

Monsanto

FROM NAME LOCATION PHONE

Dept. of Medicine & Environmental Health G. Roush, Jr., M.D. G2WG 8800

DATE March 14, 1983
SUBJECT DISPOSAL METHODS FOR DIOXIN
REFERENCE
TO M. L. Mullins
F3EA

At the task force meeting on dioxins for Missouri, the attached documents on disposal methods and costs were distributed.

Since each member of the committee has responsibility to bring what he can to the committee, if you have any comments regarding these disposal methods or if you think one is more appropriate than another, or if there is a disposal method not mentioned that should be included, I would welcome such comments.

Our next meeting of the committee is scheduled for March 17. If you don't have comments prepared for me by that date, the next meeting of the committee is March 30.

If you have questions regarding the enclosures or my specific needs, please give me a call.

George Roush, Jr., M.D.

/hc
Attachments

CONFIDENTIAL
SUBJECT TO PROTECTIVE ORDER.

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SPECIFIC DISPOSAL METHODS

Following is a brief description of each of the specific disposal strategies which have been presented to the Department of Natural Resources to date. They are listed in alphabetical order according to the firm that made the proposal. It must be noted that the majority of these proposals are very preliminary, and are dependent on as yet unresolved variables such as the amount of material to be treated.

Acurex Waste Technologies, Inc.

This firm has proposed treating the contaminated soil with a two step chemical process to remove the dioxin. The first step would be to wash the soil a number of times with a solvent to remove the dioxin. Next, the dioxin-laced solvent would be concentrated and treated with a proprietary reagent which would degrade the dioxin. The cost for this process is estimated at \$200 per cubic yard of material treated.

Most of Acurex's past experiences have been with PCB removal and destruction. The process described above was initially designed and developed for PCB removal, but works well on dioxin due to structural similarities between the two compounds.

CECOS

This firm has not made a formal proposal as of yet, but has expressed interest in the situation pending our supplying them with more specific site information. They have a wide background in hazardous waste management, including involvement with the clean-up effort at Love Canal. They operate two hazardous waste treatment and disposal facilities in New York and Ohio.

Chemical Waste Management, Inc.

This firm has proposed a clean-up strategy which involves on-site extraction of the dioxin from the soil using a solvent. The dioxin-laden solvent is then purified and subjected to U.V. photolysis to degrade the dioxin. Following photolysis the solvent is sent to the firm's incinerator ship, the Vulcanus, for ocean incineration. The cleaned up soil would be sent to a landfill for disposal.

This firm has an established background in hazardous waste treatment, including being commissioned to clean up a high priority abandoned site in Gary, Indiana, under a Superfund contract awarded by the Environmental Protection Agency.

Fluor Engineers, Inc.

This firm has not submitted a specific proposal as of yet, but has expressed an interest in being involved with the clean-up effort. Fluor's Environmental Services group has a background in environmental consulting and support, of which hazardous waste management and disposal is a part.

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Midland Ross Corp.

This firm's preliminary proposal includes the on-site construction of a pyrolytic incinerator. This type of incineration is a two step process, in which the first step removes the organics from the contaminated soil by decomposition at controlled temperature in the absence of oxygen. In the second step, the organics are fed into a high temperature incinerator and destroyed. The soil is left as inert char.

Midland Ross specializes in the construction of pyrolytic systems as described above. Preliminary estimates from the firm indicate a unit can be constructed on site for \$2-3 million which would handle 500-600 cubic yards of contaminated soil per day. A meeting is set up between firm representatives and members of the Department of Natural Resources to discuss their proposal in depth.

Midland Ross has some experience in the field of contaminated site clean-up, including the clean-up of a Kepone-contaminated site in Hopewell, Virginia, which included a contaminated lagoon as well as a number of abandoned waste filled drums.

Rollins Environmental Services (TX), Inc.

This firm has expressed an interest in applying their area of expertise, which is above ground closure, to each of the contaminated sites. Closure is, in effect, a method of above ground landfilling.

This firm has participated in several solidification and above ground closure projects at hazardous waste sites in New Jersey, New York, and Texas. Since no solidification is required in this instance, the firm has made a preliminary telephone cost estimate of \$10-25 per cubic yard of contaminated soil for construction of on-site above ground landfills.

SCA Chemical Services, Inc.

This firm also has not yet submitted a specific disposal plan as yet, but has indicated their interest in involvement with the situation. They have a background in incineration of hazardous wastes including the recent completion of a high temperature drum loaded incineration facility in Chicago. This unit became operational in January, 1983.

SEVERAL OF THE ABOVE FIRMS HAVE MADE PRESENTATIONS TO THE DEPARTMENT OF NATURAL RESOURCES, AND SEVERAL MORE HAVE INDICATED A DESIRE TO DO SO. ALSO, MOST OF THE ABOVE FIRMS HAVE INDICATED WILLINGNESS TO GO BEFORE THE GOVERNOR'S TASK FORCE ON DIOXIN TO MAKE A FORMAL PRESENTATION.

SUMMARY OF COST ESTIMATES

EXCAVATION: Removal of contaminated soils and loading for transportation or on-site treatment. The estimated cost would be \$20 per cubic yard. Since all proposed treatment methods involve this action, it is included in Table 1, but the estimated cost must be added independent of clean-up method.

TRANSPORTATION: Transporting of the contaminated soils by licensed hazardous waste transporters. Truck liners, used as primary containment to prevent contact of contaminated soils with the trailer, would be an extra cost. Estimated cost is \$.05/mile X cubic yard. Since mileage is an unknown variable, this category is not included in Table 1.

REPLACEMENT OF SOILS: Replacing clean soils to original contours, fertilizing and seeding. Estimated costs will vary depending on site topography, vegetative cover and material costs. Average estimated cost would be approximately \$10 per cubic yard. Since all proposed methods involve this action it is included in Table 1, but the estimated cost must be added independent of clean-up method.

INPLACE STABILIZATION OF SITE: Some sites may be "engineered" to prevent migration of the contaminated soils from the site. This option would only be viable to those sites which have limited exposure. Activities would include: diversion of drainage, modification of surface contours, fertilizing and seeding, and a means to prevent entry. Since this work would be site specific, estimated cost would be too variable to estimate, so this category is not included in Table 1.

STORAGE AND MONITORING: While this proposal will not destroy the contaminated soils, it will remove them from the exterior environment until proper disposition can be accomplished. This proposal would include construction of a building to contain the waste, monitoring well placement, quarterly sampling and maintenance for a 10 year period. The estimated cost would be \$30 per cubic yard.

LANDFILLING: The estimated costs of landfilling the contaminated soil in a permitted landfill range from \$25 to \$75 per cubic yard. The lower range would be an estimate for constructing an "above ground" landfill. The higher range is for disposal in an existing landfill assuming the regulatory agencies would approve. The estimated costs include only the landfill fee, and not testing, excavation, transportation, or replacement of soils.

PLACEMENT OF CAP: Placing either an artificial or natural cap over the site. The cap would be a layer of sand with drainage pipe, a low permeability liner, a layer of sand, a layer of soil, and seed and fertilize to natural environment. The estimated costs range from \$45 to \$180 per square yard dependent on topography and materials cost.

CHEMICAL EXTRACTION TREATMENT: This method involves extracting the contaminants from the soil, and treating the extractant to destroy the contaminant. The clean soil would then be replaced. The estimated costs would be \$200 per cubic yard not including excavation, transportation or replacement of soils.

INCINERATION: Incineration is an expensive alternative because the contaminated soil must be heated to high temperatures, but the soil has no heating value. Estimated costs vary between \$625 to \$1,500 per cubic yard. The lower estimated cost range is for the operation of a small mobile unit. The larger estimated cost range is for an existing commercial incinerator. The estimated costs do not include excavation, transportation, or replacement of soils.

PROPOSED CLEAN-UP METHODS MAY INCLUDE ANY ONE OR ANY COMBINATION OF THE CLEAN-UP METHODS LISTED IN TABLE 1. THE ESTIMATED VOLUMES AND COSTS CONTAINED IN THIS SUMMARY ARE PRELIMINARY.

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TABLE 1

Estimated Clean-Up Costs for 2378-T.C.D.D. Contaminated Site

Site	Volume (yd ³)	Excavation (\$1,000)	Replacement of Soils (\$1,000)	Storage and Monitoring (\$1,000)	Landfilling (\$1,000)	Placement of Cap (\$1,000)	Chemical Extraction Treatment (\$1,000)	Incineration (\$1,000)
1 Minker Residence Site	33,300	666	333	999	832.5-2,497.5	450-1,800	6,600	20,812.5-49,950
2 Romaine Creek	111,100	2,222	1,111	3,333	2,777.5-8,332.5	----	22,220	69,437.5-166,650
3 Stout Residence Site	22,200	444	222	666	555-1,665	148.5-594	4,440	13,875-33,300
*4 Spring River								
*5 Denny Farm Site								
6 Shenandoah Stables Site	11,100	222	111	333	277.5-832.5	148.5-594	2,220	6,937.5-16,650
7 Bliss Farm Road Site	100	2	1	3	2.5-7.5	4.5-18	20	62.5-150
8 Bubbling Springs Stable Site	1,900	38	19	57	47.5-142.5	49.5-198	380	1,187.5-2,950
9 Meosho & Wastewater School	400	8	4	12	10-30	6.3-25.2	80	250-600
10 Timberline Arena	1,900	38	19	57	47.5-142.5	49.5-198	380	1,187.5-2,950
*11 Erwin Farm Site								
12 Rusha Farm Site	100	2	1	3	2.5-7.5	11.25-45	20	62.5-150
*13 Syntex Disposal Site								
*14 Bill Ray Farm Site								
15 Times Beach Site	220,000	4,400	2,200	6,600	5,500-16,500	29,565-118,260	44,000	137,500-330,000
16 Ruth Sullins Property	25	0.5	0.25	0.75	625-1,875	1,125-4.5	5	15.63-37.5
17 Southern Cross Timber Co. Site	32,000	640	320	960	600-2,400	2,160-8,640	6,400	20,000-48,000
18 Saddle & Spur Stable Site	2,900	58	29	87	72.5-217.5	193.5-774	580	1,812.5-4,350
19 Hamill Transfer Company Site	22,200	444	222	666	555-1,665	1,438.5-5,394	4,440	13,875-33,300
20 Overnight Transfer Incorp., Site	16,000	320	160	480	400-1,200	1,039-4,356	3,200	10,000-24,000
21 Jones Truck Line Site	14,900	298	149	447	372.5-1,117.5	1,033.5-4,014	2,980	9,312.5-22,350
22 Methodist Church Site	3,000	60	30	90	75-225	193-792	600	1,875-4,500

*Insufficient Data at this time.

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