

FINAL TECHNICAL REPORT

Project Title: Environmental Assessment of Oklahoma
Abandoned Drilling and Production Sites and
Associated Public Education/Outreach Activities

Final Technical Report

**The Annual Technical Report for Period December 15, 2000 to December 14, 2001
Is Incorporated Within**

Grant Starting Date: December 15, 1998

Grant Completion Date: December 14, 2001

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Report Issue Date: March, 2002

Grant Number: DE-FG26-99BC15036

Government Award: \$600,000

Institution: Oklahoma Energy Resources Board (OERB)
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U.S. DOE Patent Clearance is not required prior to the publication of this document.

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EXECUTIVE SUMMARY

Background and Objectives

The U.S. Department of Energy has participated with the OERB since 1995 by providing grant funding for on-going work in both environmental assessment of abandoned oilfield exploration and production sites and associated public education/outreach activities. The OERB, a state agency created in 1993 by the Oklahoma legislature, administers programs funded by an assessment of one tenth of one percent on all oil and natural gas produced and sold in the state of Oklahoma. Approximately one half of the funds are used to assess and remediate abandoned oilfield sites and the other half are being used to educate about the importance of the oil and natural gas industry and OERB's environmental efforts.

Financial participation through grant funding by the U.S. D.O.E. has been \$200,000 annually which represents approximately 3 percent of OERB's private funding. Most of OERB's revenues come from an assessment of 1/10th of 1% on the sale of crude and natural gas in Oklahoma. The assessment is considered voluntary in that any interest owner may ask for a refund annually of their contributions to the fund. On average, 95% of the assessment dollars have remained with OERB, which shows tremendous support by the industry. This *Final Report* summarizes the progress of the three year grant.

The purpose of this three-year project was to continue the progress of the OERB to accomplish its environmental and educational objectives and transfer information learned to other organizations and producing states in the industry.

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Environmental Assessment of Abandoned Oil and Gas Drilling and Production Sites

Until the creation of the OERB, there was no funding available to address the surface problems associated with historical oilfield site operations. The OERB has filled an environmental gap by providing voluntary industry funding to clean up problems left behind by an un-regulated era. The beauty of this program is that Oklahoma's current petroleum industry is voluntarily taking steps to be environmentally responsible for restoring the sins of the past.

The OERB uses a competitive bidding process to select private environmental consulting firms and contractors to conduct site assessments, evaluation and remediation. Field work is thoroughly documented and coordinated between the consulting firm, OERB staff and the OERB Environmental Restoration Committee. Monthly details are reported in an executive summary format to keep board members up to date on the progress.

In order for the OERB to perform site assessments, projects must be recommended by the Oklahoma Corporation Commission, the state's regulatory agency for oil and gas activities. Since OERB began its cleanup assessment and remediation activities in 1994 more than 4,745 individual sites have been forwarded to OERB and 3,225 sites have been completely restored. Funding from the industry substantially increased in 2001, allowing OERB to have its largest environmental budget ever in 2002 at \$9.8 million. We were able to completely restore 940 sites in calendar year 2001 and are currently restoring sites at the rate of four per day.

The OERB staff and consultants are constantly reviewing methods and technologies to identify and improve more effective and efficient ways to restore salt and hydrocarbon impacted soils, etc. As these improvements are identified (see environmental technical report), the OERB continues to share and transfer information to

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other government agencies, trade associations, consortium, and the private sector. For example, the OERB completed a project for the BLM which included an operations manual describing how to assess and restore oilfield sites entitled *Lease Operations Environmental Guidance Document*. The document is now available in a Compact Disk format and is available for download on www.oerb.com. Other projects include using waste products from municipalities to remediate salt impacted soils and a joint project with the Oklahoma Corporation Commission and the Environmental Protection Agency to remediate sites containing hydrocarbons near Lake Oologah in Northeastern Oklahoma.

Public Education/Safety Program

The OERB is also committed to education programs to increase the public's knowledge about oilfield safety and basic principles about how the oil and natural gas industry explores for, produces and uses petroleum. These programs provide valuable information to students, teachers and their parents, in hopes of making them more energy literate as well as providing students with a knowledge of the dangers associated with playing around oilfield equipment.

Research conducted by the OERB through D.O.E. funding showed that approximately two thirds (2/3) of the middle school teachers surveyed believe that fossil fuels will no longer be the dominant fuel by the year 2020. In addition, independent researchers found that Oklahomans generally believe that the oil and gas industry is an out-dated industry on the decline that takes advantage of the environment.

Since that time, the OERB has developed education programs for grades 3-12 including hundreds of trained speakers from the industry called *Petroleum Professionals in the Classroom* (Petro Pros) who volunteer to talk with students about the basics of

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exploring and producing oil and natural gas. An estimated 65,000+ students have witnessed a *Petro Pro* presentation which includes the viewing of the important safety video called "Play It Smart."

The safety video is an important part of the safety education program. OERB has received hundreds of calls for the video from teachers and administrators. The video is also provided to teachers after each *Petro Pro* presentation. A professionally developed multi-media campaign has also been used in television, radio and print to educate the public about the dangers associated with oilfield equipment. This safety information is also presented on www.oerb.com and the OERB's new student website www.xploration.com.

The *Fossils to Fuel* curriculum was introduced to the classroom in 1997 to educate grades 3 through 6 about how the industry explores, produces and uses petroleum. More than 1,587 teachers have been trained in the hands-on curriculum and an estimated 38,000+ students have participated in the curriculum.

In response to the success of *Fossils to Fuel*, a new curriculum has been developed for middle schools called *Petro Active*. The six-week program has been field tested and professional development started in the summer of 2000. To date, 222 teachers have been trained in the use of *Petro Active*. This middle-level curriculum also contains a unit dedicated to safety.

Because of the need for energy educational programs and the success of the OERB, other states have begun to incorporate OERB programs into their educational efforts. *Petro Pros* presentations have been heard in states like Texas, Louisiana, Michigan, Colorado, Illinois, Virginia and as far away as Venezuela. The Ohio Oil and Gas Energy Education Program and the Illinois Oil and Gas Energy Education Program

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have developed oilfield safety programs for students in their respective states using OERB materials as a guide.

The OERB is also a major sponsor of the *Building a Presence for Science*, a national program initiated by the National Science Teachers Association, to bring National Science Standards to every classroom in Oklahoma. The OERB is providing a copy of the standards to every school in the state, as well as funding for the master teachers' initial training.

To better reach students in Oklahoma, as well as outside the state, the OERB developed a state-of-the-art web site designed especially for students. Xploration.com, which launched in early 2001, consists of learning tools for elementary and middle school students, oil and gas research materials, as well as energy-related science projects. The new site even has a section dedicated to oilfield safety. Scholarship and career information for high school students is provided on the OERB's main website www.oerb.com.

Continuing the Progress

The OERB has been successful in continuing the progress that has been sustained throughout its history. It's a tribute to Oklahoma's producers and royalty owners who have supported the OERB through thick and thin with voluntary contributions since its inception in 1993. Refunds of the assessment have averaged less than 5 percent of the contributions.

The industry takes a lot of pride in the fact that over 3,225 abandoned oilfield sites have been completely restored since 1994. Because of increased technology and efficiency, the OERB will continue to assess and restore more sites with less money.

Oklahoma's students deserve an opportunity to learn about energy, and particularly about petroleum. It has been an important part of their heritage and students

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need to know how it impacts their daily lives. Oklahoma's students are getting that chance through the OERB as more than an estimated 297,000 are being introduced to energy education materials. As these programs continue, the impact will be felt for years to come.

As OERB continues to make its imprint on the environment and in the minds of the public, we wish to thank the U.S. Department of Energy for participating with us through grant funding. OERB is committed to a pro-active approach to the environment and educational activities and allowing others to examine the success story.

**ENVIRONMENTAL ASSESSMENT OF OKLAHOMA ABANDONED
DRILLING AND PRODUCTION SITES AND ASSOCIATED PUBLIC
EDUCATION/OUTREACH ACTIVITIES**

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Oklahoma oil and gas producers and royalty owners are taking part in the nation's first voluntary industry-funded public awareness and student education program for oilfield safety and petroleum education. The program is administered by the Oklahoma Energy Resources Board (OERB), a state agency which was created by the Oklahoma Independent Energy Education and Marketing Act of 1993. The OERB is an unpaid 21 member board composed of independent and major petroleum company personnel, oil and natural gas purchasing company personnel, and a royalty owner representative. The OERB administers an assessment of one tenth of one percent on the value of all oil and natural gas sold in Oklahoma. The expenditure of these funds is divided between the agency's two primary objectives: environmental restoration of abandoned well sites and education. Any contributor to the fund who does not wish to participate in the program may annually request a refund.

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OBJECTIVES

The purpose of the environmental program will be accomplished through two primary objectives:

Task 1 – Environmental Assessment of Abandoned Oil and Gas Drilling and Production Sites and Environmental Technology Transfer.

- Task 1.1 Perform Phase I Environmental Site Assessments (Phase I ESA)
 - Task 1.1.1 Gather data, characterize and prioritize sites
 - Task 1.1.2 Physically visit and document site conditions, and assess the potential for environmental contamination
 - Task 1.1.3 Perform record review, site reconnaissance, interviews, and site reporting for abandoned oil and natural gas exploration and production sites.
- Task 1.2 Perform Phase II Environmental Site Assessments (Phase II ESA).
 - Task 1.2.1 Take appropriate soil and water samples sufficient to define a baseline or background level of certain constituents at a site, including the geographical extent, volume and concentration levels.
 - Task 1.2.2 Perform field sampling, laboratory analyses, and site reporting for abandoned oil and natural gas exploration and production sites.
 - Task 1.2.3 Perform site reporting, which includes a site characterization summary with a simplified presentation of sampling, preliminary remediation and restoration plans, and procedures for any restoration work.
- Task 1.3 Conduct Research and Characterize Technologies for Environmental Remediation.
 - Task 1.3.1 Perform comparative field tests and identify cost-effective and efficient technologies and practices for remediation and restoration of soils, mud and disposal pits and any other surface contamination at Oklahoma oil and gas production and exploration sites resulting from Task 1.2 and 1.3.

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- Task 1.4 Environmental Technology Transfer. Task 1.4.1 To transfer project results to the oil and natural gas industry, regulatory agencies, and other interested parties through associated conventions, workshops or field demonstration projects.
- Task 1.4.2 Field projects are to be held in a central location, if possible, and workshops are to be held in conjunction with oil and gas industry association meetings or conferences.
- Task 1.4.3 Workshops and field projects can be coordinated with the Oklahoma Corporation Commission and shall summarize the most cost effective technologies and practices for environmental assessment, remediation and restoration activities.

Task 2 - Public Education, Research and Safety Programs

- Task 2.1 Expand the student education programs to include energy education at the elementary and secondary level by implementing an existing curriculum or development of a new curriculum, including teaching materials, professional development, budgeting, and a plan for inclusion into science classes statewide.
- Task 2.2 Develop and implement an oilfield safety program to educate children and adults about the dangers associated with oilfield equipment. The plan would include development, production and distribution of an oilfield safety video and supportive materials to effectively gain children's attention and educate about such dangers as pumping units and tank batteries.
- Task 2.3 Transfer information about energy education/safety programs. The purpose of this task is to transfer education materials, safety messages and project results of energy education programs to other oil and gas industry leaders, officials and interested parties outside Oklahoma through direct mail-outs and/or speaking engagements at associated conventions.

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SUMMARY OF TECHNICAL PROGRESS

Task 11. Perform Phase I Environmental Site Assessments (Phase I ESA)

Task 1.1.1 Gather data, characterize and prioritize sitesThe following definitions have been historically used in the OERB program by the environmental consultant to distinguish between projects and sites. A distinction between projects and sites is necessary as a means to adequately identify all parts of a project such that the restoration of each unique part can be properly resolved.

PROJECT - A Project is a geographic area that may include one or more sites and is based on the initial paperwork, or form that reports orphaned or abandoned site(s) needing environmental restoration as turned into the OERB.

Comments: This initial paperwork is completed by any field inspector or official representative of the Oklahoma Corporation Commission (OCC), or a field inspector or official representative of any other state agency in Osage County. All projects must be reviewed to determine if there is a responsible party by the OCC or other

appropriate party (such as the Bureau of Indian Affairs) prior to being sent to the OERB for inclusion in the environmental restoration program. A Project typically has one land owner and is generally confined to a geographic area limited by the land which is owned by that individual, usually but not always being located within a ¼ section (160 acres) of land. Two projects with the same land owner may be located in adjacent ¼ sections of the same section or within adjacent sections (640 acres). The determining factor in creating a single project is the OERB/OCC form which the field inspector turns in to initiate restoration activity.

SITE - A Site is a small geographic area which is a distinct part of a Project.

Comments: Sites are generally related to individual locations of exploration and production (E & P) activity most closely associated with an individual well (a well site should be documented with a 1002A form and a plugging report, when available). A common example of a single site can include that area immediately around the well head and/or the area directly related to the well site itself, including any reserve and/or working pits, all concrete pads, foundations,

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standard derrick corners, and other concrete associated with that particular well location. Other examples can include a central tank battery associated with multiple wells, abandoned equipment, concrete foundations associated with any line pumps or equipment that are removed from well locations, exposed flowlines when such flowlines are some distance from a well site, isolated working or production pits, denuded and/or eroded areas, hydrocarbon impacted soil located away from a well, or any small, distinct geographic area requiring special consideration for restoration activities. The number of sites within a single project can vary from one to as many as twelve plus sites. It is the intention of the definition of site to enable the Phase I ESA inspecting team to identify all parts of a project such that each unique geographic area within the project boundary can properly be restored.

In order to maximize efficiencies, the OERB, in most cases, performs its Phase II ESA at the same time the Phase I ESA is performed. As of December 31, 2001, the OERB completed 416 Phase I and/or II ESAs on approximately 1,151 individual sites. Since the Program's inception, the OERB has performed a total of 1,685 Phase I and/or II ESAs on 4,211 individual sites.

Task 1.1.2 Physically visit and document site conditions, and assess the potential for environmental contamination

Each reported site was visited by a Phase I ESA team, usually consisting of two technicians, to record the environmental status at each location. During the visit, a visual inspection and initial assessment is performed to determine the potential for environmental contamination.

Task 1.1.3 Perform record review, site reconnaissance, interviews, and site reporting for abandoned oil and natural gas exploration and production sites.

Each assessment team records each project with both video and digital still cameras as they perform a reconnaissance of the reported area. The team also makes a geographic sketch of the project and its site(s). In addition, the team interviews the landowner and, when necessary, reviews Oklahoma Corporation Commission, county courthouse records and other pertinent historical sources to determine the history and past ownership of each well site.

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Task 1.2 Perform Phase II Environmental Site Assessments (Phase II ESA).

Task 1.2.1 Take appropriate soil and water samples sufficient to define a baseline or background level of certain constituents at a site, including geographic extent and volume and concentration levels.

Samples obtained during a Phase II ESA are site specific and vary from site to site. The sampling is typically performed based on site conditions, suspected contaminants and/or knowledge of process. Sampling is performed to determine the potential impact associated with historical E & P activities. Should sampling reveal that impacted areas are present, a sampling program is then designed to further characterize these areas for restoration design purposes.

As mentioned in Task 1.1.1, the OERB, as of December 31, 2001, performed a total of 416 Phase I and/or II ESA's on a total of approximately 1,151 individual sites.

Task 1.2.2 Perform field sampling, laboratory analyses, and site reporting for abandoned oil and natural gas exploration and production sites.

The following sampling protocols are general guidelines in sample collection and analysis. These protocols are based on the assumption that the sites are non-commercial with limited public access and only oil and gas E & P waste are associated with the site. Even though projects associated with the OERB program are similar in nature, each site is unique and sampling is adjusted accordingly.

Surfacial Hydrocarbons

Surfacial weathered hydrocarbons are generally confined to the surface and may not require sampling. Field personnel bore or dig through the hydrocarbon impacted area to verify that the contamination is confined to the surface and the immediate underlying areas. This determination is usually made with field

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evidence (visual and olfactory). If subsurface contamination is evident, samples are then obtained in accordance with working and reserve pits, tank battery areas and field evidence of hydrocarbon impact, as outlined below.

The extent of surfacial weathered hydrocarbons varies from project to project. The area of impact is generally confined as determined visually and generally does not extend greater than one foot below ground surface (bgs). Surface areas range from a few square feet to several thousand square feet.

Samples obtained from surfacial weathered hydrocarbon areas are normally analyzed for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, and Xylene (BTEX), Chlorides and Specific Conductance. The results vary, but typically the TPH concentration is below 5,000 parts per million (ppm), BTEX concentrations are non-detect or less than 1 ppm, the Chloride concentration is less than 250 ppm and the Specific Conductance is less than 500 micromhos per centimeter (mho/cm).

Working and Reserve Pits and Tank Battery Areas, No Field Evidence of Impact

Samples are obtained from working and reserve pits and tank battery areas where there is no field evidence of impact due to knowledge of process rather than visual observations. Soil and water samples are obtained from these areas to provide information that supports the field observations that impacts from E & P operations are not present.

Soil samples are obtained from pit or tank battery areas that are absent of water or are only partially filled with water. A single composite soil sample is generally sufficient. The sample is typically obtained utilizing a hand auger and is a composite of surface locations within the pit or tank battery area including the walls of any berms. In areas that contain multiple pits or bermed areas of similar nature, samples may be composited to reduce analytical costs. Soil samples are typically analyzed for TPH, BTEX, Chlorides and Specific Conductance.

Water samples are collected from pit or bermed areas that appear to hold water on a regular basis. In areas that hold water seasonally or during wet periods, water sampling is performed on a case by case basis. In areas that contain multiple pits

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or bermed areas of similar nature, samples may be composited to reduce analytical costs. Water samples are typically analyzed for TPH, BTEX, Chlorides and Specific Conductance. The samples are collected from the horizon of the water that is most likely to have the highest concentration of the contaminant. For example Chloride samples would be obtained from the bottom since it is a sinker while TPH and BTEX samples would be obtained from the top since it is a floater.

Analytical results are generally below detection limits or below action levels for the samples obtained from working and reserve pits and tank battery areas where there is no field evidence of impact.

Working and Reserve Pits and Tank Battery Areas, Field Evidence of Hydrocarbon Impact

Samples are typically obtained from working and reserve pits and tank battery areas where there is field evidence of hydrocarbon impact to determine the nature and extent of the impact. The number of samples obtained and sampling points vary from project to project depending on the aerial and vertical extent of the impact. The number of samples obtained are minimized by evaluating the physical characteristics of the site (i.e. visual extent of the impact, topography, soil types, etc.) and restoration protocol (i.e. if impacted soil is to be removed or remediated on-site, then sampling is designed to provide a reasonable estimate of the volume of impact).

Subsurface or surface soil samples are typically collected from the most impacted area(s) based on field observations (i.e. visual, olfactory or organic vapor monitor (OVM) readings). Samples to delineate the extent of impact may also be collected at a certain depth below impacted areas and where there is no field evidence of impact (i.e. to ascertain the vertical extent of impact) or around the perimeter of the impacted area (i.e. to ascertain the aerial extent of impact). These samples are generally analyzed for TPH, BTEX, Chlorides and Specific Conductance.

Visually impacted surface water samples are generally collected and analyzed for disposal purposes. If hydrocarbon impacted water or saltwater is encountered in a contained area (i.e. tanks or pits) and the intent is to dispose the liquids according to OCC regulations (i.e. via an injection well), then sampling may not be

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performed if there is sufficient evidence to support that the liquids are E & P waste which are exempt from RCRA regulations. Sampling of visually impacted streams, creeks, rivers, ponds, etc. is performed on a case by case basis. Groundwater samples may be obtained if encountered in borings where an impact may or is suspected of being present (i.e. in areas where impacted soil is in close proximity to the groundwater or where surface impact could migrate to groundwater via subsurface conduits). Groundwater samples are typically analyzed for TPH, BTEX, Chlorides and Specific Conductance.

The extent of impact in working and reserve pits and tank battery areas where there is field evidence of hydrocarbon impact varies from project to project. The area of impact is generally confined to what visual extent is observed and typically ranges in volume from a few to several thousand cubic yards.

Analytical results for the samples obtained from these areas vary widely due to several factors which include the source, nature and age of the impact as well as the characteristics of the soil present at the site. Of the constituents typically analyzed, TPH and Chlorides are most commonly identified as having concentrations which exceed action levels.

Tanks

Tank contents are generally sampled for disposal purposes. If the intent is to dispose the contents according to OCC regulations (i.e. via an injection well or application to county or lease roads), then sampling may not be performed if there is sufficient evidence to support that the contents are E & P waste which are exempt from RCRA regulations. Disposal of E & P waste via an injection well generally does not require analytical results and, in some counties, County Commissioners and OCC Field Inspectors do not require that sampling be performed prior to application of tank bottoms or weathered hydrocarbons to county roads. If samples are collected, they are typically analyzed for TPH, BTEX, Eight RCRA Metals, Zinc, Chlorides and Specific Conductance.

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Denuded Areas From Saltwater Impact

Composite soil samples are typically obtained from denuded areas associated with saltwater impact. The samples are collected from the top six inches of soil at random systematic locations (typically, a minimum of ten to fifteen samples) and are then composited. In denuded areas of two acres or less, one sample is generally sufficient. Larger areas (greater than two acres) are divided into equal areas (not to exceed two acres per section). Composite samples are then obtained from each area. The larger areas are divided so that the each section is progressively farther from the apparent source (i.e. if the apparent source is at the north end of the denuded area, then the area is divided from north to south). The composite samples are then analyzed for Chlorides and Specific Conductance.

Salinity Management.

The extent of saltwater impact varies from site to site and typically ranges from a few hundred square feet to in excess of forty acres.

Analytical results also vary from site to site. Denuded areas typically contain Total Soluble Salts which exceed the level required for productive soil.

Confirmatory Sampling

Confirmatory samples are collected in areas where impact has been removed or where the progress or completion of a restoration process is being reviewed (i.e. landfarm cells or denuded areas). The samples are analyzed for the constituents identified during the ESA sampling.

SUMMARY

As noted earlier, these sampling protocols are only guidelines and each site encountered is unique and may require modifications to the sampling protocol. Sampling sites which are commercial or are suspect of contaminants not associated with E & P operations is handled on a case by case basis.

This year, the OERB completed the restoration of its 3,000th site. As of December 31, 2001, the OERB spent nearly \$15,000,000 restoring a total of 3,225

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sites in 55 out of Oklahoma's 77 counties. Thousands of sites still require restoration.

Task 1.2.3 Perform site reporting, which includes a site characterization summary with a simplified presentation of sampling, preliminary remediation and restoration plans, and procedures for any restoration work.

After the analytical information is received from the analytical laboratory, the site project manager evaluates the information and develops a preliminary plan for restoration. The restoration plan takes into consideration the analytical results, the landowner's desire for the land's use, information from agronomy and/or water agencies (such as the U.S. Soil Conservation Service, the Oklahoma Water Resources Board and the county extension agent), and the geographical and geological aspects of the site. Once the consulted agencies and landowner agree on the remediation plan, a scope of work is written detailing the issues involving site remediation. The OERB environmental contractor then initiates a bidding process with registered contractors.

The OERB bidding process is modeled after the policies and procedures of the Oklahoma Department of Central Services, the state agency which regulates the majority of bidding and purchasing for Oklahoma state government.

Task 1.3 Conduct Research and Characterize Technologies for Environmental Remediation.

Task 1.3.1 Perform comparative field tests and identify cost-effective and efficient technologies and practices for remediation and restoration of soils, mud and disposal pits, or any other surface contamination at Oklahoma oil and gas production and exploration sites. This characterization will result from Tasks 1.2 and 1.3 and shall be presented in a summary report format.

The following summarizes the activities that the OERB is presently pursuing in conjunction with this Task:

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At the onset of the Environmental Restoration Program, the OERB performed a broad range of analytical samples on its projects to determine the overall chemical composition of E & P sites. Initially, sampling included analysis for Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Total Petroleum Hydrocarbons (TPH), Eight RCRA Metals, Specific Conductance, Chlorides, Salinity Management and General Soil Testing. After restoring approximately 1,000 plus sites, it was determined that no constituents had been encountered that exceeded regulatory guidelines. Upon approval by the Oklahoma Corporation Commission, the sampling regimen was reduced to BTEX, TPH, Chlorides, Specific Conductance, Salinity Management and General Soil Testing. To date, no constituents have been encountered which exceed regulatory guidelines. The OERB hopes to ultimately compile and utilize this data to benefit regulators and industry.

The OERB continues working with the Oklahoma Department of Environmental Quality (ODEQ), the Okmulgee County Natural Resources Conversation Service (NRCS), the Stephens County NRCS, and the Association of South Central Oklahoma Governments (ASCOG) in performing land application of municipal wastewater sludge on various OERB brine-impacted projects located in Okmulgee County, Oklahoma.

The OERB continues to monitor the effectiveness of its remediation activities and reviews emerging technologies that could potentially benefit the Program.

Task 1.4 Environmental Technology Transfer.

Task 1.4.1 To transfer project results from Tasks 1.1, 1.2 and 1.3 to the oil and natural gas industry, regulatory agencies, and other interested parties through associated conventions, workshops or field demonstration projects.

All of the OERB's records are open to the petroleum industry and any interested party through the Oklahoma Open Records law. The work performed and research conducted by the OERB through its environmental consultant is also open to inspection, and such inspection is encouraged by both the OERB and BEACON

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Environmental Assistance Corporation, the environmental consultant. Workshops are conducted to assist with the technology transfer (please see Task 1.4.2 and Task 1.4.3.)

During the term of this grant, the OERB Staff met with the several states including, Texas, Illinois, Ohio, Kansas, and Colorado concerning the establishment of voluntary check-off programs. As a result, voluntary check-off programs were established in Ohio and Illinois. The OERB is hopeful that other States or even a National Check-Off Program will one day be implemented.

Task 1.4.2 Field projects are to be held in a central location, if possible, and workshops are to be held in conjunction with an oil and gas industry association meeting or conference.

Field projects are often discussed at workshops and seminars hosted by the petroleum industry and royalty owners associations, in addition to informal discussions with these groups at association meetings. During the term of this grant, the OERB made countless presentations outlining the OERB's objectives which are to improve the public image of Oklahoma's Oil and Gas Industry by providing funding for environmental restoration and providing a high profile educational campaign. Presentations were made to organizations including the National Department of Energy, the Oklahoma Independent Petroleum Association, the Society of Petroleum Engineers, the Environmental Federation of Oklahoma, the International Petroleum Environmental Conference, students at various State Universities as well as various high school environmental and earth science classes.

Task 1.4.3 Workshops and field projects are to be coordinated with the Corporation Commission and shall summarize the cost effective technologies and practices for the environmental assessment, remediation and associated environmental regulatory issues.

During the term of this grant, the OERB staff provided field trips for state high school students. Any interested teacher may contact the OERB and request a field trip on petroleum exploration and production -- such as a visit to an active well site -- or a visit to an environmental restoration site. Students of

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the Prairie to Peaks Science Educational Program and various high school earth and environmental science classes routinely participated in OERB field trips.

On an ongoing basis, the OERB continues to provide presentations to numerous entities including schools, civic organizations, advisory groups and trade associations in conjunction with this Task.

Task 2 Public Education, Research and Safety Programs

Task 2.1 Expand the student education programs to include energy education at the elementary and secondary level by implementing an existing curriculum or development of a new curriculum, including teaching materials, professional development, budgeting, and a plan for inclusion into science classes statewide.

To date, 1,587 elementary and middle level teachers have been trained in the use of OERB's *Fossils to Fuel* curriculum. The OERB is continuing professional development for this energy education program. *Fossils to Fuel* is a hands-on earth science curriculum that comes complete with a teacher's guide and activities kit. The activities kit consists of everything, aside from a few consumable items, needed to complete the entire curriculum. The six-week program is designed to help students in grades 4-6 learn basic concepts of how energy is transformed from the sun, to carbon-based matter, to petroleum and ultimately into our homes and schools. *Fossils to Fuel* is considered adaptable to lower and upper level students as well.

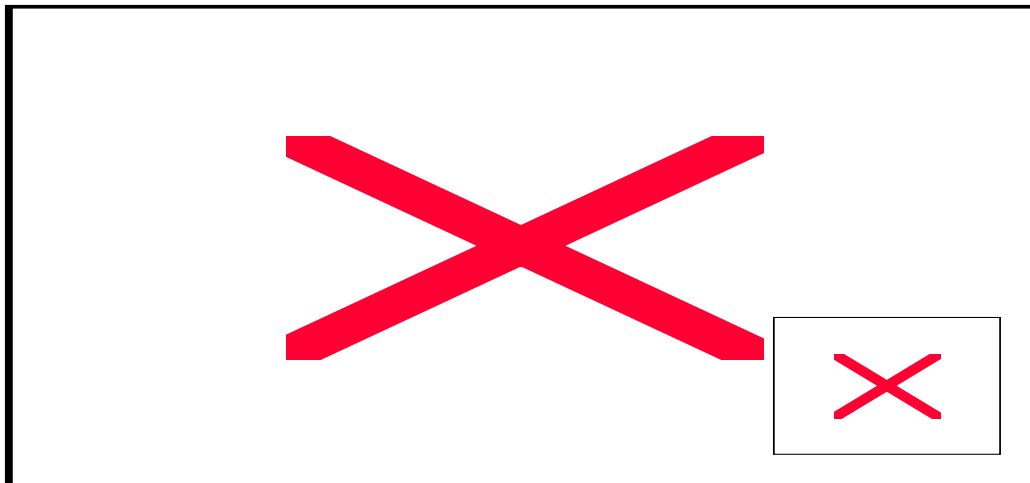
Training for *Petro Active*, a new middle-level curriculum, began in the summer of 2000. To date, 222 middle-level teachers have been trained in the use of the *Petro Active* curriculum. The OERB is continuing professional development for this energy education program. *Petro Active* is a hands-on earth science curriculum that comes complete with a teachers's guide and activities kit. As with *Fossils to Fuel's* activities kit, the *Petro Active* activities kit comes complete with everything needed to complete the entire curriculum, aside from a few consumable items. The six-week program is designed to help students in grades 7-9 learn basic concepts about the exploration, production and many uses of petroleum.

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Both *Fossils to Fuel* and *Petro Active* are provided to educators through professional development sessions at area professional development centers.

Several of the *Fossils to Fuel* and *Petro Active* activities are provided to teachers and students through participating papers in the Newspapers in Education project. Twice monthly from October to April, participating newspapers publish editorial content about the oil and natural gas industry as well as Science Snoopers activities which are based on activities from *Fossils to Fuel* and *Petro Active*. Based on data provided to the OERB from participating papers, it is estimated that 69,000 students have been reached through the Newspapers in Education Project.

More than 297,000 Oklahoma students have been impacted by OERB sponsored curricula or programs—and that’s just the beginning. The new student website www.Xploration.com can reach thousands of students in Oklahoma as well as around the world.



Petro Pros - 65,572 students reached to date
Petro Active - 19,503 students reached to date; 222 teachers trained
Fueling Around - 38,056 students reached to date
Fossils to Fuel - 104,030 students reached to date, 1,587 teachers trained
Petroleum Challenge - 950 students reached to date
Newspaper in Education - 69,608 students reached to date
Total Students Reached to Date - 297,719

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Task 2.2 Develop and implement an oilfield safety program to educate children and adults about the dangers associated with oilfield equipment. The plan would include development, production and distribution of an oilfield safety video and supportive materials to effectively gain children’s attention and educate about such dangers as pumping units and tank batteries.

The OERB continues its distribution of the now-popular Play It Smart! safety video to schools and libraries statewide, interested fire and police departments, the Oklahoma Safe Kids Coalition, public health departments, churches, community organizations and other interested parties. The video is a permanent part of the OERB Petroleum Professional in the Classroom program, with the video shown during each classroom presentation. “Play it Smart!” is also included in the *Petro Active* Curriculum Activities Kit. The video is shown as part of a curriculum unit covering safety. The video can be obtained through the OERB’s website www.oerb.com and the OERB’s student website www.xploration.com. The OERB is still examining other methods of distribution and responding to public requests for the video.

The OERB also put in place public service announcements (PSAs) focusing on safety. The OERB’s advertising agency also developed a poster focusing on safety. This poster is being provided to all Oklahoma classrooms through the *Petro Pro*, *Petro Active* and *Fossils to Fuel* programs. The poster and PSA can be downloaded from OERB’s main website www.oerb.com and OERB’s student website www.xploration.com.

Task 2.3 Transfer information about energy education/safety programs. The purpose of this task is to transfer education materials, safety messages and project results of energy education programs to other oil and gas industry leaders, officials and interested parties outside Oklahoma through direct mail-outs and/or speaking engagements at associated conventions.

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The OERB disseminated information concerning its energy education/safety programs to members of the Oklahoma Independent Petroleum Association at its various meetings. This information was also disseminated to oil and natural gas industry representatives at area Petro Pro training sessions.

Information regarding OERB's educational and environmental efforts was provided to various other state's oil and gas industry leaders and officials at the International Oil and Gas Compact Commission's Annual Meeting, as well as meetings such as the Commission on Marginally Producing Oil and Gas Wells Trade Fairs, National Association of Royalty Owners Annual Meetings and various oil and gas associations meetings in Texas, Colorado, Ohio and Illinois.

The OERB Progress Report and Classified Newsletter were distributed to interested parties in-state and out-of-state. The Classified newsletter contains information about the education aspects of the OERB, and the Progress Report contains information about both the education and environmental aspects. Information concerning OERB curricula and teacher training, as well as the environmental program was provided via the Internet through www.oerb.com. Energy education information as well as safety information was provided to students and teachers via the Internet through www.xploration.com.

"Play it Smart!" safety videos were sent to out-of-state teachers as well as oil and gas associations in Ohio, Colorado, Illinois, Texas, California and Louisiana.

CONCLUSION

The purpose of this three-year project was to continue the environmental restoration and educational objectives of the OERB and transfer information learned to other organizations and producing states in the industry.

The OERB has completely restored more than 3,225 individual sites since the inception of the program. The OERB staff and consultants constantly review methods and technology to identify and improve more effective and efficient ways to restore salt and hydrocarbon impacted soils, etc. During this grant period, the OERB has worked with the BLM on a project which included an operations manual describing how to assess and

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restore oilfield sites entitled *Lease Operations Environmental Guidance Document*. The document is available in Compact Disk format as well as being available for download from OERB's web site www.oerb.com. The OERB has also been working closely with the Oklahoma Corporation Commission and Environmental Protection Agency to remediate sites near Lake Oologah in Northeastern Oklahoma; as well as working on projects which use waste products from municipalities to remediate salt impacted soils.

With D.O.E. funding, the OERB was able to conduct research which showed that approximately two thirds (2/3) of the middle school teachers surveyed believed fossil fuels will no longer be the dominant fuel by the year 2020. Additionally, independent research found that Oklahomans generally believe the oil and natural gas industry is an out-dated industry and takes advantage of the environment.

Since that research, OERB has developed education programs for grades 3-12 including hundred of trained speakers from the industry called *Petroleum professionals in the Classroom (Petro Pros)* who volunteer to talk with students about the basics of exploring and producing oil and natural gas. Over 65,000+ students have witnessed a *Petro Pro* presentation which includes the viewing of the important safety video called "Play It Smart." The video is also provided to teachers after each *Petro Pro* presentation. A professionally developed multi-media campaign has also been used in television, radio, and print to educate the public about the dangers associated with oilfield equipment. This safety information is also presented on www.oerb.com and OERB's new student website www.xploration.com.

In response to an earlier program *Fossils to Fuel*, a new curriculum was developed in 2000 called *Petro Active*. Over 222 teachers have been trained to use this new program which also contains a unit dedicated to safety.

Because of the need for energy educational programs and the success of the OERB, other states have begun to incorporate OERB programs into their educational efforts. *Petro Pro* presentations have been heard in states like Texas, Louisiana, Michigan, Colorado, Illinois, Virginia, and as far away as Venezuela. Ohio and Illinois has used OERB materials as a guide in their Oil and Gas Energy Education Programs.

The OERB has sponsored the *Building a Presence for Science*, a national program initiated by the National Science Teachers Association to bring National Science Standards to every classroom in Oklahoma. The OERB provides a copy of the standards to every school in the state, as well as funding for the master teacher's initial training.

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To better reach students in Oklahoma as well as outside the state, the OERB developed a state-of-the-art website. Xploration.com, consists of learning tools, oil and natural gas research materials, as well as energy-related science projects.

With the successful completion of over 3,225 abandoned oilfield sites, and many educational programs, OERB has a wealth of information and knowledge to share with other states and individuals. Two state-of-the-art websites www.oerb.com and www.Xploration.com assist in the transfer of valuable technical, safety, and teaching information.

With the continued support of the oil and natural gas industry and royalty owners, the OERB is on a path of further educational development and environmental remediation; and stands ready to assist other states with the development of oilfield safety programs.

Again, the OERB wishes to thank the U.S. Department of Energy for participating in the development of this program through grant funding.

REFERENCES

Since this is the first program of its kind, the only reference is the Oklahoma Energy Resources Board (OERB) itself. All information and reference materials are on file in the OERB offices located at: 3555 N.W. 58th Street, Suite 430, Oklahoma City, OK 73112.