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FIELD STUDY OF DISPOSED SOLID WASTES
FROM ADVANCED COAL PROCESSES

ANNUAL TECHNICAL PROGRESS REPORT

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Prepared by:

Radian Corporation
8501 MoPac Blvd.
P.O. Box 201088
Austin, Texas 78720-1088

Prepared for:

Dan Brdar
Department of Energy
Morgantown Energy Technology Center
3610 Collins Ferry Road
P.O. Box 880
Morgantown, West Virginia 26505

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Frank Beaver, MMRRI
Dorothy Stewart
Larry Holcombe
Danny Jackson

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1.0 BACKGROUND AND CONTRACTUAL ITEMS

Radian Corporation and the North Dakota Mining and Mineral Resources Research Institute (MMRRI) are funded to develop information to be used by private industry and government agencies for managing solid waste produced by advanced coal processes. This information will be developed by conducting several field studies on disposed wastes from these processes. Data will be collected to characterize these wastes and their interactions with the environments in which they are disposed.

The first two tasks of this project involve the development of test plans. Through July of 1988 we have developed a generic test design manual, detailed test procedures manual, and test plans for three sites. Task three, field studies, will be initiated as soon as final site access is obtained and the facilities producing the waste are fully operational.

2.0 WORK ACCOMPLISHED MAY 1987 TO MAY 1988

The final draft of the Test Procedures Manual was delivered in July 1987. Three sites had been selected for the field studies during earlier stages of the project: Colorado-Ute's fluidized bed combustion (FBC) unit in Nucla, Colorado; Ohio Edison's limestone injection multistage burner (LIMB) retrofit in Lorain, Ohio; and an FBC unit in central Illinois. Test plans for these three sites have been drafted and site access agreements are well underway.

2.1 Test Procedures Manual

The Test Procedures Manual for the study was delivered in July 1987. This manual contains the procedures that will be used for the testing. The goal of the manual is to provide a consistent framework for the testing. Although certain aspects of testing will be site specific and cannot be

prescribed in the manual, many of the test procedures will be the same at each site. Detailed procedures are given for the following parts of the testing:

- Waste acquisition and transport;
- Site reconnaissance;
- Preparation;
- Permitting;
- Construction;
- Monitoring;
- Sample preservation and handling;
- Waste and soils analysis;
- Liquids analysis;
- Data management;
- Quality control; and
- Closure.

2.2 Colorado-Ute Site

Final test plans were submitted for the Colorado-Ute site in June of 1988, and site access was obtained in July of 1988. As of July 1988, the start of steady state testing of the facility was slated for mid-September 1988. This is the phase of operation that would generate wastes suitable for the field study.

The Colorado-Ute Electric Association (CUEA) operates the Nucla Station coal-fired electric generating power plant near Naturita, Colorado, in southwestern Montrose County. An area location map is presented in Figure 2-1. The principal waste products from the 110 MW unit are fly ash collected in fabric filters and bottom ash consisting of spent bed material. These wastes originate in the circulating fluidized-bed boiler from combustion of coal and injection of limestone to reduce SO_2 emissions. Secondary waste products consist of water treatment clarifier sludge, sand filter backwash,

LEGEND:

--- 6000 --- CONTOURS (FT.)

===== RIVER

---(90)--- HIGHWAY

● POPULATED AREA

▨ COLORADO - UTE ELECTRIC ASSOCIATION PROPERTY

0 5
SCALE: MILES

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Figure 2-1. Location Map for Colorado-Ute Site

and cooling tower basin sediments; however, these low volume wastes will not be considered in this field study.

The test cell design at Colorado-Ute provides for the isolation of a small body of waste (nominally 100 feet square and eight feet in depth) which can be monitored more intensely than would be possible in a large, unconfined landfill. Critical design parameters for the test cell include:

- Maintaining a complete hydrologic balance of all water entering the test cell;
- Measuring physical properties of the waste over time;
- Tracking solute migration through the waste body;
- Determining solute concentrations in interstitial solutions within the waste and underlying soils;
- Determining the attenuation of solutes in soil underlying the test cell; and
- Monitoring groundwater underlying the test cell for solutes leached from the waste.

Details of the test design and monitoring program are presented in the test plan.

2.3 Ohio Edison Site

The final test plan for the Ohio Edison LIMB test site was submitted in June of 1988. Site access is well underway, with a major issue being the location of the test cells on the host utilities property. The LIMB demonstration is scheduled to achieve steady state operation in mid-September.

The U.S. Environmental Protection Agency (EPA), the State of Ohio, Ohio Edison Company, and Babcock & Wilcox (B&W) are planning the demonstration of a retrofit LIMB demonstration at Ohio Edison's Edgewater Plant in Lorain, Ohio. The LIMB technology involves direct injection of dry sorbents into the boiler for capture of SO_2 from the flue gas. This technology is a low capital cost alternative for the removal and control of acid gas emissions from existing boilers. The solid wastes generated are fly ash combined with excess lime (unused sorbent) and calcium sulfate (spent sorbent). Figure 2-2 presents an area location map for the proposed field study.

The test design and monitoring program will be very similar to that for the Colorado-Ute site. The major difference will be the inclusion of a second test cell. One test cell will be constructed with wastes at a moisture content representing the material as it is hauled from the plant -- typically 10 to 15 percent moisture by weight. The second cell will be constructed with a moisture content that optimizes the pozzolanic properties of the ash. The ash, when placed in contact with sufficient moisture, will undergo hydration reactions that result in a concrete-like material. These reactions may be extremely beneficial for disposal of the wastes.

2.4 Freeman United (Illinois) Site

The draft final test plan for the Illinois site on Freeman United property was submitted in July of 1988. Site access is well underway, although formal permission from Freeman United Coal Company and state permits must be secured. The targeted waste source, Midwest Grain Company's FBC unit, is currently operating.

The Midwest Grain Company operates a coal-fired steam generating unit near Pekin, Illinois. The unit has a relatively small bubbling fluidized bed combustion boiler that has a capacity of 120,000 pounds of steam per hour. The primary fuel for the bubbling bed is a bituminous coal with a medium sulfur content of 2.39 percent. The waste consists of fly ash, from

Figure 2-2. Location Map for Ohio Edison Site

mechanical collectors, bottom ash from spent bed material, and fly ash from fabric filters.

The test cells are proposed to be located within the Buckhart coal mine which is about 30 miles from the Midwest Grain Company and about 5 miles south of Canton, Illinois. This area is approximately 5000 acres of abandoned strip-mined land. The proposed disposal site is owned and operated by Freeman United Coal Mining Company. Figure 2-3 presents an area location map.

The test design at the Freeman United site will be very similar to the Ohio Edison site. As with Ohio Edison, two test cells will be constructed and monitored. One cell will be constructed with friable waste material, nominally 10 to 15 percent moisture, and one cell at a moisture content to promote pozzolanic activity.

3.0 WORK SCHEDULED FOR MAY 1988 THROUGH MAY 1989

Field testing should be implemented at all three sites during the next year. All three test sites could be constructed in the September-October time frame, conditional upon plant operating schedules and obtaining site access. Monitoring will then proceed according to the test plans, which call for initial characterization of wastes and soils, quarterly sampling during the first year of operation, and annual sampling thereafter. Monitoring of soil/waste pore waters and ground waters will vary depending on the site conditions.

4.0 ISSUES

The schedule for the overall project has slipped considerably from the original plan, due mainly to delays in operations of the demonstration plants and problems in obtaining site access.

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Figure 2-3. Location Map for Freeman United Site