1 of 1

**Environmental Restoration Program
Pollution Prevention Checklist Guide
for the Facility Characterization
Project Phase**

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ACRONYMS

AOC	area of contamination
CAA	Clean Air Act of 1970
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FC	facility characterization
NPDES	National Pollution Discharge Elimination System
PPE	personal protective equipment
PP/WM	pollution prevention/waste minimization
QA	quality assurance
RCRA	Resource Conservation and Recovery Act of 1976

1. PURPOSE

A facility characterization (FC) is conducted to determine the nature and extent of contamination at a potential hazardous facility waste site. The information gathered during an FC includes (1) data on the volume and chemical nature of the waste, (2) information on the extent of contamination and the migration potential of the contaminants, (3) preliminary information on evaluation of alternative concepts that can or cannot be considered, and (4) supportive technical and cost data.

For the purposes of identification, the following operational phases will be used for definition for this phase of the decommissioning and decontamination process (1) facility characterization before clean up, (2) characterization during clean up, (3) characterization of waste materials, and (4) site characterization after clean up. A key consideration in this process is the prevention of any waste to be generated from these characterization activities.

The purpose of this checklist guide is to assist users with incorporating pollution prevention/waste minimization (PP/WM) in all FC phase projects of the Environmental Restoration (ER) Program. This guide will help users document PP/WM activities for technology transfer and reporting requirements. Automated computer screens will be created from the checklist data to assist users with implementing and evaluating waste reduction. Users can then establish numerical performance measures to measure progress in planning, training, self-assessments, field implementation, documentation, and technology transfer. Cost savings result as users train and assess themselves and perform preliminary waste assessments.

2. APPLICABILITY

This checklist guide applies to all ER Program participants performing FC phase projects for all sources of pollution including air emissions, water, and solid waste. This guide is intended to serve three primary audiences:

- Site project managers and others on the project team engaged in activities focusing on or ultimately serving the process of incorporating PP/WM in the FC phase project;
- ER PP/WM specialists—for use as a general overview to help ensure that PP/WM criteria are being applied whenever possible in all FC phase projects; and
- ER Technology Development and Application specialists—for use as a tool for providing new and effective technology information to the site project managers.

Although this checklist guide may be used by a number of individuals as indicated above, it is incumbent on the ER Program to ensure that the projects select and apply technologies that not only result in the smallest quantities of waste with the least toxicity, but also minimize environmental releases during remediation. Minimizing waste generation should be considered in addition to the capital, maintenance, and operating costs to implement liabilities and any potential threat to human health and the environment.

3. INTRODUCTION

ER activities differ significantly from routine production facilities. While the focus for PP/WM for production operations is often on source reduction and recycling, those techniques are not readily adaptable to ER projects. Opportunities for source reduction and recycling are limited for clean-up activities since ER inherits contaminated waste sites from previous production processes, where ongoing process operations generally do not exist. Although treatment is not a preferred alternative per the U.S. Environmental Protection Agency (EPA) hierarchy, the nature of ER activities is generally such that clean up of the site by the application of some treatment technology is often the only alternative. The fact that the waste exists cannot be changed.

The success of incorporating PP/WM in the FC phase project will be determined ultimately by how successful the generator minimizes the volume and toxicity of the waste.

4. USE OF THIS CHECKLIST GUIDE FOR THE FC PROJECT

The document guide is organized into three sections. The first section of the checklist guide contains general questions concerning the generator's pollution prevention program in general. The second section of the checklist guide entails questions about the pollution prevention program as it applies to the FC project phase. The third section of the guide is more waste stream specific and contains questions about contaminants and media. The generator is also asked to give their rationale on how they would incorporate pollution prevention.

5. INSTRUCTIONS FOR FC PROJECT PHASE USERS CHECKLIST

The following are steps used to simplify this guide.

5.1 PROJECT INFORMATION

Complete the project information as requested in Sect. 1 of the checklist (Fig. 1, p. 4).

5.2 FACILITY/SITE DESCRIPTION

Complete the facility/site description of the facility as requested in Sect. 1 of checklist (Fig. 1).

5.3 GENERAL QUESTION INFORMATION

Complete the general questions as requested in Sect. 1 of the checklist (Fig. 1).

5.4 FC PHASE-SPECIFIC QUESTION INFORMATION

Complete the FC project phase questions as requested in Sect. 2 of the checklist (Fig. 1).

5.5 WASTE STREAM INFORMATION

Complete the waste stream questions as requested in Sect. 3 of the checklist (Fig. 1).

SECTION 1. GENERAL QUESTION INFORMATION

Project Name:

Project Manager:

Phase: FC

Project Location:

Facility/Site Description: _____

	<u>YES</u>	<u>NO</u>
1. Is there a PP/WM Site Plan on site?	_____	_____
2. Have those that report to management been trained on:		
• Site general employee radiation training?	_____	_____
• 24-hr SARA/OSHA (HAZWOPER) with 8-hr annual refresher?	_____	_____
• RCRA hazardous waste generator?	_____	_____
• Pollution prevention and waste minimization?	_____	_____
3. Does the PP/WM plan have the following objectives and statements of scope?		
• A statement of PP/WM scope and objectives developed and distributed to all project personnel?	_____	_____
• A statement of PP/WM scope and objectives developed and distributed to all contractor personnel?	_____	_____
• A statement of PP/WM scope and objectives developed and distributed to all safety and emergency response personnel?	_____	_____
• Specific numerical goals for PP/WM for each project waste stream set and distributed or displayed to all project personnel?	_____	_____
• Specific numerical goals for PP/WM for each project waste stream set and distributed or displayed to all contractor personnel?	_____	_____
• Specific numerical goals for PP/WM for each project waste stream set and distributed or displayed to all safety and emergency personnel?	_____	_____
4. Have project managers or personnel initiated PP/WM plans for projects that are scheduled to start within 180 days or less from now?	_____	_____

Fig. 1. FC Project Phase Checklist.

	<u>YES</u>	<u>NO</u>
• PP/WM incorporated in any of the project work and waste management plans?	_____	_____
• A section on PP/WM incorporated in at least of one of the project work and waste management plans?	_____	_____
• A section on PP/WM in all the project work and waste management plans?	_____	_____
• A section on PP/WM in all the project work and waste management plans? Each section discusses at least three techniques to reduce or prevent waste generation?	_____	_____
5. Do project managers or personnel have the following data relating to site operations and waste streams so that PP/WM opportunities can be identified?		
• Supply and distribution records (i.e., chemical inventory, chain of custody, and waste drum tracking)?	_____	_____
• Maintenance records (i.e., inspection and preventive maintenance, repair orders)?	_____	_____
• Supervision records [i.e., quality assurance (QA) audits, noncompliance, and personnel records]?	_____	_____
• Required permits and records (i.e., CAA, NPDES, and RCRA monitoring, RCRA accumulations facility inventories and manifests, CERCLA reportable quantity release, sample waste analyses, and RADCON Manual Compliance)?	_____	_____
• PP/WM Program documentation (i.e., all work and waste management plans for projects scheduled 180 days or less from now)?	_____	_____
• Design information (i.e., process flow diagrams and material balances)?	_____	_____
• Environmental information and reporting (i.e., sample waste analyses, RCRA/Tennessee Annual Report, EPA Biannual Report, and Pollution Prevention Act Tri-Report)?	_____	_____
• Raw material site information (i.e., material safety data sheets, contractor data logs, site operating procedures, and project schedules and milestones)?	_____	_____

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>
• Economic information (i.e., waste treatment, disposal, operating, maintenance, and departmental and pollution prevention implementation costs)?	_____	_____
6. Have project managers or personnel had the PP/WM Program audited in the last 12 months?	_____	_____
Was the program audited in the following manner?		
• A periodic schedule for audit of activities was made?	_____	_____
• The audit is performed by those who have direct responsibility for performing the activities being audited?	_____	_____
• The audit is performed by those who do not have direct responsibility for performing the activities being audited?	_____	_____
• The audit is always reviewed by responsible management?	_____	_____
• Follow-up action is always taken as a result of the audit?	_____	_____
7. Have project managers or personnel insisted on assessment of your waste streams to reduce or prevent waste generation?	_____	_____
Have the following project waste assessment elements been performed?		
• Review of the PP/WM operations and waste management issues and targeted work sites that should be assessed?	_____	_____
• Development of flow diagrams and materials balances for each targeted work site?	_____	_____
• Identification of PP/WM opportunities and projects that address those opportunities?	_____	_____
• Evaluation and ranking of projects into a coordinated long-range plan?	_____	_____
8. Do project managers or personnel have cost, schedule, and program contents specific to the PP/WM Program activities?	_____	_____
What kind of waste accounting is performed?		

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>
• Are operating cost records kept?	_____	_____
• Are treatment cost records kept?	_____	_____
• Are disposal cost records kept?	_____	_____
• Are maintenance cost records kept?	_____	_____
• Are life-cycle cost records kept?	_____	_____
• Are costs to implement pollution prevention activities kept?	_____	_____
• Are real-time cost savings since PP/WM plan implementations kept?	_____	_____
9. Have project managers or personnel evaluated the PP/WM Program to numerical goal criteria in the last 12 months?	_____	_____
Are the following criteria used to evaluate the PP/WM Program?		
• Number of numerical goals achieved?	_____	_____
• Number of cost reductions achieved?	_____	_____
• Number of noncompliances cited?	_____	_____
• Number of new technologies integrated?	_____	_____
• Number of noncompliances corrected?	_____	_____
10. Do project managers or personnel keep and organize records from PP/WM activities for QA purposes?	_____	_____
Are your records from pollution prevention activities kept and organized in the following manner?		
• Records furnish documentary evidence from all pollution prevention activities?	_____	_____
• Records are well-organized and are easy to assess?	_____	_____
• Records are protected against damage, deterioration, or loss?	_____	_____
• Requirements and responsibilities for record transmittal, distribution, retention, maintenance, and dispositions are established and documented?	_____	_____
11. Is technology information available for comparison from other sites for PP/WM assessment?	_____	_____

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>
• Parameters and results of a material or characterization activity?	_____	_____
• Impact of the project of implementing a new technology?	_____	_____
• Characterization activities and materials currently used?	_____	_____
• Remedial characterization activities and materials under consideration?	_____	_____
12. If new technology information is available from other sites, does the facility manager or personnel have a timetable, cost schedule, and possible implementation procedures on the new technology?	_____	_____
13. Do facility managers or personnel implement mechanisms for quality improvement in PP/WM to prevent noncompliance?	_____	_____
How often does management assess the PP/WM to ensure that it is adequate and is effectively implemented?		
_____ Never.		
_____ No regular schedule for assessing the PP/WM Program; performed occasionally.		
_____ Regular schedule for assessing the PP/WM Program: performed every 2 years.		
_____ Regular schedule for assessing the PP/WM Program; performed every year.		
_____ Regular schedule for assessing the PP/WM Program; performed at least every 6 months.		
14. Does the facility manager/personnel know who handles the waste generated?		
_____ It is not known who handles the waste.		
_____ The site waste management organization handles the waste.		

Fig. 1 (continued)

- _____ The site management organization handles the waste and provides some data to meet reporting requirements.
- _____ The site waste management organization handles the waste and provides all data to meet reporting requirements.

SECTION 2. FC PHASE-SPECIFIC QUESTION INFORMATION

	<u>YES</u>	<u>NO</u>
1. Does the PP/WM Program adequately address FC?	_____	_____
2. Is PP/WM currently incorporated in the treatability study documents (optional)?	_____	_____
3. Is PP/WM currently incorporated in the feasibility study documents (per Energy Systems Procedure EP-C-05)?	_____	_____
4. Does the FC phase of the PP/WM Program include specific quantitative goals for reducing the volume and toxicity of each waste stream?	_____	_____
5. If specific numerical goals are not included for each waste stream, is a strategy outlined to arrive at numerical goals?	_____	_____
6. Does the FC phase of the PP/WM Program include programmatic goals for the evaluation of new technologies to reduce waste generation?	_____	_____
7. Does the FC phase of the PP/WM Program contain a line-item budget for its waste minimization program?	_____	_____
8. Has the organization developed baseline data for the generation of waste from FC-phase activities?	_____	_____
9. Do project managers or personnel keep and organize records from FC-phase PP/WM activities for QA purposes?	_____	_____
Are the records from FC-phase PP/WM activities kept and organized in the following manner?		
• Records furnish documentary evidence from all FC-phase PP/WM activities?	_____	_____
• Records are well-organized and are easy to assess?	_____	_____

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>
• Records are protected against damage, deteriorations, or loss?	_____	_____
• Requirements and responsibilities for record transmittal, distribution, retention, maintenance, and dispositions are established and documented?	_____	_____
10. Does the PP/WM Program explain how PP/WM principles are incorporated into the FC phase?	_____	_____
11. Does the FC phase of the PP/WM Program require that waste assessments be conducted on the waste streams?	_____	_____
12. Does the FC phase of the PP/WM Program identify research and development projects related to PP/WM?	_____	_____
13. Does the FC phase of the PP/WM Program describe any planned technology-transfer activities?	_____	_____
14. Does the FC phase of the PP/WM Program provide a procedure for self-evaluation?	_____	_____
15. Does the FC phase of the PP/WM Program explain how design principles that minimize waste generation are incorporated into new construction and options that involve new or modified processes?	_____	_____
16. Does the FC phase of the PP/WM Program require PP/WM training for all project, contractor, and safety and emergency response personnel in the following?	_____	_____
• Site general employee radiation training?	_____	_____
• 24-hr SARA/OSHA (HAZWOPER) with 8-hr annual refresher?	_____	_____
• RCRA hazardous waste generator?	_____	_____
• Pollution prevention and waste minimization?	_____	_____
17. Does the FC phase of the PP/WM Program include a method of accounting for the cost of PP/WM activities?	_____	_____
18. Does the FC phase of the PP/WM Program require audits at least every 12 months?	_____	_____
Are the following features part of the audit program?		
• A periodic schedule exists for audit of activities?	_____	_____

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>
• Audits are performed by those who do not have direct responsibility for performing the activities being audited?	_____	_____
• Audits are reviewed by responsible management?	_____	_____
• Follow-up action is taken as a result of audits?	_____	_____
19. Does the FC phase of the PP/WM Program address the need for, and methods of, waste segregation as it affects PP/WM?	_____	_____
20. Does the FC phase of the PP/WM Program address the need for, and methods of, housekeeping as it affects PP/WM?	_____	_____

SECTION 3. WASTE STREAM INFORMATION

Based on any previous studies, known spills, interviews, and research of the facility, answer the following questions.

1. Check the waste categories that apply.

_____ LLW	_____ LLW/RCRA	_____ LLW/TSCA
_____ LLW/RCRA/TSCA	_____ Sanitary	_____ TRU
_____ RCRA	_____ TSCA	_____ RCRA/TSCA

2. What is the level of contamination?

_____ Surface
 _____ Subsurface
 _____ Both

3. If present, does the contamination come in contact with water sources/supply?

Stream/pond/river	_____	_____
Sanitary sewer/wells	_____	_____
Groundwater tables	_____	_____

4. What makes up the material streams and what is the estimated volume of each?

Material Stream	Estimated Volume in Cubic Feet
Concrete rubble	
Clean concrete	
Concrete	
contaminated	
w/radionuclides	
Ferrous metals	
Nonferrous metals	
Chemical and hazardous	
materials	
Protective clothing	
Wood and combustible	
materials	
Asbestos	
PCB equipment	
PCB	
hydrocarbon	
liquids	
PCB—soil/sludge	
PCB—water	
PCB—buildings	
Acids	
Contaminated waters	
Freon	
Glass	
Mercury at Y-12	
Oils and organics	
Enriched uranium	
Transite siding	
Nickel	
Copper wire	
Assorted metals	
Lead	
Mixed waste	
Sludges	
Contaminated soil	
TRU waste	

5. What is the total area of the site in square feet? _____
6. What are other potential sources or pathways for contaminant migration (air, etc.)?

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>	<u>DNA</u>
7. Has the data previously discussed been assessed for adequacy?	_____	_____	
8. Is the area of contamination (AOC) clearly defined?	_____	_____	
9. Is PP/WM incorporated in the facility characterization work plan?	_____	_____	
10. Does this site contain waste bins that are clearly identified for contaminated/noncontaminated wastes to avoid waste stream commingling?	_____	_____	
11. Are known contaminated areas within the AOC clearly identified (i.e., signs and contamination tape) to prevent unauthorized access and the spread of contaminants?	_____	_____	
12. Are known contaminated areas within the AOC periodically inspected by the appropriate health and safety group to help ensure unauthorized access and that the spread of contamination is kept to a minimum?	_____	_____	

Please answer the following waste stream questions with a "yes," "no," or "DNA" answer or an amount requested.

Soils (outside building facility)

1. What diameter borehole is currently being used? _____ (answer in inches)			
2. Could the diameter of the exploratory boring be reduced?	_____	_____	_____
3. How many borings are currently drilled per 100 ft ² ? _____			
4. Could the number of exploratory borings be decreased?	_____	_____	_____
5. Could some exploratory borings be substituted by direct push technology?	_____	_____	_____
6. What is the average depth of borings? _____			
7. Can the total depth of the borings be decreased?	_____	_____	_____
8. What is the average size and number of pits currently dug per 100 ft ² ? _____			
9. Can the size and number of pits be reduced?	_____	_____	_____

Fig. 1. (continued)

	<u>YES</u>	<u>NO</u>	<u>DNA</u>
10. What is the number of soil samples per 100 ft ² ? _____			
11. Can the number of soil samples be reduced?	_____	_____	_____
12. Could all or a percentage of the soil be returned to boring, pit, or source?	_____	_____	_____
13. Can a percentage be spread around the boring, pit, or source?	_____	_____	_____
14. Could the actual amount of the sample removed from the boring, pit, or source be reduced?	_____	_____	_____
15. Could a percentage of soils and sediments be stored in the AOC for future treatment or disposal?	_____	_____	_____
16. Can a percentage of soils and sediments be sent to an on-site treatment, storage, and disposal facility?	_____	_____	_____
17. What measures could be taken to segregate hazardous/non hazardous soils?			
_____ a. Separate visually clean and dirty soils into two piles. Analyze both piles; if clean remove from AOC.			
_____ b. Build berms around suspected dirty soil and analyze.			
_____ c. Cover piles with plastic to prevent cross contamination.			
_____ d. Rope areas containing exposed soils during sampling with contamination tape to prevent any unauthorized access and the spread of surface/subsurface contamination.			
18. What measures can be taken to prevent spills and keep rainwater from infiltrating the contaminated soils?			

Fig. 1 (continued)

- _____ a. Use plastic sheets on ground when collecting samples.
 - _____ b. Use berms to contain liquids.
 - _____ c. Have sump pumps available.
 - _____ d. Use new catchers in split spoons.
 - _____ e. Cover cuttings and equipment at the end of the day.
 - _____ f. Accessibility to spill clean up and prevention materials (pillows, booms, sorb peat, etc.).
19. What equipment can be used to prevent contamination from getting in crevices (smooth surfaces)?
- _____ a. Knives, spatulas.
 - _____ b. Spoons, bowls.
 - _____ c. Split spoons, smooth edge augers.
 - _____ d. Brushes, steel wool.

Solids (inside building facility)

	<u>YES</u>	<u>NO</u>	<u>DNA</u>
1. Does instrumentation exist to adequately characterize alpha, beta, and gamma radiation?	_____	_____	_____
2. Does instrumentation exist to adequately characterize organic and inorganic contaminants?	_____	_____	_____
3. If so, will the instrumentation adequately characterize the type and level of contaminants in and on these materials?	_____	_____	_____
4. Is there background information that can be used to limit the number of samples and analyses required for adequate characterization?	_____	_____	_____
5. Depending on the size of the clean up area, could robotics or remote manipulators be used to characterize levels and types of contaminants on floors, walls, structural steel, etc.?	_____	_____	_____

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>	<u>DNA</u>
6. Could probes or manipulators be used to reduce the quantity of waste identified as "Possible Internal Contamination"?	_____	_____	_____

Sediments/Sludges (outside building facility)

1. What diameter borehole is currently being used?
_____ (answer in inches)			
2. Could the diameter of the exploratory boring be reduced?	_____	_____	_____
3. How many borings are currently drilled per 100 ft ² ?
_____			
4. Could the number of exploratory borings be decreased?	_____	_____	_____
5. Could some exploratory borings be substituted by direct push technology?	_____	_____	_____
6. What is the average depth of the borings? _____			
7. Can the total depth of the borings be decreased?	_____	_____	_____
8. What is the average size and number of pits currently dug per 100 ft ² ? _____			
9. Can the size and number of pits be reduced?	_____	_____	_____
10. What is the number of soil samples collected per 100 ft ² ? _____			
11. Can the number of soil samples be reduced?	_____	_____	_____
12. Could all or a percentage of the soil be returned to the boring, pit, or source?	_____	_____	_____
13. Can a percentage be returned to the boring, pit, or source?	_____	_____	_____
14. Could the actual amount of the sample removed from the boring, pit, or source be reduced?	_____	_____	_____

Sediments/Sludges (inside building facility)

1. Does instrumentation exist to adequately characterize alpha, beta, and gamma radiation?	_____	_____	_____
2. Does instrumentation exist to adequately characterize organic and inorganic contaminants?	_____	_____	_____

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>	<u>DNA</u>
3. If so, will the instrumentation adequately characterize the type and level of contaminants in and on these materials?	_____	_____	_____
4. Is there background information that can be used to limit the number of samples and analyses required for adequate characterization?	_____	_____	_____
5. Depending on the size of the clean-up area, could robotics or remote manipulators be used to characterize levels and types of contaminants on floors, walls, structural steel, etc.?	_____	_____	_____
6. Could probes or manipulators be used to reduce the quantity of waste identified as "Possible Internal Contamination"?	_____	_____	_____
<u>Surface Water, Groundwater, Drilling Fluids</u> (outside building facility)			
1. What is the average number of location points (for surface samples) or monitoring wells (for groundwater samples) selected per 100 ft ² ? _____			
2. Could the number of location points/monitoring wells be reduced?	_____	_____	_____
3. What is the diameter of the monitoring wells currently being installed? _____			
4. Could the diameter of the monitoring wells be reduced?	_____	_____	_____
5. How many drums of drilling liquids/sludge will be used to install monitoring wells per 100 ft ² ? _____			
6. What is the frequency of the sampling events? (biweekly, quarterly, etc.) _____	_____	_____	_____
7. Could the number and frequency of surface water and groundwater samples be reduced?	_____	_____	_____
8. Could the actual amount of the sample removed from location points, monitoring wells, and drums of drilling fluids/slurry be reduced?	_____	_____	_____
9. Could a percentage of the samples removed be discharged to surface water within AOC?	_____	_____	_____

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>	<u>DNA</u>
10. Could a percentage of the samples removed be spread around the boring, pit, or source?	_____	_____	_____
11. Could any surface water, groundwater, and drilling fluid samples be reduced by liquid evaporation tanks or other engineering controls?	_____	_____	_____
12. Could added water/mud while installing water monitoring wells and soil borings be reduced?	_____	_____	_____
13. Could a percentage of the water or fluid collected be stored in the AOC for future treatment or disposal?	_____	_____	_____
14. Could a percentage of the water or fluid collected be sent to an on-site treatment, storage, and disposal facility?	_____	_____	_____

Liquids (inside building facility)

1. Does instrumentation exist to adequately characterize alpha, beta, and gamma radiation?	_____	_____	_____
2. Does instrumentation exist to adequately characterize organic and inorganic contaminants?	_____	_____	_____
3. If so, will the instrumentation adequately characterize the type and level of contaminants in and on these materials?	_____	_____	_____
4. Is there background information that can be used to limit the number of samples and analyses required for adequate characterization?	_____	_____	_____
5. Depending on the size of the clean-up area, could robotics or remote manipulators be used to characterize levels and types of contaminants on floors, walls, structural steel, etc.?	_____	_____	_____
6. Could probes or manipulators be used to reduce the quantity of waste identified as "Possible Internal Contamination"?	_____	_____	_____

Decontamination Liquids

1. How many drums of decon liquids are expected to be generated per 100 ft²? _____
2. Could a substantial amount of decon liquid be prevented by:

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>	<u>DNA</u>
a. Cleaning only augers and tools in direct contact with contaminants, instead of the complete rig?	_____	_____	_____
b. Using dedicated pumps/boilers that are left in place?	_____	_____	_____
c. Using disposable sampling equipment?	_____	_____	_____
d. Using the last rinse for reuse for a future wash (if last rinse decon water is below contamination limits)?	_____	_____	_____
e. Only cleaning that equipment designated contaminated by the appropriate health and safety group?	_____	_____	_____
3. Could decon liquid be minimized by using evaporation tanks or other engineering processes?	_____	_____	_____
4. Could decon liquids be treated and reused (i.e., closed system with resin tanks)?	_____	_____	_____
5. Could low pressure/volume washers be substituted for other cleaning devices requiring higher volumes of water/cleaning fluids?	_____	_____	_____
6. Could a percentage of purge water and decon liquid be stored in the AOC for future treatment or disposal?	_____	_____	_____
7. Could a percentage of purge water and decon liquids be sent to an on-site treatment, storage, and disposal?	_____	_____	_____
8. Could those decon fluids that are, or have the potential to be hazardous, be substituted for a less hazardous or less toxic cleaning fluid?	_____	_____	_____
9. Does instrumentation exist to adequately characterize alpha, beta, and gamma radiation?	_____	_____	_____
10. Does instrumentation exist to adequately characterize organic and inorganic contaminants?	_____	_____	_____
11. If so, will the instrumentation adequately characterize the type and level of contaminants in and on these materials?	_____	_____	_____
12. Is there background information that can be used to limit the number of samples and analyses required for adequate characterization?	_____	_____	_____

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>	<u>DNA</u>
13. Depending on the size of the clean-up area, could robotics or remote manipulators be used to characterize levels and types of contaminants on floors, walls, structural steel, etc.?	_____	_____	_____
14. Could probes or manipulators be used to reduce the quantity of waste identified as "Possible Internal Contamination"?	_____	_____	_____

Personal Protective Equipment

1. How many drums of personal protective equipment (PPE) are expected to be generated when working an area 100 ft ² ? _____			
2. Could a substantial percentage of PPE be prevented if the level of protection was reduced (through research of available site data and an in-depth health and safety site inspection before the initiation of field activities)?	_____	_____	_____
3. Could a percentage of PPE be lowered by keeping changes to a minimum while maximizing worker safety protection?	_____	_____	_____
4. Could a percentage of PPE gloves, boots, and suits be decontaminated for reuse instead of disposal?	_____	_____	_____
5. Could a percentage of PPE be sent to an on-site treatment, storage, and disposal facility?	_____	_____	_____
6. What type of personal protective equipment (PPE) is required?	_____	_____	_____
_____ a. Full face respirators (cartridge/PAPR)			
_____ b. Coveralls			
_____ c. Tyvec disposable suits			
_____ d. Steel-toed safety shoes			
_____ e. Eye goggles/safety glasses			
_____ f. Disposable gloves			
_____ g. Rubber gloves			
_____ h. Disposable shoe covers			
7. Can any of the disposable PPE be replaced with reusable/decontaminated apparel?	_____	_____	_____

Fig. 1 (continued)

	<u>YES</u>	<u>NO</u>	<u>DNA</u>
<u>Air Emissions</u>			
1. Does the facility manager or personnel use any type of equipment or ventilation that has the potential to produce effluent waste air emissions?	_____	_____	_____
2. Could this equipment be substituted for other equipment designed to reduce or nullify any effluent waste air emissions?	_____	_____	_____
3. Could this equipment be fitted with filtering devices (e.g., HEPA filters) that could reduce effluent waste air emissions?	_____	_____	_____
4. Could the equipment be tied into a main engineering process system (such as a scrubber system) to reduce potential mixed/hazardous/radiological waste air emissions?	_____	_____	_____
5. Does the facility manager or personnel use a monitoring system specifically designed for waste air emissions?	_____	_____	_____

Fig. 1 (continued)

6. BIBLIOGRAPHY

- Energy Systems (Martin Marietta Energy Systems, Inc.). 1993. *Oak Ridge K-25 Site Technology Logic Diagram, Vol. 1: Technology Evaluation*. K-2073, Oak Ridge K-25 Site, Oak Ridge, Tennessee, February.
- Energy Systems. 1993. *Oak Ridge K-25 Site Technology Logic Diagram, Vol. 2: Technology Logic Diagrams*. K-2073, Oak Ridge K-25 Site, Oak Ridge, Tennessee, February.
- Energy Systems. 1993. *Oak Ridge K-25 Site Technology Logic Diagram, Vol. 3, Part A: Characterization, Decontamination, and Dismantlement*. K-2073, Oak Ridge K-25 Site, Oak Ridge, Tennessee, February.
- Energy Systems. 1993. *Oak Ridge K-25 Site Technology Logic Diagram, Vol. 3, Part B: Remedial Action, Robotics/Automation, and Waste Management*. K-2073, Oak Ridge K-25 Site, Oak Ridge, Tennessee, February.
- Energy Systems. 1993. *Decontamination and Decommissioning Technology Assessment*. DOE/OR-1051, Oak Ridge K-25 Site, Technical Division, Oak Ridge Tennessee, March.

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