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OCDO MONTHLY PROJECT STATUS REPORT
LAND APPLICATION USES OF DRY FGD BY-PRODUCTS
OCDO GRANT AGREEMENT NO. CDO/D-89-35

STATUS REPORT NUMBER 36

REPORTING PERIOD - JANUARY 1994

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MASTER

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**Land Application Uses of Dry FGD By-Products
Monthly Report
January, 1994
Warren A. Dick and Joel H. Beeghly**

1.0 Land Application Project

A meeting was held with OSU Research Foundation to review and discuss the post-due invoices and efforts to make payment. The problem with the USGS invoice was reviewed with hopes that we can employ their services at the Fleming AML site and thereby remedy the problem between OSU and USGS for services paid but not rendered.

2.0 Meetings, Reports

Preparations were made by both OSU and Dravo Lime to make presentation at the "High Calcium/Sulfur Coal By-Products in Agriculture" workshop at Purdue University, February 7-8 sponsored by the U.S. Department of Agriculture, Agriculture Research Service and Purdue University. Four presentations related to the Land Application Project were scheduled.

Preparation was also required for the International Mine Land Reclamation Conference and the Southern Illinois University Conference on Coal Combustion By-Products both in April. Abstracts for "Call for Papers" were due for the American Coal Ash Conference, January, 1995 and Pittsburgh Coal Conference, September, 1994.

3.0 Demonstration Sites

3.1 ODOT Rt 541

In spite of the severe winter weather, the ODOT District 5 Special Projects group has nearly completed reconstructing the State Route 541 slide. Approximately 3000 tons of Tidd PFBC ash have been placed. Computer analyses conducted on the before and after embankment cross-sections show that the stability of the reconstructed slope has been increased substantially by the inclusion of the Tidd ash. The ash was also used to rebuild the road base, a section about 100 yards long.

3.2 ODOT Rt 83

There is still a possibility that the demonstration project planned for State Route 83 near Cumberland can be conducted. The Construction Engineer for District 5 has authorized the reassignment of one of the district's engineers to this project. This individual has already enrolled in the Civil Engineering Department as a graduate student and begun taking graduate CE classes. She will be conducting her work on the State Route 83 slide at no cost to the project. AEP has offered the Tidd ash to the project and has identified a location near the highway that could serve as a site for the ash stockpile. However, since AEP cannot deliver the ash to the site as they did on State Route 541 project, and we have not at this time identified any other way to pay the trucking costs, the further development of this project remains uncertain.

3.3 Fleming AML Site

A revised beneficial use permit application using the FBC ash from GM and local yard compost was presented by Warren Dick to the Trustees of the Joint Solid Waste Management District of Tuscarawas, Wayne, and Stark Counties on February 4. The Trustees, who are the respective county commissions, and other public officials for the first time heard our plan. Some citizens including the "Club 3000" citizens advisory committee were present but were not permitted by the chairman to ask questions. We believe the presentation was basically well received by the Trustees and Executive Director, Mr. Phil Palumbo. The county health department and Mayor of Dover are believed to still hold some reservations and about our plans mostly dealing with the impact on groundwater, i.e. Dover water wells.

A written response to town leaders of the Club 3000 was prepared by Warren Dick and reviewed by OCDO. This answer was in response to written questions submitted to Warren Dick addressing various concerns about the site. Similar concerns of the County Health Department and Mayor of Dover are also being addressed.

The 5 acre limit criteria for DOE's environmental assessment (EA) was addressed. Since they pay basically for monitoring the site, the DOE's EA has no limit of acreage. The actual treatment is paid by the Ohio Division of Reclamation (ODNR). The ODNR funding comes from the Office of Surface Mining (U.S. Department of Interior) and they require an EA for the treatment portion. An EA was conducted by ODNR as part of their plans to reclaim the Fleming AML site.

The Ohio EPA stated on February 10 that a public hearing was not required, since they do not regulate application of yard compost. A coal ash beneficial use application will be filed, which is revised from that submitted last fall. Copies will be distributed soon to the Steering Committee.

The wisdom and plan for a "town meeting" to provide information and chance for questions was discussed on February 17 with the Tuscarawas County Commissioners, who offered to host such a meeting, and the County Health Department. Max Bonifant, a Franklin Township Trustee and Tom Sewell of the Soil Conservation Service also attended. Their willingness to help conduct this "informational meeting" was relayed to a meeting the next day at OCDO and attended by representatives of the Ohio EPA, Ohio DOR, USGS, OSU and Dravo. Ohio EPA and the DOR agreed to attend but keep a low profile. A separate planning meeting was requested for the Mayor of Dover and his wastewater treatment plant superintendent and a final meeting with all the local organizations to be held before the informational meeting.

3.4 LIMB Stockpile

Stabilized base mixes, i.e. by standard Procter procedure, of a blend of the aged LIMB ash and a bottom ash did not yield sufficient strength. The aged 2 ½ year material has little free lime and the calcium carbonate equivalency has dropped in half to approximately 25% CaCO₃. Central Fuel Company has accepted the responsibility for determining the end use of this material.

4.0 Contract Problems - See 3.3

5.0 Work Schedule

- 5.1 Continue editing of the Phase 2 report.
- 5.2 Attend workshop (February 7-8) at Purdue University on agronomic uses of FGD by-products. (This meeting is organized by the U.S. Department of Agriculture.)
- 5.3 Meet with county, township, local officials and citizens to present the Fleming AML reclamation plan. After this meeting the permit will be submitted to Ohio EPA (by middle of February). Obtain commitment for FGD material from General Motors.
- 5.4 Complete ODOT project on Route 541.
- 5.5 Continue to develop plans for the LIMB ash stockpile.
- 5.6 Decide on proposal to AEP and ODOT concerning the Rt 83 embankment.
- 5.7 Prepare abstracts of papers for submittal to upcoming conferences.

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LAND APPLICATION USES OF DRY FGD BY-PRODUCTS
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STATUS REPORT NUMBER 37
REPORTING PERIOD - FEBRUARY 1994

Joel H. Beeghly (412) 777- 0711
Warren A. Dick (216) 263-3877

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Land Application Uses of Dry FGD By-Products

Monthly Report

February, 1994

Warren A. Dick and Joel H. Beeghly

1.0 OSU Land Application Project

1.1 Sampling, Analysis and Technical Reports

1.1.1 Purdue Agricultural Workshop

Joel Beeghly, Terry Logan, Sam Traina and Warren Dick made presentations at a workshop on the "Use of High Calcium/Sulfur Coal By-Products in Agriculture" held at Purdue University on February 7-8. This workshop was supported by the USDA and Warren Dick was asked and has agreed to host a similar type of workshop next year in Ohio. There is a lot of interest at this time in developing an even greater base of information on how FGD by-products can be beneficially used. One report was given at the workshop where FGD by-product generated by coal-fired boilers was ready 100% beneficially recycled.

1.1.2 Phase 1 and Phase 2 Reports

Our latest word from the publisher of the Phase 1 report is that it is progressing smoothly and the report should be ready for printing in April or May. Several sections of the Phase 2 report have been received by Warren Dick and have been edited and placed into the Phase 2 draft document.

1.1.3 Future Presentations

Preparation was also required for the International Mine Land Reclamation Conference and the Southern Illinois University Conference on Coal Combustion By-Products both in April. Abstracts were due for the American Coal Ash Conference, January, 1995 and Pittsburgh Coal Conference, September, 1994. OSU personnel from the Department of Agronomy, Agriculture Economics, and Civil Engineering and also Dravo Lime Company submitted abstracts to the two conferences.

1.2 Field Demonstration Sites

1.2.1 Fleming AML Site

The majority of our efforts in the month of February was to move forward the reclamation project at the Fleming AML site. Meetings were held as follows:

February 4 - Joint Stark-Tuscarawas - Wayne Joint Solid Waste District
February 17 - Tuscarawas County Commissioners
February 18 - Meeting in Columbus with ODNR, OEPA, OCDO, OSU and USGS.
February 22 - Tuscarawas County Health Department and Mayor of Dover.
February 25 - Mayor of Dover and Club 3000

A permit application to use FGD by-product material as an alkaline amendment material for reclamation of the Fleming AML site was submitted to the Ohio EPA on March 2, 1994. They have promised a quick response.

Probably the best way to present the various issues that have been raised by the local citizens about the use of FGD by-product materials for reclamation of the AML site is to include a copy of a letter written by Dr. Warren Dick and addressed to Mr. Jim Kneubuchl. The only attachment not included with the attached material are the copies of the NEPA exclusion documents.

We now feel the local officials including the Mayor are supportive of our project. Another local meeting held in early March to plan the "town meeting" reaffirmed this belief. One of the strongest opinions was to have the actual FGD - compost mixture produced and analyzed for the presentation to the town meeting to be held sometime in April.

1.2.2 Other Demonstration Sites

Nothing new to report since the January report. Winter weather prevents much activity other than monitoring.

2.0 Contract Problems

See 1.2.1

3.0 Work Schedule

3.1 Phase 2 Report

- 3.2 Confirm availability of FGD material for the Fleming Site from both Tidd plant and Pontiac, MI. Arrange for mixing tests at the compost company yard using Tidd PFBC and GM CFBC material.
- 3.3 Prepare for Conference at Southern Illinois University in early April.



Ohio Agricultural Research
and Development Center

Department of Agronomy
1680 Madison Avenue
Wooster, OH 44691-4096
Phone 216-263-3878
FAX 216-263-3658

February 16, 1994

Mr. Jim Kneubuehl
128 East Third Street
Dover, OH 44622

Dear Mr. Kneubuehl,

Thank you for taking time to write out some of your questions related to reclamation of the Fleming AML site. I appreciate the opportunity to communicate with you and I hope that this type of dialogue can lead to a better understanding by everyone of exactly what is being proposed.

Your letter raised nine specific questions that you wanted me to answer. I will answer them one at a time in the order they were raised in the attachment to your letter. There were several other issues raised in the letter itself that I will respond to at the end.

1. *What are the concentrations of TCDD, TCDF and remaining dioxin equivalents?*

The best way to answer this question is to actually provide you the data sent from Triangle Laboratories for the sample containing 50% FGD from the GMC plant and 50% Toledo sewage sludge. This printout provides all of the information needed to calculate worst case scenarios such as I did when I gave my presentation before you and others attending the Stark-Tuscarawas-Wayne Joint Solid Waste Management District Board Meeting on February 4. These data were in the previous EPA permit application that you have a copy of. Also enclosed with this letter is a copy of the calculations I presented at the February 4th meeting where I assumed a worst case scenario.

We are proposing to have dioxin tests done on the following samples as part of the revised project: 1) the FGD material itself, 2) the mixture of FGD and compost at the proportions that will be used in the final reclamation material, 3) the spoil at the site itself, 4) one sample immediately after reclamation is completed and 5) a second sample two years after reclamation is completed.

2. *What type of test was used to measure dioxin concentrations?*

The test was conducted by Triangle Laboratories (North Carolina) and a personal call was made to the laboratory. The procedure used in their laboratory for dioxin concentration measurements is a high resolution gas chromatography/mass spectrometry method. The exact reference citation of the method is *EPA Method 8290, In EPA Manual, 1986 Revision, Test Methods for Evaluation of Solid Waste*. Triangle Laboratories is one of only a few laboratories in the United States certified to conduct dioxin measurements.

3. *What are the concentrations of As, Al, Ba, Cd, Cr, Hg, and Pb in the FGD and compost mix?*

Tables 1 and 2 (attached) show concentrations of these metals and other metals in the FGD, compost, and FGD-compost mix. The mix values were calculated based

on the premise that 125 tons of FGD will be mixed with 50 tons of compost. Thus FGD will contribute 71.5% of the total concentrations and compost will contribute 28.5%.

4. A copy of the EPA permit is requested.

A draft of the permit application was distributed to you and others at the meeting held in Bolivar on February 4. When we submit our final permit application to the Ohio EPA, we will send you two copies.

5. What are the total dioxin equivalents in the FGD?

This question was addressed above in my response to question 1. The total toxicity equivalents (TTE) in the sample containing 50% FGD and 50% Toledo sewage sludge was 23.16 ppt (parts per trillion). This value is determined by weighting the various congeners, as shown in the worksheet, leading to the final value of 23.16 ppt. We have been assuming a worst case, although a highly unrealistic, scenario in our calculations. We have assumed all of the dioxin comes from the FGD and none from the sludge. Although this obviously over estimates the dioxin content in the FGD, it serves as a basis for discussion. If we do this, the maximum concentration of total toxicity equivalents of dioxin (TTE) in the FGD would be 46.32 ppt. I refer you back to my reply to your Question #1 and the calculations included as part of that reply.

6. Where will the compost and FGD be mixed? What method will be used in mixing? How will ratios in the mix be assured/controlled? Will an air permit be obtained?

We have discussed having the compost contractor mix the FGD with the compost. Our most extensive conversations have been with Earth-N-Wood, North Canton and they have agreed to do the mixing at their plant before the material is transported to the Fleming AML site. The method used for mixing will be a windrow turner commonly used to mix compost windrows. The ratios of FGD to compost will be determined based on truck weights full and then again after unloading. The amounts of FGD and compost required will be determined prior to mixing at the plant so that we can place into the windrow the exact amounts needed.

An air permit is not required for abandoned mineland reclamation projects but we will apply for an air permit from the Ohio EPA for the acreage receiving the FGD and compost mixture. I will be happy to share this document with you also when it is completed and submitted.

We would be happy to have someone locally work with us to be sure that the amounts mixed and brought to the site do not exceed what has been permitted. We understand that this may have happened in a previous project, unrelated to this project, and we want to assure you that we intend to closely control applications for this project.

7. What tonnage of FGD by-product will be used at the Fleming AML site?

The application rates will be 125 tons/acre of FGD and 50 tons/acre of compost. Nine acres, out of a total of approximately 40 acres to be reclaimed, will receive this

mixture. An additional two acres will receive only the 125 tons/acre of FGD. We can thus calculate the total tonnage of FGD and compost to be applied on the site.

FGD

9 acres x 125 tons/acre = 1,125 tons FGD (in the nine acres to be treated with the FGD and compost mixture)

2 acres x 125 tons/acre = 250 tons FGD in the two acres receiving only FGD

1,125 tons + 250 tons = 1,375 tons total of FGD

Compost

9 acres x 50 tons/acre = 450 tons total of compost

An additional 0.60 acres, divided into 15 small plots will be treated with resoil, FGD, or FGD plus compost. The rates used will not exceed those used in the rest of the project and the total amount of additional FGD and compost that will be used on these small plots will not exceed 50 tons of FGD and 20 tons of compost.

8. *What is the cost to obtain a) FGD by-product b) compost and c) to mix the two materials? How will the final mixed product be tested?*

A separate sheet is attached giving detailed information of expected costs of reclamation using resoil on the Fleming AML site, using FGD plus compost, and using soil that is offsite and would need to be brought to the site. These numbers were obtained from the ODNR and from personally talking to suppliers of compost. These numbers are our best estimates since actual bids have not yet been received. However, the experiences of the Ohio Department of Natural Resources (Division of Reclamation) are quite extensive in reclamation and so their estimates should be accurate.

After the mixing has been completed, a sample will be obtained for determination of metals, dioxin, nutrients and pH.

9. *Cost of using the available local soil from a location four to five miles away from the Fleming AML site*

This question is answered above in response to your question No. 8.

Other issues raised in your letter included a question of how the FGD is collected at the Fleming AML site, i.e. whether in a baghouse, scrubber, precipitator. The ash that will be used is a mixture of bed ash and fly ash collected in a baghouse. The ratio of bed ash to fly ash is 40% bed ash to 60% fly ash. Our data presented above, in answer to Question No. 3, is from a sample comprised of a mixture of bed ash (40%) and fly ash (60%).

You also requested a copy of the NEPA exclusion form. NEPA documents from both the U.S. Department of Energy (Morgantown) and the Ohio Department of Natural Resources (Division of Reclamation) have been obtained. These are enclosed with this letter.

The dioxin data were obtained from a sample that had 50% FGD and 50% Toledo sludge. The sample designation "Pontiac fly ash plus N-Viro" was the name assigned by Triangle Laboratories for tracking purposes. A more accurate sample description would have been "Pontiac fly ash plus

Page 4 - Kneubuehl

Toledo sludge". The total dioxin toxicity equivalents (TTE) in the FGD-sludge sample mentioned in the Landowner Consent form (23 ppt) is also the same value as shown on the dioxin report sheet from Triangle Laboratories.

Again, I would be happy to have you or others work with us to ensure that proper mixing, sampling and application of the reclamation materials occurs.

Sincerely,

Warren A. Dick.

Warren A. Dick
Professor

- c. Hon. Greg DiDonato, State Representative
- Hon. Rick Homrighausen, Mayor of Dover
- Ms. Jackie Bird, Director, Ohio Coal Development Office
- Mr. Roger Spies
- Dr. Irvin Silverstone
- Mr. H. Alexander

**DIVISION OF WATER POLLUTION CONTROL
SLUDGE DIOXIN AND DIBENZOFURAN REPORTING FORM**

FACILITY NAME AND ADDRESS: N-Viro Energy Systems Ltd. 3450 West Central Ave. Suite 328, Toledo OH 43606	SITE IDENTIFICATION # Fleming Reclamation Project TS-DV-2	CONTRACT LAB/ANALYST: Triangle Laboratories of RTP RECEIVED ACQUISITION SERVICES 96 JUN -3 PM 12:01
	STATION CODE:	
NPDES #:	STATE IDENTIFICATION # (SOURCE):	SAMPLE NUMBER/DATE: N-Viro Soil 3/20/93

PARAMETER	CAS #	REPORTING CODE	CONCENTRATION (ng/kg)	DETECTION LIMIT (ng/kg)	TEF- a. b.	TE
SLUDGE SOLIDS (% TOTAL)	-----	70318	63.1 %		-- --	
Total TCDD	41903575		86.3		-- --	
Total TCDF	55722275		59.2		-- --	
Total PeCDD	36068229		456		-- 0.5	
Total PeCDF	304021154		63.3		-- 0.5	
Total HxCDD	344654608		458		-- 0.1	
Total HxCDF	55684941		74.4		-- 0.1	
Total HpCDD	37871004		1050		-- 0.01	
Total HpCDF	38998753		55.0		-- 0.01	
OCDD	3268879		3980		0.001	3.98
OCDF	39001020		28.1		0.001	0.03
2,3,7,8 TCDD	1746016	34675	0.64		1	0.64
2,3,7,8 TCDF	51207319	38691	7.7		0.1	0.77
1,2,3,7,8 PeCDD	40321764		1.6		0.5 -- x0.5	0.40

**OHIO ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
SLUDGE DIOXIN AND DIBENZOFURAN REPORTING FORM (PAGE 2)**

PARAMETER	CAS #	REPORTING CODE	CONCENTRATION (ng/kg)	DETECTION LIMIT (ng/kg)	TEF	TE
1,2,3,7,8 PeCDF	57117416		4.7	94 JUN -3 PM 12:01	0.05	0.24
2,3,4,7,8 PeCDF	57117314		3.6		0.5	1.80
1,2,3,4,7,8 HxCDF	39227286		2.4		0.1	0.24
1,2,3,6,7,8 HxCDF	57653857		49.6		0.1	4.96
1,2,3,7,8,9 HxCDF	19408743		23.5		0.1	2.35
1,2,3,4,7,8 HxCDF	70648269		8.0		0.1	0.80
1,2,3,6,7,8 HxCDF	57117449		5.3		0.1	0.53
1,2,3,7,8,9 HxCDF	72918219			0.2	0.1 x 0.5	0.01
2,3,4,6,7,8 HxCDF	60851345		7.8		0.1	0.78
1,2,3,4,6,7,8 HpCDF	35322469		538		0.01	5.38
1,2,3,4,6,7,8 HpCDF	67562394		25.1		0.01	0.25
1,2,3,4,7,8,9 HpCDF	55673897			0.3	0.01 x 0.5	0.00

TOTAL TTE (TTE for all dioxin and dibenzofuran isomers and isomer classes) = $23.16 \times 2 =$

ADDITIONAL REMARKS: a) at AR = 250 tons/ac Spoil Dioxin Concentration (SC) after sludge application: SC = 5.8 ppt
b) at AR = 100 tons/ac $\frac{4}{100} \times 32$ SC = 2.3 ppt

I certify under penalty of law that I have personally examined and am familiar with the information submitted and based on my inquiry of those individuals immediately responsible for obtaining the information. I believe the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

DATE REPORT COMPLETED:

6/29/93

SIGNATURE OF REPORTER:

Jerry M. Brigham

TITLE OF REPORTER:

Professor

Dioxin Calculations

The data presented are from total dioxin analysis of an N-Viro soil product made from approximately 50% Pontiac GMC dry alkaline FGD by-product (the same as to be applied at the Fleming site) and 50% Toledo sewage sludge. *It is most likely that less than half of the total dioxin in this mixture is in the FGD component and more than half in the sewage sludge.* Nevertheless, in conducting the following calculations we will assume the worst scenario, namely that all of the dioxin in the N-Viro product originated in the FGD portion of the mixture. Under this assumption, therefore, there are 46.32 ppt (parts per trillion) total TTE (TTE for all dioxin and dibenzofuran isomers and isomer classes) in the Pontiac GMC dry alkaline FGD by-product.

If this FGD by-product is applied at the proposed rate of 125 dry tons per acre and incorporated to a 8 inch depth in the spoil, the final TTE concentration in the treated spoil will be 4.34 ppt TTE.

A sample calculation follows.

Dioxin Sample Calculation

1. $(46.32 \text{ ppt TTE, dioxin})(2 \times 10^{-9}) = 0.000000092 \text{ lbs}$
TTE (dioxin)/dry ton FGD

2. FGD applied at a rate of 125 tons per acre would result
in the following total amount of TTE (dioxin) applied

$$(125 \text{ tons FGD})(0.000000092 \text{ lbs/dry ton FGD}) =$$
$$0.00001158 \text{ lbs TTE (dioxin/acre)}$$

3. Assuming an 8-inch depth of spoil weighs 2,667,000 lbs,
the final TTE (dioxin) concentration in the spoil

$$\frac{0.00001158 \text{ lbs TTE/acre}}{2,667,000 \text{ lbs spoil/acre}} = 0.00000000000434 \text{ lbs TTE/lb spoil}$$

which is the same as 4.34 ppt TTE (dioxin) concentration

Table 1.

Total chemical analyses of the FGD, compost and borrow topsoil.

Parameter	FGD - Pontiac GMC (4 samples)		Compost	Borrow Topsoil for Resoiling	
	Highest value	(mean)		Sample 1	Sample 2
Trace Elements (µg g ⁻¹)					
Arsenic	111.0	(71.5)	12.0	6.3	5.5
Cadmium	2.1	(1.5)	<0.2	7.8	3.3
Chromium	72.8	(42.2)	371	98.3	95.6
Copper	80.6	(49.5)	27	72.4	62.8
Lead	33.0	(17.4)	18	24.0	15.9
Mercury	1.0		<1.0	-	-
Molybdenum	25.3	(22.4)	35	3.8	<0.2
Nickel	103.4	(78.8)	505	46.5	44.8
Selenium	15.2	(8.6)	0.31	<0.7	<0.7
Zinc	184	(112)	91	140.9	137.8
pH (1:1 water)	12.6	(12.5)	8.3	4.4	4.3

Table 2. Summary of Metal Concentrations and Loading Rates

Metal	Analysis			503 Ceiling	Proposed Loading ²		Allowed Cumulative Loading	
	FGD	Compost	Mix ¹		Mix	Resoil	503	OEPA
	----- ppm -----				----- lbs/acre -----			
As	111	12	82	75	28.7	11.0	36.6	-
Cd	2.1	<0.2	1.6	80	0.5	6.6	34.8	8.9
Cr	72.8	371	157	3000	55	191	2680	-
Cu	80.6	27	65	4300	23	126	1340	250
Pb	33.0	18	28.7	840	10	32	267	1000
Hg	1.0	<1.0	1.0	57	0.4	-	15.2	-
Mo	25.3	35	28.1	75	10	8	16.1	-
Ni	103.4	505	218	420	76	90	375	250
Se	15.2	0.31	11.0	100	4	1.4	89.3	-
Zn	184	91	157	7500	55	275	2500	500

¹28.5% compost and 71.5% FGD

²175 tons/acre for compost-FGD mix, 1000 tons/acre for resoil (loading rates based on resoil sample #2).

RECLAMATION COSTS FOR FLEMING RECEIVED
ACQUISITION SERVICES

1. Onsite resoiling material used

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Pan soil at \$1.20/cubic yard. A total of 1,075 cubic yards/acre are needed to provide an eight inch cover.

Preliming of spoil (before resoil cover is applied) requires 40 tons limestone/acre at \$20/ton = \$800/per acre

Lime application to resoil material at 15 tons/acre and \$20/ton = \$300/acre

Soil : \$1.20/cubic yard x 1,075 cubic yards required/acre = \$1,290/acre

Lime: \$20/ton x 55 tons/acre = \$1,100/acre

TOTAL COSTS = \$1,290/acre + \$1,100/acre = \$2,390/acre

If soil had to be purchased from a neighboring piece of property immediately adjacent to the reclamation site (so that it could still be considered "onsite" resoil material) one should assume an approximate cost of \$0.50/cubic yard. This would add 1,075 cubic yards/acre x \$0.50/cubic yard = \$537/acre to the cost calculated above. The new total would, therefore be \$2,390/acre + \$537/acre = \$2,927/acre.

2. Cost of using FGD/compost mix.

FGD from the GMC plant in Pontiac Michigan will be used. This plant burns Ohio coal and uses Ohio limestone for scrubbing. The cost of trucking the FGD to the Fleming site is about the same as the disposal cost. Therefore, we are assuming the the FGD will be delivered at no cost to the state or to our project but will essentially be paid for by the GMC plant in lieu of the disposal fees. Trucks will offload the FGD at the compost facility so that mixing can be accomplished before proceeding to either the Fleming AML minesite (to deliver the FGD and compost mixture) or to the coal mine site to be reloaded with coal.

Compost costs. It takes approximately 2.7 cubic yards of compost (dry weight basis) to yield one ton. Therefore the total amount of cubic yards required to make 50 tons is 2.7 cubic yards/ton x 50 tons/acre = 135 cubic yards/acre. We have received quotes from two different suppliers of yard waste compost in Northeast Ohio and the cost for compost is \$5/cubic yard (for material). Therefore, 135 cubic yards/acre x \$5/cubic yard = \$675/acre.

Trucking from the compost facility to the Fleming site involves a short haul and is estimated to cost \$4/ton and since 175 tons/acre of the FGD/compost mixture will be used, the cost for this final stage of trucking totals \$4/ton x 175 tons/acre = \$700/acre

To mix the FGD with the compost would cost an additional \$2/cubic yard of compost or \$270/acre.

FGD : Delivered at no cost to the project.
Compost : \$675/acre (material) + \$270/acre (mixing) = \$945/acre
Trucking : \$700/acre

TOTAL COSTS = \$1,645/acre

3. Cost of using resoil from a site 4.5 miles away

Hauling soil to Fleming from 4.5 miles away and, assuming the soil is free for the taking, still requires that heavy loading equipment, trucks, drivers and fuel be paid. ODNR estimates these costs to be \$1.75/ton or \$2.13/cubic yard. Resoil to a depth of 8 inches requires 1,333 tons of resoil. Therefore, this option would cost \$2,334/acre.

Liming costs would be the same as that calculated for option #1 or \$1,100/acre.

If the area from which the resoil material is removed requires a Phase 1 archaeology survey, an additional cost of \$3,000 (total) would be required.

Resoil material : \$2,334/acre
Lime : \$1,100/acre

TOTAL COSTS = \$3,434/acre

Cost Summary

1.	Resoil material obtained onsite	\$2,390/acre
2.	FGD + compost	\$1,645/acre
3.	Cost of offsite resoil material	\$3,434/acre

Notes

1. Calculations for soil were made assuming 90 lbs/cubic foot (Ohio EPA requirement)
2. The above do not show any cost for spreading fertilizers which would be approximately equal for the three options.
3. Cost of spreading the materials also have not been included in the above estimates. There is much more material to be handled if resoil is used.
4. If the disposal fee is not totally applied to offset the trucking costs of the FGD from Pontiac, MI to the compost facility, the cost for trucking could vary anywhere from 0 (all disposal fee applied to trucking costs) to \$16/ton (none of the disposal fee applied to the trucking costs).
5. Final costs will only be known after all bids have been obtained and the project has been completed. We will share this information with you.

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OCDO MONTHLY PROJECT STATUS REPORT
LAND APPLICATION USES OF DRY FGD BY-PRODUCTS
OCDO GRANT AGREEMENT NO. CDO/D-89-35
STATUS REPORT NUMBER 38
REPORTING PERIOD - MARCH 1994

Joel H. Beeghly (412) 777-0711
Warren A. Dick (216) 263-3877

Land Application Uses of Dry FGD By-Products

Monthly Report

March, 1994

Warren A. Dick and Joel H. Beeghly

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1.0 **Monthly Progress**

1.1 **Sampling, Analysis and Technical Reports**

- 1.1.1 Field soil and water samples from last year's work have essentially been completed. Reclamation of the Fleming site will result in even more samples this year than last year and this summer promises to be a busy one in terms of field sampling. A "quality control" sampling of the ash and ash-compost product is being implemented while being produced at Earth & Wood.
- 1.1.2 Warren Dick was called by Discover Magazine to check on facts for a story that will be printed on the use of FGD for land application. This story is another one that has resulted from the press release written last year.
- 1.1.3 Plans are being made for an Open House called BioHio to be held on the OARDC campus from July 22-24, 1994. The theme of the open house is the cooperative relationship between Ohio State University and industry. A large number of displays will be created, one focusing on our FGD land application project. The support by all of the sponsors of this project will be acknowledged and Dravo Lime Company, American Electric Power, and Ohio Edison have been invited to participate as industry representatives. Governor Voinovich and his cabinet have been invited to attend.
- 1.1.4 A paper on the Tidd PFBC material was prepared for Southern Illinois University Conference called "Management of High Sulfur Coal Combustion Residues: Issues and Practices", that was held April 5-7, 1994. J. H. Beeghly made the presentation. Copies are available upon request.
- 1.1.5 Phase 1 report abstract is listed in DOE report. See attachment.

1.2 **Field Demonstration Sites**

1.2.1 **Fleming AML Site**

Two meetings were held by OSU's Warren Dick, Howard Johnson, and local public and citizens to plan a town meeting where Warren would make a presentation and answer questions about the project. The Mayor of Dover and the Tuscarawas County Health Commissioner agreed to host and moderate the meeting to be held April 6. A letter was extensively worked on by Warren

Dick and reviewed by Dravo and OCDO to Jim Kneuble of Club 3000 in response to their earlier written letter. Also at these meetings was an agreement to provide dioxin and other tests performed on samples the actual yard compost-FGD mixture to be applied.

The General Motors, Pontiac, Michigan contacts reneged on their interest and willingness in providing their AFBC ash for reasons of apathy and lack of indemnification by us. They agreed to let us try to get the material through their new ash broker-sales agent, JTM Industries, who are familiar to Dravo Lime. Tony Boothby of JTM agreed to give us a least one truck load per day on the condition we have the OEPA approval and we pay the trucking. Because of the higher cost and questionable availability, we plan to use the GM material for only the watershed experiments (4 acres and 125 dry ton per acre). These watersheds will be monitored for surface and leachate water quality, soil quality, and plant quality.

With the permission from AEP, the PFBC material from the Tidd plant will be used for reclaiming the areas outside the six one-acre watersheds. Rainulator studies and ground water studies will be focused on this material.

A letter (attached) dated March 31 was received from Ohio EPA informing us that they had reviewed our permit application and that the company and FGD materials met their criteria for being non-toxic. A beneficial use exemption was thus granted.

- 1.2.2 The DOE (Morgantown) has informed the project that they would be willing to pay for some of the cost of trucking FGD for repair of a road slip on the highway, Ohio 83. Plans are being considered as to "if" and "how" to proceed with this project. This work would be conducted under the direction of Dr. Bill Wolfe, Civil Engineering Department of Ohio State University.

2.0 Contract Problems

The Ohio State University contract with the USGS will need to be revised to include a new statement of work that is specific for the Fleming site. This will be obtained from USGS after reclamation materials have been placed on the Fleming site. An agreement in principal has been obtained on a work plan from USGS so that delays in beginning ground water monitoring activities should be minimized.

3.0 Work Schedule

- 3.1 Prepare mixes of compost plus FGD at Earth-N-Wood and send samples to Triangle Laboratories for dioxin analyses. Metal and neutralizing power analyses will be conducted at Ohio State University. Trucking is being coordinated by Dravo and OSU Agronomy. Practice "crisis prevention and

management control" when delivering to the AML site.

- 3.2 Work with Tuscarawas County Health Department in obtaining well water samples for baseline analysis of water quality.
- 3.3 Apply for Ohio EPA fugative dust permit for AML site.
- 3.4 Prepare for rainulator runs on the agronomic plots at Coshocton for determination of surface water quality when agricultural soils are treated with FGD.
- 3.5 A Core Steering Committee meeting at Wooster and the Fleming AML site is anticipated for mid or latter part of May.

4.0 **Post April 6 Meeting Report**

The town meeting was set up and moderated by the Mayor of Dover and Tuscarawas County Health Department as stated above. Based on a general consensus of project personnel attending, the community now supports the project. About four people from the Club 3000 continue to object but have not been persuasive to the Mayor, the county health department, and other local officials. The Health Department and Club 3000 will continue to watch for mismanagement on our part or on the part of the truckers delivering to the site.



State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149
(614) 644-3020
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George V. Voinovich
GovernorDonald R. Schregardus
Director

March 31, 1994

Professor Warren A. Dick
OARDC
Dept. of Agronomy
1680 Madison Avenue
Wooster, Ohio 44691-4096

Dear Professor Dick:

We have reviewed the information you supplied in your March 2, 1994 report and March 16, 1994 letter regarding the use of flue-gas-desulfurization (FGD) by-product and yard waste compost on the Fleming AML site. The report states that the FGD waste will be land applied (by itself and mixed with composted yard waste) as part of an experimental project that will evaluate the use of these materials for reclaiming mine land. The project will take place on the Fleming Abandoned Mine Land site in Franklin Township, Tuscarawas County and is part of an ODNR reclamation project.

The results from the TCLP analyses that you provided for the FGD by-products showed that those materials meet our criteria for being non-toxic. Based on this, and a review of the concentrations of metals, pH, etc. in the FGD by-product, compost and resulting soil mixture, and the project plan that you provided, we have determined that your proposed plan is a beneficial use under DWPC Policy 4.07 and does not pose a threat to waters of the state. A permit to install or plan approval is therefore not required from the Ohio EPA for the proposed project. Please note that if you find that the FGD material will not be from one of the sources cited in the March 2, 1994 project proposal, this determination would no longer stand.

For your information, the Division of Solid and Infectious Waste Management notes that the levels of nickel found in the compost product to be used in the project are relatively high. The level is below federal standards for land application of biosolids, but is significantly higher than would be expected in source separated yard waste compost and higher than allowable limits in other states with compost quality standards. You may wish to discuss this with your supplier to determine if lower nickel levels can be achieved so that this product will be more "typical" of yard waste compost.

Prof. Dick
Fleming
Page 2

For our records, we would ask that you supply us with sample results from the material that is actually used in the project, both FGD by-product and compost. We would like to see analytical results for all of the parameters listed in Table 1 of the March 16, 1994 letter for the compost, and Table 11 of the report for the FGD by-product. Please submit a copy of this information to the Division of Surface Water (attention Cathy Alexander) and the Division of Solid and Infectious Waste (attention Alison Shockley). We would also appreciate you sending copies of data compiled throughout the project (i.e. not necessarily raw data, but summaries, progress reports, etc.) and the final report on the project.

If you have any questions, please feel free to contact me at (614) 644-2041 or Cathy Alexander at (614) 644-2024.

Sincerely,

George Elmaraghy

George Elmaraghy, P.E.
Assistant Chief
Division of Surface Water

\ca

pc: Janet Barth, SEDO, DSW
Cathy Alexander, DSW
Alison Shockley, DSIWM
Joel Beehly, Dravo Lime
Dave Nicklaus, ODNR
Hon. Greg DiDonato, State Representative
Hon. R. Homrighausen, Mayor of Dover
Steve Wermuth, TCHD
Jackie Bird, OCDO
Ralph Haefner, USGS
Laura Powell, Dir. Office
Nancy O'Meara, PIC

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(DOE/MC/23060-3509)

Land application uses for dry FGD by-products, Phase 1 report. Bigham, J.; Dick, W.; Forster, L.; Hitzhusen, F.; McCoy, E.; Stehouwer, R.; Traina, S.; Wolfe, W. Dravo Lime Co., Pittsburgh, PA (United States). Apr 1993. 354p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC28060. Order Number DE94000039. Source: OSTI; NTIS; GPO Dep.

The 1990 amendments to the Clean Air Act have spurred the development of flue gas desulfurization (FGD) processes, several of which produce a dry, solid by-product material consisting of excess sorbent, reaction products containing sulfates and sulfites, and coal fly ash. FGD by-product materials are treated as solid wastes and must be landfilled. It is highly desirable to find beneficial reuses for these materials provided the environmental impacts are minimal and socially acceptable. Phase 1 results of a 4 and 1/2 year study to demonstrate large volume beneficial uses of FGD by-products are reported. The purpose of the Phase 1 portion of the project was to characterize the chemical, physical, mineralogical and engineering properties of the FGD by-product materials obtained from various FGD technologies being developed in the state of Ohio. Phase 1 also involved the collection of baseline economic data related to the beneficial reuse of these FGD materials. A total of 58 samples were collected and analyzed. The results indicated the chemical composition of the FGD by-product materials were dominated by Ca, S, Al, and Si. Many of the elements regulated by the US Environmental Protection Agency reside primarily in the fly ash. Phase 1 results revealed that FGD by-product materials are essentially coal fly ash materials diluted with unreacted sorbent and reaction products. High volume beneficial reuses will depend on the economics of their substituting for existing materials for various types of applications (e.g. as an agricultural liming material, soil borrow for highway embankment construction, and reclamation of active and abandoned surface coal mines). Environmental constraints to the beneficial reuse of dry FGD by-product materials, based on laboratory and leachate studies, seem to be less than for coal fly ash.

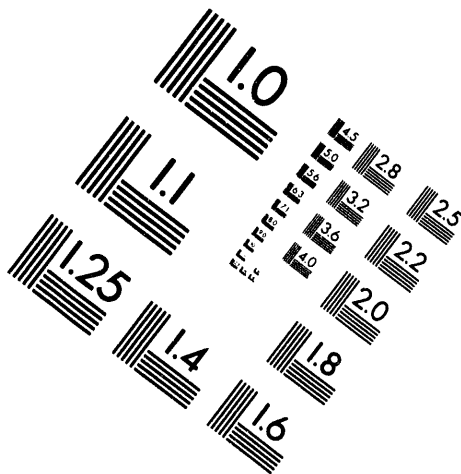
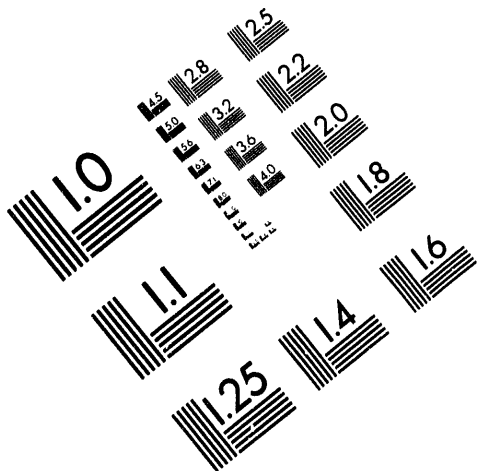
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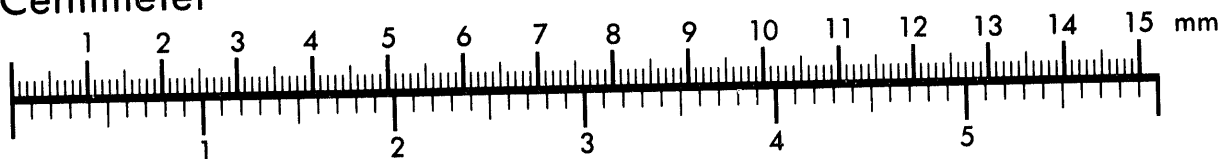
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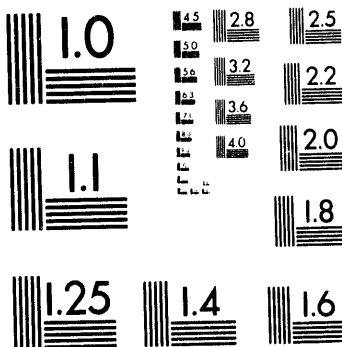
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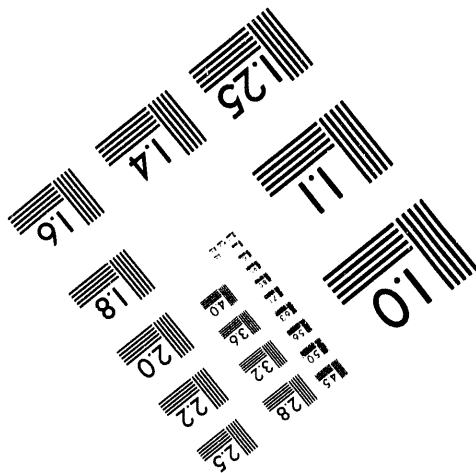
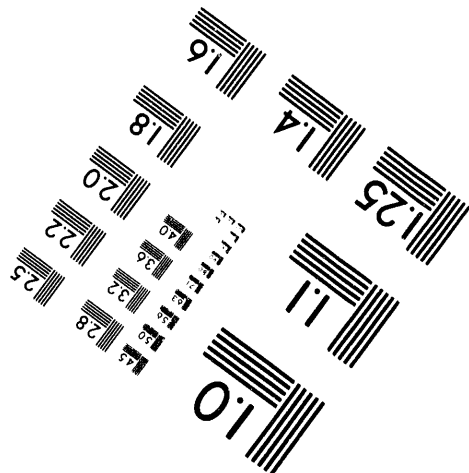
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