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11

INITIAL SCREENING OF THERMAL DESORPTION FOR SOIL REMEDIATION

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INTRODUCTION

Petroleum contaminated soils - caused by spills, leaks, and accidental discharges--exist at many sites throughout the United States. Thermal desorption technologies which are increasingly being employed to treat these soils, have met soil cleanup criteria for a variety of petroleum products.

Currently the United States Environmental Protection Agency is finalizing a technical report entitled *Use of Thermal Desorption for Treating Petroleum-Contaminated Soils* to assist remedial project managers, site owners, remediation contractors, and equipment vendors in evaluating the use of thermal desorption technologies for petroleum contaminated soil applications. The completed report will be available from the Center for Environmental Research Information (CERI) by June 1992.

CONTENTS OF TECHNICAL REPORT

The report will discuss the following areas:

- Thermal desorption theory.
- The relationship of thermal desorption applicability, operations, and efficiency to site, contaminant and soil characteristics, as well as the effects of regulatory requirements.
- Commercial thermal desorption systems.
- Operating costs for thermal desorption systems.

Comprehensive appendices to the report serve as an encyclopedic source with detailed discussions on related topics; for example:

- Thermal desorption theory.
- Site, contaminant, and soil characteristics, and their impact on thermal desorption applicability.
- Regulatory issues affecting the permitting and operation of thermal desorption systems.
- Commercially available thermal desorption systems.
- Project task lists for use of mobile and fixed-based systems.
- Estimation of costs for using mobile or fixed-based thermal desorption systems.
- Comparison of thermal desorbers to incinerators.

THREE-LEVEL SCREENING METHOD

The report will also present a three-level screening method to help a reader predict the success of applying thermal desorption at a specific site. This method utilizes a series of worksheets that will assist the reader in accomplishing the following activities:

- Performing an initial assessment, based on limited data, to determine the applicability of thermal desorption for a given application.
- Identifying thermal desorption and off-gas treatment system requirements.
- Developing an overall cost estimate for treating a site using thermal desorption.

The objective of screening level one is to determine the likelihood of success in a specific application of thermal desorption. It will take into account procedures for collecting and evaluating data on site characteristics, contaminant characteristics, soil characteristics, and regulatory requirements. This level will establish whether or not thermal desorption should be evaluated further for site remediation, whether treatment should occur on-site or off-site, and if on-site is a viable option, what system size will be most cost-effective.

Screening level two will evaluate alternative thermal desorption technologies and factors such as the type of unit operations and operating conditions that are required to achieve specific cleanup criteria. It will also identify the most viable equipment alternatives.

Screening level three will guide in the preparation of an economic evaluation of the treatment alternatives selected in the first two levels. It identifies project tasks that must be conducted and provides typical cost factors for treating petroleum contaminated soils by thermal desorption technologies.

The scope of this paper addresses only screening level one which provides a preliminary assessment of the applicability of thermal desorption to a particular site. This topic encompasses worksheets that are an integral part of the "user friendly" screening process. Level one screening provides a foundation for the subsequent two levels which follow a similar "user friendly" worksheet approach to evaluating thermal desorption technologies and establishing costs for thermal desorption in an overall remediation project.

Figure 1 illustrates the three-level screening method presented in the report.

The screening level one worksheets are developed to simplify the evaluation of thermal desorption effectiveness and are based on the collection of limited data. The worksheets do not constitute a design manual, nor a final basis for choosing thermal desorption as a remedy. They provide a pre-selection screening method to determine if the utilization of thermal desorption to a particular site warrants further consideration.

LEVEL ONE SCREENING

The first level of screening describes six steps for collecting and evaluating key data that will affect the application of thermal desorption at a specific site. These data are defined as "critical success factors."

The worksheets in the report guide the reader through the six steps:

1. Data collection.
2. Waste classification.
3. On-site versus off-site treatment selection.
4. Critical success factor evaluation.
5. Contingency planning.
6. Treatment system selection.

The initial screening accomplished by these six steps limits the number of alternatives that will be subjected to further screening levels.

STEP 1: DATA COLLECTION

This first step in screening level one involves the collection of data in four major categories:

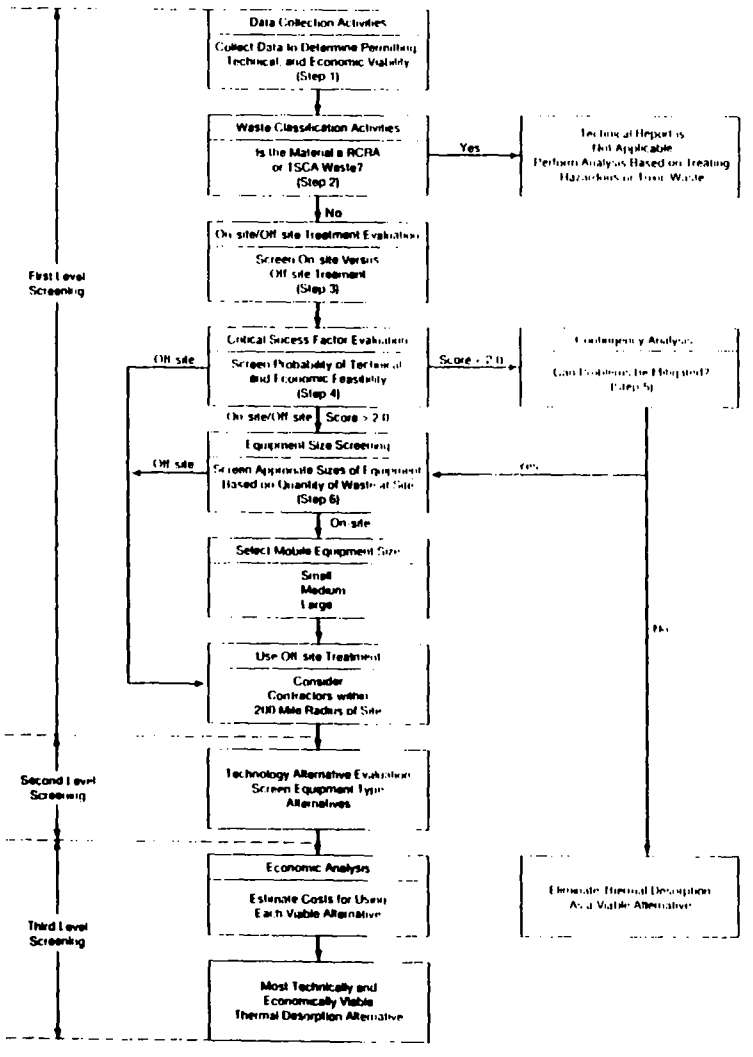


Figure 1 Thermal desorption evaluation decision diagram.

- Contaminant characteristics
- Site characteristics
- Regulatory requirements
- Soil characteristics

Table 1 details these types of data. The method limits the number of parameters in the screening analysis in order to minimize the time and cost of the evaluation. The source of these data, required to complete the critical success factor evaluation, generally include limited field investigations, standard analytical tests, or published sources. The report appendices contain detailed information regarding the potential impact of each item presented.

STEP 2: WASTE CLASSIFICATION

This second step in level one screening uses the data collected in the first step to confirm that the site is appropriate for further evaluation. The report focuses on the cleanup of petroleum-contaminated soil as a non-RCRA and non-TSCA waste. The flow chart in Figure 2 provides a decision tree for classifying the contaminated soil and confirming the applicability of the report. The appendices in the report contain detailed explanations of each element in the flow chart.

STEP 3: ON-SITE VERSUS OFF-SITE TREATMENT SELECTION

Figure 3 presents a decision diagram to compare the economic effectiveness of on-site or off-site treatment. This figure is only a screening tool; it is not a substitute for a detailed economic analysis of alternatives. The report discusses economic analysis in depth as a separate topic.

STEP 4: CRITICAL SUCCESS FACTOR EVALUATION

In this fourth step, worksheets address each critical success factor. Completing these worksheets employs simple qualitative and/or quantitative methods for rating each factor according to the probability for the successful application of thermal desorption. The form ranks each factor as having a least, average, or highest probability for successful use of thermal desorption.

Example - Calculation of the Probability of Success

Table 2 contains an example of a completed critical success factor screening evaluation for an on-site application. The remedial manager first defined the critical contaminant as well as the site, regulatory, and soil characteristics. The manager assumed that an on-site cleanup of 800 tons of soil contaminated with No. 6 fuel oil will occur at a 1.25 acre commercial retail facility in a state having the assumed criteria presented in the example. The contamination at this site resulted from a leaking underground storage tank. The TPH concentration is 12,000 mg/kg and metal concentrations do not exceed state or local criteria.

Table 1 Thermal Desorption Data Requirements Critical Success Factors

Characteristic	Data Collection		
	Rationale	Source	Method[a,b]
Contaminant Characteristics			
Petroleum product type	Selection of required soil treatment temperature	Owner's knowledge of tank usage	Site owner interview
Concentration of TPH in contaminated soil	Determination of treatment and disposal requirements under state and local regulations, selection of required soil treatment temperature and residence time, potential to exceed lower explosive concentration limits in thermal desorption device.	Analytical data from soil boring samples	EPA 418.1 is most common method, state and local requirements may vary
TCLP extract concentration of metals or organics (lead from leaded gasoline is most likely contaminant)	Material may be classified as a RCRA hazardous waste if TCLP extract concentrations exceed values listed in 40 CFR 261. Exclusions apply for wastes from underground storage tanks that are subject to the RCRA Corrective Action requirements in 40 CFR 280. See flow chart in Figure 2. If material is a hazardous waste, this Technical Report is not applicable.	Analytical data from soil boring samples	EPA 1311 (extraction) EPA 6010 (metals) EPA 8260 (volatile organics) EPA 8080 (semivolatile organics)
Concentration of PCBs in contaminated soil	If PCBs are present at a concentration of greater than 50 ppm, the waste is subject to TSCA regulations and this Technical Report is not applicable.	Analytical data from soil boring samples	EPA 8080

Table 1 Thermal Desorption Data Requirements Critical Success Factors (Continued)

Characteristic	Data Collection		
	Rationale	Source	Method[a,b]
Data Requirements Critical Success Factors Total metals concentration (As, Ba, Cd, Cr, Pb, Hg, Se, Ag)	State and local regulatory requirements for treatment or disposal of contaminated soil.	Analytical data from soil boring samples	EPA 3050 (acid digestion) EPA 6010 (metals), meet with regulatory agencies
Site Characteristics			
Contaminant source	Exemptions apply for wastes that exhibit the RCRA characteristic of toxicity codes D018-D043 if the waste is from a leaking underground storage tank that is subject to the Corrective Action Requirements in 40 CFR 280. See flow chart in Figure 2.	Identification of contaminant source	Site review
Contaminated soil quantity (tons)	Selection of on-site versus off-site treatment.	Soil borings, concentration of contaminants, soil cleanup criteria	Use approved analytical methods from SW-846
Site usage	Project cost estimate should include revenue loss from normal site activities.	Revenue loss each day that site is out of service	Site owner's cost estimate
Operational area available	Must be sufficient to set up and operate process equipment and maintain feed and treated soils stockpile (on-site treatment only).	Plot plan drawing of area available for operations	Site survey

Table 1 Thermal Desorption Data Requirements Critical Success Factors (Continued)

	Data Collection		
Characteristic	Rationale	Source	Method[a,b]
Surrounding land use	Adjoining land uses such as schools, parks, health care facilities, or dense urban development may preclude on-site treatment	Map showing surrounding land uses	Site survey
Distance to stationary thermal desorption facility (off-site treatment only)	Potential cost of soil transportation, evaluation of on-site versus off-site treatment options.	Location of stationary thermal desorption facilities in geographical area	Contact state regulatory agency
Ambient temperature	Frozen soil is difficult to excavate, pretreat, and process in thermal treatment devices.	Average temperature at time of treatment	Weather of U.S. Cities, Vol 1 & 2, Gale Research, Detroit, Michigan, 1985.
Regulatory Requirements			
No. of permits required	Total permitting cost (on-site treatment only).	Review of state and local requirements	Meet with regulatory agencies
Site specific performance testing requirements	Testing costs and project schedule impacts, including analytical turnaround (on-site treatment only).	Review of state and local requirements	Meet with regulatory agencies
TPH target residual level	Soil treatment time and temperature requirements, soil disposal alternatives.	Review of state and local requirements	Meet with regulatory agencies

Table 1 Thermal Desorption Data Requirements Critical Success Factors (Continued)

	Data Collection		
Characteristic	Rationale	Source	Method[a,b]
BTEX target residual level	Soil treatment time and temperature requirements, soil disposal alternatives.	Review of state and local requirements	Meet with regulatory agencies
Transportation restrictions	Some states may restrict off-site transportation of petroleum contaminated soils.	Review of state and local requirements	Meet with regulatory agencies
Soil Characteristics			
Moisture content	Materials handling properties, drying duty of thermal desorption process	Analytical data from soil boring samples	ASTM D-2216
Soil classification (coarse grained soils)	Material size reduction requirements.	Analytical data from soil boring samples	USCS
Soil classification (fine grained soils)	Material carryover from TD device, material plasticity characteristics.	Analytical data from soil boring samples	USCS
Soil classification (organic soils)	Potential for TPH analysis interferences because of naturally occurring organic matter	Analytical data from soil boring samples	USCS

[a] SW-846 - "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods". U.S. EPA. SW-846. Third Edition. November, 1988. Methods 6010, 418.1, and 1311 are analytical methods described in SW-846.
Methods ASTM D-2216 is an analytical method described in American Society for Testing and Materials (ASTM), latest approved method.
[b] USCS - Unified Soil Classification System.

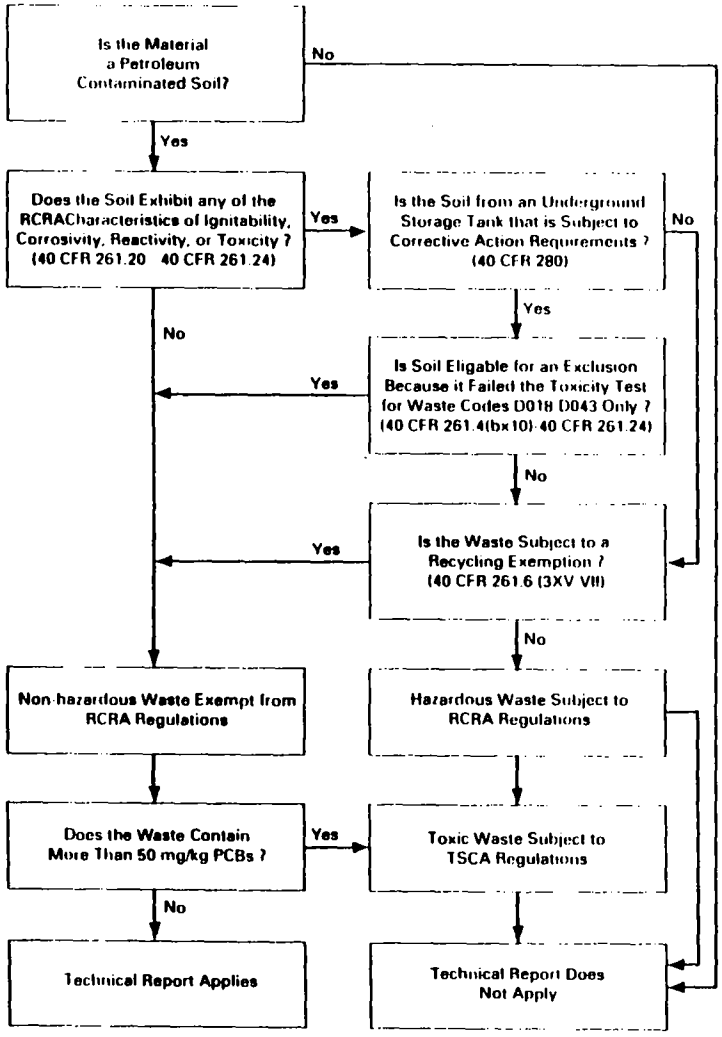


Figure 2 Waste classification decision diagram.

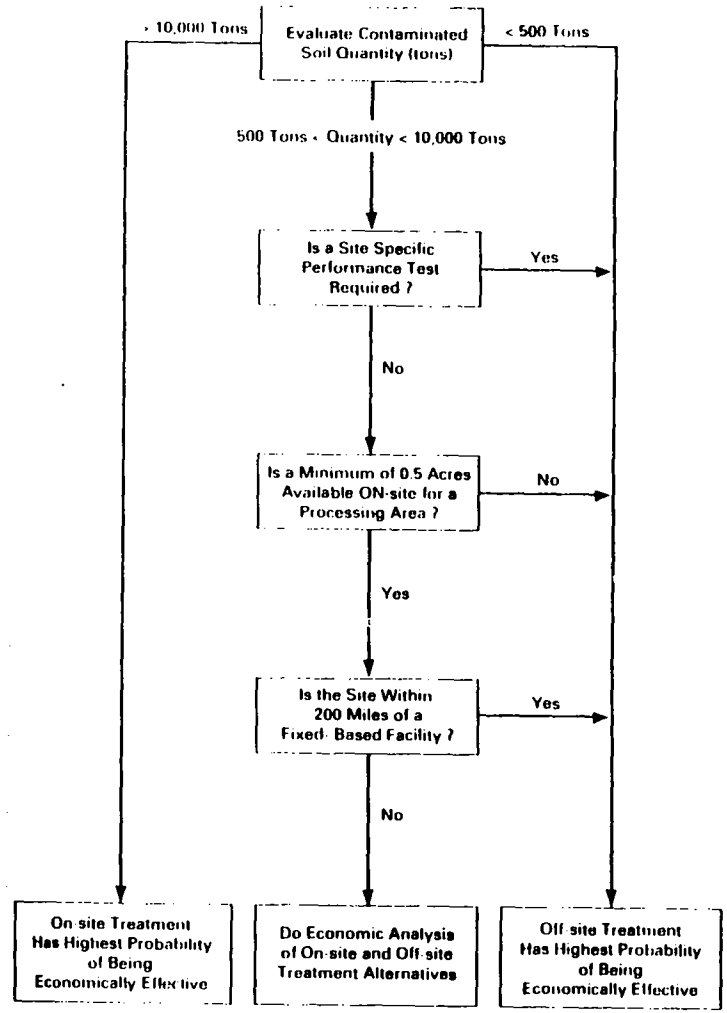


Figure 3 On-site versus off-site treatment decision diagram.

Table 2. Example of Thermal Desorption Critical Success Factor Evaluation

Evaluation Type: On-Site X Off-Site / Feature	Units	Condition or Value at Site	Critical Success Factor Category: Least (1)	Average (2)	Highest (3)	Score
Contaminant Characteristics						
Petroleum Product Type	NA	No. 6 Fuel Oil	No. 6 fuel oil, lube oil, used motor oil, crude oil	No. 1 fuel oil (kerosene), No. 2 fuel oil (diesel fuel), No. 3 fuel oil, No. 4 fuel oil	Naptha (light or heavy), aviation gasoline, automobile gasoline, jet fuel A and B	1
Concentration of TPH in Contaminated Soil	mg/kg	12,000	>30,000	5,000 – 30,000	<5,000	2
Contaminant Source	NA	UST	Other (Waste may exhibit hazardous characteristics and be subject to RCRA)	NA	Underground storage tank subject to Corrective Action Requirements in 40 CFR 280	3
Concentration of PCBs in Contaminated Soil	mg/kg	<5	>50	NA	<50	3
Total metals concentration (State specific disposal criteria. Rank as least likely to exceed if criteria is exceeded for any metal).			At least one parameter greater than criteria	NA	All parameters less than criteria	3
State or local criteria:						
Antimony	NA	mg/kg	5			
Arsenic	55	mg/kg	7			
Barium	2,750	mg/kg	1,450			
Cadmium	55	mg/kg	11			
Chromium	275	mg/kg	34			
Lead	77	mg/kg	45			
Mercury	17	mg/kg	<1			
Selenium	165	mg/kg	<2			
Silver	165	mg/kg	<5			
Thallium	NA	mg/kg	<2			
Other ____	____	mg/kg	____			

Table 2. Example of Thermal Desorption Critical Success Factor Evaluation (Continued)

Evaluation Type: On-Site X Off-Site / Feature	Units	Condition or Value at Site	Critical Success Factor Category: Least (1)	Average (2)	Highest (3)	Score
TCLP extract concentrations (RCRA criteria listed below, rank as least likely to exceed if criteria is exceeded for any parameter and no exclusions apply as shown in Figure 2.			At least one parameter greater than criteria	NA	All parameters less than criteria or exclusion applies	3
D004 Arsenic	5.0	mg/kg	<1.0			
D005 Barium	100.0	mg/kg	<5.0			
D006 Cadmium	1.0	mg/kg	<0.5			
D007 Chromium	5.0	mg/kg	<1.0			
D008 Lead	5.0	mg/kg	<4.0			
D009 Mercury	0.2	mg/kg	<0.1			
D010 Selenium	1.0	mg/kg	<0.5			
D011 Silver	5.0	mg/kg	<2.0			
D012 Endrin	0.02	mg/kg	ND			
D013 Lindane	0.4	mg/kg	ND			
D014 Methoxychlor	10.0	mg/kg	ND			
D015 Toxaphene	0.5	mg/kg	ND			
D016 2,4-D	10.0	mg/kg	<2.0			
D017 2,4,5-TP (Silvex)	1.0	mg/kg	<1.0			
D018 Benzene	0.5	mg/kg	6.3	NOTE: Benzene exclusion applies because waste is from an UST remediation.		
D019 Carbon tetrachloride	0.5	mg/kg	ND			
D020 Chlordane	0.03	mg/kg	ND			
D021 Chlorobenzene	100.0	mg/kg	ND			
D022 Chloroform	6.0	mg/kg	ND			
D023 o-Cresol	200.0	mg/kg	ND			
D024 m-Cresol	200.0	mg/kg	ND			
D025 p-Cresol	200.0	mg/kg	ND			
D026 Cresol	200.0	mg/kg	ND			
D027 1,4-Dichlorobenzene	7.5	mg/kg	ND			
D028Dichloromethane	0.5	mg/kg	ND			
D029 1,1-Dichloroethylene	0.7	mg/kg	ND			

Table 2. Example of Thermal Desorption Critical Success Factor Evaluation (Continued)

Evaluation Type: On-Site X Off-Site			Condition or Value at Site	Critical Success Factor Category			Score
Factors		Units		Least (1)	Average (2)	Highest (3)	
D030 2,4-Dinitrotoluene	0.13	mg/kg	ND				
D031 Heptachlor	0.008	mg/kg	ND				
D032 Hexachlorobenzene	0.13	mg/kg	ND				
D033 Hexachlorobutadiene	0.5	mg/kg	ND				
D034 Hexachloroethane	3.0	mg/kg	ND				
D035 Methylethylketone	200.0	mg/kg	ND				
D036 Nitrobenzene	2.0	mg/kg	ND				
037 Pentachlorophenol	100.0	mg/kg	ND				
D038 Pyridine	5.0	mg/kg	ND				
D039 Tetrachloroethylene	0.7	mg/kg	ND				
D040 Trichloroethylene	0.5	mg/kg	ND				
D041 2,4,5-Trichlorophenol	400.0	mg/kg	ND	ND = Nondetected. Detection limits were below TCLP criteria for all parameters.			
D042 2,4,6-Trichlorophenol	2.0	mg/kg	ND				
D043 Vinyl chloride	0.2	mg/kg	ND				
Site Characteristics							
Contaminated soil quantity (evaluate for on-site treatment only)		tons	800	<500	500 - 2,000	>2,000	2
Site Usage		NA	Retail	Retail	NA	Other	1
Operational area available (evaluate for on-site treatment only)		acres	1.25	<0.5	0.5 - 2.0	>2.0	2
Surrounding land use (evaluate for on-site treatment only)		NA	Commercial	Public use areas such as schools, health care facilities, or parks; dense urban development; heavy residential)	Commercial, light residential	Industrial	2
Distance to stationary thermal desorption facility (evaluate for off-site treatment only)		miles	NA	>300	100 - 200	100	—
Average ambient temperature at time of treatment		°F	75	<32	NA	>32	3

Table 2. Example of Thermal Desorption Critical Success Factor Evaluation (Continued)

Evaluation Type: On-Site X Off-Site		Condition or Value at Site	Critical Success Factor Category			Score
Factors	Units		Least (1)	Average (2)	Highest (3)	
Regulatory Requirements						
Number of permits required (evaluate for on-site treatment)	NA	3	>4	3 - 4	0 - 2	2
Site specific performance testing required (evaluate for on-site treatment)	NA	No	Yes	NA	No	3
TPH target residual level	mg/kg	50	<1	<10	<100	3
BTEX target residual level	mg/kg	<2	<1	<5	<10	2
Soil Characteristics						
Moisture Content	%	22	>25	10 - 25	<10	2
USCS Soil Classification: Coarse Grained Soils (rate either coarse, fine, or organic soils category, not all three)	NA	NA	GW, GP, GC, Cobbles, Boulders	GM, SP	SW, SP, SM	—
USCS Soil Classification: Fine Grained Soils (rate either coarse, fine, or organic soils category, not all three)	NA	CH	CL, CH	MH, OH	ML, OL	1
USCS Soil Classification: Organic Soils (rate either coarse, fine, or organic soils category, not all three)	NA	NA	OH, Pt	NA	NA	—
Evaluation Summary						
A. Total Sum of Scores in All Categories						38
B. Total Number of Parameters Rated						17
C. Average Composite Score (A/B)						2.23

The data in this worksheet compiled a total score of 38 from 17 rated parameters, with an average score of 2.23. This score warrants further consideration of thermal desorption. The manager should continue through the two additional screening levels.

Benzene concentrations in the leachate exceed the TCLP standard. Moderate regulatory considerations require three permits, little or no performance testing, and residual target levels of 50 mg/kg TPH and <2 mg/kg BTEX. The soil is fine-grained inorganic clay with a moisture content of 22%.

Using the site values recorded on the example worksheet, the reader calculates the appropriate score for each critical success factor. A score of 3 has a "highest" probability of success; 2 indicates "average"; and 1 is the "least likely to succeed." In some instances a particular success factor may not be applicable to an alternative, or data may not be available. Duplicate evaluations must consider on-site and off-site treatment separately, since several data factors apply to only one of these alternatives.

An evaluation summary appears at the bottom of the worksheet. By calculating the total score for all categories and dividing by the number of factors that were rated, the reader can compile an overall composite score. This score indicates the probability for success in this application of thermal desorption.

The composite score is a relative indicator of technical difficulty and treatment cost. Sites that receive a composite score greater than 2.0 are the most technically and economically viable candidates. Treatment costs for these applications will generally range from $35 to $65 per ton. A score below 2.0 indicates lower viability and higher costs ($65 to $125 per ton).

The data in this worksheet compiled a total score of 38 from 17 rated parameters, with an average score of 2.23. This score warrants further consideration of thermal desorption. The manager should continue through the two additional screening levels.

STEP 5: CONTINGENCY PLANNING

The reader can use Table 3 to prepare contingency plans for any critical success factors with a "least" probability for success. In many cases, engineering or administrative procedures can mitigate the possible effects of a parameter with a "least" probability rating.

STEP 6: TREATMENT SYSTEM SELECTION

Figure 4 contains a diagram for determining the most cost-effective size of thermal desorption equipment as a function of contaminated soil volume at a site. A vertical line drawn from the site size value on the x axis will intersect with one or more horizontal operating range bars that represent various sizes of treatment equipment. The systems identified (by the intersection of the line with bars representing them) should continue on to second and third level screening.

Table 3 Critical Success Factor Contingency Analysis.

Characteristic	Reason for impact	Contingency plan
Contaminant Characteristics		
Petroleum product type	Petroleum product requires high treatment temperature.	Selection of thermal desorption devices with appropriate operating temperature range.
Concentration of TPH in contaminated soil	High (>2-3%) concentration of TPH in contaminated soil may cause concentration of organics in thermal desorption offgas to be above lower explosive limit for directly heated thermal desorption devices.	Blend highly contaminated soil with lower TPH concentration soils to reduce overall average concentration or use indirectly heated thermal desorption device.
TCLP extract concentration of metals or organics	Concentration of parameter in TCLP extract exceeds criteria.	Material must be handled as a RCRA hazardous waste. Technical Report does not apply.
Total metals concentration (As, Ba, Cd, Pb, Hg, Se, Ag)	Exceeds state regulatory criteria for preferred treated soil disposal alternative.	Use alternative treated soil disposal option or stabilize treated material.
Concentration of PCBs in contaminated soil	PCB concentration greater than 50 ppm.	Material must be handled as a TSCA toxic waste. Technical Report does not apply.

Table 3 Critical Success Factor Contingency Analysis (Continued)

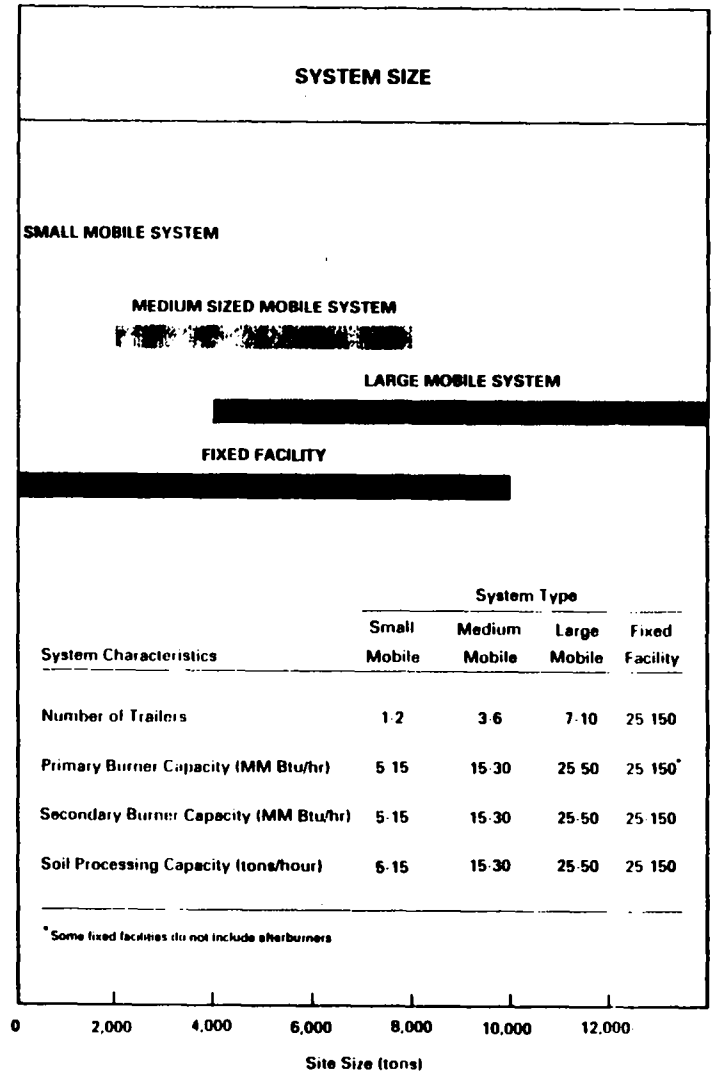
Characteristic	Reason for impact	Contingency plan
Site Characteristics		
Contaminanted soil quantity	Small quantity of soil (< 500 tons).	Use off-site treatment.
	Large quantity of soil (> 10,000 tons).	Use on-site treatment.
Site usage	Revenue lost from site's normal commercial operations because site is out of service.	Use off-site treatment.
Operational area available	Insufficient operational area available for on-site treatment (Note: area required depends on capacity of mobile thermal treatment system).	Use off-site treatment.
Surrounding land use	Adjoining land uses such as schools, parks, health care facilities, or dense urban development.	Use off-site treatment.
Distance to stationary thermal desorption facility	Transportation cost to ship soils.	Use on-site treatment.
Ambient temperature	Low ambient temperature may cause soil to freeze and be difficult to screen and difficult to thaw in thermal desorber.	Perform project during warmer weather. Crush material before processing in thermal desorption device.

Table 3 Critical Success Factor Contingency Analysis (Continued)

Characteristic	Reason for impact	Contingency plan
Regulatory Requirements		
No. of permits required	Permitting cost.	Use off-site treatment. Performance testing cost. Use off-site treatment or use stack testing data from similar application if appropriate.
TPH target residual level	Capability of meeting performance criteria.	Select technology with appropriate soil treatment temperature and residence time.
BTEX target residual level	Capability of meeting performance criteria.	Select technology with appropriate soil treatment temperature and residence time.
Soil Characteristics		
Moisture content	Soil moisture content too high to feed and process soil properly.	Air dry soil if sufficient area is available, weather is appropriate, and project schedule allows time for drying (may need to consider control of fugitive emissions).
USCS Soil Classification	Soils are classified as group GW, GP, GC, cobbles, or boulders (coarse grained soils).	Screen soil to remove oversize material. Wash rocks or crush rocks to a size that can be processed in thermal desorption system (typically <2.0 inches diameter).

Table 3 Critical Success Factor Contingency Analysis (Continued)

Characteristic	Reason for impact	Contingency plan
USCS Soil Classification	Soils are classified as group CL or CH (fine grained soils).	Reduce soil feed rate and burner firing rate (if applicable) to reduce carryover. Air dry material or blend with lime, kiln dust, or dry soil so that it is below the plastic limit.
USCS Soil Classification	Soil is classified as group OH or Pt (organic soils).	Use alternative analytical technique which is not subject to interferences from humic materials. Correct TPH analytical results on treated soils for apparent background levels in thermally treated soils which have no known petroleum contamination.



System Characteristics	System Type: Small Mobile	Medium Mobile	Large Mobile	Fixed Facility
Number of Trailers	1-2	3-6	7-10	25-150
Primary Burner Capacity (MM Btu/hr)	5-15	15-30	25-50	25-150*
Secondary Burner Capacity (MM Btu/hr)	5-15	15-30	25-50	25-150
Soil Processing Capacity (tons/hour)	6-15	15-30	25-50	25-150

* Some fixed facilities do not include afterburners

Figure 4 Thermal desorber size versus site size.

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION No.
EPA/600/A-94/013		

4. TITLE AND SUBTITLE	5. REPORT DATE
Initial screening of Thermal Desorption for Soil Remediation	
	6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S) James Yezzi[1], Anthony Tafuri[1], Seymour Rosenthal[2], William L. Troxler[3]	8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS [1] Risk Reduction Engineering Laboratory, USEPA Edison, NJ 08837 [2] Foster Wheeler Enviresponse, Inc., Edison, NJ 08837 [3] Focus Environmental, Inc., Knoxville, TN 37923	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS Risk Reduction Engineering Laboratory--Cinti Office of Research and Development U.S. Environmental Protection Agency Cincinnati OH 45268	13. TYPE OF REPORT AND PERIOD COVERED Book Chapter
	14. SPONSORING AGENCY CODE EPA/600/14

15. SUPPLEMENTARY NOTES Project Officer: James Yezzi 908/321-6703
Hazardous Waste Management Handbook, Spring 1993, p.135-154

16. ABSTRACT

The purpose of this paper is to present procedures for collecting and evaluating key data that affect the potential application of thermal desorption for a specific site. These data are defined as "critical success factors". The screening procedure can be used to perform an initial assessment, based on limited data, to determine if thermal desorption may be a viable technology for a given application.

The critical success factor screening methodology is executed in six steps: 1) Data collection, 2) Waste classification, 3) On-Site versus off-site treatment evaluation, 4) Critical success factor evaluation, 5) Contingency planning and 6) Treatment system size evaluation.

Procedures for performing and summarizing the Results of each of these screening steps are presented. The screening procedures were developed to simplify the evaluation of thermal desorption effectiveness and are based on the collection of limited data. The screening steps do not constitute a design manual, nor a final basis for choosing thermal desorption as a remedy. They provide a pre-selection screening method to determine if the utilization of thermal desorption to a particular site warrants further consideration.

If the results of the critical success factor screening evaluation are positive, the user should perform additional analyses to evaluate equipment alternatives. Alternatives that are considered include the use of specific types of thermal desorber technologies or offgas treatment systems and the selection of the appropriate size of thermal desorption system for mobile applications.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
thermal desorption, thermal desorption screening, treatment of petroleum contaminated soils, low temperature thermal desorption		

18. DISTRIBUTION STATE RELEASE TO PUBLIC	19. SECURITY CLASS (This Report) UNCLASSIFIED	21. NO. OF PAGES 21
	20. SECURITY CLASS (This Report) UNCLASSIFIED	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE