3.6.11

Fuss & O'Neill Inc.

TECHNICAL MEMORANDUM

TO: Michael Nalipinski, RPM

FROM: David Bramley, PM

DATE: February 23, 1993

RE: Linemaster Switch Corp.
Feasibility Study (FS) Response

CC: Lynne Jennings - EPA
Gary Kennett - Linemaster
Naomi Davidson - DEP
Leslie White - DEP
Al Smith - Murtha, Cullina, Richter & Pinney

On February 18, 1993 a meeting was held at Linemaster to discuss the comments of the Agency on the FS. Among the items discussed was the need for emissions control on the existing air stripper and on the proposed soil vapor extraction (SVE) system. The Agency advised that an OSWER Directive dated June 15, 1989, specifies air discharge limits for ozone precursors (chlorinated hydrocarbons among other) in ozone nonattainment areas to 3 lb/hr or 15 lb/day or 10 tpy. In addition, 40 CFR 264 Subpart AA limits emissions to 10 parts per million (ppm) by weight in air without treatment.

The FS proposed that no off-gas treatment be included on the existing Interim Removal Treatment System (IRTS) air stripper. Controls were included for the proposed SVE system. The Agency requested that Fuss & O'Neill determine the actual and proposed rates of emissions from the air stripper and the SVE system, calculate the cost of controls, and evaluate the need for controls. The Agency also requested clarification of the cost for emission controls (carbon filtration) developed in the Sensitivity Analysis shown in Table 15-1 of the FS.

Rather than modify the text of the FS, and to maintain the schedule established by the Agency, the information generated was to be

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summarized in a Technical Memorandum and forwarded to the Agency.

OSWER Directive 9355.0-28 indicates that VOC controls should be required for sources with facility-wide emissions in excess of 3 pounds per hour in ozone nonattainment areas. Thus, controls would not specifically be required by this directive. The directive also states that its control levels "are not intended to preclude or replace State proposals for more stringent levels of control in pursuit of Clean Air Act goals as part of SIP revisions in nonattainment areas".

Connecticut regulations would, therefore, constitute more stringent levels of control for the entire facility in this case, because controls would be required for the soil gas system beyond those imposed by any other federal ARARs in the absence of State regulations. Further controls on the air stripping systems are not warranted by any State or Federal ARARs.

Subpart AA sets standards for affected process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations managing hazardous wastes with organic concentrations of at least 10 ppmw. All vents to which the standards apply must either reduce total organic emissions from all affected vents to less than 3 pounds per hour and 3.1 tons per year, or install control devices to reduce organic emissions from all affected vents by 95 percent.

As can be seen from Table 1, neither the Interim Removal Treatment System stripper nor the faciltiy water supply stripper (combined) contact wastewater at 10 ppmw or greater, and thus the standard is not applicable to these sources. Furthermore, their emission rates

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are well below the rate required by the standard of 3 pounds per hour, and would therefore be in compliance even if the standard were deemed relevant and appropriate.

In the preamble to Subpart AA (FR Vol. 55 No. 120, p. 25462), EPA considered facilities that manage very low concentration organic wastes, and groundwater remediation systems specifically, concluding that "Facilities with organic emissions from process vents that do not exceed these emission rates will not have to install controls or monitor emissions from affected process vents...The quantity of emissions and the risk associated with air strippers treating streams with concentrations below 10 ppmw may be relatively small, thus minimizing the potential harm of deferring control until a later time."

For the soil vapor extraction system, Subpart AA does not appear to apply because it is not one of the listed processes, and because the "waste" would be in vapor phase at its point of generation. It should be noted, however, that conceptual design included carbon adsorption that will remove VOCs to non-detect levels.

EMISSIONS CONTROL SENSITIVITY ANALYSIS

Off-Gas Discharge Rates

In the FS Site alternatives were developed by combining Source Control (SC) and Migration Management (MM) technologies to address both soil and groundwater contamination. These alternatives address the contamination, both outside of and below the production facility, for effectiveness, implementability and cost. Because there is an operating groundwater treatment system, the existing

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air stripping system was retained for all four Site Alternatives. The four site alternatives are:

- SA-1 No Action (Ground-Water Collection and Treatment)
- SA-2 Containment (Ground-Water Collection and Treatment)
- SA-3 Vacuum Extraction (Ground-Water Collection and Treatment)
- SA-4 Air Sparging (Ground-Water Collection and Treatment)

The preliminary designs developed in the FS included carbon adsorption for off-gas treatment on the SVE system. Because both the rate and mass of emissions are very low in the air stripping system, and because the systems have been permitted by the CT DEP without emissions controls, no emissions controls cost estimates were developed in the FS except in the Sensitivity Analysis.

Table 1, attached summarizes the emissions from the systems that are currently operating at the site. Total emissions from the two existing air strippers, one to treat the plant water supply, the other is part of the Interim Removal Treatment System (IRTS), are 0.029 lb/hr, 0.67 lb/day, and total much less than the OSWER Action Limits of 3 lb/hr and 15 lb/day.

To evaluate the potential discharge of VOCs from the proposed soil vapor extraction system (SVE), analytical data from five of the monitoring wells installed in the Zone 1 area were examined and the "worst case" emission rate was estimated for these five wells. This worst case rate would be one that would be expected to exist

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TABLE 1

VOC EMISSIONS

IRTS AIR STRIPPER

Month	Total VOC (ug/l)	Flow (gpd)	Discharge lb/hr	Discharge lb/day
Jan '93	651.1	95200	0.02	0.52
Dec '92	978.5	83860	0.03	0.68
Nov	715.0	91250	0.02	0.54
Oct	896.3	92460	0.03	0.69
Sept	858.0	77040	0.02	0.55
Aug	1770.6	40320	0.02	0.60
July	3065.7	40608	0.04	1.04
Average			0.028	0.66

FACILITY WATER SUPPLY STRIPPER

Total influent VOCs prior to IRTS startup in June 1992

Feb '92	3098 ug/l
April '92	2601 ug/l
June '92	1632 ug/l
Average	2444 ug/l

Total VOC Emissions (2500 gpd) = 0.05 lb/day

Total influent VOCs after IRTS startup in June 1992

Aug '92	670 ug/l
Oct '92	464 ug/l
Dec '92	270 ug/l
Average	468 ug/l

Total VOC Emissions (2500 gpd) = 0.01 lb/day

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FEB 23 '93 03:55PM FUSS & O'NEILL P.4

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for approximately 10 days (based on information developed during the bench-scale testing) then begin to decline at a rate similar to other SVE systems.

SVE EMISSIONS

Well No.	VOC Emission Rate (lb/hr)
DW-1t	0.301
DW-2t	0.005
DW-3t	0.003
OW-4t	0.024
OW-5t	0.071
TOTAL	0.404
AVERAGE	0.081

The wells listed above are located near the original source of release of VOCs. Consequently, virtually all other wells will discharge VOCs at a lower rate. If, hypothetically, all of the proposed 40 vapor extraction wells discharged VOCs at the above average rate continuously from startup, the total rate would be only 3.2 lb/hr. The SVE system, as outlined in the FS would, however, include emissions control to reduce the rate of discharge to a non-detect level.

Combining all the discharges, without emissions control would result in a possible worst case scenario of a total discharge of VOCs of 3.23 lb/hr (77.5 lb/day). Of this total, 99.1 percent would originate from the SVE system (during the first few weeks of operation), and less than one percent would be the result of air stripping. Consequently, it would be necessary to spend at least

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$225,500 to reduce the discharge of VOCs from the site by less than one percent.

Over time, the VOC concentration of VOCs in the vapor extraction wells will decrease. Although the proportion of VOCs discharged from the air stripping system will increase, the total volume (and rate) of VOCs discharged will decrease. A decrease in the average concentration of VOCs to 0.07 lb/hr/well would reduce the total discharge to 2.8 lb/hr. A decrease in the average rate to 0.015 lb/hr/well would reduce the total discharge to 14.4 lb/day. Thus, because emission controls are proposed for the SVE system, the negligible added removal that would be achieved with air stripper off-gas treatment would not be cost effective.

Cost of Off-Gas Controls

In Section 15.1 of the FS it was determined that air stripping would be the recommended groundwater treatment technology. This was done because there is an existing, operating air stripping treatment system effectively treating the groundwater from the groundwater extraction system. The air stripping technology, however, does not destroy VOCs. It transfers them from the groundwater to the air for ultimate destruction by the natural environment. UV/Oxidation, on the other hand, destroys VOCs in the treatment process and would comply with SARA's preference for a technology that reduces the volume of contaminants. Therefore, one item of sensitivity is the degree of treatment and residuals that may exist.

In addition to replacing air stripping with UV/Oxidation, the effect of adding vapor-phase carbon treatment to the existing air stripper was evaluated. Also examined was the effect of operating the source control remedial systems for 30 years rather than the 10 years anticipated. (Costs for the source control remediation for SA-3 and SA-4 assumed three years of operation spread over ten years to simulate the likely intermittent operation of the systems).

Table 15-3 of the FS is attached and modified to include "Not Applicable" to represent a No Action alternative. Also, the costs of SA-3 and SA-4 in the table have been modified to include the present worth of the annual cost of off-gas treatment rather than the simple annual cost (increase the total cost of both alternatives by $18,200). The net present worth cost of adding off-gas treatment to the IRTS air stripper is $225,500 and was developed as follows. (Also refer to Appendix H of the FS).

Gas phase treatment equipment (includes carbon canisters, air heater, etc. for approx. 1300 cfm flow at 50% humidity)	$25,000
Building modifications	$10,000
Duct work	$ 5,000
Freight	$ 6,000
Installation (includes controls, etc.)	$10,000
Contingencies (25%)	$14,000
TOTAL Capital Cost	$70,000

The O&M costs were calculated for the additional power, labor, maintenance and for the carbon use. Assumptions included uniform use of the carbon over the 30 year life of the system and purchase and regeneration costs of two dollars per pound of carbon (which may be low). Based on the mass of TCE calculated for the deep

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bedrock aquifer in Section 9.2 of the FS (5780 pounds), and a carbon use rate of 3 lbs. of carbon per pound of TCE removed, 17,340 pounds of carbon would be use to remediate the bedrock aquifer. The breakdown of O&M costs is as follows. The present worth cost is based on a 4 percent interest rate and a 30 year life. Replacement costs for equipment are lump sum costs that occur in year 16.

Item	Present Worth Cost
Electricity ($0.08/kwh)	$ 47,700
Labor (1 hr/wk @ $25/hr)	$ 22,500
Maintenance (allowance)	$ 8,600
Carbon (600 lb/yr @ $4/lb)	$ 41,500
Sampling/Analysis (off-gas)	$ 23,200
SUBTOTAL	$140,500
Replacements	$ 15,000
Capital cost	$ 70,000
Total Present Worth Cost	$225,500

The estimate of the cost for the SVE system was developed less rigorously because an operational system is not in place as is with the existing air stripper. Due to the nature of the soil and based on the results of the pilot test conducted at the site in 1989, it was assumed that an air flow rate of approximately 10 cfm per well could be achieved. Using an estimated 40 extraction wells would result in an air discharge rate of approximately 400 cfm. As is discussed above, the concentration of VOCs in the discharge from the SVE system will vary with time. Because the exact variation cannot be predicted, it was assumed that the carbon would be used uniformly over the life of the remedial effort. Although this will not be the case, it will not affect the evaluation of the SC

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alternatives because both SA-3 and SA-4 use the same technology and the cost difference will be internally consistent.

The estimate prepared for the FS assumed one, 2,000 lb vessel would be used each year. This was done because it is less difficult to arrange transportation and reactivation of a large volume of carbon than for several, small, 200 - 400 pound canisters. During the initial operation of the SVE system the rate of carbon use likely will be higher. This would result in a higher first year operating cost, but would have less effect on the longer term O&M cost because the concentration of VOCs in the vapor will decrease.

The cost of emission controls for the SVE system include the capital cost of the carbon filters and the annual cost of carbon replacement and regeneration and disposal. From Table 15-6, the carbon filters cost $20,000 (including contingencies). Because it is anticipated that the SVE system would be operated intermittently, the estimated three year remediation period was extended to ten years to represent the intermittent operation. Assuming the use of 2,000 pounds of carbon per year (which may be low in the first year), the present worth of the annual carbon use cost is $20,200, for a ten year remediation period, making the total present worth cost approximately $40,000. For a 30 year period, the SVE system likely would cease operation after ten years. If, however, the same assumptions were applied to a 30 year period, the total present worth cost of the carbon system would increase only slightly to approximately $42,000.

Finally, referring again to Table 15-3, it was noted during the meeting at Linemaster on 2/18 that the cost to increase the remediation time to 30 years decreased when compared to replacing

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air stripping with UV/Oxidation in SA-3 (the SVE alternative), while it increased in SA-4 (the air sparging alternative). This occurs in SA-4 because the magnitude of the O&M cost for the air sparging option is greater than the cost of changing from air stripping to UV/Oxidation. In SA-3, the magnitude of the cost of changing to UV/Oxidation is greater than the increase in O&M cost for operating the SVE system for 30 years. The Total Present Worth Cost increase to change to UV/Oxidation is approximately $651,000 (Table 14-5 minus Table 14-4). The cost to increase the remediation time to 30 years for SA-3 is $617,400; the cost is higher for SA-4, $822,000, because of higher O&M costs. Therefore, it costs approximately $34,000 less to operate the air stripper (and SVE system) for 30 years than it does to convert to a UV/Oxidation system and operate it for 30 years which is shown in Table 15-3.

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TABLE 15-13
SENSITIVITY ANALYSIS
FEASIBILITY STUDY REPORT
LINEMASTER SWITCH CORPORATION
WOODSTOCK, CONNECTICUT
DECEMBER 1992

SENSITIVITY CONDITION	SA-1 NO-ACTION	SA-2 CONTAINMENT	SA-3 VACUUM EXTRACTION	SA-4 AIR SPARGING
Air Stripping ground-water treatment	$1,873,400	$2,267,900	$2,428,100	$2,438,100
Add vapor phase carbon for off-gas treatment	Not Applicable	$2,493,400	$2,653,600	$2,663,600
Replace air stripping with UV/Oxidation	Not Applicable	$2,918,100	$3,079,300	$3,089,300
Increase source remediation time to 30 years	Not Applicable	No change from original	$3,041,500	$3,280,000
Cost saved by eliminating emissions controls from SVE system	Not Applicable	Not Applicable	$ 40,200	$ 40,200

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