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USDA-REA-EIS (ADM) - 78-9F

Western Farmers Coal-Fired Power Plant
and Associated Transmission

Final Environmental Impact Statement

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REA has prepared this Environmental Impact Statement to examine Western Farmers alternatives to meeting projected power requirements. REA has concluded that a 400 MW coal-fired steam-electric generating plant and transmission lines (345 kV-138 kV) to two substations near Valliant, Oklahoma is the best alternative based on present information. This Impact Statement discusses the project alternatives, proposed action and associated environmental impacts.

September 1978

Input to this Environmental Impact Statement was provided by Region VI, U.S.E.P.A. under an agreement between REA and EPA, under which REA would serve as the lead agency for this project.

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This Final Environmental Impact Statement describes the expected environmental effects of the construction and operation of a 400 MW coal-fired, steam-electric generating unit, to be located in Choctaw County, Oklahoma, and the related transmission facilities. This statement includes all comments received from official agencies and from the public. It is my judgement that the proposed action by the Rural Electrification Administration in providing a commitment to guarantee a loan to finance the project for Western Farmers Electric Cooperative to Anadarko, Oklahoma, will be consistent with the policies set forth in the National Environmental Policy Act.

David A. Hamil

Administrator
Rural Electrification Administration

WFEC-EIS OUTLINE

Figures

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1.0 Summary

Western Farmers Electric Cooperative (WFEC) has applied to the Rural Electrification Administration (REA) for guaranteed loan funds of approximately 350 million dollars for the construction of a 400 MW (nameplate) coal-fired,steam-electric generating unit and associated transmission. REA has reviewed the Site Selection Study, Plant and Transmission Environmental Analysis, Fuel Supply Study and Power Supply Study prepared by Burns and McDonnell for WFEC. Comments were requested and received on the Site Selection Study from the Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service and Soil Conservation Service. These comments are included in Appendix 8 of this Environmental Impact Statement. Comments by the above were considered by REA in evaluating the Site Selection Study and in determining the acceptability of the proposed site.

REA has reviewed the environmental, socioeconomic, and power requirements of WFEC and has determined that construction of the proposed 400 MW coal plant at the Hugo site represents the best solution to the cooperative's projected power requirements at the present time.

This Environmental Impact Statement describes the impact of the proposed action and alternatives evaluated by REA and EPA.

1.1 Description of Proposed Action

Western Farmers Electric Cooperative (WFEC) proposes to construct and operate a new steam-electric generating plant to be located in southeastern Choctaw County, Oklahoma.

The plant site consists of approximately 3,000 acres of which construction activities will directly impact 1,400 acres.

The principal features of the proposed project are as follows:

1) The proposed unit will have a nameplate rating of 400 MW and is scheduled to commence operation in April 1982. The net capacity or that power available at the substation (gross capacity minus station requirements for pumps, fans, flue gas cleaning, etc.) will be 376 MW.

2) Fuel for the proposed unit will be obtained from the Powder River Basin in eastern Wyoming. In October 1977, Western Farmers issued a letter of intent to enter into a 15-year coal supply contract with Shell Oil Company.

Transportation of fuel from the mining operation to the generating station will be by unit train. Delivery to the site will be over the tracks of the Northern and Frisco Railways. The track is adequate for the proposed use and no significant adverse impacts are anticipated as a result of increased traffic. The railroad cars used in the unit train may be owned by Western Farmers. A 90 day coal storage pile will be maintained on site, with an additional 66 hours of full load capacity in the coal storage silos.

3) The pulverized coal boiler for the proposed unit will be designed for a maximum heat input of 4,128 million Btu per hour which corresponds to a maximum turbine rating of 442 MW. The maximum burn rate is 255.8 tons per hour. The boiler is designed specifically to burn low sulfur, Western coal, but can burn Oklahoma coal with only minor modifications.

Operation will result in 27,000 pounds per hour of fly ash and 7,000 pounds per hour of bottom ash. The storage areas will be sufficient for the 35-year lifetime of the plant. Fly ash and bottom ash disposal areas will be lined, if necessary, to minimize leaching and adverse environmental impacts.

4) The furnace will be designed to limit the emissions of oxides of nitrogen to 0.7 pounds per million Btu. Combustion control techniques will be applied to the boiler design to reduce the main factors in nitrogen oxide formation: i.e., flame temperature, the length of time the combustion gases are maintained at that temperature and the amount of excess air present in the flame. At the same time, proper boiler operating practices will be followed to maintain flame stability thus insuring safe and economical operation.

5) Boiler flue gases will be treated for particulate removal by use of electrostatic precipitators which will remove fly ash to meet the emission use standards of 0.1 pound per million Btu heat input. The major components of the precipitator are the housing, gas distribution system, discharge electrodes, collecting surfaces and rapping system.

The project is proposing that SO_2 emissions will be controlled on the proposed unit by utilizing low sulfur compliance coal. These provisions will allow the project to operate within the rules and regulations of the State of Oklahoma and the Federal Government.

6) Water for the plant will be supplied from the Hugo Reservoir via the Kiamichi River. Water from the river will be extracted via vertical pumps located on an intake structure and piped to an on-site storage pond. The plant water will be subject to clarification in the on-site storage pond and given further treatment for removal of colloidal color and nonreactive silica before its use in the cooling towers and other plant processes. The storage pond on-site will maintain a 27-day water supply.

The water requirements for the other plant uses such as potable supply, boiler feed and other clean makeup services will be provided by water treatment facilities to demineralize, chlorinate and filter the water.

After being used in the plant, the water will be treated to meet State and Federal regulations. The water will then be piped approximately six to seven miles and discharged into the Red River, approximately one-quarter mile past the confluence of the Kiamichi and Red Rivers. The proposed unit will require 7.46 million gallons per day from the Kiamichi River and will discharge 1.71 million gallons per day into the Red River when operating at full load.

7) Cooling Towers of the cross flow induced draft type will provide cooling for the circulating water to the condenser. The cooling towers will be arranged in at least two multiple cell banks, with provisions such as reversible fans, cell isolation valves, etc., in order to maintain and control the water temperatures. This will permit operation during cold weather. The cooling towers will be operated to concentrate makeup water at a maximum of 15 times. Total dissolved solids will be controlled by blowdown or removal of a portion of the water for the system. Chlorine additions will be used for bacterial growth control within the system. Blowdown is the purged circulating cooling water which has excessive concentrations of dissolved solids and silica. Cooling tower blowdown will be directed to the bottom ash pond.

WFEC also proposed to build two transmission lines in conjunction with the proposed new plant. These will consist of approximately 18 miles of 345 kV line and approximately 11 miles of 138 kV line.

A 138 kV transmission line connecting the Public Service of Oklahoma Valiant Switching Station to the Western Farmers Valiant Distribution Station has previously been financed by REA. This project was advertised (public notice published) on August 24, 1977, and no opposition to the project, on environmental grounds, has come to our attention. No construction has taken place on this line to date. However, this line may require a design modification to better facilitate delivery of power from the plant into the integrated system. The line routing would be unchanged, although the conductor size may be increased over that originally contemplated.

The locations of the corridor routes were selected after consultations with the U. S. Fish and Wildlife Service, the Army Corps of Engineers, the U. S. Forest Service, the U. S. Soil Conservation Service, the Oklahoma Department of Wildlife Conservation and other concerned State and local governmental agencies, with a view toward minimal environmental impact and sound practices of engineering and finance.

County road maps and U.S.G.S. 1:24000 topographic maps were used in conjunction with low level overflights, Agricultural Stabilization and Conservation Service (ASCS) aerial photography and ground surveys of the proposed corridor locations to determine environmental, engineering and economic feasibility of several alternate routes for each line. Some of these alternate routes consisted of isolated reaches joined with sections of the proposed best route. Others were entirely separate corridors. Maps of the proposed route are included in Appendix 2 (Transmission Analysis) Section I.4.

These lines will connect the proposed new generating facility with the existing WFEC Valliant Substation via 11 miles of 138 kV line and the existing Public Service of Oklahoma (PSO) Valliant Substation via 18 miles of 345 kV line. Both lines travel in an easterly direction after leaving the plant.

Specifically, the 138 kV line, after leaving the generation station substation, will travel about four miles in an easterly direction where it will cross over Gates Creek at a location about one-half mile north of historic Old Fort Towson. Care will be taken to disturb as little aquatic life as possible in this area. After crossing Gates Creek, the line will continue eastward for 5½ miles where it crosses Clear Creek near the Choctaw-McCurtain County line. The line then continues easterly for another 1½ miles to its termination point in the existing WFEC Valliant Substation.

The entire length of the line traverses rangeland and some sparsely wooded pasture areas.

The 345 kV line extends easterly for about 1½ miles after leaving the generating station substation. Near the eastern border of the plant site, the lines head sharply southward for about three miles. At this point the line crosses a PSO 138 kV corridor. After crossing this corridor the proposed WFEC 345 kV line turns easterly again and parallels the existing PSO 138 kV line. About one-half mile after making the turn, the line crosses Oklahoma State Highway 109 about one-half mile north of the Kiamichi River bridge. About one mile after crossing Highway 109, the line crosses Gates Creek. The line was routed south of the PSO 138 kV line to avoid interference with the Lake Raymond Gary State Park about three-quarters of a mile to the north. After crossing Gates Creek, the line continues eastward for about six miles to the Choctaw-McCurtain County line. Clear Creek is crossed about three-quarters of a mile after the county line. Two and one-half miles further east, the line crosses Garland Creek. The line then continues eastward for about two miles. The line then turns northeast for about one-half mile until it enters the existing PSO Valliant Substation. The majority of the line lies parallel to the PSO 138 kV line and is located one-half mile to the south of it. The entire length of the proposed 345 kV line traverses very gently rolling terrain. Principal land uses along the route are cattle range and some wooded rangeland. Every attempt will be made to keep clearing to a minimum.

1.2 Requirements for Federal Action

Western Farmers has applied to REA for financial assistance for the proposed system expansion. REA has determined that its proposed action is a major Federal action significantly affecting the quality of the human environment, thus requiring the preparation of an Environmental Impact Statement (EIS). This Environmental Impact Statement has been prepared by the Rural Electrification Administration, with input provided by the U. S. Environmental Protection Agency (EPA) pursuant to the requirements of Section 102(2)(C) of the National Environmental Policy Act of 1969. This Statement represents the independent determination made by the Rural Electrification Administration based upon information from various sources, including the Reports on the Environmental Analysis for both the Coal-Fired Generating Facility and also the Electric Transmission Facilities for the Western Farmers Electric Cooperative. These documents are attached as Appendicies 1 and 2 to this Environmental Impact Statement.

The Environmental Protection Agency (EPA) is considering the issuance of a National Pollutant Discharge Elimination System (NPDES) permit for wastewater discharge from the proposed generating facility into the Red River. Section 511(C)(1) of the Federal Water Pollution Control Act as amended (FWPCA) requires that the National Environmental Policy Act of 1969 (NEPA) apply to the issuance of a permit under Section 402 of FWPCA for the discharge of any pollutant by a new source as defined in Section 306 of FWPCA. EPA intends to use this document to fulfill its requirements and obligations under the NEPA.

EPA has agreed that REA will be the lead agency and will prepare the EIS in accordance with REA Bulletin 20-21: 320-21 and the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) such that it will fulfill both agencies' requirements. All necessary Federal, State, local and private permits and approvals will be obtained before construction is commenced.

Before the loan can be approved, REA must be assured that appropriate action will be taken during the construction and operation phases of the project to insure that adverse environmental effects will be kept to a minimum, and public health and safety will be protected. The REA documents associated with the project will require the borrower to comply with all Federal, State and local environmental regulations.

All reasonable safeguards will be taken to protect the health and safety of the public and all practical environmental protections will be incorporated to minimize adverse effects that may result from the proposed action.

1.3 Areas of Controversy

This EIS has been issued in draft form in order to obtain public and agency comments on the proposed action described herein. Comments received on the Draft EIS have been considered in the preparation of this Final EIS and are included in Section 10. REA's responses to the comments received and evaluations of areas of controversy, can be found in Section 9 of this Final EIS.

REA has received comments on the Site Selection Study from the Environmental Protection Agency, Soil Conservation Service, Fish & Wildlife Service, and the Army Corps of Engineers. The site selection process has been reevaluated in light of these comments. A summary evaluation of the comments is presented below:

A. Environmental Protection Agency:

EPA had three comments regarding water quality impact, NPDES application and archaeological sites. These concerns are addressed in this EIS.

B. Soil Conservation Service:

SCS commented on site runoff and the possible existence of prime farmlands. Consideration of prime farmland has been added to the site selection study. An evaluation of site runoff is included in the EIS for the proposed site. The amount of prime farmland on all the sites was considered and is one factor included in the site evaluation.

C. <u>Corps of Engineers:</u>

The Corps commented on the need for detailed construction drawings and discussed Section 10 and 404 permits that would be required for site development. Since the site selection study represents a macro review of potential sites for power plant development, a detailed analysis of plant-related components for each potential site is not possible. Detailed permit application will be made at the appropriate time.

D. <u>Fish & Wildlife Service:</u>

Fish & Wildlife's comments included site capacity, rare and endangered species, discharges, intake structure design and vegetation. These comments represent areas of consideration and detail that are more appropriate in the EIS than the site selection study. The site selection study is not based on a detailed field evaluation of each potential site and flora and fauna are treated on a regional, rather than a site specific basis. Detailed information requested by Fish & Wildlife is included in this EIS for the preferred Hugo site. It is REA's understanding that this procedure is acceptable to Fish & Wildlife. Fish and Wildlife Service has raised no objection to Hugo as the preferred site.

Comments and replies on the Draft Environmental Impact Statement can be found in Section 9.

1.4 Project Effects

Prime areas of concern for a coal-fired, steam-electric generating plant are air and water quality, land use and socioeconomics. These are largely brought about by change resulting from locating a major industrial facility in a predominantly rural area.

1.4.1 Environmental Issues

1.4.1.1 Air Quality

1.4.1.1.1 Compliance Ambient Air Standards

The proposed coal-fired plant will be required to comply with ambient air standards. The Environmental Protection Agency, under Public Law 91-604 has established National Ambient Air Quality Standards, relating to allowable ground level concentrations. These are listed below along with the anticipated ground level concentrations resulting from plant operation.

TABLE 1

AMBIENT AIR QUALITY STANDARDS

Particulates	Primary (ug/m^3)	Secondary (ug/m^3)	Anticipated Ground Level Concentrations (ug/m^3)	Percent of most Restrictive
Annual geometric mean	75	60	29	50
Maximum 24-hour	260	150	90	60
Sulfur Oxides				
Annual arithmetic mean	80	--	5	6.3
Maximum 24-hour	365	--	38	10.4
Maximum 3-hour	--	1300	120+	9.2+
Nitrogen Oxides				
Annual arithmetic mean	100	100	0.6+	0.6+

As Table 1 shows, the plant will be able to operate within existing Ambient Air Quality Standards with no problem. Figures in the table shown as (+) indicate that measured ground level values are not available and must be added to the figures shown in the table.

The State of Oklahoma has adopted the National Ambient Air Quality Standards as State Standards. The Primary Standards have been established to protect the public health and the Secondary Standards to protect the public welfare with an adequate margin of safety. REA, in conjunction with other concerned agencies, will insure that the plant is designed to comply with the above listed standards.

The U. S. Environmental Protection Agency has established Air Quality Control Regions, in addition to the Ambient Air Standards mentioned above. Three regional classifications have been established as defined below:

Class I: Protect pristine areas in which little to no air quality deterioration is accepted.

Class II: Areas in which some deterioration of air quality, associated with moderate industrial development is accepted.

Class III: Areas in which greater deterioration of air quality associated with more intense industrial development is accepted.

The above-mentioned regional classifications have been established for the prevention of significant deterioration (PSD) of air quality. The proposed project will be located in a Class II Area and relate as follows to the Federal PSD requirements:

TABLE 2

FEDERAL PSD REQUIREMENTS - CLASS II

Maximum Allowable Increase

Pollutant	Increment (ug/m^3)	Proposed Project (ug/m^3)	Percent of Increment
Sulfur Dioxide			
Annual arithmetic mean	20	1.3	6.5
24-hour maximum	91	18.0	19.8
3-hour maximum	512	106.0	20.7
Particulate Matter			
Annual geometric mean	19	0.1	0.5
24-hour maximum	37	1.3	3.5

No difficulty is anticipated in complying with the PSD Requirements.

As stated in the regulation, 42 FR 57460, November 3, 1977:

ii The maximum allowable concentration of any air pollutant in any area to which this section applies shall not exceed a concentration for such pollutant for each period of exposure equal to--

(a) The concentration permitted under the national secondary ambient air quality standard, or

(b) The concentration permitted under the national primary ambient air quality standard, whichever concentration is lowest for such pollutant for such period of exposure.

Western Farmers has submitted a Prevention of Significant Deterioration (PSD) application to EPA. The PSD application has been reviewed and EPA determined that neither the National Ambient Air Quality Standards nor the PSD increments would be violated as a result of the project.

In addition to the Federal PSD requirements, the State of Oklahoma has established a Non-Significant Deterioration (NSD) Standard to set maximum allowable increments for particulates and sulfur dioxide. The Oklahoma Air Councel (OAC) has also established allowable air pollution increments used in their source review. The Oklahoma standards are shown below:

TABLE 3

OKLAHOMA AIR POLLUTION INCREMENTS

Pollutant	Increment (ug/m^3) NSD	Increment (ug/m^3) OAC	Proposed Plant (ug/m^3)	Percent of Increment Most Stringent
Sulfur Dioxide				
Annual arithmetic mean	30	15	1.3	8.7
24-hour maximum	130	100	18	18
3-hour maximum	650	---	106	16.3
Particulate Matter				
Annual geometric mean	15	10	0.1	1
24-hour maximum	55	30	1.3	4.3

Table 3 shows that all State increments will be complied with.

The proposed plant will be designed to meet the most stringent of these requirements, or that which is applicable at the time design is finalized.

1.4.1.1.2 Emission Standards

Emission standards have been established to regulate the quantities of pollutants emitted from power plant stacks. Sulfur dioxide, particulate and nitrogen oxides are the prime emissions associated with the operation of power plants. The Federal and State standards established for coal-fired units are shown in the following table along with anticipated plant emissions.

TABLE 4

AIR QUALITY EMISSION STANDARDS

Pollutant	Standard	Proposed Plant	Percent of Standard
Particulates	0.10 lb/MBTU	0.1 lb/MBTU	100
Sulfur dioxide	1.2 lb/MBTU	1.2 lb/MBTU	100
Nitrogen oxides	0.7 lb/MBTU	0.7 lb/MBTU	100

Emission rates are for maximum two-hour averages as stated in "Standards of Performance for New Stationary Sources," Federal Register, V. 36, No. 247, Part II, Thursday, December 23, 1971, as amended June 14, 1974. Federal standards permit a 20 percent opacity, with a maximum of 27 percent opacity for not more than 6 minutes in any hour. The Oklahoma standard allows a Ringleman No. 1 value, with a Ringleman No. 3 permitted for not more than 5 minutes in any hour. Additional detail regarding Oklahoma standards can be found on Table II-4 of Appendix 1. The proposed project must comply with State and Federal law to meet REA loan requirements.

The New Source Performance Standards for coal preparation plants applies to the proposed project since more than 200 tons of coal per day is involved and the plant contains coal storage and handling systems. The standards limit discharge to the atmosphere from pneumatic coal cleaning equipment as follows:

particulate matter can not exceed	0.040gm/dscm
opacity can not exceed	10 percent

Discharge to the atmosphere from any coal processing conveying equipment, coal storage system, or coal transfer and loading system can not exceed 20 percent opacity.

1.4.1.2 Water Quality/Quantity

The proposed project will withdraw water from the Kiamichi River and ultimately dispose of the waste water stream in the Red River. Construction of the plant may affect water quality through the discharge of runoff from the construction site. Operation of the unit will be regulated through a series of State and Federal permits that will be required for both construction and operation.

1.4.1.2.1 Discharge Regulations

Construction of the proposed project may result in some sedimentation of the Kiamichi and Red Rivers primarily resulting from construction of the intake and discharge structures. The National Pollutant Discharge Elimination System Permit (NPDES) for the project will contain specific discharge limitations for all phases of plant construction and operation. A copy of the proposed NPDES permit is included in the Final EIS as Appendix 5. Runoff and siltation may also result from the construction of the plant and associated structures.

Federal Effluent Limitation Guidelines and Federal Water Regulations can be found on Table 11-13 in Appendix 1.

1.4.1.2.2 River Water Quality Standards

The State of Oklahoma has established water quality standards and stream classification for the waters of the State. The EPA has also developed criteria for water quality. Water quality is important both to the organisms living in the rivers and also to the proposed power plant where it is used by the operating personnel and in the stream generation process. The impact of plant operation can be visualized by comparing water quality entering the plant with the discharge water quality and river water quality after mixing. Water is taken from the Kiamichi River and discharged to the Red River, so that no impact from operation is anticipated downstream of the intake structure on the Kiamichi.

A table presenting the Red River water quality, plant discharge and Red River water quality after mixing follows Section 1.4.1.2.3. Specific numerical values for applicable State Standards are shown and additional information is available in Section II.2.1 of Appendix 1. The State and Federal discharge limits will be complied with and monitoring requirements established in accordance with State and NPDES guidelines.

1.4.1.2.3 River Water Flow

The proposed plant will draw 7.46 million gallons per day from the Kiamichi River and discharge 1.71 million gallons per day to the Red River. Water flow in the Kiamichi River is controlled from the Hugo Reservoir and dam located about five miles upstream of the proposed intake structure. Since Kiamichi River flow can be regulated from the reservoir, little or no impact is anticipated as a result of plant water withdrawal. The discharge represents approximately 0.25 percent of the minimum 7-day low flow of 678 million gallons per day reported for the Red River and is expected to be assimilated into the river with no significant adverse effects. A brief summary of the chemical effects of operation compared to State Standards follows:

DISCHARGE QUALITY

Discharge		Red River	Outfall Maximum	Quality After Mixing	State Standards
Nitrates	(mg/l)	1.1	10	1.12	≤ 10.0
Sulfates	(mg/l)	262	1100	264	(1)
Dissolved Oxygen	(mg/l)	14.5	12.8		≥ 5.0
Ph	--	8.6	6.5-8.5		6.5-8.5
Turbidity	(Jackson units)	110	50	110	50 (2)

(1) ..."not to exceed one standard deviation greater than the arithmetic mean of historical data gathered at that point."

(2) Must maintain naturally occuring background when it exceeds 50 Jackson Units.

Additional detail is available on Table 14 in Section 4.2.1.2.

No significant environmental impacts are anticipated as a result of discharges from the proposed unit.

1.4.1.3 Land

The proposed plant site, transmission and pipeline corridors were investigated to determine the potential impact on land use in the area. Critical factors considered include: prime and unique farmland, wetlands, critical habitat, flora and fauna. formally classified areas and archaeological and historic sites. Approximately 1,400 acres of the 3,045 acre plant site will be directly affected by plant-related facilities and transmission towers. About 25 percent of the site can be classified as prime farmland and will be affected by various aspects of construction and plant facilities. The remaining land on the plant site will likely improve from present conditions. The 475 acres included in the transmission corridor will remain available for agricultural purposes following construction.

1.4.1.4 Socioeconomic

A detailed socioeconomic study has been prepared for the area surrounding the proposed plant site. Population, income, business, labor force, housing and available services are some of the prime areas of concern. Both the construction and operational effects of the proposed project are evaluated. Evaluation is by means of projections from literature searches, area examination and application of data from prior projects.

Excess sewage and water capacity are available and no hindrance to area development is expected. The gradual buildup in construction personnel and long work time will help minimize the impact of the project. There is a high percentage of public assistance in Choctaw County and the expected population influx could increase the need for assistance. It is estimated that 70 percent of the construction work force will be commuters. Community services should not be strained and, although everyone in the area will be affected to some degree by the project, no significant adverse impacts are anticipated from construction or operation of the unit.

1.4.1.4.1 Transportation and Housing

Construction and operation of the proposed project in a rural area will result in increased traffic loading and the need to provide housing to the people moving into the area. The proposed project is not expected to have significant impact on area transportation, with the exception of short periods during shift changes when traffic will likely be heavy. U. S. Route 70 parallels the north boundary of the site and is the principal traffic artery in the area. Construction labor will necessitate additional housing units (likely rental) and trailer parks. Impacts, resulting from construction and operation, are expected to occur gradually over a number of years, allowing adequate time for the application of mitigative measures.

1.4.1.4.2 Economics

The cost of the proposed action both environmentally and financially was evaluated. The overall cost of the proposed action is examined in light of alternatives available to the cooperative.

The project will add a large industrial facility to the predominantly rural area resulting in a new influx of cash to the local economy. Potential beneficial effects include an expanded tax base and job opportunities.

1.4.1.5 Noise

Applicable State and Federal noise limitations will be observed for both construction and operation of the project. It is expected that most areas of the plant will be below 90 dBA, although short units of noise may exceed this during construction (pile driving) and operation (blowing steam lines). Noise at the plant boundaries is not anticipated to exceed 60 dBA. Where no noise limits exist, the plant will be designed to comply with EPA noise criteria limits.

1.4.1.6 Flora and Fauna

Construction and operation of the proposed facility is not expected to have a significant adverse impact to fauna and flora in the area. Plant site flora is limited and fauna has been adversely affected due to previous land mismanagement.

1.4.1.7 Rare and Endangered Species

REA knows of no impact on any rare or endangered species as established by the Fish and Wildlife Service of the U. S. Department of Interior and the State of Oklahoma that will occur as a result of the proposed project location. Literature searches and field investigations were used to determine ranges and potential impacts. REA has submitted a request for consultation under 16 U.S.C. 1536, Section 7 of the Endangered Species Act of 1973 to the U. S. Fish and Wildlife Service.

1.4.1.8 Transmission-Electrical Effects

Electromagnetic effects, ozone generation, grounding of metallic objects and other concerns regarding operation of the transmission system were investigated to insure safe operation. Operation of the proposed 345 kV and 138 kV lines will not result in significant impacts resulting from ozone, electrostatic or electromagnetic effects.

1.4.1.9 Ash and Sludge Disposal

Fly ash and bottom ash from the proposed unit will be disposed of in lined (if required) on-site disposal areas. The 27.600 pounds per hour of fly ash will be disposed dry, while bottom ash (7,000 pounds per hour) will be mixed with water and hydraulically conveyed to the bottom ash pond. The disposal areas will be constructed to minimize leaching and there will be no discharge. The ash disposal areas will require approximately 200 acres and will be sufficient for the life of the plant. Sludge disposal is not required since the proposed unit will utilize low sulfur coal to meet SO_2 regulations.

1.4.1.10 Aesthetic/Visual

The proposed coal plant will change the proposed site area from its present agricultural use to a heavy industrial facility. A vegetation border will remain around the facility, but it will not be possible to completely hide the facility. The estimated 500 foot stack and 50 foot tower and vapor plume will likely be visible. Transmission, where located on an existing corridor will generally not result in a significant visual change. However, portions of the proposed lines will be visible to travelers along Route 70 and other area roads.

1.4.1.11 Aviation

Potential aviation impact can result from the stacks of the proposed power plant and also the transmission line leaving the facility. Proper aircraft warning devices will be installed on the plant stack and registration notification will be made to the FAA regarding the plant. No problems are anticipated as a result of the proposed lines.

1.4.1.12 Recreation

The proposed project is located near Lake Hugo. The surrounding area contains an abundance of recreational facilities offering a variety of outdoor pursuits such as hunting, fishing, picnic grounds, tennis courts, swimming pools and ball diamonds. No impact regarding availability of recreational areas is anticipated. The proposed facility may be responsible for the creation of new recreation areas, although this is unlikely at present.

2.0 Purpose

The proposed project is required to help Western Farmers to meet the demands of its member cooperatives, which have more than doubled during the 1967 to 1976 period. Western Farmers' current generating capacity (720 MW) is all natural gas-fired. The proposed addition will supply 376 MW of coal-fired electrical generation. Proposed energy legislation leaves the long-term future of natural gas for electrical generation in doubt and makes it imperative that Western Farmers seek other fuels for electrical generation. Due to the termination of contracts and lack of available purchase power, Western Farmers must supply an increasing proportion of its members' needs.

Western Farmers is also proposing to own a 17.4 percent undivided ownership interest in Units 1 and 2 of the Black Fox nuclear generating station which will provide 200 MW in 1983 and another 200 MW in 1985; a total of 400 MW. The proposed coal plant is required to meet the projected deficits in the Western Farmers' system that is projected to occur even with participation in the Black Fox project.

The transmission lines associated with the proposed coal plant are required to take the electrical energy from the plant to substations for distribution into the distribution grid. The new transmission lines will consist of a 138 kV line to Western Farmers' Valliant Substation and a 345 kV line to Public Service of Oklahoma's Valliant Substation.

2.1 Need for Power

Western Farmers is presently capable of generating 720 MW with the gas-fired units in its system. This is complemented by an additional 260 MW of capacity available from the Southwest Power Administration (SPA). The SPA power is considered to be peaking power.

Western Farmers' net peak demand from its member cooperatives has more than doubled in the 1967 to 1976 period. Demand and energy requirements over this time period are summarized in the following table:

WFEC Peak Demand and Energy Requirements

Year	Peak Demand (MW)[1]	Energy Requirement (KWh)[2]
1967	250	1,200
1968	270	1,300
1969	310	1,400
1970	350	1,600
1971	380	1,800
1972	420	2,000
1973	470	2,200
1974	520	2,300
1975	550	2,700
1976	630	2,900

(1) To nearest 10 MW
(2) To nearest 100 kWh

NOTE: Includes loads of non-REA Act beneficiaries supplied.

The data in the above table represent actual operating conditions over the time period shown. This data is used in the preparation of a Power Requirement Study that is prepared by Western Farmers in accordance with REA Bulletin 120-1, "Development, Approval, and Use of Power Requirement Studies."

Each borrower, in making its own forecast of number and classes of consumers and their anticipated usage, is encouraged by REA to base their forecasts on their knowledge of developing land use patterns in its area; prospective residential, commercial and industrial development, probable rate levels; existing and anticipated patterns of energy usage and appliance saturation; availability patterns of energy usage and appliance saturation; availability of alternate energy sources; and governmental policies related to energy conservation and preservation of the environment.

REA's assistance is to encourage the forecasters to consider pertinent factors which may influence load growth. REA also evaluates each study for conformity to Bulletin 120-1 and reasonableness.

REA continues to monitor load growth projections for Western Farmers. The Power Requirement Study figures, approved June 1978, (discussed in Section 3.12) are the best and most current projection available. These figures show that even with a new coal unit at 376 MW and Black Fox Units No. 1 and 2 available, a capacity deficit starts in the third year after the installation of the last unit. Review by REA indicates that without the capacity represented by the Black Fox Station there would be capacity deficits from 1986 on. If in addition the coal-fired unit were not on line by 1982 as planned the capacity deficit would start that year.

3.0 Alternatives

REA has examined various alternatives available to Western Farmers regarding the projected need for increased power. Alternative forms of generation and load reduction were examined in relation to the President's proposed National Energy Plan. The proposed National Energy Plan calls for decreased use of oil and natural gas for electrical generation and an increased effort to reduce electrical consumption.

Alternatives to the proposed action can be divided into six basic subcategories as follows:

1. Alternative not requiring new Western Farmers' generation
2. Alternate Form of Generation and Fuel
3. Alternate Plant Sites
4. Alternative Plant Facilities
5. Alternative Transmission Routes
6. Alternative Transmission Design

The U. S. Environmental Protection Agency, a cooperating agency in the preparation of this EIS, has the alternatives of either issuing or denying the NPDES permit for the project. These alternatives are discussed in Section 3.7, Alternatives Available to the USEPA under the following subsections:

3.7.1 Issuance of the NPDES permit by USEPA

3.7.2 Denial of the NPDES permit by USEPA

3.1 Alternatives Not Requiring New Western Farmers' Generating Capacity

Various alternatives were investigated to allow Western Farmers to reduce load demands or find other sources of generation that would not require the installation of new capacity in the Western Farmers' system. These are detailed in the following sections:

3.1.1 Conservation and Loan Management

3.1.1.1 Conservation

Conservation programs adopted by Western Farmers include stressing the importance of energy conservation to its members through local publication, cooperative publication, radio announcements, etc. These include hints on effective methods of reducing electrical consumption and stressing the advantages of better insulation. Since conservation is a major part of the President's proposed National Energy Plan, Western Farmers will continue to investigate ways of conserving electricy. Conservation has been considered in the preparation of the 1977 Power Requirements Study and is reflected in the lower projected rates of growth. Even with the projected reduction in load growth brought about by conservation, additional capacity will be required in the Western Farmers' system.

3.1.1.2 Load Management

An area of increasing concern is the potential benefits to be gained from load management. In seeking an alternative to the continuing increase in cost of providing service to their consumers, one of the alternatives available to cooperatives is to offer load management type rates. The intent would be to pass on to the consumer, through lower rates, any savings that could be realized by an alteration of the consumption pattern. It is difficult to state precisely what the impact of a load management program might be upon the total load requirements for Western Farmers. A load management scheme would likely reduce the peak demand requirements; however, it is unlikely that it will reduce the total energy consumption.

Consideration would also have to be given as to the possibility of altering the consumer usage patterns while at the same time not establishing new peaks. A possible method to accomplish this would be to impose a demand charge to increase the cost of electricity during peak periods. At the present time, Western Farmers does not serve any distribution cooperative where there is a disproportionately large irrigation load or where irrigation has an impact upon the overall power supply requirements for Western.

With regard to other types of load management, specifically water heating and space heating, it is also difficult at this time to state what impact they might have upon total system requirements. Water heater and air conditioner cycling can be controlled by signals sent over the power lines to help reduce peaks. Many of these schemes are better suited to urban areas rather than rural areas. The member systems are examining load management. However, implementation of load management programs are not expected to eliminate the near-term need for additional capacity. Load management programs may significantly alter the long-term projections and scheduling of future generating projects.

3.1.2 No Additional Power

This alternative is acceptable only if additional generating capacity is not required. Western Farmers has demonstrated the need for additional generating capacity as discussed below.

The latest Power Requirements Study prepared for Western Farmers Electric Cooperative was approved by REA in June 1978. The total Western Farmers loads' forecast in this study increased at an annual rate of about 10.9 for the year 1976 through 1981 and at a rate of about 10.8 from 1981 through 1991. These loads are shown in the accompanying Table under the heading "1978 PRS".

These figures show that even with the proposed coal unit at 376 MW and Black Fox Units No. 1 and 2 available, a capacity deficit starts in the third year after the installation of the last unit. Review by REA indicates that without the addition of the proposed coal-fired unit on line by 1982, as planned, a capacity deficit would start that year. If, in addition, the capacity represented by the Black Fox Station was not available, there would be even greater capacity deficits from 1986 on.

Western Farmers is a member of the Southwest Power Pool and as such is obligated to maintain capacity reserves of at least 15 percent. The amounts shown in the column headed "Capacity Responsibility" are those needed to meet the load and this obligation.

Available capacity consists of existing gas-fired generating facilities and power purchases. These data are from the Power Cost Study for Western Farmers prepared by Burns and McDonnell Engineers.

The "New Generation", tabulation includes the 376 MW shown for the planned coal-fired generating unit expected to be in operation in late 1981 to meet the summer peak of 1982. Western Farmers' share of Black Fox Unit No. 1 (200 MW) is to be available to meet summer peak 1984 and an additional 200 MW from Black Fox Unit No. 2 is expected for peak 1986.

The final column, "Capacity (Deficit) or Surplus", shows that even with these planned additions, Western Farmers would have sufficient capacity to meet its loads only to 1988. The availability of temporary surpluses in those years will enable Western Farmers to further reduce its use of its gas-fired generation. It will also provide capacity needed in the event plant construction is delayed for any reason. Present planning is to purchase any capacity needed after this time until additional capacity can be studied for addition to the system.

With the need for additional power so demonstrable it is evident that the "no action" alternative is not viable.

PAGES 34 and 35 REMOVED

TABLE 6

WESTERN FARMERS POWER AND ENERGY PROJECTIONS (REMOVED) AND PLANNED ADDITIONAL GENERATION (MEGAWATTS)

Year	1978 PRS Peak Demand	Purchases By Member Systems	Total WFEC Power Responsibility Demand	PSO Firm Purchases[1]	Demand Less Firm Purchases	Reserves[2]	Capacity Responsibility	Existing Generation	SPA Power[3]	New Generation[4]	Total New Generation	Capacity (Deficit) or Surplus
1978	735	24	711	74	637	95	732	719	260	0	0	247
1979	802	21	781	84	697	105	802	719	260	0	0	177
1980	875	29	846	93	753	113	866	715	260	0	0	109
1981	954	33	921	97	825	124	948	715	260	0	0	27
1982	1035	36	999	105	894	134	1028	715	260	376	376	323
1983	1122	37	1085	115	970	145	1115	715	260	0	376	236
1984	1217	41	1176	133	1043	156	1200	715	260	200	576	351
1985	1320	44	1276	147	1130	169	1299	715	260	0	576	252
1986	1431	46	1385	163	1223	183	1406	715	260	200	776	345
1987	1552	50	1502	179	1324	199	1522	715	260	0	776	229
1988	1683	55	1628	197	1432	215	1646	715	260	0	776	105
1989	1825	57	1768	217	1551	233	1784	715	260	0	776	(33)
1990	1979	63	1916	249	1667	250	1917	715	260	0	776	(166)
1991	2148	66	2082	263	1819	273	2092	715	260	0	776	(341)

[1] Public Service Co. of Oklahoma

[2] Reserves are equal to the system demand (less firm purchases) times 15 percent

[3] Southwestern Power Administration

[4] New generation consists of a coal-fired unit in 1982, joint ownership in nuclear units in 1984 and 1986 and another coal-fired unit in 1991.

3.1.3 Purchase Power from Others

Western Farmers has investigated the alternative of purchased power, but has not been able to obtain firm commitments for their requirements. In the Southwest Power Pool (SPP), of which Western Farmers is a member, no excess baseload power on the order required is available, with future power outlooks being less encouraging. Purchase, rather than ownership, from Black Fox is possible, but is not considered a viable alternative from an economic standpoint. Therefore, purchase power cannot be considered a viable alternative in this instance.

3.1.4 Shared Units

Western Farmers proposes to acquire a 17.4 percent undivided ownership interest in the Black Fox Station (pending REA approval and financing), a nuclear station planned by the Public Service Company of Oklahoma. At the present time, the feasibility and practicality of other shared units does not appear to exist. Western Farmers will continue to pursue the possibility of shared units to promote more efficient generating capacity in Oklahoma and the surrounding states.

3.2 Alternative Forms of Generation and Fuels

A wide range of alternatives are available for power generation, but it is necessary to impose restrictions in order that a realistic comparison can be made. Western Farmers has determined, in an REA approved power study, that an additional capacity is needed in the Western Farmers' system by 1981. The generation required and time frame established are two important constraints against which all alternatives must be judged.

Alternatives considered include:

3.2.1 Nuclear-Steam Electric

3.2.1.1 Fission Reactors

In most current state-of-the-art nuclear reactors, the heat released by nuclear fission is used to create steam, which then drives a turbine generator producing electricity. Although particulate and chemical emissions to the atmosphere are practically nonexistent, the spent fuel is highly radioactive, dangerous to handle and the possibility of radiation leakage must be constantly monitored. Nuclear plants are well suited for continuous base load operation and Western Farmers has taken steps to participate in nuclear generation. Western Farmers has submitted an application to REA for financing to become a part-owner in two nuclear-fueled, steam-generating units (Black Fox) planned by the Public Service Company of Oklahoma. REA has prepared an Environmental Impact Statement for Western Farmers' participation in the Black Fox station. If REA finds environmental requirements satisfied and if funds are available, Western Farmers will become a part-owner in Black Fox.

The nuclear alternative was eliminated early in the selection process due to the long lead time involved, the substantially increased land and water requirements and economic factors. A nuclear plant, in the 400 MW range that is required by Western Farmers, would not be cost effective. A nuclear unit could also not be available by 1981 with engineering design and environmental evaluation taking place now. However, a portion of Western Farmers' future load requirements will likely be met through the utilization of nuclear power by participation in Public Service of Oklahoma's Black Fox project as described above.

3.2.1.2 Fusion Reactors

It is unlikely that a demonstration fusion plant will be built much before 1990, with commercial operation not likely for some time after that. Fusion could not therefore be considered a viable alternative to meet projected generating requirements in 1981.

3.2.2 Fossil-Steam Electric

A fossil fuel-fired, steam-electric generator utilizes the heat formed by the combustion of a fossil fuel (coal, oil, natural gas) to generate steam, which then drives a turbine generator producing electricity. This is the recommended alternative.

3.2.2.1 Oil and Natural Gas

Oil and natural gas are clean burning fuels that produce little air pollution, but the supply situation and increased prices no longer make them attractive for electric power generation. All of Western Farmers' generating plants are currently natural gas-fired and it is in the best interest of the cooperative to decrease and eventually eliminate its dependence on this fuel. Energy legislation will likely ban natural gas from future electric power generation. The possible initial reduced costs due to less air pollution caused by the use of oil, for example, would likely be offset or exceeded by increased fuel costs over the life of the unit and the possibility of a ban on oil and gas use for generation. The President's energy plan calls for increased use of coal to generate electricity and help reduce our dependence on foreign oil. A detailed evaluation of an oil or natural gas-fired plant was not deemed necessary primarily for the fuel-related reasons stated above. For this same reason, REA has eliminated the possibility of using gas or oil-fired combustion turbines or combined cycle units to meet the projected energy requirements of the cooperative.

3.2.2.2 Coal Fuel Alternatives

Three primary grades of coal can be considered as likely fuels for a coal-fired unit in Oklahoma. These are lignite, high sulfur bituminous and low sulfur subbituminous coal. Since the use of any of these fuel types is dependent upon a source of supply, this evaluation is based only on those fuels available to the project. More than fifty potential coal suppliers were contacted and sources of coal ranged from Montana, Wyoming, Colorado, Utah and New Mexico to Indiana, Illinois and Oklahoma, with a lignite offering from Texas. Additional information regarding the coal alternative evaluation can be found in Section V.4.3 of the Generating Facility EA. The principal reason for the selection of the low sulfur sub-bituminous coal over the other alternatives (primarily high sulfur bituminous and lignite) is economics. A separate analysis entitled "Fuel Supply Study for Western Farmers Electric Cooperative, 1977" was prepared and is available to those requiring more information.

Oklahoma coal offerings were made, but the coal would likely not be available for use in the proposed unit. The Oklahoma coal offers that were made were not from active mines, would likely not be sufficient for the life of the plant, would require new underground mines and generally were not supported by completed engineering feasibility studies or environmental studies. The timeframe involved makes it unlikely that Oklahoma coal would be available for the proposed start-up date. For these reasons, the use of Oklahoma coal was not judged to be a feasible alternative.

The remaining coal offerings (those for which sufficient data was presented) were analyzed to determine the total present value of the costs associated with each fuel over a fifteen year period. The assumptions made and results of this analysis are included in Appendix 3 to this EIS. Delivery of the coal was considered in the analysis, with possible delivery modes consisting of rail, barge and truck. Slurry delivery of coal is not considered a practicable alternative for the proposed project due to existing legal problems which are unlikely to be resolved in time to insure that a pipeline would be available by the proposed start-up date. As a result of this analysis, coal from the Buckskin Mine in the Power River Basin was selected with unit train delivery. The ultimate analysis of the proposed fuel on an average-as-received basis is listed below:

Element	Percent
Carbon	49.54
Hydrogen	3.47
Oxygen	9.40
Nitrogen	0.67
Sulfur	0.486
Moisture	29.65
Ash	6.78
HHV	8127 BTU/lb

3.2.2.3 Coal Gassification

An alternative use of coal is the coal gassification process. Gassification of coal results in a clean burning gas, suitable for use in a steam generator. High sulfur coal can be converted to a clean-burning gas perhaps eliminating the need for sulfur control equipment on the generating plant. Although the process has potential, commercial quantities of gas have yet to be produced and it is unlikely that a system would be available in time to meet the 1982 start-up date proposed by Western Farmers.

This was not considered a viable alternative to the proposed project since coal gassification is not commercially available.

3.2.3 Other Sources of Generation

3.2.3.1 Solar Energy

Three alternative methods of solar power generation are thermal conversion, photovoltaic conversion and the burning of photosynthetic materials.

Thermal conversion would utilize a thermodynamic cycle to generate electricity as is used in present steam electric generating plants with the exception that concentrated solar energy would be the heat source. There are no solar collection systems commercially available that are suitable for power plant use (400 MW size or greater) and it is unlikely that one would be developed within the timeframe available before the proposed unit is scheduled to come on line. Solar-thermal generation is in the developmental stages and a small generator (10 MW) is expected to be operating in the near future. This will be an experimental facility designed to test the operation/solar-thermal generation. It will be the first demonstration of a solar-thermal central station power generator. Drawbacks with the system include land area required for the collectors and the need for large storage capacity or other generation for sunless periods.

Photovoltaic conversion, although well-developed through spacecraft use, would require large electrical storage facilities and would be prohibitively expensive based on current technological development. Another possibility would be the use of a large solar collector in space, with microwave beaming of the energy to earth. Photovoltaic is probably the most highly developed form of solar energy conversion due to the use of solar panels on spacecraft. Current earth-bound uses include powering remote weather stations and signal buoys. Similar problems exist, as with the thermal conversion, since a backup generating source or electrical storage is required for sunless periods.

Photosynthetic energy sources involve the conversion of solar energy into plant tissue through photosynthesis and the conversion of this material to a high energy fuel. Although the process of converting plant tissue to high energy fuels is not highly developed at this time, it is possible that in the future fast growing plants can supply fuel to some electrical generating stations. This process eliminates the problems caused by sunless periods to photovoltaic or thermal conversion systems. The system is capable of meeting both energy and demand requirements and could operate similar to a current fossil-fueled generating station.

With the exception of the photosynthetic sources, solar power generating systems can supply electrical energy, but cannot meet demand requirements. This deficiency in the systems requires either a back-up generator, or a method of storing the electricity until it is required. Technical and economic feasibility and the environmental impacts of the solar alternatives have not been developed to the extent where they can be considered viable alternatives to the proposed project.

3.2.3.2 Wind Power

Wind power has and is presently used to satisfy many small energy needs around the world. One present use of windmills is the pumping of irrigation water, while a possible use of windmills would be as power boosters along transmission lines. By connecting the windmills directly to the line, the additional generation can be used as a make-up for line loss and, secondly, generation from the central station could be reduced as available wind power increases. While the potential amount of wind energy is large, large scale wind generation systems do not exist at present.

A 1.25 MW wind unit operated atop Grandpa's Knob in Vermont in the early 1940's. This unit operated until 1945 when it stopped generating due to a structural failure. Currently, the largest operating wind powered generators are a 200 kW machine at Clayton, New Mexico and a 200 kW generator on Culebra Island, Puerto Rico. The Department of Energy (DOE) proposes to test a 2.0 MW wind-powered generator in the near future on Howard's Knob overlooking Boone, North Carolina.

It is unlikely that the current rate of development would allow serious consideration of a wind replacement for the proposed plant. Wind-powered generators encounter the same problems as solar regarding the availability of demand energy. Wind-powered generators are not currently available, or sufficiently evaluated to be considered viable alternatives to the proposed project.

3.2.3.3 Hydroelectric

This alternative was eliminated due to a lack of feasible sites.

3.2.3.4 Geothermal

Geothermal power generation utilizes the heat of the earth for steam production. Although geothermal power generation is under investigation in some areas of the country and is currently generating electricity in California, there are no known or potential geothermal areas available to Western Farmers. If an extensive search should locate such a resource, it is not likely that it could be developed in the timeframe required. REA does not consider this to be a viable alternative to the proposed project.

3.2.3.5 Magnetohydrodynamics (MHD)

MHD generation is based on the principle that an electric charge moving in a magnetic field produces an electromotive force. In an MHD generator, ionized gases are passed through a magnetic field to produce an electric current. Although MHD power has been generated, large scale application of this principle has yet to be developed. It is likely that problems involved in scaling up the equipment and development of materials capable of operating in the corrosive MHD environment for long periods of time will require considerable time to solve. Based on the current state of development, the availability of an MHD generator to supply 400 MWe of electricity in 1981 is considered highly unlikely. Therefore, MHD is not a viable alternative to the proposed project.

3.2.3.6 Fuel Cell

Fuel cells generate electricity by the direct conversion of chemical energy. Hydrogen, extracted from fossil fuels is combined with oxygen in the fuel cell to produce fuel residue, water, heat and electricity with little environmental problems. An advantage of the minor environmental impacts is that fuel cell generators can be located close to load centers where waste heat utilization becomes practical and transmission distances are reduced. Fuel cells show promise of being commercially available for utility requirements in the near future. United Technologies Corporation, in cooperation with DOE and the Electric Power Research Institute is developing a 4.8 MWe fuel cell that is expected to be commercially available in the early 1980's. These fuel cells will, however, use natural gas or naphtha as a fuel and therefore would likely conflict with the President's Energy Program. Western Farmers is presently installing coal-fired generation to reduce its dependence on natural gas and a natural gas fuel cell would not help in this regard. Large scale fuel cell generation (equivalent to the output of the proposed unit) is still untried and not considered a viable alternative to the proposed project.

3.2.3.7 REA Preferred Alternative

To supply Western Farmers' projected demands in the specified timeframe, REA concludes that a fossil-fueled-fired, steam-electric generating plant is the preferred alternative. Coal-fired generation will reduce the cooperative's dependence on natural gas and likely be less costly than oil generation. Environmental impacts of coal-fired generation can be reduced to acceptable limits by the application of control technology and REA's finding is that a coal-fired plant is an environmentally acceptable way for Western Farmers to meet projected demands.

3.3 Alternate Plant Sites

Potential plant sites were evaluated through an extensive map and literature review followed by field review of those sites considered to be most suitable. Southeastern Oklahoma was selected as the general siting area due to water supply and load distribution. Areas of critical environmental concern, such as national forests, parks, historic sites and extreme topographic features resulted in a site being judged unsuitable. The site selection process proceeded in three major steps as shown in the following outline.

(1) Establish General Criteria--Define Project:

The initial requirements that must be met before the site selection study can begin are to determine a need for the plant and establish the optimum size. Additional information regarding these aspects can be found in other sections of this EIS, in the Power Requirement Study and the Site Selection Study.

(2) Define Regional Study Area:

This leads to the selection of a general siting area, which in this case is southeast Oklahoma. An evaluation of this area leads to the selection of candidate site areas.

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(2) Define Regional Study Area:

This leads to the selection of a general siting area, which in this case is southeast Oklahoma. An evaluation of this area leads to the selection of candidate site areas.

(3) Apply the Evaluation Criteria:

This step involves the application of criteria through literature search, map review and some site examination. This included: topography, important cultural areas, rail network, water availability, highways, incorporated areas, national forests, and scenic areas, housing and historic sites. Potential sites are selected from the candidate siting areas established in the previous step. Application of these criteria resulted in the selection of nine alternative sites in the general siting area.

(4) Evaluation and Comparison of Alternatives:

The nine sites selected in the previous step were evaluated with the following criteria: compatibility with existing environment, water source and supply development cost, site suitability from engineering aspects.

This led to the three preferred alternative sites that are discussed in this EIS. Further application of evaluation criteria resulted in the selection of the preferred site near Hugo.

As the above discussion indicates, the criteria become more restrictive as the number of alternative sites decreases. The three preferred alternative sites are Hugo, Leflore and Atoka, with the recommended site being Hugo.

The figure and table on the following pages summarizes the site selection process as applied to this project. Additional information on alternate sites can be found in Appendix 1. For those requiring more information, a separate siting study is available on request.

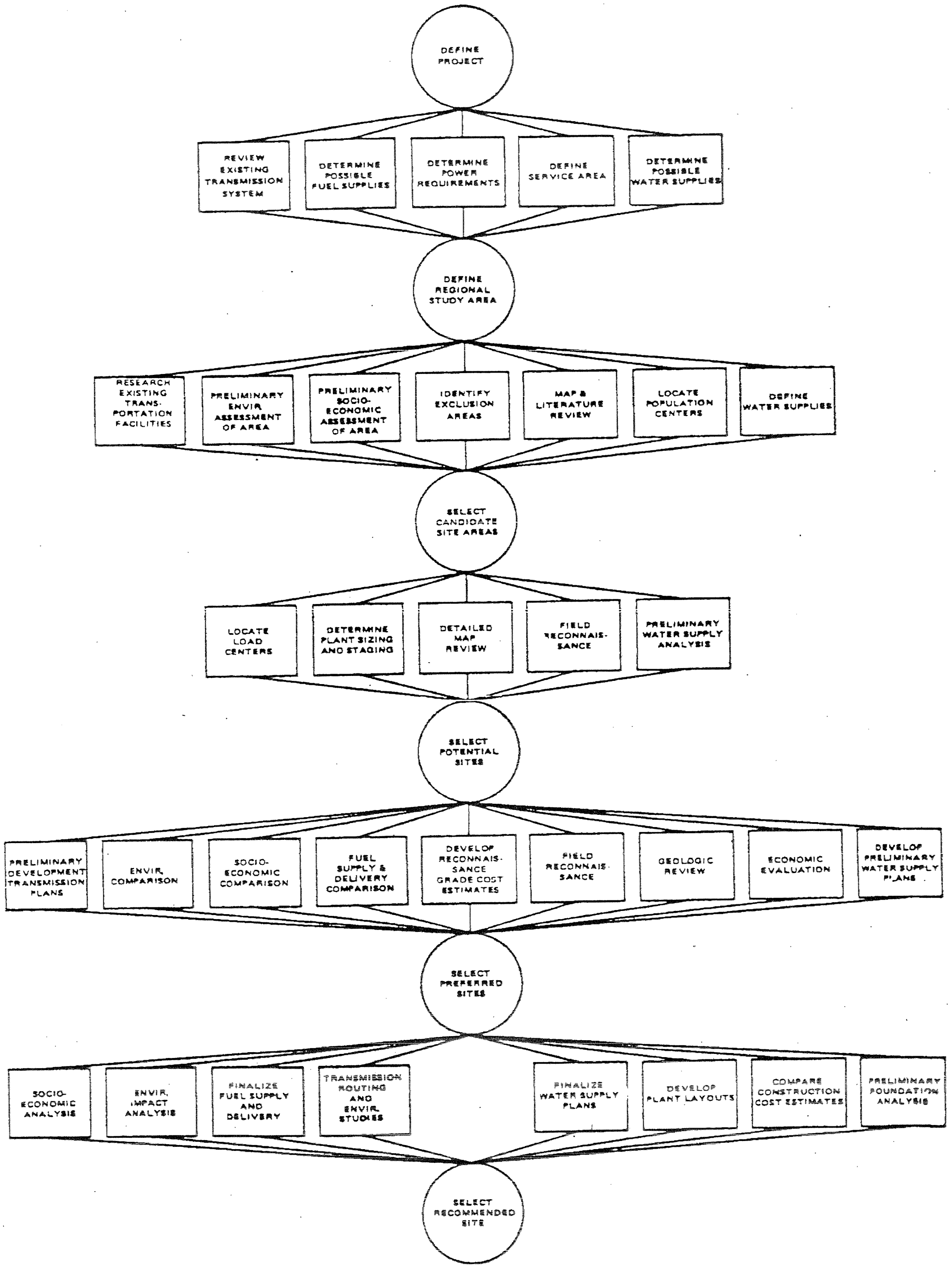


Figure 1

FLOW CHART
SITE SELECTION METHODOLOGY

TABLE 7

PRIME SITE SELECTION
(from 3 alternate sites to 1 preferred site)

Site	Present Value Of Total Differential Costs (1976$)	Environmental Assessments			Socio-economic Assessment	Social Effect	Water Source	Miles Of Water Line Off-Site	Est. Gross Land Use[1] (%)					Fuel Haul Distance (mi.)	Est. Transmission R/W (Ac.)
	1000$	Archaeological	Aquatic	Flora & Fauna		Houses On Site			Irrig. Crop	Dry Crop	Pasture	Non-Productive	Rural Domestic		
LeFlore	193,090	Greatest Impact	Least Impact	Greatest Impact	Least Impact	0	Eufaula Reservoir	0	0	85	0	15	0	1387	3428
Hugo	203,582	Possible Impact	Minimal Impact	Least Impact	Moderate Impact	2	Hugo Reservoir	1	0	20	75	4	1	1614	2048
Atoka	215,185	Least Impact	Greatest Impact	Moderate Impact	Moderate Impact	8	Blue River	2	0	50	33	15	2	1502	542

[1] *Subsequent correspondence with area SCS representatives indicated the Hugo Site contained the least amount of Prime Farm Land. Percentage breakdown is as follows: (LeFlore ≈ 71%; Hugo ≈ 25%; Atoka ≈ 62%).*

REA has reviewed the siting study submitted by Western Farmers and is in agreement with the conclusions reached therein. The siting study was also reviewed by Region VI U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and U.S. Soil Conservation Service. Comments received from these agencies are included in Appendix 8 to this EIS. These comments were evaluated and changes made in the siting study where required. Many of the comments, however, related to specific design details which were inappropriate for inclusion in the siting study. Specific design details are examined in the Environmental Analysis and EIS.

REA examined the three proposed site alternatives in January 1977. As a result of reviewing the site selection study, a field reconnaissance (macroanalysis) of the three sites and consideration of other agency inputs, REA has concluded that the Hugo site is an acceptable location for the proposed coal plant. No Federal agency contacted by REA has raised any objection to the proposed power facility at the Hugo site as a result of the site selection study.

3.4 Alternate Plant Sizing

3.4.1 Larger Unit - The installation of a 500 MW (nameplate) unit was considered as an alternative to the proposed 400 MW unit. This size unit was rejected as uneconomic when compared with the anticipated loads to be supplied and economics of a smaller 376 MW unit. The larger unit was judged to have a greater overall negative environmental impact in relation to benefits derived from the availability of excess capacity over anticipated loads for a number of years.

3.4.2 Smaller Unit - The next logical smaller size unit would be 200 MW nominal. The immediate environmental and economic impact of such a unit would be somewhat less. However, the long-term impacts would be greater for in order to provide the additional capacity not afforded by this smaller unit would require either additional or larger future units which would negate these short-term benefits. Also, the unit power and energy cost of the smaller station would be greater. The latest revised load projections on which this capacity addition is based reflect the reduced load growth trends originating during the oil embargo, (the reduced trends may be temporary for growth now appears to be returning to pre-embargo rates). The smaller unit provides no capacity to allow for upward adjustments in the load growth rates or for the possible delay in the Black Fox Nuclear Station coming on line. In either case a capacity shortage would result, necessitating the construction of additional generating capacity or the purchase from others of expensive capacity, if such is available at that time, which is considered unlikely. The smaller unit would allow less load to be transferred from gas to coal.

3.5 <u>Alternative Plant Facilities</u> - Alternative plant facilities that were evaluated following the decision that the proposed project would be a coal-fired, steam-electric generating station included the following:

1. Cooling systems;
2. Waste disposal systems; and
3. Flue gas cleaning systems.

3.5.1 Cooling Systems

Four major types of cooling systems which were evaluated include:

1. Once-Through;
2. Wet-Tower Evaporative;
3. Dry; and
4. Wet-Dry.

Evaluation of these systems led to the selection of the wet-tower evaporative cooling method for the proposed plant. Table 8 summarizes the critical parameters for cooling system comparison.

3.5.1.1 Once-Through

Once-through cooling is accomplished by passing the cooling water through the condenser and then returning the heated water back to the water source at a point remote from the intake. This type of system requires between 8 to 12 acre-feet of water per megawatt per year (consumptive) including all uses, and returns water at a significantly greater temperature than the inlet conditions. This system could be installed directly on a river bank, or used with a cooling pond or lake. A once-through system at this particular location would likely cause significant impacts to the aquatic environment if installed on either the Kiamichi or Red Rivers. Neither of these rivers has sufficient flow to support a once-through cooling system. Aquatic impacts could be somewhat reduced with once-through cooling by utilizing a man-made cooling pond or lake. Large surface areas are required for heat dissipation and organisms that may develop in the pond could be adversely affected by the temperature changes associated with a plant shutdown.

Once-through without a cooling pond is the least expensive system to install, but would result in the greatest potential aquatic environmental impact at this location.

3.5.1.2 Wet-Tower Evaporative

Hot water from the condenser is pumped to the top of a cooling tower where the heat is dissipated by evaporation as the water falls through the tower fill and returns to the tower basin. Air flow through a wet-tower can be either by means of a mechanical fan, or a natural circulation system. This system generally requires less water to be circulated through the condenser than is required in the once-through system.

The evaporative system is a closed system, with the water continuously recirculated. However, water is lost by evaporation, which increases the concentration of dissolved solids within the system. This tends to induce the dissolved solids to plate out the condenser tubes and reduce the effective heat transfer within the condenser. To limit the concentration of dissolved solids, fresh water is introduced into the system creating an excess volume that must be removed from the system during operation. The total water makeup to the system equals the amount of water evaporated plus the amount of water blowndown. Water consumption with this cooling method, including all plant uses, would likely range between 16 to 20 acre-feet per megawatt per year. An advantage of this system, due to the reduced amount of water circulated, is that the plant can be economically located at a greater distance from its water supply. The blow down water can also be used for ash sluicing and other plant uses.

Cooling system cost, as a function of fuel consumption and plant capacity, is another factor that must be evaluated in system evaluation and selection. Since the wet tower evaporative system is essentially the same as a once-through with recirculated water, both can be considered base values in a cooling system comparison. By assigning the once-through system a value of one, the fuel and capacity factors of the wet-tower evaporative system can also be expressed as the base value. This procedure allows the various cooling methods to be compared. The wet-tower system is the preferred alternative because of cost, environmental and operating factors.

3.5.1.3 Dry

Dry cooling uses an air cooled condenser to remove heat from the turbine exhaust steam. This method requires the least amount of water, but costs approximately six times more than the wet-tower evaporative system. A dry cooling system would require approximately one to two acre-feet per megawatt per year (consumption). A dry system does not require any make-up water since air is the cooling median. The only water consumption is that required for condenser "pre-spray" at high ambient air temperatures and other plant uses. This system also requires higher condenser pressures than the others, which result in a loss of efficiency and generating capacity.

The higher condenser pressures and loss of efficiency could result in more coal consumption in order to maintain the same plant output available with the other cooling methods. The fuel and capacity factors for the dry system would be +10 percent and -13 percent, respectively.

3.5.1.4 Wet-Dry

This system combines a dry cooling section and a wet evaporative cooling section in one cooling tower. Mechanical draft fans are used to induce air flow through the two sections of the cooling tower. The circulating water flows first through the dry section and then through the wet section. When the full cooling capacity of the tower is not needed, the air flow through the wet section is reduced by closing louvers at the air inlet, which reduces evaporation of the cooling water. This system requires a blowdown and make-up cycle similar to that of the wet-tower evaporative system. Total water consumption is approximately 8 to 10 acre-feet per megawatt per year for the wet-dry system. This example is for a 60 percent water saving, although the actual saving will vary depending upon the wet-dry surface ratio in the tower. The fuel and capacity factors for the wet-dry system can be expressed as +3 percent and -2 percent, respectively. This system was not selected due to increased cost, availability of water for a wet-tower, and limiting operating experience with a wet-dry system.

3.5.1.5 Cooling System Comparison

The characteristics of the various cooling methods evaluated for the proposed coal-fired generating plant are summarized in the following table.

TABLE 8

COOLING SYSTEM COMPARISON

Cooling Method	Water Consumption Acre-Feet Per MW/Year	Increased Fuel Consumption %	Capacity Loss %
Once-through	8-12	Base	Base
Wet-Tower Evaporative	16-20	Base	Base
Dry	1-2	+10	-13
Wet-Dry	8-10*	+3	-2

*Maximum saving over wet-tower.

3.5.2 Waste Disposal Systems

3.5.2.1 Water

Three waste water discharge alternatives were evaluated for the proposed plant. These are summarized below:

1. Discharge pipeline to Kiamichi River. This alternative would require extensive treatment of the discharge water to meet the discharge water quality standards for the Kiamichi River.* This alternative was not considered feasible due to the associated high treatment costs and increased water usage resulting from the limited recycling necessary to meet water quality standards.

2. Discharge pipeline to Red River. This alternative would utilize a pipeline to the Red River and be subject to somewhat less restrictive discharge limitation than that of the Kiamichi River. Table 9 summarizes the relative quality of the Red and Kiamichi Rivers. This is the preferred plan for the proposed project.

3. Bird Creek to Kiamichi. This alternative is similar to No. 1 except that Bird Creek would serve as the discharge canal to the Kiamichi River. Extensive treatment would be required to meet the Kiamichi River standards and another area of concern was the ability of Bird Creek to handle the proposed discharge quantity.

3.5.2.2 Ash and Sludge

Ash disposal can be accomplished by returning it to the mine, disposal on the plant site, or selling the ash. No markets are known to exist in the Hugo area for the fly ash and shipping the ash to potential distant markets was not considered feasible. Due to the distance involved (approximately 1,000 miles), it was not considered practical to ship the ash back to the mine. It was concluded that the best alternative was to dispose of the ash in an on-site disposal area. This disposal area would require approximately 160 acres.

*The low total dissolved solids (TDS) concentration in the Kiamichi River is the limiting factor. The historical mean TDS concentration in the Kiamichi River at Sawyer, Oklahoma, is 35 Mg/L. The State Water Quality Standards prevent the discharge of cooling water into the Kiamichi if the TDS concentration in the cooling water exceeds one standard deviation from the mean historical value after mixing, calculated for the 2 year, 7 day low flow condition. A rough estimate is that TDS from the cooling water would be approximately 42.6 Mg/L after mixing.

TABLE 9

KIAMICHI AND RED RIVERS
WATER QUALITY

Kiamichi	Parameter in Mg/L Unless Otherwise Stated	Red
8.9	TOC	9.9
72.5	Total Hardness	351
25	Total Alkalinity	87.5
22.3	Suspended Solids	31.3
0.53	Nitrate (N)	0.03
4.2	Ammonia (N)	2.6
0.05	Total (PO_4) (P)	0.05
0.01	Soluble (PO_4) (P)	0.01
4	Sulfate	154
7.8	Dissolved Oxygen	9.2
7.3	PH Units	8.2
24.5	Temperature °C	20.5
*	Fecal Coliforms No./100 ML	*
*	Turbidity, JTV	*
59	Specific Conductance	1125

Data are average of sampling data available at time of preparation.

*not available

Data based on two sampling dates from Aquatic Biology Study.

Low sulphur coal is proposed to be utilized instead of a flue gas desulfurization system and a scrubber will not be required (see PSD Permit in Appendix 5). A discussion of sludge disposal for a limestone system is included in Section 3.5.3.4.2 of this EIS and represents a worst case situation, should a flue gas desulphurization system be required at a later date.

3.5.3 Emission Controls

Possible emission controls include electrostatic precipitators, cyclones and baghouses.

3.5.3.1 Electrostatic Precipitator

An electrostatic precipitator removes fly ash particles from the flue gas by applying three fundamental steps: (1) electrical charging of suspended fly ash particles, (2) collection of the charged particles in an electric field, and (3) removal of the precipitated ash from the collecting electrodes and disposal of the collected particulates. This is the proposed particulate removal system.

3.5.3.2 Cyclones

A cyclone changes the velocity of the inlet stream into a double roster where the entering gas spirals downward on the outside of the cyclone and upward on the inside of the cyclone outlet. This causes fly ash particles to move toward the outer wall of the cyclone where they are removed to a receiver. Cyclones generally cannot provide the degree of particulate removal required to meet current emission standards and were judged to be impractical for the proposed project.

3.5.3.3 Baghouse

A baghouse operates similar to a household vacuum clearner in that the flue gas is forced or drawn through tubular fiber bags. Drawbacks with this system include high pressure drops and bag replacement. New bags release fine-sized dust particles until a sufficient mat of particles builds up on the bag.

Baghouses are excellentparticulate removers, although they are generally used on smaller sized units and industrial plants. However, for the proposed application, the drawbacks associated with baghouses were judged by the cooperative to outweigh the advantages and they were not selected as the preferred alternative, although REA would not object to their use.

3.5.3.4 SO_2 Removal

3.5.3.4.1 Low Sulfur Coal

Compliance with current State and Federal air regulations, as applicable to the proposed plant, will be accomplished by utilizing a low-sulfur coal from Wyoming. Western is guaranteed by contract that the coal will be compliance when mined or by blending methods.

3.5.3.4.2 Limestone Scrubber

A description of a limestone scrubber system, summarized from the EA, is provided here to explain system operation and show the anticipated waste production and disposal problems. This system is not contemplated, but could be required should the coal quality change, or should more restrictive SO_2 requirements be applied to the unit by changing regulations. On September 12, 1978, as part of its clean air and coal use program for future energy development, the Environmental Protection Agency had published in the Federal Register proposed regulations that could require that new coal-fired electric power plants be equipped with facilities for reducing potential sulfur dioxide emissions. The proposed EPA regulations have been evaluated with respect to applicability to the Hugo coal-fired generating plant. Based upon correspondence and evaluation of the proposed regulations, REA believes it is reasonable to conclude that Western Farmers will under the regulations of EPA be able to operate the proposed Hugo coal-fired electric generating plant without facilities for reducing potential sulfur dioxide emissions.

The limestone FGD system works on the principle of gas absorption accompanied by chemical reaction. An absorption tower and related equipment provide thorough contact between the flue gas the the limestone slurry to promote interphase diffusion of the two materials. Spray is usually countercurrent to the gas flow to provide a high rate of mass transfer of its sulfur dioxide into the slurry. Once the sulfur dioxide is absorbed in the liquid, a number of irreversible chemical reactions take place, resulting in the formation of calcium sulfite and sulfate. Since the process is nonregenerable, a portion of the spent slurry (reacted limestone) is constantly purged from the process and additional limestone is added.

Waste products from the process would be dewatered and disposed with the fly ash. If such a system were to be added to the proposed unit, expansion of the existing ash disposal areas, or the creation of a new area would be required for the combined ash and sludge. Since the quantity of sludge produced is a function of the sulfur content, disposal requirements increase with percentage of sulfur in the coal. There is sufficient on-site area available for disposal, if required. A limestone system would add approximately $60 million dollars (or approximately 18%) to the capital cost and would substantially increase the yearly operationg cost. The plant has been designed so that should facilities for reducing potential sulfur dioxide emissions be required such facilities could be added without other major modifications. The number of operating personnel and maintenance and operating costs for the plant would be increased. For the potential operation of the plant (7,000 hours use per net kW) the costs, associated with the investment (8.5 percent annual interest rate) and operating and maintenance of the additional facilities and the decrease in revenue potential because of capacity reduction would be approximately 5 mills per kWh or approximately 18% of such costs without the facilities.

REA knows of no reason to require Western Farmers to install facilities for reducing potential SO_2. In recognition of:

- selection to use low sulfur coal,
- low potential SO_2 emission expected,

- present ambient air quality,
- matters discussed in 1.4.1.1.1 "Compliance Ambient Air Standards",
- other matters discussed in 1.4.1.2 "Emission Standards",

REA does not in itself feel it would be useful to require the expenditure for additional facilities for reducing potential SO_2 emissions in view of the results that would be achieved.

3.6 Alternative Transmission Routes

The objective in establishing the utility corridors to the Valliant Substation was to make maximum use of existing corridors. This resulted primarily in looking to the north and south of the existing PSO lines in the area. Figure 5 in Section 4.3.4 taken from Appendix 2 shows the corridor location with the preferred and alternate routes shown.

Investigation of routes between the proposed plant site and the PSO Valliant Substation resulted in the preferred routes shown on Figure 5. Alternatives to the proposed routes, and the reasons for investigation and rejection follow.

No. 1: This alternate 345 kV route was investigated in the hope of decreasing visual impact, however, this alternate route would be further separated from the existing PSO corridor, and would involve creating an additional utility corridor.

The preferred and alternate routes were investigated in the hope of continuing to parallel the existing corridor for as long as possible, thus not creating an additional utility corridor, which would be involved here.

No. 2: This alternate route lies north of the preferred 138-kV transmission line route and disadvantages would be similar to those described for No. 1 above. This alternate also would involve creating an additional utility corridor.

No. 3: This alternative would utilize existing transmission lines. Since Public Service Company of Oklahoma (PSO) has directed Western Farmers Electric Cooperative (WFEC) to remove their loads from the PSO distribution system, this alternative was not considered practicable. Extensive work would also be required to upgrade the PSO lines for the additional load. Other transmission lines are not available in the area to be served by the proposed lines.

The area crossed by the corridor is sparsely settled and chiefly used for grazing. Due to the close location of the alternates in relation to the proposed line, no significant physical differences exist in the areas that would be crossed. The major considerations are the populated areas, historic and recreational areas. No threatened species or critical habitat are expected to be impacted by any of the routes. More detail on line routing can be found in Appendix 2.

3.7 Alternative Transmission Design

Transmission line support structures can be of either steel, wood or concrete material. Steel and concrete poles are primarily used where appearance is a primary concern. In the rural areas where the proposed corridors will be located, treated wood poles were judged to be more compatible with the surroundings, economical and easier to maintain. Steel lattice structures are used for high loading conditions and not required for the proposed lines.

Wood poles were determined to be the preferred alternative. H-frame structures were selected over single poles since the overall cost is somewhat less and the resulting structures are sturdier. About the same number of poles are required for either alternative since a single pole is one-half as strong as the two poles used on an H-frame and therefore must be spaced at about one-half the distance that an H-frame is spaced.

Underground construction was not considered a practical alternative due to cost, construction and maintenance problems, and electrical limitations caused by the distances involved.

Voltages higher and lower than the proposed 138 kV and 345 kV were considered for each of the line routes. For each of the proposed lines, a lower voltage would not be adequate to handle the loads of the Western Farmers distribution and a higher voltage would not be needed in the foreseeable future.

3.8 Alternatives Available to the U.S.E.P.A.

The two alternatives available to the U.S.E.P.A. in exercising its regulatory authority under Section 402 of the Federal Water Pollution Control Act as amended are to issue or deny the New Source NPDES permit requested by Western Farmers (the applicant) for discharges from the proposed generating facility.

3.8.1 Issuance of the NPDES Permit Proposed by U.S.E.P.A.

Issuance of this permit (copy attached as Appendix 6) will allow Western Farmers to discharge waste water from this proposed generating unit into the Red River. The impact of the issuance of this permit will be to allow the generating unit to operate as discussed in this statement. The environmental impacts of this operation are discussed in detail in Section 4 and are summarized below:

Site preparation and construction activities will result in the removal of approximately 1,400 acres of vegetation from the 3,000 acre plant site. Soils on the site are generally severely eroded due to over grazing and therefore no significant impact on the agricultural use of the land is anticipated. Some additional loss of vegetation will be associated with the development of the transmission lines, however, construction practices will minimize the amount of vegetation removed and after construction the land can continue to be used for grazing.

Construction of the intake and discharge structure will likely result in increased turbidity in the Kiamichi and Red Rivers. Turbidity, PH and suspended solids will be controlled by the New Source NPDES permit and no significant impacts to aquatic life are anticipated.

Construction activity will increase the concentration of particulate matter in the air: however, dust suppression measures, such as wetting will be implemented to minimize the increase. The major adverse air quality impact will be associated with project operation rather than construction. Operating effects will include increases in ambient levels of sulfur dioxide, particulate matter and nitrogen oxides; however, modeling results indicate that these concentrations will be below the standards which have been established to protect public health and welfare. Waste water discharge from the plant will result in slight thermal and ehcmical water quality impacts to the Red River, however, all liquid discharges will be treated to comply with approved water quality standards before discharge and therefore no significant adverse impacts are anticipated.

Socioeconomic impacts, both beneficial and adverse, may result from construction and operation of the proposed facility. Communities may be temporarily disrupted due to the effect of the immigration of the work force. Adverse impacts, including increased demand for community services, increased pressure for real estate and mobile home sites and increased traffic. Beneficial effects include an expanded tax base and increased job opportunities.

3.8.1.1 NPDES Permit Modificaton

EPA may modify the NPDES permit included in this EIS based on comments received during the review process. It is also possible that nonwater-related environmental stipulation may be placed in the permit on the basis of EPA review.

3.8.2 Denial of the NPDES Permit by U.S.E.P.A.

The U.S.E.P.A. may deny the application for a New Source NPDES permit if the agency determines that the proposed discharge will violate effluent limitations, or if violation of the Oklahoma Standards are anticipated. The denial of the NPDES permit will result in no effluent discharge from the facility. If the application is denied, the applicant (Western Farmers) may elect not to build at the site or to design the generating unit to operate without a discharge.

The major impact of electing not to build at the proposed site would be the possible economic loss to Western Farmers and the probable loss to the State and region of needed power for future growth. Because the need for power will continue, a decision to complete the proposed project, but not to discharge, would require alternate methods for waste disposal. One possible alternate would be the discharge of waste water to an evaporation pond. Environmental constraints of this alternative include the use of a large land area for the construction of the evaporation pond along with the associated environmental impacts to land use, possible effects of increased atmospheric moisture, increased water consumption, and increased cost as well as its low aesthetic value. The primary beneficial impact of the system would be the absence of discharge.

4.0 Environmental Assessment of Proposed Action

If the generating plant and transmission lines are constructed as proposed, the environmental impacts associated with both construction and operation of the facility are expected to be as follows:

4.1 Air

The proposed plant will be designed to meet all applicable standards which provide acceptable air quality with a margin of safety. The detailed analysis to support this follows.

The detailed procedures used to calculate short-term ground level emission concentrations of sulfur dioxide and particulate and annual average ground level concentrations of sulfur dioxide, particulate and nitrogen oxides can be found in Section II.1.6 of Appendix 1. A summary of the calculated trace element emission rates and ground level concentrations is presented in Section 4.1.4.4 and 4.1.2, respectively.

Short-term maximum ground level concentrations were calculated using three principal plume dispersion conditions: normal dispersion, fumigation and plume trapping. Each of these conditions is represented by the basic Gaussian plume model. A detailed evaluation and calculated values of the Gaussian model are outlined in Section II.1.6.2 of Appendix 1.

The Annual Average Ground Level Concentrations were calculated using the Air Quality Display Model (AQDM) developed by the Office of Air Programs under the Environmental Protection Agency (EPA). Through a mathematical simulation of the atmospheric diffusion process, the AQDM determines the estimated arithmetic mean concentration at ground level over an annual period. The procedure and detailed results appear in Section II.1.6.3 of Appendix 1.

The procedure described above must comply with current EPA methods. However, to provide additional modeling data an alternate dispersion model was calculated. The "Single Source (CRSTER) Model" developed by EPA was used. Both the CRSTER Model and the models described above are based on the standard Gaussian plume model using Briggs' plume rise equations.

Both the CRSTER and AQDM Models predict compliance with applicable increments for sulfur dioxide and particulates. The CRSTER Model computation results are presented in Table 12 of Section 4.1.2. Presented in Appendix 8 is a copy of the Prevention of Significant Deterioration Permit issued by EPA based on the above analysis.

4.1.1 Emission

Emission from the plant will not exceed Federal and State limitations as shown in Section 1.4.1.1.1 of this EIS. The particulate, sulfur dioxide and nitrogen oxide emission rates were calculated for the proposed coal being burned at full load in the boiler. This information was then utilized in the air modeling calculation as described in Section 4.1 above and in Appendix 1. The following sections describe how the individual parameters were obtained. Detailed calculations can be found on pages II-7 to II-32 in Appendix 1. Operating parameters can be found in Table 10.

4.1.1.1 Particulates

Western Farmers proposes to install a cold-side precipitator to control particulate emissions to remain within the Federal and State emission standard of 0.1 pounds of fly ash per million BTU heat input.

TABLE 10

OPERATING PARAMETERS

4128 million BTU/hr.		Heat Input
8127	BTU/lb	Fuel Heating Valve
0.486	Percent	Sulfur in Coal
442	MWe	Unit Electrical Output
225.8	tons/hr.	Coal Burned
47.55	tons/day	SO_2 Emission
3.96	tons/day	Particulate Emission
27.74	tons/day	NO_x Emission
152.4	meters	Stack Height
7.36	meters	Stack Diameter
410.8°K		Flue Gas Exit Temperature
12.19	meters/second	Flue Gas Exit Velocity

Table 11

MAXIMUM CALCULATED CONCENTRATIONS, PREVENTION OF SIGNIFICANT DETERIORATION (PSD), NON-SIGNIFICANT DETERIORATION (NSD), AND AIR COUNCIL INCREMENTS

Pollutant	Maximum Predicted Concentrations ($\mu g/m^3$)	Class II[1] PSD Increments ($\mu g/m^3$)	State NSD[2] Increments ($\mu g/m^3$)	Air Council[2] Increments ($\mu g/m^3$)	Measured Background ($\mu g/m^3$)	Background Plus Max. Concentration ($\mu g/m^3$)	State[2] and Federal[5] Air Standards ($\mu g/m^3$)
Sulfur Dioxide							
Annual arithmetic mean	1.0	20	30	15	4.8[3]	5.8	80
24-hour max.	9	91	130	100	29.0[3]	38.0	365
3-hour max.	120	512	650	—	not available	—	1300
Particulate Matter							
Annual geometric mean	0.08	19	15	10	29.2[4]	29.28	60
24-hour max.	0.66	37	55	30	89[4]	89.66	150
Nitrogen Oxides							
Annual arithmetic	0.59	—	—	—	not available	—	100

[1] *40 CFR 52.21 as amended November 3, 1977.*

[2] *"Guidelines and Policies with Regard to Permit Processing," Oklahoma Clean Air Act, July 1977, Oklahoma State Department of Health.*

[3] *1975 Oklahoma Air Quality Report, Oklahoma State Department of Health, Idabell monitor.*

[4] *1976 Oklahoma Air Quality Report, Oklahoma State Department of Health, Vallaint monitor.*

[5] *"National Primary and Secondary Ambient Air Quality Standards." 40 CFR, 50*

$\mu g/m^3$ — micrograms per cubic meter

4.1.1.3 Nitrogen Oxides

Boiler design and operation of the proposed unit will be such that the Federal and State standard of 0.7 pounds of nitrogen oxides (NO_x) per million BTU heat input will not be exceeded. The boiler contract specifies in the boiler guarantee that NO_x will not exceed 0.7 pounds per million BTU. The NO_x emission rate of 27.74 tons per day can then be utilized in the air modeling calculation discussed in Section 4.1.

4.1.1.4 Trace Elements

A list of trace elements that may be found in the coal supply for the proposed plant is included in Appendix 4. Most of the trace elements in the coal are expected to be retained in the bottom ash or fly ash and will, therefore, find their way to the ash pond. Trace elements occurring in fossil fuels, which in sufficient quantities may be considered as hazardous, are beryllium, fluorine, arsenic, selenium, cadmium, mercury, and lead.

Based on the information in the trace element analysis, the following table can be developed to show the anticipated maximum and minimum values for the elements of primary concern occurring in this coal.

Element	Minimum Value lb/lb coal	Maximum Value lb/lb coal
Beryllium	1×10^{-7}	1×10^{-6}
Fluorine	2.7×10^{-5}	1.9×10^{-4}
Arsenic	1×10^{-6}	1.3×10^{-5}
Selenium	2×10^{-7}	3×10^{-6}
Cadmium	4×10^{-7}	2×10^{-6}
Mercury	5×10^{-8}	8.5×10^{-7}
Lead	4×10^{-7}	6×10^{-6}

Based on a burn rate of 225.8 tons of coal per hour, a range of trace element emission rates can be developed. These are shown in the following table:

TABLE 13

TRACE ELEMENT EMISSION RATES

Element	Max. in Coal ppm	Emission Rate Range lb/hr.
Beryllium	0.5	4.5×10^{-2} -- 4.5×10^{-1}
Fluorine	190	1.2×10^{-1} -- 8.6×10^{-1}
Arsenic	13	4.5×10^{-1} -- 5.9
Selenium	0.9	9×10^{-2} -- 1.4
Cadmium	1	1.8×10^{-1} -- 9×10^{-1}
Mercury	0.85	2.3×10^{-2} -- 3.8×10^{-1}
Lead	6	1.8×10^{-1} -- 2.7

As the above table shows, the quantities of trace elements in the flue gas or ash are rather small and trace elements are not expected to have any adverse effects. The rates shown above assume no removal in the precipitator. At the present time, no Federal or State regulations exist that specify emission limits for trace elements in coal. However, no known adverse effects have been attributed to trace element emission resulting from the combustion of coal in power plants. The proposed plant will represent the current state-of-the-art design practices, and operation of this unit is not expected to create a trace element problem. A recent ERDA publication, Effects of Trace Contaminants from Coal Combustion (ERDA 77-64), confirms this by concluding that, ". . . atmospheric releases of trace elements are not likely to have significant, detectable effects on the chemical composition of soil, vegetation, and water in the near term (40 years)."

4.1.2 Ground Level Concentrations

Anticipated ground level concentrations resulting from the operation of the proposed unit were calculated using the Air Quality Display Model (AQDM) and the recently developed Single Source Model (CRSTER). Both models use the standard Gaussian plume model using Briggs' plume rise model equations. A detailed description of the equations used can be found in Section II.1.6.2.1 of the attached Plant Environmental Analysis.

Meteorological data for use in the models was not available for the plant site itself and was taken from the nearest stations that met the model input requirements. Wind data was taken from Sherman-Perrin AFB, Texas, and mixing height data was taken from a station in Oklahoma City. It should be noted that accuracy of the results from air pollution modeling is dependent upon model accuracy and the degree to which the input data represents the physical situation in the region of interest. A detailed discussion of the calculations involved can be found in Appendix 1.

Background values for the area were taken from Oklahoma Air Quality Reports published by the Oklahoma State Department of Health. Table 11 shows the results of the air calculations based on the AQDM, while Table 12 shows the results of the CRSTER model. As the results indicate, the resulting ambient concentrations will be in compliance with either method of calculation. The CRSTER results, while more conservative, indicate no difficulty in complying with the regulations.

There are no known sources in the vicinity of the proposed plant that would likely result in any stack gas interaction. The nearest industrial facility having an appreciable stack emission is a Weyerhouse plant approximately 15 miles east of the proposed plant. The wind conditions in the area are predominantly from the south, which tend to further reduce any interaction between the plants.

4.1.3 Monitoring

4.1.3.1 Emission

After the new unit goes into operation, an emission monitoring program will be put into effect. Sulfur dioxide, fuel, and smoke monitoring equipment, as stated in "Standards for Performance for New Stationary Sources" (Federal Register - December 23, 1976, as amended) will be installed, calibrated, maintained and operated on a continuing basis as part of the project. The Oklahoma State Commissioner of Health and U.S.E.P.A. will be invited to observe the tests, review the program and inspect the equipment. They will also be furnished a written report of the results.

4.1.3.2 Ambient

An ambient air monitoring program will be established in accordance with any requirements of the State of Oklahoma and U.S.E.P.A. Since Western Farmers will likely propose additional generating units to be added to the proposed unit, at some future date, an ambient air monitoring program appears to be essential. Details of the ambient monitoring program will be developed as the project progresses.

REA believes that the requirement for ambient monitoring is questionable if the predicted ground level concentrations are below 75 percent of the most stringent standard. Above this value monitoring would be required. Trace element monitoring is not necessary unless required by EPA.

4.1.4 Construction Impact - Air

Air impacts caused by construction activities will be temporary and result primarily from fugitive dust and equipment emissions. Fugitive dust will be controlled by wetting and all vehicles and equipment will be maintained in proper operating condition to minimize excessive exhaust emissions. Western Farmers will inform REA of any actions taken to maintain equipment and reduce fugitive dust in the monthly construction reports.

4.2 Water

Water for the proposed project will be purchased from the Corps of Engineers and delivered to the plant's intake structure approximately five miles downstream of the Hugo Dam via the Kiamichi River and discharged to the Red River approximately one-half mile east of the confluence of the Red and Kiamichi Rivers. It is estimated that the proposed unit will require 7.46 million gallons per day. Water flow in the Kiamichi is regulated by release from the reservoir and the plant water requirement will not affect downstream water use. Flow above the intake will be increased to maintain downstream flow consistent with existing conditions. Flow in the river between the dam and intake structure will increase to provide the necessary water for plant operation. Since river flow is determined by water releases from the reservoir, present flow conditions in the Kiamichi are variable. No significant impacts (biological, etc.) are anticipated in the Kiamichi as a result of the proposed project.

Western Farmers has received permission from the State to withdraw water from Hugo Reservoir via the Kiamichi River. Studies indicate that sufficient water should be available for the 35-year lifetime of the proposed plant. Available water from Hugo Reservoir is 32 million gallons per day at the present time and will increase to 140 million gallons per day in 1980. Plant water use will be approximately 5 percent of the available water.

4.2.1 Aquatic Impacts

The effect of the operation of the proposed unit on the Red and Kiamichi Rivers is discussed in the following sections.

4.2.1.1 Intake

Section 316B of the Federal Water Pollution Control Act, as amended, requires that the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental effects. The cooling water intake structure for the Western Farmers' project will be subject to these regulations.

The proposed intake structure will be designed and constructed to accommodate three units at the site. The construction impact associated with an intake structure designed for one unit and one for three units is not significantly different. Operational impacts would vary due to the change in water requirements. The 316B analysis is based on flow volume required for three (3) unit operation. Other than the above-considerations, the analysis is for one unit and any future units financed by REA will be considered on a case-by-case basis in impact statements prepared at that time.

Cooling water is to be supplied by the Hugo Reservoir and drawn from the Kiamichi River by an intake structure proposed to be located on the Kiamichi River at 33° 59' 02" north latitude, 95° 19' 59" west longitude, approximately five river miles downstream of the Hugo Dam. The intake structure will draw the cooling water from the river at the proposed point and deliver it to the plant's raw water storage and via an intake pipeline shown in Figure 1-22 of Appendix 1. The raw water storage pond will be approximately 2,520 acre-feet in size and will contain a 27-day water supply for plant operation. The preliminary intake structure design is shown in Figures 2, 3 and 4. Western Farmers has utilized the Environmental Protection Agency's Development Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impact (April 1976) as guidance and development for the proposed intake structure.

The proposed facilities consist of the intake pump structure, housing three vertical turbine pumps; the underground piping to the plant site; and three Johnson Intake Screens with three 30 inch diameter intake conduits to the structure. The intake structure will contain three (3) Johnson Screens that are cylindrical in shape, 14 feet long and three feet in diameter. Maximum intake velocity will be 0.5 feet per second at a maximum flow rate of 21,000 gallons per minute.

Operation of the intake structure is not expected to result in significant adverse environmental impacts. The design is based on the results of exhaustive aquatic studies. The studies have ascertained the population diversity of existing and predictable aquatic life in the Kiamichi River and were beneficial in establishing criteria to minimize impact to the species. Based on the studies, it was concluded that a 1mm screen opening should be used.

Experimental studies indicate a cylindrical profile-wire screen like that shown in Figure 4 operated at an intake velocity of 0.5 fps virtually eliminates impingement of fish larger than 15mm fork length (FL). Further, test of fish less than 30mm FL held near a functioning intake screen operating at 0.5 fps for three hours showed no impingement or stress. A copy of the test is included as Appendix 5.

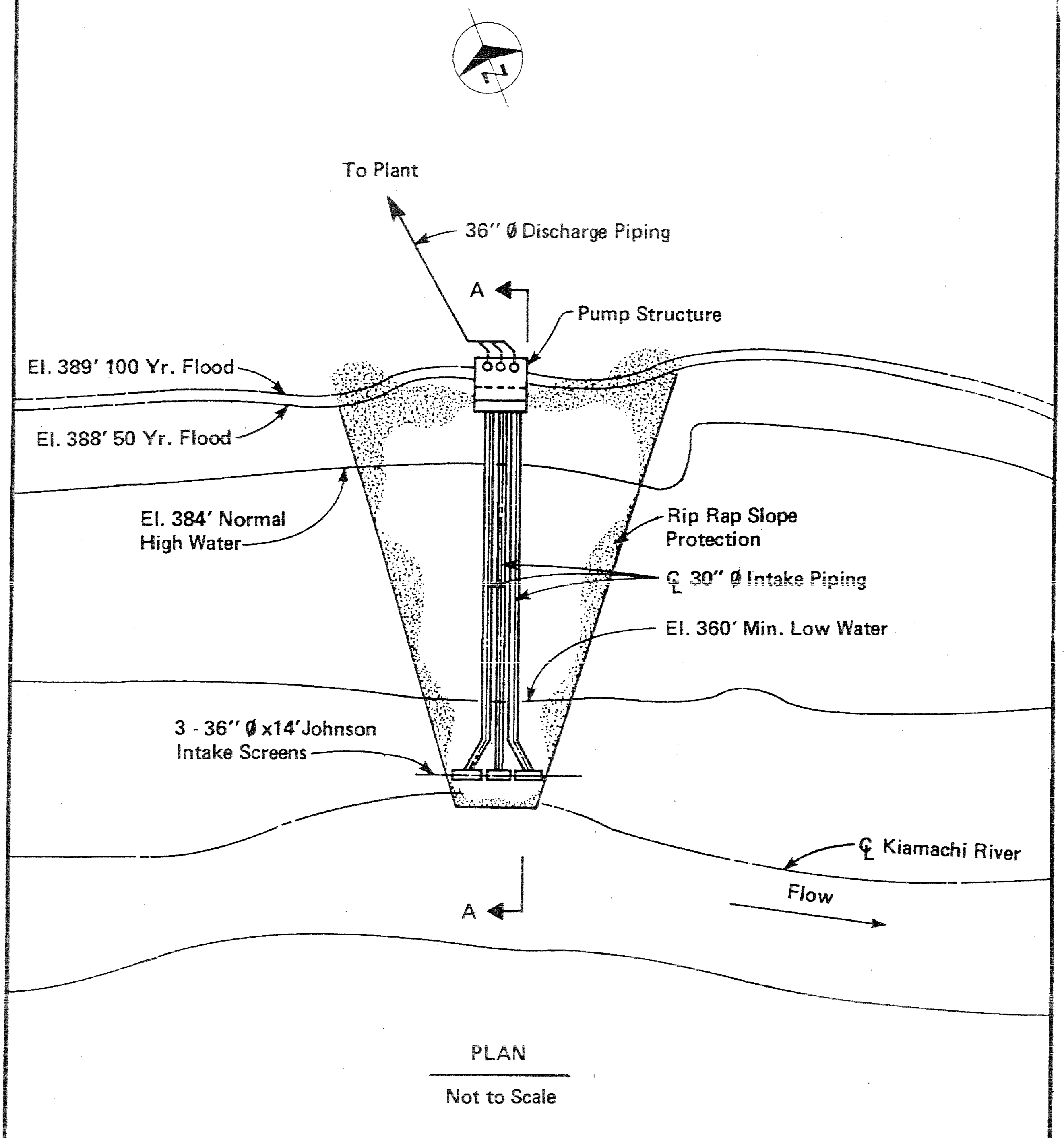
Preliminary studies on egg mortality have indicated that a minimal survival rate of 95 percent can be expected at an approach velocity of 0.5 fps. The study also showed a 97.5 percent reduction in fish egg entrainment while demonstrating a high resistance to fouling in that the screen is essentially self-cleaning in a current (Hanson, et al.).

The study performed by Ichthyological Associates, Inc., on the profile-wire screen intake screen method concluded in part that:

> "...Impact to the aquatic environment is expected to be many times less than that of a comparable intake protected by traveling screens..." (Hanson, et al.)

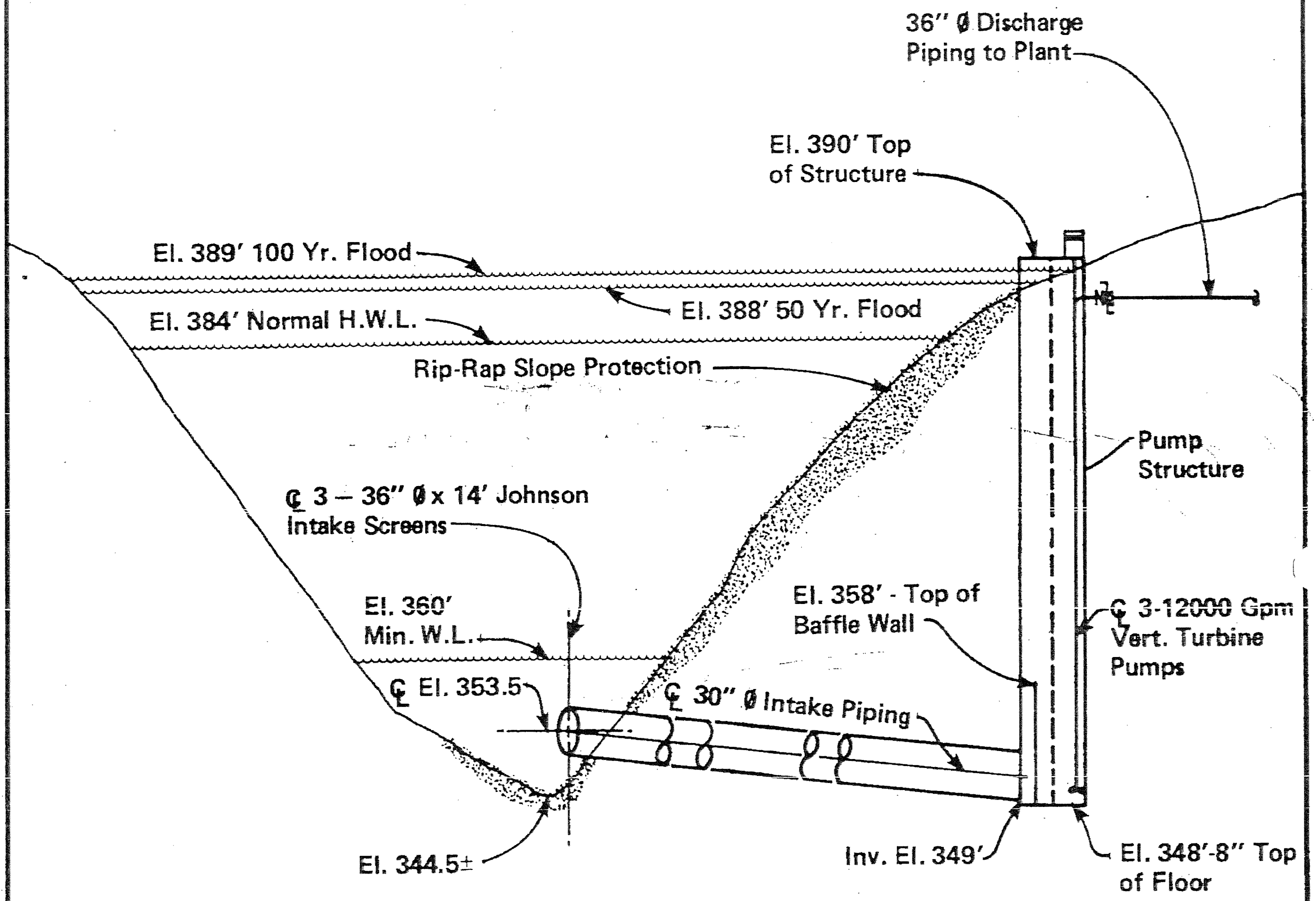
The substantial reduction in the entrainment and impingement of aquatic organisms has been attributed to the infinite number of escape routes, the inverse relationship existing between the approach velocity and the distance from the screen, flow dynamics which alert fish to impending danger, small slot size and the use of ambient water flow to assist aquatic life in escaping or avoiding the intake structure.

EPA will consider comments received on the proposed intake design prior to issuing final approval pursuant to the requirements of Section 316.B of the Federal Water Pollution Control Act.



Barns & McDonnell
Engineers–Architects–Consultants

Figure 2
INTAKE STRUCTURE DESIGN

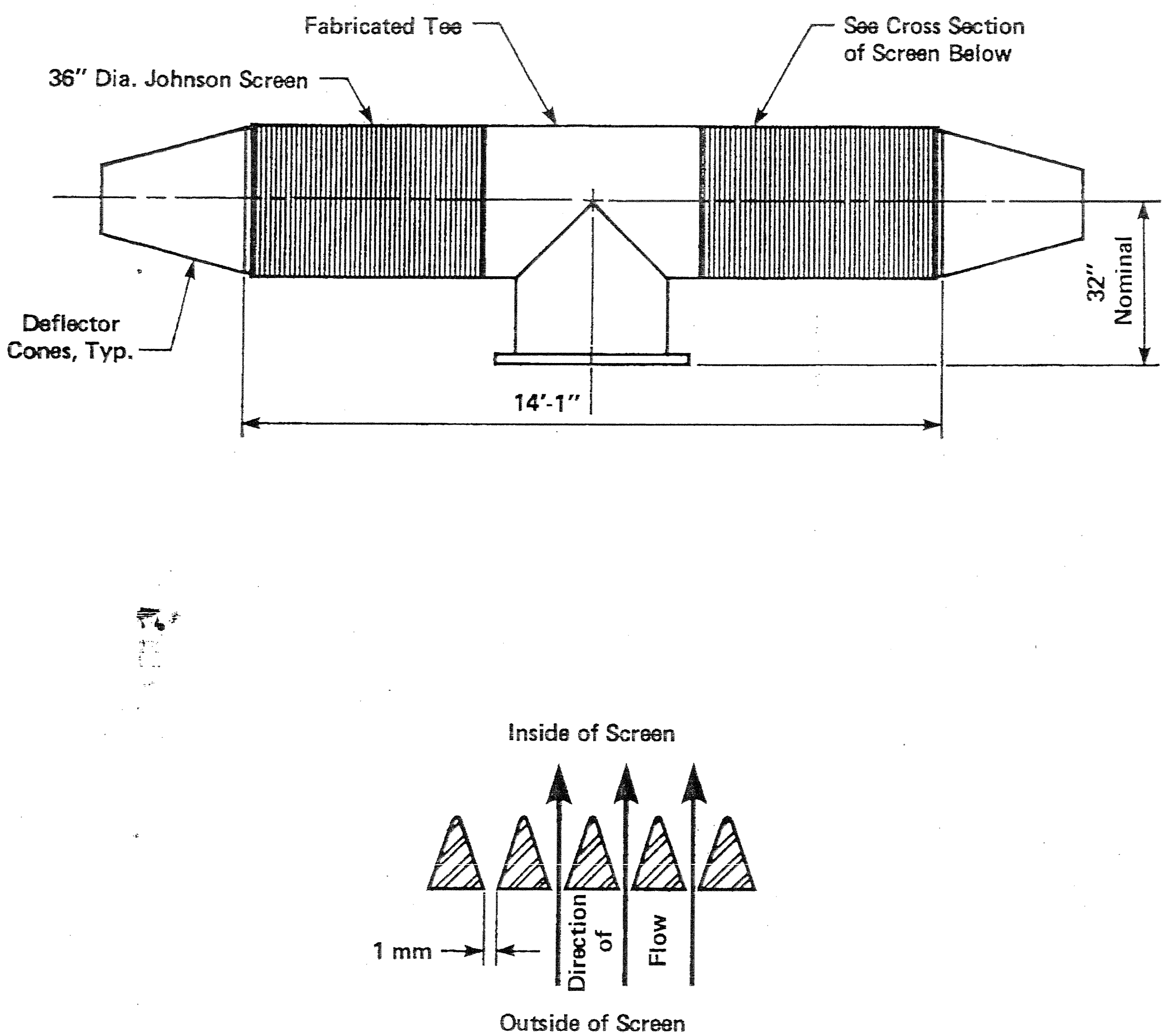


SECTION A

Not to Scale

Burns & McDonnell

Figure 3
INTAKE STRUCTURE DESIGN



INTAKE SCREEN DETAIL

Figure 4
JOHNSON INTAKE SCREEN

4.2.1.2 Outfall

The design of the proposed plant will reduce the temperature of the discharge to the Red River by using the cooling water in plant processes. Cooling tower blowdown will be discharged to the bottom ash pond, which also serves as a receiving body for boiler blowdown, bottom ash transport and air heater cleaning waste water. Chlorine residual in the cooling tower blowdown should not exceed 0.1 ppm. With this procedure, the bottom ash pond also serves as a cooling and neutralization pond before final discharge to the Red River. The maximum temperature differential is expected to be 1.4°F above the natural equilibrium temperature with the proposed unit operating at full load. The Oklahoma regulations limit the maximum rise in temperature of any receiving water body to 5°F.

TABLE 14

DISCHARGE WATER QUALITY

	Arthur City[1] (mg/L)	Outfall (Max.) (mg/L)	Quality After Mixing (mg/L)
Hardness	495	1600	498
Alkalinity	218	1500	221
Suspended Solids	N.D.	100	--
Nitrates	1.1	10	1.12
Total (PO_4) (P)	0.26	17.5	0.3
Sulfates	262	1100	264
Dissolved Oxygen	14.5	12.8	--
Specific Conductance	1980	2870	1982
PH Units	8.6	6.5 to 8.5	--
Iron	0.23	1.82	0.23
Turbidity	110	50	110
Ammonia	1	1	1

[1]Arthur City USGS sampling station located 26 miles upstream of discharge point on Red River. The flow rate used was the 7-day, 2-year return flow.

Water quality after mixing in Table 14 was calculated on a volumatric basis (discharge volume to river volume) and represents an estimate of water quality. As the table indicates, the Red River water quality after mixing is not appreciably changed from the upstream value. No significant adverse effects are anticipated for any species in this portion of the Red River.

4.2.1.3 General

Species diversity in the Kiamichi River is shown in Table 1-23 in Appendix 1. Operation of the plant is not expected to result in a decrease in diversity of benthic microinvertebrates of greater than 1 between upstream and downstream stations as required by State law. If required by the State of Oklahoma, monitoring will be maintained to insure that this condition is met. Appendix 1 shows fish species collected in the Kiamichi, Gates Creek, and the Red River. Information gathered during the field studies indicates that the useful productivity of the Kiamichi River in the vicinity of the proposed plant has been reduced since the construction of Hugo Reservoir. Several species considered to be rare or endangered occur in Gates Creek above Lake Raymond Gary, but the proposed plant will have no impact on this area. Lake Raymond Gary is located approximately two miles east of the plant site. A map showing the relationship of the lake and Gates Creek to the plant site can be found on Figure 1-2 in Appendix 1. Sampling in the Kiamichi suggests a fairly high ratio of rough fish to game fish species. It is not anticipated that construction or operation of the outfall structure will have a significant negative effect on the fish population in the Red River.

4.2.2 Intake and Discharge Water Pipeline

Water will be piped approximately two miles from the intake structure on the Kiamichi River to the plant. The environmental effects of construction of these corridors are expected to be small. No impact should occur during operation. Water discharged from the plant will be piped approximately seven miles to the outfall structure on the Red River. Both pipelines will be buried and environmental impacts will be limited to the construction of the lines. Land on the proposed corridors is presently used for grazing, although it is severely overgrazed.

4.2.3 Plant Water Use

Water flow through the various plant processes can be found in Figure II-17 (Appendix 1). Since the proposed plant is a new source, it will be subject to Federal effluent guidelines and standards as presented in 40 CFR Chapter 1, Subchapter N, Part 423, Subpart A, Section 423.15 and Subpart D, Section 423.45. A summary of plant processes resulting in water use and discharge follows and a table specifying the discharge limitations for the various processes can be found at the end of this section. Water discharge quality will be controlled through the NPDES permit and no significant adverse impacts are anticipated.

Bottom Ash Pond Blowdown:

Bottom ash will be sluiced to the bottom ash pond. Water will be recycled from the pond for sluicing. Make-up water for the pond will be provided by blowdown from other systems as described below. Blowdown from the bottom ash pond will be discharged to the process waste pond for neutralization and sedimentation before discharging to the Red River.

Boiler Blowdown:

Water must be removed from the boiler and fresh, demineralized water must be added in order to control the buildup of dissolved solids in the system. This waste stream is relatively high quality water (less than 50 ppm total dissolved solids) and will be used as make-up water for the bottom ash handling system.

Cooling Tower Blowdown:

Cooling water must be removed from the cooling tower and fresh treated water must be added to prevent the buildup of scale forming dissolved solids. The blowdown will be used as make-up water for the bottom ash handling system.

Low Volume Sources:

Low volume sources include demineralizer, floor and equipment drains, and air heater wash water. Demineralizer discharge is produced from regeneration of ion exchange resin in the demineralizer. Floor and equipment drains contain oil and will be treated in an oil separator prior to discharge. Air heater wash water is drained from the air heater on the stream generator during intermittent wash cycles. The discharge from low volume sources will be used as make-up water for the bottom ash handling system.

Metal Cleaning Wastes:

Metal cleaning operations remove scale and other deposits from equipment with acid cleaners. Small quantities of copper and iron are removed with the scale and the waste water from these operations will be collected and routed to the bottom ash pond.

Sanitary Wastes:

Sanitary wastes will be treated in lagoons and the effluent used as make-up to the bottom ash handling system.

Runoff:

The coal storage area will be graded to drain into a retention pond capable of retaining a 10-year 24-hour rainfall event. In the pond, the runoff will be treated through sedimentation and neutralization to control the suspended solids and pH.

The oil unloading and storage area will be diked to retain any run-off and surfaces within the diked areas will be treated with an impervious material to prevent possible oil contamination of groundwater. A Spill Prevention Control and Countermeasure Plan will be prepared. Runoff will be treated in an oil separator and used with the coal storage area retention pond discharge as make-up for the bottom ash handling system.

Hazardous Materials:

Hazardous materials stored on the site consist of fuel oil storage, transformer oil, chemicals for the demineralizer and chlorine for the cooling tower. Storage facilities will comply with standard industrial practices for these materials.

Water Treatment Waste:

Waste from water treatment processes will be sent to the bottom ash pond.

4.2.4 Construction

Construction activities on the plant site will result in some runoff problems. Adverse impacts to water resources in the area will be reduced through the activities described below.

Runoff during construction will flow to holding ponds on the site for sedimentation and neutralization, if required. Diking, terracing and/or mulching will be employed as necessary and stripped areas will be revegetated as soon as possible. Discharges from the ponds will be directed to natural drainage channels in the area. Flow rate from these ponds will be monitored. Turbidity, pH and suspended solids will be controlled according to the new source permit for construction and operation.

Construction of the intake and outfall structures will likely cause some temporary increases in stream turbidity that will exceed the prescribed state turbidity limits. However, construction activities will be confined, to the extent practicable, to those times of the year that will result in the least impact to aquatic life. The construction work on the intake and outfall structures will be scheduled during normal low flow periods. Sheet piling will be driven around the construction work area and all excavated material will be placed on the bank above the high water level. Areas subject to erosion will be rip-rapped to protect the bank and facilities.

Western Farmers proposes to drill three wells on the plant site for construction water use. Temporary approval to use 2,420 acre-feet per year at a rate of 1,500 gallons per minute has already been granted by the State. This is not expected to have a significant impact on ground water resources in the area.

4.2.5 NPDES Permit/Monitoring

Western Farmers has made application to Region VI U.S.E.P.A. for an NPDES permit for the proposed facility, which will state the monitoring requirements for the project. A copy of the draft NPDES permit is included as Appendix 6 to this EIS.

4.2.6 Transmission Lines

4.2.6.1 Hugo-PSO Valliant Segment

This line segment will cross Bird, Gates, Doaksville, Clear and Garland Creeks. All creeks will be spanned and there will be no construction on the stream banks. Any chemicals or petroleum products required during construction will be stored so that they cannot enter streams.

Erosion resulting from construction near water ways (streams, etc.) will be controlled by means of drainage ditches, diking and a revegetation program coordinated with Soil Conservation Service to rapidly stabilize the surface to minimize top soil loss and resultant stream sediment loading. Heavy equipment will not directly traverse streams unless an existing water crossing or routing around the stream is not feasible. The root mat will be retained, wherever possible, to stabilize slopes and further reduce the possibility of soil erosion.

Line construction will likely result in the possibility of some minor short-term stream sedimentation. The environmental effects will be small due to routing and mitigating criteria. The principal adverse impact associated with the line is visual. Minor impacts will involve farming operation restriction and possible land use changes. Some bird collision may occur. No significant long-term adverse impacts are anticipated.

4.2.6.2 Hugo-WFEC Valliant Segment

This segment will cross Bird, Gates and Clear Creeks. Anticipated environmental effects are the same as stated in the previous section and the same environmental controls will be implemented.

4.3 Land/Vegetation

4.3.1 Wetlands, Floodplains and Prime Farmland

REA has examined the potential impacts to wetlands, floodplains and prime farmland in regard to Executive Orders 11990 and 11988 dated May 24, 1977, and Secretary of Agriculture Memorandum 1827 dated June 21, 1976.

4.3.1.1 Prime Farmland

Prime and unique farmland was examined in relation to the Secretary of Agriculture's Memorandum No. 1827, Supplement 1. There are no unique farmlands that will be affected by the plant, or transmission line construction. Soil characteristics are the primary factor in establishing prime farmlands and Figure 1-11 in Appendix 1 shows potential cropland areas that could be classified as prime farmland. All three alternate sites contain prime farmland as shown on Table 7 (page 51) with the proposed site having the least (25%). The transmission corridors have not been classified as to the possible amount of prime farmland due to the lack of up-to-date soil maps. Additional information is available in Section 2.1 of Appendix 2. Land to be corssed by the transmission line is primarily used for grazing and land on the proposed plant site has been poorly managed. REA does not believe that the proposed project will have a significant adverse impact to prime farmland. In fact, the analysis of alternative sites set forth in this EIS indicates no feasible alternative such that conversion of prime farmland would not be necessary as a result site selection.

4.3.1.2 Wetlands

Executive Order 11990 states that, "Each agency ... shall take action to minimize the destruction, loss or degradation of wetlands ..." REA knows of no wetland areas located on either the proposed site, or the transmission corridors. Therefore, no long or short term adverse impacts associated with the destruction or modification of wetlands will occur.

4.3.1.3 Floodplains

Executive Order 11988 requires that, "Each agency shall ... preserve the natural and beneficial values served by floodplains ..." The nature of the proposed project makes it impossible to completely avoid impacting any floodplains. Figures 1-7 in Appendix 1 identifies those floodplain areas that will be affected by the proposed project. The transmission lines are not expected to impact any floodplains. A part of the intake structure, discharge structure and a portion of the outfall pipeline corridor will be located in floodplain areas. There are no practicable alternatives to the structures located in the floodplain areas and Western Farmers will take all practicable measures during construction and operation to minimize harm to the floodplain. The physical plant facilities will not, however, be located in any known floodplain areas. Figures 2 and 3 on pages 84 and 85 show the relation of the intake structure to the flood elevations. Construction activities on the intake and outfall structures will be scheduled during normal low flow periods to reduce the environmental impact. Areas subject to erosion will be rip-rapped to protect the bank. The only impacts resulting from the discharge pipeline will occur during construction. Most of the pipe lines will be placed underground and will not cause an adverse alteration of the floodplain resulting in increased flood hazards. REA does not foresee any significant adverse impact to the floodplain areas as a result of construction or operation of the proposed project, which is a critical action facility and sees no problem in this instance since (based on the information available) the facility is located at an elevation considered to be above the 500-year floodplain.

4.3.2 Plant Site

Vegetation on the plant site will be affected by the construction activities and a significant portion will be removed. Approximately, 1,400 acres of vegetation will be removed from the 3,000 acre plant site. Soils on the site are generally severely eroded and rather thin due to poor soil management practices such as overgrazing. About 25 percent of the area is classified as prime farmland (less than the other sites), but the land is generally used as pasture land. It is unlikely that the land would be used for farming if the land was not taken for the plant. Construction activity will result in the removal of vegetation as shown below:

Vegetation Removed (from WFEC-EA)

Vegetative Site	Acreage Removed	% of Vegetative Type on Plant Site Area	% of Plant Site Area
Wooded	154.43	37.60	5.16
Riparian	92.87	28.13	3.10
Interspersed	457.40	49.66	15.29
Grassland	694.50	52.22	23.22
Total	1,399.20		46.76

A total of 88 plant species were found on the proposed plant site. Existing plant communities are the product of a variety of disrupting forces from the original land clearing to present mismanagement practices. Two species encountered on the site were included in the list of rare and/or endangered plants for Oklahoma at the time of the survey. These are the water hickory (Caryo aquatica) and the nutmeg hickory (Carya myristicaeformias). Neither of these is included on the Federal list of rare and endangered species and are not included on the most recent Oklahoma list (1977). The eastern edge of Oklahoma represents the western edge of this range and neither species is difficult to find in the Red and Kiamichi River bottoms near the proposed site. No species currently listed on either the Oklahoma or Federal as rare and/or endangered lists were found in the area and are not expected to be. Existing vegetation will remain on over 53 percent of the plant site.

There are no designated wetland areas on the plant site.

The changes brought about by site development are not expected to have a significant impact on the site or surrounding area since productivity of the site was already poor due to previous land mismanagement. Overall site condition is expected to improve even with little or no management changes.

4.3.3 Pipeline Corridors

The intake and discharge pipeline corridors will be approximately 100 feet wide and require about 109 acres of land. The pipeline corridors will be routed to avoid riparian areas and thereby reduce the magnitude of impact associated with the pipeline construction. Following construction, steps will be taken to restore the impacted area in accordance with Soil Conservation Service recommendations. Land use along the corridors will be consistent with land use patterns in the area.

4.3.4 Transmission

4.3.4.1 Hugo-PSO Valliant Section

This transmission line is approximately 18 miles in length and requires a 150-foot wide right-of-way. The 327 acres of land required are all in agricultural use, with some interspersed woodland. This proposed routing parallels an existing PSO transmission line and the new corridor will be an extension of an existing right-of-way. Utilization of this utility corridor concept will reduce the amount of land needed for right-of-way and thereby result in less environmental impact.

Almost all soils to be crossed by the line are susceptible to wind and water erosion when the vegetation cover is removed. Construction, such as retention of the root mat, will minimize the amount of vegetative removal and thereby reduce erosion potentials. Existing roads will be used to the greatest extent practicable to reduce the need for new access and construction roads. Land crossed by the transmission line is primarily used for grazing and can continue in this function following construction. It is not known what percentage of soils may be classified as prime farmland, although the presence of the line will not prevent the land from being farmed if this should be desired. Since transmission lines have only a slight impact (minor inconvenience to farming operations) on agricultural uses of lands crossed, REA does not consider the question of Prime Farmland to be critical in this instance.

It is likely that some soil disturbance, including rutting by construction equipment, will occur during construction. Reseeding and land restoration will be carried out in accordance with Bureau of Land Management and Soil Conservation Service guidance.

A small amount of vegetation will have to be removed from the final route. Vegetation to be crossed can generally be classified as pasture, range and forested areas. Forested areas consist primarily of oak, pine, elm and hackberry. Forested areas will be avoided if possible and only vegetation tall enough to create a problem will be removed. Where removal of trees is required, the root mat will be retained to minimize soil erosion potential.

The grassland areas are generally covered by coarse bunchgrasses such as sporololue, panicum and little bluestem. Common forbs include gummed snow-on-the-mountain and rattlesnake master. These species are common to this part of Oklahoma and construction of the line is not expected to result in any significant impact.

Transmission line routing will attempt to avoid any rare and endangered species if they should be located on the transmission corridors.

USDA and USDI guidelines regarding the locating and construction of transmission lines will be followed. There are no designated wetland areas along the proposed transmission line routes.

4.3.4.2 Hugo-WFEC Valliant Section

This line is approximately 11 miles long and will require a 100-foot right-of-way. As with the Hugo-PSO line, the land crossed is all in agricultural use.

Anticipated environmental impacts resulting from this line segment should be no different from that described above.

Figure 5 locates the proposed lines.

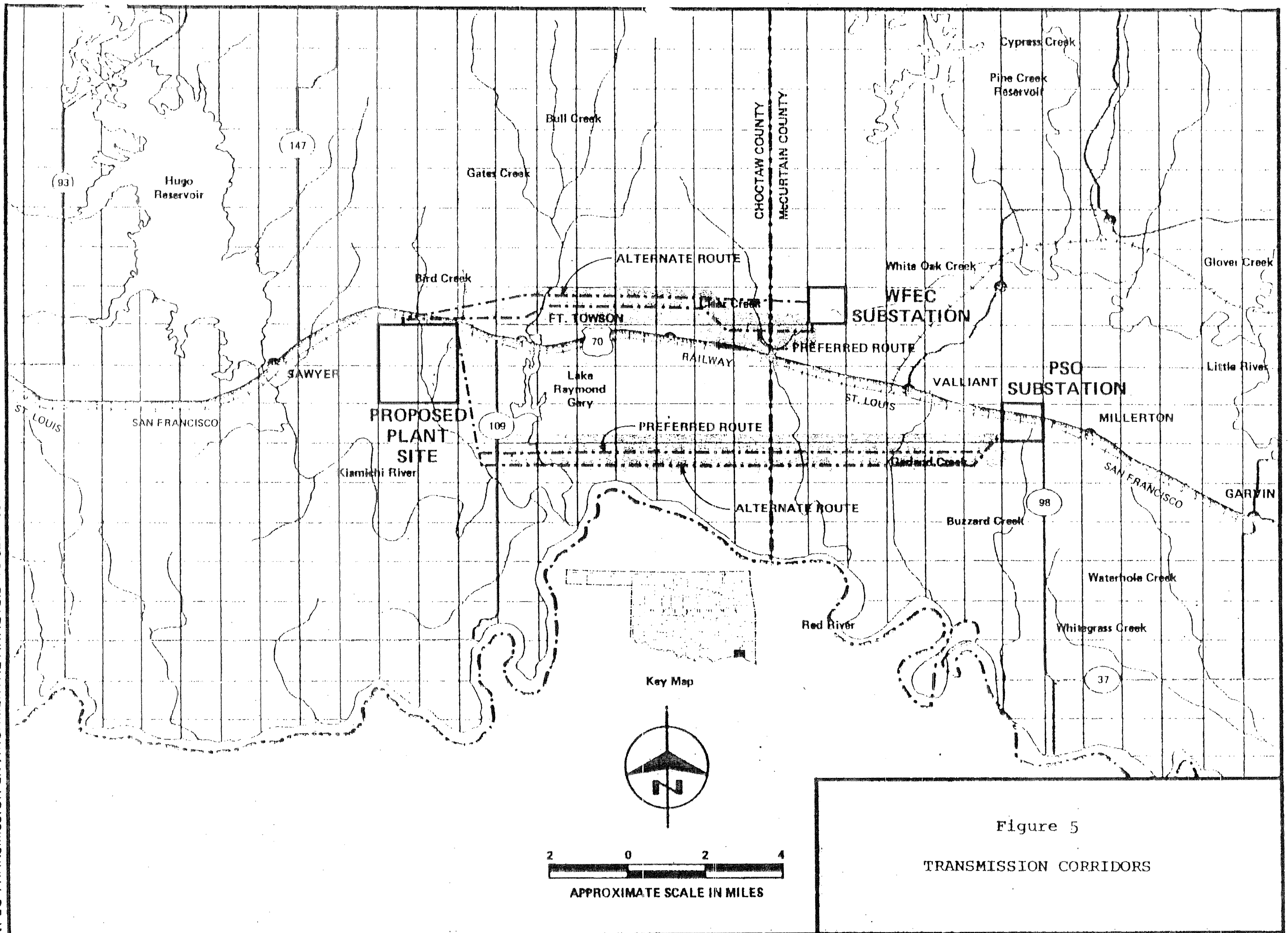


Figure 5

TRANSMISSION CORRIDORS

4.3.5 Transmission Line Maintenance Practices

Routine maintenance on the transmission lines will include the following:

1. Each line is flown about every 60 days.

2. Lines are patrolled on foot once a year.

3. A planned 10-year pole maintenance program. This includes digging around the base of each pole, inspection boring just below the ground line and re-treating this area before backfilling or replacing the pole as required.

4. When non-emergency repairs are required, they are performed when soil and terrain conditions are best to minimize damage of the land.

5. The desires of the landowner are followed concerning the restoration of areas disturbed by maintenance.

No pesticides or herbicides will be applied for line maintenance unless specifically requested by the property owners. Chemical use will be determined on a case-by-case basis and only those approved by the Environmental Protection Agency, Department of Agriculture, and Department of Interior.

4.3.6 Rare and/or Endangered Species-Flora

No rare and/or endangered species are expected to be impacted by any of the proposed construction, or operation activities. Although two species found on the site were included on the Oklahoma list of rare and/or endangered plants, they are no longer listed. There are no species currently listed on either the Oklahoma or Federal rare and/or endangered species lists that have been, or are expected to be found in the area affected by the project.

4.4 Fauna

4.4.1 Plant Site

Wildlife on the plant site will be affected by construction through the removal of vegetation and the resulting destruction of wildlife habitat. The site has been severely overgrazed in the past and consequently the suitability of wildlife habitat is less than it might otherwise have been. About 53 percent of the on-site vegetation will not be removed in the site clearing and construction operations. This land will continue to be available as wildlife habitat. There are 37 mammal species that have ranges and habitats which include the proposed power plant site. Only 16 species of mammals have been found on the proposed site. A list of species that may occur on the site and those that have been observed to date can be found in Appendix 7. None of these species is listed as rare and/or endangered by either the U. S. Department of Interior or the State of Oklahoma. On-site investigations have resulted in little wildlife being found. A detailed terrestrial biology report is available if more information is required.

Birds were sampled in each of the habitat types on the plant site. The studies documented 55 species of birds during the late summer and fall sampling periods. No rare and/or endangered birds were observed on the plant site.

Wildlife displacement will occur because of the construction activities and likely result in secondary impacts in the areas to which the animals move. The result of this activity could be a loss in the number of animals. However, the low wildlife population currently existing on the site will reduce the severity of disruptions caused by site development. The only exceptions are Bobwhite quail and mourning doves which can be expected to be moderately impacted. About 15 percent of the interspersed habitat, preferred by quail and mourning doves, on the site will be removed by site development activities. The displacement of these species caused by this activity may result in some adverse impacts.

Reptiles and amphibians were sampled opportunistically, by looking for signs of their presence and also sightings. The studies indicate that no rare or endangered species are located on the site. More detail on species can be found in Appendix 7.

Long-term impacts are expected to be minor and it is possible that the proposed project may even benefit wildlife on the plant site. The overgrazing and poor land management practices of the past will cease with site development leading to a potential improvement in wildlife conditions.

4.4.2 Pipeline Corridors

Construction of the intake and discharge pipelines are expected to cause only minor wildlife impact. The pipeline corridors will be located outside of riparian areas to lessen the potential impact of the action. Removal of trees on the pipeline corridor will represent the primary land change. The corridors are off the plant site and depending upon the right-of-way agreement, may or may not be under the control of Western Farmers. If the corridors are not used for agricultural purposes, it is likely that wildlife utilization will increase. An access road will lead to the intake structure, but it is not planned to maintain a road along the entire corridor.

4.4.3 Transmission Lines

4.4.3.1 Hugo-PSO Valliant Segment

A relatively wide variety of species are present in the area traversed by the proposed line. Since the new line will be parallel to an existing transmission corridor, much of the area has been previously cleared. This will limit the change in habitat that can result from line construction.

Construction noise will disturb wildlife in the area. The disturbance will be rather short-lived and animals are likely to resume the use of agricultural, pasture and shrub land following construction. Woodlands will be changed with the inclusion of distinct, open areas, with the subsequent establishment of shrubby margins along the woods edge. The actual line routing will avoid woodlands to the extent possible.

Field examination of the transmission corridors has not been performed, although no significant differences from plant site conditions are anticipated. Common mammals in the area to be crossed by the line include white-tailed deer, gray and fox squirrel, cottontail rabbits, ninebanded armadillos, raccoon, opossum and coyotes. Based on plant site examination, it is concluded that most of the species have relatively low population levels and will not be adversely affected by the proposed line. No rare or endangered species are known to exist in the area. A field examination of the proposed corridor will be performed before construction begins and modification made to the specific line routing if required.

However, due to the previous clearing in the area, it is expected that the transmission line will have little impact on area fauna.

4.4.3.2 Hugo-WFEC Valliant Segment

Impacts will not be appreciably different than those described above.

4.4.4 Rare and/or Endangered Species-Fauna

Investigation of fauna to date have resulted in no rare and/or endangered species being found. All areas to be affected by the project show a relatively low wildlife population. Biological investigations are continuing and final information will be updated, if required. Based on investigations completed to date, there will be no impact to rare and/or endangered species.

4.5 Historic and Archaeological Sites

4.5.1 Plant Site

There are no historic sites on the plant site, nor any close enough to be impacted by construction and operation of the project. A summary of nearby historic sites in relation to the project is presented below:

A. Fort Towson--approximately three miles northeast of proposed plant site.

B. Doaksville--two miles northeast of proposed plant site.

C. Old Chief's House--nine miles northeast of proposed plant site.

All three sites are listed in the National Register of Historic Places. A listing of other historic sites in the area can be found in Section 1.4.5.1 of Appendix 1. An archaeological field survey has been performed on the proposed site. A letter from the State Archaeologist can be found in Appendix 1 of the EIS. No historic or prehistoric resources of potential significance were found.

Construction and operation of the proposed project will not affect any known archaeological sites and is sufficiently removed from any historic sites that no impact is anticipated. However, if an item of apparent archaeological or historical interest should be found, the State Archaeologist and/or State Historic Preservation Officer will be notified. The area where the discovery is made will not be disturbed until a determination on the importance of the find is made. No effect is anticipated to any properties listed or eligible for listing in the National Register.

4.5.2 Pipelines

The intake and discharge pipelines will not affect any known archaeological or historic sites. If any potential historic or archaeological artifacts should be uncovered during construction, work in that location will cease. The State Archaeologist will be notified of the find and following his decision, work will resume, or the corridor will be modified to avoid the find. No effect is anticipated to any properties listed or eligible for listing in the National Register.

4.5.3 Transmission

Figure 2 shows the relation of the proposed lines to the existing PSO lines and the nearest historic site. It is not anticipated that any adverse impacts will result from the line location. The State Historic Preservation Officer and State Archaeologist have been contacted regarding the location of the proposed lines. Responses received from these officials indicate that the proposed transmission line routings are acceptable. Letters to this effect can be found in Appendices 4 and 5 of Appendix 2. No effect is anticipated to any properties listed or eligible for listing in the National Register.

4.5.3.1 Hugo-PSO Valliant Segment

Old Fort Towson and the Old Chief's House are the historic sites of primary interest in the area of the transmission line corridor. These sites are outside the proposed corridor by more than two miles respectively. The proposed line will be adjacent to an existing PSO transmission line and segments may be visible from the historic sites. The existing PSO line has not had any known impact on the sites and it is anticipated that the proposed line will not result in any impacts. An archaeological survey will be made before line construction begins, if required by the State Archaeologist. Use of a transmission line corridor will allow the final route selection to avoid, if necessary, any archaeological sites that may be found.

4.5.3.2 Hugo-WFEC Valliant Segment

This proposed transmission line corridor travels north and east to the WFEC Valliant Substation and has a potential impact on both Old Fort Towson and the Old Chief's House. The line will pass within 1/4 mile of Old Fort Towson and 3/4/ mile of the Old Chief's House. Segments of the line will be visible from both sites. REA's interpretation of the "Criteria for Effect" as stated in the National Historic Preservation Act of 1966 leads us to the conclusion that a finding of "no effect" can be made for the proposed action. If required by the State archaeologist, an archaelogical survey will be made of the line corridor before final route selection, with the results of the survey sent to REA.

4.6 Recreation

4.6.1 Plant

No recreational facilities will be created or adversely affected as a result of the proposed project.

4.6.2 Pipeline

No recreational facilities will be created or affected by the construction of the pipeline. Following construction, the pipeline corridor will be allowed, to the extent practicable, to revert back to the preconstruction conditions. Until a final agreement is reached, it is not known if the land will remain under the control of the individual landowners. The access road to the intake structure will not be available to the public.

4.6.3 Transmission

The transmission lines are routed to avoid conflict with existing and proposed recreation areas. The transmission line right-of-way will likely remain the property of the present landowners and Western Farmers will only purchase an easement on the property.

4.7 Aesthetics

4.7.1 Plant

The topography of the area will limit the visibility of the proposed project. Forested areas around the plant site will further limit the visibility of the proposed plant from nearby observers. Architectural features of the plant will be chosen to be aesthetically pleasing and functional in design. Revegetation and landscaping will be planned to improve the site's appearance. The primary off-site visual impact from the plant will be the stack. Water vapor plumes from the stack and cooling tower will also be visible depending on weather conditions.

4.7.2 Transmission

Both transmission lines will be intermittently visible from U. S. Highway 70 and the Hugo-PSO Valliant transmission line segment will pass within approximately one and one-half miles south of the Raymond Gary Recreational Area. Both lines will be constructed on wooden "H"-frame structures, with about 7.3 structures per mile. The lines will be built according to USDA-USDI Guidelines for Transmission Lines to best minimize the line's aesthetic intrusion on the landscape.

4.8 Aviation

4.8.1 Plant

The Federal Aviation Administration will be notified of the proposed construction and will be given the opportunity to review this impact statement. Aircraft warnings (lights, etc.) will be installed on the power plant stack as required. The nearest airfield is approximately ten miles from the plant and no significant impacts to aviation are expected.

4.8.2 Transmission

The appropriate forms and routing map will be filed with the Federal Aviation Administration for the proposed transmission lines. Experience with transmission lines of the size proposed (138 kV and 345 kV) has shown that the lines pose no problem to air traffic.

4.9 Noise

4.9.1 Plant

The equipment associated with a large fossil fuel-fired steam-electric generator has the potential of producing high noise levels. To protect the health and welfare of the plant personnel, permissible noise levels set forth in the William-Steiger Occupational Safety & Health Act of 1971 and the Walsh-Healy Public Contracts Act of 1967 for personal exposure will be observed by the engineering plan for the proposed project.

Equipment, with the potential for producing excessive noise, will be purchased with specified noise limits or with noise suppression designed into the system. It is expected that most areas of the plant will be at or below 90 dBA; exposure to which is limited to eight hour periods by OSHA regulations. Areas with higher noise levels will be divided from other areas of the plant by enclosures containing suitable noise suppression qualities. Noise suppression equipment will be provided when feasible and, where necessary, personal protection devices will be issued and signs established for employee protection.

A day-night sound-level (Ldn) of 55 dBA is the level identified by EPA as being reguisite to protect the public health and welfare with an adequate margin of safety for both activity interference and hearing loss. Ldn is defined as the equivalent "A" weighted sound-level during a 24-hour time period with a 10-decibel weighting applied to the equivalent sound-level during night-time hours of 10 p.m. to 7 a.m.

The nearest dwelling is located approximately 6,600 feet from the proposed site, where the "A" weighted sound-level is estimated to be less than 60 dBA. This is in a rural area with no current industrial activity. Western Farmers will monitor noise at this location if complaints should arise during plant construction. Following start-up, noise monitoring will be performed to obtain site boundary noise values.

The plant site is bordered on the north by U. S. Highway 70 and the St. Louis-San Francisco railroad. There is no development on any of the other plant site boundaries. Noise levels will be measured as specified above.

Sound pressure levels due to power plant related noise sources at the property lines are normally not expected to exceed a sound pressure level equivalent to an "A" weighted sound level of 67 dBA. This is based on a 1,500-foot minimum distance between plant and property line.

Sound pressure levels at the nearest present residence and in areas of potential future development are not expected to exceed the EPA recommended 55 dBA Ldn. Following start-up of the proposed unit, sound pressure levels will be recorded at the above-mentioned locations and at the plant boundaries. The results of these measurements will be submitted to REA and if found to be excessive, appropriate action will be taken to reduce the levels.

4.9.2 Transmission Noise, Electromagnetic Radiation and Electrostatic Effects

The leaking of electrons from the transmission line (corona) to the surrounding atmosphere is responsible for audible noise, radio and TV interference and ozone production. For wet conductor conditions, the audible noise level 100 feet from the centerline of the 345 kV transmission line is estimated at 35 dBA. No problems of radio or TV interference are expected to occur. Television interference is not expected to result from operation of either the 138 kV or the 345 kV line during fair or foul weather. The 138 kV line is not expected to affect radio reception, although some interference from the 345 kV line could occur. Corona impact 100 to 200 feet from the centerline of the transmission line is expected to have little or no effect on fair weather radio reception in the primary service area of the station. Foul weather reception will be somewhat reduced near the line, although interference is expected to be minimal beyond 450 feet from the line. In cases where the transmission line is located nearer than 200 feet to a permanent resident and causes interference, Western Farmers will work with the resident to minimize interference to the extent practicable.

Corona discharge could result in the generation of ozone in addition to the radio and television interference described above. The paper "Oxidant Measures in the Vicinity of Energized 765 kV Lines" by M. Frydman, A. Levy, and S. Miller, IEEE TRANSACTIONS ON POWER APPARATUS AND SYSTEMS, 1973, page 1141, describes tests made on oxidant concentrations near 765 kV lines. Although the instruments used could detect an increase in oxidant concentration of two parts per billion, the test concluded that "no ozone contribution attributable to the transmission lines was detectable during the tests." Therefore, it is highly unlikely that any measurable quantities of ozone will be produced by the proposed 345 kV lines or the 138 kV lines.

A secondary effect of transmission line operation is the accumulation of an electric charge on conductive objects in the vicinity of high voltage lines. To minimize, or prevent electrostatic shock, fences and other conductive objects will be grounded. Grounding procedures will be such that annoyance level (1mA or greater) shocks will be eliminated. Upon completion and energization of the transmission lines (both 138 kV and 345 kV), Western Farmers will measure induced current levels and take action, as required, to insure that the 1mA limit is not exceeded. Results of these measurements and a summary of actions taken, such as increased grounding, will be forwarded to REA at that time.

4.9.3 Substations

Transformers at the substations will emit a continuous low-level 60 Hz hum. Control of radio and television interference will follow applicable criteria from the "Radio Noise Design Guide for High Voltage Transmission Lines," Volume PAS 90, No. 2, published by IEEE, dated March/April 1971. Noise level tests will be conducted at the substation boundaries following energization of the stations. Results of these measurements will be submitted to REA. If excessive operational noise levels are found, corrective measures, such as increased screening, will be applied.

The 345 kV line will terminate at the existing PSO-Valliant 345 kV Substation. At most, an additional bay will be required inside the present substation facility to accommodate the new line. The 138 kV line will terminate at the existing WFEC-Valliant Substation.

4.10 Coal

4.10.1 Supply and Transport

Coal will be supplied from the Powder River Basin in eastern Wyoming. Western Farmers has no plans to enter the coal mining business to provide coal for this proposed unit. The coal will come from an existing mine, which is subject to all applicable Federal regulations regarding mining and reclamation. The overall environmental impact of the coal mining operation has been covered in the Powder River Basin Impact Statement prepared by the U.S. Department of Interior.

Coal will be delivered to the site by unit train over the tracks of the Northern and Frisco Railways. The coal will be blended at the mine to insure that it is within contract specifications to meet applicable emission regulations. Rotary car dumpers will unload the unit trains when they arrive. The coal will be weighed and conveyed to the storage area by a conveyor system. All active handling points will be completely enclosed to prevent fugitive dust. The live coal storage silos can supply the plant for at least 66 hours at full load and the dead storage pile can supply the unit for 90 days at full load. Western Farmers intends to own the rail cars that will haul the coal.

4.10.2 Analysis

Coal for use in the proposed plant will have the following properties on an average as-received basis:

Ultimate Analysis

Element	Percent
Carbon	49.54
Hydrogen	3.47
Oxygen	9.40
Nitrogen	0.67
Sulfur	0.486
Moisture	29.65
Ash	6.78
Heating Value	8127 BTU/lb

A maximum weighted average sulfur content of 0.6 pounds of sulfur per million BUT (MBTU) or compliance with the New Source Performance Standards of 1.2 lb/MBTU fired are the terms stated in the coal contract. Western Farmers will blend the coal, as required, in order to insure that sulfur dioxide emissions do not exceed 1.2 pounds per million BTU. Emissions from the plant are discussed in Section 4.1.1 of this EIS. A trace element analysis is included in Appendix 4 and an evaluation of trace element emissions can be found in Section 4.1.1.4 of the EIS.

4.10.3 Ash and Sludge Disposal

Combustion of coal in the boiler will result in the generation of fly ash and bottom ash.

Fly ash particles flow through the boiler in the flue gas and approximately 99 percent of the ash particles are removed in the precipitator before the flue gas is discharged from the stack. Bottom ash is composed of ash agglomerate that collect in the ash pit at the bottom of the boiler. The 6.78 percent ash coal proposed for use in the boiler will produce approximately 28,000 lb/hr of fly ash, of which about 400 lb/hr will be discharged from the stack, and 7,000 lb/hr of bottom ash.

Bottom ash (approximately 7,000 lb/hr) will be collected in a water filler reservoir, crushed and hydraulically conveyed to the bottom ash pond. Fly ash will be pneumatically conveyed from the precipitator to storage silos. The fly ash will then be pumped dry from the storage silos to the ash pond. Water spray will be used in the disposal area to minimize fugitive dust problems. The ash storage areas are designed to be available for the 35-year lifetime of the plant.

Leaching will be minimized by lining the waste disposal areas with either a clay or plastic liner, if necessary. Trace elements that remain in the ash will be locked in when the ash sets and are not anticipated to leach from the disposal area. If the trace elements emissions in Table 13 were all assumed to go to the ash disposal area, this would represent about 0.04 percent of the total ash. Fly ash disposal system will be dry and there will be no discharge from the ash pond as required in the "Standards of Performance for New Point Sources."

The ash from the proposed coal sets as concrete when wetted, which will further reduce the possibility of leaching.

Sludge disposal is not a problem with the proposed unit since a flue gas desulfurization system is not contemplated. However, the plant is being designed so that a flue gas desulfurization system can be added in the future, if required.

4.11 Fugitive Dust

4.11.1 Construction

Construction activities, especially those involving earth-moving operations will generate dust from equipment movement and also wind erosion. Dust will be reduced by wetting and reseeding and mulching will take place as soon as possible.

4.11.2 Operation

The major sources of fugitive dust during operation will result from the coal handling and ash disposal areas. Coal handling and lime storage, if required, will generally take place within enclosed structures with the exception of the dead storage area.

Dust generated during the unloading and conveying processes will be collected in several baghouse collectors. Dust from the baghouse collectors will ultimately be disposed by combustion in the boiler.

The following features are included to control dusting problems:

1. Baghouse type dust collectors at each belt transfer point.
2. All coal-handing structures will be totally enclosed, including the conveyor galleries.

3. The two-yard stockout areas will be designed to minimize dusting.

4. The large, live volume of the coal storage silo will reduce the disruption of the treated dead storage piles.

Fly ash is handled in closed containers and little dust problems are anticipated in transfer from the collection silos to the transport trucks. The ash will be wetted at the disposal site to minimize dust generation. Western Farmers does not plan to pave the haul road from the plant to the disposal area so there will be some dust generated. Wetting will serve to reduce the generation of dust from the haul road.

4.12 Oil

The proposed plant will require No. 2 fuel oil for start-up and flame stabilization of low loads. The oil will be delivered to the plant by either truck or rail tank cars and stored on-site for use as required. Although the oil storage facilities have not yet been designed, it is likely that 450,000 gallons will be stored in steel storage tanks. The tanks will be diked for spill protection and Western Farmers will file a Spill Prevention and Countermeasure Plan for the facility. The tanks will be constructed to comply with Regulation No. 15 of the Oklahoma Clean Air Act to control hydroactive emissions.

4.13 Socioeconomics

4.13.1 Population and Employment

Construction and operation of the proposed generating plant will have an impact on the people and economy of the area surrounding the site. A detailed study of the socioeconomics of the area was prepared and is available to those in need of more information in this area. This section of the EIS is also supplemented by Section II.4.6 in Appendix 1.

The proposed project will result in temporary and relatively short-term impacts from the construction efforts and longer term economic impacts over the 35 year life of the plant. Peak employment during construction is estimated at 800 employees. If Units 2 and 3 are constructed, a new peak of 912 employees is anticipated. This would occur if construction began on Unit 2 while peak activity was taking place on Unit 1. Employment figures will gradually peak and then decline over approximately a four-year period for the proposed unit thereby reducing the impact on the Hugo area. Previous studies indicate that a relatively long construction period helps to minimize the socioeconomic impact. It is estimated that several hundred permanent employment positions will be created as a result of the project.

A construction workforce living within commuting distance of the construction site will also tend to reduce the socioeconomic impacts. For the proposed project, it is estimated that approximately 35 percent of the workforce will be within daily commuting distance and 35 percent will be weekly commuters. The remainder of the workforce will be temporary residents and will have the greatest impact on community services since they will locate their families in the area.

Construction contractors generally employ a relatively small number of permanent employees and rely on the local area's labor resource pool to provide laborers and skilled workmen. However, the percentage of local workers will be higher during the first several months of construction due to the immediate need for general nonskilled and semiskilled labor. Construction activity will cause an increase in service industry employment and add to the area economy. The gravity model used in the socioeconomic study shows the indirect employment approaching 210 people during the projected construction peak. The model also indicated that the project annual growth rate for towns in the area should not exceed 10 percent. This is the limit at which local service capabilities are strained, as estimated by the Denver Research Institute. If the annual growth rate exceeds 15 percent, a total breakdown of local and regional institutions could occur. Hugo will have the greatest population impact followed by Idabel and Paris, each area's annual growth rate projected to be below 5.0 percent; a level at which no significant adverse impacts on the area are expected. It is estimated that Paris, Texas, will absorb about 36 percent of the immigrating population and thereby reduce the impact on Hugo. The larger community base is expected to reduce the impacts resulting from the proposed project from that experienced with other energy-impacted communities.

4.13.2 Housing

A major area of concern is the housing required for the employees who are not daily commuters. It is estimated that the distribution pattern shown below will apply:

Weekly Commuters	Temporary Residents	Permanent-Induced Employees
50% Mobile Homes	75% Mobile Homes	75% Single-Units
50% Boarding Rooms, etc.	20% Multi-Units	20% Multi-Units
	5% Single-Units	5% Mobile Homes

Since construction force buildup will be gradual, proper planning can reduce the overall impact. Because of the temporary nature of the construction workforce, mobile homes are considered the logical alternative in providing adequate short-term housing facilities. In planning for this demand, attention should be directed toward: (1) improving and expanding the existing mobile home parks; (2) the location of proposed parks; and (3) the regulations governing the areas designated as mobile home site areas. Boarding rooms, which include motels, hotel and other miscellaneous types of living quarters will also likely be heavily utilized by the construction workforce. Permanent employees will be more likely to utilize single-unit dwellings as shown in the above table. The site area is generally characterized by an adequate vacancy rate for single-unit dwellings for sale. This includes construction population impact, but the gradual increase in demand should allow adequate lead time for new construction. Upgrading of existing substandard units, as supply and demand functions dictate, could alleviate some of the supply problems. This type of renovation will be helpful in improving the existing community structures and can provide usable housing units in less time. The demand for the multi-unit accommodations will exceed that for single-unit structures. This is due to the high percentage of single-unit dwellings in the site area and a corresponding lack of multi-unit dwellings. This demand like the single-unit structures will be characterized by a gradual buildup, allowing significant lead time for local building industries to respond.

Planning will allow for the impact to be minimized. To minimize the housing impact, Western Farmers has met with local planning agencies and provided information relative to the anticipated population increases. Western will help to establish an "Energy Impact Plan" to define impacts to expect and programs to deal with the long-range as well as the short-term adjustments to be established. This will aid the communities in mitigating possible negative impact.

4.13.3 Health and Social Services

The Choctaw area has one physician to every 771 people and a ratio of 10 hospital beds per thousand. Health services appear to be adequate for the construction phase of the project, but these services should be reexamined on a community basis during this period. It is possible that unique characteristics inherent to each community could affect the adequacy level.

Choctaw County has a high percentage of public assistance (19.3%) and it is possible that the population influx could result in an increase in need for assistance.

It is expected that case loads involving family counseling, child abuse, children services, and transit services would increase proportional to population increases. On the other hand, cases involving income maintenance would probably increase at a less proportionate rate. This is primarily due to the increased employment opportunities associated with the plant's construction.

Fire and police services will also encounter an increased work load although the extent is difficult to evaluate at this time.

4.13.4 Community Services and Economics

Excess capacity is available to Hugo, Idabel and Paris in both water and sewage systems. No negative impacts are anticipated in these areas due to the available capacity.

Recreational facilities are available in the area and no negative impacts are anticipated. Choctaw County has many lakes, reservoirs, parks and other recreational areas totaling over 24,000 acres. As a general rule, the Urban Land Institute considers 20.5 acres of recreational space per 1000 populus to be adequate. In addition, approximately 90,000 acres are available at Lake Texoma, which is within 60 miles of the plant site.

School-age population increases, as developed by the gravity model, show an anticipated peak of 302, 195 and 63 students for Hugo, Paris and Idabel town areas respectively. This represents a modest annual growth of less than one percent for the Hugo town area which is the greater impacted community. This would indicate that the impact to the educational institutions should be minimal. However, the possibility of occasional system overload does exist if the residential distribution changes drastically or if the school-age population inflow is not normally distributed. These disturbances, if they should occur, are expected to be short-term with area adjustments made by the various school districts involved.

The average annual payroll for the proposed unit is estimated to approach $1.8 million and it is also estimated that an additional $1.63 million will be generated by the operational workforce payroll. A majority of this increase will be spent in the area and will generate additional demand for goods and services.

This increase in the areas' mean worker income will result in not only substantial personal income tax receipts, but also, increased revenue from personal property taxes, sales tax, gasoline, cigarette tax, alcohol tax and other miscellaneous revenue generating assessments.

With the influx of money in the area and increased demand for services, local rent, motel/boarding rooms, housing costs and other costs may likely increase. While the entire economy will benefit from the increased income, such services as recreational, restaurant and grocery establishments will experience a higher marginal share. There will be some lag experienced in revenues from the project (taxes, etc.) in relation to increased service requirements brought about by construction activities. That is, demand on housing and community services will occur before the tax base is augmented by the project. The increased money volume will have a possible negative spin-off effect, resulting in slightly higher prices for goods and services for the entire area. It is expected that virtually every person will be affected either directly or indirectly by the economic consequences of the proposed project.

4.14 Previously Classified Areas

No National Forests, State Forests, wildlife refuge or other previously classified areas will be affected by the proposed power plant or associated transmission lines.

4.15 Beneficial Environmental Effects

4.15.1 Improve/Maintain Quality of Life

The proposed project is needed for Western Farmers' members to meet the increasing demands of their consumers. Construction and operation of the proposed unit will provide the member cooperative with an adequate and dependable supply of wholesale power at a reasonable cost. Much of the electrical energy produced by the plant will be used by the farmers and ranchers who comprise the economic base of southeastern Oklahoma. This will help to insure that economic development of the area will not be limited due to power deficiencies.

The economic stimulus resulting from construction and operation of the unit will cause personal income increases, which can result in increased tax revenues generated by increased sales.

4.15.2 Natural Resources/Energy

Western Farmers is currently dependent on natural gas for all its electrical generation. The proposed project is an important first step to make Western Farmers less dependent on natural gas and begin the conversion to a coal-fired generation base. This will allow the gas to be used in other areas such as home heating.

4.15.3 Flora and Fauna

The changes in land use patterns that would be brought about by the plant construction and operation can be considered a major beneficial effect. Present vegetation will remain on over 53 percent of the plant site area, approximately 1,592 acres. The removal of intense grazing pressure from these unoccupied areas will inevitably result in successional changes that will allow greater biological productivity, greater species diversity, more suitable wildlife habitat and the production of biological communities more similar to those native to southeastern Oklahoma and more aesthetically pleasing to local inhabitants.

Riparian areas will develop a shrubby understory which will be beneficial to birds, herptiles, and small mammals. Mourning dove, quail, and songbird habitat will be significantly enhanced, following completion of construction activities.

The net effect is expected to be beneficial to both on-site flora and fauna.

4.16 Unavoidable Adverse Environmental Impacts

Efforts will be made during construction and operation to minimize any adverse impacts resulting from the proposed project. However, even with all precautions, certain impacts cannot be avoided. These are discussed below.

4.16.1 Plant

4.16.1.1 Flora and Fauna

Flora and fauna will be adversely affected through habitat destruction resulting from construction activities. Flora will be killed and animals deriving food, shelter and breeding territories from the affected land must either move, or be destroyed. Displaced animals may be lost if the areas they migrate to already support a full population. The new animals will place additional stress on the prime resources of food, shelter and territory, with the increased competition resulting in a net loss of animals. This is expected to be less serious in the present situation due to the condition of the land and a general paucity of animals.

4.16.1.2 Air and Water

Construction will result in increased dust and sediment loadings in the Kiamichi and Red River. These effects are temporary and should be controlled to within applicable State and Federal standards.

Operation of the unit will result in emissions to the air and the Red River. These will be controlled to within Federal and State standards. The plant will use up part of the available air increment, which could impact on future development in the area.

The proposed unit will release a maximum of 47.55 tons per day of sulfur dioxide, 3.96 tons per day of particulate and 27.74 tons per day of nitrogen oxides. The unit will be in compliance with all applicable emission and discharge regulations and little or no adverse effects are expected to flora and fauna in the area. The ground level concentrations of emissions in the area are calculated to comply with the Federal Secondary Ambient Air Standards. Increased ground level concentrations resulting from operation of the proposed unit will be within the allowable Class II increment as established by the U.S.E.P.A.

The cooling towers are expected to evaporate a maximum of 5.72 million gallons per day on a summer day. Under most meteorological conditions, this will condense and form a visible water plume extending from the cooling towers.

The plant will be responsible for the addition of blowdown wastes and heat to the Red River. All wastes will be treated and passed through the bottom ash pond and process waste pond before being discharged. All liquid discharges will be treated, as required, to comply with applicable effluent guidelines for power plants. Therefore, it is concluded that, although discharges will occur, they will not have a significant impact on human health or welfare, wildlife, or the aquatic life in the Red River.

4.16.1.3 Socioeconomics

Some socioeconomic impacts will result from the proposed project. The improved economy and resultant higher prices will likely have an adverse effect on fixed income people in the area. Land use changes could also occur that would result in a reduction of currently agricultural and vacant land and a change to greater industrial use.

4.16.2 Transmission

The transmission right-of-way from the plant site to the Valliant Substation will require approximately 472 acres along 29 miles. Line routing will avoid trees whenever possible, although some trees may be impacted. Due to the agricultural nature of the area, limited adverse impacts are expected to result from the lines. Wildlife habitats will be primarily affected where present woodland may be removed.

Clearing the land may result in some soil erosion which could occur in the form of topsoil loss, sheet erosion, rilled and gullied slopes, and gullied waterways. Soil erosion problems will be controlled to the extent possible through a soil stabilization program coordinated with the Soil Conservation Service, Forest Service, appropriate State agencies and private landowners in affected areas. In general, erosion problems will be short-term.

The transmission line and cleared right-of-way will remain a visual presence throughout its life. The right-of-way will be restricted to nearly all development purposes, although agricultural and recreational use will be possible following construction.

4.17 Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Utilization of the site for the generation of electricity can be revised as a short-term use of land, air and water resources when viewed on the time scale of several generations. However, it is likely that the site will be used for power generation beyond the life of the proposed unit. It is not likely that the site will return to preconstruction conditions due to major on-site changes resulting from the water storage pond, ash ponds and possible sludge ponds.

Plant operation in conjunction with already existing background contamination is not expected to result in any significant long-term effects to air and water quality in the area. Construction and operation of this facility will not preclude future industrial development in the area and may enhance development through the availability of electrical energy.

Application of land management may allow portions of the site to be opened to grazing sometime in the future. The initial removal of this land from agricultural activity through the construction of the power plant will result in a reversal of previous land mismanagement. This may enhance the development of a more diverse biological habitat and lead to increased productivity on that part of the site not used for power generation-related facilities.

Water used by the plant will be renewed through the hydrologic cycle, although not necessarily in the same area from which it is taken. Flora in the Kiamichi River will not be adversely affected by the plant and other development, or recreational uses of the river will not be precluded.

The consumption of coal and oil will provide the short-term benefit of electrical energy, while reducing reserves of these fuels available for future use. Coal is our most abundant fuel reserve and the 50 million tons required over the life of the plant represents 0.002 percent of the total estimated resources of 3.2 trillion tons stated in the 1974 Keystone Coal Manual. Oil use is limited to start-up and low load flame stabilization, which will limit the total quantity consumed over the life of the project. Avoidance of natural gas and reduced use of oil will free these materials for home heating and use in the petrochemical industries.

The transmission lines associated with the project will require approximately 472 acres for right-of-way. Use of this land will be restricted, but no significant effect is anticipated to the agricultural activities common to the area. Development of this land that economic development of the area will not be limited due to power deficiencies.

The economic stimulus resulting from construction and operation of the unit will cause personal income increases, which can result in increased tax revenues generated by increased sales.

4.15.2 Natural Resources/Energy

Western Farmers is currently dependent on natural gas for all its electrical generation. The proposed project is an important first step to make Western Farmers less dependent on natural gas and begin the conversion to a coal-fired generation base. This will allow the gas to be used in other areas such as home heating.

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Clearing the land may result in some soil erosion which could occur in the form of topsoil loss, sheet erosion, rilled and gullied slopes, and gullied waterways. Soil erosion problems will be controlled to the extent possible through a soil stabilization program coordinated with the Soil Conservation Service, Forest Service, will be prevented for the lifetime of the lines. In general, the short-term disturbances resulting from line construction will not affect long-term agricultural productivity of the lands crossed.

A significant temporary increase in the industrial workforce in the area will occur during construction of the project. This may be responsible for the development of a long-term trend that will result in a greater industrialization of the area, with a concurrent reduction in an agricultural base. The long-term increase in the industrial workforce directly related to the plant itself is estimated to be approximately 60 people, which will likely be assimilated into the Hugo, Idabel and Paris areas. It is likely that this development will cause some changes over the long-term to the areas predominantly agricultural base.

The cumulative effect of power availability and mutual resources in the area will likely result in the development of long-term growth opportunities in this part of the state.

4.18 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments can be described as those changes caused by the project that would prevent the restoration of the present order of environmental resources. The water and waste disposal ponds to be constructed on the site represent major irreversible actions associated with the project. It is unlikely that these areas could be restored to preconstruction environmental conditions.

An irretrievable commitment of resources can be defined as the consumption of a nonrenewable resource. Coal and oil consumed in the generation of electricity are irretrievably lost to other uses.

Most resources are either left undisturbed, or committed only temporarily during construction or the life of the project and are not irreversibly or irretrievably lost. Some large components of the facility such as underground foundations and certain pieces of equipment are irretrievable due to practical aspects of reclamation. Construction labor is not retrievable, but the construction workers will be available to work on other projects following construction of the proposed unit.

The use of environmental resources (air, water, land) for the project does not, in general, represent an irreversible or irretrievable commitment of resources.

5.0 Existing Environment

The proposed project will have an impact on Choctaw County and McCurtain County in southeastern Oklahoma. The proposed plant site is located in Choctaw County and the transmission lines cross portions of both counties. A detailed discussion of the present environment can be found in Appendix 1, Plant Environmental Analysis and Appendix 2, Transmission Environmental Analysis.

6.0 Preparers

This Environmental Impact Statement was prepared by the Environmental Branch of REA with primary input provided by the REA Southwest Area Office, Western Farmers Electric Cooperative, Burns & McDonnell Consulting Engineers. The Environmental Protection Agency, Soil Conservation Service, Corps of Engineers and Fish and Wildlife Service all contributed input to this Environmental Impact Statement.

7.0 Mailing List for the Draft Environmental Impact Statement

FEDERAL AGENCIES

Department of Commerce (1)

Economic Development Administration
Special Assistant for the Environment
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14th and Independence Avenue, N. W.
Washington, D. C. 20230

HEW

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U. S. Department of Health, Education and Welfare, Room 4740 - HEW North
200 Independence Avenue, S. W.
Washington, D. C. 20202

Environmental Protection Agency (5)

Room 537, West Tower
401 M Street, S. W.
Washington, D. C. 20460

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1201 Elm Street
Dallas, Texas 75270

Department of the Interior (20)

Assistant Secretary - Program Development and Budget
Director, Office of Environmental Project Review
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Bureau of Sport Fisheries and Wildlife
Department of the Interior
Washington, D. C. 20240

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Department of Transportation

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Department of Energy
Energy Research and Development Administration

Director (1)
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ERDA - Mail Stop: E-201
Washington, D. C. 20545

Federal Energy Regulatory Commission

Chief (1)
Bureau of Power
Federal Power Commission, Rm 5100
825 North Capitol Street, N. E.
Washington, D. C. 20426

Water Resources Council

Director, (1)
Water Resources Council
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8th Floor
Washington, D. C. 20426

Corps of Engineers

District Engineer (1)
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Tulsa, Oklahoma 74102

Advisory Council on Historic Preservation (1)

1522 K Street, N. W.
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P. O. Box 53551
Oklahoma City, Oklahoma 73105

Oklahoma Historical Society
Historical Building
Oklahoma City, Oklahoma 73105

State Clearinghouses

Office of Community Affairs and Planning
State Grant - In - Aid Clearinghouse
5500 North Western
Oklahoma City, Oklahoma 73118

Areawide Clearinghouses

Northeast Counties of Oklahoma
Economic Development District
P. O. Drawer E
215 South Wilson
Vinita, Oklahoma 74301

State Historic Preservation Officer

235 Pasteur Building
1111 North Lee
Oklahoma City, Oklahoma 73103

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Oklahoma Chapter Sierra Club
1959 E. 33rd Place
Tulsa, Oklahoma 74105

Burns & McDonnell Consulting Engineers
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P. O. Box 173
Kansas City, Missouri 64141

Western Farmers Electric Cooperative
Attention: Mr. Alan Mauzy
P. O. Box 429
Anadarko, Oklahoma 73005

Choctaw County Library
208 E. Jefferson
Hugo, Oklahoma 74743

Idabel Public Library
Idabel, Oklahoma 74745

8.0 Appendices

APPENDIX 1	Environmental Analysis - Plant
APPENDIX 2	Environmental Analysis - Transmission
APPENDIX 3	Coal Supply Study Summary
APPENDIX 4	Trace Element Analysis
APPENDIX 5	Biological Text of Johnson Screens
APPENDIX 6	NPDES Permit
APPENDIX 7	Species Lists
APPENDIX 8	Comments Received on Site Study
APPENDIX 9	PSD Permit

APPENDIX 1

Environmental Analysis - Plant

(ATTACHED)

APPENDIX 2

Environmental Analysis - Transmission

(ATTACHED)

APPENDIX 3

Coal Supply Study Summary

Fuel Source:

Initial efforts in the Fuel Supply Study were to mail invitations to submit proposals to furnish coal for the proposed plant. Invitations were sent to more than fifty potential coal suppliers and responses to the invitations numbered nearly forty. A map indicating the location of the potential coal supplies indicated by the responses is shown on Figure V-3.

At the request of Western Farmers, a special effort was made to locate and identify all potential coal supplies in Oklahoma. Contacts were made with all known agencies in Oklahoma involved with the coal industry. Only three offers were received from potential suppliers in Oklahoma, none of which would furnish sufficient fuel for one unit of the proposed plant for its life of 35 years. Also, none of the Oklahoma offers would provide coal from an active mine and all the offers were to sell only reserves, or interests in reserves, which would require that Western Farmers engage a mining company to operate the mine. These and other considerations influenced Western Farmers' Board of Directors to eliminate all Oklahoma proposals and led the Board to recommend that Burns & McDonnell pursue negotiations for a compliance fuel.

Due to the decision of the Western Farmers' Board of Directors, continuing investigations were limited to compliance fuel offers located in Colorado and the Powder River Region in Wyoming. Preliminary investigations led to elimination of the Colorado offers on the basis of cost per ton quoted by the Colorado offers. Intensive investigations were then performed for each compliance coal offer located in the Powder River region of Wyoming. The locations of those offers considered are shows on Figure No. V-4. After economic comparisons based on cost per ton, coal quality, and haul distance, the Powder River offers were reduced to the seven offers which appeared to provide the most reasonable fuel supply for Western Farmers. Representatives of the seven selected coal supply companies were then invited to the offices of Western Farmers to discuss final contract offers and terms. Comparisons of these final offers and terms led to the selection of three preferred offers and these companies were again interviewed for the purpose of rectifying and coordinating any discrepancies or points of disagreement which may have existed in the final offer and contract. After consultation with the Western Farmers' staff and Board of Directors, a preferred offer was selected and a letter of intent to supply coal for the first unit of the proposed plant was signed. Table V-1 shows a coal quality analysis of the coal for which the letter of intent was signed.

Coal Transport:

Movement of coal from the Powder River Basin today is almost exclusively by rail. Some minor quantities are shipped to local markets by truck and conveyor, but the economical haul distance for these modes of transportation is 100 miles or less. Coal-slurry pipelines may be used in the future to move high volumes of coal long distances. Several long distance pipelines are currently under study to move western coal to the Midwest and South. Problems of obtaining eminent domain and water rights may impede the development of coal-slurry pipelines as a delivery system for several years. For the purposes of this report, rail transportation is assumed to be the only viable means to move the Powder River Basin fuel into Southeastern Oklahoma (Figure V-3).

The freight rate structure for bituminous coal is not clearly defined. Bituminous coal is rated class 17½ in the governing Uniform Freight Classification but little, if any, coal is transported at class rates. Commodity rates are generally used to establish a transportation rate for bituminous coal. Commodity rates commonly used are defined as follows:

1. Single-car Rates apply to shipments requiring the use of one car. The tonnage is usually 100 tons or less and frequently is based on the marked capacity of the car. This rate structure is the least efficient use of equipment and personnel and therefore results in the highest freight rate.
2. Multiple-Car Rates are based on a sufficient tonnage to require the use of two or more cars, moving from one point of origin to one point of destination at one time. A frequently used criteria for multiple-car rates is a minimum of 1,500 tons per shipment.
3. Train-Load Rates are based on a sufficient tonnage to make up an extra train, usually 5,000 tons or more. The railroad equipment is usually furnished by the railroad and the movement does not have a predetermined continuously scheduled cycle. Recent trends in established costs indicate that train-load rates and multiple-car rates are very nearly the same.

Table V-1

POWDER RIVER BASIN
COAL QUALITY ANALYSIS

a. ALKALIES IN COAL – (% of Ash)

	MIN.	AVG.	MAX.
Na_2O	0.00	0.71	1.49
K_2O	0.00	0.56	1.28
Total as Na_2O	X	X	X

b. Chlorides X X X

c. ASH FUSION TEMPERATURE °F (ASTM-D271)

	REDUCING			OXIDIZING		
	MIN.	AVG.	MAX.	MIN.	AVG.	MAX.
(1) Initial Deform.	2058	2212	2367	2086	2250	2413
(2) Softening Temp.						
(a) Spherical H=W	2069	2224	2379	2097	2262	2427
(b) Hemispherical $H = \frac{W}{2}$	2080	2235	2390	2105	2274	2442
(3) Fluid Temp.	2094	2253	2411	2103	2281	2458

d. ASH ANALYSIS (% of Ash)

	MIN.	AVG.	MAX.
SiO_2 (Silica)	15.21	34.01	52.81
Al_2O_3 (Alumina)	6.14	17.58	29.02
Fe_2O_3 (Iron Oxide)	3.50	5.18	6.86
TiO_2 (Titania)	0.62	0.84	1.06
Mn_3O_4 (Manganese Oxide)	X	X	X
CaO (Lime)	5.13	19.59	34.05
MgO (Magnesia)	1.95	4.39	6.83
Na_2O (Sodium Oxide)	0.00	0.71	1.49
K_2O (Potassum Oxide)	0.00	0.56	1.28
P_2O_5 (Phosporus Pentoxide)	0.04	0.68	1.32
SO_3 (Sulfur Trioxide)	3.48	15.68	27.88
Trace Metals	X	X	X

Table V-1 (Con't)

e. PROXIMATE ANALYSIS

As Received Basis – Guaranteed Values

	% OF COAL	
Moisture	32.27	max.
Volatile Matter	28.95	min.
Fixed Carbon	30.81	min.
Ash	8.57	max.
Sulfur	0.80	max.
BTU/lb	7,7 46	min.

f. Free swelling index/ASTM D 720-57

g. Grindability, Hardgrove — 50.17 min.

h. ULTIMATE ANALYSIS

	% OF COAL "As Received"
Carbon, Total	47.38
Hydrogen	3.36
Nitrogen	0.71
Sulfur, max.	0.80
Oxygen	11.98
Chlorine	0.01
Ash, max.	8.57
Moisture, max.	32.27
BTU/lb (Dulong)	X

4. Unit-Train Rates are based on movements in which a sufficient fixed number of railroad cars and power units are dedicated to one service between one point of loading and one point of unloading and moving in continuously shceduled cycles. In many cases the cars are owned by the shipper. The number of cars required to constitute a unit-train shipment is not fixed, with some present unit-train operations consisting of as many as 100 to 110 cars. Unit-train rates are the most economical of all railroad coal movement rate structures.
5. Annual volume and conditional rates are those based primarily on the stipulated movement of a stated tonnage over a specific period of time. A frequent annual-volume requirement is that 1-million tons be shipped during one calendar year. Annual volume rates can be applied to and used in conjunction with any of the four previously discussed rate structures.

Numerous variations exist to these basic rate structures such as unit-train sharing, car-load and multiple-car concentrations. Specific rate structures and the terms and conditions of each coal movement are the results of negotiation between the carrier and the shipper and take into consideration specific movement variables in addition to the general rate structure categories discussed above.

For the comparative analysis and evaluation procedures used in this report it is assumed that the fuel will be delivered by unit-train. A minimum unit-train was assumed to contain 100 cars, each car having a capacity of 100 tons. A unit-train moving coal 1,350 miles, one way, will require approximately 8 days to complete one round trip (approximately 45 round trips per year). One 100-car unit-train could be expected to deliver approximately 450,000 tons of coal per year. Assuming that a total of approximately 1,200,000 tons of coal per year will be required by the first unit of the proposed plant, operation of three 100-car unit-trains will be necessary.

APPENDIX 4

Trace Element Analysis

C I & E CO.
A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES, 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434

E AD DRESS ALL CORRESPONDENCE TO
EAS AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373 4772

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2099
Houston, Texas 77001

Oct. 28, 1975

Sample Identification
by

of sample
orted to us Coal

Shell Oil Co.

Core Hole No. 16
Smith Seam
Core Nos. 5, 6, 7, 8, & 9
113.0' - 169.0'
*Flameless Atomic Absorption
All elements not reported < 0.1 ppm weight

le taken at xxxxx

e taken by Shell Oil Co.

e sampled Received 9-22-75

Analysis report no. 72-36578 Page 2

TRACE ELEMENTS

ENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.
ium	<1	Gadolinium	0.2	Yttrium	2
ium	<1	Europium	0.1	Strontium	90
uth		Samarium	0.2	Rubidium	0.4
	.0.4	Neodymium	0.6	Bromine	0.4
llium		Praseodymium	0.3	Selenium	0.2
ury	*0.08	Cerium	3	Arsenic	2
		Lanthanum	2	Germanium	
inum		Barium	13	Gallium	0.6
ium		Cesium	< 0.1	Zinc	40
um		Iodine	< 0.1	Copper	11
ium		Tellurium		Nickel	5
sten		Antimony		Cobalt	0.4
alum		Tin	0.2	Manganese	15
ium		Cadmium		Chromium	3
ium		Silver		Vanadium	5
bium		Palladium		Scandium	6
ium		Rhodium		Fluorine	≃74
um		Ruthenium		Boron	30
ium		Molybdenum	5	Beryllium	<0.1
osium		Niobium	0.9	Lithium	0.4
ium		Zirconium	7		

Respectfully submitted,

C I & E Co.

C.W. ..., District Manager

Charter Member

CT&E Co.

OCT 30 1975

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434

PLEASE ADDRESS ALL CORRESPONDENCE TO:
75 EAST 51st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-4...

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box
Houston, Texas 77001

Oct. 28, 1975

Sample identification by

Kind of sample reported to us	Coal	Shell Oil Co.
Sample taken at	XXXXX	Core Hole No. 16 Roland Seam Core Nos. 1, 2, 3, & 4 71.0' - 101.0'
Sample taken by	Shell Oil Co.	*Flameless Atomic Absorption **Heterogeneous
Date sampled	Received 9-22-75	All elements not reported < 0.1 ppm weight

Analysis report no. 72-36577 Page 2

TRACE ELEMENTS

ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM
Uranium	2	Gadolinium	0.6	Yttrium	11
Thorium	2	Europium	0.3	Strontium	280
Bismuth		Samarium	1	Rubidium	3
Lead	2	Neodymium	3	Bromine	0.5
Thallium		Praseodymium	2	Selenium	0.9
Mercury	*0.11	Cerium	30	Arsenic	2
Gold		Lanthanum	5	Germanium	≤ 0.1
Platinum		Barium	42	Gallium	4
Iridium		Cesium	0.3	Zinc	530
Osmium		Iodine	0.2	Copper	26
Rhenium		Tellurium		Nickel	8
Tungsten	0.4	Antimony	≤ 0.2	Cobalt	4
Tantalum		Tin	2	Manganese	210
Hafnium	0.4	Cadmium	≤ 1	Chromium	18
Lutecium		Silver		Vanadium	41
Ytterbium		Palladium		Scandium	6
Thulium	< 0.1	Rhodium		Fluorine	≃27
Erbium	0.3	Ruthenium		Boron	36
Holmium	0.3	Molybdenum	**15	Beryllium	0.2
Dysprosium	0.7	Niobium	1	Lithium	3
Terbium	0.3	Zirconium	38		

Respectfully submitted,

CT&E Co.

L. W. Taylor

L.W. TAYLOR, District Manager

Charter Member

C I & E Co.

OCT 30 1975

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434

ADDRESS ALL CORRESPONDENCE TO
?75 E. ?ST 51st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-4772

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2099
Houston, Texas 77001

Oct. 28, 1975

Sample Identification by

Kind of sample reported to us: Coal

Sample taken at: XXXXX

Sample taken by: Shell Oil Co.

Date sampled: Received 10-22-75

Shell Oil Co.
Core Hole No. 16
Smith Seam
Core No. 9
169.0' - 174.0'
*Flameless Atomic Absorption
**Heterogeneous
All elements not reported < 0.1 ppm weight

Analysis report no. 72-35888 Page 2

TRACE ELEMENTS

ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.
Uranium	2	Gadolinium	0.4	Yttrium	9
Thorium	2	Europium	0.2	Strontium	340
Bismuth		Samarium	0.5	Rubidium	0.3
Lead	3	Neodymium	1	Bromine	0.2
Thallium		Prsaeodymium	1	Selenium	**3
Mercury	*0.06	Cerium	5	Arsenic	**7
Gold		Lanthanum	4	Germanium	
Platinum		Barium	100	Gallium	2
Iridium		Cesium		Zinc	6
Osmium		Iodine	0.2	Copper	24
Rhenium		Tellurium		Nickel	4
Tungsten		Antimony		Cobalt	5
Tantalum		Tin	0.4	Manganese	25
Hafnium		Cadmium	≤2	Chromium	11
Lutecium		Silver		Vanadium	40
Ytterbium		Palladium		Scandium	7
Thulium		Rhodium		Fluorine	≃33
Erbium		Ruthenium		Boron	33
Holmium		Molybdenum	3	Beryllium	0.5
Dysprosium		Niobium	0.5	Lithium	0.3
Terbium	0.2	Zirconium	12		

LWT/vh

Respectfully submitted,

C I & E Co.

L. W. Taylor

L.W. TAYLOR, District Manager

C T & E Co.

OCT 30 1975

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES, 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434

PLEASE ADDRESS ALL CORRESPONDENCE TO
875 EAST 51st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-47..

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2099
Houston, Texas 77001

Oct. 28, 1975

Sample identification by

Shell Oil Co.

Kind of sample reported to us: Coal

Core Hole No. 16
Roland Seam
Core No. 4
101.0' - 106.0'
*Flameless Atomic Absorption
All elements not reported < 0.1 ppm weight

Sample taken at: XXXXX

Sample taken by: Shell Oil Co.

Date sampled: Received 8-22-75

Analysis report no. 72-35882 Page 2

TRACE ELEMENTS

ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.
Uranium	2	Gadolinium	0.5	Yttrium	11
Thorium	2	Europium	0.4	Strontium	170
Bismuth		Samarium	2	Rubidium	16
Lead	6	Neodymium	4	Bromine	0.7
Thallium		Praseodymium	3	Selenium	0.7
Mercury	*0.12	Cerium	19	Arsenic	1
Gold		Lanthanum	7	Germanium	≤0.3
Platinum		Barium	150	Gallium	5
Iridium		Cesium	2	Zinc	8
Osmium		Iodine	0.2	Copper	27
Rhenium		Tellurium		Nickel	5
Tungsten		Antimony	0.4	Cobalt	3
Tantalum		Tin	0.7	Manganese	23
Hafnium		Cadmium	≤0.8	Chromium	56
Lutecium		Silver		Vanadium	150
Ytterbium		Palladium		Scandium	11
Thulium		Rhodium		Fluorine	≃190
Erbium		Ruthenium		Boron	38
Holmium		Molybdenum	10	Beryllium	1
Dysprosium		Niobium	3	Lithium	15
Terbium	0.3	Zirconium	42		

Respectfully submitted,

CT&E Co.

L. W. TAYLOR, District Manager

LWT/vh

Charter Member

C I & E Co.

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434

ADDRESS ALL CORRESPONDENCE TO 75 E. 61st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-4772

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2099
Houston, Texas 77001

Oct. 28, 1975

Sample identification by

Kind of sample reported to us: Coal

Shell Oil Co.

Core Hole No. 16
Roland Seam
Core No. 1
66.0' - 71.0'
66.0' - 67.5' lost
*Flameless Atomic Absorption
All elements not reported < 0.1 ppm weight
MC = Major Concentration

Sample taken at: XXXXX

Sample taken by: Shell Oil Co.

Date sampled: Received 8-22-75

Analysis report no. 72-35379 Page 2

TRACE ELEMENTS

ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.
Uranium	3	Gadolinium	0.3	Yttrium	19
Thorium	4	Europium	0.3	Strontium	160
Bismuth	< 0.2	Samarium	0.7	Rubidium	4
Lead	2	Neodymium	2	Bromine	0.4
Thallium		Praseodymium	1	Selenium	0.7
Mercury	*0.13	Cerium	23	Arsenic	5
Gold		Lanthanum	7	Germanium	0.4
Platinum		Barium	35	Gallium	3
Iridium		Cesium	0.2	Zinc	9
Osmium		Iodine	0.1	Copper	33
Rhenium		Tellurium		Nickel	29
Tungsten		Antimony		Cobalt	8
Tantalum		Tin	0.6	Manganese	MC
Hafnium		Cadmium	< 0.7	Chromium	27
Lutecium		Silver		Vanadium	34
Ytterbium		Palladium		Scandium	14
Thulium		Rhodium		Fluorine	≅ 68
Erbium		Ruthenium		Boron	12
Holmium		Molybdenum	6	Beryllium	0.2
Dysprosium		Niobium	1	Lithium	0.4
Terbium	0.1	Zirconium	28		

Respectfully submitted,

CT&E Co.

L. W. Taylor

L.W. TAYLOR, District Manager

LWT/vh

CT&E Co.

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726 8434

OCT 30 1975

...SE ADDRESS ALL CORRESPONDENCE TO
...5 EAST 51st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-4772

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2099
Houston, Texas 77001

Oct. 28, 1975

Sample Identification by

...d of sample ...ported to us: Coal

...ple taken at: XXXXX

...ple taken by: Shell Oil Co.

...ate sampled: Received 9-22-75

Shell Oil Co.

Core Hole No. 13
Smith Seam
Core Nos. 5, 6, 7, 8, & 9
212.0' - 281.0'
*Flameless Atomic Absorption
**Heterogeneous
All elements not reported < 0.2 ppm weight

Analysis report no. 72-36576 Page 2

TRACE ELEMENTS

...MENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM ...
...nium	3	Gadolinium	0.3	Yttrium	14
...rium	3	Europium	0.2	Strontium	340
...muth		Samarium	0.5	Rubidium	8
...d	3	Neodymium	1	Bromine	0.2
...llium		Praseodymium	0.7	Selenium	≤0.3
...cury	*0.06	Cerium	16	Arsenic	1
...d		Lanthanum	6	Germanium	
...tinum		Barium	170	Gallium	2
...dium		Cesium	0.3	Zinc	3
...ium		Iodine	0.1	Copper	24
...nium		Tellurium		Nickel	5
...gsten	0.7	Antimony	≤0.3	Cobalt	3
...talum		Tin	13	Manganese	67
...nium		Cadmium	≤2	Chromium	10
...ecium		Silver		Vanadium	50
...erbium		Palladium		Scandium	3
...lium		Rhodium		Fluorine	≅110
...ium		Ruthenium		Boron	33
...mium		Molybdenum	**4	Beryllium	0.1
...prosium		Niobium	2	Lithium	1
...bium	0.2	Zirconium	5		

Respectfully submitted,

CT&E Co.

E. W. Taylor

E. W. TAYLOR, District Manager

CT&E Co.

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES, 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434

OCT [illegible] 1975

ASE DRESS ALL CORRESPONDENCE TO.
75 E[illegible] 51st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-4772

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2099
Houston, Texas 77001

Oct. 28, 1975

Sample identification by

nd of sample eported to us	Coal		Shell Oil Co.
			Core Hole No. 13
			Roland Seam
nple taken at	XXXXX		Core Nos. 1, 2 & 3
			162.0' - 198.0'
			*Flameless Atomic Absorption
ple taken by	Shell Oil Co.		**Heterogeneous
			All elements not reported < 0.2 pp weight
Date sampled	Received 9-22-75		

Analysis report no. 72-36575

TRACE ELEMENTS

MENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM
nium	2	Gadolinium	0.4	Yttrium	14
rium	2	Europium	0.2	Strontium	150
muth		Samarium	0.5	Rubidium	0.3
d	0.9	Neodymium	0.5	Bromine	0.2
llium		Praseodymium	0.3	Selenium	0.3
cury	*0.08	Cerium	7	Arsenic	2
d		Lanthanum	3	Germanium	≤0.1
tinum		Barium	20	Gallium	2
dium		Cesium		Zinc	**68
ium		Iodine	0.1	Copper	24
nium		Tellurium		Nickel	10
gsten		Antimony		Cobalt	5
talum		Tin	0.6	Manganese	67
nium		[illegible]	≤0.7	Chromium	21
ecium		[illegible]		Vanadium	27
terbium		Palladium		Scandium	3
ulium		Rhodium		Fluorine	≃66
bium		Ruthenium		Boron	26
lmium		Molybdenum	4	Beryllium	0.2
sprosium		Niobium	1	Lithium	1
rbium	0.2	Zirconium	18		

Respectfully submitted,

CT&E Co.

L. W. Taylor

L.W. TAYLOR, District Manager

LWT/pf

C I & E CO.

OCT 31 1975

A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434

SE ADDRESS ALL CORRESPONDENCE TO:
EAST 51st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-4772

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2009
Houston, Texas 77001

Oct. 29, 1975

Sample Identification by

d of sample ported to us	Coal	Shell Oil Co.
ple taken at	XXXXX	Composite Sample Core Hole No. 13 Smith Seam Core No. 9 281.0' - 286.0'
ple taken by	Shell Oil Co.	*Flameless Atomic Absorption **Heterogeneous
te sampled	Received 8-22-75	All elements not reported < 0.1 ppm weight

Analysis report no. 72-36111 Page 3

TRACE ELEMENTS

MENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM W
ium	2	Gadolinium	0.2	Yttrium	8
rium	3	Europium	0.1	Strontium	190
muth		Samarium	0.4	Rubidium	3
d	3	Neodymium	0.9	Bromine	0.1
llium		Prsaeodymium	0.8	Selenium	0.5
cury	*0.85	Cerium	18	Arsenic	**13
d		Lanthanum	5	Germanium	≤0.2
tinum		Barium	70	Gallium	3
dium		Cesium	<0.1	Zinc	8
ium		Iodine	< 0.1	Copper	33
nium		Tellurium		Nickel	10
gsten		Antimony		Cobalt	10
talum		Tin	0.3	Manganese	6
nium		Cadmium	≤0.4	Chromium	27
ecium		Silver		Vanadium	44
erbium		Palladium		Scandium	7
lium		Rhodium		Fluorine	≃28
ium		Ruthenium		Boron	18
nium		Molybdenum	2	Beryllium	0.3
rosium		Niobium	2	Lithium	7
ium	0.1	Zirconium	25		

Respectfully submitted,

C I & E Co.

L.W. TAYLOR, District Manager

Charter Member

LWT/vh

OCT 31 1975

C T & E Co.

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GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434

ADDRESS ALL CORRESPONDENCE TO: EAST 51st AVE., DENVER, COLO. 80239 — OFFICE TEL. (303) 373-4772

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2099
Houston, Texas 77001

Oct. 29, 1975

Sample identification by

Kind of sample reported to us: Coal

Sample taken at: XXXXX

Sample taken by: Shell Oil Co.

Date sampled: Received 8-22-75

Shell Oil Co.

Composite Sample
Core Hole No. 13
Smith Seam
Core No. 4 & 5
207.0' - 212.0'
207.0' - 207.5' not received
*Flameless Atomic Absorption
All elements not reported <0.2 ppm weight

Analysis report no. 72-36107 Page 3

TRACE ELEMENTS

ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.
Uranium	3	Gadolinium	0.5	Yttrium	32
Thorium	3	Europium	0.4	Strontium	160
Bismuth		Samarium	1	Rubidium	7
Lead	3	Neodymium	2	Bromine	0.6
Thallium		Praseodymium	2	Selenium	0.5
Mercury	*0.03	Cerium	42	Arsenic	3
Gold		Lanthanum	13	Germanium	≤0.4
Platinum		Barium	58	Gallium	5
Iridium		Cesium	≤0.1	Zinc	30
Osmium		Iodine		Copper	69
Rhenium		Tellurium		Nickel	20
Tungsten		Antimony	0.4	Cobalt	6
Tantalum		Tin	1	Manganese	23
Hafnium		Cadmium	≤0.8	Chromium	45
Lutecium		Silver		Vanadium	57
Ytterbium		Palladium		Scandium	8
Thulium		Rhodium		Fluorine	≈75
Erbium		Ruthenium		Boron	15
Holmium		Molybdenum	5	Beryllium	0.3
Dysprosium		Niobium	3	Lithium	1
Terbium	0.3	Zirconium	52		

Respectfully submitted,

C T & E Co.

L. W. Taylor

L. W. TAYLOR, District Manager

LWT/vh

CT&E Co.
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OCT 31 1975

E ADDRESS ALL CORRESPONDENCE TO.
EAST 51st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-4772

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2099
Houston, Texas 77001

Oct. 29, 1975

Sample Identification by

of sample orted to us	Coal	Shell Oil Co.
e taken at	XXXXX	Composite Sample Core Hole No. 13 Roland Seam Core No. 3 & 4 198.0' - 203.0'
e taken by	Shell Oil Co.	*Flameless Atomic Absorption All elements not reported <0.1 pp weight
e sampled	Received 8-22-75	

Analysis report no. 72-36105 Page 3

TRACE ELEMENTS

NT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT
ium	1	Gadolinium	0.2	Yttrium	7
um	1	Europium	0.1	Strontium	390
ith		Samarium	0.3	Rubidium	2
	1	Neodymium	0.8	Bromine	0.3
ium		Praseodymium	0.4	Selenium	0.2
ry	*0.05	Cerium	9	Arsenic	1
		Lanthanum	3	Germanium	
nium		Barium	58	Gallium	2
um		Cesium	0.2	Zinc	18
m		Iodine	0.1	Copper	27
um		Tellurium		Nickel	5
ten		Antimony	0.1	Cobalt	1
lum		Tin	1	Manganese	35
um		Cadmium	≤0.8	Chromium	17
ium		Silver		Vanadium	25
bium		Palladium		Scandium	4
um		Rhodium		Fluorine	≤57
m		Ruthenium		Boron	27
um		Molybdenum	4	Beryllium	0.1
osium		Niobium	2	Lithium	0.8
um	0.1	Zirconium	75		

Respectfully submitted,

CT&E Co.

L.W. Taylor

L.W. TAYLOR, District Manager

LWT/vh

C T & E CO.
A DIVISION OF COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434

ADDRESS ALL CORRESPONDENCE TO:
... 51st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-4772

SHELL OIL COMPANY
Two Shell Plaza
P. O. Box 2099
Houston, Texas 77001

Oct. 28, 1975

Sample identification by

Shell Oil Co.

Composite Sample
Core Hole No. 13
Roland Seam
Core No. 1
157.0' - 162.0'
*Flameless Atomic Absorption
**Heterogeneous
All elements not reported ∠0.2 ppm weight

Kind of sample reported to us: Coal

Sample taken at: XXXXX

Sample taken by: Shell Oil Co.

Date sampled: Received 8-22-75

Analysis report no. 72-36102 Page 3

TRACE ELEMENTS

ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.	ELEMENT	CONC. PPM WT.
onium	2	Gadolinium	0.3	Yttrium	47
orium	2	Europium	0.2	Strontium	520
smuth		Samarium	1	Rubidium	2
ad	2	Neodymium	3	Bromine	0.4
allium		Praseodymium	1	Selenium	0.7
rcury	*0.06	Cerium	13	Arsenic	5
ld		Lanthanum	5	Germanium	
atinum		Barium	**97	Gallium	4
idium		Cesium	0.1	Zinc	12
mium		Iodine	0.1	Copper	37
enium		Tellurium		Nickel	10
ngsten		Antimony	0.5	Cobalt	5
ntalum		Tin	1	Manganese	51
fnium		Cadmium	≤1	Chromium	16
tecium		Silver		Vanadium	61
terbium		Palladium		Scandium	10
ulium		Rhodium		Fluorine	≃38
bium		Ruthenium		Boron	40
lmium		Molybdenum	13	Beryllium	0.4
sprosium		[illegible]	2	Lithium	0.2
rbium	0.2	[illegible]	110		

Respectfully submitted,

C T & E Co.

L.W. Taylor

L.W. TAYLOR, District Manager

LWT/pf

APPENDIX 5

Biological Test of Johnson Screens

A PRACTICAL RAW WATER INTAKE SCREEN THAT SUBSTANTIALLY REDUCES THE ENTRAINMENT AND IMPINGEMENT OF EARLY LIFE STAGES OF FISH

Brian N. Hanson, William H. Bason,
Barry E. Beitz, and Kevin E. Charles

Ichthyological Associates, Inc.
Delmarva Ecological Study
R.D.#1, Box 286
Middletown, Delaware 19709

ABSTRACT

The proposed construction of a nuclear generating station in a striped bass spawning area precipitated studies of available screening technology. Experimental studies indicated a .040-inch slot (1-mm) cylindrical well screen operated at 0.5-fps intake velocity virtually eliminated impingement of fishes larger than 15 mm fork length (FL). Intake velocities as high as 1.75 fps also produced low impingement. Tests of fish less than 30 mm FL held near a functioning intake (0.5 fps) for as long as 3 hr yielded no impingement or stress. Striped bass between 8 and 17 mm FL were capable of resisting the intake at more than 1 fps for longer than 30 min; larger specimens (12-17 mm), when impinged, showed excellent ability to escape. The screen effectively removed virtually all striped bass eggs from the cooling water. Preliminary egg mortality studies indicate that at least 95% survival can be expected at an approach velocity of 0.5 fps and impingement durations up to 2 min.

Fouling studies showed that screens were highly resistant to clogging, essentially self-cleaning in a current, and easily backwashed. Onsite studies in the Chesapeake and Delaware Canal have shown that a 24- x 30-inch, .040-inch slot screen is capable of providing its designed capacity for weeks without backwashing or cleaning. Samples of filtered water from the model intake have shown substantial reduction in organisms/m^3 of filtered versus ambient water.

A PRACTICAL RAW WATER INTAKE SCREEN WHICH SUBSTANTIALLY REDUCES THE ENTRAINMENT AND IMPINGEMENT OF EARLY LIFE STAGES OF FISH

Brian N. Hanson, William H. Bason,
Barry E. Beitz, and Kevin E. Charles

Ichthyological Associates, Inc.
Delmarva Ecological Study
R.D.#1, Box 286
Middletown, Delaware 19709

INTRODUCTION

The objective of this study was to develop a surface water intake compatible with power plant operation and capable of protecting the early life stages of fishes. Review of existing technology indicated profile wire screen (Fig. 1) possessed the greatest potential to meet the desired objectives. Screens were purchased from Johnson Division of Universal Oil Products and this report evaluates their potential as a low impact surface water intake screen.

Studies were initially directed toward the determination of entrainment and impingement of striped bass eggs, larvae, and young by a profile wire screen intake. Studies were expanded to include other fishes, egg mortality due to impingement, biological and detrital fouling rates, in situ long-term testing, and cleaning techniques. Due to the practical and applied nature of the work, all experiments were designed to provide a go/no go result. If the screen failed to meet any biological or engineering requirement, experimentation would have ceased due to the lack of improvement over existing technology.

MATERIALS AND METHODS

Test Apparatus

Most experiments were conducted in a 30- x 15-ft oval flume (Fig. 2). The aluminum and plywood channel was ~~32~~ 33 inches wide and 48 inches deep. A 4- x 8- x 4-ft sump attached to the flume's inner wall served as the site for the model intake. Water was pumped from the sump by a 5-hp horizontal turbine pump which initiated a gravity flow from the flume channel through the test screen. ~~The maximum sustainable pump rate was 505 gpm.~~ Pump rate was measured with an Envirotech Sparling water meter and controlled by butterfly valves. Discharge reentered the flume opposite the sump box. Total volume of the facility at maximum depth (40 inches) was ~~4,388~~ 5,472 gallons.

A single 83-inch diameter paddle wheel with six 27- x 40-inch blades was used to generate flume currents. The wheel was driven by a 3-hp electric motor through a variable speed hydraulic transmission coupled to a 20 : 1 right angle gear reduction. Water velocity was measured with a Marsh-McBirney Model 201 electromagnetic current meter.

Egg mortality studies were conducted in a 10- x 5-ft oval flume. The channel was 12 inches wide and 17 inches deep. A 36-inch diameter paddle wheel with six 17- x 11-inch blades was used to generate current. The wheel was driven by a 1/2-hp variable speed motor coupled to a variable speed hydraulic transmission. Total volume of the facility was ~~111.6~~ 239.1 gallons.

A test cage (29.0- x 22.5- x 28.5-inch) was used to keep test specimens in the proximity of the intake during experimental runs in static mode (channel velocity = 0). The front panel was plexiglass; the sides and bottom were 500-micron mesh nytex fabric. The bottom was custom fit to expose the specimens to only the top half of the screen (Fig. 6). The bottom portion of the screen was frequently covered to reduce the effective open area and increase the maximum intake velocity.

Since the exclusion of striped bass eggs and larvae was the major objective, slot widths of .040-inch and less were investigated. All cylindrical screens were 12 inches in diameter and 24 inches long. Fish and egg impingement and detrital fouling studies were most frequently conducted with a .040-inch slot, .120-inch wire (25% open area) screen. The effect of slot size on detrital fouling was determined with .040-, .020-, and .010-inch slot screens, each constructed of .060-inch wire. A 12-inch square screen panel (.020-inch slot, .060-inch wire) was used for egg mortality studies.

Cylindrical screens were positioned horizontally across the flume channel at about midwater opposite a 36- x 48-inch viewing port (Fig. 2). The panel screen was placed in the small flume channel perpendicular to flow, 1 inch downstream of a 12- x 12-inch viewing port.

Egg Mortality

Striped bass eggs were supplied from an on-site hatchery. All eggs were incubated in a solution of 50,000 IU/l penicillin-G and 50 mg/l streptomycin sulfate for at least 15 hr before testing. Each test consisted of a 30-, 60-, and 120-second impingement trial of live eggs with one replicate and one control for each duration. Any given test utilized eggs from a single brood. Natural die-off rates were monitored with long-term controls which were accomplished by holding live eggs in a gallon jar of antiseptic solution. Eggs were aerated and held until the brood's testing was completed. Total dead eggs were counted and recorded every 30 min. Eggs were then preserved in a formalin-rose bengal solution for microscopic examination.

Impingement trials and replicates proceeded in the following manner. An unknown number of live eggs was released at mid-depth into a 0.5-fps current

4 ft upstream of the test screen. After impingement for the prescribed duration, the current was stopped. Eggs were siphoned from the screen into a gallon jar partially filled with antiseptic solution. Samples were inspected for mortality at 5, 20, 45, and 60 min for the first two tests; thereafter inspection was made at 5, 30, and 60 min. Samples were preserved after 1 hr.

Trial controls were held in flume water for the appropriate time period then siphoned into a holding jar filled with the antiseptic solution. Mortality was monitored for 1 hr and the samples preserved.

Preserved samples were examined with a Bausch & Lomb stereo zoom dissecting scope. Developmental stage was determined and the live and dead ratio determined. Eggs were termed dead when they contained abnormal or disintegrating embryonic material, an emulsified oil globule, or translucent perivitelline space. The smallest and largest eggs in each sample were measured.

Egg-Screen Interaction

Egg impingement studies were conducted in the large flume. Tests were designed to evaluate egg-screen interactions at various channel velocities. Approximately 300 preserved striped bass eggs, 2-3 mm in diameter, were released 10 ft upstream of the .020-inch slot screen operated at a mean intake velocity of 0.5 fps. Three experiments of one trial each were run at channel velocities of 0.50, 0.75, and 1.25 fps. Interactions were filmed and percent impinged noted. The .040-inch slot screen functioning at 0.5 fps was exposed to 15,000 preserved eggs to determine the effect of various channel velocities (0.5-2.6 fps) on impingement. Changes of location and number of impinged eggs were monitored for each of the four test velocites.

The value of an air bubble curtain as an impingement preventative and cleaning mechanism was investigated at channel velocities of 0.5 and 2.0 fps. Compressed air was released through a 12-inch long perforated nozzle at 10 psi. The nozzle was positioned to allow the bubble curtain to strike the leading side of the screen.

Approximately 500 ml of preserved eggs (2-3 mm diameter) were dispersed in the large flume at a channel velocity of 1.0 fps to evaluate entrainment. Intake was initiated through a 12-inch diameter unscreened hole at 500 gpm for 10 min. Entrained eggs were collected in the sump with a 500-micron mesh net and their volume measured.

The .040-inch slot screen was installed and the above procedure repeated. In addition, eggs still in the flume were removed; those impinged on the screen were recovered in a 32- x 60-inch, 500-micron mesh net. The volume of impinged eggs was measured and used to determine the percent impinged.

Striped Bass Larvae

Swimming ability and avoidance behavior of striped bass larvae exposed to a functioning screen were studied in static mode. Specimens were obtained from the on-site hatchery. Two stocks of fish, 4 and 5 days old, were held in separate 20-gallon aquaria and fed brine shrimp. Daily tests of each stock were made for 16 days.

Fish, in groups of 50 or less, were acclimated to flume temperatures for up to 3 hr and released into the test area formed by the screen and test cage. After a 2-min acclimation to the enclosure, a preset intake velocity (0.13-0.50 fps) was initiated through the .040-inch slot screen. Swimming ability and behavior of larvae were noted until all specimens entrained (usually less than 5 min). Specimens were recovered in a 500-micron mesh net placed over the screen discharge pipe. Total length of the largest and smallest specimens and all dead fish was recorded. Survivors of each test were held in a separate 20-gallon aquarium for later experiments.

After the stock of untested specimens was depleted, all survivors (20-21 days old) were transferred to a 500-gallon tank supplied with unfiltered pond water and used in subsequent tests. These fish exhibited greater resistance to entrainment so tests were terminated after 30 min. Intake velocities ranged from 0.5 to 1.5 fps. Impingement occurrences, fish-min impinged, number entrained, behavior, and swimming ability were recorded. Fish-min denotes the sum of the products of the number of fish and the time exposed to any event. Tests of larvae were discontinued when specimens reached 33 days of age (up to 17 mm TL).

Fish Impingement

Fish were collected by seine from the Bohemia River, Chesapeake and Delaware (C&D) Canal, Delaware River, and nearby freshwater ponds. Striped bass were also supplied by the on-site hatchery.

Test specimens were transported in insulated, aerated containers and held in two 6- x 2- x 1-ft deep plywood boxes continuously supplied with flume water. Water was pumped through a sand filter to the holding boxes and drained through standpipes back to the flume. Some smaller test specimens (<20 mm FL) were held in a 500-gallon tank and 425-gallon swimming pool. These facilities were supplied with water from a nearby pond. Except for striped bass, specimens were not fed prior to testing.

Specimens acquired from brackish waters were acclimated (4-16 hr depending on salinity) to flume water in insulated, aerated containers prior to testing. Flume salinity was raised to 4 ppt during the summer to minimize holding and acclimation mortality. This limited osmotic stress on weaker and more sensitive species as well as migrant marine fishes.

Before testing, specimens held in flume water were allowed to adjust to the test cage for 5-20 min; fish held in other facilities were acclimated for as long as 60 min.

Two different experimental procedures were used during impingement studies in static mode. In the first procedure, the pump was started at a preset rate and the effects noted. Intake velocity was then increased approximately 0.2 fps at 10-min intervals until the maximum rate was reached. Starting intake velocity ranged between 0.0 and 1.3 fps.

The second procedure was similar except the pump rate was held constant for 30 min. Three intake velocities (0.5, 1.0, and 1.5 fps) were tested. Specimens were continually monitored for impingement, entrainment, and behavior. Upon test termination all specimens were measured (FL).

Far field effects of the screen on seven species were investigated by increasing the size of the test area to 6 ft of flume channel centered around the .010-inch slot screen. Intake velocity was held at 1.0 fps for 10 min then increased to 1.25 fps for 15 min. After 25 min partitions were removed and fish allowed to swim freely about the flume for 13 min. A 1.0-fps channel current was then initiated and maintained for 20 min. Velocity was increased to 1.35 fps for an additional 8 min after which the test was terminated.

In dynamic mode tests, fish were acclimated for 15-25 min in a water-filled plastic bag suspended in the channel 10 ft upstream of the intake. Current of a selected velocity was generated in the flume and the pump started. Specimens were released and their behavior noted, especially on the first pass by the intake. Flume velocity was increased at 10-min intervals until velocity reached 2.00 fps; intake velocity was constant. After 10-min exposure at 2.00 fps, current in the flume was reduced to zero. Fish were exposed to the functioning intake for an additional 5 min.

An index was devised to compare the relative susceptibility of each species to a functioning Johnson screen and is given by the formula:

$$\text{Susceptibility Index} = \left[\frac{IO-ES}{IO} + 1\right]\left[\frac{FM}{TFM}\right]$$

where IO is the number of impingement occurrences; ES is the number of escapes; FM is fish-min impinged; and TFM is total fish-min exposed. The index can range from 0 to 2 and is sensitive to differences in behavior and swimming ability.

Detrital Fouling

Detrital fouling studies were conducted in the large flume from October 1976 through present. Effects and interrelationships of channel current, intake velocity, detrital load, and screen slot size were examined. Effectiveness of hydraulic backwash, compressed air backwash, and continuous cleaning with bubbles was also investigated. Two types of detrital material, peat moss and detritus from C&D Canal ichthyoplankton samples, were used. Detritus was renewed periodically because particle size was eventually reduced by pumps and cleaning activities.

All tests were run at flume levels of 30-35 inches. In so far as possible, flume volume was held constant for each series of experiments. The effects of intake velocity (0.40 fps), channel velocity (0.25-1.75 fps), and detrital load (105 cm^3/m^2 - 732 cm^3/m^3) ~~(134-939 ml)~~ on screen performance were evaluated.

A selected wet volume of test material was dispersed in the flume before testing began. Channel current was maintained at a predetermined velocity. The screen was cleaned by backwashing and/or brushing immediately prior to the test. Time-to-clog (TTC), head differential versus time, and visual observations were recorded for each run. A head differential of 12 inches in the sump was considered the endpoint of each test. Tests were usually terminated in 4 hr if substantial head differential was not generated. When the volume of detritus required to clog the screen equaled a substantial part of the test load, an additional 16 ounces of material were added 10 min after initiation of the test.

An air bubble curtain identical to that used in egg impingement studies was evaluated as a fouling preventative. The nozzle was placed so air bubbles swept up across the leading surface of the screen. Time-to-clog and fouling patterns were compared to tests conducted under the same parameters but without the bubbler system.

Hydraulic backwash was normally used to clean the screen prior to testing. A 610-gpm Homelite trash pump supplied a reverse flow of 500 gpm through the test screen (Fig. 2). Although not strictly documented, hydraulic backwash efficiency was observed and noted.

Cleaning effectiveness of air/hydraulic backwash was investigated. Each test consisted of a comparison of TTC after thorough manual cleaning and after air/hydraulic backwash. Manual cleaning was performed with a stiff bristled brush and was considered the basic cleaning technique. Compressed air was accumulated in a 2-ft^3 vessel equipped with a 4-inch butterfly valve. Backwash was accomplished by closing the 12-inch intake butterfly valve and instantaneously releasing air into the screen through a 6-ft length of 4-inch PVC pipe. Two concentrations of detritus were used in the tests.

RESULTS AND DISCUSSION

Dynamics

The initial phase of the study consisted of refining the experimental apparatus and determining the hydrodynamics of the test screens. Information provided by Johnson Division of Universal Oil Products, Inc. (Lee Cook, personal communication) indicated angle and velocity of approach should decrease from the proximal to the distal end of the cylindrical screen (Fig. 3). Current measurement and behavior of test specimens confirmed this.

As expected, measured approach velocity was always less than calculated intake velocity. Actual intake velocity could not be measured for comparison with calculated values since the available current meters could not operate at the screen surface. Theoretically, approach velocity at one wire width from the screen surface is equal to the product of intake velocity and the open area ratio. Approach velocity then decreases as a function of the square of the radius. Approach velocity 3 inches from the screen surface at 455 gpm was 0.25, 0.27, and 0.34 fps measured equidistance from the distal to the proximal end. The calculated mean intake velocity for this rate was 1.5 fps. The presence of higher approach velocity at the proximal end was verified by egg and detrital impingement patterns.

~~Visual observation in the dye test [illegible] indicated the screen's influence was restricted to that portion of the water column which would have passed through or within 2 inches of the screen. Impingement or entrainment of small suspended particles was most common along the leading edge of the screen. This phenomenon was [illegible] by channel current and was enhanced by pump rate.~~ Particles which approached the screen more obliquely were generally deflected by a boundary current. Deflection was augmented by the cylindrical shape of the screen. The buildup of impinged material was greatest on the proximal third of the upstream edge where intake velocity was highest. Material impinged elsewhere on the screen was not held as tightly and tended to move to the downstream side. Eddy and channel currents in this area produced a washing effect which increased with increasing channel velocity.

Egg-Screen Interaction

Egg-screen interaction tests revealed two distinct areas of impingement on the screen. Screen orientation to flow exposed eggs to direct impact and possible impingement on the leading edge of the screen; eddy currents resulted in a secondary area of impingement in the proximal one-third of the trailing edge.

Impingement on the leading edge was a function of channel velocity but was self limiting above 2.0 fps. At velocities greater than 2.0 fps, all available surface area was rapidly occupied; thereafter, a slow rate of interchange, approximately 1% per minute, accounted for all new impingement. A very low percentage of the eggs exposed impinged on the leading edge. This portion of the screen was the only area where entrainment and wedging in the slots occurred. Entrainment and wedging in slots is apparently caused by pressure generated by channel velocity rather than intake current.

Impingement on the trailing edge was maximum when channel velocity was equal to or less than intake velocity. Eggs in this area were loosely held as evidenced by their movements on the screen surface. As much as 20% of the passing eggs impinged on the leading edge, but most (95%) rolled over the screen and gathered in the proximal portion of the trailing edge. At higher channel velocities the number of eggs present in this area approached zero. Entrainment or wedging in the slots was never observed in this region.

Incorporation of a bubble curtain was effective in reducing egg impingement. Eggs did not impinge on areas of the screen which were struck by bubbles. The bubble curtain also removed previously impinged eggs. Entrained bubbles were vented in the sump and prevented pump cavitation. ~~Results indicate impingement of eggs can be virtually eliminated by a bubble curtain.~~ Reorienting the screen ~~so the long axis was parallel to the~~ curtain

~~would also have virtually eliminated impingement and entrainment~~. In addition, ~~hydraulic problems associated with the leading and trailing edges would be eliminated and the screen should effectively exclude particles as small as one-half the slot size due to the coanda effect.~~

Entrainment was primarily associated with the upstream side of the screen. Less than 0.1% of all eggs exposed entrained in 2 hr of testing. In tests run without the screen (pumping through the 12-inch mounting orifice), 40% of all eggs entrained during each of two 10-min trials. ~~Only 1% entrained and 11% impinged during two similar trials with the screen in place, yielding a 97.5%~~ [redacted]

Egg Mortality

A total of 26 tests was conducted with 6,945 striped bass eggs of six different stocks. Eggs ranged from 18 to 38 hr old with diameters of 1.8 to 3.2 mm (after preservation). Developmental stages tested were late-gastrula (LG), early-embryo (EE), tailbud-free (TBF), and fully-developed-embryo (FDE). Mean mortalities of tests and controls at three different impingement durations are summarized in Table 1 and Figure 4. Statistical analyses for differences in percent mortality (Student's t-test after arcsine transformation; Sokal and Rohlf 1969) yielded significant ($P < 0.05$) differences between test and control for 30-second impingement duration (stages combined), LG-EE stages (durations combined), and all data combined. In general, LG-EE eggs suffered greater mortality than other stages in both tests and controls. Higher mortality of the earliest stages tested may reflect the greater fragility of these stages.

Mortality due to impingement (test-control difference) ranged from 0.0% to 11.9%. Mean mortality of developmental stages versus impingement duration ranged from 0.0% to 2.0%. ~~Overall, mean mortality due to impingement was~~ [redacted] (Table 1).

The low average mortality of long-term controls was probably due to less handling stress. Visual inspection of eggs during the 60-min post-impingement holding time revealed most mortality occurred in the first 30 min.

Skinner (1974) reported mortality of striped bass eggs impinged on 16 mesh/inch screen (0.44-inch) was generally less than 10% at approach velocities less than 0.9 fps and less than 30% at 1.0 fps. At 0.5 fps approach velocity, immediate mortality was approximately 8% and 12% at 1 and 2 min, respectively. In our study, comparable mean mortality (test only) was 3.7% and 2.9% for 1- and 2-min impingement durations, respectively. The differences between studies may be due to screen construction, slot size (.044-inch vs. .020-inch), procedural variation, egg stage, or egg origin (wild vs. hatchery-reared in our study).

Striped Bass Larvae

A total of 42 tests was conducted with more than 1,000 hatchery-reared striped bass larvae. Larvae, 4-33 days old (5.2-20.0 mm FL), were exposed to mean intake velocities of 0.13-1.50 fps at temperatures which ranged from 13 to 24 C.

During one set of experiments, more than 930 larvae (aquaria-held) were tested daily from age 4 to 20 days (5.2-9.2 mm TL) at mean intake velocities of 0.13-0.50 fps and temperatures of 13-19 C. Ability to resist entrainment was rated subjectively on a group and individual basis (Table 2). Performance was rated on general swimming ability, resistance efforts, and burst ability as compared to the previous day's testing.

Avoidance behavior was observed in all experiments with aquaria-held larvae. Although most specimens entrained within 1 min, many exhibited positive rheotaxis and actively resisted entrainment upon contact with the screen; those which did not touch the screen entrained more or less passively.

Most larvae entrained in the proximal half of the screen where intake velocity was greatest. The percentage which actively resisted entrainment increased with age, but 100% still entrained (Table 2). Mean intake velocity was increased to 0.5 fps after 11 tests due to improvement in swimming ability; results were similar to tests at 0.35 fps (Table 2).

The extent of escape due to a washing current or movement away from the screen could not be ascertained since all tests were in the static mode with a test cage. However, in a situation with current, a "burst" from the screen after contact should greatly decrease the potential to impinge or entrain.

Tests were originally designed to monitor the increase in avoidance capability as larvae increased in age and size. However, by test day 10 the performance of the aquaria-held larvae was more or less constant. Comparison to specimens of the same age which were fed natural food and held in larger tanks or rearing ponds revealed substantial differences in size and swimming ability. Mansueti (1958) noted stunting may be due to factors such as overcrowding, lack of proper nutrients, variable effects of metabolites in the aquaria, and hormonal imbalances due to an artificial environment. These factors may explain the rapid change in growth rate and swimming ability of larvae transferred to larger tanks supplied with natural food.

In another set of tests, 100 larvae held in a 500-gallon tank and a 425-gallon pool were tested at mean intake velocities of 0.35-1.50 fps. Ages and total lengths ranged from 10 to 33 days and 8 to 17 mm. Water temperature was 19-24 C. Many of these specimens were survivors of earlier experiments. Larger size and greater ability enabled testing at higher intake velocities and resulted in frequent but usually temporary impingements. The oldest specimens tested (13-17 mm TL) were easily able to resist intake velocities up to 1.5 fps. Most temporary impingements occurred near the top of the screen where intake currents were vertical.

Overall, there were 93 impingement occurrences, 75 escapements, and 16 entrainments (Table 3). Mortality due to impingement was not investigated. Most prolonged impingements were wedged tail-first between the wires and held by their opercles; the damage incurred was probably fatal. Avoidance (no entrainment or prolonged impingement) ranged from 40 to 100% for 30-min tests. In tests with currents of 1.0-1.5 fps, 92.7% of the larvae (9.8-17.0 mm) swam for 30 min without entrainment or prolonged impingement.

Fish Impingement

A total of 1,387 specimens of 20 species was tested (Table 4). Relative susceptibility indices for species tested in numbers of 50 or more are presented in Figure 5. The .040-inch slot screen was tested at mean intake velocities as high as 1.53 fps. Water temperature ranged from 3 to 27 C. Most experiments were conducted in the static mode. This should represent the worst operating condition because of constant exposure and the absence of currents to lessen entrainment and impingement. This assumption proved valid since fish-screen interaction was virtually nonexistent in the dynamic mode.

Intake velocity, fish size, and behavior were the major factors which influenced impingement. Effect of low temperature on performance was not investigated thoroughly. Bibko et al. (1974) noted long-term swimming endurance decreased with decreasing temperature. Although some impingements occurred among the 70 striped bass (105-141 mm FL) tested at temperatures below 10 C, the data were inadequate to determine effects of temperature on performance. Observations indicated specimens were under no stress.

Frequency of impingement varied between species and in some cases was a function of behavior. Mummichog and banded killifish occasionally "rested" on the screen surface and left at will regardless of intake velocity. Some species appeared to "play" with the functioning screen while others exhibited feeding behavior on and around the screen. A direct relationship between intake velocity and impingement was assumed but was not clearly exhibited. In at least two cases the inverse was true. Atlantic menhaden and spot sustained higher impingement rates at lower velocities.

A total of 1,318 specimens of 19 species was tested in the static mode. Only 20% of the 261 impingement occurrences failed to escape. The majority of screen interactions occurred at intake velocities in excess of 1 fps or after more than 10 min exposure time. Both values exceed the expected velocity (0.5 fps) and exposure time (1 min) for an intake. Mortality usually resulted after prolonged impingement and was primarily associated with weaker or more sensitive fishes. Handling stress was probably the most important factor in causing prolonged impingement. A total of 34 specimens died as a result of testing; most were in poor condition before the tests began.

Although impingement-induced mortality should be investigated, it is expected to be a minor factor in impact assessment for fish larger than 20 mm FL. Little or no loss of scales or other physical damage was incurred by specimens impinged for long durations. The only instances of screen-induced injury occurred during runs of striped bass larvae when specimens were wedged in the slot to the level of the opercles.

A total of 69 specimens of seven species (Atlantic menhaden, banded killifish, mummichog, tidewater silverside, Atlantic silverside, bluefish, and spot) was tested in dynamic mode. Channel and mean intake velocity ranged from 0.0 to 2.0 fps and 0.41 to 1.25 fps, respectively. Only three impingements occurred; the total time impinged was 5.0 seconds. Results and observations indicate impingement of longer than 5 seconds is not expected to occur.

Striped bass was the most extensively studied fish. The following discussion is based on its performance. Results of the other 18 species tested are also presented in Table 4.

A total of 648 specimens (8-151 mm FL) was exposed to mean intake velocities of 0.31-1.50 fps in static mode. The 77 impingement occurrences resulted in a relatively low susceptibility index of 0.0335.

In 1976, 533 specimens (8-151 mm FL) were exposed to intake velocities of 0.31-1.43 fps. Of the 58 impingements, 30 escaped. Most impingements (72.4%) occurred in three of the 22 tests at intake velocities greater than 0.90 fps. Two of these tests utilized specimens of 8-17 mm TL. All impingements of specimens greater than 17 mm FL occurred after 7 min of exposure time.

Refinement of procedure and technique during 1977 studies yielded more realistic results. Of the 115 specimens (14-46 mm FL) tested, 60 were hatchery-reared and had undergone earlier testing. Exposure to mean intake velocities of 0.5-1.5 fps resulted in a total of 19 impingement occurrences with 19 escapes. Most impingements lasted less than 1 second; the longest duration was 4 seconds (0.07 min). Hatchery-reared specimens suffered impingement at all velocities tested although most (69%) occurred at 1.0 fps. All impingements of wild specimens occurred at an intake velocity of 1.5 fps after 6 min of exposure.

Performance of test specimens was consistent with published swimming speed data. Skinner (1974) found 90% of the 40-50 mm striped bass tested could swim as long as 6 min in a current of 0.8 fps. Tatham (1970) reported 0.6-0.9 fps was the maximum swimming speed for 30-41 mm bass, 0.9-1.3 fps the maximum for 43-50 mm fish, and 1.1-1.2 fps the maximum for 50-63 mm fish. Tests by Bibko et al. (1974) indicated a sustained swim speed of 0.9-2.0 fps for 88.5-137.5 mm striped bass and 1.7-2.5 fps for 150.0-212.5 mm fish.

Exposure to the screen elicited a distinct and consistent behavior pattern Upon introduction to the test cage, one or two schools formed and milled about the lower half of the enclosure. When the pump started, specimens quickly fanned out along the midsection of the screen. Most remained 1-3 inches off the screen surface and oriented into the approach vector. As intake velocity was increased, specimens tended to move toward the distal end and farther from the screen surface (Fig. 6). Observation of fish activity and measurement of approach velocity indicates striped bass appeared to prefer velocities of 0.15-0.25 fps.

Most bass appeared unstressed during tests as evidenced by feeding behavior. Avoidance behavior consisted of rapid movement to areas of reduced current; some specimens eventually returned to the school, others remained in areas of reduced current. Impingement occurred when physical control was lost; impact usually occurred in the proximal half of the screen. Most impinged individuals escaped the screen at least once. Some specimens escaped the screen on the first attempt, others moved to the distal end and escaped. Less than 3.0% of the impinged bass suffered immediate mortality or equilibrium loss.

Tests in the dynamic mode indicated young striped bass were essentially invulnerable to screen interactions because of strong orientation to the bottom.

Detrital Fouling

A total of 29 trials was conducted with three concentrations of C&D Canal detritus and peat moss. A .040-inch slot, .120-inch wire screen was operated at a mean intake velocity of 0.4 fps; channel velocity ranged from 0.25 to 1.75 fps. Table 5 gives the mean TTC of the three concentrations tested at various channel currents. Values preceded by > indicate only 0.75-1.25 inch head loss at the time of termination.

Screens clogged relatively quickly in tests at ~~97~~ 77 times normal Canal concentration. Time-to-clog generally increased as channel velocity increased due to washing by the current. The greater TTC for tests at a 0.25-fps current compared to tests at 0.50 fps probably resulted from detritus settling to the bottom at the lower channel velocity.

Screen clogging patterns were similar at all channel velocities. The leading or upstream side of the screen impinged a 3-4 inch band of detritus along the length of the screen because of channel current. As the test progressed, detritus built up and the band spread in the proximal high intake velocity areas. At the same time, a 1-2 inch band formed on the trailing edge. Both bands continued to widen, particularly in proximal areas, until they met on the top and bottom of the screen. Spreading continued on the distal portion until the entire surface was covered. Although tests were terminated at a 12-inch head differential, the screen was still passing from 60 to 90% of its initial capacity.

Incorporation of a bubble curtain positioned to sweep the leading side of the screen increased TTC up to 3,000%. Many tests were terminated with essentially no increase in head.

As detrital concentration decreased, TTC generally increased. The suspended detrital concentration normally found in the C&D Canal is 9.46 cm^3/m^3. This load is not expected to clog a screen of this type under actual operating conditions. A model intake with a 30-inch diameter, 24-inch long screen (.040-inch slot and .158-inch wire), installed in the Canal in March 1977, has operated continuously at a 0.5-fps intake velocity with no head loss due to detrital clogging or fouling. The screen did clog (12-inch head loss) on several occasions during the summer months due to heavy biofouling.

Clogged screens were hydraulically backwashed as a matter of course before a fouling test was initiated. Water was pumped through the screen in a reverse flow at rates of 200-400 gpm. All flow rates tested were equally effective in removing material from the screen. This screen was generally free of debris after 15 seconds of backwashing.

Air/hydraulic backwash was investigated in greater detail. Six experiments were conducted with a mean intake velocity of 0.5 fps and three channel velocities (0.5, 1.0, and 1.5 fps). Air pressures of 10, 25, and 50 psi were tested. Comparisons of TTC for manual and air backwash are presented in Table 6.

Approximately 23 gallons of water were contained in parts of the air backwash system below water level. Release of compressed air flushed this water through the screen slot at a velocity of approximately 2 fps. The air blast reached the slots at 36.6% of initial pressure.

This system also cleaned the screen effectively. Cleaning action appeared to result from the water pushed out ahead of the pressurized air blast. Material was blown from all areas of the screen and although a small amount reimpinged on the leading edge, most was carried away by the channel current. Head differential consistently returned to initial levels after backwash.

CONCLUSIONS

Research has demonstrated profile wire screens have great potential as surface water intakes. Impact to the aquatic environment is expected to be many times less than that of a comparable intake protected by traveling screens. The ability to reduce entrainment and impingement results from the infinite number of escape routes available, flow dynamics which enable a fish to easily determine the direction of escape, the rapid decline in approach velocity as a fish leaves the screen, small slot size, and ambient washing currents which assist escape and avoidance. Impingement of fishes larger than 20 mm FL is virtually eliminated. The small slot width transforms most potential entrainment to impingement. As opposed to impingement on a traveling screen, fish never leave the water, are supported by a greater surface area, and can escape with less difficulty due to the low intake velocities and self-cleaning characteristics of the screen. Planktonic organisms are offered greater protection due to small slot size and boundary currents. Detrital fouling is greatly reduced and the screen can be quickly and easily cleaned. This system also eliminates disposal problems of impinged debris. Biofouling is a major operational problem in brackish and marine situations. Fouling organisms attach to and proliferate on the screen surface and ultimately require removal. The use of metals with antifouling properties to construct the screen should minimize this problem.

Profile wire screens are highly versitile and specialized installations can be engineered for most locations and conditions. Our studies were directed toward the protection of early life stages (eggs, larvae, and young) of striped bass in the C&D Canal. Results to date indicate this can be accomplished with little or no constraint on intake operation.

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Table 1

Summary of striped bass egg mortality due to impingement on a .020-inch slot Johnson screen at a 0.5-fps approach velocity.

Developmental Stage	Age (hr)	Diameter (mm)	Temperature (C)
Late gastrula-early embryo (LG-EE)	18.0-31.0	1.8-3.2	15.5-22.0
Tailbud-free (TBF)	21.5-22.0	2.1-2.4	22.0
Fully developed embryo (FDE)	36.0-38.0	2.0-2.7	20.5-21.0
Total	18.0-38.0	1.8-3.2	15.5-22.0

Devel. Stage	30-Second			60-Second			120-Second			Long-term	Totals			
	Test	Control	Differ.	Test	Control	Differ.	Test	Control	Differ.	Control*	Test	Control†	Differ.	All
LG-EE														
Trials	12	6	-	12	6	-	12	6	-	4	36	18	-	58
Dead n	54	22	-	40	17	-	29	16	-	24	123	55	-	202
% Dead	6.6	4.6	2.0	5.2	3.4	1.8	4.3	3.7	0.6	0.6	5.5	3.9	1.6	5.1
Total n	813	478	-	763	498	-	669	431	-	296	2,245	1,407	-	3,948
TBF														
Trials	2	1	-	2	1	-	2	1	-	1	6	3	-	10
Dead n	2	0	-	0	0	-	0	0	-	0	2	0	-	2
% Dead	1.1	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.3
Total n	188	76	-	131	88	-	116	62	-	118	435	226	-	779
FDE														
Trials	4	2	-	3	2	-	2	1	-	2	9	5	-	16
Dead n	2	1	-	2	0	-	0	0	-	3	4	1	-	8
% Dead	0.7	0.3	0.4	0.8	0.0	0.8	0.0	0.0	0.0	0.1	0.5	0.1	0.4	0.4
Total n	283	376	-	254	127	-	225	302	-	651	762	805	-	2,218
Totals														
Trials	18	9	-	17	9	-	16	8	-	7	51	26	-	84
Dead n	58	23	-	42	17	-	29	16	-	27	129	56	-	212
% Dead	4.5	2.5	2.0	3.7	2.4	1.3	2.9	2.0	0.9	0.1	3.7	2.3	1.4	3.1
Total n	1,284	930	-	1,148	713	-	1,010	795	-	1,065	3,442	2,438	-	6,945

*These eggs were held from 2.0 to 6.5 hr. Percentages are on a per hour basis for comparison.
†Does not include long-term controls.

Table 2

Performance of hatchery-reared striped bass larvae exposed to a .040-inch slot Johnson Screen. Ambient water temperature ranged from 13 to 19 C.

n	TL (mm)	Age (days)	₰ Intake Vel. (fps)	Est. % Ent. In 1 min	Min to 100% Entrained	Relative Resistance to Intake* Group	Relative Resistance to Intake* Individual†
50	5.2	4	0.20, 0.78	85	1.43	P	F
50	6.0-6.5	5	0.20	85	1.33	P	F
50	6.0-6.5	5	0.28	100	0.75	P	P
50	6.0-6.5	5	0.13	80	1.25	P	F
20	5.5-6.3	5	0.35	30	3.00	P	P
50	6.3-6.9	6	0.35	80	5.00	F	G
50	5.9-6.1	6	0.35	75	5.00	P	P
50	5.9-6.1	7	0.35	95	1.50	P	P
25	6.3-6.4	7	0.35	75	5.00	P	G
50	6.4	8	0.35	75	20.00	F	F
50	6.0-6.3	8	0.35	75	2.00	F	F
50	6.0-6.2	9	0.35	75	10.00	F	F
25	5.4-6.0	9	0.35	90	3.00	P	G
50	6.0-6.4	10	0.35	95	2.00	P	G
25	5.3-6.3	10	0.35	25	3.00	G	G
25	6.2-6.4	11	0.35	60	5.00	F	G
25	6.0-6.6	11	0.35	75	9.00	F	G
25	-	12	0.35	75	2.00	F	G
20	6.2-6.8	12	0.35	90	5.00	F	P
20	6.0-7.3	13	0.35	85	10.00	F	F
20	6.0-7.0	13	0.35	80	2.50	F	G
15	6.4-7.0	14	0.35	75	2.00	F	G
25	7.0-7.9	14	0.50	90	1.50	F	G
35	6.5-7.3	15	0.35	50	15.00	G	E
15	7.0-7.9	15	0.50	80	10.00	F	F
10	6.5-7.3	16	0.50	50	3.00	F	F
9	6.3-7.9	17	0.50	50	2.00	F	G
10	8.0-9.0	18	0.50	100	1.00	P	F
10	6.7-7.4	19	0.50	100	1.00	P	F
15	7.8-9.2	19	0.50	35	22.00	G	E
10	7.8-8.8	20	0.50	40	12.00	G	E

* P = Poor, F = Fair, G = Good, E = Excellent

† Rating of 10% of total.

Table 3
Performance of hatchery-reared striped bass larvae to .040-inch slot Johnson screens.
Ambient water temperature ranged from 19 to 24 C. Fish were held in a 500-gallon Bishop tank and a 425-gallon pool and fed freshwater invertebrates. Test duration was 30 min.

n	TL (mm)	Age (days)	X Intake Velocity (fps)	Est. Percent Entrained In First Min	Percent Entrained	Impingement Occurrences	Escapes	Fish-min	Relative Resistance to Intake* Group	Relative Resistance to Intake* Individual†
1	8.0-10.0	10-14	0.5	0	100††	3	3	0.03	-	E
10	9.8-10.9	18	0.5	0	30	3	0	24.90	G	E
10	8.6-11.2	18	1.0	30	50	10	7	107.89	P	G
10	8.3-12.4	19	1.0	0	10	11	4	160.14	P	E
2	13.0-15.4	19-23	0.5	0	0	6	4	53.54	-	G
7	10.3-10.9	24	0.5	0	43	3	3	0.67	G	G
7	8.3-12.1	26	0.5	0	0	0	-	-	E	E
11	8.4-13.6	29	0.5	0	18	1	0	29.23	G	E
11	9.8-14.5	30	1.0	0	9	20	20	0.26	G	E
11	12.5-16.1	30	1.5	0	0	24	22	45.93	G	G
10	13.0-17.0	32	1.0	0	0	4	4	0.07	E	E
10	13.0-17.0	32	1.5	0	0	8	8	0.07	E	E

* P = Poor; F = Fair; G = Good; E = Excellent
† Rated 10% of total.
†† Entrained in 25 min.

Table 4

Summary of performance of fishes exposed to Johnson screens in static and dynamic modes.
(I.O. = Impingement Occurrence.)

Species	n	FL (mm)	Temp. (C)	$\bar{X}$ Intake Velocity (fps)	I.O.	Escapes	Fish-min	Mean Impingement Dur. (min)	Suscept. Index
Alewife	37	37-65	17.0-24.0	0.50-1.50	0	-	-	-	0.0000
Atlantic menhaden	77	38-145	22.0-24.0	0.50-1.50	15	12	34.25	2.28	0.0164
Bay anchovy	68	25-71	22.0-27.0	0.50-1.50	85	73	214.95	2.53	0.1202
Carp	39	17-30	19.5-23.0	0.00-0.79	7	7	26.00	3.71	0.0118
Silvery minnow	4	30-31	17.0-21.0	0.50-1.50	0	-	-	-	0.0000
Golden shiner	14	35-56	12.5	0.21-1.42	0	-	-	-	0.0000
Spottail shiner	34	23-77	17.0-24.0	0.50-1.50	5	1	186.01	37.20	0.2989
Banded killifish	10	34-89	22.0-24.0	0.96-1.42	0	-	-	-	0.0000
Mummichog	7	37-75	22.5	0.98-1.42	0	-	-	-	0.0000
Tidewater silverside	44	27-81	20.0-24.0	0.41-1.50	3	3	0.29	0.06	0.0001
Atlantic silverside	136	34-95	22.0-26.0	0.50-1.50	7	7	0.09	0.01	T
Threespine stickleback	1	23	24.0	1.00	2	2	0.04	0.02	0.0013
White perch	96	21-41	17.0-24.0	0.50-1.50	24	24	4.79	0.20	0.0017
Striped bass	648	8-151	3.0-25.0	0.31-1.50	77	49	996.96	12.95	0.0335
Pumpkinseed	3	70-91	23.0	1.50	0	-	-	-	0.0000
Bluegill	30	25-98	11.0-23.0	0.20-1.50	0	-	-	-	0.0000
Yellow perch	18	34-40	17.0	0.50-1.50	0	-	-	-	0.0000
Bluefish	4	64-135	20.0-22.5	0.41-1.25	0	-	-	-	0.0000
Weakfish	53	31-93	24.0-25.0	0.50-1.50	13	13	0.70	0.05	0.0004
Spot	64	36-98	20.0-23.5	0.50-1.50	23	19	71.65	3.12	0.0427
Total	1,387	8-151	3.0-27.0	0.00-1.50	263	212	1,535.73	5.84	0.0250

T < 0.00005

Table 5
Mean time-to-clog (min) of a .040-inch slot
Johnson Screen exposed to three concentrations of detritus.
Mean intake velocity was 0.4 fps.

Channel Velocity (fps)	Ratio of Detrital Concentration to Normal C&D Canal Levels		
	~~14~~ 11	~~28~~ 22	~~97~~ 77
0.25	-	-	30.25
0.50	>240.00	48.41	26.33
0.75	200.00	-	43.06
1.00	>300.00	82.09	74.22
1.25	>315.00	310.61	315.00
1.50	>420.00	-	>240.00
1.75	-	-	>110.00

Table 6
Comparison of manual and air backwash cleaning efficiency based on time-to-clog (TTC) at a mean intake velocity of 0.5 fps for a .040-inch slot Johnson Screen.

Channel Velocity (fps)	Detritus Concentration (cm^3/m^3)	Air Pressure of Backwash (psi)	Number of Trials	Mean TTC (min)
0.5	~~130.5~~ 105.6	Manual	1	28.77
0.5	~~130.5~~ 105.6	10	2	30.33
1.0	~~130.5~~ 105.6	Manual	1	25.83
1.0	~~130.5~~ 105.6	10	2	25.38
1.5	~~261.0~~ 209.2	Manual	2	16.33
1.5	~~261.0~~ 209.2	10	3	14.48
1.5	~~261.0~~ 209.2	Manual	2	14.47
1.5	~~261.0~~ 209.2	25	4	13.22
1.5	~~261.0~~ 209.2	Manual	3	16.07
1.5	~~261.0~~ 209.2	25	4	14.32
1.5	~~261.0~~ 209.2	Manual	3	16.28
1.5	~~261.0~~ 209.2	50	3	15.32

Through a page numbering error, the next page number is 31. There is no page 30.

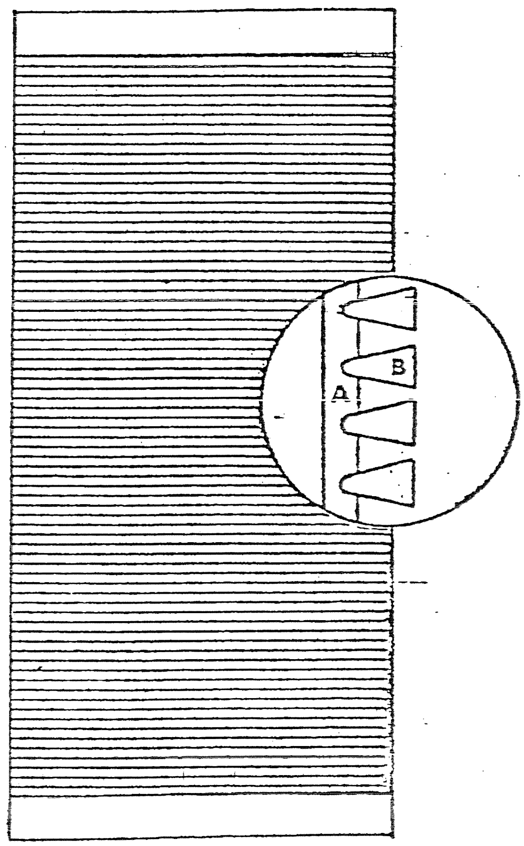

Figure 1. - Schematic diagram of a cylindrical Johnson screen with detailed enlargement showing profile shape of wire. The screen is constructed with a single continuous wrap of wire. A = Internal Support Rod, B = Wire.

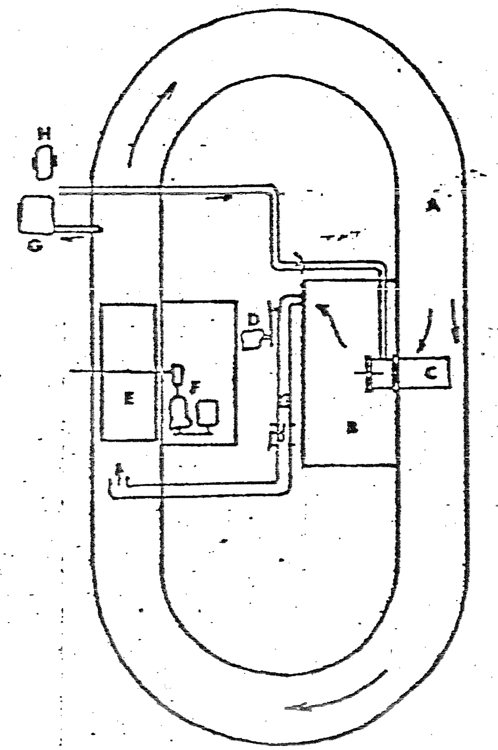

Figure 2. - Schematic diagram of the large flume. A = Channel, B = Sump, C = Screen, D = Intake Pump, E = Paddle Wheel, F = Paddle Wheel Drive, G = Hydraulic Backwash Pump, H = Air Compressor.

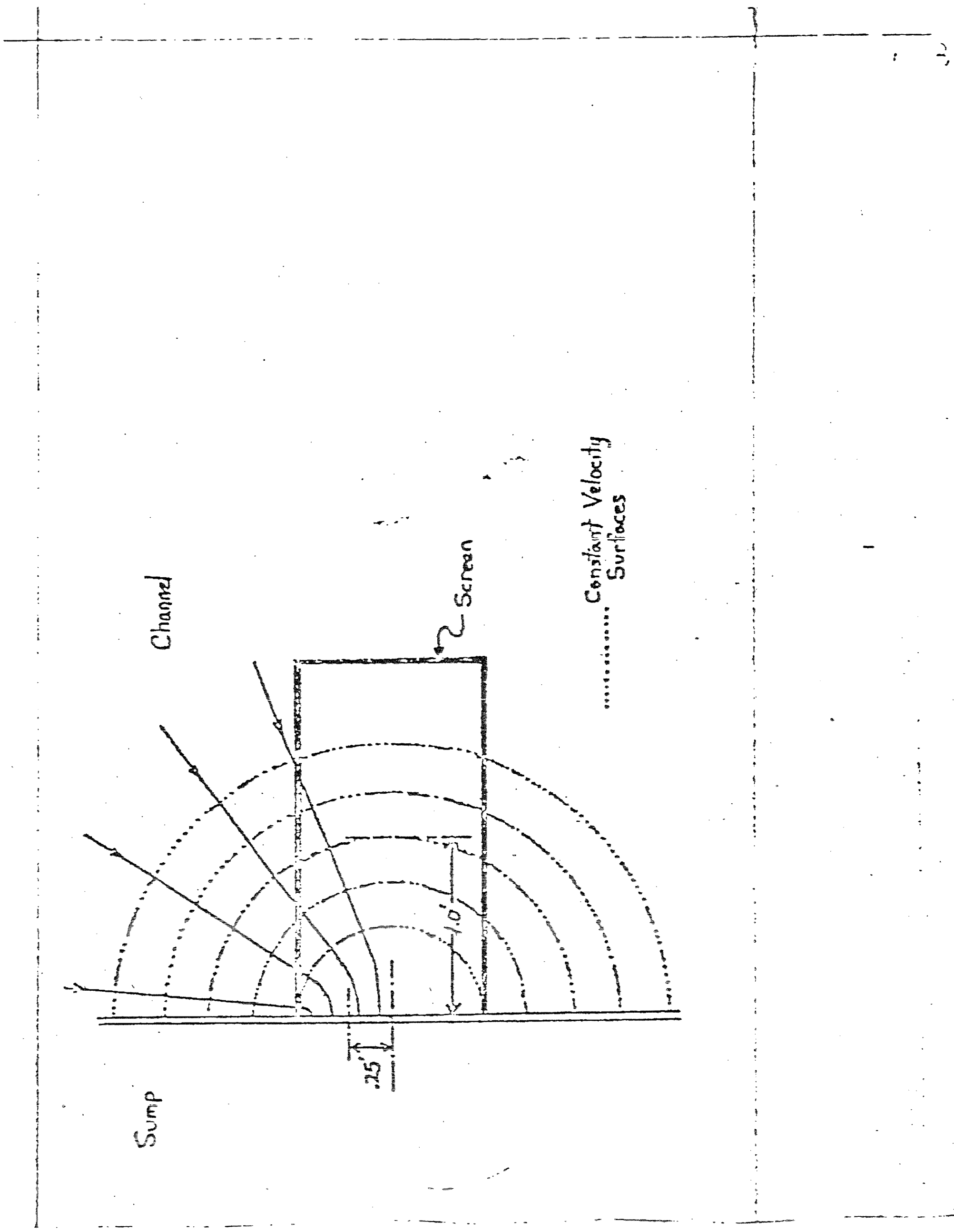

Figure 3. - Schematic diagram of flow patterns associated with a Johnson screen. (Provided by Lee Cook, Universal Oil Products).

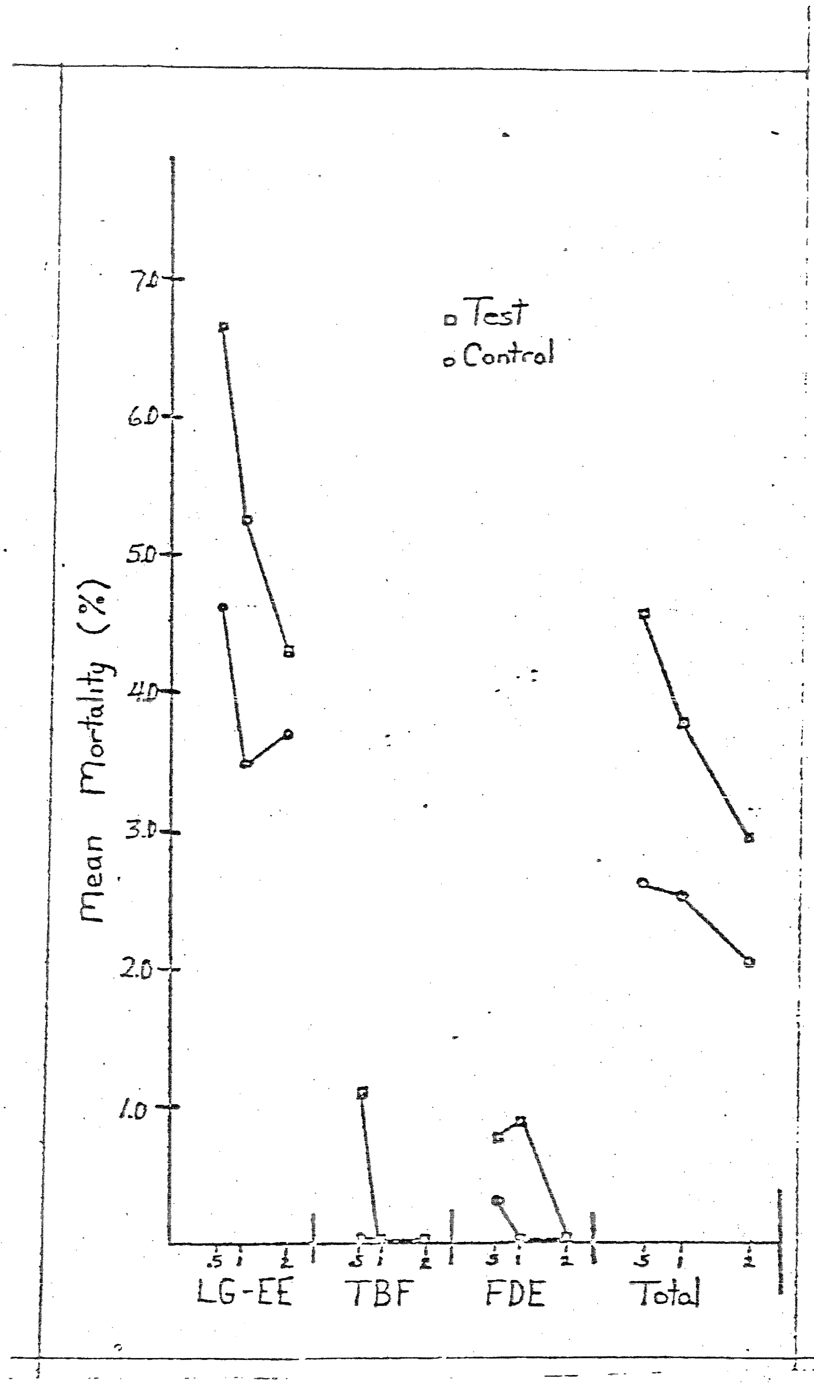

Figure 4. - Mean mortalities of striped bass eggs impinged on a .020-inch slot Johnson screen for 0.5, 1.0, and 2.0 min.

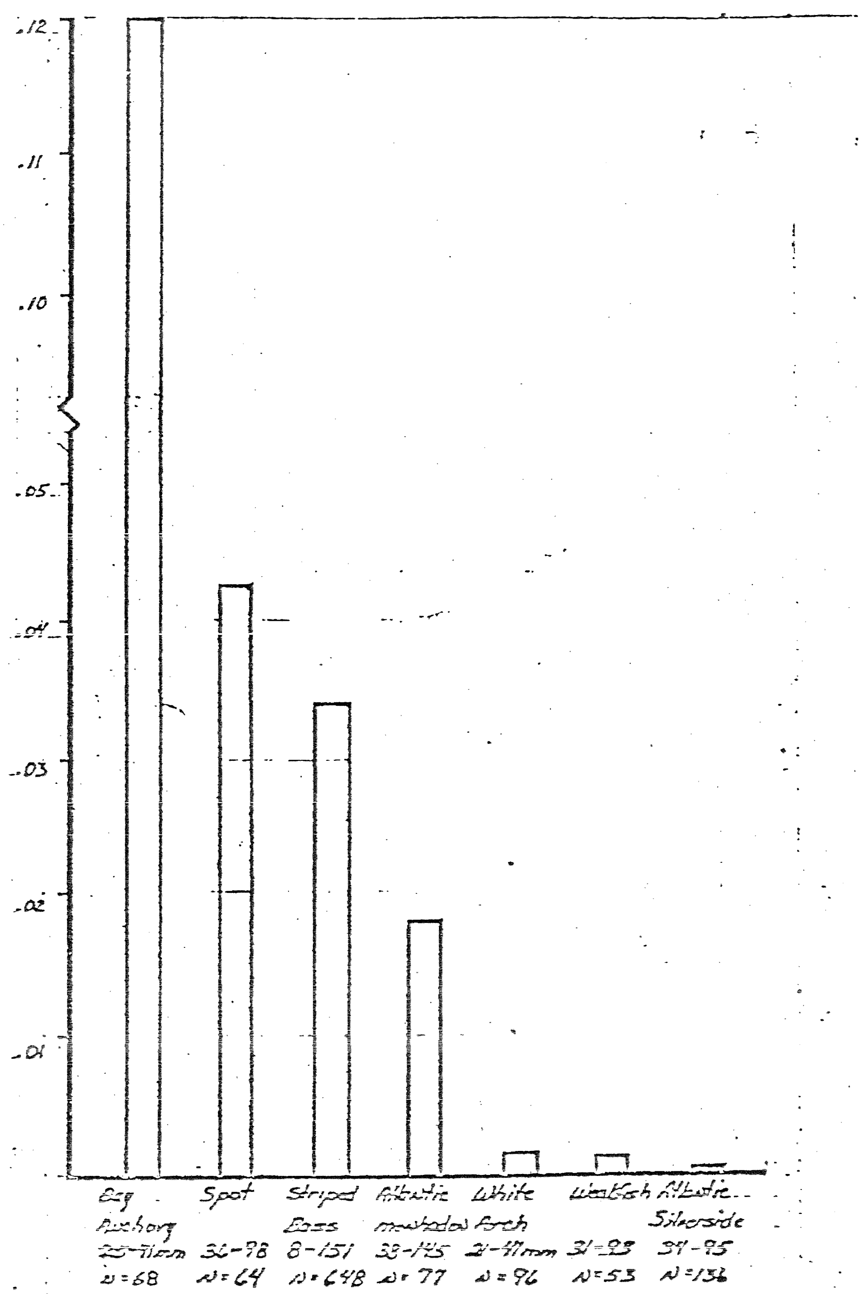

Figure 5. - Relative susceptibility indices for species tested (n >50).

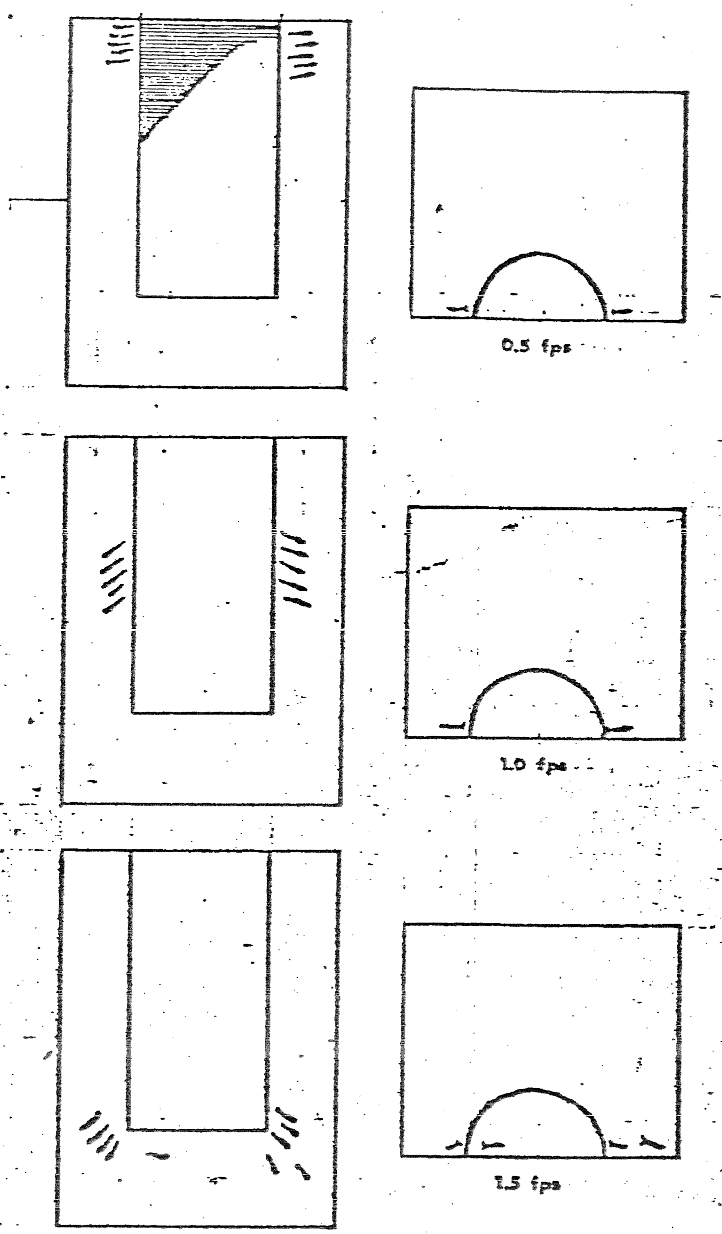

Figure 6. - General location and orientation of striped bass at three intake velocities.

Permit No. OK0035327
Application No. OK0035327

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et. seq; the "Act"),

Western Farmers Electric Cooperative
P. O. Box 429
Anadarko, Oklahoma 73005

is authorized to discharge from a facility located at

East of Hugo, Choctaw County, Oklahoma

to receiving waters named

the Red River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

This permit shall become effective on

This permit and the authorization to discharge shall expire at midnight,

Signed this day of

Howard G. Bergman
Director
Enforcement Division

EPA Form 3320-4 (10-73)

A-1 **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

During the period beginning effective date and lasting through the expiration date of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 002, process waste pond effluent

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)			
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow—m^3/Day (MGD)	N/A	N/A	(1.26)	(1.71)	Continuous	Record
Temperature	N/A	N/A	26.1°C(79°F)**	33.9°C(93°F)***	Continuous	Record
Total Suspended Solids	****	****	N/A	N/A	1/week	24-hr. Composite*****

** See Part III, Paragraph C.
*** Instantaneous maximum
**** Limits shall be computed for each month based on daily average flows of continuting waste source categories, See Part III, Paragraph H.
***** See Part III, Paragraph G.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored by continuous record

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Where the process waste pond discharges to the Red River

A-2 EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through the expiration of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 02A (Control point) water treatment plant sludge decant.
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Avg	Discharge Limitations kg/day (lbs/day) Daily Max	Other Units (Specify) Daily Avg	Other Units (Specify) Daily Max	Monitoring Requirements Measurement Frequency	Monitoring Requirements Sample Type
Flow—m^3/Day (MGD) **	N/A	N/A	(*)	N/A	Daily	Totalized
Oil and Grease	N/A	N/A	15 mg/l	20 mg/l	1/week	Grab

* Report
** Identified as source A, See Part III, paragraph H.

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Prior to mixing with other sources and/or release to the bottom ash pond.

A-3 **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

During the period beginning effective date and lasting through the expiration of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 02B (Control point) demineralizer regenerant.
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Avg	Daily Max	Other Units (Specify) Daily Avg	Daily Max	Monitoring Requirements Measurement Frequency	Sample Type
Flow—m^3/Day (MGD) **	N/A	N/A	(*)	N/A	Daily	Totalized
Oil and grease	N/A	N/A	15 mg/l	20 mg/l	1/week	Grab

* Report
** Identified as source B; See Part III, paragraph H.

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Prior to mixing with any other sources and/or release to the bottom ash pond.

A-4 EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through the expiration of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 02C (Control point) cooling tower blowdown.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day)		Other Units (Specify)		Monitoring Requirements	
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow—m^3/Day (MGD)**	N/A	N/A	(*)	N/A	Daily	Totalized
Free Available Chlorine Chlorine***	N/A	N/A	.2 mg/l	.5 mg/l	1/week	Grab

* Report
** Identified as source C; See Part III, paragraph H
*** See Part III, Paragraph D; limitations shall be representative of periods of chlorination

See Part III, Paragraph J

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Prior to mixing with any other sources and/or release to the bottom ash pond.

A-5 EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through the expiration of this permit. the permittee is authorized to discharge from outfall(s) serial number(s) 02D (Control point) boiler blowdown.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)		Measurement Frequency	Sample Type
	Daily Avg	Daily Max	Daily Avg	Daily Max		
Flow—m^3/Day (MGD)**	N/A	N/A	(*)	N/A	Daily	Totalized
Iron, Total	N/A	N/A	1 mg/l	1 mg/l	1/week	Grab
Copper, Total	N/A	N/A	1 mg/l	1 mg/l	1/week	Grab
Oil and Grease	N/A	N/A	15 mg/l	20 mg/l	1/week	Grab

* Report
** Identified as source D; see Part III, paragraph H.

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):
Prior to mixing with any other sources and/or release to the bottom ash pond.

A- 6 EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through the expiration of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 02E (Control point) plant drains

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)		Measurement Frequency	Sample Type
	Daily Avg	Daily Max	Daily Avg	Daily Max		
~~Flow~~-m^3/Day (MGD)**	N/A	N/A	(*)	N/A	Daily	Totalized
Oil and Grease	N/A	N/A	15 mg/l	20 mg/l	1/week	Grab

* Report
** Identified as source E; see Part III, pagragraph H.

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Prior to mixing with any other sources and/or release to the bottom ash pond.

A-7 **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

During the period beginning effective date and lasting through the expiration of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 02F (Control point) sanitary treatment wastes.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)			
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow—m^3/Day (MGD) **	N/A	N/A	(*)	N/A	Daily	Totalized
BOD_5	N/A	N/A	30 mg/l	45 mg/l	1/week	Grab
Total Suspended Solids	N/A	N/A	30 mg/l	45 mg/l	1/week	Grab

* Report
** Identified as source F; see Part III, paragraph H.

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Prior to mixing with any other sources and/or release to the bottom ash pond.

A-8 EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through the expiration of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 02G (Control point) air heater wash water.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)			
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow—m^3/Day (MGD)**	N/A	N/A	(*)	N/A	Daily	Totalized
Oil and Grease	N/A	N/A	15 mg/l	20 mg/l	1/week	Grab

* Report
** Identified as source G; see Part III, paragraph H.

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Prior to mixing with any other sources and/or release to the bottom ash pond.

A- 9 EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through the expiration of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 02H (Control point) bottom ash transport water.
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Avg	Daily Max	Other Units (Specify) Daily Avg	Daily Max	Monitoring Requirements Measurement Frequency	Sample Type
Flow—m^3/Day (MGD) **	N/A	N/A	(*)	N/A	Daily	Totalized
Oil and Grease	N/A	N/A	.75 mg/l***	1 mg/l***	1/week	Grab

* Report
** Identified as source H; see Part III, paragraph H.
*** or below level of detectability

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):
Prior to mixing with any other sources and/or release to the bottom ash pond.

A- 10 EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through the expiration of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 02I (Control point) holding pond discharge from coal pile and oil unloading area runoffs.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)			
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow—m^3/Day (MGD) **	N/A	N/A	(*)	N/A	Daily	Totalized

* Report

** Identified as source I; see Part III, paragraph H.

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Prior to mixing with any other sources and/or release to the bottom ash pond.

A-11 EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through the expiration of this permit the permittee is authorized to discharge from outfall(s) serial number(s) 02J (Control point) oil unloading area runoff.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)			
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	N/A	N/A	(*)	N/A	Daily	Estimate
Oil and Grease	N/A	N/A	15 mg/l	20 mg/l	1/week**	Grab

* Report
** During periods of runoff

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

Prior to discharge from the oil separator to the holding pond.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

   None

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

C. MONITORING AND REPORTING

1. *Representative Sampling*

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. *Reporting*

Monitoring results obtained during the previous 3 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on . Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

Mr. Howard G. Bergman, Director
Enforcement Division (6AE)
Environmental Protection Agency
First International Building
1201 Elm Street
Dallas, Texas 75270

Mr. Robert W. Radcliff, Exec. Director
Oklahoma Water Resources Board
Jim Thorpe Building (5th Floor)
Oklahoma City, Oklahoma 73105

3. *Definitions*

a. The "daily average" discharge means the total discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, the daily average discharge shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.

b. The "daily maximum" discharge means the total discharge by weight during any calendar day.

4. *Test Procedures*

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. *Recording of Results*

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses;

d. The analytical techniques or methods used; and

e. The results of all required analyses.

6. *Additional Monitoring by Permittee*

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. *Records Retention*

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

A. MANAGEMENT REQUIREMENTS

1. *Change in Discharge*

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. *Noncompliance Notification*

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

a. A description of the discharge and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. *Facilities Operation*

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. *Adverse Impact*

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. *Bypassing*

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Regional Administrator and the State in writing of each such diversion or bypass.

6. *Removed Substances*

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. *Power Failures*

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I,

b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. *Right of Entry*

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. *Transfer of Ownership or Control*

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. *Availability of Reports*

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. *Permit Modification*

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. *Toxic Pollutants*

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. *Civil and Criminal Liability*

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. *Oil and Hazardous Substance Liability*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. *State Laws*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. *Property Rights*

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. *Severability*

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PART III

OTHER REQUIREMENTS

A. There shall be no discharge of polychlorinated biphenyl transformer fluid.

B. The "daily average" concentration means the arithmetic average (weighted by flow value) of all the daily determinations of concentration made during a calendar month. Daily determinations of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the daily determination of concentration shall be the arithmetic average (weighted by flow value) of all the samples collected during that calendar day.

The "daily maximum" concentration means the daily determination of concentration for any calendar day.

C. Daily average temperature is defined as the flow weighted average temperature (FWAT) and shall be calculated and recorded on a daily 24-hour basis. FWAT shall be computed at equal time intervals not greater than two hours. The methods of calculating FWAT is as follows:

$$\text{FWAT} = \frac{\text{SUMMATION (INSTANTANEOUS FLOW X INSTANTANEOUS TEMPERATURE)}}{\text{SUMMATION (INSTANTANEOUS FLOW)}}$$

D. The term "free available chlorine" shall mean the value obtained using the amperometric tiration method for free available chlorine described in "Standard Methods for the Examination of Water and Wastewater," page 112 (13th edition).

Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the permittee can demonstrate to the permitting Agency that the units in a particular location cannot operate at or below the limitations specified in this permit.

E. As a provision of this permit, the applicant is subject to the requirements of section 316(b) of PL 95-217.

G. The term "24-hour composite sample" means a sample consisting of a minimum of eight samples of effluents collected at regular intervals over a normal operation day and combined proportional to flow, or a sample continuously collected proportional to flow over a normal operating day.

H. NEW SOURCE STANDARDS AND SUPPLEMENTARY CONTROLS

This facility is required to meet all standards which establish the quantity or quality of pollutants or pollutant properties for a new source facility as contained in 40 CFR 423.15. The permittee shall provide all necessary treatment and controls. All applicable new source limitations are applied at Outfall 002 (page 2) and prior control points. Additionally, standards are applied to control of thermal discharge at outfall 002 and to control of treated sanitary sewage effluents, at control point 02F.

Combined waste treatment and discharge are allowed for control of total suspended solids and pH in accordance with 40 CFR 423.15(k). 40 CFR 423.15(i) does not address limitations for total suspended solids in cooling tower blowdown. These pollutants, present in intake, do not qualify for net or pass-through in accordance with 40 CFR 125.28 and are limited accordingly.

Flow monitoring or totalizing methods shall be provided for all sources for which combined waste treatment is provided. Methods which are implemented shall accurately identify the flow contributions of each source to within an accuracy of 10%. Daily average flow for each source shall be reported supplementary to DMR's for each month.

Discharge limitations for each month shall be computed and included on the DMR for outfall 002 as follows:

Total Suspended Solids

Daily average lbs/day = (A+B+C+D+E+F+G) (8.34)(30) +(H)(8.34)(1.5) + (I)(8.34)(50)

Daily maximum lbs/day = (A+B+C+D+E+G)(8.34)(100) + (F)(8.34)(45) + (H)(8.34)(5) +(I)(8.34)(50)

I. If cooling tower design incorporates the use of any asbestos construction materials, this permit will be reevaluated to consider the application of appropriate asbestos limitations.

J. Materials shall not be added to cooling towers for corrosion inhibition and control. This requirements includes but is not limited to the use of zinc, chromium and phosphorous for corrosion inhibition.

K. This permit may be modified, or alternatively, revoked and reissued, to comply with any applicable effluent limitation issued pursuant to the order the United States District Court for the District of Columbia issued on June 8, 1976, in Natural Resources Defense Council, Inc. et. al. v. Russell E. Train, 8 ERC 2120 (D.D.C. 1976), if the effluent limitation so issued:

(1) is different in conditions or more stringent than any effluent limitation in the permit; or

(2) controls any pollutant not limited in the permit.

FOR AGENCY USE

STANDARD FORM C – MANUFACTURING AND COMMERCIAL

SECTION II. BASIC DISCHARGE DESCRIPTION

Complete this section for each discharge indicated in Section I, Item 9, that is to surface waters. This includes discharges to municipal sewerage systems in which the wastewater does not go through a treatment works prior to being discharged to surface waters. Discharges to wells must be described where there are also discharges to surface waters from this facility. SEPARATE DESCRIPTIONS OF EACH DISCHARGE ARE REQUIRED EVEN IF SEVERAL DISCHARGES ORIGINATE IN THE SAME FACILITY. All values for an existing discharge should be representative of the twelve previous months of operation. If this is a proposed discharge, values should reflect best engineering estimates.

ADDITIONAL INSTRUCTIONS FOR SELECTED ITEMS APPEAR IN SEPARATE INSTRUCTION BOOKLET AS INDICATED. REFER TO BOOKLET BEFORE FILLING OUT THESE ITEMS.

1. Discharge Serial No. and Name
   a. Discharge Serial No. (see instructions) — 201a — 002
   b. Discharge Name Give name of discharge, if any. (see instructions) — 201b — Plant Operating Effluent
   c. Previous Discharge Serial No. If previous permit application was made for this discharge (see Item 4, Section I), provide previous discharge serial number. — 201c — N.A.
2. Discharge Operating Dates
   a. Discharge Began Date If the discharge described below is in operation, give the date (within best estimate) the discharge began. — 202a — N.A. YR MO
   b. Discharge to Begin Date If the discharge has never occurred but is planned for some future date, give the date (within best estimate) the discharge will begin. — 202b — 81 YR MO
   c. Discharge to End Date If discharge is scheduled to be discontinued within the next 5 years, give the date (within best estimate) the discharge will end. — 202c — N.A. YR MO
3. Engineering Report Available Check if an engineering report is available to reviewing agency upon request. (see instructions) — 203 — ☒ Environmental Impact Statement (EIS) with Attachments available through REA, Wash., D.C.
4. Discharge Location Name the political boundaries within which the point of discharge is located.

			Agency Use
State	204a	Oklahoma	204d
County	204b	Choctaw	204e
(if applicable) City or Town	204c	N.A.	204f

5. Discharge Point Description Discharge is into (check one): (see instructions) — 205a
   - Stream (includes ditches, arroyos, and other intermittent watercourses) ☒ STR
   - Lake ☐ LKE
   - Ocean ☐ OCE
   - Municipal Sanitary Wastewater Transport System ☐ MTS
   - Municipal Combined Sanitary and Storm Transport System ☐ MCS

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Municipal Storm Water Transport System ☐ STS

Well (Injection) ☐ WEL

Other ☐ OTH

If 'other' is checked, specify — 205b ____

6. Discharge Point — Lat/Long Give the precise location of the point of discharge to the nearest second.

Latitude — 206a 33 DEG 57 MIN 49 SEC

Longitude — 206b 95 DEG 13 MIN 43 SEC

7. Discharge Receiving Water Name Name the waterway at the point of discharge.(see instructions) — 207a Red River

If the discharge is through an outfall that extends beyond the shoreline or is below the mean low water line, complete Item 8.

207b For Agency Use

Major	Minor	Sub

207c

For Agency Use 303e

8. Offshore Discharge

a. Discharge Distance from Shore — 208a N.A. feet

b. Discharge Depth Below Water Surface — 208b ____ feet

9. Discharge Type and Occurrence

a. Type of Discharge Check whether the discharge is continuous or intermittent. (see instructions) — 209a ☒ (con) Continuous ☐ (int) Intermittent

b. Discharge Occurrence Days per Week Enter the average number of days per week (during periods of discharge) this discharge occurs. — 209b 7 days per week

c. Discharge Occurrence — Months If this discharge normally operates (either intermittently, or continuously) on less than a year-around basis (excluding shutdowns for routine maintenance), check the months during the year when the discharge is operating. (see instructions) — 209c

☒ JAN ☒ FEB ☒ MAR ☒ APR

☒ MAY ☒ JUN ☒ JUL ☒ AUG

☒ SEP ☒ OCT ☒ NOV ☒ DEC

Complete Items 10 and 11 if "intermittent" is checked in Item 9.a. Otherwise, proceed to Item 12.

10. Intermittent Discharge Quantity State the average volume per discharge occurrence in thousands of gallons. — 210 N.A. thousand gallons per discharge occurrence.

11. Intermittent Discharge Duration and Frequency

a. Intermittent Discharge Duration Per Day State the average number of hours per day the discharge is operating. — 211a N.A. hours per day

b. Intermittent Discharge Frequency State the average number of discharge occurrences per day during days when discharging. — 211b ____ discharge occurrences per day

12. Maximum Flow Period Give the time period in which the maximum flow of this discharge occurs. — 212 From July (month) to Aug (month)

FOR AGENCY USE

13. Activity Description Give a narrative description of activity producing this discharge.(see instructions)

213a

Production of electricity from coal; Specific discharge - causing activities are as follows:

a) Demineralizer regenerant
b) Bottom ash transport water
c) Plant drains
d) Boiler Blowdown
e) Coal pile runoff
f) Air heater wash water
g) Cooling Tower Blowdown
h) Oil Unloading Area Runoff
i) Boiler Cleaning Waste
j) Water Treatment Plant Sludge Decant
k) Sanitary Water Usage

14. Activity Causing Discharge For each SIC Code which describes the activity causing this discharge, supply the type and maximum amount of either the raw material consumed (Item 14a) or the product produced (Item 14b) in the units specified in Table I of the Instruction Booklet. For SIC Codes not listed in Table I, use raw material or production units normally used for measuring production.(see instructions)

a. Raw Materials

214a	SIC Code (1)	Name (2)	Maximum Amount/Day (3)	Unit (See Table I) (4)	Shared Discharges (Serial Number) (5)
	4911	Coal	6138 TPD		001

b. Products

214b	SIC Code (1)	Name (2)	Maximum Amount/Day (3)	Unit (See Table I) (4)	Shared Discharges (Serial Number) (5)
	4911	Electric Power	0.4	1,000 MWd	001

FOR AGENCY USE

15. **Waste Abatement**

a. Waste Abatement Practices
Describe the waste abatement practices used on this discharge with a brief narrative. (see instructions)

215a

Narrative: (1) Bottom ash and process waste ponds used for sedimentation, equalization, neutralization, and temperature control. (2) Stormwater runoff treated by sedimentation and neutralization in separate run-off ponds sized to hold 10 yr-24 hr storm. (3) Plant drains wastes and oil unloading area runoff treated in API separators prior to discharge to bottom ash pond. Sanitary wastes treated to "Secondary Treatment Standards" prior to discharge to bottom ash pond.

b. Waste Abatement Codes
Using the codes listed in Table II of the Instruction Booklet, describe the waste abatement processes for this discharge in the order in which they occur if possible.

215b

(5)

(1) ESEPAR,	(2) ESEGRE,	(3) EPUMPS,
(4) PHYSIC,	(5) RECOVE,	(6) RECYCL,
(7) LOCALS,	(8) OMONIT,	(9) PEQUAL,
(10) PSEDIM,	(11) PTEMPE,	(12) PSKIMC,
(13) PSEPAR,	(14) CNEUTR,	(15) CPHADJ,
(16) BAERAT,	(17) ,	(18) ,
(19) ,	(20) ,	(21) ,
(22) ,	(23) ,	(24) ,
(25) .		

FOR AGENCY USE

16. Wastewater Characteristics

Check the box beside each constituent which is present in the effluent (discharge water). This determination is to be based on actual analysis or best estimate.(see instructions)

Parameter 216	Present	Parameter 216	Present
Color 00080	X	Copper 01042	X
Ammonia 00610		Iron 01045	X
Organic nitrogen 00605		Lead 01051	
Nitrate 00620	X	Magnesium 00927	X
Nitrite 00615		Manganese 01055	
Phosphorus 00665	X	Mercury 71900	
Sulfate 00945	X	Molybdenum 01062	
Sulfide 00745		Nickel 01067	
Sulfite- 00740		Selenium 01147	
Bromide 71870		Silver 01077	
Chloride 00940	X	Potassium 00937	X
Cyanide 00720		Sodium 00929	X
Fluoride 00951		Thallium 01059	
Aluminum 01105		Titanium 01152	
Antimony 01097		Tin 01102	
Arsenic 01002		Zinc 01092	
Beryllium 01012		Algicides* 74051	
Barium 01007		Chlorinated organic compounds* 74052	
Boron 01022		Pesticides* 74053	
Cadmium 01027		Oil and grease 00550	X
Calcium 00916	X	Phenols 32730	
Cobalt 01037		Surfactants 38260	
Chromium 01034		Chlorine 50060	X
Fecal coliform bacteria 74055	X	Radioactivity* 74050	

*Specify substances, compounds and/or elements in Item 26.

Pesticides (insecticides, fungicides, and rodenticides) must be reported in terms of the acceptable common names specified in *Acceptable Common Names and Chemical Names for the Ingredient Statement on Pesticide Labels*, 2nd Edition, Environmental Protection Agency, Washington, D.C. 20250, June 1972, as required by Subsection 162.7(b) of the Regulations for the Enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act.

FOR AGENCY USE

17. Description of Intake and Discharge

For each of the parameters listed below, enter in the appropriate box the value or code letter answer called for.(see instructions)

In addition, enter the parameter name and code and all required values for any of the following parameters if they were checked in item 16; ammonia, cyanide, aluminum, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, phenols, oil and grease, and chlorine (residual).

Parameter and Code 217a	Influent		Effluent					
	Untreated Intake Water (Daily Average) (1)	In-Plant Treated Intake Water (Daily Average) (2)	Daily Average (3)	Minimum Value Observed or Expected During Discharge Activity (4)	Maximum Value Observed or Expected During Discharge Activity (5)	Frequency of Analysis (6)	Number of Analyses (7)	Sample Type (8)
Flow* Gallons per day 00056	5,990,000	5,990,000	1,260,000	380,000	1,710,000	ESTIMATED		
pH Units 00400	7.3	8.0		6.5	8.5	ESTIMATED		
Temperature (winter) °F 74028	41	41	42	39	55	ESTIMATED		
Temperature (summer) °F 74027	79	79	79	71	93	ESTIMATED		
Biochemical Oxygen Demand (BOD 5-day) mg/l 00310	7	7	8	3	12	ESTIMATED		
Chemical Oxygen Demand (COD) mg/l 00340	20	20	NO DATA	FOR ESTIMATION		ESTIMATED		
Total Suspended (nonfilterable) Solids mg/l 00530	44	20	30	20	100*	ESTIMATED		
Specific Conductance micromhos/cm at 25° C 00095	69	69		740	2870	ESTIMATED		
Settleable Matter (residue) ml/l 00545	NO DATA FOR ESTIMATION.							

*Other discharges sharing intake flow (serial numbers).(see instructions)

*Coal pile and oil unloading area runoff flows will be diverted into retention pond sized to retain 10 yr-24 hr storm flow. Suspended solids will be monitored and maintained less than 50 mg/l prior to diverting to bottom ash pond. Suspended solids in the sanitary treatment effluent will be monitored and maintained less than "secondary treatment standards."

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7. (Cont'd.)

Parameter and Code 217a	Influent: Untreated Intake Water (Daily Average) (1)	Influent: In-Plant Treated Intake Water (Daily Average) (2)	Effluent: Daily Average (3)	Effluent: Minimum Value Observed or Expected During Discharge Activity (4)	Effluent: Maximum Value Observed or Expected During Discharge Activity (5)	Effluent: Frequency of Analysis (6)	Effluent: Number of Analyses (7)	Effluent: Sample Type (8)

(1) Any parameter present will be discharged in quantities in compliance with all state and federal standards.

(2) Parameters not listed as present may be added from plant operations. Do not know what additional parameters will be added or in what quantities they will be added prior to plant operation. The permit application will be amended following plant start-up to reflect the actual effluent quality. Values listed as estimates in Item 17 will be amended with actual effluent data for the parameters listed.

18. Plant Controls Check if the following plant controls are available for this discharge. (218)

Alternate power source for major pumping facility. ☐ APS

Alarm or emergency procedure for power or equipment failure ☐ ALM

Complete Item 19 if discharge is from cooling and/or steam water generation and water treatment additives are used.

19. Water Treatment Additives If the discharge is treated with any conditioner, inhibitor, or algicide, answer the following:

a. Name of Material(s) (219a): (a.1) Sulfuric acid and chlorine added to cooling water for algae control.

(a.2) Ferric chloride, polymer and lime added in in-plant water treatment plant.

b. Name and address of manufacturer (219b):

c. Quantity (pounds added per million gallons of water treated). (219c): Ferric Chloride = 0.28 lbs/1000 gal treated, polymer = 0.017 lbs/1000 gal treated.

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d. Chemical composition of these additives (see instructions). 219d ______________________

Complete Items 20-25 if there is a thermal discharge (e.g., associated with a steam and/or power generation plant, steel mill, petroleum refinery, or any other manufacturing process) and the total discharge flow is 10 million gallons per day or more. (see instructions)

20. Thermal Discharge Source Check the appropriate item(s) indicating the source of the discharge. (see instructions) 220

- Boiler Blowdown ☐ BLBD
- Boiler Chemical Cleaning ☐ BCCL
- Ash Pond Overflow ☐ APOF
- Boiler Water Treatment — Evaporator Blowdown ☐ EPBD
- Oil or Coal Fired Plants — Effluent from Air Pollution Control Devices ☐ OCPP
- Condense Cooling Water ☐ COND
- Cooling Tower Blowdown ☐ CTBD
- Manufacturing Process ☐ MFPR
- Other ☐ OTHR

21. Discharge/Receiving Water Temperature Difference

Give the maximum temperature difference between the discharge and receiving waters for summer and winter operating conditions. (see instructions)

Summer 221a ______ °F.

Winter 221b ______ °F.

22. Discharge Temperature, Rate of Change Per Hour 222 ______ °F./hour

Give the maximum possible rate of temperature change per hour of discharge under operating conditions. (see instructions)

23. Water Temperature, Percentile Report (Frequency of Occurrence)

In the table below, enter the temperature which is exceeded 10% of the year, 5% of the year, 1% of the year and not at all (maximum yearly temperature). (see instructions)

Frequency of occurrence

		10%	5%	1%	Maximum
a. Intake Water Temperature (Subject to natural changes)	223a	°F	°F	°F	°F
b. Discharge Water Temperature	223b	°F	°F	°F	°F

24. Water Intake Velocity (see instructions) 224 ______ feet/sec.

25. Retention Time Give the length of time, in minutes, from start of water temperature rise to discharge of cooling water. (see instructions) 225 ______ minutes

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DISCHARGE SERIAL NUMBER

FOR AGENCY USE

26. Additional Information

226

Item	Information
6, 17	Information concerning construction runoff volume(s) and location(s) will be submitted following completion of site grading plans. This should be submitted in the fall of 1978. Runoff effluent quality to be in compliance with all federal and state standards.

FOR AGENCY USE

STANDARD FORM C — MANUFACTURING AND COMMERCIAL

SECTION II. BASIC DISCHARGE DESCRIPTION

Complete this section for each discharge indicated in Section I, Item 9, that is to surface waters. This includes discharges to municipal sewerage systems in which the wastewater does not go through a treatment works prior to being discharged to surface waters. Discharges to wells must be described where there are also discharges to surface waters from this facility. SEPARATE DESCRIPTIONS OF EACH DISCHARGE ARE REQUIRED EVEN IF SEVERAL DISCHARGES ORIGINATE IN THE SAME FACILITY. All values for an existing discharge should be representative of the twelve previous months of operation. If this is a proposed discharge, values should reflect best engineering estimates.

ADDITIONAL INSTRUCTIONS FOR SELECTED ITEMS APPEAR IN SEPARATE INSTRUCTION BOOKLET AS INDICATED. REFER TO BOOKLET BEFORE FILLING OUT THESE ITEMS.

1. Discharge Serial No. and Name
   a. Discharge Serial No. (see instructions) — 201a: 001
   b. Discharge Name. Give name of discharge, if any. (see instructions) — 201b: Construction Runoff Effluent
   c. Previous Discharge Serial No. If previous permit application was made for this discharge (see Item 4, Section I), provide previous discharge serial number. — 201c: N.A.

2. Discharge Operating Dates
   a. Discharge Began Date. If the discharge described below is in operation, give the date (within best estimate) the discharge began. — 202a: N.A. YR MO
   b. Discharge to Begin Date. If the discharge has never occurred but is planned for some future date, give the date (within best estimate) the discharge will begin. — 202b: 78 YR 9 MO
   c. Discharge to End Date. If discharge is scheduled to be discontinued within the next 5 years, give the date (within best estimate) the discharge will end. — 202c: 81 YR MO

3. Engineering Report Available. Check if an engineering report is available to reviewing agency upon request. (see instructions) — 203: ☒ Environmental Impact Statement (EIS) with attachments available through Rural Electrification Administration, Washington, D.C.

4. Discharge Location. Name the political boundaries within which the point of discharge is located.

			Agency Use
State	204a	Oklahoma	204d
County	204b	Choctaw	204e
(If applicable) City or Town	204c	N.A.	204f

5. Discharge Point Description. Discharge is into (check one): (see instructions) — 205a

- Stream (includes ditches, arroyos, and other intermittent watercourses) ☒ STR
- Lake ☐ LKE
- Ocean ☐ OCE
- Municipal Sanitary Wastewater Transport System ☐ MTS
- Municipal Combined Sanitary and Storm Transport System ☐ MCS

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Municipal Storm Water Transport System — ☐ STS

Well (Injection) — ☐ WEL

Other — ☐ OTH

If 'other' is checked, specify — 205b ______

6. **Discharge Point — Lat/Long** Give the precise location of the point of discharge to the nearest second.

See Item 26.

Latitude — 206a ____DEG ____MIN ____SEC

Longitude — 206b ____DEG ____MIN ____SEC

7. **Discharge Receiving Water Name** Name the waterway at the point of discharge.(see instructions)

207a Bird Creek to Kiamichi River

If the discharge is through an outfall that extends beyond the shoreline or is below the mean low water line, complete Item 8.

207b

For Agency Use		
Major	Minor	Sub

207c

For Agency Use
303e

8. **Offshore Discharge**

   a. **Discharge Distance from Shore** — 208a N.A. ______feet

   b. **Discharge Depth Below Water Surface** — 208b ______feet

9. **Discharge Type and Occurrence**

   a. **Type of Discharge** Check whether the discharge is continuous or intermittent. (see instructions) — 209a N.A.
   ☐ (con) Continuous
   ☐ (int) Intermittent

   b. **Discharge Occurrence Days per Week** Enter the average number of days per week (during periods of discharge) this discharge occurs. — 209b __days per week

   c. **Discharge Occurrence — Months** If this discharge normally operates (either intermittently, or continuously) on less than a year-around basis (excluding shutdowns for routine maintenance), check the months during the year when the discharge is operating. (see instructions) — 209c

☐ JAN ☐ FEB ☐ MAR ☐ APR
☐ MAY ☐ JUN ☐ JUL ☐ AUG
☐ SEP ☐ OCT ☐ NOV ☐ DEC

Complete Items 10 and 11 if "intermittent" is checked in Item 9.a. Otherwise, proceed to Item 12.

10. **Intermittent Discharge Quantity** State the average volume per discharge occurrence in thousands of gallons. — 210 N.A. ______thousand gallons per discharge occurrence.

11. **Intermittent Discharge Duration and Frequency**

   a. **Intermittent Discharge Duration Per Day** State the average number of hours per day the discharge is operating. — 211a N.A. hours per day

   b. **Intermittent Discharge Frequency** State the average number of discharge occurrences per day during days when discharging. — 211b N.A. discharge occurrences per day

12. **Maximum Flow Period** Give the time period in which the maximum flow of this discharge occurs. — 212 N.A. From ____ to ____ (month) (month)

FOR AGENCY USE

13. **Activity Description** Give a narrative description of activity producing this discharge.(see instructions)

213a Plant Construction

14. **Activity Causing Discharge** For each SIC Code which describes the activity causing this discharge, supply the type and maximum amount of either the raw material consumed (Item 14a) or the product produced (Item 14b) in the units specified in Table I of the instruction Booklet. For SIC Codes not listed in Table I, use raw material or production units normally used for measuring production.(see instructions)

N.A.

a. Raw Materials

	SIC Code	Name	Maximum Amount/Day	Unit (See Table I)	Shared Discharges (Serial Number)
214a	(1)	(2)	(3)	(4)	(5)

b. Products

	SIC Code	Name	Maximum Amount/Day	Unit (See Table I)	Shared Discharges (Serial Number)
214b	(1)	(2)	(3)	(4)	(5)

FOR AGENCY USE

15. Waste Abatement

a. Waste Abatement Practices
Describe the waste abatement practices used on this discharge with a brief narrative. (see instructions)

215a Narrative: Construction Runoff Ponds

b. Waste Abatement Codes
Using the codes listed in Table II of the Instruction Booklet, describe the waste abatement processes for this discharge in the order in which they occur if possible.

215b
(1) PEQUAL, (2) PSEDIM, (3) ____,
(4) ____, (5) ____, (6) ____,
(7) ____, (8) ____, (9) ____,
(10) ____, (11) ____, (12) ____,
(13) ____, (14) ____, (15) ____,
(16) ____, (17) ____, (18) ____,
(19) ____, (20) ____, (21) ____,
(22) ____, (23) ____, (24) ____,
(25) ____.

FOR AGENCY USE

16. Wastewater Characteristics N.A.

Check the box beside each constituent which is present in the effluent (discharge water). This determination is to be based on actual analysis or best estimate.(see instructions)

Parameter 216	Present	Parameter 216	Present
Color 00080		Copper 01042	
Ammonia 00610		Iron 01045	
Organic nitrogen 00605		Lead 01051	
Nitrate 00620		Magnesium 00927	
Nitrite 00615		Manganese 01055	
Phosphorus 00665		Mercury 71900	
Sulfate 00945		Molybdenum 01062	
Sulfide 00745		Nickel 01067	
Sulfite 00740		Selenium 01147	
Bromide 71870		Silver 01077	
Chloride 00940		Potassium 00937	
Cyanide 00720		Sodium 00929	
Fluoride 00951		Thallium 01059	
Aluminum 01105		Titanium 01152	
Antimony 01097		Tin 01102	
Arsenic 01002		Zinc 01092	
Beryllium 01012		Algicides* 74051	
Barium 01007		Chlorinated organic compounds* 74052	
Boron 01022		Pesticides* 74053	
Cadmium 01027		Oil and grease 00550	
Calcium 00916		Phenols 32730	
Cobalt 01037		Surfactants 38260	
Chromium 01034		Chlorine 50060	
Fecal coliform bacteria 74055		Radioactivity* 74050	

*Specify substances, compounds and/or elements in Item 26.

Pesticides (insecticides, fungicides, and rodenticides) must be reported in terms of the acceptable common names specified in *Acceptable Common Names and Chemical Names for the Ingredient Statement on Pesticide Labels,* 2nd Edition, Environmental Protection Agency, Washington, D.C. 20250, June 1972, as required by Subsection 162.7(b) of the Regulations for the Enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act.

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Description of Intake and Discharge

For each of the parameters listed below, enter in the appropriate box the value or code letter answer called for.(see instructions)

In addition, enter the parameter name and code and all required values for any of the following parameters if they were checked in Item 16; ammonia, cyanide, aluminum, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, phenols, oil and grease, and chlorine (residual).

Parameter and Code 217a	Influent		Effluent					
	Untreated Intake Water (Daily Average) (1)	In-Plant Treated Intake Water (Daily Average) (2)	Daily Average (3)	Minimum Value Observed or Expected During Discharge Activity (4)	Maximum Value Observed or Expected During Discharge Activity (5)	Frequency of Analysis (6)	Number of Analyses (7)	Sample Type (8)
Flow* Gallons per day 00056	See	Item 26.						
pH Units 00400								
Temperature (winter) °F 74028								
Temperature (summer) °F 74027								
Biochemical Oxygen Demand (BOD 5-day) mg/l 00310								
Chemical Oxygen Demand (COD) mg/l 00340								
Total Suspended (nonfilterable) Solids mg/l 00530								
Specific Conductance micromhos/cm at 25° C 00095								
Settleable Matter (residue) ml/l 00545								

*Other discharges sharing intake flow (serial numbers).(see instructions)

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17. (Cont'd.)

Parameter and Code 217a	Influent		Effluent					
	Untreated Intake Water (Daily Average) (1)	In-Plant Treated Intake Water (Daily Average) (2)	Daily Average (3)	Minimum Value Observed or Expected During Discharge Activity (4)	Maximum Value Observed or Expected During Discharge Activity (5)	Frequency of Analysis (6)	Number of Analyses (7)	Sample Type (8)

18. Plant Controls Check if the following plant controls are available for this discharge.

218 N.A.

Alternate power source for major pumping facility. ☐ APS

Alarm or emergency procedure for power or equipment failure ☐ ALM

Complete item 19 if discharge is from cooling and/or steam water generation and water treatment additives are used.

19. Water Treatment Additives If the discharge is treated with any conditioner, inhibitor, or algicide, answer the following:

a. Name of Material(s) 219a N.A.

b. Name and address of manufacturer 219b

c. Quantity (pounds added per million gallons of water treated). 219c

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d. Chemical composition of these additives (see instructions). 219d

Complete items 20-25 if there is a thermal discharge (e.g., associated with a steam and/or power generation plant, steel mill, petroleum refinery, or any other manufacturing process) and the total discharge flow is 10 million gallons per day or more. (see instructions)

20. Thermal Discharge Source Check the appropriate item(s) indicating the source of the discharge. (see instructions) 220 N.A.

- Boiler Blowdown ☐ BLBD
- Boiler Chemical Cleaning ☐ BCCL
- Ash Pond Overflow ☐ APOF
- Boiler Water Treatment — Evaporator Blowdown ☐ EPBD
- Oil or Coal Fired Plants — Effluent from Air Pollution Control Devices ☐ OCFP
- Condense Cooling Water ☐ COND
- Cooling Tower Blowdown ☐ CTBD
- Manufacturing Process ☐ MFPR
- Other ☐ OTHR

21. Discharge/Receiving Water Temperature Difference N.A.

Give the maximum temperature difference between the discharge and receiving waters for summer ~~and winter operating conditions.~~ (see instructions)

Summer 221a ______ °F.

Winter 221b ______ °F.

22. Discharge Temperature, Rate of Change Per Hour 222 ______ °F./hour

Give the maximum possible rate of temperature change per hour of discharge under operating conditions. (see instructions)

23. Water Temperature, Percentile Report (Frequency of Occurrence) N.A.

In the table below, enter the temperature which is exceeded 10% of the year, 5% of the year, 1% of the year and not at all (maximum yearly temperature). (see instructions)

Frequency of occurrence

		10%	5%	1%	Maximum
a. Intake Water Temperature (Subject to natural changes)	223a	°F	°F	°F	°F
b. Discharge Water Temperature	223b	°F	°F	°F	°F

24. Water Intake Velocity (see instructions) 224 N.A. feet/sec.

25. Retention Time Give the length of time, in minutes, from start of water temperature rise to discharge of cooling water. (see instructions) 225 N.A. minutes

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FOR AGENCY USE
OK0035327

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER

STANDARD FORM C – MANUFACTURING AND COMMERCIAL

SECTION I. APPLICANT AND FACILITY DESCRIPTION

Unless otherwise specified on this form all items are to be completed. If an item is not applicable indicate 'NA.'

ADDITIONAL INSTRUCTIONS FOR SELECTED ITEMS APPEAR IN SEPARATE INSTRUCTION BOOKLET AS INDICATED. REFER TO BOOKLET BEFORE FILLING OUT THESE ITEMS.

Please Print or Type

1. **Legal Name of Applicant** (see instructions) — 101: Western Farmers Electric Cooperative

2. **Mailing Address of Applicant** (see instructions)
   - Number & Street — 102a: P.O. Box 429
   - City — 102b: Anadarko
   - State — 102c: Oklahoma
   - Zip Code — 102d: 73005

Fee $40.00 37048
Copies
State of
COE
BSFW
NOAA

3. **Applicant's Authorized Agent** (see instructions)
   - Name and Title — 103a: Burns & McDonnell Engineering Company
   - Number & Street Address — 103b: 4600 East 63rd Street
   - City — 103c: Kansas City
   - State — 103d: Missouri
   - Zip Code — 103e: 64141
   - Telephone — 103f: 816 (Area Code) 333-4375 (Number)

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4. **Previous Application** If a previous application for a National or Federal discharge permit has been made, give the date of application. Use numeric designation for date. — 104: YR MO DAY

I certify that I am familiar with the information contained in this application and that to the best of my knowledge and belief such information is true, complete, and accurate.

Maynard Human — Printed Name of Person Signing

102e: General Manager — Title

Maynard Human — Signature of Applicant or Authorized Agent

102f: 78 3 29 (YR MO DAY) — Date Application Signed

18 U.S.C. Section 1001 provides that:

Whoever, in any matter within the jurisdiction of any department or agency of the United States knowingly and wilfully falsifies, conceals or covers up by any trick, scheme, or device a material fact, or makes any false, fictitious or fraudulent statement or representation, or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years, or both.

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Received ___ ___ ___ OFFICE: ____EPA Region Number

FOR AGENCY USE

5. **Facility/Activity** (see instructions) Give the name, ownership, and physical location of the plant or other operating facility where discharge(s) does or will occur.

Name	105a	Western Farmers Electric Cooperative Coal-Fired Generating Facility. Sections 21, 22, 27, 28; TWP 6S Range 19E Choctaw County, Oklahoma
Ownership (Public, Private or Both Public and Private)	105b	☒ PUB ☐ PRV ☐ BPP
Check block if Federal Facility and give GSA Inventory Control Number	105c	☐ FED
	105d	
Location: Street & Number	105e	South of U.S. Highway 70 approximately 12 miles due
City	105f	east of Hugo, Oklahoma
County	105g	Choctaw
State	105h	Oklahoma

6. **Nature of Business** State the nature of the business conducted at the plant or operating facility.

106a	Electric Power Generation & Transmission
106b	AGENCY USE

7. **Facility Intake Water** (see instructions) Indicate water intake volume per day by sources. Estimate average volume per day in thousand gallons per day.

Municipal or private water system	107a	thousand gallons per day
Surface water	107b	5990 thousand gallons per day
Groundwater	107c	thousand gallons per day
Other*	107d	380 thousand gallons per day
Total Item 7	107e	6370 thousand gallons per day
*If there is intake water from 'other,' specify the source.	107f	Stormwater Runoff

8. **Facility Water Use** Estimate average volume per day in thousand gallons per day for the following types of water usage at the facility. (see instructions)

Noncontact cooling water	108a	5280 thousand gallons per day
Boiler feed water	108b	220 thousand gallons per day
Process water (including contact cooling water)	108c	440 thousand gallons per day
Sanitary water	108d	50 thousand gallons per day
Other*	108e	380 thousand gallons per day
Total Item 8	108f	6370 thousand gallons per day
*If there are discharges to 'other,' specify.	108g	Stormwater Runoff
If there is 'Sanitary' water use, give the number of people served.	108h	130 people served

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9. All Facility Discharges and other Losses; Number and Discharge (see instructions) Volume Specify the number of discharge points and the volume of water discharged or lost from the facility according to the categories below. Estimate average volume per day in thousand gallons per day.

		Number of Discharge Points		Total Volume Used or Discharged, Thousand Gal/Day
Surface Water	109a1	1	109a2	1260
Sanitary wastewater transport system	109b1		109b2	
Storm water transport system	109c1		109c2	
Combined sanitary and storm water transport system	109d1		109d2	
Surface impoundment with no effluent	109e1		109e2	
Underground percolation	109f1		109f2	
Well injection	109g1		109g2	
Waste acceptance firm	109h1		109h2	
Evaporation	109i1	4	109i2	5110
Consumption	109j1		109j2	
Other*	109k1		109k2	
Facility discharges and volume Total item 9.	109l1	5	109l2	6370
*If there are discharges to 'other,' specify.	109m1			

10. Permits, Licenses and Applications
List all existing, pending or denied permits, licenses and applications related to discharges from this facility (see instructions).

	Issuing Agency	For Agency Use	Type of Permit or License	ID Number	Date Filed YR/MO/DA	Date Issued YR/MO/DA	Date Denied YR/MO/DA	Expiration Date YR/MO/DA
110	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
1.	EPA		PSD (air)	PSD-OK-53	11/15/77	Pending		
2.	Okla Dept		Construction - Air Pollution Permit					
	of Health		(Reg No 14)	77-082-C	11/21/77	2/27/78		
3.	Okla Water		Stream Water	77-160	12/12/77			
	Res Bd		Appropriation					

(Cont. on Attachment A)

11. Maps and Drawings
Attach all required maps and drawings to the back of this application. (see instructions)

12. Additional Information

112 Item Number	Information
	N.A.

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Attachment A (Section I - Item 10-continued)

Issuing Agency	Type of Permit or License	ID Number	Date Filed Yr/Mo/Da	Date Issued Yr/Mo/Da	Date Denied Yr/Mo/Da	Expiration Date Yr/Mo/Da
Corps of Engineers	404	Scheduled for Submission Apr. '78				
Oklahoma Water Resources Board	Water Discharge Industrial	Scheduled for Submission Apr. '78				
Oklahoma Water Resources Board	401 Certification	Scheduled for Submission Apr. '78				
Oklahoma Dept. of Health	Water Pollution - Sewage/Sanitary	Scheduled for Submission Apr. '78				
Oklahoma Dept. of Health	Solid Waste Disposal Area	Scheduled for Submission Apr. '78				
Oklahoma Dept. of Health	Controlled Industrial Waste Disposal Site & Processing Facility	Scheduled for Submission Apr. '78				
Oklahoma Water Resources Board	Groundwater Appropriation	77-876	12/12/77			

APPENDIX 7

Species Lists

Table 1. Periphyton collected* from the Kiamichi River** on 3 Sep 77

	Relative Abundance***
Bacillariophyta	
Eupodiscales	
Cyclotella meneghiniana	R
Melosira distans	A
Melosira granulata	A
Stephanodiscus hantzschii	R
Achnanthales	
Cocconeis placentula	R
Naviculales	
Gomphonema olivaceum	R
Gyrosigma spencerii	R
Navicula cryptocephala	R
Navicula cuspidata	R
Navicula pupula	R
Navicula tripunctata	R
Bacillariales	
Nitzschia dissipata	C
Nitzschia sp.	R

* Collected by scraping rocks, logs, etc.

** Collected from rock outcrop approximately 18 km downstream from the Hugo Dam, 3 km upstream from the Highway 109 bridge

*** Rare: occurred in <15% of the fields observed; Common: 16 - 85%; Abundant: >85%

Table 2. Phytoplankton collected* from the Kiamichi River** on 3 Sep 77

	Cells/ml
Cyanophyta	
Hormogonales	
Anabaena sp.	31.6
Bacillariophyta	
Eupodiscales	
Cyclotella meneghiniana	79.1
Melosira distans	316.4
Melosira granulata	13478.6
Fragilariales	
Asterionella formosa	47.5
Naviculales	
Diploneis smithii	15.8
Gomphonema olivaceum	189.8
Navicula cryptocephala	31.6
Navicula cuspidata	15.8
Navicula sp.	31.6
Bacillariales	
Nitzschia dissipata	47.5
Nitzschia paradoxa	31.6
TOTAL	14316.9

* Collected by filtering 50 liters of water through a Wisconsin plankton net (mesh size = 80μ)

**Collected near a rock outcrop approximately 18 km downstream from the Hugo Dam, 3 km upstream from the Highway 109 bridge

Table 3. Zooplankton collected* in the Kiamichi River** on 3 Sep 77

	Density (individuals/liter)
Protozoa	
Difflugia sp.	47.5
Rotatoria (rotifers)	
Brachionus sp.	2.4
Filinia sp.	13.6
Kellicottia sp.	17.9
Keratella sp.	9.4
Lecane sp.	0.9
Arthropoda - Crustacea	
Cladocera (water fleas)	
Alona costata	0.2
Bosmina longirostris	1.5
Ceriodaphnia reticulata	5.6
Diaphanosoma brachyurum	13.9
Eucopepoda (copepods)	
Cyclops bicuspidatus thomasi	0.8
Diaptomus reighardi	6.3
Mesocyclops edax	0.2
Copepodids	4.8
Nauplii	57.3
TOTAL	182.3

* Collected by filtering 50 liters of water through a Wisconsin plankton net (mesh size = 80μ)

** Collected near a rock outcrop approximately 18 km downstream from the Hugo Dam, 3 km upstream from the Highway 109 bridge

Table 4. Benthic macroinvertebrates collected* in the Kiamichi River** on 3 Sep 77

	% total sample
Oligochaeta (aquatic earthworms)	
Plesiopora	
Naididae	
Paranais sp.	1.5
Crustacea	
Decapoda	
Palaemonidae	
Palaemonetes kadiakensis	.5
Insecta	
Ephemeroptera (mayflies)	
Heptageniidae	
Stenonema sp.	23.9
Odonata (dragonflies, damselflies)	
Coenagrionidae	
Argia sp.	1.5
Neuroptera (spongilla flies)	
Sisyridae	
Climacia sp.	.5
Trichoptera (caddis flies)	
Leptoceridae	
Leptocella sp.	.5
Psychomyiidae	
Psychomiid Genus A	22.9
Diptera (flies)	
Chironomidae	
Ablabesmyia auriensis	5.8
Chironominae pupae	2.9
Dicrotendipes sp.	6.8
Glyptotendipes sp.	18.5
Pedionomus beckae	1.0
Phaenopsectra sp.	.5
Polypedilum sp.	5.8
Stenochironomus sp.	.5
Tanypodinae pupae	1.5
Tribelos sp.	1.5
Pelecypoda (clams)	
Unidentified organisms	3.9

* Collected with an Ekman dredge, dip nets, and hand picking

** Collected from rock outcrop approximately 18 km downstream from the Hugo Dam, 3 km upstream from the Highway 109 bridge

Table 5. Periphyton collected* in Gates Creek on 3 Sep 77

	Relative Abundance**	
	Dam***	Bridge****
Cyanophyta		
Hormogonales		
Aphanizomenon flos-aquae	R	-
Oscillatoria sp.	-	C
Bacillariophyta		
Biddulphiales		
Biddulphia laevis	-	C
Eupodiscales		
Melosira granulata	R	-
Melosira islandica	R	-
Fragilariales		
Fragilaria brevistriata	-	R
Fragilaria sp.	R	-
Synedra ulna	R	R
Eunotiales		
Eunotia curvata	R	-
Naviculales		
Cymbella tumida	-	R
Cymbella turgida	-	C
Cymbella ventricosa	R	-
Diploneis smithii	-	R
Gomphonema angustatum	R	C
Gomphonema olivaceum	R	C
Gyrosigma spencerii	-	R
Navicula capitata	-	R
Navicula cryptocephala	R	C
Navicula cuspidata	-	R
Navicula pupula	R	-
Navicula salinarum	R	-
Navicula tripunctata	R	C
Navicula sp.	-	R
Rhopalodia gibba	-	R
Bacillariales		
Nitzschia amphibia	-	R
Nitzschia acicularis	R	-
Nitzschia dissipata	C	C
Nitzschia filiformis	R	R
Nitzschia hungarica	R	-
Nitzschia paradoxa	R	C

(Table [illegible] cont.)

	Relative Abundance	
	Dam***	Bridge****
(Bacillariales cont.)		
Nitzschia sigmoidea	-	R
Nitzschia tryblionella	-	R
Surirellales		
Surirella sp.	-	R

*Collected by scraping rocks, logs, etc.
**Rare: occurred in <15% of the fields observed; Common: 16 - 85%; Abundant: >85%
***Collected in a pool area below Lake Raymond Gary Dam
****Collected near a low water bridge approximately 5 km below the dam and 1 km upstream from the confluence of Gates Creek and the Kiamichi River

Table 6. Phytoplankton collected* in Gates Creek on 3 Sep 77

	Cells/ml	
	Dam**	Bridge***
Cyanophyta		
Hormogonales		
Anabaena sp.	39.5	1.6
Oscillatoria sp.	55.3	4.7
Bacillariophyta		
Eupodiscales		
Cyclotella meneghiniana	-	2.4
Melosira distans	55.3	0.8
Melosira granulata	63.2	6.3
Melosira islandica	-	0.8
Fragilariales		
Fragilaria crotonensis	-	1.6
Fragilaria sp.	7.9	0.8
Synedra ulna	47.4	2.4
Naviculales		
Amphora ovalis	-	0.8
Caloneis bacillum	7.9	-
Cymbella ventricosa	15.8	-
Gomphonema angustatum	23.7	-
Gomphonema olivaceum	63.2	-
Navicula cryptocephala	-	3.2
Navicula pupula	-	1.6
Navicula tripunctata	7.9	1.6
Navicula sp.	39.5	-
Pleurosigma delicatulum	-	0.8
Rhopalodia gibberula	7.9	-
Surirellales		
Surirella sp.	-	1.6
Bacillariales		
Nitzschia acicularis	7.9	7.9
Nitzschia amphibia	15.8	0.8
Nitzschia dissipata	31.6	7.9
Nitzschia paradoxa	47.4	2.4
Nitzschia parvula	7.9	-
TOTAL	545.1	50.0

* Collected by filtering 50 liters of water through a Wisconsin plankton net (mesh size = 80μ)

** Collected in a pool area below Lake Raymond Gary Dam

*** Collected near a low water bridge approximately 5 km below the dam and 1 km upstream from the confluence of Gates Creek and the Kiamichi River

Table 7. Zooplankton collected* in Gates Creek on 3 Sep 77

	Density (individuals/liter) Dam**	Bridge***
Protozoa		
Difflugia sp.	2.4	<0.1
Rotatoria (rotifers)		
Asplachna sp.	0.4	-
Brachionus sp.	-	0.1
Euchlanis sp.	0.3	-
Trichocerca sp.	0.2	<0.1
Arthropoda - Crustacea		
Cladocera (water fleas)		
Alona costata	-	<0.1
Bosmina longirostris	-	<0.1
Camptocercus rectirostris	0.1	-
Ceriodaphnia reticulata	0.1	<0.1
Diaphanosoma brachyurum	-	0.2
Oxyurella tenuicaudis	0.2	-
Simocephalus serrulatus	0.2	-
Podocopa (seed shrimps)	6.0	<0.1
Eucopepoda (copepods)		
Eucyclops agilis	2.2	-
Macrocyclops albidus	1.6	-
Copepodids	2.0	0.1
Nauplii	6.3	0.3
Arthropoda - Arachnida		
Acari (aquatic mites)	0.1	<0.1
TOTAL	22.1	0.9

* Collected by filtering 50 liters of water through a Wisconsin plankton net (mesh size = 80μ)

** Collected in pool area below Lake Raymond Gary Dam

*** Collected near a low water bridge approximately 5 km below the dam and 1 km upstream from the confluence of Gates Creek and the Kiamichi River

Table 8. Benthic macroinvertebrátes collected* in Gates Creek on 3 Sep 77

	% total sample	
	Dam**	Bridge***
Oligochaeta (aquatic earthworms)		
Plesiopora		
Naididae		
Naidium osborni	3.6	-
Paranais sp.	4.9	-
Tubificidae		
Branchiura sowerbyi	6.5	-
Limnodrilus claparedeianus	49.8	-
Hirudinea (leeches)		
Arhynchobdellida		
Erpobdellidae		
Erpobdella punctata	1.2	-
Glossiphonidae		
Helobdella stagnalis	0.4	-
Crustacea		
Amphipoda (scuds)		
Talitridae		
Hyalella azteca	-	0.3
Insecta		
Ephemeroptera (mayflies)		
Baetidae		
Baetis sp.	-	3.4
Odonata (dragonflies, damselflies)		
Coenagrionidae		
Argia sp.	-	0.7
Megaloptera (dobsonflies)		
Corydalidae		
Corydalus cornutus	-	0.3
Sialidae		
Sialis sp.	0.4	-
Trichoptera (caddis flies)		
Hydropsychidae		
Cheumatopsyche sp.	-	74.2
Coleoptera (beetles)		
Elmidae		
Narpus sp.	-	2.0

(Table 8 cont.)

	% total sample	
	Dam**	Bridge***
(Coleoptera cont.)		
Helodidae		
Scirtes sp.	-	0.3
Diptera (flies)		
Chironomidae		
Chironomus sp.	11.7	-
Chironominae pupa	2.0	0.7
Dicrotendipes modestus	0.8	-
Glyptotendipes sp.	4.9	-
Goeldichironomus sp.	0.8	-
Pentareura sp.	0.4	-
Polypedilum sp.	-	15.1
Tanypus sp.	4.9	-
Chaoboridae		
Chaoborus sp.	4.0	-
Tabanidae		
Chrysops sp.	-	0.3
Gastropoda (snails)		
Pulmonata		
Physidae		
Physa halei	1.6	0.3
Lymnaeidae		
Lymnaea columella	0.4	0.3
Planorbidae		
Unidentified organisms	-	0.5
Unidentified organisms	0.4	-
Pelecypoda (clams)		
Heterodonta		
Sphaeriidae		
Eupera sp.	0.8	-
Unidentified organisms	0.4	0.7

* Collected with an Ekman dredge, dip nets, and hand picking
** Collected in pool area below Lake Raymond Gary Dam
*** Collected near a low water bridge approximately 5 km below the dam and 1 km upstream from the confluence of Gates Creek and the Kiamichi River

Table 9. Periphyton collected* from the Red River** on 3 Sep 77

	Relative Abundance***
Cyanophyta	
Hormogonales	
Anabaena sp.	R
Aphanizomenon flos-aquae	R
Bacillariophyta	
Eupodiscales	
Coscinodiscus rothi	R
Cyclotella meneghiniana	C
Melosira distans	R
Melosira granulata	R
Melosira islandica	R
Stephanodiscus hantzschii	R
Fragilariales	
Synedra ulna	R
Naviculales	
Cymbella ventricosa	R
Diploneis smithii	R
Gomphonema angustatum	R
Gomphonema olivaceum	R
Navicula cryptocephala	R
Navicula tripunctata	R
Navicula pupula	R
Rhopalodia gibberula	R
Bacillariales	
Nitzschia acicularis	R
Nitzschia angustata	R
Nitzschia dissipata	C
Nitzschia hungarica	R
Nitzschia linearis	R
Nitzschia lorenziana	R
Nitzschia parvula	R
Nitzschia sigma	R
Nitzschia sigmoidea	R

* Collected by scraping rocks, logs, etc.

** Collected approximately 1 km downstream from the confluence of the Red and Kiamichi rivers

*** Rare: occurred in <15% of the fields observed; Common: 16 - 85%; Abundant: >85%

Table 10. Phytoplankton collected* from the Red River** on 3 Sep 77.

	Cells/ml
Cyanophyta	
Hormogonales	
Oscillatoria sp.	43.0
Chrysophyta	
Chrysomonadales	
Mallomonas sp.	7.2
Bacillariophyta	
Eupodiscales	
Cyclotella meneghiniana	50.1
Melosira distans	85.9
Melosira granulata	930.8
Stephanodiscus hantzschii	43.0
Fragilariales	
Fragillaris crotonensis	21.5
Fragillaria sp.	7.2
Synedra ulna	14.3
Achnanthales	
Achnanthes sp.	7.2
Naviculales	
Cymbella ventricosa	7.2
Gomphonema olivaceum	21.5
Gyrosigma spencerii	21.5
Navicula cryptocephala	50.1
Navicula cuspidata	14.3
Navicula tripunctata	157.5
Rhopalodia gibberula	7.2
Bacillariales	
Cymatopleura sp.	7.2
Nitzschia angustata	28.6
Nitzschia dissipata	78.8
Nitzschia tryblionella	7.2
TOTAL	1611.3

*Collected by filtering 50 liters of water through a Wisconsin plankton net (mesh size = 80μ)

**Collected approximately 1 km downstream from the confluence of the Red and Kiamichi rivers

Table 11. Zooplankton collected* from the Red River** on 3 Sep 77.

	Density (individuals/liter)
Protozoa	
Difflugia sp.	0.3
Rotatoria (rotifers)	
Asplachna sp.	7.4
Brachionus sp.	28.2
Filinia sp.	0.3
Kellicottia sp.	0.4
Lecane sp.	1.5
Notholca sp.	0.7
Trichocerca sp.	0.4
Arthropoda - Crustacea	
Caldocera (water fleas)	
Bosmina longirostris	0.3
Diaphanosoma brachyurum	0.7
Eucopepoda (copepods)	
Cyclops vernalis	0.6
Diaptomus siciloides	2.9
Copepodids	4.2
Nauplii	6.3
TOTAL	54.2

*Collected by filtering 50 liters of water through a Wisconsin plankton net (mesh size = 80μ)

**Collected approximately 1 km downstream from the confluence of the Red and Kiamichi rivers

Table 12. Benthic macroinvertebrates collected* in the Red River** on 3 Sep 77

	% total sample
Crustacea	
Decapoda	
Palaemonidae	
<u>Palaemonetes</u> <u>kadiakensis</u>	11.4
Insecta	
Ephemeroptera (mayflies)	
Baetidae	
<u>Caenis</u> sp.	2.8
Odonata (dragonflies, damselflies)	
Gomphidae	
<u>Dromogomphus</u> sp.	2.8
<u>Gomphus</u> sp.	1.4
Hemiptera (true bugs)	
Corixidae	
<u>Trichocorixa</u> sp.	7.1
Nepidae	
<u>Ranatra</u> <u>fusca</u>	1.4
Trichoptera (caddis flies)	
Hydropsychidae	
<u>Cheumatopsyche</u> sp.	11.4
Coleoptera (beetles)	
Elmidae	
<u>Narpus</u> sp.	2.8
Diptera (flies)	
Chironomidae	
<u>Ablabesmyia</u> <u>auriensis</u>	10.0
Chironominae pupae	7.1
<u>Glyptotendipes</u> sp.	4.3
<u>Micropsectra</u> sp.	2.8
<u>Polypedilum</u> sp.	7.1
<u>Psectrocladius</u> sp.	1.4
<u>Rheotanytarsus</u> sp.	17.1
<u>Tanypus</u> sp.	7.1
Gastropoda (snails)	
Pulmonata	
Physidae	
<u>Physa</u> sp.	1.4

* Collected with an Ekman dredge, dip nets, and hand picking

** Collected approximately 1 km downstream from the confluence of the Red and Kiamichi rivers

Table 13. Fishes collected in the Red River below the confluence with the Kiamichi River, 3 Sep and 6 Oct, 1977.

Lepisosteus osseus
Dorosoma cepedianum
Hybopsis aestivalis
*Notropis athcrinoides**
*Notropis buchanani**
*Notropis lutrensis**
*Notropis potteri**
Notropis shumardi
Notropis venustus
*Notropis volucellus**
hybrid *N. lutrensis* x *N. venustus**
*Pimephales vigilax**
Carpiodes carpio
Fundulus notatus
Gambusia affinis
Menidia audens
Morone chrysops
*Lepomis macrochirus**
Pomoxis annularis
Aplodinotus grunniens

*Denotes fish occurring commonly at the site

Table 14. Fishes collected in Gates Creek at low water bridge above confluence with Kiamichi River, 2 and 4 Sep and 6 Oct, 1977.

Lepisosteus osseus
Notemigonus crysoleucas
Notropis boops
Notropis buchanani
Notropis lutrensis
_Notropis umbratilis_*
hybrid _N. lutrensis_ x _N. venustus_*
Notropis shumardi
_Notropis venustus_*
_Pimephales vigilax_*
Ictiobus bubalus
Ictalurus punctatus
_Fundulus notatus_*
_Labidesthes sicculus_*
Lepomis cyanellus
_Lepomis macrochirus_*
Lepomis microlophus
Micropterus punctulatus
Micropterus salmoides
_Pomoxis annularis_*

*Denotes fish occurring commonly at the site

Table 15. Fishes collected in the Kiamichi River between Hugo Dam and the confluence with the Red River between 31 Aug 1976 and 7 Oct 1977.

Lepisosteus osseus

Lepisosteus platostomus

Dorosoma cepedianum*

Notropis atherinoides*

Notropis lutrensis*

Notropis potteri*

Notropis shumardi*

Notropis umbratilis*

hybrid N. venustus x N. lutrensis*

Pimephales vigilax*

Carpiodes carpio*

Gambusia affinis*

Fundulus notatus*

Labidesthes sicculus*

Menidia audens

Lepomis cyanellus*

Lepomis macrochirus*

Lepomis megalotis*

Micropterus punctulatus

Pomoxis annularis

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*Denotes fish occurring commonly at the site

Table II-26

PLANT SPECIES ENCOUNTERED IN BIOLOGICAL SURVEY, FALL 1977

Common Name	Scientific Name[1]
American elm	Ulmus americanum
Barley	Hordeum pusillum
Basswood	Tilia sp.
Bermuda grass	Cynodon dactylon
Big bluestem	Andropogon gerardi
Bitter sneezeweed	Helenium amarum
Blackjack oak	Quercus marilandica
Black locust	Robinia psuedo-acacia
Black oak	Quercus velutina
Black tupelo	Nyssa sylvatica
Broomweed	Guiterrezia dracunculoides
Buckbrush	Symphoricarpos orbiculatus
Bundleflower	Desmanthus illinoensis
Bur oak	Quercus macrocarpa
Butterfly weed	Asclepias tuberosa
Cardinal flower	Labelia cardinallis
Chinkapin oak	Quercus muhlenbergii
Chittamwood	Bumelia lanuginosa
Cocklebur	Xanthium strumarium
Cockspur thorn	Cratagus crus-galli
Compass-plant	Silphium laciniatum
Dallis grass	Paspalum dilatatum
Eastern redcedar	Juniperus virginiana
Euphorbia	Euphorbia hexagonia
Foxtail	Setaria geniculata
Fragrant sumac	Rhus aromatica
Gaura	Gaura filimormis
Goldenrod	Solidago sp.
Grape	Vitis sp.
Green ash	Fraxinus pennsylvatica
Greenbriar	Smilax rotundifolia
Gumweed	Grindelia lanceolata
Hackberry	Celtis sp.
Honey locust	Gleditsia tricanthos

Table II-26 (Continued)

Common Name	Scientific Name
Honeysuckle	Lonicera sp.
Indiangrass	Sorghastrum nutans
Indian paint-brush	Castilleja sp.
Iva	Iva sp.
Jack-in-the-pulpit	Arisaema triphyllum
Johnson grass	Sorghum halepense
Korean lespedeza	Lespedeza stipulacea
Lacegrass	Eragrostis capillaris
Lanceleaf ragweed	Ambrosia bidentata
Little bluestem	Andropogon scoparius
Live oak	Quercus virginiana
Milkweed	Asclepias sp.
Nutgrass	Cyperus sp.
Nutmeg hickory	Carya myristicaeformis
Osage-orange	Maclura pomifera
Panicum	Panicum oligosanthes
Partridge pea	Cassia sp.
Paspalum	Paspalum sp.
Persimmon	Diospyros virginiana
Plum	Prunus munsonia
Poison ivy	Toxicodendron radicans
Purpletop	Tridens flavus
Purslane	Portulaca parvula
Ragweed	Ambrosia artemisiifolia
Rattlesnake master	Eryngium yuccifolium
Redbud	Cercus canadensis
Red mulberry	Morus rubra
Rough buttonweed	Diodia teres
Roughleaf dogwood	Cornus drummondii
Rubus	Rubus sp.
Slender lespedeza	Lespedeza virginica
Slippery elm	Ulmus rubra
Smooth sumac	Rhus glabra
Snow-on-the-mountain	Euphorbia marginata
Soapberry	Sapindus drummondii
Sowthistle	Sonchus sp.

Table II-26 (Continued)

Common Name	Scientific Name
Spanish oak	Quercus palcata
Splitbeard	Andropogon ternarius
Sporobolus	Sporobolus sp.
Spurge	Euphorbia supina
St. Johns-wort	Hypericum sp.
Sunflower	Helianthus sp.
Switchgrass	Panicum virgatum
Tick-treefoil	Desmondium sessilifolium
Tridens	Tridens stricutus
Triple-awn grass	Aristida oligantha
Uniola	Uniola sessilifolia
Violet	Viola sp.
Virginia creeper	Parthenocissus quinquefolia
Walnut	Juglans sp.
Water hickory	Carya aquatica
Western ragweed	Ambrosia psilostachya
White ash	Fraxinus americana
Winged elm	Ulmus alata

[1] *Scientific names are from "Keys to the Flora of Oklahoma" by U.T. Waterfall.*

Table III-1
MAMMALS WITH RANGES AND HABITATS OCCURRING ON THE HUGO PLANT SITE

Species[1]	Status[2]	Observed Fall 1977	Observed Spring 1978
Beaver (Castor canadensis)	C	X	
Big brown bat (Eptesicus fuscus)	C		
Black rat (Rattus rattus)	C		
Black-tailed jackrabbit (Lepus californicus)	U	X	
Bobcat (Lynx rufus)	C		
Cotton mouse (Peromyscus leucopus)	C		
Coyote (Canis latrans)	C	X	
Deer mouse (Peromyscus maniculatus)	C		
Eastern cottontail (Sylvilagus floridanus)	C	X	
Eastern pipistrel (Pipistrellus subflavus)	C		
Eastern wood rat (Neotoma floridana)	C	X	
Evening bat (Nycticeius humeralis)	C		
Fox squirrel (Sciurus niger)	C	X	
Fulvous harvest mouse (Reithrodontomys fulvescens)	C		
Gray fox (Urocyon cinereoargenteus)	C		
Gray squirrel (Sciurus carolinensis)	C	X	
Hispid cotton rat (Sigmodon hispidus)	C	X	
Hoary bat (Lasiurus cinereus)	C		
House mouse (Mus musculus)	C		
Least shrew (Cryptotis parva)	C		
Long-tailed weasel (Mustela frenata)	U		
Mink (Mustela vison)	U		
Nine-banded armadillo (Dasypus novenmcinctus)	C	X	
Norway rat (Ratus norvegicus)	C		
Opossum (Didelphis marsupialis)	C	X	
Pine vole (Microtus pinetorum)	U		
Plains pocket gopher (Geomys bursarius)	C		
Raccoon (Procyon lotor)	C	X	
Red bat (Lasiurus borealis)	C		
Red fox (Vulpes vulpes)	U		

Table III-1 (Continued)

Species[1]	Status[2]	Observed Fall 1977	Observed Spring 1978
Shorttail shrew (Blarina brevicauda)	C		
Silver-haired bat (Lasionycteris noctivagans)	U		
Southern flying squirrel (Glaucomys volans)	C		
Spotted skunk (Spilogale putorius)	U		
Striped skunk (Mephitis mephitis)	C	X	
White-footed mouse (Peromyscus leucopus)	C	X	
White-tailed deer (Odecoileus virginiana)	C	X	

[1]*Common names follow Jones, Carter, and Genoways (1973); Scientific names follow Hall and Kelson (1959).*
[2]*From U.S. Army Corps of Engineers (1974) and Powell (1976). C = Common E = Endangered, R1 = Rare 1, R2 = Rare 2, U = Uncommon.*

Table III-3

BIRD SPECIES POTENTIALLY USING HABITATS FOUND ON THE WFEC HUGO PLANT SITE, CHOCTAW COUNTY, OKLAHOMA

Common Name	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Observed: Fall 6-10 Oct. 1977	Observed: Winter	Observed: Spring
Acadian flycatcher	Empidonax virescens	T,SR	I				
American avocet	Recurvirostra americana	T,SR	M				
American bittern	Botaurus lentiginosus	T,SR	M				
American coot	Fulica americana	PR	M				
American golden plover	Pluvialis dominica	T	M				
American goldfinch	Spinus tristis	PR	I				
American redstart	Setophaga ruticille	T,SR	F				
American widgeon	Mareca americana	T,WV	M				
American woodcock	Philohela minor	T,SV	I				
Anhinga	Anhinga anhinga	(I)SV,(I)AV	M				
Bachman's sparrow	Aimophila aestivalis	T,WR	I				
Baird's sandpiper	Erolia bairdii	T	M				
Bald eagle	Haliaeetus leucocephalus	WR	M,I				
Baltimore oriole	Icterus galbula	T,SR	I,F				
Bank swallow	Riparian riparia	T,SV	O				
Barn owl	Tyto alba	PR	I				
Barn swallow	Hirundo rustica	T,SR	O				
Barred owl	Strix varia	PR	F	X	X		
Belted kingfisher	Megaceryle alcyon	T,SR	M				
Bewick's wren	Thryomanes bewickii	PR	I				
Black-and-white warbler	Mniotilta varia	T,SR	F				
Black-bellied plover	Squatarola squatarola	T	M				
Blackburnian warbler	Dendroica fusca	T	I,F				
Black duck	Anas rubripes	T,WV	M				
Black-throated green warbler	Dendroica virens	T	F				

Table III-3 (Continued)

Common Name	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Observed: Fall 6-10 Oct. 1977	Observed: Winter	Observed: Sprir
Blackpoll warbler	Dendroica striata	T	F				
Black vulture	Coragyps atratus	PR	O,I	X	X		
Blue goose	Chen caerulescens	T,WV	M				
Blue-gray gnatcatcher	Polioptila caerulea	T,SR	F				
Blue grosbeak	Guiraca caerulea	T,SR	I				
Blue jay	Cyanocitta cristata	PR	I,F	X	X		
Blue-winged teal	Anas discors	T,WV	M				
Blue-winged warbler	Dendroica magnolia	T,SR	I				
Boat-tailed grackle	Cassidix mexicanus	PR	I,F				
Bobolink	Dolichonyx oryzivorus	T	M				
Bobwhite	Colinus virginianus	PR	O,I	X	X		
Bonaparte's gull	Larus philadelphia	T,WV	M				
Brewer's blackbird	Euphagus cyanocephalus	T,WV	O		X		
Broad-winged hawk	Buteo platypterus	T,SR	F	X	X		
Brown creeper	Certhia familiaris	T,WV	F				
Brown-headed cowbird	Molothrus ater	T,SR	O,I				
Brown-headed nuthatch	Sitta pusilla	PR	F				
Brown thrasher	Toxostroma rufum	PR	I	X	X		
Bufflehead	Bucephala albeola	T,WV	M				
Canada goose	Branta canadensis	T,WR	M				
Canada warbler	Wilsonia canadensis	T	I				
Canvasback	Aythaya valisineria	T,WV	M				
Cardinal	Richmondena cardinalis	PR	I,F	X	X		
Carolina chickadee	Parus carolinensis	PR	I,F	X	X		
Carolina wren	Thryothorus ludovicianas	PR	I,F	X	X		
Caspian tern	Hydroprogne caspia	T,SV	M				
Catbird	Dumetella carolinensis	T,SR	I				

Table III-3 (Continued)

Common Name	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Observed: Fall 6-10 Oct. 1977	Observed: Winter	Observed: Spring
Cattle egret	*Bubulcus ibis*	SR	M				
Cedar waxwing	*Bombycilla cedrorum*	T,WV	I				
Cerulean warbler	*Dendroica caerulea*	T,SR	F				
Chestnut-sided warbler	*Dendroica pennsylvanica*	T	I				
Chimney swift	*Chaetura pelagica*	T,SR	O,I				
Chipping sparrow	*Spizella passerina*	T,SR	I,F				
Chuck-willis-widow	*Caprimulgus carolinensis*	T,SR	F				
Clay-colored sparrow	*Spizella pallida*	T	I				
Cliff swallow	*Petrochelidon pyrrhonota*	T,SR	O				
Common crow	*Corvus brachyrhynchos*	PR	O,I	X	X		
Common egret	*Casmerodius albus*	SR	M				
Common flicker	*Colaptes auratus*	PR	I		X		
Common gallinule	*Gallinula chloropus*	T,SR	M				
Common goldeneye	*Bucephala clangula*	T,WV	M				
Common grackle	*Quiscalus quiscula*	T,SR	O,I				
Common loon	*Gavia immer*	T,WV	M				
Common merganser	*Mergus merganser*	T,WR	M				
Common nighthawk	*Chordeiles minor*	T,SR	O,I				
Common snipe	*Capella gallinago*	T,WR	M				
Cooper's hawk	*Accipiter cooperii*	PR	F	X	X		
Dickcissel	*Spiza americana*	T,SR	O				
Double-crested cormorant	*Phalacrocorax auritus*	T	M				
Downy woodpecker	*Dendrocopos pubescens*	PR	F	X	X		
Eared grebe	*Podiceps caspicus*	T	M				
Eastern bluebird	*Sialia sialis*	PR	I	X	X		
Eastern kingbird	*Tyrannus tyrannus*	T,SR	O,I	X	X		
Eastern meadowlark	*Sturnella magna*	PR	O	X	X		
Eastern phoebe	*Sayornis phoebe*	T,SR	I				

Table III-3 (Continued)

Common Name	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Observed: Fall 6-10 Oct. 1977	Observed: Winter	Observed: Spring
Eastern wood pewee	Contopus virens	T,SR	F				
Evening grosbeak	Hesperiphona verspertina	(I) WV	O,I				
Field sparrow	Spizella pusilla	PR	I,F	X			
Fish crow	Corvus ossifragus	V	I				
Forester's tern	Sterna foresteri	T,SR	M				
Fox sparrow	Passerella iliaca	T,WR	I,F				
Franklin's gull	Larus pipixcan	T	M				
Gadwall	Anas strepera	T,WV	M				
Glossy ibis	Plegadis falcinellus	SPV,SV	M				
Golden-crowned kinglet	Regulus satrapa	T,WR	F				
Golden eagle	Aguila chrysaetos	PR	I				
Golden-winged warbler	Vermivora chrysoptera	T	F				
Goshawk	Accipiter gentilis	WV	F				
Grasshopper sparrow	Ammodramus savannarum	T,SR	O				
Gray-cheeked thrust	Hylocichla minima	T	F				
Great blue heron	Ardea herodias	PR	M	X			
Great crested flycatcher	Myiarchus crinitus	T,SR	I,F	X			
Greater prairie chicken	Tympanuchus cupido	PR	I				
Greater scaup	Aythya affinis	T,WV	M				
Greater yellowlegs	Totanus melanoleucus	T	M				
Great horned owl	Bubo virginianus	PR	F				
Green heron	Butarides virescens	T,SR	M	X			
Green-winged teal	Anas carolinensis	T,WV	M				
Hairy woodpecker	Dendrocopos villosus	PR	I,F	X	X		
Harlan's hawk	Buteo harlani	WR	I				
Harris' sparrow	Zonotrichia guerula	T,WR	I				
Hermit thrush	Hylocichla guttata	T,SR	F				
Herring gull	Larus argentatus	T,WV	M				

Table III-3 (Continued)

Common Name	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Observed: Fall 6-10 Oct. 1977	Observed: Winter	Observed: Spring
Hooded merganser	Lophodytes cucullatus	T,WV	M				
Hooded warbler	Wilsonia citrina	T,SR	F				
Horned grebe	Podiceps auritus	T,WV	M				
Horned lark	Eremophila alpestris	PR	O				
House sparrow	Passer domesticus	PR	O,I				
House wren	Troglodytes aedon	T,SR	I				
Hudsonian godwit	Limosa haemastica	T	M				
Indigo bunting	Passerina cyanea	T,SR	I,F				
Kentucky warbler	Oporornis formosus	T,SR	I,F				
Killdeer	Charadrius vociferus	PR	M	X			
King rail	Rallus elegans	T,SR	M				
Lapland longspur	Calcarius lapponicus	T,WV	O				
Lark sparrow	Chondastes grammacus	T,SR	I				
Least bittern	Ixobrychus exilis	SR	M				
Least flycatcher	Empidonax minimus	T,(I)SV	I				
Least sandpiper	Erolia minutilla	T,WV	M				
Least turn	Sterna albifrons	T,SR	M				
Leconte's sparrow	Passerherbulus caudacutus	T,WV	O				
Lesser scaup	Aythya affinis	T,WV	M				
Lesser yellowlegs	Totanus flavipes	T	M				
Lincoln's sparrow	Melospiza lincolnii	T,WV	O				
Little blue heron	Florida caerulea	T,SR	M				
Loggerhead shrike	Lanius ludovicianus	PR	O,I	X	X		
Long-billed dowitcher	Limnodromus scolopaceus	T	M				
Long-billed marshwren	Telmatodytes palustris	T,WR	M				
Louisiana heron	Hydranassa tricolor	R(SV),(R)AV	M				
Louisiana waterthrush	Seiurus motacilla	T,SR	F				
Magnolia warbler	Dendroica magnolia	T	F				

Table III-3 (Continued)

Species	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Fall 6-10 Oct. 1977	Winter	Sprin
Mallard	Anas platyrhynchos	T,WR	M				
Marsh hawk	Circus cyaneus	T,WR	F				
Mockingbird	Mimus polyglottos	PR	I	X	X		
Mourning dove	Zenaida macroura	T,SR	O,I	X	X		
Mourning warbler	Oporornis philadelphia	T	I				
Myrtle warbler	Dendroica coronata	T,WR	I				
Nashville warbler	Vermivora ruficapilla	T	O,I				
Northern waterthrush	Sciurus noveboracensis	T	M				
Olivaceous cormorant	Phalacrocorax olivaceus	SV,AV	M				
Olive-sided flycatcher	Nuttallornis borealis	T	I,F				
Orange-crowned warbler	Vermivora celata	T	O,I				
Orchard oriole	Icterus spurius	T,SR	I,F				
Osprey	Pandion haliaetus	t	m				
Ovenbird	Seiurus aurocapillus	T,SR	F				
Painted bunting	Passerina ciris	T,SR	I,F	X			
Palm warbler	Dendroica palmarum	T	O,I				
Parula warbler	Parula americana	T,SR	F				
Pectoral sandpiper	Erolia melanotos	T	M				
Peregrine falcon	Falco peregrinus	T,WV	I				
Philadelphia vireo	Vireo philadelphicus	T	I,F				
Pied-billed grebe	Podilymbus podiceps	T,SR	M				
Pigeon hawk	Falco columbarius	T,WV	I,F				
Pileated woodpecker	Dryocopus pileatus	PR	F				
Pintail	Anas acuta	T,WV	M				
Pine siskin	Spinus pinus	T,WV	O,I				
Pine warbler	Dendroica pinus	PR	F				
Piping plover	Charadrius melodus	T	M				
Prairie warbler	Dendroica discolor	T,SR	I				

Table III-3 (Continued)

Common Name	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Observed: Fall 6-10 Oct. 1977	Observed: Winter	Observed: Sprin
Prothonotary warbler	Protonotaria citrea	T,SR	F				
Purple finch	Carpodacus purpureus	T,WV	O,I				
Purple gallinule	Porphyrula martinica	SR	M				
Purple martin	Progne subis	T,SR	O,I				
Red-bellied woodpecker	Centurus carolinus	PR	I	X	X		
Red-breasted merganser	Mergus serrator	T,WV	M				
Red- breasted nuthatch	Sitta canadensis	T,WV	F				
Red crossbill	Loxia curvirostra	(I) WV	I,F				
Red-eyed vireo	Vireo olivaceus	T,SR	F				
Redhead	Aythya americana	T,WV	M				
Red-headed woodpecker	Melanerpes erythrocephalus	PR	I				
Red-shouldered hawk	Buteo lineatus	PR	I				
Red-tailed hawk	Buteo jamaicensis	PR	I	X			
Red-winged blackbird	Agelaius phoeniceus	PR	M,O				
Ring-billed gull	Larus delawarensis	T,WV	M				
Ring-necked duck	Aythya collaris	T,WV	M				
Roadrunner	Geococcyx californianus	PR	O,I				
Robin	Turdus migratorius	PR	I				
Rock dove	Columbia livia	PR	O,I				
Roseate spoonbill	Ajaia ajaja	SV,AV	M				
Rose-breasted grosbeak	Pheucticus ludovicianus	T	F				
Rough-winged swallow	Stelgidopteryx ruficollis	T,SR	O				
Ruby-crowned kinglet	Regulus calendula	T,WV	F				
Ruby-throated hummingbird	Archilochus colubris	T,SR	I				
Ruddy duck	Oxyura jamaicensis	T,WV	M				
Ruddy turnstone	Arenaria interpres	T	M				
Rufus-crowned sparrow	Aimophila ruficeps	PR	I				

Table III-3 (Continued)

Common Name	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Observed: Fall 6-10 Oct. 1977	Observed: Winter	Observed: Sprin
Rufous-sided towhee	Pipilo erythropthalmus	T,WR	I				
Rusty blackbird	Euphagus carolinus	T,WR	M,I				
Savannah sparrow	Passerculus sandwichensis	T,WV	O				
Scarlet tanger	Piranga olivacea	T,SR	F				
Scissor-tailed flycatcher	Muscivora forficata	T,SR	O	X	X		
Screech owl	Otus asio	PR	I				
Semipalmated plover	Charadrius semipalmatus	T	M				
Semipalmated sandpiper	Ereunetes pusillus	T	M				
Sharp-shinned hawk	Accipiter striatus	T,WR	F				
Sharp-tailed sparrow	Ammospiza caudacuta	T	M,O				
Short-billed marsh wren	Cistothorus platensis	T	M				
Short-eared owl	Asimo flammeus	T,WV	M				
Shoveler	Anas clypeata	T,WV	M				
Slate-colored junco	Junco hyemalis	T,WV	I				
Smith's longspur	Calcarius pictus	WR	O				
Snowy egret	Leucophoyx thula	SR	M				
Snow goose	Chen hyperbora	T,WV	M				
Snowy owl	Nyctea scandiaca	(I)AV,(I)WV	O,I				
Snowy plover	Charadrius alexandrinus	T,SR	M				
Solitary sandpiper	Tringa solitaria	T	M				
Song sparrow	Melospiza melodia	T,WV	O,I				
Sora	Porzana carolina	T	M				
Sparrow hawk	Falco sparverius	PR	O				
Spotted sandpiper	Actitis macularia	T	M				
Sprague's pipit	Anthus spragueii	T,WV	M,O				
Starling	Sturnus vulgaris	PR	O,I				
Stilt sandpiper	Micropalama himantopus	T	M				

Table III-3 (Continued)

Common Name	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Observed: Fall 6-10 Oct. 1977	Observed: Winter	Observed: Spring
Summer tanager	*Piranga ruba*	T,SR	F				
Swainson's hawk	*Buteo swainsoni*	T,SR	O				
Swainson's thrust	*Hylacichla ustulata*	T	F				
Swainson's warbler	*Limnothlypis swainsonii*	SR	F				
Swamp sparrow	*Melospiza georgiana*	T,WV	M,O				
Tennessee warbler	*Vermivora peregrina*	T	F				
Traill's flycatcher	*Empidonax traillii*	T	I,F				
Tree swallow	*Iridoprogne bicolor*	T	O				
Tufted titmouse	*Parus bicolor*	PR	I,F		X		
Turkey	*Meleagris gallopavo*	PR	I,F				
Turkey vulture	*Cathartes aura*	T,SR	O,I	X	X		
Veery	*Hylocichla fuscescens*	T	F				
Vesper sparrow	*Pooecetes gramineus*	T,WV	I	X	X		
Virginia rail	*Rallus limicola*	T,SR	M				
Warbling vireo	*Vireo gilvus*	T,SR	F				
Water pipit	*Anthus spinoletta*	T,WV	M				
Western kingbird	*Tyrannus verticalis*	T,SR	O,I				
Western sandpiper	*Ereunetes mayri*	T	M				
Whimbrel	*Numenius phaeopus*	T	M				
Whip-poor-will	*Caprimulgus vociferus*	T,SR	F				
Whistling swan	*Olor columbianus*	T,WV	M				
White-breasted nuthatch	*Sitta carolinensis*	PR	F				
White-crowned sparrow	*Zonotrichia leucophrys*	T,WR	I				
White-eyed vireo	*Vireo griseus*	T,SR	F				
White-faced ibis	*Plegadis chihi*	T,SV	M				
White-fronted goose	*Anser albifrons*	T,(I)WV	M				
White ibis	*Eudocimus albus*	SV	M				

Table III-3 (C[illegible]nued)

Common Name	Scientific Name	Status[2]	Habitat[3]	Observed: Late Summer 6-12 Sept. 1977	Observed: Fall 6-10 Oct. 1977	Observed: Winter	Observed: Sprin[illegible]
White-necked raven	Corvus cryptoleucus	T,SR	O				
White pelican	Pelecanus erythrorhynochos	T	M				
White-throated sparrow	Zonotrichia albicollis	T,WR	I				
White-winged crossbill	Loxia leucoptera	(I)V	I				
Willet	Catoptrophorus semipalmatus	T	M				
Wilson's phalarope	Steganopus tricolor	T	M				
Wilson's warbler	Wilsonia pusilla	T	I	X			
Winter wren	Troglodytes troglodytes	T	MV				
Wood duck	Aix sponsa	T,SR	M				
Wood ibis	Mycteria americana	SV,AV	M				
Wood thrush	Hylocichla mustelina	T,SR	F				
Worm-eating warbler	Helmitheros vermivorus	T,SR	F				
Yellow-breasted chat	Icteria vivrens	T,SR	I,F				
Yellow-bellied sapsucker	Sphyrapicus varius	T,WR	I,F				
Yellow-billed cucoo	Coccyzus americanus	T,SR	I,F	X			
Yellow-crowned night heron	Nyctanassa violacea	SR	M	X			
Yellow throat	Geothypis trichas	T,SR	I				
Yellow-throated vireo	Vireo flavifrons	T,SR	F				
Yellow-throated warbler	Dendroica dominica	SR	F				
Yellow warbler	Dendroica petechia	T,SR	I				

[1] *From Final Environmental Statement, Hugo Lake, Kiamichi River, Oklahoma. Army Corps of Engineers, Tulsa, Oklahoma. February 1974*

[2] *S = Summer, A = Autumn, W = Winter, P = Permanent, T = Transient, V = Visitant, R - Resident, (I) = Irregular, (R) - Rare.*

[3] *M - Marsh, shore and water; O = Open, I - Interspersed, F - Forest.*

Table III-8

REPTILE AND AMPHIBIAN SPECIES LIKELY TO BE FOUND ON THE WFEC HUGO PLANT SITE, CHOCTAW COUNTY, OKLAHOMA[1]

Species	Status[2]	Observed Fall 1977	Observed Spring 1978
Salamanders			
Eastern tiger salamander (*Ambystoma tigrinum*)	C		
Many-ribbed salamander (*Eurycea multiplicata*)	S		
Western lesser siren (*Siren intermedia*)	R2		
Frogs and Toads			
Blanchard's cricket frog (*Acris crepitans*)	C	X	
Bullfrog (*Rana catesbeiana*)	C		
Dwarf American toad (*Bufo americanus*)	C		
Fowler's toad (*Bufo woodhousei*)	C		
Gray treefrog (*Hyla versicolor*)	C		
Green frog (*Rana clamitans*)	U		
Leopard frog (*Rana pipiens*)	C	X	
Spring peeper (*Hyla crucifer*)	C		
Upland chorus frog (*Psuedacris triseriata*)	C		
Turtles			
Alligator snapping turtle (*Macroclemys temmincki*)	U		
Common snapping turtle (*Chelydra serpentina*)	C		
Missouri slider (*Chrysemys floridana*)	C		
Ornate box turtle (*Terrapene ornata*)	C		
Razor-backed musk turtle (*Sternothaerus carinatus*)	C		
Red-eared turtle (*Chrysemys scripta*)	C	X	
Smooth softshell turtle (*Trionyx muticus*)	C		
Stinkpot (*Sternothaerus odoratus*)	C		
Texas softshell turtle (*Trionyx spinifer*)	C		
Three-toed box turtle (*Terrapene carolina*)	C	X	

Table III-8 Continued

Species	Status[2]	Observed Fall 1977	Observed Spring 1978
Lizards			
Broad-headed skink (Eumeces laticeps)	C		
Eastern collared lizard (Crotaphytus collaris)	C		
Five-lined shink (Eumeces fasciatus)	C	X	
Green anole (Anolis carolinensis)	U		
Ground skink (Lygosoma laterate)	C		
Northern fence lizard (Sceloporus undulatus)	C	X	
Prairie racerunner (Cnemidophorus sexlineatus)	U		
Southern coal skink (Eumeces anthracinus)	C		
Snakes			
Black rat snake (Elaphe obsoleta)	C	X	
Eastern coachwhip (Masticophis flagellum)	C		
Eastern hog-nosed snake (Heterodon platyrhinos)	C		
Eastern yellow-bellied racer (Coluber coustrictor)	C		
Midland water snake (Natrix sipedon)	C		
Northern copperhead (Agkistrodon coutortrix)	C		
Prairie kingsnake (Lamphropeltis calligaster)	C		
Red-sided garter snake (Thamnophis sirtalis)	C		
Timber rattlesnake (Crotalus horridus)	C		
Western cottonmouth (Agkistrodon picivorous)	C	X	
Western diamondback rattlesnake (Crotalus atrox)	C		
Western rough green snake (Opheodrys aestivus)	C	X	

[1] *Adapted from Powell (1976), and U.S. Army Corps of Engineers (1974).*

[2] *E = Endangered, R1 = Rare 1, R2 = Rare 2, S = Status Undetermined U = Uncommon, C = Common*

<u>APPENDIX 8</u>

Comments Received on Site Study

State Office - Stillwater, Oklahoma 74074

January 9, 1978

Mr. Joseph Binder, Chief, Environmental Branch
Rural Electric Administration
Agriculture Building, South
Washington, DC 20020

Dear Mr. Binder:

We have reviewed the preliminary report on the site selection study for the proposed coal-fired generating plant for the Western Farmers Electric Cooperative as requested, and have the following comments:

1. The proposed Atoka site is located in the drainage area of the Caney Creek Watershed Project developed by the Soil Conservation Service under the authority of the Watershed Protection and Flood Prevention Act (PL-83-566). Approximately 1600 acres of the Atoka site drain into two floodwater-retarding structures already involved in this project. Runoff from the site into these structures may significantly affect water quality particularly during construction if effective erosion control and runoff measures are not utilized.

2. The report does not specifically address soils. In all probability there are soils that meet the definition of prime farmlands at each of the project sites. Your study should evaluate the impact of your proposed action on prime farmlands. Our local field office will be pleased to provide soil information if it is available for the sites under consideration.

We appreciate your invitation for our representatives to attend the onsite inspection of the three primary sites but because of prior commitment, please do not expect anyone from our agency to participate. We will be pleased to provide any available materials that will help in the detailed studies of the site selected.

Sincerely,

Roland R. Willis
State Conservationist

cc: ~~(with attachment)~~
John Beard, Area Conservationist, SCS, Hugo Area Office
Dirk C. Minson, Burns & McDonnell, Kansas City, MO

RECEIVED
JAN 11 1978
Burns & McDonnell
K. C. Office

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FIRST INTERNATIONAL BUILDING
1201 ELM STREET
DALLAS, TEXAS 75270

January 26, 1978

Mr. R. D. Sands
Project Manager
Burns & McDonnell
P. O. Box 173
Kansas City, Missouri 64141

Dear Mr. Sands:

We have reviewed your report entitled "Site Selection Study for the Proposed Coal-Fired Generating Plant for the Western Farmers Electric Cooperative." We have the following preliminary comments at this time:

1. Water quality impacts of wastewater discharges should be considered in site selection.

_. An NPDES permit application should be submitted as soon as possible, but in no case later than 180 days prior to beginning discharge. This includes any construction discharges.

3. It is stated on page 77 that there is a high probability of finding 3 to 5 archeological sites along Bird Creek. We believe an archeological survey of the Hugo site area should be conducted and clearance from the Oklahoma State Archeologist received before any construction activities commence. Also coordination with the Oklahoma State Historic Preservation Officer and the Advisory Council on Historic Preservation is needed.

We appreciate the opportunity to provide our input at this time. Further comments will be made on the EIS.

Sincerely yours,

David N. Peters

David N. Peters, Chief
Project Assessment Section (6AEPP)

cc: Donald L. Olsen

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Ecological Services
Room 3097 Federal Building
333 W. 4th Street
Tulsa, OK 74103

January 24, 1978

Mr. R. D. Sands, P.E.
Burns & McDonnell
P. O. Box 173
Kansas City, MO 64141

Dear Mr. Sands:

We have reviewed the Site Selection Study for Western Farmer's proposed coal-fired generating plant, Project 76-023-4-001. Our comments are provided as requested in your December 20, 1977, letter.

While adequate in other respects, the document may be held to be deficient in its treatment of fish and wildlife. It is hoped that our comments will serve to underscore environmental interests and that improved treatment of fish and wildlife resources in future documents will result.

In Selection of Ultimate Site Capacity as limited by considerations for air quality, (page 16), it is indicated that maximum allowable coal-fired plant capacity is 1000 MW in Oklahoma. Since a 1600 MW installation is being considered, planned dependence upon a relaxed limitation must be construed. This subject should be additionally examined and elaborated.

Document coverage of discharge, clearly a determinant of the difficulty of site development, should be expanded. Receiving waters for blow-down should be specified and measures to be implemented for containment of disposal-area wastes should be described. Site-specific obligations relative to discharge quality (as generally stated on page 23) should be detailed.

Rather than the regional treatment of "Rare and Endangered Species" provided on page 58, site-specific data recognizing both the State's listing and Endangered and Threatened Wildlife and Plants (Federal Register, Vol. 42, No. 135, July 14, 1977) should be held to be required for site-location recommendations.

REVOLUTION BICENTENNIAL
1776-1976

Among plant and animal species deserving attention are bald eagle populations wintering at Hugo Lake and those Proposed Endangered and Nominated Threatened Plants in the counties subject to plant/transmission line construction (see attachment).

It should be noted that categorization of the selected preferred site (Hugo) as least desirable from an archeological viewpoint (page 77) is in conflict with the page 59 statement that the LeFlore site is least desirable archeologically. In this same context it seems that the page 77 statement to the effect that no potential significance should attach to archeological sites probably occurring along Bird Creek (Hugo site) should be explained.

We suggest that a carefully designed intake structure should be included in planning rather than "is possible" as the final sentence of Hugo Aquatic on page 77 implies.

It may be noted that fauna is not explicitly considered under the Hugo site heading Terrestrial Flora and Fauna.

The vegetative-cover condition and land use at the Hugo site is not provided. Therefore, the reader has not been given a perspective for consideration of the statement that the LeFlore site is most diverse. Basis for the statement that the Hugo site is least productive of the three preferred sites by reason of soil limitations and past and current land mismanagement practices (which may not be unique) should be elaborated.

It may be seen that little has been provided in the way of support for the statement that Hugo "---is the most desirable from an environmental standpoint of the three preferred sites considered in the analysis", page 118.

We appreciate the opportunity for comment.

Sincerely yours,

Sidney H. Wilkirson

Sidney H. Wilkirson
Field Supervisor

Enclosure

cc: Western Farmers Elec. Coop, Anadarko, OK
Ok Dpt of Wildlife Conservation, Ok City, OK Attn: Ric Gomez
Area Manager, FWS, Austin, TX (ES)

March 29, 1977

OKLAHOMA DISTRIBUTION

Proposed Endangered and Nominated Threatened Plants

Proposed Endangered (Federal Register Vol. 41 No. 17 6/16/76)

Leavenworthia aurea, Golden glade cress

Streptanthus squamiformis, Twist flower

Eriocaulon kornickianum, Smallwood Pipewort

Vicia reverchonii, Hairy pod vetch

Castanea ozarkensis, Ozark chinquapin

Calamovilfa arcuata, (unnamed) Sandgrass

Nominated Threatened (Federal Register Vol. 40 No. 127 7/1/75)

Alnus maritina, (unnamed) Alder

Lesquerella angustifolia, (unnamed) Bladderpod

Carex latebracteata, (unnamed) Sedge

Monarda stipatoglandulosa, Horsemint

Physostegia micrantha, (unnamed) False dragon-head

Callirhoe papaver var. bushii, (unnamed) Poppy-mallow

Known Distribution by County

...air - #5

...yan - 7

...erokee - 5, 12

...octaw - 1, 8

...laware - 5

...hnston - 7

...timer - 5

...flore - 5, 9

Mayes - 5, 12

McCurtain - 1, 2, 5, 8, 9, 10, 11

Muskogee - 3

Pushmataha - 3, 6, 10

Seminole - 4

Sequoyah - 12

Tulsa - 12

Washington - 5

APPENDIX 6

NPDES Permit

OK 9-31
OK 35321

WESTERN FARMERS ELECTRIC COOPERATIVE
Post Office Box 429
Anadarko, Oklahoma 73005
405-247-3351

March 29, 1978

35327

Environmental Protection Agency
Ms. Adlene Harrison, Administrator
Region VI
First International Building
1201 Elm Street
Dallas, Texas 75270

Re: NPDES Permit Application
Western Farmers Electric Cooperative
Coal-fired Plant - Unit 1

Dear Ms. Harrison:

Pursuant to Section 125.12 of Title 40 of Code of Federal Regulations, Western Farmers Electric Cooperative, Owner and operator of the proposed coal-fired plant, hereby applies for a National Pollutant Discharge Elimination System (NPDES) permit.

We anticipate the review of the enclosed NPDES application for permit to discharge wastewater (Standard Form C) will be reviewed in accordance with 40 CFR 125.11. The required filing fee of $100 is enclosed less the $10 already submitted with the short form C. If your staff requires further information to process our application, please do not hesitate to contact us. Your expeditious review of the enclosed permit will be greatly appreciated.

Sincerely,

Maynard Human

Maynard Human
General Manager

jm
Enc.

cc: Sands
Adler

RECEIVED
MAR 31 1978
6AEP

RECEIVED
MAR 3 1 1978
6AEP

DEPARTMENT OF THE ARMY
TULSA DISTRICT, CORPS OF ENGINEERS
POST OFFICE BOX 61
TULSA, OKLAHOMA 74102

22 December 1976

SWTOD-N

PUBLIC NOTICE
GENERAL PERMIT NO. GP-OYT-DO-03-0000
INTAKE AND OUTFALL STRUCTURES IN OKLAHOMA IN
NAVIGABLE WATERS OTHER THAN NAVIGABLE WATERS OF THE UNITED STATES

Pursuant to Title 33 CFR 209.120 as published in the Federal Register on 25 July 1975, notice is hereby given that the following work will be authorized by a general permit under Section 404 of the Federal Water Pollution Control Act Amendments of 1972. A Public Notice for this general permit was issued on 19 July 1976. The Little Rock District Engineer will authorize, under this general permit, work on navigable waters in the Lee Creek drainage basin in eastern Oklahoma. The Tulsa District Engineer will authorize work on all other navigable waters in Oklahoma.

Scope of Work: Work authorized by this general permit is limited to the construction of intake and outfall structures where dredging and filling will take place below the ordinary high water mark. The amount of material that can be excavated in connecting trenches is limited to an average of one cubic yard per linear foot. The excavated material will be disposed above the ordinary high water mark or used as backfill. Fill material is limited to 20 cubic yards of excavated material, 20 cubic yards of stone for bank protection, and 10 cubic yards of concrete. This general permit does not apply to intake structures from which 50 percent or more of the intake water will be used for cooling purposes. Work on wetlands, on defined archeological and historical sites, and sites listed in the National Register of Historical Places and State Historic Sites are excluded from this general permit.

Location of Work: This general permit is applicable to all "navigable waters" in Oklahoma, excluding the McClellan-Kerr Arkansas River Navigation System and Lake Texoma.

Duration of General Permit: This general permit is in effect for a period of five years from the date of issuance unless it is revoked in the interim. Revoking the general permit will not affect the work that had been authorized when the general permit was in effect.

Water Quality Certification: The Oklahoma Water Resources Board, Jim Thorpe Building, 5th Floor, Oklahoma City, Oklahoma 73105, has certified that all work performed under this general permit will meet State water quality standards for dredged and fill material. These certifications apply only to the construction of intake and outfall structures authorized by this general permit.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

SWTOD-N
General Permit No. GP-OY1-DO-03-0000

Additional Permits:

a. If required, a NPDES permit under Section 402 of the Federal Water Pollution Control Act must be obtained from the Environmental Protection Agency before applying for authorization under this general permit. For information concerning NPDES permits, contact the Oklahoma Pollution Control Coordinating Board, P.O. Box 53504, Oklahoma City, Oklahoma 73105.

b. If required, a certification or waiver of certification for the effluent discharge must be obtained before applying for authorization under this general permit. For information concerning this certification, contact the Oklahoma Water Resources Board, Jim Thorpe Building, 5th Floor, Oklahoma City, Oklahoma 73105.

c. If a permit is required to appropriate water for the operation of an intake structure, it must be obtained before applying for authorization under this general permit. The permit for appropriation of water must be obtained from the Oklahoma Water Resources Board, Jim Thorpe Building, 5th Floor, Oklahoma City, Oklahoma 73105.

Procedures for Obtaining Authorization: Requests for authorizations on navigable waters in the Lee Creek drainage basin in eastern Oklahoma must be sent to the Little Rock District Engineer, P.O. Box 867, Little Rock, Arkansas 72203. If the intake or outfall structure is to be located on a Tulsa District Corps of Engineers' Lake, the request must be sent to the lake Resident Engineer. All other requests for authorizations in Oklahoma must be sent to the Tulsa District Engineer, P.O. Box 61, Tulsa, Oklahoma 74102.

The following procedures will be utilized in applying for authorization under this general permit and subsequent processing of such requests.

a. The applicant will furnish a description of the work with a written request to perform the work, a copy of the required State and Federal permits and the telephone number at which he can normally be reached during working hours.

The description of the work should include the following:

(1) The location of the work shown on a map.
(2) Description of the intake or outfall structure including drawings.
(3) The amounts of excavation and fill required.
(4) The types of excavated and fill materials involved in the work.
(5) The location of the disposal area for excavated materials.

b. If the District Engineer determines that the proposed work meets the provisions of the general permit, and no extraordinary conditions exist that would warrant filing a formal application, he will authorize the work by letter to the applicant.

SWTOD-N
General Permit No. GP-OY1-DO-03-0000

c. If the District Engineer determines that the proposed work does not meet the provisions of the general permit, or that extraordinary conditions exist, he will notify the applicant that filing of a formal application will be necessary.

Conditions of General Permit: All work authorized under this general permit will be subject to the conditions stated on inclosure 1.

1 Incl
As stated

Anthony A. Smith
ANTHONY A. SMITH
Colonel, CE
District Engineer

CONDITIONS OF GENERAL PERMIT

NO. GP-OY1-DO-03-0000

General Conditions:

1. That activities authorized by the District Engineer under this general permit shall be consistent with the terms and conditions of this general permit; and that any activities not specifically authorized by the District Engineer shall constitute a violation of the terms and conditions of this general permit which may result in the modification, suspension, or revocation of the District Engineer's authorization, in whole or in part, as set forth more specifically in General Conditions 10 and 11 hereto, and in the institution of such legal proceedings as the United States Government may consider appropriate, whether or not the District Engineer's authorization has been previously modified, suspended, or revoked in whole or in part.

2. That all activities authorized by the District Engineer shall be at all times consistent with applicable water quality standards, effluent limitations and standards of performance, prohibitions, and pretreatment standards established pursuant to Sections 301, 302, 306, and 307 of the Federal Water Pollution Control Act of 1972 (P.L. 92-500; 86 Stat. 816), or pursuant to applicable state and local law.

3. That the authorized activity shall, if applicable water quality standards are revised or modified during the term of the District Engineer's authorization, be modified, if necessary, to conform with such revised or modified water quality standards within 6 months of the effective date of any revision or modification of water quality standards, or as directed by an implementation plan contained in such revised or modified standards, or within such longer period of time as the District Engineer, in consultation with the Regional Administrator of the Environmental Protection Agency, may determine to be reasonable under the circumstances.

4. That the permittee agrees to make every reasonable effort to prosecute the work authorized herein in a manner so as to minimize any adverse impact of the work on fish, wildlife and natural environmental values.

5. That the permittee agrees to prosecute the work authorized herein in a manner so as to minimize any degradation of water quality.

6. That the permittee shall permit the District Engineer or his authorized representative(s) or designee(s) to make periodic inspections at any time deemed necessary in order to assure that the activity being performed under authority of the District Engineer's authorization is in accordance with the terms and conditions prescribed herein.

7. That the permittee shall maintain the structure or work authorized herein in good condition.

Inclosure 1

8. That the District Engineer's authorization does not convey any property rights, either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations, nor does it obviate the requirement to obtain State or local assent required by law for the activity authorized herein.

9. That the District Engineer's authorization does not authorize the interference with any existing or proposed Federal project and that the permittee shall not be entitled to compensation for damage or injury to the structures or work authorized under this general permit which may be caused by or result from existing or future operations undertaken by the United States in the public interest.

10. That the District Engineer's authorization may be summarily suspended, in whole or in part, upon a finding by the District Engineer that immediate suspension of the authorized activity would be in the general public interest. Such suspension shall be effective upon receipt by the permittee of a written notice thereof which shall indicate (1) the extent of the suspension, (2) the reasons for this action, and (3) any corrective or preventative measures to be taken by the permittee which are deemed necessary by the District Engineer to abate imminent hazards to the general public interest. The permittee shall take immediate action to comply with the provisions of this notice. Within ten days following receipt of this notice of suspension, the permittee may request a hearing in order to present information relevant to a decision as to whether his authorization should be reinstated, modified, or revoked. If a hearing is requested, it shall be conducted pursuant to procedures prescribed by the Chief of Engineers. After completion of the hearing, or within a reasonable time after issuance of the suspension notice to the permittee if no hearing is requested, the permit will either be reinstated, modified, or revoked.

11. That the District Engineer's authorization may be either modified, suspended, or revoked in whole or in part if the Secretary of the Army or his authorized representative determines that there has been a violation of any of the terms or conditions of the authorization or that such action would otherwise be in the public interest. Any such modification, suspension, or revocation shall become effective 30 days after receipt by the permittee of written notice of such action which shall specify the facts or conduct warranting same unless (1) within the 30-day period the permittee is able to satisfactorily demonstrate that (a) the alleged violation of the terms and the conditions of the District Engineer's authorization did not, in fact, occur or (b) the alleged violation was accidental, and the permittee has been operating in compliance with the terms and conditions of the authorization and is able to provide satisfactory assurances that future operations shall be in full compliance with the terms and conditions of the authorization; or (2) within the aforesaid 30-day period, the permittee requests that a public hearing be held to present oral and written evidence concerning the proposed modification, suspension, or revocation. The conduct of this hearing and the procedures for making a final decision either to modify, suspend, or revoke the District Engineer's authorization in whole or in part shall be pursuant to procedures prescribed by the Chief of Engineers.

12. That in authorizing work under this general permit, the Government has relied on the information and data which the permittee has provided in connection with his permit application. If, subsequent to the issuance of the District Engineer's authorization, such information and data prove to be false, incomplete or inaccurate, the authorization may be modified, suspended or revoked, in whole or in part, and/or the Government may, in addition, institute appropriate legal proceedings.

13. That any modification, suspension, or revocation of the District Engineer's authorization shall not be the basis for any claim for damages against the United States.

14. That the permittee shall notify the District Engineer at least two weeks before work is started and within two weeks after work is completed.

15. That if the work is not completed within one year of the District Engineer's authorization, the authorization will automatically expire.

16. That the District Engineer's authorization may not be transferred to a third party without his written approval.

Special Conditions:

17. That work will be conducted in a manner that will minimize increased turbidity of the water in the work area.

18. If items of apparent historical or archeological interest are discovered in Oklahoma during construction, they shall be left undisturbed and the Oklahoma State Archeologist, Oklahoma Archeological Survey, 1335 South Asp Avenue, Norman, Oklahoma 73069, and State Historic Preservation Officer, 1108 Colcord Building, Oklahoma City, Oklahoma 73102, shall be notified immediately.

19. That the work will not be located in the proximity of a public water supply intake.

20. That the discharge of dredged or fill material will not contain unacceptable levels of pathogenic organisms in areas used for sports including physical contact with the water.

21. That the discharge of dredged or fill material will not occur in areas of concentrated shellfish production.

22. That the discharge will not destroy or endanger the critical habitat of a threatened or endangered species, as identified under the Endangered Species Act.

23. That the intake structure should be designed so that intake velocities do not exceed .5 feet per second.

APPENDIX 9

PSD Permit

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FIRST INTERNATIONAL BUILDING
1201 ELM STREET
DALLAS, TEXAS 75270

CERTIFIED MAIL: RETURN RECEIPT #856410

MAR 30 1978

RECEIVED
WESTERN FARMERS
APR 3 1978
GENERATION

Mr. Allan Mauzey
Western Farmers Electric Cooperative
Post Office Drawer 429
Anadarko, Oklahoma 73005

Dear Mr. Mauzey:

A review of your application for authority to construct a 400 megawatt steam generating unit near Fort Towson, Oklahoma as specified in your Significant Deterioration Review, Application Number PSD-OK-53 dated November 15, 1977, has been completed by the Environmental Protection Agency (EPA). A determination has been made to approve your project. Our final determination indicates that you have met the requirements of the prevention of significant deterioration regulations of 40 CFR 52.21, as amended by the Clean Air Act Amendments of 1977, that is, the operation of your proposed project at the location specified, (1) will not cause a violation of the Class II air quality deterioration increments, (2) will not cause a violation of the National Ambient Air Quality Standards, (3) will not have an impact on the air quality of any mandatory Class I areas, and (4) will use best available control technology to control emissions of sulfur dioxide (SO2) and particulate matter (TSP).

A violation of any condition issued as part of this approval as well as any construction which proceeds at variance with information submitted in the application is regarded as a violation of construction authority and is subject to enforcement action. Also, before you start construction you must meet, if applicable, all other Federal EPA requirements such as the 40 CFR part 60 (New Source Performance Standards), the National Pollutant Discharge Elimination System (NPDES), and the National Environmental Policy Act (NEPA). Commencement of construction prior to the completion of the NEPA process may result in enforcement action pursuant to Section 6.906 of 40 CFR Part 6, Preparation of Environmental Impact Statement. Furthermore, it must be pointed out that issuance of your prevention of significant deterioration certification does not free you of the responsibility to comply with other air pollution control strategies and all local, State, and Federal regulations which are part of the Oklahoma State Implementation Plan.

This approval is issued in accordance with the following conditions:

1. The source will be constructed in accordance with the application and supportive facts submitted for EPA review.

2. The source shall meet the requirements for the application of best available control technology as follows:

   a) The source shall comply with the requirements of the New Source Performance Standards (NSPS) for Solid Fossil Fuel-Fired Steam Generators (40 CFR, Part 60, Subpart D); i.e., the maximum emissions of sulfur dioxide (SO2) and total suspended particulate (TSP) shall be 1.2 and 0.1 pounds per million BTU, respectively.

   b) The source shall comply with the NSPS for Coal Preparation Plants (40 CFR, Part 60, Subpart Y).

3. The maximum emission rates of SO2 and TSP for the proposed unit shall not exceed 4957.3 and 412.9 pounds per hour, respectively.

4. Compliance with the above required emission limitations shall be determined by the test methods and procedures as outlined in 40 CFR, 60.46 and 60.254.

5. Approval under the prevention of significant deterioration requirements shall take effect on the date of this notice. In accordance with the proposed prevention of significant deterioration rules which appeared in the Federal Register of December 8, 1977, construction must commence before December 1, 1978. If construction is not commenced by December 1, 1978, (where the term "commenced" is defined under 40 CFR 52.21(b)(7) as promulgated in the Federal Register on November 3, 1977), then this approval shall become invalid, and it will be necessary to resubmit an application under the new prevention of significant deterioration regulations which are expected to be promulgated on March 1, 1978.

The complete analysis including public comments, which justifies this approval, has been fully documented by the EPA Regional Office for future reference, if necessary. Any questions concerning this approval may be directed to Oscar Cabra by phone at (214) 767-2742 or by letter to this office.

Sincerely,

Myron O. Knudson
for Adlene Harrison
Regional Administrator

cc: John W. Gallion, Chief
Air Quality Service

Dirk Minson
Burns & McConnall Engineering

AFFIDAVIT OF INTENT

Western Farmers Electric Cooperative
Post Office Drawer 429
Anadarko, Oklahoma 73005

PSD-OK-53

Construction of a steam generating unit near Fort Towson, Oklahoma.

This permit would have been issued on or before this date, February 28, 1978, but for the order entered in Environmental Defense Fund v. Environmental Protection Agency, No. 78-281 (D.D.C.) on February 24, 1978.

Myron O Knudson

for Adlene Harrison
Regional Administrator

SWTOD-N

16 January 1978

Mr. Doug Harvell
Western Farmers Electric
Cooperative
P.O. Box 429
Anadarko, OK 73005

Dear Mr. Harvell:

Per your request of 21 December 1977, we have reviewed the Site Selection Report for Western Farmers Electric Cooperatives proposed coal-fired generating plant. Since detailed construction drawings were not supplied for each of the proposed sites an in-depth review of the work could not be accomplished. However, we do wish to offer the following site specific comments.

I. Hugo Site:

Work at this site may be authorized under nationwide permits (Incl 1) and/or General Permits (Incl 2). However, if the proposed work does not fall within the quantities of the permits or meet their special conditions an individual permit would be required for the work under Section 404 of the Federal Water Pollution Control Act Amendments of 1972.

II. LeFlore Site:

Construction drawings of the proposed levy and detailed locations of the ash disposal area and borrow area are required to adequately review the proposed work. However, structures placed in, over, and/or under the McClellan-Kerr Arkansas River Navigation System (Arkansas River) require a permit under Section 10 of the River and Harbor Act of 3 March 1899; and the placement of any fill or dredged material below the ordinary high water line requires a permit under Section 404 of the Federal Water Pollution Control Act Amendments of 1972.

III. Atoka Site:

The placement of fill material for the construction of the storage reservoir would require a Section 404 permit.

RECEIVED
JAN 19 1978
Burns & McDonnell
K.C. Office

SWTOD-N
Mr. Doug Harvell

16 January 1978

IV. Yeager, Haskell and Wilberton Sites:

The proposed pipelines and the diversion structure (Wilberton Site) may be authorized under the attached nationwide and/or general permits.

V. Bromide, Lomar, and Dustin Sites:

The pipelines may be authorized under the attached nationwide and/or general permits. However, the placement of fill for the construction of the reservoirs would require a Section 404 permit.

We wish to thank you for the opportunity to review the proposed project and sites. Should you have any questions or require additional information concerning the Corps Section 10 and Section 404 permit programs, please contact the Navigation Branch at (918) 581-7351.

Sincerely yours,

JAMES P. JONES
Chief, Operations Division

2 Incl
As stated

Copy furnished:

Mr. Dirk C. Minson
Burns & McDonnell
P.O. Box 173
Kansas City, MO 64141

Rural Electrification Admin. (REA)
Mr. Joe Binder, Chief
Environmental Branch
U.S. Agriculture Bldg. (South)
Washington, D.C. 20050

NATIONWIDE PERMIT FOR UTILITY LINE CROSSINGS
SECTION 404 PERMIT PROGRAM

A nationwide permit for the placement of dredged or fill material in waters of the United States for utility line crossings has been published in 33 CFR 323.4 (see Federal Register dated 19 July 1977). The nationwide permit authorizes the placement of dredged or fill material as backfill or bedding for utility line crossings, providing there is no change in the preconstruction bottom contours of the waterbody and all excess material is removed to an upland disposal area. A "utility line" is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquifiable or slurry substance, for any purpose, and any cable, line or wire for the transmission, for any purpose, of electrical energy, telephone and telegraph messages, and radio and television communication. Utility lines crossing navigable waters of the United States will require a permit under the Section 10 permit program. Navigable waters of the United States which are located within the boundaries of the Tulsa District Corps of Engineers are: The McClellan-Kerr Arkansas River Navigation System; Lake Texoma; the Red River from Fulton, Arkansas, to the Arkansas-Oklahoma State Line; and the Little River from its confluence with the Red River to Horatio, Arkansas.

For a utility line crossing to be authorized under this nationwide permit, it must satisfy the following conditions:

1. The discharge will not be located in the proximity of a public water supply intake.

2. The discharge will not occur in areas of concentrated shellfish production.

3. The discharge will not destroy a threatened or endangered species as identified under the Endangered Species Act, or endanger the critical habitat of such species.

4. The discharge will not disrupt the movement of those species of aquatic life indigenous to the waterbody.

5. The discharge will consist of suitable material free from toxic pollutants in other than trace quantities.

6. The fill created by the discharge will be properly maintained to prevent erosion and other non-point sources of pollution.

7. The discharge will not occur in a component of the National Wild and Scenic River System or in a component of a State wild and scenic river system.

If a proposed crossing satisfies <u>all</u> of the above conditions and is not located in a navigable water of the United States, it is automatically permitted and no further permit action from the Corps of Engineers is required. However, State or local approval of the work may also be required.

In addition to the conditions specified above, the following management practices should be applied to the maximum extent practicable in order to minimize adverse effects upon the aquatic environment:

1. Discharges of dredged or fill material into waters of the United States should be avoided or minimized through the use of other practical alternatives.

2. Discharges in spawning areas during spawning seasons should be avoided.

3. Discharges should not restrict or impede the movement of aquatic species indigenous to the waters or the passage of normal or expected high flows or cause the relocation of the waters (unless the primary purpose of the fill is to impound waters).

4. If the discharge creates an impoundment water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow, should be minimized.

5. Discharges in wetlands areas should be avoided.

6. Heavy equipment working in wetlands should be placed on mats.

7. Discharges into breeding and nesting areas for migratory waterfowl should be avoided.

8. All temporary fills should be removed in their entirety.

For additional information concerning the nationwide permit, please contact the Chief, Navigation Branch, Tulsa District Corps of Engineers, P.O. Box 61, Tulsa, OK 74102 or telephone 918-581-7351.

NATIONWIDE PERMIT FOR BANK STABILIZATION
SECTION 404 PERMIT PROGRAM

A nationwide permit for bank stabilization in waters of the United States has been published in 33 CFR 323.4 (see Federal Register dated 19 July 1977). The nationwide permit authorizes the discharge of material for bank stabilization, provided that the bank stabilization activity is less than 500 feet in length, is necessary for erosion prevention and is less than an average of one cubic yard per running foot along the bank. Bank stabilization placed in navigable waters of the United States will require a permit under the Section 10 permit program. Navigable waters of the United States which are located within the boundaries of the Tulsa District Corps of Engineers are: The McClellan-Kerr Arkansas River Navigation System; Lake Texoma; the Red River from Fulton, Arkansas, to the Arkansas-Oklahoma State Line; and the Little River from its confluence with the Red River to Horatio, Arkansas.

For bank stabilization to be authorized under this nationwide permit, it must satisfy the following conditions:

1. No bank stabilization is to be placed in any wetland area or in any locality or manner so as to impair surface water flow into or out of any wetland area.

2. The discharge will not be located in the proximity of a public water supply intake.

3. The discharge will not occur in areas of concentrated shellfish production.

4. The discharge will not destroy a threatened or endangered species as identified under the Endangered Species Act, or endanger the critical habitat of such species.

5. The discharge will not disrupt the movement of those species of aquatic life indigenous to the waterbody.

6. The discharge will consist of suitable material free from toxic pollutants in other than trace quantities.

7. The fill created by the discharge will be properly maintained to prevent erosion and other non-point sources of pollution.

8. The discharge will not occur in a component of the National Wild and Scenic River System or in a component of a State wild and scenic river system.

If a proposed bank stabilization project satisfies all of the above conditions and is not located in a navigable water of the United States, it is automatically permitted and no further permit action from the Corps of Engineers is required. However, State or local approval of the work may also be required.

In addition to the conditions specified above, the following management practices should be applied to the maximum extent practicable in order to minimize adverse effects upon the aquatic environment:

1. Discharges of dredged or fill material into waters of the United States should be avoided or minimized through the use of other practical alternatives.

2. Discharges in spawning areas during spawning seasons should be avoided.

3. Discharges should not restrict or impede the movement of aquatic species indigenous to the waters or the passage of normal or expected high flows or cause the relocation of the waters (unless the primary purpose of the fill is to impound waters).

4. If the discharge creates an impoundment water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow, should be minimized.

5. Discharges in wetlands areas should be avoided.

6. Heavy equipment working in wetlands should be placed on mats.

7. Discharges into breeding and nesting areas for migratory waterfowl should be avoided.

8. All temporary fills should be removed in their entirety.

For additional information concerning the nationwide permit, please contact the Chief, Navigation Branch, Tulsa District Corps of Engineers, P.O. Box 61, Tulsa, OK 74102 or telephone 918-581-7351.

NATIONWIDE PERMIT FOR DISCHARGES INTO CERTAIN WATERS OF THE UNITED STATES
SECTION 404 PERMIT PROGRAM

A nationwide permit for discharges into certain waters of the United States has been published in 33 CFR 323.4 (See Federal Register dated 19 July 1977). The nationwide permit authorizes discharges of dredged or fill material in the following waters of the United States:

(1) Non-tidal rivers, streams and their impoundments including adjacent wetlands that are located above the headwaters. The term headwater is defined as that point on a stream where a flow of five cubic feet per second is equaled or exceeded 50 percent of the time.

(2) Natural lakes, including their adjacent wetlands, that are less than 10 acres in surface area and that are fed or drained by a river or stream above the headwaters. In the absence of adjacent wetlands, the surface area of a lake shall be determined at the ordinary high water mark. The term ordinary high water mark is defined as that line on the shore established by physical characteristics such as a clear natural line impressed on the bank; shelving; changes in the character of the soil; destruction of terrestrial vegetation; the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding areas.

(3) Natural lakes, including their adjacent wetlands, that are less than 10 acres in surface area and that are isolated and not a part of a surface river or stream. In the absence of adjacent wetlands, the surface area of a lake shall be determined at the ordinary high water mark.

(4) Other non-tidal waters of the United States other than isolated lakes larger than 10 acres (see (3) above) that are not part of a surface tributary system to interstate waters or navigable waters of the United States.

For a discharge to be authorized under this nationwide permit, it must satisfy the following conditions:

(1) That the discharge will not destroy a threatened or endangered species as identified under the Endangered Species Act, or endanger the critical habitat of such species.

(2) That the discharge will consist of suitable material free from toxic pollutants in other than trace quantities.

(3) That the fill created by the discharge will be properly maintained to prevent erosion and other non-point sources of pollution.

(4) That the discharge will not occur in a component of the National Wild and Scenic Rivers System or in a component of a State wild and scenic river system.

If a proposed discharge of dredged or fill material satisfies all of the above conditions and is located in a water of the United States indicated in items (1) through (4), it is automatically permitted and no further permit action from the Corps of Engineers is required. However, State or local approval of the work may also be required.

In addition to the conditions specified above, the following management practices should be applied to the maximum extent practicable in order to minimize adverse effects upon the aquatic environment:

1. Discharges of dredged or fill material into waters of the United States should be avoided or minimized through the use of other practical alternatives.

2. Discharges in spawning areas during spawning seasons should be avoided.

3. Discharges should not restrict or impede the movement of aquatic species indigenous to the waters or the passage of normal or expected high flows or cause the relocation of the waters (unless the primary purpose of the fill is to impound waters).

4. If the discharge creates an impoundment water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow, should be minimized.

5. Discharges in wetlands areas should be avoided.

6. Heavy equipment working in wetlands should be placed on mats.

7. Discharges into breeding and nesting areas for migratory waterfowl should be avoided.

8. All temporary fills should be removed in their entirety.

For additional information concerning the nationwide permit, please contact the Chief, Navigation Branch, Tulsa District Corps of Engineers, P.O. Box 61, Tulsa, OK 74102 or telephone 918-581-7351.

DEPARTMENT OF THE ARMY
TULSA DISTRICT, CORPS OF ENGINEERS
POST OFFICE BOX 61
TULSA, OKLAHOMA 74102

SWTOD-N

16 March 1977

PUBLIC NOTICE
GENERAL PERMIT NO. GP-OY1-ND-06-0000
EXCAVATION AND FILL FOR SUBAQUEOUS
CABLE AND PIPELINE CROSSINGS
TULSA DISTRICT NAVIGABLE WATERS IN OKLAHOMA

Pursuant to Title 33 CFR 209.120 as published in the Federal Register on 25 July 1975, notice is hereby given that I will authorize the following work by a general permit under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 and, on Lake Texoma, under Section 10 of the River and Harbor Act of 1899. A public notice for this general permit was issued on 25 August 1976. No objections were received in response to that notice.

Scope of Work: Work to be authorized by this general permit will be limited to subaqueous cable and pipeline crossings, not to exceed 500 feet in length, nor require more than 10 cubic yards of excavated and fill material per linear foot. The amount of material for bank stabilization structures shall not exceed 500 cubic yards for each bank.

ocation of Work: This general permit will be applicable to all "navigable waters" in Oklahoma, excluding the following areas:

1. McClellan-Kerr Arkansas River Navigation System.

2. Wetlands.

3. On defined archeological or historical sites.

4. Sites listed in the National Register of Historical Places.

5. State Historical Sites.

6. Rivers designated by the Scenic River Act of 1974, Title 82, Oklahoma Statute, Section 1452, to be state wild and scenic rivers. These are the Illinois River, Barren Fork Creek, Flint Creek, Lee Creek, and upper Mountain Fork River (Above Broken Bow Lake).

Duration of General Permit: This general permit will be in effect for a period of 5 years from the date of issuance unless it is revoked in the interim. Revoking the general permit will not affect the work that had been authorized when the general permit was in effect.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976 ater Quality Certification: The Oklahoma Water Resources Board, 5th Floor, im Thorpe Building, Oklahoma City, Oklahoma 73105, has certified that all ork performed under this general permit will meet State water quality tandards. This certification will apply only to the excavation and placeent of fill material as authorized by this general permit. All other ischarges will require separate authorizations.

rocedures for Complying with the General Permit: The following procedures ill be utilized:

a. Persons desiring to accomplish work under this general permit will urnish a description of the work and a telephone number at which they can e reached during working hours. If construction crosses a Tulsa District orps of Engineers' lake, the information must be sent to the lake Resident ngineer. All information for work other than on a Corps' lake in Oklahoma ust be sent to the Tulsa District Engineer, P.O. Box 61, Tulsa, Oklahoma '4102. The description of the work should include the following:

1. The location of the work shown on a map.
2. The amount of excavation required and the disposal plan for the excavated material including the location of the disposal site.
3. The amount and type of bank stabilization material used.
4. A drawing showing the location of the bank stabilization.

b. Inquiries about work under the general permit involving Government roperty on Corps' lakes must include a letter requesting an easement. The equest should contain a centerline description of the cable or pipeline.

c. If the District Engineer determines that the proposed work meets he provisions of the general permit, and no extraordinary conditions exist hat would warrant filing a formal application, he will advise the petitioner y letter that the work falls within the scope of the general permit. The etitioner may proceed with the work as long as all conditions of the general ermit are met.

d. If the District Engineer determines that the proposed work does not eet the provisions of the general permit, or that extraordinary conditions xist, he will notify the petitioner that filing of a formal application will e necessary.

xempt Work: Persons constructing subaqueous cable and pipeline crossings are dvised that these crossings are exempt from Section 404 permit requirements if he following conditions are met:

1. Material excavated from the trench is placed in uniform rows alongside the trench or stockpiled on the bank above the ordinary high water mark.

2. Only the material that is excavated from the trench is used as backfill, and the bottom is returned to original contours.

3. All excess material is removed from the waterbody.

4. The applicant must furnish the following information:

   (a) The location of the work shown on a map.

   (b) The amount of excavation required and the disposal plan for any excess material including the location of the disposal site.

   (c) A description of how the work is to be performed.

The District Engineer will then make a determination as to whether the proposed ork meets the exemptions and a permit is not required or if conditions exist which warrant the filing of an application or if the work may be included under the general permit.

Non-Exempt Work: Section 10 permits on subaqueous cable and pipeline crossings will always be required on Lake Texoma and the McClellan-Kerr Arkansas River Navigation System. A Section 10 permit on Lake Texoma may be obtained in two ways. If the crossings fall within the scope of this general permit, the work can be reviewed in a relatively short period of time. If the crossings do not fall within the scope of the general permit, applications for individual permits should be submitted. Individual permit applications will also be required for work on the McClellan-Kerr Arkansas River Navigation System since it is excluded from the general permit.

A Section 404 permit on subaqueous cable and pipeline crossings will be required for work that does not meet the conditions stated above under "Exempt Work". Permits can be obtained in two ways. If the crossings fall within the scope of the general permit, the work can be reviewed in a relatively short period of time. If the crossings do not fall within the scope of the general permit, applications for individual permits should be submitted.

Applications for individual permits should be submitted in accordance with the pamphlet "Applications for Department of the Army Permits for Activities in

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Waterways". Free copies of this pamphlet are available upon request. Processing an individual permit application normally requires 90 days.

Conditions of General Permit: All work performed under this general permit will be subject to the conditions stated on inclosure 1.

1 Incl
As stated

RICHARD W. MATTES
Lieutenant Colonel, CE
Acting District Engineer

2 E/[illegible]

CONDITIONS OF GENERAL PERMIT NO. GP-OYI-ND-06-0000

General Conditions:

1. That all activities identified and authorized herein shall be consistent with the terms and conditions of this general permit; and that any activities not specifically identified and authorized herein shall constitute a violation of the terms and conditions of this general permit which may result in the modification, suspension or revocation of the authorization under this general permit, in whole or in part, as set forth more specifically in General Conditions 10 and 11 hereto, and in the institution of such legal proceedings as the United States Government may consider appropriate, whether or not this general permit has been previously modified, suspended, or revoked in whole or in part.

2. That all activities authorized under the general permit shall be at all times consistent with applicable water quality standards, effluent limitations and standards of performance, prohibitions, and pretreatment standards established pursuant to Sections 301, 302, 306, and 307 of the Federal Water Pollution Control Act of 1972 (P.L. 92-500; 86 Stat. 816), or pursuant to applicable state and local law.

3. That the authorized activity shall, if applicable water quality standards are revised or modified during the term of the general permit, be modified, if necessary, to conform with such revised or modified water quality standards within 6 months of the effective date of any revision or modification of water quality standards, or as directed by an implementation plan contained in such revised or modified standards, or within such longer period of time as the District Engineer, in consultation with the Regional Administrator of the Environmental Protection Agency, may determine to be reasonable under the circumstances.

4. That the permittee agrees to make every reasonable effort to prosecute the work authorized herein in a manner so as to minimize any adverse impact of the work on fish, wildlife and natural environmental values.

5. That the permittee agrees to prosecute the work authorized herein in a manner so as to minimize any degradation of water quality.

6. That the permittee shall permit the District Engineer or his authorized representative(s) or designee(s) to make periodic inspections at any time deemed necessary in order to assure that the activity being performed under authority of this permit is in accordance with the terms and conditions prescribed herein.

7. That the permittee shall maintain the structure of work authorized herein in good condition.

8. That this general permit does not convey any property rights, either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations, nor does it obviate the requirement to obtain State or local assent required by law for the activity authorized herein.

9. That this general permit does not authorize the interference with any existing or proposed Federal project and that the permittee shall not be entitled to compensation for damage or injury to the structures or work authorized under this general permit which may be caused by or result from existing or future operations undertaken by the United States in the public interest.

10. That the permittee's authorization under this general permit may be summarily suspended, in whole or in part, upon a finding by the District Engineer that immediate suspension of the activity would be in the general public interest. Such suspension shall be effective upon receipt by the permittee of a written notice thereof which shall indicate (1) the extent of the suspension, (2) the reasons for this action, and (3) any corrective or preventative measures to be taken by the permittee which are deemed necessary by the District Engineer to abate imminent hazards to the general public interest. The permittee shall take immediate action to comply with the provisions of this notice. Within ten days following receipt of this notice of suspension, the permittee may request a hearing in order to present information relevant to a decision as to whether his authorization should be reinstated, modified, or revoked. If a hearing is requested, it shall be conducted pursuant to procedures prescribed by the Chief of Engineers. After completion of the hearing, or within a reasonable time after issuance of the suspension notice to the permittee, if no hearing is requested, the authorization under this general permit will either be reinstated, modified, or revoked.

11. That the permittee's authorization may be either modified, suspended, or revoked in whole or in part if the Secretary of the Army or his authorized representative determines that there has been a violation of any of the terms or conditions of this general permit or that such action would otherwise be in the public interest. Any such modification, suspension, or revocation shall become effective 30 days after receipt by the permittee of written notice of such action which shall specify the facts or conduct warranting same unless (1) within the 30-day period the permittee is able to satisfactorily demonstrate that (a) the alleged violation of the terms and the conditions of the general permit did not, in fact, occur or (b) the alleged violation was accidental, and the permittee has been operating in compliance with the terms and conditions of the general permit and is able to provide satisfactory assurances that future operations shall be in full compliance with the terms and conditions of this general permit; or (2) within the aforesaid 30-day period, the permittee requests that a public hearing be held to present oral and written evidence concerning the proposed modification, suspension, or revocation. The conduct of this hearing and the procedures for making a final decision either to modify, suspend, or revoke the permittee's authorization under this general permit in whole or in part shall be pursuant to procedures prescribed by the Chief of Engineers.

12. That to determine if the permittee's work is within the scope of this general permit, the Government has relied on the information and data which the permittee has provided. If, subsequently, such information and data prove to be false, incomplete or inaccurate, the authorization under this general permit may be modified, suspended or revoked, in whole or in part, and/or the Government may, in addition, institute appropriate legal proceedings.

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13. That any modification, suspension or revocation of this general permit shall not be the basis for any claim for damages against the United States.

14. That the permittee shall notify the District Engineer at least two weeks before work is started and within two weeks after work is completed.

15. That if the work is not completed within one year of the determination that the work falls within the scope of the general permit, the right to work under the general permit will automatically expire.

16. That the permittee's right to work under the general permit may not be transferred to a third party without the District Engineer's written approval.

Special Conditions:

17. That work will be conducted in a manner that will minimize increased turbidity of the water in the work area.

18. That if items of apparent historical or archeological interest are discovered during construction, they shall be left undisturbed and the Oklahoma State Archeologist, Oklahoma Archeological Survey, 1335 South Asp Avenue, Norman, Oklahoma 73069, and State Historic Preservation Officer, 1108 Colcord Building, Oklahoma City, Oklahoma 73102, shall be notified immediately.

19. That the work will not be located in the proximity of a public water supply intake.

20. That the discharge of dredged or fill material will not contain unacceptable levels of pathogenic organisms in areas used for sports including physical contact with the water.

21. That the discharge of dredged or fill material will not occur in areas of concentrated shellfish production.

22. That the discharge of dredged or fill material will not destroy or endanger the critical habitat of a threatened or endangered species, as identified under the Endangered Species Act.

23. That clean, non-pollutional material will be used for construction.

9.0 Comments and Replies on the Draft EIS

9.1 U. S. Environmental Protection Agency

9.2 Advisory Council on Historic Preservation

9.3 U. S. Department of Health Education and Welfare

9.4 Oklahoma State Department of Health

9.5 U. S. Department of Interior

9.6 Sierra Club

9.1 U. S. Environmental Protection Agency

A. The issues and impacts on air and water quality, aquatic communities wildlife and land use are adequately covered. Several broad statements such as "care will be taken to disturb as little aquatic life as possible" and "overall site condition is expected to improve even with little or no management changes" and "Long-term impacts are expected to be minor and it is possible that the proposed project may even benefit wildlife on the plant site" are overly optimistic and largely unsubstantiated and offer no quantitative measures.

Reply

Qualitative assessments are presented in the EIS in an attempt to reveal the anticipated overall environmental impact of the proposed project in plain language and without excessive length. These features, which REA has incorporated into the subject EIS, are consistent with the proposed CEQ Draft NEPA Regulations and President Jimmy Carter's Executive Order No. 11991.

Quantative assessments can be found in Appendicies to the EIS and support documents that are available on request. Copies of these documents are being forwarded to EPA.

B. The Final EIS should point out that a Western Farmer's Prevention of Significant Deterioration (PSD) application has been submitted for Unit 1. Upon review, EPA determined that neither the National Ambient Air Quality Standards nor the PSD increments would be violated as a result of the project.

Reply

This information has been added to the Environmental Impact Statement. See page 14.

C. A significant regulatory requirement has been omitted from the list of Emission Standards in Section 1.4.1.1.2. The New Source Performance Standards (NSPS) for Coal Preparation Plants (40 CFR, Part 60, Subpart 4) should be addressed.

Reply

The proposed power plant will comply with 40 CFR, Part 60, Subpart Y, NSPS for Coal Preparation Plants, as stated in the PSD Permit. Sections 4.10 and 4.11 of the EIS describes the coal handling facilities and control measures for fugitive dust. Information on NSPS for Coal Preparation Plants has been added to Section 1.4.1.1.2.

D. In Section 4.1.1.2 (page 74), a sentence in the second paragraph reads incorrectly with regard to pounds of sulfur per pound of coal. The sulfur content should be expressed as a percentage by weight (i.e., 0.486% sulfur). Such a percentage of sulfur content should be shown to have an emission rate less than the NSPS emission standards.

Reply

The sentence referenced above was stated incorrectly in the Draft EIS. The coal contract calls for a weighted average sulfur content not to exceed 0.6 pounds of sulfur per million BTU "as received", with emissions limited to a maximum of 1.2 pounds of sulfur dioxide per million BTU of coal burned. Coal with a heating value of 8,127 BTU/pound and a sulfur content of .486% will result in a sulfur dioxide emission rate of 1.196 pounds per million BTU when burned in the proposed unit. This section of the EIS has been corrected.

E. In Section 4.1.3.2 (page 78), one paragraph states that ambient air monitoring is essential. The second paragraph relates a belief on the part of REA, that ambient monitoring is questionable. The agency's belief should be deleted and only the regulatory requirements should be addressed.

Reply

REA did not state that ambient air monitoring in general is questionable as implied in the comment. Paragraph two in Section 4.1.3.2 states, "that the requirement for ambient monitoring is questionable if the predicted ground level concentrations are below 75 percent of the most stringent standard."

F. We do not believe that alternate coal sources have been adequately explored. A more aggressive approach to lining up prospective suppliers early in the planning process should be used. Lists of possible supplies should include the BTU rating, sulfur and ash content for each one.

Reply

A detailed alternative coal analysis was prepared by Burns & McDonnell for Western Farmers. The study is referenced in Section 3.2.2.2 of the Environmental Impact Statement.

A coal supply search and study was performed on behalf of Western Farmers by Burns & McDonnell Engineering Company in Kansas City, Missouri. The study began in May, 1976, and concluded with a coal contract being signed in October, 1977. A final Fuel Supply Study was published in July, 1977, and is available upon request.

Invitations to submit proposals to furnish coal for the proposed Western Farmers' Plant were mailed to more than 50 potential coal suppliers during May, 1976. Recipients of the invitations ranged from the major coal producing companies of the country to coal brokerage firms representing numerous diverse coal interest. Forty coal offerings were presented for consideration. The offerings varied from complete responses offering coal to Western Farmers from active mines, proposed mines, and mines which would be opened for this project to the sale of reserves or rights to reserves. Sources of coal ranged from Montana, Wyoming, Colorado, Utah, and New Mexico to Indiana, Illinois, and Oklahoma. One offering was made to sell lignite from Texas.

A special effort was made to investigate and evaluate the potential offerings from Oklahoma. As a result of these efforts, a great deal of information concerning Oklahoma coal was obtained. Based on the proposals received for Oklahoma coal, Burns & McDonnell determined that the amount offered was insufficient to meet the project's immediate needs.

A detailed analysis of coal offerings was limited to those for which sufficient quality data was furnished to define necessary design parameters for the boiler, precipitator, and scrubber to estimate capital and operating cost. The objective of this analysis was to determine the total present value of the cost associated with using each fuel for a fifteen year period.

A copy of the Fuel Supply Study is being sent to EPA.

G. Maps and Graphics - Although mostly adequate in the Assessment, they are missing from the Draft EIS. A description on intake-outfall pipeline corridors within the property boundary should be in both the Assessment and the EIS. Figure 1-20 gives a fairly good idea of what is projected for this piece of land, but it could be made even clearer if the plant was superimposed on a drafted composite of the ecological data maps. All pipeline corridors, permanent parking, paths, and roads should be included. Impact maps are absent from both reports. One map which depicts the areas of environmental concern which will be affected by the construction/operation of the facility is an important descriptive tool and should be included.

Reply

The Assessment is attached as an appendix to the EIS and, as such, the maps and graphics in the Assessment are part of the EIS.

Impacts associated with the intake and discharge pipeline corridors within the property boundary will be similar to that described in the EIS. Although specific routes within the property boundary are yet to be determined, avoidance areas and corridor restoration efforts will be as described for the off-site corridors. Precise information regarding site layout, plant piping, and other on-site details does not exist and may in fact undergo several changes depending on construction needs and limitations once on-site preparation and construction have begun.

For the purposes of clarity, a narrative method of the amount and types of impacts associated with the proposed site was used. It was felt that to superimpose additional data on a complex graphic exhibit would only serve to complicate the data presented. However, the Terrestrial Report, which is available, presents a graphic representation of the plant facilities and their impact to the ecological systems of the proposed plant site. We are sending EPA a copy of this document for further information.

H. Step 1.C of the U. S. Water Resources Council's Floodplain Management Guidelines for Implementing Executive Order 11988 (Federal Register, February 10, 1978) defines utilities as critical actions. The minimum floodplain of concern for critical actions is the area subject to inundation from a flood having a 0.2 percent chance of occurring in any given year (500-year floodplain). The 500-year flood elevations for the proposed and alternate plant sites should be discussed in the final statement. Will the plant be designed to "operate" during a 500-year flood or merely survive such a flood? Will the proposed project be compatible with the Water Resources Council's guidelines?

Reply

Flood Insurance Rate Maps (FIRMs) for the Fort Touson area are not available. In discussions with the Corps of Engineers and the SCS, it was determined that the 500-year floodplain for the Kiamichi River and Bird Creek have not been developed. However, this facility is approximately 85 feet about the 100-year floodplain of the Kiamichi River and approximately 30 feet above the normally dry channel of Bird Creek. It is felt that at this elevation, the plant is above the 500-year floodplain and that a flood of this magnitude would not hamper normal operations.

I. That "no recreation facilities will be adversely affected as a result of the proposed project" may not be totally true. Both noise (during construction and operation) and aesthetic impacts are likely to affect the nearby recreational facilities.

Reply

The only aesthetic impacts which is anticipated to affect the nearby recreational areas would result from the stack and possible cooling tower plume. The plant location is well hidden from Highway 70 and the recreational areas by wooded areas and local relief.

It is not anticipated that nearby recreational areas would be adversely affected due to noise levels during operation. During construction, some audible noise may impact nearby areas; however, the levels will be within the regulatory requirements.

The minimum plant to property line distance is approximately 1500 feet and the distance to the nearest residence is about 6600 feet. Sound levels at the plant boundary are not expected to exceed 67 dBA, while the level at the nearest residence is not anticipated to exceed the EPA recommended 55 dBA Ldn. Since the nearest recreational areas are beyond these distances, noise impact is likely to be minor, with no significant adverse impacts.

J. The proposed site is surrounded by two popular recreational areas and construction activity may cause temporary traffic problems to visitors as well as residents for the area. The proximity to residences is not indicated in either EIS or the Assessment. If these are close by, will they be impacted in any way?

Reply

Some traffic congestion may be experienced during the construction phase of the proposed project. However, these should be of short duration during the peak construction phase. This congestion is considered to be unavoidable; however, the project's impact is not considered to be of a degree which would exceed the design capability of the major area highways.

There are several residents in close proximity to the plant site (the nearest being about 6600 feet away) which will be affected by increased usage of U. S. Highway 70 during construction activities. Anticipated traffic congestion is most likely to occur during shift changes and will be a short-term daily occurrence during construction.

K. We suggest that specimen trees and vegetation of high quality be given preferential treatment. Hickories (*Carya aquatica* and *C. myristaeformis*) which occur on the site are nowhere common in the United States and are attractive, valuable trees. In order to improve the site, as is hopefully mentioned several times in the EIS, a plan which is based on quality, maturity of vegetation and least erodible soils could point out the most suitable areas for roads, pipelines and ponds.

Reply

The two species of hickory that were found on the site, nutmeg hickory (*Carya myristicacformis*) and water hickory (*Carya aquatica*), are tentatively listed in a State of Oklahoma publication as rare-2. This status is given to species that "...may be quite abundant where it does occur, but is known in only a few localities or in a restricted habitat within Oklahoma." The plant site is locatedon the western edges of the respective U. S. ranges of both species. Personal communication between Burns & McDonnell and Dr. Donald Stone at Duke University, an expert on the family to which hickories belong (Juglandaceae), has revealed that to say "nowhere in the U.S. are these common" is incorrect. Nutmeg hickory is very abundant in disjunct populations distributed in 11 Arkansas Counties. It also occurs in 10 Texas, 6 Louisiana, 5 Mississippi, 3 Alabama, 1 South Carolina and 2 Oklahoma Counties. Locally dense populations are generally associated with limestone outcrops or calcareous soils. The species can be locally uncommon but is by no means threatened with extinction. The plant site is within its "locally common" region as is the entire Kiamichi Basin. Areas not impacted by site development can develop into ideal sites for establishment of more individuals of nutmeg hickory if the old fields are left undisturbed.

Water hickory, exhibiting a much broader range than nutmeg hickory, is never really abundant within its range except in certain parts of Northern Louisiana. Occupying stream beds throughout its range, it occurs periodically within the riparian community. Although never found in dense stands, it nonetheless is not unique within its range, including the southeastern parts of Oklahoma. Only one individual was actually seen on the site during the extensive vegetation surveys. This tree was observed in the North West portion of Section 27 on the proposed site. No development is scheduled for this area and therefore no impacts are anticipated.

There are no plans to avoid or give preferential treatment to specific vegetative areas of the site during construction.

L. It is stated on page 93 that the Western Farmers' plant will use 2,420 acre-feet of groundwater per year at a rate of 1,500 gallons per minute. The statement indicates that such a withdrawal rate will not significantly effect groundwater resources in the area. Additional information substantiating this statement should be included in the Final EIS.

Reply

The State of Oklahoma has given Western Farmers' preliminary approval to use 2,420 acre-feet of groundwater per year at a rate of 1500 gallons per minute. The withdrawal rate is not finalized at this time. The State of Oklahoma will determine the amount of water that can be safely pumped from each well after test wells have been drilled. The quantity of groundwater outlined in the comment is a conservative value and actual consumption will likely be less.

M. On page 66 the statement says that EPA has two alternatives in regard to the NPDES--either to issue or deny the permit. It should be pointed out that the permit also may be modified based on comments received on the EIS. Although the NPDES permit is for discharge of wastewater, it is conceivable that nonwater-related environmental stipulations may be placed in the permit based upon the EPA review.

Reply

This information has been added in the Final Environmental Impact Statement.

9.2 Advisory Council on Historic Preservation

The Council has reviewed the DES and notes that the Rural Electrification Administration has determined that the proposed undertaking will not affect properties included in or eligible for inclusion in the National Register of Historic Places. Accordingly, the Council has no further comment to make at this time. It is suggested, however, that the final environmental statement contain the Oklahoma State Historic Preservation Officer's concurrence in REA's determination of no effect.

Reply

Letters from the State Historic Preservation Officer and State Archaeologist are included in Appendicies 2 and 1 respectively. Copies of these letters follow and indicate no conflict with the REA determination in the EIS.

STATE OF OKLAHOMA

OFFICE OF THE STATE HISTORIC PRESERVATION OFFICER

HISTORICAL BUILDING
OKLAHOMA CITY, OKLAHOMA 73105

ISTORIC PRESERVATION
EVIEW COMMISSION

EORGE L. CROSS, Ph.D.
hairman

OBERT E. BELL, Ph.D.
HARLES W. HARRIS, Ph.D.
AMES L. LOFTIS, A.I.A.
. MILT PHILLIPS

ARRY L. DEUPREE, M.D.
ate Historic
reservation Officer

December 14, 1977

Mr. William A. Lynk
Burns and McDonnell
P. O. Box 173
Kansas City, Missouri 6414

Dear Mr. Lynk:

The State Historic Preservation Office has completed its review of the proposed installation of transmission lines in the service area of the Western Farmers Electric Cooperative. No effect on any property currently listed in the National Register of Historic Places or the Oklahoma Survey Inventory is indicated.

Sincerely,

Harry L. Deupree, M.D.

Harry L. Deupree, M.D.
State Historic
Preservation Officer

HLD:mt

RECEIVED
DEC 21 1977
Burns & McDonnell
K. C. Office

The
University of Oklahoma 1335 South Asp Avenue Norman, Oklahoma 73019

Oklahoma Archaeological Survey

September 1, 1977

Mr. William A. Singleton
Barns and McDonald
P.O.Box 173
Kansas City, Missouri 64141

Re: Cultural resources in Western Farmers Electrical Cooperative proposed power plant, Choctaw County, Oklahoma (Sections 21, 22, 27, and 28, T6S-R19E).

Dear Sir:

I have received a letter report from Mr. Wayne Young, University of Oklahoma archeologist, regarding the archeological survey of this proposed plant location. His September 1, 1977, letter indicates that no prehistoric or historic resources of potential significance to the locale, region, state or nation were found to occur on the proposed location.

As a result of his findings, I am most pleased to recommend that this proposed project be cleared for construction.

Yours truly,

Don G. Wyckoff
State Archeologist

DGW:fdw

The power plant will be located in southeastern Oklahoma. Their supply of coal will be in Wyoming. Coal will be transported by unitized train and the cars will return empty. About 200 acres of land will be allotted for ash disposal, and the disposal area is expected to be full after 35 years. Some of this land is prime farmland. One alternative that has not been considered is to return the ash to Wyoming on the return train to be disposed of at the coal mine. This would require some handling cost at each end but no transportation cost.

Reply

Section 3.5.2.2 of the EIS contains a short summary of the alternative mentioned in the above comment. Additional information as to why this alternative was not considered feasible is presented below:

> The transportation of ash from the proposed plant site in southeastern Oklahoma to the mine in Wyoming for disposal would result in substantial transportation cost increases. Transportation of ash would require the purchase or lease of closed containers for rail or truck transport. The facilities for this type of ash transport would require Western Farmers to incur additional capital and transportation costs as these facilities differ from the unit rail-cars purchased for coal delivery.
>
> The interstate transportation of waste products for disposal is a questionable alternative and one which has recently come under fire in the courts with no adequate resolution.

9.3 U. S. Department of Health Education and Welfare

A. In reviewing the proposed project, it was our understanding that all effluent and emission discharges would meet applicable Federal and State rules and regulations. However, the statement concerning Polychlorinated Biphenyls (PCB's) on page II-48 of the Environmental Analysis states that compliance standards will be determined at the end of the mixing zone or on a case-by-case basis. The final Effluent Guidelines for Steam Electric Power Generating Plants Point Source Discharge published October 8, 1974, states that "there shall be no discharge of PCB's." We would like to see a commitment to this effect in the final environmental impact statement. It is well known that PCB's in the environment cause adverse effects to human health.

Reply

There will be no discharge of PCB's from the proposed generation facility during either construction or operation.

9.4 Oklahoma State Department of Health

There is insufficient information given in the draft to make a determination if the disposal of sludge and fly ash will adversely affect the environment. Our Industrial and Solid Waste Division has not been contacted regarding this aspect and we suggest the responsible parties do so.

Reply

The proposed unit will burn low sulfur coal and use of a flue gas desulfurization system is not contemplated. Therefore, there will be no sludge waste disposal.

Fly ash will be preumatically conveyed to the fly ash disposal ponds. It is REA's understanding that specifications and permit application for fly ash disposal were submitted for approval to the Industrial Solid Waste Division of the Oklahoma State Department of Health. While the status of the permit is unknown as of this date, Western will comply with the regulations governing the construction and operation of the proposed facility.

9.5 U. S. Department of Interior

A. Our review indicates that one plot of property involved in the proposed project is a portion of an original Indian allotment with a one-half mineral interest in the western half of Section 17, T. 6 S., R. 21 E. This plot is considered restricted Indian land by the Bureau of Indian Affairs and they may have trust responsibilities for that property. The Muskogee Area Office, Bureau of Indian Affairs, Muskogee, Oklahoma, should be contacted for further information.

Reply

The plot of land described in the above comment is not part of the proposed site property and as such will not be impacted by the project. That part of Section 17 which is part of the plant site is located approximately one-half mile east of the Indian Trust Land.

B. On page 3, the draft statement suggests that high-sulphur local coal might be burned at some future date. If so, impacts of this action should be addressed in the final statement along with proposed modifications regarding local coal transport, control of increased SO_2, and sludge disposal.

Reply

A brief discussion of the impacts associated with the use of high-sulfur coal is provided in the EIS and also in Appendix I. If a decision to use high-sulfur coal is made, REA will evaluate the impact of the change at that time.

C. We understand that known mineral resources in the vicinity of the power plant and transmission line corridor include natural asphalt, high quality limestone, sand and gravel, and clays. However, the environmental analysis for the generating station should evaluate usage of these materials. We also note that sand and gravel and asphalt are not mentioned in the environmental analysis for the transmission line, and should be included.

Although there are two active limestone quarries in Choctaw County, neither the plant site nor the power line corridors will conflict with either quarry. Although we do not anticipate serious conflict between the proposed project and mineral production facilities in the area, we suggest that the final statement should discuss all major mineral resources in the area and indicate whether any possibility of conflict of use exists.

Reply

The transmission lines are not anticipated to preclude the exploitation of any mineral resources and, if required, could be rerouted if such activity were anticipated. Use of the plant site for mineral extraction will be possible following the end of the facilities useful life. There is no indication that on-site mineral deposits are economically attractive, or large enough to warrant extraction activity. A detailed examination of all mineral resources in the area is beyond the scope of this EIS. REA does not see any possibility of conflict of use with any known mineral production facilities in the area.

D. The environmental analysis on the transmission facilities indicates that an archeological survey of the line corridors will be performed. The name and institution of the investigator conducting the survey should be cited in the final statement. If any sites are recorded during the survey, information should be included in the final statement regarding the nature and significance of the sites and the effect of the project on such sites. If the project will adversely affect significant archeological resources, a plan of action should be cited to mitigate this effect. Contract specifications should include a sentence to the effect that if any archeological resources are encountered during construction, operations will cease at the site and a professional archeologist will be consulted as to the significance of the material.

Reply

The archeological survey of the transmission corridors has not been made as of this date. However, the investigator chosen to do the survey will be approved by the State Archaeologist. The State Historic Preservation Officer and State Archaeologist have reviewed the proposed and alternate corridors and letters to this effect can be found in Appendix 2. Any cultural resources encountered during construction will cause construction to cease at that location until a professional archaeologist evaluates the significance of the material. This requirement is a part of the REA loan contract.

E. The potential impact of the power plant emissions on recreational sites within the vicinity of the proposed plant, especially in Hugo, should be addressed in detail in the final statement. The impact and effects of the water to be withdrawn from the Kiamichi River on recreational use of the river should be addressed. The Kiamichi River has been identified in the 1974 Oklahoma Statewide Comprehensive Outdoor Recreation Plan as a potential addition to the Oklahoma Scenic River System. Any adverse effects to this possible addition should also be discussed in the final statement.

<u>Reply</u>

Emissions and resulting ground level concentrations from the proposed plant will be in compliance with Federal and State ambient air regulations established to protect public health and welfare. Therefore, no adverse impacts to recreational facilities is anticipated.

Water withdrawal from the Kiamichi River will not result in low flow conditions below the dam, since Western Farmers' requirements will be released from the dam in addition to the normal water releases. Although the Kiamichi River was identified as a potential addition to the Oklahoma Scenic River System in 1974, information from the Oklahoma Water Resources Board is that the portion of the Kiamichi River below Hugo Dam would be excluded.

F. The draft statement asserts on page 93 that three wells will be used to pump about 1,500 gpm during construction. The probable duration of the withdrawal of up to 2,420 acre-feet per year should be predicted in the final statement. The anticipated drawdown of water levels and radius of influence should be calculated on the basis of the values of transmissivity and storage coefficient given on page I-16 of the environmental analysis for the plant. In addition, the number and location of wells within the radius of influence of the plant's withdrawals should be shown or discussed and the resultant impacts assessed in the final statement. The ultimate fate or use of the three plant wells should also be addressed.

Reply

The withdrawal of 2,420 acre-feet per year is presented as a maximum anticipated value and actual withdrawal rates should be less. Until test wells are drilled, it is not possible to provide specific accurate answers to the other questions. The State of Oklahoma will determine the exact rate of pumping to be allowed as a result of examining the test wells. Following construction, the wells will be retained for emergency potable water supplies.

G. It is noted on page 1-84 in the environmental analysis for the generating facility that sludge discharged from the flue gas desulfurization system, if required, will be mixed with fly ash and transported to a landfill. Since fly ash contains toxic substances, we recommend that measures to control leachate migration from landfill sites into the hydrologic environment should be considered in the final statement.

Reply

The ash disposal area will be lined to prevent leaching (see Section 1.5.7 in Appendix 1).

Section 4.10.3 (Ash and Sludge Disposal) in the EIS also discusses proposed measures to control leaching from the disposal area.

H. Although it is stated that an average of 7.46 mgd of water will be extracted from the Kiamichi River, no reference is provided regarding the purchase of additional waters from the Hugo Reservoir to augment the instream flow. Since the average discharge from Hugo Reservoir via the Kiamichi River is only 15 cfs during December and January, the applicant's proposed withdrawal of an average of 11.5 cfs could have severe impacts on aquatic and terrestrial communities. Particularly severe impacts could occur for some rare and endangered species of fish and wintering bald eagle populations. More specific information should be provided in the final statement regarding the water supply for this proposed facility. Planned measures to minimize impacts on fish and wildlife should also be described. Increased releases from Hugo Reservoir to accommodate the applicant's needs especially during low flow periods may be needed and should be discussed in the final statement.

Reply

As stated in Section 4.2 (Water) of the EIS, flow downstream of the dam will be increased above the normal water release to provide the necessary water for plant operation. There will be no reduction in flow downstream of the dam due to the operation of the proposed plant.

I. Although statements of intent to purchase water rights from the U. S. Army Corps of Engineers appear in both the draft statement and applicant's reports, no document of approval is mentioned. State approval, through the Oklahoma Water Resources Board, will be required to withdraw the required water volume from the Kiamichi River. Documentation of these approvals should be cited in detail in the final statement.

Reply

Western Farmers' Board of Trustees signed the contract between Western Farmers and the Corps of Engineers for water storage and release in June 1978. The contract is now awaiting signature by the Secretary of the Army. The surface water permit was issued to Western Farmers (Stream Water Permit 77-160) by the Oklahoma Water Resources Board in April 1978.

J. We believe that the treatment of the potential impacts of the proposed action on threatened and endangered species is inadequate throughout the draft statement. The attached table lists rare (state designation), threatened, and endangered plant and animal species which have been collected or are known to occur on the plant site, transmission and pipeline corridors or their areas of influence.

Two of the plants listed are proposed to be listed as endangered or nominated to be listed as threatened (Leavenworthia aurea and Lesquerella angustifolia, respectively). Both have been observed or collected from the project vicinity and could be impacted by construction and operation of the proposed facilities. The final statement should specifically address these species and assess the impacts of the proposed project.

In addition, three fish species that are designated rare on the State list, are known to occur in the Red River drainage including the Kiamichi River and Gates Creek and are sensitive to any habitat alteration. Since the applicant proposes construction of both transmission lines and pipelines crossing or otherwise affecting stream environments, potential impacts on these species could occur. We recommend that the final statement provide an adequate analysis of the proposed construction on these species and their habitat.

Reply

Appendicies and supplement material to the EIS are available that provide the detailed information requested in the above comment. We are forwarding to the Department of Interior a copy of the Aquatic and Terrestrial Assessment prepared for the Hugo plant site. No threatened or endangered species have been identified on the proposed site and therefore no impacts are anticipated.

Leavenworthia aurea was not seen at any time during the terrestrial biology study. It is highly probable (based on the study) that the species does not exist on the site and no impacts are expected. Lesquerella angustifolia (nominated for inclusion as a threatened plant species) was found on the site during the late spring vegetation survey. The locations of the plants on the site were on the edge of an old washed-out road on the extreme northwest corner of Section 27 and occasionally on overgrazed areas in Section 29 where thin soils were exposed. These habitat types compare favorably with those identified in a report prepared by the OSU Department of Biological Sciences and the OU Biological Survey which states that known habitat types for Lesquerella angustifolia are, "shallow soils over limestone, but also on disturbed areas, roadsides and railroad right-of-ways..." Lesquerella angustifolia is an annual mustard and the actual plants have never expired; only the seeds persist. Natural processes can transport the seeds to other suitable sites for germination and establishment. Construction on the proposed site is not expected to result in a substantial detrimental impact to the overall vigor of the species since the habitat types for this plant are not uncommon in Choctaw County, and since this species has been collected at many other sites in Choctaw and McCusturin Counties, as well as northern Texas. Construction may, in fact, result in a short-lived invasion of Lesquerella angustifolia before it is replaced by later successional species. Since habitat areas for Lequerella angustifolia are not rare in the county, the impact on the species, as a whole, by this project is expected to be minimal.

The outfall pipe will cross Gates Creek at the low-water bridge (see the Aquatic Biology Study which has been forwarded to D.O.I). The creek will be affected for a short period during construction and little impact is expected to occur algal, invertebrate, and fish population. The Aquatic Biology Study indicates that Gates Creek, "in the vicinity of the low-water bridge is not a particularly productive area as far as fish are concerned."

Transmission lines will not require substantial clearing and access road construction since they will parallel existing PSO corridors. All streams will be spanned by the transmission lines and no construction will occur on the stream banks. Construction equipment will not directly traverse stream unless an existing water crossing in routing around the stream is not feasible. Minor stream sedimentation may result during construction but will be short-lived and no significant impacts to the stream are anticipated.

REA has made formal application for consultation under Section 7 of U.S.C. 1536 to U. S. Fish and Wildlife Service. It is hoped that this consultation will result in a satisfactory solution to the question of rare, threatened, and endangered species.

K. Withdrawal of water from the Kiamichi River during winter low flows could have serious impacts on wintering bald eagle populations in the area. Since the birds habitually feed on fish downstream from large reservoirs, extremely low flows would limit the feeding habitat for this species as well as have deleterious effects on some of the above-mentioned sensitive species of fish. We are very concerned that severe impacts on these endangered species and on terrestrial and aquatic communities could result if sufficient water were not released downstream to compensate for that diverted by the applicant. The final statement should address these potential impacts to Federal and State protected species specifically and formulate plans to alleviate the deleterious effects. We also recommend that the final statement discuss releases proposed from Hugo Dam to mitigate these impacts.

<u>Reply</u>

See reply to "H" above.

L. Concentrations of chlorine in plant discharge waters should be given in the final statement. In the draft statement, the example NPDES permit states 0.5 mg/l as the daily maximum limitation. The effects of this concentration on aquatic organisms should also be discussed in the final statement.

It is implied in the draft statement that environmental impacts of the water pipeline will be limited to the construction of the lines. Even with suitable treatment, vegetation will be disrupted after construction and require a period of time to recover. During this lag phase (which will be variable in length in different situations) varying degrees of impacts on flora and associated fauna will occur. These impacts should be fully assessed in the final statement.

We find that the draft statement contains conflicting figures on page 102 on the numbers of species of fauna observed in the vicinity of the site. The final statement should reconcile the number of species of mammals and birds observed. The final statement should provide a more adequate assessment of the expected environment effects of the project upon the flora and fauna.

Reply

The 0.5 mg/l chlorine limitation stated in the NPDES permit refers to the cooling tower blowdown water to the bottom ash pond. The discharge quantity to the Red River would be less due to residence time in the bottom ash pond before discharge and no adverse effects to aquatic organisms are expected. Allowable discharge quantities in the NPDES permit have been established in accordance with the Federal Water Pollution Control Act Amendments of 1972 (PL-92500) and as such provides for the protection of aquatic organisms. Compliance with the established discharge regulations will, in REA's opinion, minimize impact to aquatic organisms.

Additional details regarding impacts associated with pipeline construction can be found on pages II-80 and 81 of Appendix 1.

The material on page 102 of the EIS has been corrected.

Additional detail on anticipated environmental effects of the project on flora can be found in Appendices 1 and 2 and also in the Terrestrial and Biological Studies which are being forwarded to the Department of Interior.

M. All three of the alternatives discussed in the draft statement involve direct discharge of waste water into live streams. We believe that alternatives to the proposed discharge pipeline have not been adequately discussed in the draft statement. On-site detention, treatment and discharge into Bird Creek would seem a more environmentally and potentially economically sound technique of waste water disposal, than the physical disruption entailed in construction of the proposed outfall pipeline. While pipeline construction would result in disturbance of vegetative communities, increased soil erosion and stream sediment loads, we believe that impoundment of waste water in an on-site detention reservoir would appear to have less deleterious effects on fish and wildlife. In the portions of the outfall pipeline corridor lying within floodplain areas, the effects of soil erosion could be compounded by flooding during the period between excavation and complete recovery of vegetative communities, thus increasing negative environmental impacts. The final statement should provide a more detailed assessment of the environmental impacts of this alternative.

Reply

Creation of an on-site waste water detention pond would likely result in a greater disturbance to vegetative communities and habitat than the proposed discharge pipeline. Utilization of Bird Creek as a discharge avenue to the Kiamichi River could be an alternative for discharge to the Kiamichi River. It is questionable whether Bird Creek could handle the proposed discharge quantity. The alternative of discharging to the Kiamichi was discussed with the Oklahoma Water Resources Board and feasibility studies were prepared. However, the alternative proved to be unfeasible due to the high treatment costs required to meet the required water discharge quality standard for the Kiamichi River. This and other water disposal alternatives are discussed in Section V.4.7 of Appendix I.

Construction of the pipeline will occur during the dry season which there is little likelihood of flooding. Soil Conservation Service will be contacted regarding precautionary measures and vegetative types that will provide rapid ground cover and soil stabilization.

N. On page 78 of the draft statement, mention is made of the applicant's intent to propose additional generating units at the site. The final statement should fully discuss plans for this additional capacity and assess the cumulative environmental impacts of this expansion.

Reply

Western Farmers has applied to REA for a guaranteed loan to finance a proposed 400 MW generating unit and associated transmission. REA is currently evaluating the request and this EIS is part of REA's decisionmaking process. If Western Farmers should request financing for another unit(s) in the future, REA will evaluate the request at that time.

0. We believe that this section of the draft statement does not adequately assess the fish and wildlife resources found along the proposed Hugo-PSO Valliant segment. The final statement should provide an analysis of fish and wildlife resources which more accurately reflects existing levels of these resources along the transmission corridors and potential impacts of construction and operation. Since these corridors cross a greater variety of vegetative cover types than are found on the plant site proper, it is not prudent to assume that no "significant" differences would occur in faunal communities. An important concern of the Fish and Wildlife Service regarding these corridors is the potential impacts on aquatic resources especially at stream crossings.

Reply

Additional information regarding the transmission lines and their impact on vegetation and wildlife can be found in Appendix 2 to the EIS. The proposed transmission corridors do not cross a greater variety of vegetative cover type than found on the plant site as shown in the following table:

Vegetative Community	Plant Site	Transmission Corridors
Upland Hardwood	X	X
Riparian Hardwood	X	X
Range-Pasture	X	X
Lowland Hardwood	X	
Savannah	X	

As can be seen a greater variety of vegetative types exist on the plant site. The transmission corridors cross land that is primarily used as pasture and range land. Fewer vegatative types (all of which also exist on the plant site) and the use of the land leads to the conclusion that no significant difference will occur in faunal communities. Also, the proposed lines will parallel existing PSO lines and, therefore, cross previously disturbed areas. Western Farmers will use existing roads for access and construction to the extent possible, thereby further reducing environmental impacts.

See response to "J" above regarding stream crossing impacts.

P. Fish and Wildlife Coordination - The review comments concerning fish and wildlife resources offered here are not intended to reflect a negative stance by the Fish and Wildlife Service toward the proposed action. Rather, the intent of the Service is to ensure that all imminent and potential environmental impacts, especially those relating to fish and wildlife resources, are adequately addressed in the final statement. The aspects of this project of greatest concern to the Service are the effects of construction and operation on aquatic organisms of the water intake device, uninvestigated alternatives to direct discharge of waste water, impacts of construction of the pipeline and transmission corridors -- especially at stream crossings and overall potential impacts on threatened and endangered species of plants and animals.

The proposed project will require permits from the Corps of Engineers under Section 10 of the River and Harbor Act of 1899 and under Section 404 of the Federal Water Pollution Control Act Amendments of 1972. A NPDES permit from the Environmental Protection Agency must also be issued. At a minimum, the Fish and Wildlife Service will probably recommend to the Corps of Engineers and EPA that the permits they issue should require features to ameliorate these concerns. The intake structure will need to be designed and operated in accordance with Section 316(b) of P.L. 95-217 to avoid impingement or entrainment of organisms. In addition, periodic monitoring may also be required to ascertain any physical effects on aquatic organisms, especially on eggs, larvae and fry of striped bass and other sport species.

Accordingly, the comments on this statement do not in any way preclude additional and separate comments by the Service regarding construction and operation of both intake and outfall devices upon review of appropriate permit applications and any additional information available, in accordance with the Fish and Wildlife Coordination Act.

Reply

The intake structure is discussed in Section 4.2 and Appendix 5 of the EIS and Section II.2.3 of Appendix I. Water discharge alternatives are discussed in Section V.4.7 of Appendix I and impact of the pipeline and transmission lines can be found in Appendices 1 and 2 unit addition biological information included in The Terrestrial and Aquatic Biology Studies, which are being forwarded to D.O.I.

REA has formally requested consultation with Fish and Wildlife Service under Section 7 of U.S.C. §1536. A copy of the Draft NPDES permit (Appendix 6) is included in the EIS along with a detailed study (Appendix 5) of the biological effects of the proposed intake structure. The Corps of Engineers' permits have not been applied for at this time.

9.6 Sierra Club

A. The statement of need for added capacity (p. 26-27 of the draft EIS) fails to discuss the real reasons why Western Farmers' expects a growth in demand. Instead it relys on historical growth projections that are shown in a later section (p. 32) to be most recently 20% too high (reduction of rate from 10% to 8%). Kept secret by this document is the statement made in a different EIS (NUREG--0176, p. 8-14) that Western Farmers' expects its growth to occur because its customers will be adding electric heat and hot water to their homes. This use is wildly inconsistent with the national policy of energy conservation. Two-thirds of the energy in the coal is lost before it reaches the customer's home. The existence of excellent solar alternatives to electric heat and hot water make it clear that Western Farmers' and the REA are either grossly ignorant or are purposely ignoring the Federal conservation goals.

Reply

The load growth estimates used in the Final Environmental Impact Statement are based on the latest REA approved Power Requirements Study. These estimates are not projections of past growth patterns, but rather estimates of future loads based on effects of various indicators which are expected to reflect future consumer habits. REA encourages conservation as a method to reduce load growth and the new Power Requirements Study projects lower growth rates due to the anticipated effects of conservation. The statement on page 8-14 of NUREG-0176 is, "Western expects growth in its residential load because of increased areas of electric space heating and growth in its large commercial loads because of increased use of electric pumps to extract petroleum and natural gas from the ground." This statement was not included in the subject EIS because it represents one of the many factors evaluated in load projection which are considered in Section 2.1 of the EIS.

Providing heat and hot water to rural families is not "wildly inconsistent with the national policy of energy conservation." Western Farmers, through publications, etc., stresses the importance of conservation to its members. Although solar alternatives exist for heat and hot water, a back-up system would likely be required. This would in all probability be electrical.

B. The discussion of alternatives to the coal-fired plant is completely inadequate. The only solar alternatives considered are central-station solar-electric methods. It is no surprise that these methods are found to be unsuitable as alternatives at this time.

Reply

The Alternatives Section of the EIS evaluates alternate methods of meeting Western Farmers' projected load requirements. The REA approved Power Requirements Study (PRS) has considered conservation and it is reflected in the projected rates of growth. Any anticipated effects of reduced member loads are thus a part of the PRS. This would include any significant reduction due to individual members use of solar heating, etc.

C. Why are direct solar applications that produce heat and hot water at the point of use not considered as alternatives? A January 1978 study by Roger Bezdek of the Department of Energy found that solar heat and hot water is economically competitive with electricity in Washington, D. C., a city with a climate similar to that of eastern Oklahoma. A 1978 Sun Day Fact Sheet on the economics of solar hot water and space heating cites five additional studies that reach the same conclusion.

Reply

See "B" above for response to the first question. Solar heat and hot water may be economically competitive with electricity, but the analysis is not as simple as implied in the above comment. As stated in Application of Solar Technology to Today's Energy Needs, (Office of Technology Assessment, June 1978),

> "Solar systems designed to provide domestic hot water (3.5 percent of U. S. energy demand) are competitive with electric hot water systems in most parts of the United States today if comparisons are based on the average monthly payments made for energy during the life of the system."

The Sierra Club does not appear to be considering the high capital cost associated with solar heat and hot water systems. The high initial cost is likely to prevent large number of people from using solar in the next few years.

D. Why doesn't Western Farmers' consider the alternative of building a fluidized-bed coal-fired plant? These plants are reportedly much cleaner than conventional plants and can remove the sulfur from the coal in a much more environmentally acceptable manner. They can be purchased from Stallaval Turbin AB of Sweden (Lovins, 1977, Soft Energy Paths: Ballinger, p. 48). The Department of Energy has successfully tested one of its own (DOE Info. Weekly Announcements, 1978, no. 22, p. 2). If this coal-fired plant is to be built to replace some existing gas-fired capacity, then it should probably be a fluidized-bed type plant.

Reply

Fluidized-bed coal-fired plants were not evaluated in the EIS because the stage of development has not reached the point where they are a viable alternative to the existing pulverized coal technology. A 400 MW fluidized-bed coal-fired plant is not a viable alternative.

E. The REA began its life supplying energy to rural customers for the purpose of making their lives better and easier. Today the most appropriate way for the REA to achieve this goal is to combine on=site solar energy with REA electricity. It is not fair to the customers served by the REA to encourage them to commit themselves to the more expensive life-cycle costs of electric heat and hot water. The individual interests and the national interests will be better served by the solar alternatives. The REA should be leading in this field, not ignoring it. We ask that the individual solar heat and hot water alternative be carefully and seriously considered in the final environmental statement. Plans for implementing the solar alternative should be presented as well. This way the REA can continue to promote progress in energy. We ask that this letter be included in the final EIS.

Reply

See replies to above comments as to why individual solar systems were not included.

10.0 Comments Received on the Draft EIS

- 10.1 U. S. Environmental Protection Agency
- 10.2 Advisory Council on Historic Preservation
- 10.3 U. S. Department of Health Education and Welfare
- 10.4 Oklahoma State Department of Health
- 10.5 U. S. Department of Agriculture
- 10.6 U. S. Department of Interior
- 10.7 Sierra Club

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

FIRST INTERNATIONAL BUILDING
1201 ELM STREET
DALLAS, TEXAS 75270

10.1

August 15, 1978

Mr. Donald L. Olsen
Director
Southwest Area - Electric
Rural Electrification Administration
Washington, D.C. 20250

Dear Mr. Olsen:

We have reviewed the Draft Environmental Impact Statement (EIS) for Western Farmer's power plant in Anadarko, Oklahoma. This 400 MW coal-fired steam electric generating plant with two associated transmission lines will be located on approximately 3000 acres of land in Choctaw County, southeastern Oklahoma. The following comments should be considered in the preparation of the Final EIS:

1. The issues and impacts on air and water quality, aquatic communities wildlife and land use are adequately covered. Several broad statements such as "care will be taken to disturb as little aquatic life as possible" and "overall site condition is expected to improve even with little or no management changes" and "Long-term impacts are expected to be minor and it is possible that the proposed project may even benefit wildlife on the plant site" are overly optimistic and largely unsubstantiated and offer no quantitative measures.

2. The Final EIS should point out that a Western Farmer's Prevention of Significant Deterioration (PSD) application has been submitted for Unit 1. Upon review, EPA determined that neither the National Ambient Air Quality Standards nor the PSD increments would be violated as a result of the project.

3. A significant regulatory requirement has been omitted from the list of Emission Standards in Section 1.4.1.1.2. The New Source Performance Standards (NSPS) for Coal Preparation Plants (40 CFR, Part 60, Subpart 4) should be addressed.

4. In Section 4.1.1.2 (page 74), a sentence in the second paragraph reads incorrectly with regard to pounds of sulfur per pound of coal. The sulfur content should be expressed as a percentage by weight (i.e., 0.486% sulfur). Such a percentage of sulfur content should be shown to have an emission rate less than the NSPS emission standards.

5. In Section 4.1.3.2 (page 78), one paragraph states that ambient air monitoring is essential. The second paragraph relates a belief on the part of REA, that ambient monitoring is questionable. The agency's belief should be deleted and only the regulatory requirements should be addressed.

6. We do not believe that alternate coal sources have been adequately explored. A more aggressive approach to lining up prospective suppliers early in the planning process should be used. Lists of possible supplies should include the BTU rating, sulfur and ash content for each one.

7. Maps and Graphics - Although mostly adequate in the Assessment, they are missing from the Draft EIS. A description on intake-outfall pipeline corridors within the property boundary should be in both the Assessment and the EIS. Figure 1-20 gives a fairly good idea of what is projected for this piece of land, but it could be made even clearer if the plant was superimposed on a drafted composite of the ecological data maps. All pipeline corridors, permanent parking, paths, and roads should be included. Impact maps are absent from both reports. One map which depicts the areas of environmental concern which will be affected by the construction/operation of the facility is an important descriptive tool and should be included.

8. Step 1.C of the U.S. Water Resources Council's Floodplain Management Guidelines for Implementing Executive Order 11988 (Federal Register, February 10, 1978) defines utilities as critical actions. The minimum floodplain of concern for critical actions is the area subject to inundation from a flood having a 0.2 percent chance of occurring in any given year (500-year floodplain). The 500-year flood elevations for the proposed and alternate plant sites should be discussed in the final statement. Will the plant be designed to "operate" during a 500-year flood or merely survive such a flood? Will the proposed project be compatible with the Water Resources Council's guidelines?

9. That "no recreation facilities will be adversely affected as a result of the proposed project" may not be totally true. Both noise (during construction and operation) and aesthetic impacts are likely to affect the nearby recreational facilities.

10. The proposed site is surrounded by two popular recreational areas and construction activity may cause temporary traffic problems to visitors as well as residents for the area. The proximity to residences is not indicated in either EIS or the Assessment. If these are close by, will they be impacted in any way?

11. We suggest that specimen trees and vegetation of high quality be given preferential treatment. Hickories (_Carya aquatica_ and _C. myristaeformis_) which occur on the site are nowhere common in the United States and are attractive, valuable trees. In order to improve the site, as is hopefully mentioned several times in the EIS, a plan which is based on quality, maturity of vegetation, and least erodible soils could point out the most suitable areas for roads, pipelines and ponds.

12. It is stated on page 93 that the Western Farmer's plant will use 2,420 acre-feet of groundwater per year at a rate of 1,500 gallons per minute. The statement indicates that such a withdrawal rate will not significantly effect groundwater resources in the area. Additional information substantiating this statement should be included in the Final EIS.

13. On page 65 the statement says that EPA has two alternatives in regard to the NPDES--either to issue or deny the permit. It should be pointed out that the permit also may be modified based on comments received on the EIS. Although the NPDES permit is for discharge of wastewater, it is conceivable that nonwater-related environmental stipulations may be placed in the permit based upon the EPA review.

These comments classify your Draft EIS as LO-2. Specifically, we have no objections to the project; however, we are requesting more information. Additional information on air, floodplains, groundwater, land use, and fuel sources should be incorporated in the Final Environmental Impact Statement. Our classification will be published in the _Federal Register_ in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act.

Definitions of the categories are provided on the enclosure. Our procedure is to categorize the EIS on both the environmental consequences of the proposed action and on the adequacy of the Impact Statement at the draft stage, whenever possible.

We appreciated the opportunity to review the Draft Environmental Impact Statement. Please send our office two copies of the Final Environmental Impact Statement at the same time it is sent to the Office of Federal Activities, U. S. Environmental Protection Agency, Washington, D. C.

Sincerely,

Adlene Harrison

Adlene Harrison
Regional Administrator (6A)

Enclosure

cc: Mr. Allen Hauzy
Western Farmers

ENVIRONMENTAL IMPACT OF THE ACTION

LO - Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER - Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to re-assess these aspects.

EU - Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

ADEQUACY OF THE IMPACT STATEMENT

Category 1 - Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 - Insufficient Information

EPA believes the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3 - Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement. If a draft statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make a determination

(4)

Advisory Council on
Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

10.2

August 8, 1978

Mr. Donald L. Olsen
Acting Assistant Administrator - Electric
Rural Electrification Administration
U.S. Department of Agriculture
Washington, D. C. 20250

Dear Mr. Olsen:

This is in response to your request of June 19, 1978, for comments on the draft environmental statement (DES) for the coal-fired power plant and associated transmission for Western Farmers Electric Cooperative, Valliant, Oklahoma.

The Council has reviewed the DES and notes that the Rural Electrification Administration has determined that the proposed undertaking will not affect properties included in or eligible for inclusion in the National Register of Historic Places. Accordingly, the Council has no further comment to make at this time. It is suggested, however, that the final environmental statement contain the Oklahoma State Historic Preservation Officer's concurrence in REA's determination of no effect.

Should you have any questions or require additional information regarding this matter, please contact Michael H. Bureman of the Council staff at P. O. Box 25085, Denver, Colorado 80225, or at (303) 234-4946, an FTS number.

Sincerely yours,

Louis S. Wall
Assistant Director, Office of
Review and Compliance, Denver

OK 32 Coal Plant DEIS Response

(3) 10.3

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333
TELEPHONE: (404) 633-3311

August 1, 1978

Mr. Donald L. Olsen
Acting Assistant Administrator - Electric
U.S. Department of Agriculture
Rural Electrification Administration
Washington, D.C. 20250

Dear Mr. Olsen:

We have reviewed the draft environmental impact statement on the Western Farmers' Electric Cooperative Coal-Fired Power Plant and Associated Transmission in Anadarko, Oklahoma. We are responding on behalf of the Public Health Service.

In reviewing the proposed project, it was our understanding that all effluent and emission discharges would meet applicable federal and State rules and regulations. However, the statement concerning Polychlorinated Biphenyls (PCB's) on page II-48 of the Environmental Analysis states that compliance standards will be determined at the end of the mixing zone or on a case-by-case basis. The final Effluent Guidelines for Steam Electric Power Generating Plants Point Source Discharge published October 8, 1974, states that "there shall be no discharge of PCB's." We would like to see a commitment to this effect in the final environmental impact statement. It is well known that PCB's in the environment cause adverse effects to human health.

The power plant will be located in southeastern Oklahoma. Their supply of coal will be in Wyoming. Coal will be transported by unitized train and the cars will return empty. About 200 acres of land will be allotted for ash disposal, and the disposal area is expected to be full after 35 years. Some of this land is prime farm land. One alternative that has not been considered is to return the ash to Wyoming on the return train to be disposed of at the coal mine. This would require some handling cost at each end but no transportation cost.

This EIS is a good analysis of a boom-up zoom-down growth in population. Because of the previous construction program, it would seem that there is sufficient housing potential to absorb all but a small portion of the temporary increase.

Thank you for the opportunity of reviewing this statement. We would appreciate receiving a copy of the final when it is issued.

Sincerely yours,

William H. Foege, M.D.
Assistant Surgeon General
Director

Oklahoma
State Department of Health

Northeast 10th Street & Stonewall
Post Office Box 53551
Oklahoma City, Oklahoma 73152

10.4

JUL 27 A 9:50

July 5, 1978

Mr. Donald L. Olsen, Director
Southwest Area - Electric
Rural Electrification Administration
Washington, D.C. 20250

Re: USDA Draft Environmental Impact Statement
Western Farmers' Coal-Fired Power Plant
and Associated Transmission

Dear Mr. Olsen:

Our comments on subject project are as follows:

Air Quality

While insufficient information is given in the draft, plans and specifications have been submitted to our Air Quality Service and a permit has been issued, so no further comments.

Water Quality

Regulatory responsibility lies not with this Department but with the Oklahoma State Water Resources Board, so no comments are offered.

Solid Waste

There is insufficient information given in the draft to make a determination if the disposal of sludge and fly ash will adversely affect the environment. Our Industrial and Solid Waste Division has not been contacted regarding this aspect and we suggest the responsible parties do so.

We will be glad to assist in anyway possible, if asked.

Sincerely,

Homer Groseclose
[illegible]

RG:jb

10.5

U.S. DEPARTMENT OF AGRICULTURE
ECONOMICS, STATISTICS, AND COOPERATIVES SERVICE
WASHINGTON, D.C. [illegible]

June 23, 1978

SUBJECT: Draft Environmental Impact Statement

TO: Donald L. Olsen
Acting Assistant Administrator
REA

We have no comments on the Draft Environmental Impact Statement relating to Environmental Analysis of the Electric Transmission Facilities for the Western Farmers Electric Cooperative Coal-Fired Generating Facility.

THOMAS W. DAVIS
Acting Director
Natural Resource Economics Division

78 JUN 26 P 1:43

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

73 AUG 1 A8:2

ER 78/555

AUG 30 1978

Mr. Donald Olsen
Acting Assistant Administrator - Electric
Rural Electrification Administration
U.S. Department of Agriculture
Washington, DC 20250

Dear Mr. Olsen:

Thank you for your letter of June 19, 1978, transmitting copies of the Rural Electrification Administration's draft environmental impact statement and analysis reports for a 400 MW coal-fired steam-electric generating plant and related transmission lines, Choctaw County, Oklahoma.

Our comments are presented according to the format of the statement/analyses or by subject.

Indian Trust Lands

Our review indicates that one plot of property involved in the proposed project is a portion of an original Indian allotment with a one-half mineral interest in the western half of Section 17, T. 6 S., R. 21 E. This plot is considered restricted Indian land by the Bureau of Indian Affairs and they may have trust responsibilities for that property. The Muskogee Area Office, Bureau of Indian Affairs, Muskogee, Oklahoma, should be contacted for further information.

Fuel Supply

On page 3, the draft statement suggests that high-sulphur local coal might be burned at some future date. If so, impacts of this action should be addressed in the final statement along with proposed modifications regarding local coal transport, control of increased SO_2, and sludge disposal.

Mineral Resources

We understand that known mineral resources in the vicinity of the powerplant and transmission line corridor include natural asphalt, high quality limestone, sand and gravel, and clays. However, the environmental analysis for the generating station should evaluate usage of these materials. We also note that sand and gravel and asphalt are not mentioned in the environmental analysis for the transmission line, and should be included.

Although there are two active limestone quarries in Choctaw County, neither the plant site nor the powerline corridors will conflict with either quarry. Although we do not anticipate serious conflict between the proposed project and mineral production facilities in the area, we suggest that the final statement should discuss all major mineral resources in the area and indicate whether any possibility of conflict of use exists.

Cultural Resources

The environmental analysis on the transmission facilities indicates that an archeological survey of the line corridors will be performed. The name and institution of the investigator conducting the survey should be cited in the final statement. If any sites are recorded during the survey, information should be included in the final statement regarding the nature and significance of the sites and the effect of the project on such sites. If the project will adversely affect significant archeological resources, a plan of action should be cited to mitigate this effect. Contract specifications should include a sentence to the effect that if any archeological resources are encountered during construction, operations will cease at the site and a professional archeologist will be consulted as to the significance of the material.

Outdoor Recreation

The potential impact of the powerplant emissions on recreational sites within the vicinity of the proposed plant, especially in Hugo, should be addressed in detail in the final statement. The impact and effects of the water to be withdrawn from the Kiamichi River on recreational use of the river should be addressed. The Kiamichi River has been identified in the 1974 Oklahoma Statewide Comprehensive Outdoor Recreation Plan as a potential addition to the Oklahoma Scenic River System. Any adverse effects to this possible addition should also be discussed in the final statement.

Groundwater

The draft statement asserts on page 93 that three wells will be used to pump about 1,500 gpm during construction. The probable duration of the withdrawal of up to 2,420 acre-feet per year should be predicted in the final statement. The anticipated drawdown of water levels and radius of influence should be calculated on the basis of the values of transmissivity and storage coefficient given on page I-16 of the environmental analysis for the plant. In addition, the number and location of wells within the radius of influence of the plant's withdrawals should be shown or discussed and the resultant impacts assessed in the final statement. The ultimate fate or use of the three plant wells should also be addressed.

Sludge Disposal

It is noted on page 1-84 in the environmental analysis for the generating facility that sludge discharged from the flue gas desulfurization system, if required, will be mixed with fly ash and transported to a landfill. Since fly ash contains toxic substances, we recommend that measures to control leachate migration from landfill sites into the hydrologic environment should be considered in the final statement.

Water Supply

Although it is stated that an average of 7.46 mgd of water will be extracted from the Kiamichi River, no reference is provided regarding the purchase of additional waters from the Hugo Reservoir to augment the instream flow. Since the average discharge from Hugo Reservoir via the Kiamichi River is only 15 cfs during December and January, the applicant's proposed withdrawal of an average of 11.5 cfs could have severe impacts on aquatic and terrestrial communities. Particularly severe impacts could occur for some rare and endangered species of fish and wintering bald eagle populations. More specific information should be provided in the final statement regarding the water supply for this proposed facility. Planned measures to minimize impacts on fish and wildlife should also be described. Increased releases from Hugo Reservoir to accommodate the applicant's needs especially during low flow periods may be needed and should be discussed in the final statement.

Although statements of intent to purchase water rights from the U.S. Army Corps of Engineers appear in both the draft statement and applicant's reports, no document of approval is mentioned. State approval, through the Oklahoma Water Resources Board, will be required to withdraw the required water volume from the Kiamichi River. Documentation of these approvals should be cited in detail in the final statement.

Threatened and Endangered Species

We believe that the treatment of the potential impacts of the proposed action on threatened and endangered species is inadequate throughout the draft statement. The attached table lists rare (state designation), threatened, and endangered plant and animal species which have been collected or are known to occur on the plant site, transmission and pipeline corridors or their areas of influence.

Two of the plants listed are proposed to be listed as endangered or nominated to be listed as threatened (*Leavenworthia aurea* and *Lesquerella angustifolia*, respectively). Both have been observed or collected from the project vicinity and could be impacted by construction and operation of the proposed facilities. The final statement should specifically address these species and assess the impacts of the proposed project.

In addition, three fish species that are designated rare on the State list, are known to occur in the Red River drainage including the Kiamichi River and Gates Creek and are sensitive to any habitat alteration. Since the applicant proposes construction of both transmission lines and pipelines crossing or otherwise affecting stream environments, potential impacts on these species could occur. We recommend that the final statement provide an adequate analysis of the proposed construction on these species and their habitat.

Withdrawal of water from the Kiamichi River during winter low flows could have serious impacts on wintering bald eagle populations in the area. Since the birds habitually feed on fish downstream from large reservoirs, extremely low flows would limit the feeding habitat for this species as well as have deleterious effects on some of the above-mentioned sensitive species of fish. We are very concerned that severe impacts on these endangered species and on terrestrial and aquatic communities could result if sufficient water were not released downstream to compensate for that diverted by the applicant. The final statement should address these potential impacts to Federal and State protected species specifically and formulate plans to alleviate the deleterious effects. We also recommend that the final statement discuss releases proposed from Hugo Dam to mitigate these impacts.

Fish and Wildlife Resources

Concentrations of chlorine in plant discharge waters should be given in the final statement. In the draft statement, the example NPDES permit states 0.5 mg/l as the daily maximum limitation. The effects of this concentration on aquatic organisms should also be discussed in the final statement.

It is implied in the draft statement that environmental impacts of the water pipeline will be limited to the construction of the lines. Even with suitable treatment, vegetation will be disrupted after construction and require a period of time to recover. During this lag phase, (which will be variable in length in different situations) varying degrees of impacts on flora and associated fauna will occur. These impacts should be fully assessed in the final statement.

We find that the draft statement contains conflicting figures on page 102 on the numbers of species of fauna observed in the vicinity of the site. The final statement should reconcile the number of species of mammals and birds observed. The final statement should provide a more adequate assessment of the expected environmental effects of the project upon the flora and fauna.

Alternatives

All three of the alternatives discussed in the draft statement involve direct discharge of waste water into live streams. We believe that alternatives to the proposed discharge pipeline have not been adequately discussed in the draft statement. On-site detention, treatment and discharge into Bird Creek would seem a more environmentally and potentially economically sound technique of waste water disposal, than the physical disruption entailed in construction of the proposed outfall pipeline. While pipeline construction would result in disturbance of vegetative communities, increased soil erosion and stream sediment loads, we believe that impoundment of waste water in an on-site detention reservoir would appear to have less deleterious effects on fish and wildlife. In the portions of the outfall pipeline corridor lying within flood plain areas, the effects of soil erosion could be compounded by flooding during the period between excavation and complete recovery of vegetative communities, thus increasing negative environmental impacts. The final statement should provide a more detailed assessment of the environmental impacts of this alternative.

Cumulative Impacts

On page 78 of the draft statement, mention is made of the applicant's intent to propose additional generating units at the site. The final statement should fully discuss plans for this additional capacity and assess the cumulative environmental impacts of this expansion.

Transmission Corridors

We believe that this section of the draft statement does not adequately assess the fish and wildlife resources found along the proposed Hugo-PSO Valliant segment. The final statement should provide an analysis of fish and wildlife resources which more accurately reflects existing levels of these resources along the transmission corridors and potential impacts of construction and operation. Since these corridors cross a greater variety of vegetative cover types than are found on the plant site proper, it is not prudent to assume that no "significant" differences would occur in faunal communities. An important concern of the Fish and Wildlife Service regarding these corridors is the potential impacts on aquatic resources especially at stream crossings.

Fish and Wildlife Coordination

The review comments concerning fish and wildlife resources offered here are not intended to reflect a negative stance by the Fish and Wildlife Service toward the proposed action. Rather, the intent of the Service is to ensure that all imminent and potential environmental impacts, especially those relating to fish and wildlife resources, are adequately addressed in the final statement. The aspects of this project of greatest concern to the Service are the effects of construction and operation on aquatic organisms of the water intake device, uninvestigated alternatives to direct discharge of waste water, impacts of construction of the pipeline and transmission corridors -- especially at stream crossings and overall potential impacts on threatened and endangered species of plants and animals.

The proposed project will require permits from the Corps of Engineers under Section 10 of the River and Harbor Act of 1899 and under Section 404 of the Federal Water Pollution Control Act Amendments of 1972. A NPDES permit from the Environmental Protection Agency must also be issued. At a minimum, the Fish and Wildlife Service will probably recommend to the Corps of Engineers and EPA that the permits they issue should require features to ameliorate these concerns. The intake structure will need to be designed and operated in accordance with Section 316(b) of P.L. 95-217 to avoid impingement or entrainment of organisms. In addition, periodic monitoring may also be required to ascertain any physical effects on aquatic organisms, especially on eggs, larvae and fry of striped bass and other sport species.

Accordingly, the comments on this statement do not in any way preclude additional and separate comments by the Service regarding construction and operation of both intake and outfall devices upon review of appropriate permit applications and any additional information available, in accordance with the Fish and Wildlife Coordination Act.

We hope that these comments will be useful to you in the preparation of the final statement.

Sincerely,

Larry E. Meierotto
~~Deputy Assistant~~ SECRETARY

Rare and Endangered Species in the Vicinity of Western Farmers Power Facilities

	List on which occurring				
Species	Fed. End.	Fed. Threat.	State End[1]	R-1	R-2
Pallid shiner (*Notropis amnis* Hubbs & Greene)				x	
Goldstripe darter (*Etheostoma parvipinne* Gilbert & Swain)				x	
Brown bullhead (*Ictalurus nebulosus* Lesueur)					x
Bald eagle[2] (*Haliaeetus leucocephalus*)	x				
Eastern harvest mouse (*Reithrodontomys humulis*)					x
Rice rat (*Oryzomys palustris*)					x
Swamp rabbit (*Sylvilagus aquaticus*)			x		
Chinquapin (*Castanea pumila*)				x	
Water hickory (*Carya aquatica*)					x
Nutmeg hickory (*Carya myristicaeformis*)					x
Bluejack oak (*Quercus incana*)					

Species	Fed. End.	Fed. Threat.	State End.[1]	R-1	R-2
		List on which occurring			
Golden glade cress[3] (*Leavenworthia aurea* Torr.)	x				
(unnamed Bladderpod)[4] (*Lesquerella angustifolia* (Nutt.) Wats.)		x			

1/ State endangered, R-1 & R-2 species taken from: Lewis, J.C. (chmn.) 1975. Rare and endangered vertebrates and plants of Oklahoma. Rare and Endangered Species of Oklahoma Committee and USDA, Soil Conservation Service. 44 p.

2/ Federal Register, Vol. 43, No. 31, Feb. 14, 1978.

3/ Federal Register, Vol. 41, No. 17, June 16, 1976.

4/ Federal Register, Vol. 40, No. 127, July 1, 1975.

SIERRA CLUB

12 A : 25

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SUBJECT: U.S.D.A. Draft Environmental Impact Statement for Western Farmers; Coal-Fired Plant and Associated Transmission U.S.D.A.- R.E.A.- E.I.S.(A.D.M.) 78-9D

We find the discussion of alternatives to the new coal-fired plant to be unacceptable. In order to adequately discuss alternatives it is first necessary to determine exactly who needs how much energy for what purpose. Only average statistical growth projections are mentioned in the EIS. We believe that the typical individual customer of the REA cooperative would be well served by a mix of direct solar energy with electrical back-up systems. The money that Western Farmers' plans to spend on the new plant should be invested in such a way as to make solar heat and hot water available to the REA customers. These points are discussed in more detail below, along with the suggestion that a fluidized bed coal-fired plant is the preferable option for fixed station generation capacity.

The statement of need for added capacity (p.26-27 of the draft EIS) fails to discuss the real reasons why Western Farmers' expects a growth in demand. Instead it relys on historical growth projections that are shown in a later section (p.32) to be most recently 20% too high (reduction of rate from 10% to 8%). Kept secret by this document is the statement made in a different EIS (NUREG-0176, p. 8-14) that Western Farmers' expects its growth to occur because its customers will be adding electric heat and hot water to their homes. This use is wildly inconsistent with the national policy of energy conservation. Two-thirds of the energy in the coal is lost before it reaches the customer's home. The existence of excellent solar alternatives to electric heat and hot water make it clear that Western Farmers' and the REA are either grossly ignorant or are purposely ignoring the federal conservation goals.

The discussion of alternatives to the coal-fired plant is completely inadequate. The only solar alternatives considered are central-station solar-electric methods. It is no surprise that these methods are found to be unsuitable as alternatives at this time.

Why are direct solar applications that produce heat and hot water at the point of use not considered as alternatives? A January 1978 study by Roger Bezdek of the Department of Energy found that solar heat and hot water is economically competitive with electricity in Washington, D.C., a city with a climate similar to that of eastern Oklahoma. A 1978 Sun Day Fact Sheet on the economics of solar hot water and space heating cites five additional studies that reach the same conclusion.

Perhaps those who prepared the draft EIS think that solar systems are not available. They could call the toll-free number of the National Solar Heating and Cooling Information Center (800/462-4983) for information. Or they could consult the Solar Age Catalog (Library of Congress Catalog Number 79-79117). This catalog lists 22 suppliers of complete solar hot water systems and 48 different collectors suitable for use in space heating systems.

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