Governor Frank Keating's Tar Creek Superfund Task Force

Final Report



Prepared By:

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1 October 2000

Task Force Membership

Chairman:

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Oklahoma State Senate, District 1

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Executive Summary

In an effort to assume a more vital leadership role in attacking the myriad environmental, health, and safety problems associated with the nation's highest-ranking Superfund site, Oklahoma Governor Frank Keating formed the Tar Creek Superfund Task Force on 26 January 2000. Charged with developing a comprehensive remediation plan for the ill-fated area of northeastern Ottawa County, this report contains the final recommendations of the Governor's ten-member Task Force.

Because of the enormity of the problems associated with the nation's top environmental disaster, Secretary of Environment Brian C. Griffin, who serves as Chairman of the Governor's Task Force, established eight technical Subcommittees. The Task Force relied heavily upon the arduous work and invaluable resources of its eight technical Subcommittees, whose recommendations are summarized in this document.

Once the final recommendations of the technical Subcommittees were compiled, several common themes surfaced. The most innovative and promising of those common themes was the use of constructed wetlands to restore natural resources and reclaim the damaged environment. Building upon this concept of utilizing attractive, multi-purpose wetland systems to accomplish much of the rehabilitation of the Tar Creek Superfund Site, the Task Force offers the following as its vision for the area:

To establish a world-class wetlands area and wildlife refuge within the boundaries of the Tar Creek Superfund Site that will serve as an ecological solution to the majority of the most pressing health, safety, environmental, and aesthetic concerns.

The Task Force acknowledges that such a novel goal could never be accomplished without the support and determination of critical stakeholders, including visionary local officials, area legislators, and Oklahoma's Congressional delegation. Thus, the Task Force proposes the following interim measures that must be accomplished regardless of whether or not the ultimate goal gains sufficient support:

- ➤ Continue the Governor's Task Force to oversee progress on ensuing studies and make further decisions as new information becomes available.
- Maintain the Task Force Subcommittees to address technical issues as they arise.
- ➤ Develop and initiate a new Superfund Remedial Investigation/Feasibility Study ("RI/FS") to include the following activities:
 - ✓ A comprehensive study of mine drainage discharges to determine the amount and types of treatment wetlands needed.
 - ✓ Initiate pilot wetland treatment systems to identify the most feasible and effective systems for the area.

- ✓ Develop and test appropriate uses of large volumes of chat to establish markets for its export.
- ✓ Identify mine shafts that need plugging to prevent groundwater contamination and test various closure methods.
- ✓ Investigate the bioavailability of heavy metals resulting from the consumption of wild forage foods (human and wildlife impacts).
- Establish a local industrial authority to develop the necessary infrastructure and appropriate regulatory climate for large-scale, aggressive chat marketing and export.
- Assemble a local steering committee to explore the options for, and feasibility of, a Picher/Cardin relocation.
- Create a Geographic Information Systems ("GIS") ad hoc committee to compile all available data and information on the Superfund area; assembling the data and information into a georeferenced format will allow for better decisions to be made about all aspects of the future remediation effort.
- ➤ Develop a better EPA, DOI, Tribal, and State partnership to hasten cost recovery/NRDA reimbursement (another source of funds for implementing the Task Force recommendations).

It is estimated that the studies necessary to effectively design a massive wetland project, such as the one envisioned by the Task Force, will take several years to complete. During this timeframe, the local steering committee should have a final decision on whether a relocation of Picher and Cardin is feasible. Also during this period, the local industrial authority should have accomplished the necessary groundwork for accelerating the marketing and export of chat from the Superfund area.

Introduction

Lead and zinc mining came to northeastern Oklahoma near Peoria, Ottawa County, in 1891. At one time the Tri-State Mining District, which includes the Picher Mining Field, was the leading United States producer of lead and zinc, supplying nearly 27 percent of the nation's lead and zinc products. During the peak mining years of 1907 through 1946, almost two million tons of lead and zinc were mined in the area at a value of more than \$202 million. By the time the last mining company closed its doors in 1970, the Picher Mining Field had produced 1.7 million tons of lead and 8.8 million tons of zinc.

But what once brought economic prosperity to the far northeastern corner of our state soon led to a legacy of human health and environmental calamity. The mining and milling of lead and zinc ore left approximately 300 miles of underground tunnels, 165 million tons of tailings ("chat"), over 1,320 mine shafts, and thousands of drill holes in the Oklahoma portion of the Tri-State Mining District alone. Tangible natural resource threats were first realized in 1979 when metals-laden mine water began discharging to surface streams in the Tar Creek watershed. The 40 square-mile site was added to the first National Priorities List ("NPL") when Congress created the Superfund program in 1983, and remediation efforts soon followed primarily to address the mine water discharges.

Early attempts to halt polluted mine seepage were largely unsuccessful, and the U.S. Environmental Protection Agency was ready to give up on restoring and protecting the water quality of Tar and Lytle Creeks. Just when interest in restoring the blighted area began to wane, a 1993 study of blood lead levels conducted by the Indian Health Service showed that 34% of area Native American children exhibited blood lead levels above the thresholds considered dangerous to human health. This newly discovered threat to human health propelled the Tar Creek Superfund Site to the top of the NPL, making it the highest-ranking Superfund site in the nation.

Since 1993, Superfund remediation efforts have focussed on the most apparent sources of elevated blood lead levels *viz.*, the excavation and replacement of contaminated yards and recreation areas, lead-based paint removal, and strong educational programs about the dangers of lead and pathways of exposure. While great progress appears to have been made on this particular concern, as evidenced by recent studies showing a 50% drop in the prevalence of elevated blood lead levels, much more work remains in order to address the myriad other problems exhibited at the Tar Creek Superfund Site.

Because of a lack of progress in addressing other human health, safety, and environmental threats at the Tar Creek Superfund Site, Executive Order 2000-02 was signed by Governor Frank Keating on 26 January 2000 establishing his Tar Creek Superfund Task Force. Chaired by Oklahoma's Secretary of Environment, Brian C. Griffin, the ten-member Task Force was created to help the State of Oklahoma take a more "vital leadership role in identifying solutions and resources available to address" the ills that have plagued this area of our state for decades. Governor Keating tasked his appointees with developing a final, holistic action plan for remediating the Tar Creek Superfund Site and submitting their recommendations to him by 1 October 2000.

Due to the magnitude and complexity of the assignment, in addition to the extremely short deadline, Chairman Griffin established eight Subcommittees to address eight distinct concerns displayed at the Tar Creek Superfund Site. Like the uncompensated Task Force members, Subcommittee members volunteered their time and talents to the demanding assignments given to them over the short eightmonth span of the Task Force's deliberations. The products of their efforts are contained in lengthy, but invaluable, reports that are summarized herein. Subcommittee recommendations form the basis for the final recommendations adopted by Governor Keating's Tar Creek Superfund Task Force.

Once the Subcommittee recommendations were compiled, it became apparent that addressing each concern on an individual basis would prove unwieldy and cost prohibitive. To adequately protect area residents from subsidence threats alone would cost an estimated \$10 to \$61 billion . . . unless, of course, residents would agree to move from the areas most heavily undermined, which includes primarily the towns of Picher and Cardin. This realization, coupled with the frequently mentioned remedy of using constructed wetlands, formed the basis of the Task Force's ultimate goal for a comprehensive solution to the Tar Creek dilemma.

Subcommittee Recommendations

Due to the ambitious deadline for developing solutions to the extremely complex Tar Creek Superfund Site, Chairman Brian C. Griffin divided and delegated the work of the Task Force to technical experts willing to lend assistance. In general, most of the problems and concerns associated with the site fit into one of the following categories:

- Adverse *health effects* from exposure to heavy metals
- Approximately 1,320 open or poorly sealed mine shafts
- Extensive subsidence problems
- Approximately 75 million tons of remaining mine tailings ("chat")
- Poor community drainage and chronic flooding
- Mine discharges continuing to contaminate waters and impair water quality
- Unaddressed *Native American issues* and concerns
- Slow progress on Natural Resource Damage Assessments ("NRDA") and claims

Based on these categories of concerns, Chairman Griffin established eight technical subcommittees of the Task Force and assigned them specific duties necessary to complete the charge given by Governor Keating in Executive Order 2000-02. Competent experts in the respective fields were selected to chair each Subcommittee, and the invaluable service of Subcommittee Co-Chairs and members was performed without compensation.



Health Effects Subcommittee

Co-Chairs:

Dr. Robert Lynch

University of Oklahoma Health Sciences Center

Jane Ann Nichols

Ottawa County Health Department Administrator

Assignments:

1. Compile available research and data on blood lead levels to determine the effectiveness of current efforts to abate human lead exposure. The Subcommittee shall attempt to differentiate between the effectiveness of each lead abatement effort (e.g., residential yard remediation, lead-based paint remediation, educational efforts, restricted access to contaminated areas, etc.) and report its findings to the Task Force. This report should include a statistical analysis of blood lead level measurements showing either a positive or negative correlation to the remediation efforts, culminating in recommendations on whether or not to continue current remediation activities.

2. List and prioritize other human health concerns related to exposure from mining contaminates that are not being addressed by current efforts. The Subcommittee shall explore feasible alternatives to addressing the identified concerns and make recommendations on available programs, processes, and resources to abate the concerns.

Findings:

- Past studies showed that approximately 40% of the Tar Creek area children have elevated blood lead levels, as compared to the national average of 4.4%
- While prevalence has dropped by 40%, levels remain well above state and national averages.
- Soil removal efforts have had a significant impact on reducing the prevalence of elevated blood lead levels (as have lead-based paint removal and educational efforts).

Recommendations:

- 1. Intensify efforts to track and reduce blood lead levels ("BLL").
- 2. Institute regular screening of Ottawa County children.
- 3. Track exposed children over time.
 - A. Create a GIS map of BLL and environmental exposures
 - B. Coordinate educational efforts
 - i. develop community relevant strategies
 - ii. continue BLL monitoring and develop a database to facilitate tracking, sharing, and assessment of community impact
- 4. Initiate long-term studies on health outcomes in children (e.g., occurrence of learning disabilities).
- 5. Study the effects of lead/metals exposure on adult and adolescent health.
 - A. Neurological Effects
 - B. Kidney Disease & Hypertension
 - C. Hearing Loss
 - D. Cancers
 - E. Alzheimer's & Parkinson's Diseases
- 6. Continue efforts to remediate yards with elevated levels of lead.
- 7. Study the health effects from gathering & consuming wild foods.
- 8. Continue and expand current lead-based paint remediation efforts.
- 9. Public health considerations must be first and foremost in any efforts to remove chat from area.

Cost Estimates:

Phase II of contaminated yard remediation	\$ 27,500,000
BLL screening, tracking, & mapping	\$ 25,000 + \$ 400,000 per year
Long-term learning disability study	\$ 500,000
Adult/adolescent health	\$ 4,000,000
Consuming wild foods	\$ 450,000
Accelerated LBP removal	\$ 2,000,000
TOTAL	\$ 34,475,000 + \$ 400,000 per year



Subsidence Subcommittee

Co-Chairs:
Ed Keheley
Local Resident

Mary Ann Pritchard

Director, Oklahoma Department of Mines

Assignments:

- 1. Develop an effective means for delineating areas susceptible to subsidence that exist within the immediate vicinity of the Tar Creek Superfund project area.
- 2. Explore alternatives for reducing safety and infrastructure threats from subsidence, including, but not limited to, abandoned mine stabilization techniques, voluntary relocation, and/or property condemnation.

Findings:

- As of 1986, 59 "major" collapses were identified that disturbed approximately 47 surface acres.
- At least eight more collapses have occurred since 1986 (including State Line Road).
- Continued subsidence is likely . . . threatening the health, safety, and environment in the area.

Recommendations:

- 1. Develop and maintain GIS to integrate all data associated with potential & existing subsidence areas; use this GIS to identify high-risk areas.
- 2. Consider the use of infrared technology to update existing subsidence information.
- 3. Use the Subcommittee's matrices to prioritize areas for subsidence abatement.
- 4. Conduct an immediate investigation and remediation effort on the State Line Road subsidence.
- 5. Further identify and exploit all avenues to fund subsidence abatement.
- 6. Fill selected mine shafts to reduce potential for new subsidence.
- 7. Consider using readily available chat as backfill material.

Remediation Alternatives:

Filling Existing Subsided Areas				
Using rip-rap	\$ 285,246/collapse			
Using chat	\$ 112,349/collapse			
Using berms & fencing (exclusion)	\$ 10,000/collapse			
Subsidence Prevention				
Complete fill with concrete grout	\$ 7,980,000/acre			
Targeted grouting	\$ 1,690,000/acre			
Targeted backfilling with chat	\$ 1,350,000/acre			
Residence relocation (zoning)	\$ 100,000/residence			

Cost Estimates:

	Minimum Cost	Maximum Cost
Filling 67 existing subsidence areas	\$ 670,000	\$ 19,111,482
Abating subsidence threats to residents	\$ 200,000,000	\$ 61,286,400,000
TOTAL	\$ 200,670,000	\$ 61,305,511,000



Mine Shafts Subcommittee

Co-Chairs:
James Graves
Local Resident

Mike Kastl

Oklahoma Conservation Commission Abandoned Mine Lands Coordinator

Assignments:

1. Develop an effective means for identifying and locating all open mine shafts, and other hazardous openings, that exist within the immediate vicinity of the Tar Creek Superfund project area.

2. Assess the effectiveness and feasibility of current efforts to plug abandoned mine shafts and explore other feasible alternatives to remediate this critical environmental and safety concern.

Findings:

- There are an estimated 1,320 mine shafts in the Tar Creek Superfund area, plus thousands more drill holes and other openings.
- Possibly more than 300 shafts exist in the Picher/Cardin area alone and over 2,600 shafts in the entire Tri-State Mining District!
- In addition to safety risks, open shafts erode into larger subsidence problems and exacerbate mine drainage discharges.

Recommendations:

- 1. Develop a GIS of known shafts and bore holes, along with their attributes, and solicit public input on locations of other openings.
- 2. Use the Subcommittee's matrix to prioritize closure projects.
- 3. Identify lands under BIA jurisdiction to enable closure by those authorities.
- 4. Identify underground features of openings targeted for closure to select most appropriate closure methods.
- 5. Plug open drill holes with concrete to a depth of ten feet.
- 6. Continue negotiations with EPA to approve closure program under CERCLA.

Cost Estimates:

Identification and mapping (1 year project)	\$ 250,000
Shaft and hole closure (5 year project)	\$ 10,000,000
TOTAL	\$ 10,250,000



Chat Use Subcommittee

Co-Chairs:
Neal McCaleb
Oklahoma's Secretary of Transportation

Ed Rodgers *Quapaw Tribe of Oklahoma*

Assignments:

1. Identify appropriate and inappropriate uses of chat and mill pond residuals, and prepare a report to the Task Force on guidelines that should be adopted for the responsible use of these materials. In its deliberations on this subject, the Subcommittee shall seek input from those that own, or otherwise utilize, the stockpiles of chat and mill pond residuals.

- 2. Develop an effective method of quantifying and characterizing the remaining stockpiles of chat and mill pond residuals that exist within the immediate vicinity of the Tar Creek Superfund project area. Eventually, an accurate assessment of the contaminant levels within each stockpile will be needed in order to determine the appropriate uses of each chat source.
- 3. Explore feasible alternatives for utilizing, or (as a last resort) disposing of, chat and mill pond materials in a manner that will not perpetuate the human health and environmental threats associated with these contaminated materials.

Findings:

- Approximately 75 million tons of chat exists in the Superfund area.
- Regulatory guidelines are conflicting.
- A U.S. Bureau of Indian Affairs ("BIA") moratorium on the sale of Native American-owned chat prohibits the marketing and export of the majority of the chat in the area.
- There is no way to effectively move large volumes of chat.
- There is no central point of contact to market the chat.
- Piles are an "attractive nuisance" for area residents, including youth.

Recommendations:

- 1. Establish safe, economical, and effective chat use guidelines.
- 2. Establish reasonable cost testing processes available to all.
- 3. Remove discriminatory BIA moratorium on Native American-owned chat sales.
- 4. Recognize that health and environmental problems caused by chat piles cannot be fully mitigated until chat is removed and used in a safe, economical, and effective manner.
- 5. Establish a local Industrial Trust Authority to coordinate transportation and marketing of chat.
- 6. Include the following projects in the Superfund RI/FS:
 - a) Development of new hot mix asphalt designs optimizing the use of chat
 - b) Development of a chat marketing program
 - c) Pilot projects in Ottawa County and a locale that lacks suitable local aggregates
 - i. pave over county gravel roads with 2/3 clay, 1/3 chat, and an emulsifier
 - ii. pave over county gravel roads with 2/3 clay and 1/3 chat
 - iii. chip seal county roads
 - iv. field test the new hot mix asphalt designs

Cost Estimates:

Establish Industrial Trust	\$ 125,000	
Hot-mix asphalt designs	\$ 500,000	
Marketing/Facilities Plan & Operations Budget	\$ 589,000	
Pilot Projects	\$ 600,000	
TOTAL	\$ 1,814,000	



Drainage/Flooding Subcommittee

<u>Co-Chairs:</u>
Joe Crawford
Ottawa County Commissioner

John Roberts

Tulsa District, U.S. Army Corps of Engineers

Assignments:

- 1. Evaluate the extent of the drainage and flooding problems experienced by the communities in the Tar Creek Superfund area, and propose any studies that might be necessary to more adequately define the extent of drainage and flooding problems in the area.
- 2. Outline the most appropriate alternatives for abating the drainage and flooding problems identified in the Tar Creek Superfund area.

Findings:

- The Tar Creek drainage area is greatly disturbed by more than 80 years of mining activity.
- The result is poorly draining streams that are commonly bankfull of water, even during non-flood periods.
- Without modification, the system will continue to experience frequent flooding.
- The primary concerns identified in the area include:
 - ✓ Stream aggradation due to mining activities
 - ✓ Inadequate drainage systems in the communities
 - ✓ Manmade obstructions to flow
 - ✓ Neosho River/Tar Creek flooding problems in Miami

Recommendations:

- 1. Conduct channel improvements and/or buyouts of repetitive loss structures.
- 2. Perform ecosystem restoration, including the use of constructed wetlands and riparian establishment/enhancement.
- 3. Utilize the Superfund RI/FS to fine tune a "concept plan" for addressing drainage & flooding concerns.

Cost Estimates:

Immediate Actions (1 Year)			
Stream Maintenance	\$ 140,000		
Community Master Drainage Planning	\$ 360,000		
Flooding Feasibility Study	\$ 3,000,000		
Preparation of FHMP	\$ 25,000		
Short-Term Actions (2-3 Years)			
Community Drainage Improvements	\$ 5,740,000		
Grand Lake Backwater Feasibility Study	\$ 1,700,000		
Long-Term Actions (3-5 Years)			
Tar/Lytle Creek Flood Control Construction	\$ 22,000,000		
Acquisition of Repetitive Loss Structures	\$ 15,500,000		
TOTAL	\$ 48,465,000		



Water Quality Subcommittee

Co-Chairs: Earl Hatley

Former Environmental Director Quapaw Tribe of Oklahoma

Glen Jones

Oklahoma Department of Environmental Quality

Assignments:

- 1. Compile available water quality data in an attempt to characterize the level of water quality impairment to surface and ground waters in the Tar Creek Superfund area. Additionally, the Subcommittee should determine where additional data is needed in order to quantify any further degradation or improvement that may have occurred in recent years (i.e., establish trends).
- 2. Compile available research on treatment alternatives that would remove the mining-related contaminants that impair the beneficial uses assigned to the surface and ground waters in the

former Mining District. The Subcommittee shall evaluate the feasibility of constructed wetlands, diversion techniques, drinking water treatment systems, methods of lowering the water table, and any other alternatives identified by Task Force or Subcommittee members. In its evaluation, the Subcommittee should review the work conducted by the Oklahoma Water Resources Board as part of the task force created during Governor Nigh's administration, as well as any other attempts to address water quality concerns over the past several decades.

Findings:

- Tar Creek's water quality does not meet beneficial uses.
- Contaminate concentrations in mine seepage and acidity of Tar Creek have improved.
- The shallower Boone Aquifer is contaminated with acidic, metals-laden water.
- The impaired Boone Aquifer threatens resident's drinking water source -- Roubidoux Aquifer.

Recommendations:

- 1. Include in the Superfund RI/FS comprehensive monitoring of mine drainage discharges and chat pile/mill pond runoff to develop the most feasible treatment systems.
- 2. Strengthen and coordinate all monitoring efforts to better characterize current water quality and monitor trends.
- 3. Collect and analyze fish flesh to determine the level of contamination and threat to human health (if any).
- 4. Under the Superfund RI/FS, implement pilot-scale demonstrations on passive treatment wetland systems (see Figures 1 and 2).
- 5. Once appropriate systems are identified for the unique conditions found at Tar Creek, implement full-scale passive treatment wetland systems.

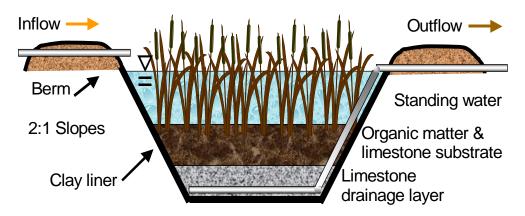


Figure 1. Diagram of a typical vertical-flow wetland used to treat net acidic mine drainage for alkalinity generation and/or metal sulfide formation.

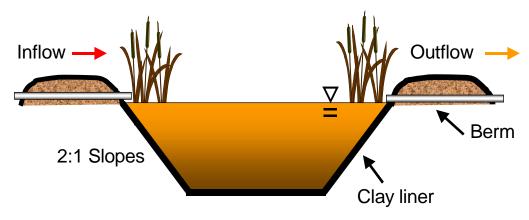


Figure 2. Diagram of a typical aerobic wetland used to treat net alkaline mine drainage for metal oxidation, hydrolysis, and precipitation.

Cost Estimates:

i Estimates.	
WQ Monitoring of Tar Creek Basin	\$ 80,000
Boone Aquifer Study	\$ 111,190
Sediment Study	\$ 20,000
Mine Discharge Monitoring	\$ 1,000,000
Chat Pile/Mill Pond Runoff Monitoring	\$ 1,000,000
Wetlands Pilot Projects	\$ 5,000,000
Wetland Remedies Coordination	\$ 100,000
Full-Scale Implementation of Wetland Systems	\$ 18,000,000
TOTAL	\$ 25,311,190



Native American Issues Subcommittee

Coordinator: Earl Hatley Former Environmental Director Quapaw Tribe of Oklahoma

Assignments:

- 1. Identify issues and concerns specific to Native Americans that are not specifically addressed by the other Subcommittees. In addition to the Native Americans that reside within the boundaries of the Tar Creek Superfund Site, the Subcommittee shall consider the concerns of Native Americans residing in areas impacted by pollution from the Tar Creek Superfund area (i.e., downstream impacts). Specifically, the impact of the moratorium placed on chat by the U.S. Bureau of Indian Affairs shall be explored, as well as any other concerns identified by the Subcommittee.
- 2. Outline any state or federal assistance needed to resolve the issues and concerns identified by the Subcommittee in its first task. Specifically, the Subcommittee shall propose legislative, administrative, and/or congressional actions needed to assist tribal organizations in resolving their unique concerns.

Findings:

- An estimated 70% of the Superfund area and 80% of the stockpiled chat is on land belonging to Quapaw tribal members.
- Federal/State remediation efforts rarely involve Tribal representation and concerns.

Recommendations:

- 1. The existing prohibition against chat sales by one Federal agency (BIA) when another (EPA) allows widespread sale and use of chat is discriminatory, and the BIA moratorium should be lifted.
- 2. The State should coordinate more with Tribal government when working with Federal programs to remediate the site.
- 3. More comprehensive air transport studies are needed, including studies to quantify the presence of hazardous silica dust, radioactive elements, and asbestos.
- 4. The Subcommittee requests a Native American hiring preference for work at the site, as well as training programs to help them qualify for jobs, since 70% of the Superfund site is on tribal lands.
- 5. Studies to assess the damages to cultural resources in, and downstream of, the Superfund site are needed.
- 6. With Indian Health Services funds being cut, more blood sampling equipment is needed for the tribes.
- 7. Research is needed to assess any impacts to cultural plant, aquatic, and animal food resources.



NRDA Subcommittee

Co-Chairs:

Kelly Hunter-Burch

Office of Attorney General, State of Oklahoma

Lloyd L. Landreth

Gardere & Wynne (Attorney for Quapaw Tribe)

Assignments:

- 1. Research the potential avenues for accurately quantifying the natural resource damages incurred in the Tar Creek Superfund area as a result of former mining activities. The Subcommittee shall develop an outline of actions needed to assess the damages incurred, including a list of cooperating agencies and entities that will assist in the effort.
- 2. Outline a process for identifying all potentially responsible parties ("PRPs") that might be considered liable for natural resource damages incurred as a result of mining activities in the Tar Creek Superfund area.

Findings:

- Natural resources potentially affected by contaminates at the site include threatened and endangered species, migratory birds, surface water, ground water, drinking water, plants, fish, biota, wildlife, and other cultural, agricultural, and terrestrial resources.
- All indications are that there have been extensive injuries to natural resources at the site.
- Natural resource damages probably exceed several hundred million dollars.

Recommendations:

- 1. Continue the existing Tri-State Partnership (three states, eight tribes, and federal government) to share resources and information on NRDA pursuits.
- 2. Finish the preassessment to determine reasonable probability of NRD claim success (Spring 2001).
- 3. Initiate Assessment Plan phase if preassessment shows probability of success (Winter 2001).
- 4. After Assessment, Trustees will present PRPs with a written demand for damages and assessment costs; litigation will be pursued if demands are not met.
- 5. Contract with a professional consultant to analyze PRP information and incorporate it into GIS.
 - A. PRP information is beneficial to both NRDA and Cost Recovery Actions
 - B. Costs should be shared between State, Tribes, DOI, and EPA
 - C. Should form a Legal Committee to facilitate better sharing of PRP information
- 6. Better integration of NRDA and remedial activities is necessary to reduce duplication of efforts.

Cost Estimates:

Oklahoma's Share of Preassessment	\$ 200,000
Restoration of Damaged Natural Resources	\$ 200,000,000
TOTAL	\$ 200,200,000

Subcommittee Conclusions

Common Themes:

- Utilization of wetlands
 - ✓ to address chronic drainage & flooding problems (*Drainage/Flooding Subcommittee*)
 - ✓ to treat mine drainage discharges and lessen its impact on Tar Creek (Water Quality Subcommittee)
 - ✓ to mitigate for approximately \$200 million in damaged natural resources (*NRDA Subcommittee*)
- Need for a steering committee to coordinate & oversee implementation of Task Force recommendations.
- Need for a GIS *ad hoc* group to develop and compile all data/mapping needs for the entire project with one GIS rep from each Subcommittee, plus some "outside" experts.

Summary of Cost Estimates:

Subcommittee	Minimum	Maximum
Health Effects	\$ 34,475,000 + \$ 400,000/year	\$ 34,475,000 + \$ 400,000/year
Subsidence	\$ 219,111,000	\$ 61,019,000,000
Mine Shafts	\$ 10,250,000	\$ 10,250,000
Chat Use	\$ 1,814,000	\$ 1,814,000
Drainage/Flooding	\$ 48,465,000	\$ 48,465,000
Water Quality	\$ 25,311,190	\$ 25,311,190
NRDA	\$ 200,200,000	\$ 200,200,000
TOTAL	\$ 540,025,190 + \$ 400,000/year	\$ 61,339,515,190 + \$ 400,000/year

Wetlands Concept

One look at the cost estimates associated with remediating each of the identified concerns on an individual basis reveals a seemingly insurmountable, not to mention cost prohibitive, undertaking. But out of the eight Subcommittee reports and countless hours of deliberation arose a holistic ecological solution that resolves the majority of the most pressing health, safety, environmental, and aesthetic concerns present at the Tar Creek Superfund Site. Although it will require several years of study and deliberation to overcome many of the indefinite details, the concept of using constructed wetlands to restore the site soon became the vision of the Task Force for restoring this ravaged landscape.

Building on the information supplied by the Subcommittees, Chairman Griffin enlisted the assistance of the U.S. Army Corps of Engineers to develop a scope of work, including cost figures, for a wetland solution. With Chairman Griffin's vision to convert the most impaired areas of the Tar Creek Superfund Site into a world-class wetland and natural resource preserve, staff from the Tulsa District of the U.S. Army Corps of Engineers developed a wetland concept plan for the Task Force's consideration.

The first step in developing the concept plan involved generating a series of maps to help delineate the most noticeable areas of concern (see Figures 3-8). From these maps, it became patently obvious that the epicenter of the mining impacts lies in and around the towns of Picher and Cardin. Probably the biggest revelation to come from this mapping exercise was the realization that the towns of Picher and Cardin overlay the most extensively tunneled area in the entire Superfund site (see Figure 4), posing a significant risk to life and property.

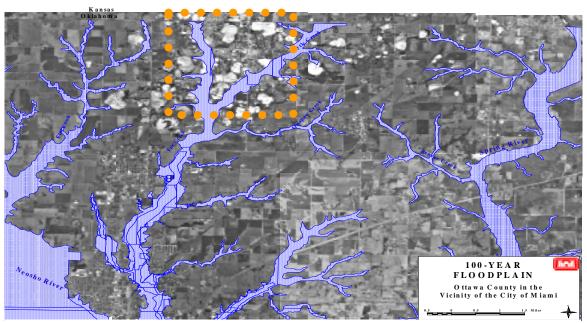


Figure 3. Map showing the 100-year floodplain (blue) in Ottawa County in the vicinity of the city of Miami. The area highlighted in orange shows the towns of Picher and Cardin.

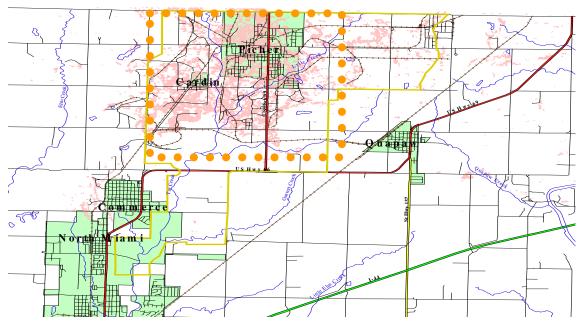


Figure 4. Map of existing subterranean caverns (pink) in the Tar Creek Superfund area, Ottawa County, Oklahoma. The orange highlighted area shows the towns of Picher and Cardin, while the yellow boundary shows the suggested wetland area boundary.

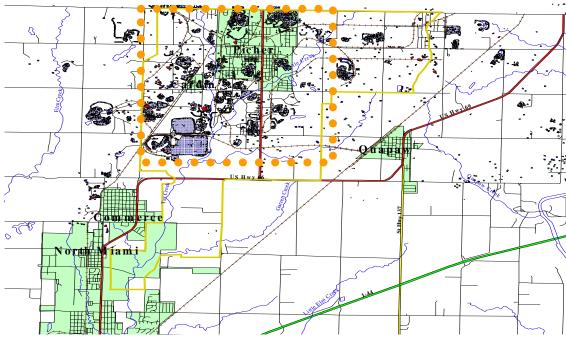


Figure 5. Map showing the locations of chat piles, mine shafts, and subsidence features (black) in the Tar Creek Superfund area, Ottawa County, Oklahoma. The orange highlighted area shows the towns of Picher and Cardin, while the yellow boundary shows the suggested wetland area boundary.

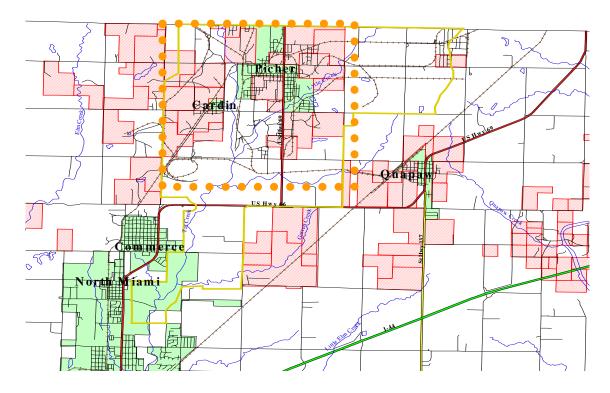


Figure 6. Map showing the Native American-owned land (red) in the Tar Creek Superfund area, Ottawa County, Oklahoma. The orange highlighted area shows the towns of Picher and Cardin, while the yellow boundary shows the suggested wetland area boundary.

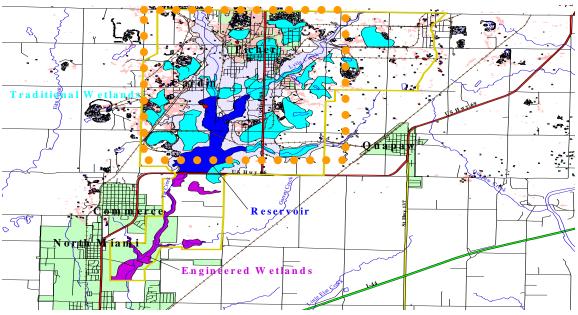


Figure 7. Map showing the proposed hydrologic modifications in the Tar Creek Superfund area, Ottawa County, Oklahoma. The wetlands concept includes the construction of traditional wetlands (light blue), engineered wetlands (purple), and a reservoir (dark blue). The orange highlighted area shows the towns of Picher and Cardin, while the yellow boundary shows the suggested wetland area boundary.

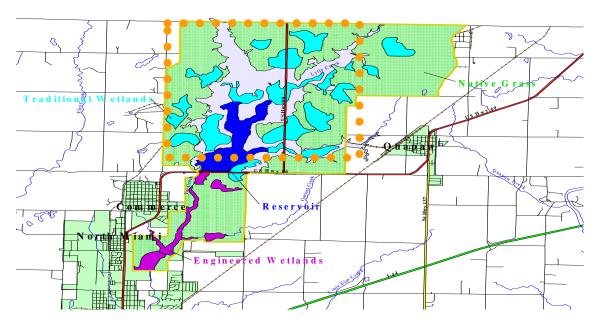


Figure 8. Map of the proposed wetland area and wildlife refuge showing aquatic (blue and purple) and terrestrial (green) features. The orange highlighted area shows the location of the towns of Picher and Cardin, while the yellow boundary shows the suggested wetland area boundary.

From the maps of the area, it becomes obvious that the residents in and around the towns of Picher and Cardin are most at risk for subsidence threats. Because Picher and Cardin are at the epicenter of the former mining activity, this area suffers from the most extensive environmental, health, and safety problems. This transparent truth, coupled with the fact that the area is historically conducive to flooding and drainage problems, makes the wetland remedy all the more practical.

Although extremely conceptual in nature, a proposal was generated to give the Task Force and interested stakeholders a rough idea of the land acquisition, construction, and cost requirements for developing a world-class wetland and natural resource area.

- Land acquisition:
 - √ 10,800 acres of unimproved land
 - ✓ 780 houses in Picher and Cardin
 - √ 47 businesses and churches
 - ✓ 1 school system
 - √ 49 rural improvements
 - ✓ ? municipal infrastructure
- Construction:
 - ✓ Reservoir: 546 acres
 - ✓ Traditional Wetlands: 1694 acres✓ Engineered Wetlands: 318 acres

Cost Estimates:

Land Acquisition (including title, appraisal, land cost, and condemnation)	\$ 74,000,000
Relocation Assistance	\$ 36,000,000
Construction	\$ 140,000,000
TOTAL	\$ 250,000,000

While the estimated cost to implement the wetland concept is still large, it pales in comparison to the billions of dollars it would cost to adequately restore the site and make it habitable using the itemized methods outlined by the Subcommittees. Additionally, the exact cost and feasibility of such a visionary proposal will take several years to ascertain. The following list details some of the questions that must be answered (through the Superfund RI/FS process) before a final decision can be made on the wetland concept.

- Can a relocation proposal that is acceptable to the residents of Picher and Cardin be generated?
- Precisely how much wetland acreage is needed for flood control in the area?
- What is the contaminated flow quantity/concentration?
- Precisely how much wetland acreage is required for adequate water quality treatment?
- What will be the overall effectiveness of passive constructed wetlands?
- What impact will wetlands have on subsidence, and *vice versa?*
- Is it suitable to use chat for the drainage layer in the constructed wetlands?
- What is the potential for adverse impacts on fish and wildlife?
- How will the acquisition of Tribal Lands and other real estate interests be handled?
- What are the operation and maintenance ("O&M") costs, and what will be the source of O&M funding?

Task Force Final Recommendations

Governor Keating's Tar Creek Superfund Task Force held its final planning meeting on 18 September 2000. After eight months of intense research and deliberation, the Task Force was ready to chart a course for the future restoration of the Tar Creek Superfund Site. Recognizing that there are still many unanswered questions as to the feasibility of achieving its ultimate goal of converting the site into a nationally-treasured wetland and natural resource preserve, the Task Force voted to support the following recommendations.

- Include several new studies under the Superfund Remedial Investigation/Feasibility Study ("RI/FS") that are necessary to refine the scope of the wetland concept and/or refine the use of more limited wetlands for water quality treatment and flood abatement. First, a comprehensive study of mine drainage discharges is needed to identify the quantity and types of constructed wetlands necessary for water quality treatment. After the discharges are adequately characterized, pilot treatment wetlands should be constructed in the study area to identify the most successful treatment systems. Because it comprises most of the essential technical experts, Oklahoma's "Wetlands Working Group" could provide technical oversight and coordination on these activities.
- ➤ Related to the wetland concept, but necessary in any area used to gather wild game and foods, the RI/FS should include studies on the impacts to humans and wildlife that consume foods within the contaminated area.
- Also under the RI/FS, research and pilot studies should be initiated to explore alternative uses for the 75 million tons of mine tailings ("chat") still in the area, thereby expanding the demand for, and accelerating the export of, this mining byproduct.
- ➤ The RI/FS should also include the identification of mine shafts and drill holes that serve as conduits for groundwater contamination, as well as pilot studies for effective ways to plug these openings. The Oklahoma Conservation Commission's Abandoned Mine Lands ("AML") program could lend the necessary technical expertise and oversight to this activity.
- Integral to, and included in, the RI/FS should be a GIS *ad hoc* committee formed to compile all the data and information collected during the Task Force deliberations, as well as all data collected under the RI/FS. Coordinated through Oklahoma's GIS Council, the committee should include at least one member of each of the Task Force Subcommittees and serve as a central source for all data and information needs. Assembling the data and information into a georeferenced format will allow for better decisions on all aspects of the remediation effort.
- In an effort to protect residents from the most serious health and safety risks, and to allow for a more effective wetland and natural resource preserve, a local steering committee should be formed to explore alternatives for relocating the towns of Picher and Cardin. Local representatives and, where necessary, government officials should meet on a periodic basis to research the complex regulations governing relocation, gauge public support for the idea, explore

all feasible options that exist, and investigate potential sources of funding and assistance. This committee could include, at a minimum, the following representatives:

- ✓ Mayors of Picher and Cardin
- ✓ Picher Housing Authority
- ✓ Quapaw Tribe of Oklahoma
- ✓ Ottawa County Health Department
- ✓ Picher/Cardin business community
- ✓ State Senator, District 1
- ✓ State Representative, District 7
- ✓ Governor's Tar Creek Superfund Task Force
- ✓ U.S. Representative, District 2
- ✓ U.S. Senators
- ✓ U.S. Environmental Protection Agency
- ✓ U.S. Department of Housing and Urban Development
- ✓ U.S. Department of Transportation/Oklahoma Department of Transportation
- ✓ U.S. Bureau of Indian Affairs
- While studies will help identify new uses for chat in the Superfund area, the Task Force also recommends establishing a local industrial authority to coordinate the marketing and transportation of chat. Such an authority also could serve as a point of contact for interested buyers, in addition to serving as a strong voice for breaking through the red tape and other barriers to full-scale chat marketing and export.
- The Task Force also recommends that a stronger partnership be forged between the U.S. EPA, U.S. Department of Interior, State of Oklahoma, and affected Native American tribes to pursue compensation for past remediation activities, as well as natural resource damages incurred. Any identified potentially responsible parties ("PRPs") could serve as another source of revenue for achieving the overall goal of creating a world-class wetland and natural resource preserve.
- Finally, the Task Force recognizes the need to continue meeting on an as-needed basis to oversee the activities initiated as a result of its recommendations. Many of the problems associated with past remediation efforts resulted from a lack of oversight, coordination, and accountability on the various aspects of the project. Additionally, several of the remedial actions will require future decision-making based on the results of the RI/FS. By maintaining its presence, the Task Force can assume the necessary leadership role in ensuring that these farsighted, long-term actions are implemented in an efficient manner.

In addition to the specific recommendations advanced at its 18 September 2000 meeting, the Task Force, at its 30 March 2000 meeting, voted to support continued funding for the remediation of contaminated yards. Because most, if not all, of the yards targeted for this second phase of remediation lie outside the proposed boundaries of the wetland area, there is no need to delay the yard remediation effort any further. Thus, *the Oklahoma Legislature should appropriate the \$2.75 million State match in order for the \$27.5 million yard remediation project to proceed*, with the

caveat that the Task Force and the Oklahoma Department of Environmental Quality ("DEQ") will increase oversight to minimize waste and/or fraud.

The studies necessary to effectively design a massive wetland project, such as the one envisioned by the Task Force, will take several years to complete. During this timeframe, the local steering committee should have a final decision on whether a relocation of Picher and Cardin is feasible. Also during this period, the local industrial authority should have accomplished the necessary groundwork for accelerating the marketing and export of chat from the Superfund area.

Finally, it is assumed that the Task Force's final recommendations will not address every concern or issue that might arise, nor will the Task Force provide direct oversight for the daily activities associated with the remediation effort. The DEQ, as the State's Superfund agency, fills this critical gap by coordinating the entire remediation effort and taking ultimate responsibility for project management. By allowing the Task Force to remain in force, the DEQ can seek guidance on any additional issues or problems that arise. The Task Force can also serve in an advisory capacity to the Governor, Oklahoma Legislature, Oklahoma Congressional Delegation, and Federal government as the remedial project advances.

Cost Estimates for Task Force Interim Recommendations:

Activity	Federal Funds	State Funds
Mine discharge & chat pile runoff studies	\$ 2,000,000	
Pilot wetland systems	\$ 5,000,000	
Pilot chat uses/marketing	\$ 1,100,000	
Pilot mine shaft plugging	\$ 500,000	
Native foods foraging study	\$ 450,000	
Chat marketing industrial authority	\$ 714,000	
GIS committee	\$ 150,000	
Phase II of yard remediation	\$ 27,500,000	\$ 2,750,000
TOTAL	\$ 37,414,000	\$ 2,750,000

GOVERNOR KEATING'S TAR CREEK TASK FORCE HEALTH EFFECTS SUBCOMMITTEE FINAL REPORT AUGUST 1, 2000

The Health Effects Sub-Committee has reached several conclusions concerning the nature and extent of health effects and their sources during its review of the situation in Ottawa County and has provided several recommendations to Governor Keating's Tar Creek Task Force. The information is presented in considerable detail in the first two reports submitted to the Task Force; therefore, this report will be used to highlight and summarize previously reported findings. The amount of funding needed for the activities presented in this and previous reports is difficult to predict without further more detailed study. Health related research projects can potentially be funded through federal mechanisms as can some remediation efforts. On-going local efforts, particularly the current yard-removal efforts, blood lead screening, and child developmental testing, require the consistent allocation of state and local funds and should be considered as the most critical items for funding related to health concerns.

- 1. Exposure to lead represents a serious public health problem in Ottawa County. Studies conducted over the past few years have indicated that as many as 40% of children in some areas have elevated blood lead levels. Although the prevalence of elevated blood lead levels has dropped, it remains well above state and national averages and should be expected to remain so until additional remediation and educational efforts are accomplished.
- 2. Soil removal efforts by EPA have had a significant impact on reducing the prevalence of elevated blood lead levels and should be supported and continued. In addition, the removal of contaminated residential soils outside of the Superfund site boundaries should be initiated.
- 3. A number of activities should be put into place, augmented, or further supported to assist on-going efforts to track and reduce blood lead level:
 - a. It is recommended that children in this area be regularly screened for blood lead levels, especially those with identified risk factors. A quantifiable goal is the screening of all children in Ottawa County. (Annual Cost \$50,000)
 - b. Children should be tracked over time to measure changes in exposure status and to identify health effects. (Annual Cost \$50,000)
 - c. A unified map of blood lead levels and environmental exposures should be created using GIS technology to better identify areas of greatest concern. (Cost \$25,000 assuming use of current equipment and software at ODEQ)
 - d. Educational efforts should be coordinated to maximize effectiveness and reduce redundancy. Two distinct educational goals have been identified:
 - 1. Develop community relevant health education and outreach strategies which will update and inform Ottawa County residents regarding the lead poisoning issues in Tar Creek Superfund Site and adjacent areas. (Annual Cost \$150,000)

- 2. Continued monitoring of blood lead levels in Ottawa County children with creation of a multi-purpose database that facilitates tracking, sharing of information, and assisted measurement of community impact. (Annual Cost \$150,000)
- 4. A long-term study on health outcomes in children should be initiated to determine the incidence of Ottawa County children with learning disabilities from visual and/or cognitive deficits that present barriers to education. There is strong evidence that adverse health outcomes of this nature are occurring; however, these effects have yet to be quantified. The current Ottawa County Health Department study indicates that 10 of the 12 (83)% of the lead-exposed children tested have some type of learning difficulty as compared to a rate of 2 to 10% in the general population of school age children. This type of evidence would be invaluable in leveraging additional educational and health funding. (Estimated cost \$500,000).
- 5. The effects of lead and other metals on adult and adolescent health have not been quantitatively assessed. Given the extent of exposure and strong anecdotal information, it appears likely that other health outcomes (e.g. kidney disease) are occurring (Table 1).

Table 1. Potential Studies of Long-Term Metals Exposure in Ottawa County			
Health Effect	Priority	Current status of knowledge/progress	Estimated Cost
Neurological Effects	1	Pilot project at Ottawa Co. Health Dept. indicates learning disabilities in some children	500K
Kidney Disease	2	Proposal submitted by OUHSC to ATSDR; approved but not funded	750K*
Hypertension	3	Anecdotal information; several dialysis clinics in tri-state area	750K*
Hearing Loss	4	Preliminary data being collected by Ottawa County Health Dept.	500K
Cancers	5	Anecdotal information	1-1.2 million
Alzheimer's Disease	6	Suggested by other studies	250K
Parkinson's Disease	7	Suggested by other studies	150K

^{*}hypertension and kidney disease could be conducted simultaneously for a combined cost of 750K

- 6. The widespread nature of soil and water contamination in Ottawa County demonstrates that wildlife is being exposed to metals on a wide scale. Although this bears obvious significance for the health of biological communities in general, a more specific concern relates to the effects on the health of people who gather and consume wild foods. A study of this nature would cost approximately \$450K.
- 7. The removal of the remaining mine wastes (chat) will be required as part of the overall remediation effort to reduce metals exposure to acceptable levels. Despite regulatory obfuscation, chat is a hazardous (toxic) material by any health-based definition with a significant potential for damaging public health. The committee recognizes that creative or non-standard solutions may be necessary for the removal of chat to remain as a practical remediation alternative; however, **public health must be the first consideration in any discussion of removal alternatives**. Reduction of risk to the lowest level practically obtainable should be the primary goal of chat removal.
- 8. Exposure to lead-based paint is a serious problem in some communities given the prevalence of homes with lead-based paint (>75% in some communities) and the physical condition of the paint. Removal of contaminated soils from these properties without remediation of paint sources will be only partially effective in addressing blood lead problems. Current HUD funded paint remediation activities conducted by the Grand Gateway Economic Development Authority should be continued and expanded. A firm estimate of the cost required for paint remediation of all homes within the Superfund area is unavailable but would be in excess of 2 million dollars.