine shafts and subsidence features mapped within the site.

157 pounds of Iron enters Tar Creek per day, on average, from an acid mine discharge near Douthat Bridge.

115 pounds of Zinc enters Tar Creek per day, on average, from an acid mine discharge near Douthat Bridge.

35% of the Indian children tested who lived on the site in 1994 had blood lead concentrations exceeding 10 micrograms per deciliter.

$167,288,000 cost over 40 years for EPA to remedy mine tailings and contaminated soils within the site.

1,542 lead contaminated residential yards remediated from 1996-1998.

19,556 people lived on-site and in communities in proximity to the mining area in 2004.

678 residential properties have been eligible for relocation through the Lead Impacted Communities Relocation Assistance Trust (LICRA) buyout program.

800 residents lived in or around the city of Picher before the May 10th, 2008 tornado.

175 mile per hour winds estimated by the National Weather Service during the May 10th, 2008 EF-4 tornado which struck Picher.

150 people injured, 30 people treated at a local hospital, and 6 fatalities, all from the Picher area.

114 homes in Picher destroyed by the May 10th, 2008 tornado.
Disclaimer
Distributed by the Quapaw Tribe Environmental Office for the purpose of combining a host of statistics previously reported by various public sources. The Quapaw Tribe does not endorse the accuracy or validity of any such statistics contained within this document.

Sources include:


Hydrogeologic Characterization Work Plan for Operable Unit 4 at the Tar Creek Superfund Site, 2008.

EPA Fact Sheet, Tar Creek Superfund Site, Ottawa County, OK, February 2008.

EPA Fact Sheet, Tar Creek Superfund Site, Ottawa County, OK, October 2002.

Record of Decision for Operable Unit 4 at the Tar Creek Superfund Site, 2008

Quapaw Tribe Web-Site, 2008.
