

# Return on Investment (ROI)

## **Proposal Preparation Guide**

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Date Published  
January 1997

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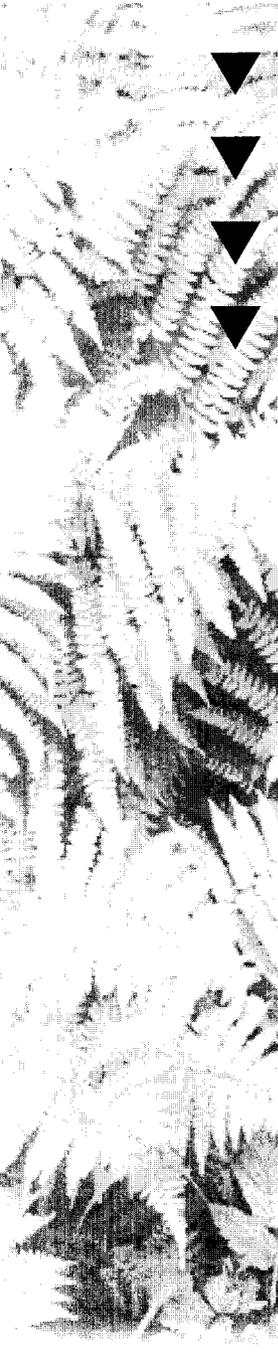
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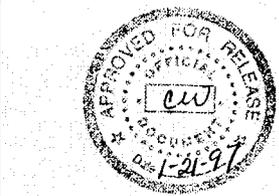
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J. C. Renner JC Renner 1/17/97  
(Print and Sign) Date

**9. Responsible Manager**  
D. E. McKenney DE McKenney 1/20/97  
(Print and Sign) Date



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Phone # 372-1926 Phone # \_\_\_\_\_

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### **Purpose of ROI Training and Guidance Document**

The ROI Proposal Preparation Guide is a tool to assist Hanford waste generators in preparing ROI proposal forms for submittal to RL. The guide describes the requirements for submitting an ROI proposal and provides examples of completed ROI forms. The intent is to assist waste generators in identifying projects that meet the criteria, provide information necessary complete the ROI forms with all of the required information, and submit a proposal that is eligible to receive funding.

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# Return on Investment (ROI) Proposal Preparation Guide

**Over \$2M is available to fund fiscal year (FY) 1997 waste minimization projects on the Hanford Site.**

This money was allocated by DOE-HQ and RL is currently seeking pollution prevention proposals from across the Hanford Site that provide a high return on investment (ROI) through reducing waste and associated management costs.

This guide accompanies the one-hour training workshop on how to prepare and submit an ROI proposal. So, let's dig in and begin the ROI process. . .

If you're interested in identifying opportunities to reduce waste in your workplace a four-hour Pollution Prevention Opportunity Assessment (P2OA) workshop can help. The P2OA process is an outstanding tool to identify opportunities for implementing pollution prevention initiatives. If you haven't already participated in P2OA training and would like to sign up, contact Dionetta Freeman (via cc:Mail or phone 373-1125) in the RFSH Waste Minimization Group.

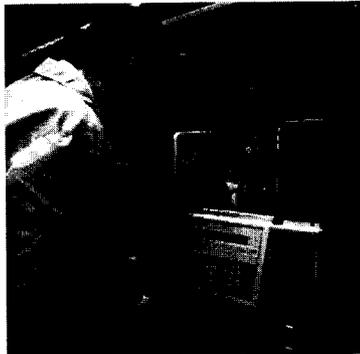
RL is looking for projects that identify the targeted waste stream(s) with specific reduction methods:

- Source reduction
- Recycling
- Waste recovery
- Volume reduction

## ROI Proposal Preparation - The Training Elements

- Why conduct a Pollution Prevention Opportunity Assessment (P2OA)?
- A one-page ROI Overview and Points of Contact.
- Project Eligibility Requirements - a questionnaire designed to determine the types of waste reduction activities that are eligible for ROI funding.
- Submittal and Selection of ROI Proposals - provides information on how to submit your proposal and the process used for selection.
- Preparing the ROI Project Proposal - the step-by-step process for preparing the ROI form, including a simplified method to determine waste related costs to be used in calculating ROI for WMin/P2 projects.
- Successful ROI Projects Proposals and P2OAs - examples of ROI proposals and P2OAs that met the criteria and received funding.
- ROI Project Guidance - provides specific reporting requirements when your project is selected to receive funding.

### **ROI Funded Project: Microchemical Instrumentation Implemented at 222-S Laboratory**



Outdated macroscale chemical instrumentation, such as ion chromatography and spectrophotometry, generates excessive amounts of mixed laboratory waste. Microchemical instrumentation was implemented to accommodate radioactive samples, saving approximately 6 cubic meters of mixed waste annually resulting in a cost savings of \$131,300.

*Hanford employees can sign up for the one-hour ROI Proposal Preparation Training Workshop by contacting Dionetta Freeman, RFSH Waste Minimization Liaison, at 373-4123.*

## Why conduct a P2OA?

Pollution Prevention Opportunity Assessments (P2OAs) are excellent candidates to receive funding through the ROI program.

During 1995-1996 Hanford implemented 30 P2 opportunities:

- Average Cost Savings per P2OA: \$103,800/yr
- Average Implementation Cost per P2OA: \$15,000
- Average Payback per P2OA: Less than 1 year

P2OA training includes:

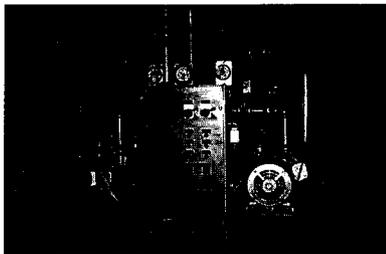
- Introductory information about pollution prevention
  - the elements, benefits and drivers
  - examples of pollution prevention and DOE P2 goals
- An examination of the assessment process and approach for conducting assessments.
- A walk-through of an actual assessment demonstrating how to complete the P2OA worksheets

Each participant receives a copy of the new Pollution Prevention Opportunity Assessment Training and Resource Guide. The guide describes how to identify, assess, and implement opportunities for preventing pollution and how to stimulate the ongoing search for such opportunities.

Ron Del Mar, an environmental scientist with FDNW shared his feedback on the P2OA workshop, "The training was very informative and brought to light all the issues involved with pollution prevention. You walk away from the workshop with the knowledge and tools needed to perform pollution prevention assessments in your workplace."

### ROI Funded Project:

### 325 Laboratory Service Pumps



A new set of oilless vacuum pumps were procured and installed in PNNL's 325 Laboratory. The new vacuum pumps eliminated the need to discharge water to the process sewer and isolated the process sewer from potential contaminants in the laboratory vacuum system. Annual cost savings resulting from the new pumps is projected at \$63,850.



Mary Betsch

*If you're interested in attending the four-hour P2OA training workshop, contact Dionetra Freeman of the RFSH Waste Minimization Group via cc:Mail or on 373-1125.*

# The ROI Program - - - At a Glance

The one-page ROI reference guide below provides a quick overview of the program at a glance.

## Return on Investment (ROI) Projects

- ✓ The ROI Program Funds  
Waste Reduction Projects

✓ Important Dates	Call Letters	Proposal Sent Quarterly	Submittal Dates
	- 10/28/96		- 12/2/96
	- 1/28/97		- 3/3/97
	- 4/28/97		- 6/2/97
	- 7/28/97		- 9/2/97

- ✓ Preparing a Proposal
  - Use the ROI Form
  - Use the ROI Waste Cost Guide to calculate cost data

- ✓ Types of Projects Encouraged
  - Source reduction
  - Recycling
  - Waste recovery
  - Volume reduction
  - Reduce mixed waste streams
  - Projects costing \$500K or less
  - Projects backed by a Pollution Prevention Opportunity Assessment

- ✓ Types of Projects Excluded
  - Projects costing over \$2M
  - Disposal with no waste recovery or recycling
  - Routine maintenance
  - Routine equipment replacement
  - Evaluation of competing proposed options
  - Research and development activities
  - Projects that are already funded

- ✓ Selection Process
  - RL Waste Minimization Team ranks proposals using weighted criteria; selects projects costing ≤\$50K
  - The RL Senior Management Board makes final selection of projects costing >\$50K

- ✓ Ranking Criteria
  - Return on Investment
    - 3 pts 77% or greater ROI
    - 2 pts 55-77% ROI
    - 1 pt 33-55% ROI
  - Annual Cost Savings
    - 3 pts >\$100,000
    - 2 pts \$50,000-\$100,000
    - 1 pt \$10,000-\$50,000
  - Time to Implement
    - 3 pts 0 - 12 months
    - 2 pts 12 - 24 months
    - 1 pt 24 - 27 months
  - Waste and Pollution Reduction
    - 4 pts Source reduction
    - 3 pts Recycling
    - 2 pts Waste recovery
    - 1 pt Volume reduction

- ✓ Need Assistance?
  - Contact your RFSH P2 POC (see contact list on page 5)

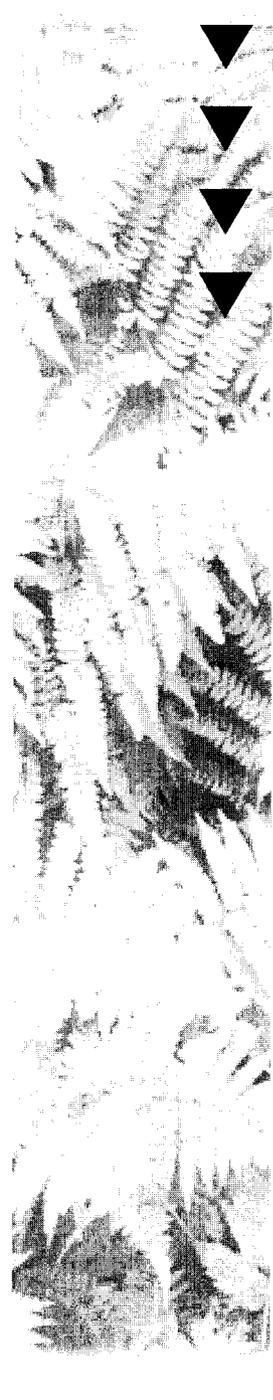
## Pollution Prevention Contacts

Facility Program	P2 Representative	Phone	RFSH P2-POC
RFSH/T Plant	Karola K. Kover	373-7300	Pete Segall 372-0469
HEHF	Sandra M. Mcinturff	376-6469	
PNNL	Jill Engel-Cox	372-0307	
ERC Team	Doug Duvon	373-5463	
	Gary Robinson	372-9221	
FDNW Construction	Ron Del Mar	376-1967	David Nichols 376-4351
DynCorp	Cheryl Ann Saylor	372-3970	
RFSH/TWRS	Mary M. Seay	373-2207	
Numatec	Deb Alexander	373-7498	
LMSI	Theodore M. Holmes	376-2372	
BWHC/B Plant/WESF	Tom Beam	372-0019	Mary Betsch 372-1627
FDH/PPF	Jeff E. Bramson	373-1359	
BWHC/PPF	Barbara E. Woodford	373-2388	
BWHC/PUREX	Stu W. Hildreth	373-3275	
DESH/K Basins/1706KE Lab	Noel O. Hinojosa	373-6874	
BWHC/FMEF/333/313 Fuel	Frank J. Carvo	376-8724	
BWHC/FFTF/ 400 Area Operations	Alan E. Hill	376-4788	
RFSH/222-S Laboratory	Attlee Benally	372-3928	Barry Place 372-1372
RFSH/ 200 Eff Treatment Facility	Nancy Ballantyne	372-1547	
RFSH/Wrap 1	Chris Lewis	372-3528	
RFSH/Solid Waste	Brett Barnes	376-3640	
RFSH/300 Eff Treat/ 340 Complex	Roger Szelmeczka	373-4200	
RFSNW/RCRA/ CERCLA Op Monitoring	Scott Myers	373-7497	

1/31/97

FDH POC	Jim Golden	376-6961
Ecology POC	Donovan Dorsey	736-3032

*The Pollution Prevention Contacts list is updated frequently, contact Dionetta Freeman on 373-1125 for the most current listing.*



## Project Eligibility Requirements

Projects must meet certain minimum eligibility requirements to be considered for ROI funding. To obtain a quick determination of the likelihood of obtaining funding, evaluate your project against the following criteria.

- |  | Yes                      | No                       |
|--|--------------------------|--------------------------|
| 1) Will your project:  |                          |                          |
| • Provide a Return on Investment (ROI) of 33% or greater?  | <input type="checkbox"/> | <input type="checkbox"/> |
| • Generate cost savings of at least \$10,000?  | <input type="checkbox"/> | <input type="checkbox"/> |
| • Reduce generation of DOE wastes and pollutants?  | <input type="checkbox"/> | <input type="checkbox"/> |
| • Cost less than \$2 million when fully implemented?   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Be implemented and operational within 27 months?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 2) Some types of projects are encouraged by the program.<br>Does your project involve of one of these? |                          |                          |
| • Source reduction   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Recycling  | <input type="checkbox"/> | <input type="checkbox"/> |
| • Waste recovery   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Volume reduction   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Reduce mixed waste streams   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Cost of \$500K or less   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Backup with Pollution Prevention Opportunity Assessment  | <input type="checkbox"/> | <input type="checkbox"/> |
| 3) Some types of projects are excluded from the program.<br>Does your project consist of one of these? |                          |                          |
| • Cost over \$2M   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Project that is already funded   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Disposal (with no waste recovery or recycling)   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Routine maintenance  | <input type="checkbox"/> | <input type="checkbox"/> |
| • Routine equipment replacement  | <input type="checkbox"/> | <input type="checkbox"/> |
| • Evaluation of competing proposed options   | <input type="checkbox"/> | <input type="checkbox"/> |
| • Research and development (R&D) activities  | <input type="checkbox"/> | <input type="checkbox"/> |

If you believe your project meets the above criteria for inclusion (items 1 and 2), and if your project does not fall into one of the categories listed in item 3 above, please begin preparing your ROI proposal. Otherwise, your project is not eligible for the ROI Program.

## Submittal and Selection

Call letters requesting ROI proposals are sent to the major Hanford contractors quarterly. Specific submittal dates are identified in the call letters, however, proposals are accepted at any time. Completed proposals are submitted to Ellen Dagan, RL Waste Minimization Program Manager, and Donna Merry, RFSH. Electronic submittals are preferred.

It is recommended that you contact your respective RL counterpart and communicate your intent to submit an ROI proposal. If you do not know who your respective RL counterpart is, contact Ellen Dagan on 376-3822, for assistance. Also, Project Hanford Management Contract (PHMC) employees should make their Fluor Daniel Hanford (FDH) counterpart aware of their ROI proposals. If you do not know who your respective FDH counterpart is, contact Jim Golden on 376-6961, for assistance.

ROI proposals are reviewed by the RL Waste Minimization team, which includes RL members from across the site. The RL Waste Minimization team ranks proposals using weighted criteria and selects projects costing  $\leq$ \$50,000. Projects costing  $>$ \$50,000 are provided to the RL Senior Management Board for final selection. Following the selection process, individual project managers are notified of the results.

### **ROI Funded Project: In-Line Solvent Recovery Recycling Project**



PNNL purchased five in-line solvent recovery systems to recover and reuse uncontaminated solvent. The recovery system uses the High Performance Liquid Chromatograph (HPLC) detector to determine when contaminants in the carrier solvent exceed predetermined levels. When these contaminants are detected by the HPLC, the recovery unit diverts the contaminated solvent to waste. However, when no contaminants are detected, the recovery unit routes the clean solvent back to the reservoir for use. With an approximate solvent recovery rate of 70%, a reduction of 100 kilograms of solvent waste is achieved annually, saving \$18,283 in management and disposal costs.

*Contact your  
RL counterpart  
and gain their  
support for  
your ROI  
proposal early  
in the ROI  
preparation  
process. If  
you're a PHMC  
employee,  
contact your  
respective FDH  
counterpart.*



# Preparing the ROI Project Proposal

The ROI Project Proposal form is provided on page 6. An electronic version of this form can be obtained by contacting your RFSH Waste Minimization point of contact (see the Pollution Prevention Contacts on page 5).

An outline of the information required for the ROI Proposal form is provided below.

I. Proposal Cover Page

II. Project Summary Data Sheet

III. Proposal Narrative

1. Project Description
2. Description of Benefit(s)
3. Basis of Data Presented (P2OAs)
4. Project Schedule, Milestones, and Deliverables
5. System/Process Flow Diagrams
  - 5.1 Process Flow Diagram - Before
  - 5.2 Process Flow Diagram - After

IV. Worksheets

1. Itemized Operating & Maintenance Annual Recurring Costs
2. Itemized Project Funding Requirements

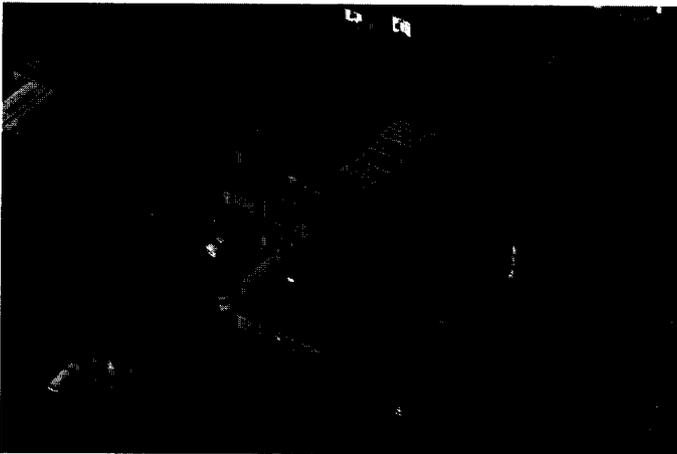
Worksheet 1: Operating and Maintenance Annual Recurring Costs is needed as a before and after comparison. Because overhead, G&A, labor, and MPR rates vary among Hanford contractors it is recommended that you contact your respective financial analyst or Sharon Howald, the RFSH Waste Minimization financial analyst on 372-1455, for current rates prior to calculating information for Worksheet 1. PNNL employees can contact Deena Bean on 372-4335 for assistance.

# ROI Proposal Preparation Guide

Please have the following information available when requesting current rates:

- Company and organization code
- Number of hours required to complete the task
- Job classifications of employees who will support this task (i.e. exempt, non-exempt, bargaining unit)
- Materials, etc.

The ROI Waste Cost Guide is provided in Appendix F on page 65. It provides detailed guidance for completing Worksheet 2: Itemized Project Funding Requirements in the ROI proposal. The information contained within the proposal serves as the basis for review of the proposed project and subsequent ranking for funding consideration. In order to ensure a degree of uniformity for review purposes, all proposals must be submitted using the ROI form and use the dollar amounts specified for waste related costs in their calculations.



## **ROI Funded Project: Modifications to the 242-A Evaporator**

The 242-A Evaporator is used to separate waste from the double-shell tanks into process condensate and slurry. The process condensate is transferred to the Liquid Effluent Retention Facility for storage until it can be treated. The slurry is sent back to the tank. This ROI modified the 242-A Evaporator by implementing a process condensate recycling loop. The process condensate is pumped from the collection tank to the intake of the filtered raw system, reducing the volume of waste produced. This modification saved approximately \$3,570,000 in life-costs and reduces the waste volume that would otherwise have to be stored for disposal by 740 cubic meters.



## Training Module

For this training workshop, we're going to start with a P2OA that examines glove box work in which transuranic wastes are generated at the Plutonium Finishing Plant (PFP)(Appendix A on page 13) and then walk-through the resulting ROI proposal entitled Sphincter Ports (Appendix B on page 27).

Please turn to page 27 now.

**Table 1**  
**Avoidable Solid Waste**  
**Management Costs\***

Waste Type/ Treatability Group	Weighted Average Cost (\$)
• Solid Low Level: Contact Handled - Untreated	\$1,900/m <sup>3</sup>
• Mixed Low Level: Debris w/o Incineration	\$13,800
Non-Debris w/o Incineration	\$14,500
Cubic meter w/Incineration	\$14,400
• Transuranic	\$45,800/m <sup>3</sup>
• Hazardous	\$9,600/m <sup>3</sup>
• Sanitary	\$35/metric ton
• Waste Water Disposal (show life cycle cost)	TBD by Waste Generator

Source: Hanford Return on Investment Waste Cost Guide, July 1995

\* These costs are variable costs (i.e., volume dependent costs that vary in direct relation with increases or decreases in the quantities of waste generated; it is these variable costs that potentially can be avoided through the implementation of WMin/PP actions).

**Table 2**  
**Standard Utility Costs**

<b>Utility</b>	<b>Standard Cost (\$ per Unit)</b>
• Electrical	45.90/KKWh
• Natural Gas	3.30/KCF 3.20/MBtu
• Coal	40.00/Ton 2.60/MBtu
• Steam	4.60/Klb
• Fuel Oil	0.60/gal
• Process Water (recirculation and cooling)	0.70/Kgal

Source: Indexing Cost Avoidance Associated With a Pollution Prevention Option at the Oak Ridge Reservation, #D940111.2TT51, April 1994.

## Successful ROI Project Proposals

Appendix D on page 43 contains the following examples of successful ROI Project Proposals. The format and cost information on some of them may differ slightly from the format and cost information currently used due to the change in guidance from DOE HQ and RL.

- Tank Farm (242-A) Evaporator Modification Project
- In-Line Solvent Recovery/Recycling Project
- Replace 325 Laboratory Vacuum Pumps
- Microchemical Instrumentation for 222-S



## ROI Project Guidance

Specific reporting procedures are required when your project is selected to receive ROI funding. These requirements are documented in the Return on Investment (ROI) Project Guidance, Appendix C on page 35. Approximately one hour per month is estimated to fulfill the reporting requirements; be sure to include this cost in Worksheet 2: Itemized Project Funding Requirements, Item #5 - Readiness Reviews/Management Assessment/Administrative Costs, when completing your ROI form. Reporting requirements include:

- Monthly Reviews - generally a 15-minute telecon providing verbal status of project activities
- Monthly Report - an electronic submittal documenting Accomplishments, Upcoming Activities, Milestone Status, Budget/Schedule, and Issues
- Monthly Detailed Cost Reports - detailed costs by cost element for each project managed by PNNL and BHI; detailed costs by element for all other contractors will be obtained from the Financial Data System (FDS) by the RFSH Waste Minimization group budget analyst
- FY 1997 Close-Out: Year-End Reports; Requests for Carryover - specific forms to be completed once the project is complete, at fiscal year end, or when project activities will flow into the next fiscal year
- Documentation of Deliverables - any written documentation regarding: your project, examples include design reviews, case studies, etc.



# **Appendix A**

## **“Glove Box Activities”**

### **Pollution Prevention Opportunity Assessment Worksheet**



POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

**WORKSHEET 1**

**TEAM AND ACTIVITY DESCRIPTION**

Date July 8, 1996      P2OA ID Code Site\_10      Facility PFP  
Activity Glove Box Activities

Team Members (*Leader)	Telephone	MSIN
*P. Segall	372-0469	B3-28
M. Betsch	372-1627	B3-28
J. Billingsley	373-2388	T5-56
J. Bramson	373-1359	T5-54
L. Cunningham	373-3685	T5-55
M. Jones	373-2564	T5-03
B. Orth	373-4108	T5-04
D. Romine	373-4108	T5-04
B. Woodford	373-2388	T5-56

**Description of Activity to be Examined in this P2OA**

Activities to be examined are glove box work in which transuranic wastes are generated. Activities include: (1) Remediation work to clean out the various contaminated glove boxes throughout the Plutonium Reclamation Facility; (2) The scrap stabilization activities and remediation/clean out activities within the Remote Mechanical C Line; (3) The routine laboratory analyses work performed in the glove boxes of the Analytical Laboratory; and (4) The contaminated material bench-scale tests of processes which take place in the glove boxes of the Plutonium Process Support Laboratory.

Glove box activities at PFP generated 17 m<sup>3</sup> of TRU waste in CY 1995. This quantity was made up of approximately 7 m<sup>3</sup> of plastics, 3.4 m<sup>3</sup> of gloves, 1.2 m<sup>3</sup> of rags, 4.25 m<sup>3</sup> of equipment and 1.3 m<sup>3</sup> of miscellaneous tools, HEPA filters and polyjars/containers.

## POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

## WORKSHEET 2

## Activity Flow Diagram

Date July 8, 1996

P2OA ID Code Site\_10

Facility PFP

## Activity Glove Box Activities

Chemical and Radioactive Inputs	
Name	Quantity
N/A	

Material Inputs	
Name	Quantity
Rags (Cloth/Paper)	.85 m <sup>3</sup>
Rags (Wet/Dry)	.34 m <sup>3</sup>
Gloves (Leaded)	1.7 m <sup>3</sup>
Gloves (Hypalon/Rubber)	1.7 m <sup>3</sup>
Plastic (Liners/Bags, Test Tubes/Vials)	6.8 m <sup>3</sup>
Misc. Tools	.51 m <sup>3</sup>
Polyjars/Containers	.51 m <sup>3</sup>
HEPA Filters	.34 m <sup>3</sup>
Equipment (valves, pumps, piping, steel boats, pots, etc.)	4.25 m <sup>3</sup>

Energy Inputs	
Name	Quantity
None	

## Activity

Activity Time Period:  
Annual (12 months)Outputs Include:  
Solid (s)  
Liquid (l)  
Air (a)

Product or Result Output	
Name	Quantity
Stabilize Materials/Pu*	
Deactivate Glove Boxes*	
Pu Storage*	
Pu Storage for Disposal*	
Maintenance*	
*N/A	

Hazardous Waste Output	
Name	Quantity
N/A	

Non-Hazardous Waste Output	
Name	Quantity
N/A	

Radioactive Waste Output	
Name	Quantity
Rags (Cloth/Paper)	.85 m <sup>3</sup>
Rags (Wet/Dry)	.34 m <sup>3</sup>
Gloves (Leaded)	1.7 m <sup>3</sup>
Gloves (Hypalon/Rubber)	1.7 m <sup>3</sup>
Plastic (Liners/Bags, Test Tubes/Vials)	6.8 m <sup>3</sup>
Misc. Tools	.51 m <sup>3</sup>
Polyjars/Containers	.51 m <sup>3</sup>
HEPA Filters	.34 m <sup>3</sup>
Equipment (valves, pumps, piping, steel boats, pots, etc.)	4.25 m <sup>3</sup>

Mixed Waste Output	
Name	Quantity
N/A	

Other	
Name	Quantity
N/A	

Total Input Volume = Total Output Volume 17 m<sup>3</sup> In = 17 m<sup>3</sup> Out

**POLLUTION PREVENTION OPPORTUNITY ASSESSMENT**  
**WORKSHEET 3A**  
**POLLUTION PREVENTION OPPORTUNITY DESCRIPTION**

**Date** July 8, 1996      **P2OA ID Code** Site\_10      **Facility** PFP  
**Activity** Glove Box Activities  
**P2O No.** 1      **P2O Title** P2 Awareness Training to Improve Work Planning

**Current Practice**

Maintenance work at PFP is originated through either new work identification or recall (i.e. preventive maintenance/surveillance items). Either process requires a work document to perform the work. During the review process of a new work document considered necessary, the determination is made whether a work document requires "planning" or "no planning" based on a specific criteria provided. If "planning" is required, the work document is routed to the appropriate actionee for preparation of the work package.

During the development of the work package, the work package preparer is responsible for performing a hazard review to ensure that safety, ALARA, and radiological measures are addressed in the work packages. The ALARA review, if determined necessary, addresses several questions related to Waste Minimization/Pollution Prevention (WMin/P2) in Part IIB, "Protective Measures/Considerations" of the ALARA Management Worksheet (AMW) which are to be answered. Upon completion of field work, if waste reduction efforts are implemented during job performance, reduction efforts are to be recorded in the post-review section of the AMW.

Currently, employees who do not receive Hazardous Materials Training, receive only a brief introduction to WMin/P2 during annual Hanford General Employee Training (HGET). There is no formal program to train work package preparers (i.e. planners, engineers, crafts, etc.) or work package reviewers on WMin/P2 ideas, techniques, or tools.

**Recommended Action**

It is recommended that WMin/P2 Awareness Training be developed for planners, engineers, crafts and other appropriate personnel involved in the work planning process. This training should provide an awareness of WMin/P2 tools and techniques to consider in the planning process and address areas such as waste generation costs, accomplishments and P2 goals.

It is noted that the Nuclear Operator WMin/P2 Awareness Workshop, given in June 1996, can be appropriately modified for presentation to the appropriate personnel involved in the work planning process.

**Calculation of Waste Reduction and/or Energy Savings**

It is estimated that improving WMin/P2 Awareness through training within the work planning process should result in an approximate 25% reduction in TRU waste generated during glove box seal-in and seal out activities. Based on process knowledge, it is estimated that packaging operations for glove box seal-in and seal-out activities for maintenance in CY 1995 accounted for approximately 4.2 m<sup>3</sup> of TRU waste. Improved planning to minimize or eliminate glove box entries supporting maintenance activities should reduce TRU waste generation by approximately 1 m<sup>3</sup>.

## POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

**WORKSHEET 3A (cont'd)****POLLUTION PREVENTION OPPORTUNITY DESCRIPTION****Calculation of Annual Cost Savings**

Waste Disposal Savings- Life Cycle Cost of 1 m<sup>3</sup> of TRU waste = \$45,800\*  
 \*(Reference: "Hanford Return on Investment Waste Cost Guide, July 1995)

Cost for Work Planning P2 Awareness Training (1 class per year)

**Instructor-** The instructor cost to teach the class would include organizing/setting up the class in addition to the actual teaching time. The anticipated cost for the 1 day class of 30 participants is \$750.

**Materials-** Materials include such items as handouts, overheads, duplicating, etc. The cost for materials is estimated at \$250.

**Student Class Time-** It is anticipated that no more than 30 students will attend the 8 hour training class. Based on 240 hours of training at a rate of \$41/hr., the total cost for the participants is \$9,840.

The total cost for the 1 day class is \$10,840. The calculation is as follows:

Instructor	750
Materials	250
Student Class Time	9,840
	\$10,840

The estimated annual savings is \$37,160. Calculated as follows:

Disposal Cost Savings	\$45,800
Annual Cost of Class	-10,840
	\$34,960

Additional areas that should result in cost savings from WMin/P2 Awareness Training is Work Planning but not included in this cost savings analysis include:

- TRU waste generation reductions from Process Room Activities
- LLW and LLW-M generation reductions
- Hazardous material waste reductions

**Calculation of Implementation Cost and Payback**

Implementation costs for the development of the P2 Awareness training in Work Planning would be minimal since it only requires a modification of the Nuclear Operator P2 Awareness Training Class presented May 30, 1996 to orient the class toward work planning. It is expected that the appropriate course modifications can be made in 4 hours (4 hours x \$52/hr) at a cost of \$208. The payback for this opportunity is less than 1 week.

Payback

$$= \text{Implementation Cost/Total Annual Savings}$$

$$= 208/34,960 = 0.006 (<1 \text{ week})$$

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

**WORKSHEET 3B**

**POLLUTION PREVENTION OPPORTUNITY DESCRIPTION**

Date July 8, 1996      P2OA ID Code P2OA\_10      Facility PFP  
Activity Glove Box Activities  
P2O No. 2   P2O Title LLW Assay Equipment Assay of Suspect TRU Waste

**Current Practice**

The current practice requires that waste removed from glove boxes be treated as transuranic (TRU) waste. This waste may be all low level (LLW) rather than TRU. However, this waste can not be reclassified due to limitations of the current assay equipment.

Suspect TRU waste is placed by Solid Waste Operations (SWO) into waste barrels and assayed initially on a Sodium Iodine (NaI) system. If the measured quantity of plutonium (Pu) is between .5 and 10 grams, this value is assigned to the barrel. Barrels which measure greater than 10 grams of Pu are assayed on a second system, a Segmented Gamma Scan Assay System (SGSAS). The measurement results from the SGSAS are used as the official value for these barrels. Barrels which measure less than .5 grams of Pu are arbitrarily assigned a Pu value by SWO and are also treated as TRU waste.

It is estimated by process knowledgeable personnel that 20% of TRU waste generated during glove box operations is treated as suspect TRU waste. In 1995 glove box activities generated approximately 17 m<sup>3</sup> of TRU waste; Therefore 3.4 m<sup>3</sup> (.20 x 17) is processed as suspect waste.

**Recommended Action**

PFP is installing a new LLW Assay System. This system can measure wastes at levels low enough to classify some suspect TRU waste barrels as low level. It is recommended that installation of the LLW Assay System be given high priority for completion of installation activities (i.e. software checkout and that the system be utilized to assay suspect TRU waste barrels with readings of less than .5 grams of Pu on the SGSAS.

## POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

**WORKSHEET 3B (cont'd)****POLLUTION PREVENTION OPPORTUNITY DESCRIPTION****Calculation of Waste Reduction and/or Energy Savings**

It is estimated that utilization of the more accurate LLW Assay System, to remeasure barrels of suspect TRU waste, will result in 25% of the suspect barrels being processed as LLW. Since it is estimated that suspect TRU waste barrels make up 3.4 m<sup>3</sup> of the TRU waste generated in glove boxes in 1995, it is expected that 0.85 m<sup>3</sup> of glove box waste processed as TRU waste will be processed as LLW.

$$3.4 \text{ m}^3 \times 0.25 = 0.85 \text{ m}^3$$

Additional areas that cost savings could occur utilizing the LLW Assay System are suspect TRU waste generation from Process Room Activities.

**Calculation of Annual Cost Savings**

Waste Disposal Savings-

Life Cycle Cost of 1 m<sup>3</sup> of TRU waste = \$45,800\*

Life Cycle cost of 1 m<sup>3</sup> of Low Level waste = \$1,900\*

\* (Reference: "Hanford Return on Investment Waste Cost Guide, July 1995)

Cost for processing 0.85 m<sup>3</sup> of TRU waste = \$38,930

Cost for processing 0.85 m<sup>3</sup> of Low Level waste = \$1,615

Cost Savings realized: \$38,930 - \$1,615 = \$37,315

**Calculation of Implementation Cost and Payback**

There is no implementation cost related to installation of the LLW Assay System since all installation activities are complete except for software checkout which is vendor responsibility. Engineering follow of the software checkout and any procedure development for equipment operation is already funded. Cost of labor for assaying approximately 17 suspect TRU waste barrels per year is estimated at \$120 per barrel for a total cost of \$2,040. The payback is

$$\frac{\$2,040}{\$37,315} = .054 \text{ years}$$

$$\$37,315$$



POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

**WORKSHEET 3C**

**POLLUTION PREVENTION OPPORTUNITY DESCRIPTION**

Date July 8, 1996      P2OA ID Code P2OA\_10      Facility PFP  
Activity Glove Box Activities  
P2O No. 3      P2O Title Sphincter Ports

**Current Practice**

The current practice for transferring materials, tools, and equipment into a glove box is by using port bags on a glove box port or sphincter ports on a glove port or window panel. Transfer of items into the glove box is referred to as a seal-in and it minimizes potential of spreading contamination from the glove box interior. The seal-in of items into a glove box via a port bag results in the generation of TRU waste consisting of plastic, tape and the transfer container; with the majority of the waste generated being plastic.

The alternate method for transferring materials, tools and equipment into a glove box is via a sphincter port. A sphincter port is constructed of alternating layers of "donut" shaped 1/2" lexan and neoprene. The diameter of the neoprene being one to two inches smaller than the glove port. Operation of a sphincter port requires that a can, polyjar or "ice cream" carton always be present in the port. A new can, polyjar or carton is used to push the item in the port into the glove box. This process is continued until required items are in the glove box. This process eliminates the tape plastic transferred into the glove box.

The use of sphincter ports to transfer items into a glove box have been previously used utilizing cans, cartons and polyjars 3 1/2" in diameter. Sphincter ports have been designed, tested and manufactured for transfer of items through 8" ports utilizing cans, cartons, and polyjars that are 4 1/4" in diameter. Specific projects in the Plutonium Reclamation Facility (PRF), cementation and furnace operations have been selected to use sphincter ports. A total of 7 sphincter ports have been constructed, four (4) using 3 1/2" diameter containers for transfers-in PRF operations and three (3) for transferring items through 8" glove ports in the cementation/furnace operations.

The estimated reduction in TRU waste generation utilizing the four sphincter ports in PRF operations, based on two (2) transfers per week per port, is approximately .4 m<sup>3</sup> per year (see Waste Reduction Savings- 0.11m<sup>3</sup> per port). The estimated reduction in TRU waste generation utilizing the three sphincter ports in the cementation/furnace operations based on two transfers per week per port, is 1 m<sup>3</sup> per year (see Waste reduction Savings- 0.17m<sup>3</sup> per port). The total TRU waste generation reduction resulting from fourteen (14) transfers per week is approximately 1 m<sup>3</sup>. In addition, a reduction in operation costs is realized as a result of reduced Health Physics Technician (HPT) coverage during the seal-in process.



## POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

**WORKSHEET 3C (cont'd)****POLLUTION PREVENTION OPPORTUNITY DESCRIPTION****Recommended Action**

PPF is utilizing sphincter ports on selected projects within the facility. It is recommended that PPF Process Engineering conduct a feasibility study to identify existing or upcoming projects for which the existing design of sphincter ports or a larger sphincter port could be used for transferring items into glove boxes and reducing TRU waste generated. Based on the results of the feasibility study, as applicable, additional sphincter ports should be manufactured. It is also recommended that PPF Process Engineering design, manufacture and test a prototype sphincter port which can be utilized for transferring materials through eleven (11) inch diameter glove ports.

**Calculation of Waste Reduction and/or Energy Savings** It is estimated that the utilization of a sphincter port capable of transferring materials into a glove box utilizing containers of 3 1/2" diameter and 4 1/4" diameter will result in TRU waste generation reductions of .11 m<sup>3</sup> and .17 m<sup>3</sup> per sphincter port annually based on two transfers-in being conducted per week.

**TRU Waste Generation Reduction****3 1/2" Diameter Container**

$$\text{Volume} = \pi r^2 h = 3.14 \times (1.75)^2 \times 7 = 67.3 \text{ in.}^3$$

Based on estimates provided by Engineering, the waste (plastic/tape) generated equals the volume of the container.

$$\begin{aligned} \text{Waste reduction} &= 2 (\text{transfers per week}) \times 52 (\text{weeks}) \times 67.3 \text{ in.}^3 \\ &= 6,999 \text{ in.}^3 = 0.11 \text{ m}^3 \text{ per sphincter port} \end{aligned}$$

**4 1/4" Diameter Container**

$$\text{Volume} = \pi r^2 h = 3.14 \times (2.125)^2 \times 7 = 99.3 \text{ in.}^3$$

Based on estimates provided by Engineering, the waste (plastic/tape) generated equals the volume of the container.

$$\begin{aligned} \text{Waste Reduction} &= 2 (\text{transfers per week}) \times 52 (\text{weeks}) \times 99.3 \text{ in.}^3 \\ &= 10,322 \text{ in.}^3 = 0.17 \text{ m}^3 \text{ per sphincter port} \end{aligned}$$

It is estimated that sphincter ports designed, tested and manufactured for transfer of items through 11" glove ports will be capable of transferring materials into a glove box utilizing a containers 6" in diameter and 11" in length will result in annual TRU waste generation reductions of .53 m<sup>3</sup> per sphincter port based on 2 transfers-in conducted per week.

**POLLUTION PREVENTION OPPORTUNITY ASSESSMENT**  
**WORKSHEET 3C (cont'd)**  
**POLLUTION PREVENTION OPPORTUNITY DESCRIPTION**

**6" Diameter Container**

$$\text{Volume} = \pi r^2 \times h = 3.14 \times (3)^2 \times 11 = 310.9 \text{ in.}^3$$

\*Based on estimates provided by Engineering, the waste (plastic/tape) generated equals the volume of the container.

$$\begin{aligned} \text{Waste Reduction} &= 2 \text{ (transfers per week)} \times 52 \text{ (weeks)} \times 310.9 \\ &= 32,329 \text{ in.}^3 = 0.53 \text{ m}^3 \end{aligned}$$

Total TRU waste generation reduction (based on the addition of 2 sphincter ports of each size) =  $0.81 \text{ m}^3 \times 2 = 1.62 \text{ m}^3$

**Calculation of Annual Cost Savings**

Waste Disposal Savings (per sphincter port based on 2 transfers per week)

Life Cycle Cost of 1 m<sup>3</sup> TRU = \$45,800\*

\* (Reference: "Hanford Return on Investment Guide, July 1995)

Cost for processing 0.11 m<sup>3</sup> of TRU waste = \$5,038.

Cost for processing 0.17 m<sup>3</sup> of TRU waste = \$7,786.

Cost for processing 0.53 m<sup>3</sup> of TRU waste = \$24,274.

Total Waste Disposal Savings Realized by Utilizing Three Additional Sphincter Ports (one of each size) = \$37,098.

**Radiation Monitoring Savings**

(per sphincter port based on 2 transfers per week)

Time Savings - 1 HPT, 2 Operators- 2 hour each per seal-in operation.

2 seal-ins/week x 52 weeks x 2 (hours) x \$ 41/hour = \$8,528 per year

Total Annual Savings(based on 2 sphincter ports of each size being added)

Total Waste Disposal Savings = 2 x \$37,098 = \$74,196

Total Radiation Monitoring Savings = \$8,528 per port x 6 (ports) = \$51,168

Total Savings= \$74,196 + \$51,168 = \$125,364

## POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

## WORKSHEET 3C (cont'd)

## POLLUTION PREVENTION OPPORTUNITY DESCRIPTION

## Calculation of Implementation Cost and Payback

## Implementation Cost-

Feasibility Study- Engineering study to identify additional projects where existing diameter sphincter ports or larger diameter sphincter ports could be utilized- \$ 5,000.

Manufacture sphincter ports (2 each) for 3 1/2" and 4 1/4" diameter containers- \$ 12,000

Design, manufacture and test prototype sphincter port for transfer-in of items through an eleven (11) inch port- \$ 25,000

Manufacture 2 larger diameter sphincter ports- \$ 10,000

Total Implementation Cost - \$ 52,000

## Payback

= Implementation Cost / Total Annual Savings

= 52,000 / 125,364 = 0.41 years



POLLUTION PREVENTION OPPORTUNITY ASSESSMENT  
**WORKSHEET 4 (cont'd)**  
POLLUTION PREVENTION OPPORTUNITY SUMMARY

Ideas to be Evaluated at a Later Point in Time

1. Cloth PPE (alternative to paper PPE-being implemented).
2. Preplanned Housekeeping (allows for appropriate waste determinations).
3. Improved Procedures (require that wastes generated and packaged be appropriately identified in order to identify what is in the package).
4. Analytical Laboratory/Plutonium Process Support Laboratory (PSSL) (reuse of equipment/extend end life).
5. Extend replacement periods (change outs).
6. Analytical Labs/PSSL-Deactivation of Glove Boxes (pie-plating).
7. Re-use of Gloves from Deactivated Glove Boxes (gloves with life expectancy remaining).
8. Laser Aided Decontamination
9. Air Lock Operated Glove Box Transfers
10. Glove Box Compactor (compaction of material in a glove box)

It is recommended that each of the items deferred from evaluation by the prioritization process, except item 1 which is being implemented, be reevaluated and prioritized for further evaluation.

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT

**WORKSHEET 5**

**FINAL SUMMARY**

Date July 8, 1996

P2OA ID Code P2OA\_10

Facility PFP

Activity Glove Box Activities

**Proposed Opportunities and Discussion**

Three opportunities were analyzed for implementation. Although each opportunity addresses the same waste stream, each can be implemented with no impact on the payback for each opportunity. Pollution Prevention (P2) Awareness Training to Improve Work Planning (Opportunity #1) will provide work package preparers (i.e., planners, engineers, crafts, etc.) an awareness of the WMin/P2 tools and techniques to consider in the planning process. The Nuclear Operator WMin/P2 Workshop, given in June 1996 can be easily modified for work package preparers. Although the evaluation was conducted for TRU waste generated from glove box activities, the waste reduction benefits should be realized not only in TRU waste generation but in a reduction in all wastes generated.

The use of LLW Assay Equipment to Assay Suspect TRU Waste (Opportunity #2) will provide an assay of suspect TRU waste generated for reclassification to LLW. Use of the new LLW assay equipment provides equipment which can provide a more accurate reclassification of suspect TRU waste to LLW. Though not addressed in the evaluation of this waste stream, suspect TRU waste generated can also be assayed utilizing the new equipment.

The evaluation of Sphincter Ports (Opportunity #3) addresses an opportunity to expand the use of the existing design of sphincter ports and recommends the design and testing of sphincter ports capable of transferring larger diameter items into a glove box.

**Recommendations and Schedule for Implementation**

It is recommended that Opportunity #1 (P2 Awareness Training to Improve Work Planning), Opportunity #2 (LLW Assay Equipment to Assay Suspect TRU Waste) and Opportunity #3 (Sphincter Ports) be implemented as soon as possible to realize the forecast TRU waste generation reductions.

# Appendix B

## “Sphincter Port”

### ROI Proposal



U.S. DEPARTMENT OF ENERGY

HIGH RETURN ON INVESTMENT POLLUTION PREVENTION

PROJECT PROPOSAL

Project Title: Sphincter Ports (Revised)

Facility Name: Aluminum Finishing Plant

We certify that the information provided herein is accurate to the best of our knowledge.

The Operations Office, and the above identified Facility, commit to operate the proposed project in the years following the original implementation period, so long as cost savings continue to be realized

DOE Manager  
Responsible  
for Project  
Implementation: \_\_\_\_\_

Operations  
Office WMin/PP  
Coordinator: \_\_\_\_\_

U.S. DEPARTMENT OF ENERGY POLLUTION PREVENTION  
EXECUTIVE BOARD  
HIGH RETURN ON INVESTMENT POLLUTION PREVENTION  
PROJECTS  
PROJECT SUMMARY DATA SHEET

**Project title:** [REDACTED] Serial Number: \_\_\_\_\_  
(HQ Assigned)

Location/Site: EM/Hanford Site Implementing CSO: EM

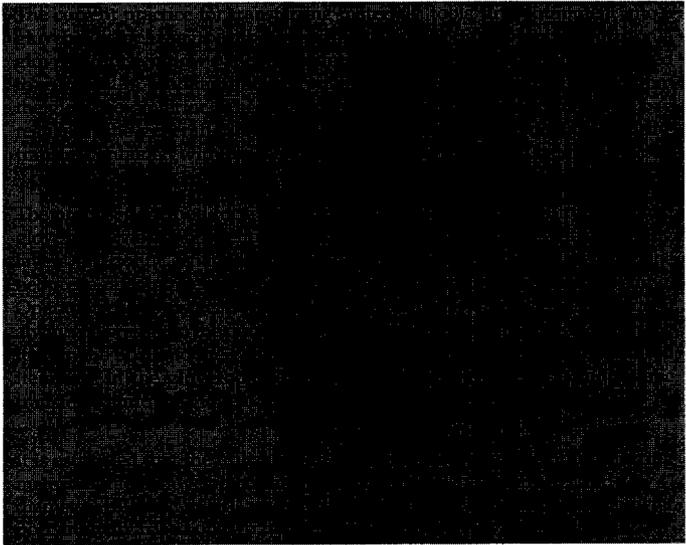
Operations Office: Richland Operations Office (RL)

Site Contact: [REDACTED]  
Phone/Fax: [REDACTED]

**Project Summary:**

Provide 3-5 bullets to describe the project, including:

1. Statement of existing process/activity condition
2. Statement of proposed change to process/activity
3. Description of resulting waste/pollutant reductions



Project Duration (months): 10 Useful Project Life (Years): 10 (L)

**Performance indicators:**

$$ROI = \frac{(B-A) - [(C+E+D)/L]}{(C+E+D)} * 100 = \dots\dots\dots\%$$

O&M Annual Recurring Costs: Project Funding Requirements:  
(i.e., Total Annual Operating Costs) (i.e., One-Time Implementation Costs)  
Annual Costs, Before = 52,176 (B) Capital Investment = 57,000 (C)  
Annual Costs, After = 50 (A) Installation Operating Expense = 50 (E)

Net Annual Savings = (B) - (C) = 34,176 Total Project Funds = (C) + (E) = 113,110

Estimated Project Termination / Disassembly Cost (if applicable) 0 (D)  
(Only for Projects where L < 5 years; D=0 if L > 5 years)

**Waste/Pollutant Quantity Reductions:**

Prevented Waste: (List type and amount in kg or m<sup>3</sup> per year)

[Redacted]

**Comments:** Use, as necessary, to qualify relevant aspects of the project not included above.

**ROI PROJECT TITLE**

**1. Project Description**

[Redacted]

approximately 4 m<sup>3</sup> per year. The estimated reduction in TRU waste generation utilizing the three splinter ports in the consolidation/transfer operations based on two transfers per week per port is 18 m<sup>3</sup> per year. If the total TRU waste generation reduction resulting from fourteen (14) transfers per week is approximately 1 m<sup>3</sup>. In addition, a reduction in operation costs is realized as a result of reduced Radiological Control Technician (RCT) coverage during the seal-in process.

PEP is utilizing splinter ports on selected pieces within the facility. PEP Engineering has identified locations for the splinter ports. Two 3-1/2" splinter ports will be located in room 230C in the new gloveboxes and four 4-1/4" ports will be located in the Active gloveboxes for decommissioning.

Attach additional pages as needed to present the relevant information.

**2. Description of Benefit(s)**

The main benefit is reduced TRU waste generation and reduced RCT coverage during the seal-in process.

Attach additional pages as needed to present the relevant information.

**3. Basis of Data Presented (PPOAs)**

A Crews Pollution Prevention Plan (PPOA) is being developed for the new gloveboxes (230C) and the Active gloveboxes.

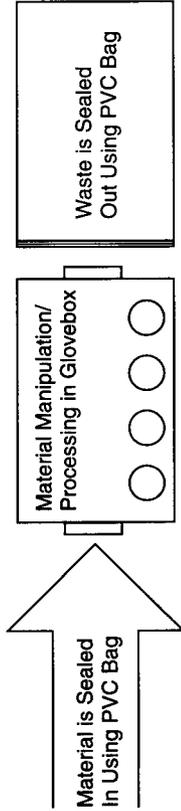
Attach additional pages as needed to present the relevant information.

**4. Project Schedule, Milestones, and Deliverables**

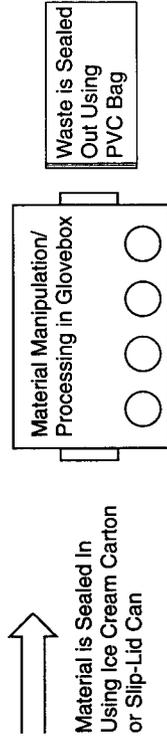
Manufacture splinter ports  
 Manufacture splinter ports  
 Manufacture splinter ports  
 Manufacture splinter ports  
 Install splinter ports (230C)  
 Install splinter ports (Active)  
 Calculate RCT coverage for  
 boxes for decommissioning

Attach additional pages as needed to present the relevant information.

5. System/Process Flow Diagrams



• PVC Bag Waste Generated by Seal In



- Ice Cream Cartons and Slip-Lids Sealed Out as Waste
- Slip-Lid Can Consumed as Product Containers for Process

## Worksheet 1: Operating & Maintenance Annual Recurring Costs

Expense Cost Items	Before Annual Costs	After Annual Costs
1. Equipment		
2. Purchased raw materials and supplies		
3. Process Operation Costs: Utility Costs (see Table 2) Labor Costs [REDACTED]	[REDACTED]	
4. PPE & related health/safety supply costs		
5. Waste Management Costs: Waste container costs Treatment/Storage [REDACTED] Inspection/Compliance costs	[REDACTED]	
6. Recycling Costs Material collection/separation/preparation a. Material and supply costs b. Operations and maintenance labor costs Vendor costs for recycling		
7. Administrative/other Costs		
<b>Total Annual Cost: Before (B) = [REDACTED]</b>		<b>After (A) = [REDACTED]</b>

Table 1:  
Avoidable  
Solid Waste  
Management  
Costs is on  
page 10.

Table 2:  
Standard  
Utility Costs  
is on page 11.

## Worksheet 2: Itemized Project Funding Requirements (i.e., One Time Implementation Costs)

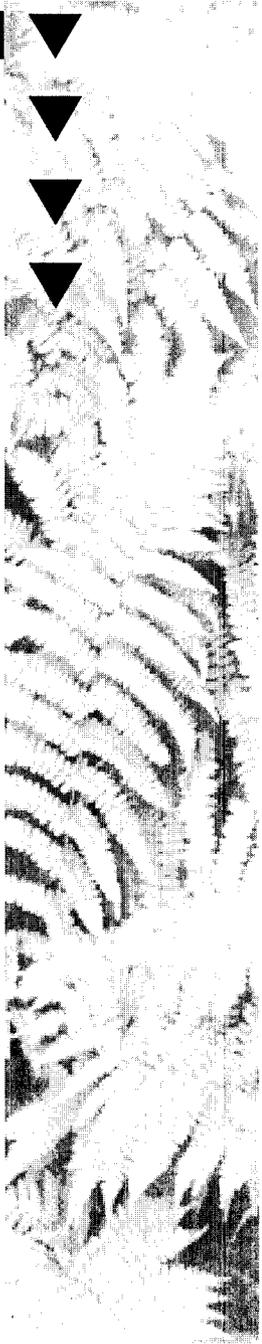
Category	Cost \$
<b>Initial Capital Investment</b> GPE:    GPP:    (mark, as applicable)	
<b>1. Design</b>	
<div style="background-color: #333; color: #fff; padding: 2px;">                     Miscellaneous supplies (attach)                 </div>	\$12,000
<div style="background-color: #333; color: #fff; padding: 2px;">                     Installation                 </div>	\$5,000
<b>Subtotal: Capital Investment = (C)</b>	<b>\$17,000</b>
<b>Installation Operating Expenses</b>	
1. Planning/ Procedure development	
2. Training	
3. Miscellaneous supplies	
4. Startup/Testing	
5. Readiness reviews/Management assessment/ Administrative Costs	
6. Other installation operating Expenses (explain)	
<b>Subtotal: Installation Operating Expense = (E)</b>	<b>          </b>
<b>TOTAL PROJECT FUNDING REQUIREMENTS = (C + E)</b>	
<b>          </b>	
Useful Project Life = (L) <input type="text"/> Years	Time to Implement : <input type="text"/> Months
Estimated Project Termination/Disassembly Cost (if applicable) = (D) \$ <input type="text"/>	
(Only for Projects where L < 5 years; D = 0 if L > 5 years)	
<b>Return on Investment Calculation</b>	
ROI% = <input style="width: 150px;" type="text"/>	
Notes: Before (B) and After (A) are Operating & Maintenance Annual Recurring Costs from Worksheet 1.	



# **Appendix C**

## **ROI**

### **Project Guidance**





## ROI PROJECT GUIDANCE

All ROI Points of Contact (POCs) need to include monthly reporting activities in their ROI Project budget planning; this level of reporting is a required element for the Program.

### **Monthly Reviews**

Reviews of all ROI Projects are held monthly until project completion, generally as a telecon with the respective ROI Point of Contact (POC), Ellen Dagan (RL Waste Minimization), Donna Merry (RFSH), and Jean Renner (RFSH). FY 1997 monthly reviews have been scheduled for the 2nd Tuesday of each month beginning at 7:45 a.m.

December 10	March 11	June 10
January 14	April 8	July 8
February 11	May 13	

ROI POCs will receive the Monthly Review agenda, including tentative time schedule (generally 15 minutes per ROI Project), in advance of the scheduled date. During the review, ROI POCs are expected to report on cost, schedule, and milestone progress (provided in Monthly Report).

### **Monthly Report**

Each ROI POC will receive an electronic monthly reporting format (WordPerfect file) for their respective Project from Jean Renner, the RFSH ROI coordinator. Each ROI POC is expected to update the report each month (see guidance below) and submit it electronically to Jean. An example of the monthly reporting format for the Reusable Rag Contract is on page 70. Use of this reporting format simplifies monthly, quarterly, and annual ROI reporting requirements.

### **Monthly Accomplishments**

Describe activities pursued during the past month and any milestones completed.

### **Upcoming Activities**

Describe future actions that will be taken to achieve milestones and implement the project.

### **Milestone Status**

List each deliverable and scheduled completion date; provide current status, i.e., percent complete for respective reporting period or provide date the deliverable was met.

## ***Budget/Schedule***

Identify authorized budget, actuals fiscal year to date (FYTD), balance remaining, and percent complete.

## ***Issues***

State problem areas or milestones in jeopardy and identify actions to fix or minimize the impact.

## **FY 1997 Close-Out: Year-End Reports: Requests for Carryover**

### ***Close-Out Reports***

Once all activities identified in an ROI Project Proposal have been completed, ROI POCs complete a Close-Out Report. The format for this report includes the following: Report Date, Funding Type, Contact and Telephone Number, Project Title, Project Description, Yearly Savings Projected, Useful Life, Time to Implement, Prevented Waste Type, Quantity of Waste, Comments, and Lessons Learned including issues, corrective actions, and other considerations. The Close-Out Report form is on page 40.

### ***Year-End Reports***

If the ROI Project continues into the next Fiscal Year (FY), a Year-End Report must be completed during September. The Year-End Report includes the same reporting fields identified above for the Close-Out Report and is on page 41.

### ***Request for Carryover***

If your work scope will not be completed during FY 1997 and additional funds are needed during the next fiscal year to continue activities, submit a "P2/WMin FY 1998 Request for Carryover Funding." The Request for Carryover requires the following information: Project Title, Cap/TPCN#, FY 1997 Budget (\$K), FY 1997 Costs Projected through the end of September (\$K), Requested Carryover (\$K), and Carryover Justification Narrative. The Carryover Request form is on page 42.

### ***Documentation of Deliverables***

Any written documentation for your respective ROI Project deliverables should be provided directly to Ellen Dagan, RL Waste Minimization Program Manager, with a copy to Jean Renner for the ROI Project File. Examples of such documentation include: design reviews, case studies, etc.

**FY 1997 Return-on-Investment (ROI)  
Project Monthly Report**

<b>Reporting Month:</b>	September 1997
<b>Point of Contact:</b> <b>Phone:</b> <b>Preparation Date:</b>	Kim McDowell 376-1263 October 4, 1997
<b>Project Title:</b>	Reuseable Rag Contract
<b>Project Description:</b> <i>(Briefly describe the objective(s) of the project)</i>	Procure reusable rag laundry service in place of existing disposable rag practices.
<b>Accomplishments:</b> <i>(Describe activities pursued during the past month and any milestones completed)</i>	<ul style="list-style-type: none"> <li>• Contacts were made with seven potential users</li> <li>• Three of those contacts have joined the program:             <ul style="list-style-type: none"> <li>- 271B/200E, Jim Pinkel (373-0180), 500 rags/month</li> <li>- 2025E/200E, Jerry Vigue (373-5731), 25 rags/month</li> <li>- 310/340 Treated Effluent Disposal Facility Lyman Powell (376-6857), 50 rags/month</li> </ul> </li> <li>• Submitted Year-End Report</li> <li>• Requested FY 1997 Carryover Funding</li> </ul>
<b>Upcoming Activities:</b> <i>(Describe future actions that will be taken to achieve milestones and implement the project)</i>	<ul style="list-style-type: none"> <li>• Follow-up with other four potential users</li> <li>• Continue follow-up with participating facilities to ensure program is being utilized fully and cost effectively</li> <li>• Focus on recruiting non-participating facilities that can benefit from the service</li> <li>• Explore opportunity of combining contracts (ERC, ICF Kaiser, WHC) to one vendor and a single procurement specialist</li> </ul>

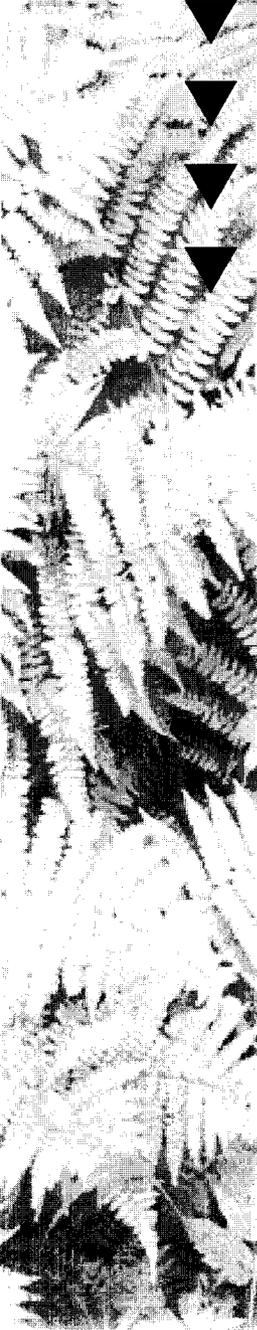
<p><b>Milestone Status:</b>  <i>(List each deliverable and scheduled completion date; provide current status, i.e., percent complete for respective reporting period or provide date the deliverable was met)</i></p>	<ul style="list-style-type: none"> <li>• Establish rag contract with local laundry vendor by 9/30/95. 100% Complete - 9/15/95</li> <li>• Increase facilities/laboratories participating in reusable rag service. Ongoing</li> </ul>
<p><b>Budget/Schedule:</b></p>	<p>Authorized budget: \$5,000          Actuals FYTD: \$600          Balance Remaining: \$4,400          Percent complete: 13%</p>
<p><b>Issues:</b>  <i>(State problem areas or milestones in jeopardy and identify actions to fix or minimize impact)</i></p>	<ul style="list-style-type: none"> <li>• Facilities exist that are generating rag waste which should be utilizing the program             <ul style="list-style-type: none"> <li>- Enhance communication of program and opportunity to reduce waste and save cost</li> </ul> </li> </ul>

FY 1997 Return-on-Investment (ROI) Close-Out Report

<b>Report Date:</b>	
<b>Point of Contact:</b> <b>Phone:</b>	
<b>Project Title:</b>	
<b>Project Description:</b> <i>(Briefly describe the objective(s) of the project)</i>	
<b>Yearly Savings Projected:</b> <i>(ROI calculations)</i>	
<b>Useful Life:</b> <i>(from implementation date)</i>	
<b>Time to Implement:</b> <i>(in months)</i>	
<b>Prevented Waste Type:</b>	
<b>Quantity of Waste:</b>	
<b>Comments:</b>	
<b>Lessons Learned:</b>	<p>Issues:</p> <p>Lessons Learned:</p> <p>Other Considerations:</p>

## FY 1997 Return-on-Investment (ROI) Year-End Report

<b>Report Date:</b>	
<b>Point of Contact:</b> <b>Phone:</b>	
<b>Project Title:</b>	
<b>Project Description:</b> <i>(Briefly describe the objective(s) of the project)</i>	
<b>Yearly Savings Projected:</b> <i>(ROI calculations)</i>	
<b>Useful Life:</b> <i>(from implementation date)</i>	
<b>Time to Implement:</b> <i>(in months)</i>	
<b>Prevented Waste Type:</b>	
<b>Quantity of Waste:</b>	
<b>Comments:</b>	
<b>Lessons Learned:</b>	<p><b>Issues:</b></p> <p><b>Lessons Learned:</b></p> <p><b>Other Considerations:</b></p>



**FY 1998 Return-on-Investment (ROI) Funding Carryover Request (\$K)**

<b>Project Title:</b>	
<b>Cap#/TPCN:</b>	
<b>FY 1997 Budget (\$K):</b>	
<b>FY 1997 Costs Projected thru Sept. (\$K):</b>	
<b>Requested Carryover (\$K):</b>	
<b>Carryover Justification Narrative:</b>	
<b>Submitted by:</b>	
<b>Date:</b>	

# Appendix D

## Some Successful ROI Project Proposals

<b>Tank Farm (242-A) Evaporator Modification Project</b>	<b>Page 44</b>
<b>In-Line Solvent Recovery/ Recycling Project</b>	<b>Page 52</b>
<b>Replace 325 Laboratory Vacuum Pumps</b>	<b>Page 54</b>
<b>Microchemical Instrumentation for 222-S</b>	<b>Page 56</b>



## Tank Farm 242-A Evaporator Modification ROI Project Proposal

### Summary

This project will reduce the amount of mixed waste generated at the 242-A Evaporator and save the Department of Energy \$10,000,000 over 10 years.

The 242-A evaporator receives mixed waste from the Hanford Tank Farms and uses evaporation to reduce the volume of waste that ultimately will be returned to the Tanks farms. During the evaporation process, overhead filters (deentrainer pads) are used to keep particles from entering the vapor stream. The deentrainer pads require periodic cleaning with water to backflush out deposited fines.

At present fresh water is used to clean the filters by rinsing. This generates mixed waste because the fresh water becomes contaminated by the particles in the filters and must be treated as mixed waste.

In addition, fresh water is also used to maintain pump seal pressure. Whenever there is leakage from a pump, the fresh water becomes contaminated with the mixed waste, and must be treated as mixed waste itself. The fresh water currently in use comes from raw Columbia River water that is piped to the evaporator, where it must pass through grates and purifying processes before being used.

Rather than use raw water, this project recycles the condensate generated by the evaporation process. The recycled condensate will be used to clean the overhead filters, and to maintain pump seal pressure. Not only does this result in recycled condensate, but it will greatly reduce the volume of mixed waste generated by reducing the amount of raw water introduced into the process (source reduction), and will cut down on costs associated with handling raw water and mixed waste.

### Description of Current Operation

The 242-A Evaporator uses a high capacity (100 gpm), forced circulation process for concentrating high level tank wastes prior to stabilization and disposal. The evaporator will be operated on a campaign basis through the year 2005 and will probably average 2 to 3 campaigns per year during that period.

Filtered raw water is used in two areas of the process that this proposal is concerned with:

First, the P-B-1 and P-B-2 pumps are equipped with mechanical seals as opposed to a packed seal. These mechanical seals use filtered raw water as a barrier fluid combined with silicon carbide seal rings to prevent intrusions of process solution into the pump bearing cavity. The seal water also performs a

cooling function for the mechanical seal. The seal water system is a single pass design since there is a potential for seal water contamination due to a seal failure. The seal water effluent is collected and returned to the feed tank to be reprocessed.

Secondly, filtered raw water is used for the deentrainment pad spray system. This system uses spray nozzles, operated in a sequential pattern, to clear solids from the lower deentrainment pad.

### Proposed Modifications

A portion of the process condensate (effluent condensed from tank waste) can be rerouted to replace filtered raw water used for the pump seals and deentrainer pad sprays. Under normal operation, process condensate would be supplied from holding tank C-100 to the existing seal water system and deentrainer sprays through a new pump, filters, and 3-way valve. After passing through the seals, turbidity meters, which measure the relative amount of suspended solids in a liquid, or radiation monitors would monitor the seal effluent for potential contamination due to a seal failure (see Figure 3). The effluent from the seals would be recycled back to tank C-100 provided there hasn't been a seal failure. Should a seal failure occur, solenoid valves in the return line would activate, diverting the contaminated seal effluent to tank 102-AW for processing as mixed waste. Process condensate pressure to the seal water system would be monitored by an in line pressure switch. Upon detection of a low pressure condition, the 3-way valve would activate, resulting in the seal water system and deentrainment pad sprays being supplied by the filtered raw water system.

### Current and Proposed Operating Costs

The operating costs used in this cost savings analysis are based on treatment costs of \$2/gallon for 242-A and \$1/gallon for C-018H (200 Area Effluent Treatment Facility). Pump seal water flow rate and deentrainment pad spray flow rate are both 2 gpm over a 45 day operating period (total water usage of 129,600 gallons each per campaign). Cost to lift and treat raw water assumed to be negligible. The cost data is estimated on a per campaign basis.

Current Costs	After Proposed Modification
129,600 gal of Seal water and pad spray must be processed through 242-A and C-018H:	Seal water usage is 0 gal., pad spray remains at 129,600 gal. reprocessed through 242-A and recycled prior to going to LERF.
Treatment cost, 242-A = 259,200 gal. @ \$2/gal. = \$518,400	Treatment cost, 242-A = 129,600 gal. @ \$2/gal. = \$259,200
Treatment cost, C-018H = 259,200 gal. @ \$1/gal. = \$259,200	
Total cost = \$518,400 + \$259,200 = \$777,600	Total cost = \$259,200

\*Dollar values represent conservative estimates for treatment and disposal costs.



**Cost Savings and Waste Reduction.**

The cost savings resulting from implementing use of process condensate for seal water and deentrainer pad sprays would be:

$\$777,600 - \$259,200 = \$518,400$  per campaign.

Raw water usage would be reduced by 259,200 gallons per campaign.

Waste volume reduction would be 259,200 gallons per campaign.

**Implementation Costs and Schedule**

	<u>\$*1,000</u>	<u>Time</u>
Modification design	30	Sept. 1994, 3 weeks
Equipment and raw materials	20	
Fabrication	25	Nov-Dec, 6 weeks
Installation	188	Dec-Jan, 6 weeks
Project management	15	
Total	<u>278</u>	

**Return on Investment**

Total implementation costs are estimated to be recovered during the first processing campaign following project completion. Based on 2.5 campaigns per year the ROI would be 3.7 (370%) for the first year and require about 3 months to recover the initial investment. Cumulative savings over the projected operating life of 242-A could exceed \$10M (20 campaigns).

**Cognizant Engineer**

The Cognizant Engineer and point of contact is Dave Haring 509-373-3514.

## Return on Investment Project Submission Form

1) **Responsible facility for which project is being requested:** EM

**Point of contact:** David Haring MSIN R1-43  
Westinghouse Hanford  
P.O. Box 1970  
Richland, WA 99352  
Phone 509-373-3514

2) **Project Title:**

Tank Farm 242-A Evaporator Modification

3) **Project Information:**

A detailed description is attached.

**Description:** Use process condensate (PC) and water from pump seal to replace raw water and reduce the amount of low-level liquid waste generated. Replace raw water with PC for use as deentrainment pad spray. Figures 1 and 2 show a schematic diagram of the system as it exists now and after modification respectively.

**Duration of project:** Five months

**Waste reduction method:** This project will include both source reduction and recycling.

**Costs:** Capital Equipment Cost including installation \$278K

Operating Cost minimal

Total Cost \$278K

Risk Factor: Off the shelf technology

4) **Project Savings/Return on Investment (ROI):**

4a. **Actual savings**

Each 2.5 million gallon campaign will reduce treatment/disposal costs by approximately \$518K and avoid 259K gallons of waste generated by 242-A. Dollar values include both fixed and variable costs.

4b. **Percent Return on Investment**

Based on 2.5 campaigns per year, the ROI would be about 370 percent.

5) **Impact:**

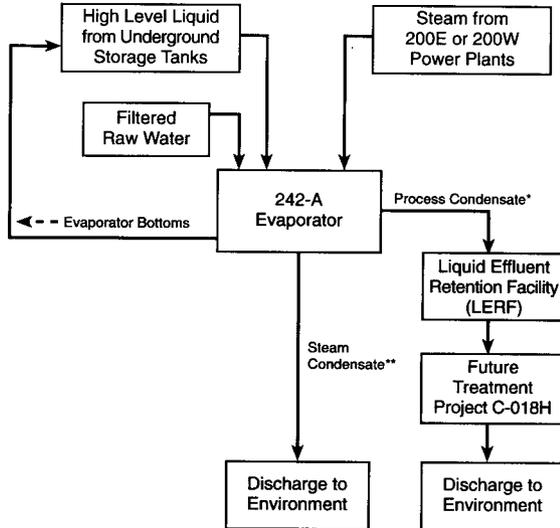
5a. **Describe waste stream(s) affected and amount of waste per year reduced.**

- Raw water used: 650K gallons
- Additional waste treated through 242-A: 324K gallons
- Waste generated by 242-A requiring additional storage/treatment: 650K gallons

5b. **Impact of project on any other factors.**

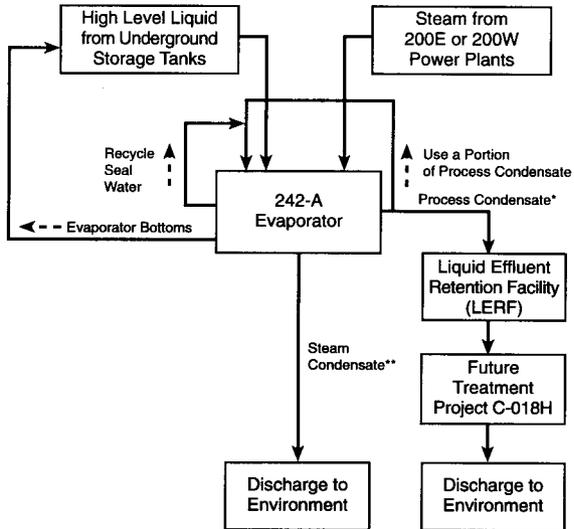
There will be no discernable impact to other factors.

**Figure 1**  
**242-A Evaporator Operation**



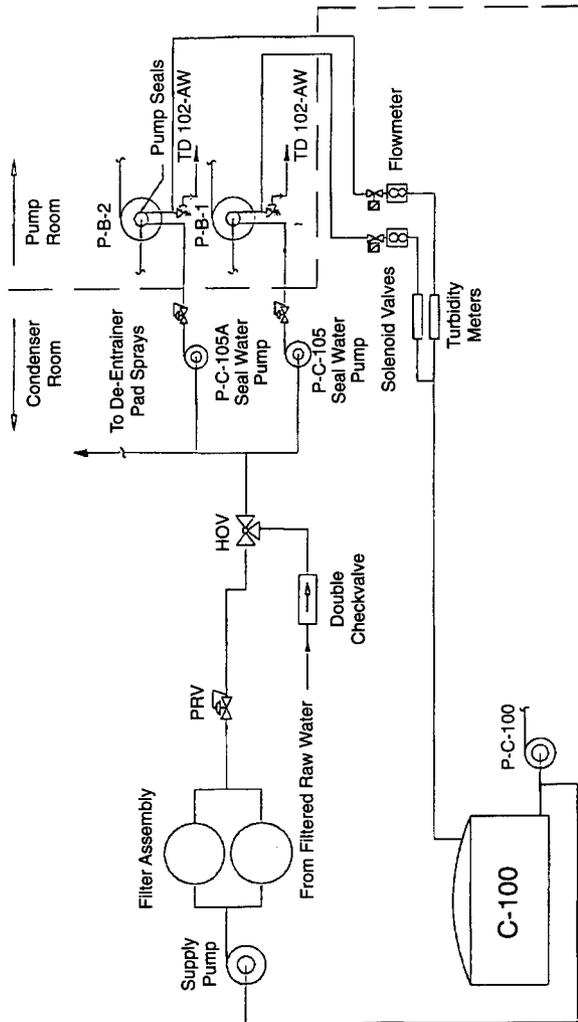
\* Process Condensate (PC) derived from the treatment of tank waste.  
\*\* Condensate derived from power plant steam.

Figure 2  
242-A Evaporator Operation After Modification



\* Process Condensate (PC) derived from the treatment of tank waste.  
 \*\* Condensate derived from power plant steam.

**Figure 3**  
**Details of Proposed Modifications to Use Process**  
**Condensate for Pump Seals and Deentrainer Pad Spray**



## TWRS Plant 242-A Evaporator Modification - Project Management Plan

CONDENSATE RECYCLE LOOP LONG LEAD PARTS LIST	
DESCRIPTION	COST
Aurora Series 110, Model D4S Pump (1 each)	\$ 800.00
Cuno Filter Assemblies Model FL081VEI-EZH2K1 and Filters (2 @ \$2000.00 each)	\$ 4,000.00
Cash Acme Type FR 10, 2" PCV Valve (1 each)	\$ 600.00
DURCO 1½" MG432A5 D4L with Automax S115SR10 Actuator 3-Way Ball Valve (1 each)	\$ 1,100.00
Foxboro Model 841GM-CII-AM Pressure Transmitter (1 each)	\$ 600.00
Foxboro Model 843DP-B01I-SS-A Differential Pressure Transmitter (2 @ \$1000.00 each)	\$ 2,000.00
Associated Hardware	\$ 5,900.00
<b>TOTAL</b>	<b>\$ 15,000.00</b>

CRITICAL CONDENSATE RECYCLE LOOP LONG LEAD PARTS LIST	
DESCRIPTION	COST
Aurora Series 110, Model D4S Pump (1 each)	\$ 800.00
Cuno Filter Assemblies Model FL081VEI-EZH2K1 and Filters (1 each)	\$ 2,000.00
Cash Acme Type FR 10, 2" PCV Valve (1 each)	\$ 600.00
DURCO 1½" MG432A5 D4L with Automax S115SR10 Actuator 3-Way Ball Valve (1 each)	\$ 1,100.00
Foxboro Model 841GM-CII-AM Pressure Transmitter (1 each)	\$ 600.00
Foxboro Model 843DP-B01I-SS-A Differential Pressure Transmitter (1 each)	\$ 1,000.00
Associated Hardware	\$ 2,100.00
<b>TOTAL</b>	<b>\$ 8,200.00</b>

## In-Line Solvent Recovery/Recycling ROI Project Proposal

**Cognizant Engineer:** R.R. Nielson

**Project Type:**  Source Reduction  Recycle/Reuse

**Waste Type:**  LLW  LLW-M  TRU  TRU-M  
 SAN  State  RCRA  TSCA

**Project Duration:** July 1, 1995 to September 30, 1995

**Useful Project Life:** (Years): >10

**Total Project Cost:** \$22.5K

### Narrative:

**Purpose:** To allow reuse of recovered solvent resulting from high performance liquid chromatography (HPLC) in the laboratory and to achieve pollution prevention through reuse of solvent that would normally be disposed of as hazardous waste.

**Scope:** The solvent recovery rate for this type of system is approximately 70% (conservatively). The purchase and installation of the equipment, vendor instruction and in-house training is expected to achieve a payback period of less than 4 months. The primary operational cost savings are due to decreased solvent disposal and decreased purchase costs. The expected savings per year (per unit) is \$1,500 in purchase costs and approximately \$11,000 in waste disposal costs, based on cost data from the DOE Waste Avoidance Model. Five units will be purchased for this project.

	<u>No Recovery</u>	<u>70% Recovery</u>
<b>Annual Waste Quantity:</b>	175 l/yr (~136.5 kgs)	52.5 l/yr (~41 kgs)
<b>Annual Solvent Purchased:</b>	136.5 kgs	41 kgs
<b>Savings:</b>	(136.5) (\$15) = \$2,047.50	(41) (\$15) = \$615.00
	\$2,047.50 - \$615.00 = \$1,432.50	
<b>Hazardous Waste Management:</b>		
<b>Labor:</b>	(136.5 kgs)(\$105) = \$14,332.5	(41 kgs)(\$105) = \$4,305
<b>Savings:</b>	\$14,332.5 - \$4,305 = \$10,027.50	
<b>Disposal:</b>	2.53 drums	0.76 drums
<b>Savings:</b>	(2.53) (\$500) = \$1,265	(0.76)(\$500) = \$380
	\$1,265 - \$380 = \$885.00	
<b>Total Savings:</b>	(\$12,345.00/Unit)(5 Units) = \$61,725.00	
<b>Annual Cost Savings = \$62K</b>		
<b>ROI Calculation:</b>		
(B-A) = \$62K/year		
(C+E) = \$22.5K		
L = Neglected (>10 years)		
<b>Payback Period Calculations:</b>	Payback Period = 22.5K / (\$62K/year) = 0.36 years	
	ROI % = (62K/year) / (22.5K) x 100 = 276%	

**Procedure:** The proposed equipment is the "Solvent Recycler 2000" by Alltech, which attaches to the HPLC waste line and connects to the HPLC signal output. The Recycler monitors the HPLC detector signal to determine when peaks and other contaminants are eluting from the system. As soon as a contaminant is detected, the Recycler's switching valve diverts contaminants to waste. When no contaminants are detected, the Recycler's switching valve sends clean solvent back to the mobile phase reservoir for reuse. An easy-to-operate microprocessor allows user selection of control parameters such as the threshold deviation from zero that is considered a contaminant, and the delay time (for valve opening) after the detector drops below the threshold value.

Solvent can be recovered several times in this manner. Recovered solvent is high in purity and does not affect chromatography results, as proven by UV spectrophotometric analysis of the mobile phase before and after recycling. The purchase price is \$1,895 (including three year warranty) plus shipping, installation fees, and optional spare parts package. The Recycler reduces isochratic mobile phase consumption by recycling pure mobile phase and sending contaminants to waste containers.

**Tasks:** The project will be divided into the following four tasks, to begin July 1, 1995 and to extend through September 30, 1995:

- |                      |   |
|----------------------|---|
| <b>Task 1:</b>       | <b>Product Evaluation</b>   |
| Funding:             | \$1K  |
| Duration:            | July 1 to July 31 (1 month)   |
| Deliverable:         | Determine best system   |
| Description of Work: | Evaluate different vendors/products and determine if "Alltech" system meets current needs             |
| <b>Task 2:</b>       | <b>Equipment Procurement</b>  |
| Funding:             | \$15K   |
| Duration:            | July 1 to August 31 (2 months)  |
| Deliverable:         | Procure and install 5 solvent recycling systems for HPLC applications                                 |
| Description of Work: | Purchase and install equipment  |
| <b>Task 3:</b>       | <b>Reporting</b>  |
| Funding:             | \$2K  |
| Duration:            | September 1 to September 30 (1 month)   |
| Deliverable:         | Report to DOE on cost and waste savings   |
| Description of Work: | Track and report on estimated cost and waste savings  |
| <b>Task 4:</b>       | <b>Project Management</b>   |
| Funding:             | \$4.5K  |
| Duration:            | July 1 to September 30 (3 months)   |
| Deliverable:         | None  |
| Description of Work: | This task will be responsible for project management issues such as budget analysis, scheduling, etc. |



## Replace 325 Laboratory Service Vacuum Pumps ROI Project Proposal

**Project Manager:** J.L. Gaston

**Project Type:**  Source Reduction  Recycle/Reuse

**Waste Type:**  LLW  LLW-M  TRU  TRU-M  
 X\* SAN  State  RCRA  TSCA

\*Process waste water

**Project Duration:** December 31, 1995, eight month duration

**Useful Project Life:** (Years): 15 Years

**Total Project Cost:** \$103,770

### Narrative:

**Current Practice:** During operation of the PNNL 325 laboratory liquid ring vacuum pumps, a continuous waste stream of 17 liters per minute (4.5 gpm) of water is discharged to the process sewer. The water is continually directed into the liquid ring vacuum pump where it is used to seal and cool the pump, during this stage the water is in direct contact with any potentially contaminated liquids, solids or gases that have been drawn into the laboratory vacuum system. After performing its purpose the water is then discharged to the process sewer carrying away heat and any laboratory contaminants captured from the vacuum air stream. A total of 8.9 million liters (2.4 million gallons) of water are dumped to the process sewer each year by these pumps. This waste water is then carried to the Treated Effluent Disposal Facility (TEDF) via the 300 Area underground process sewer.

**Proposal:** The purpose of this project is to procure and install a set of new vacuum pumps that are oilless and will eliminate the need to discharge water to the process sewer. By purchasing these pumps as a skid mounted package with single point electrical and mechanical connections and all controls, disconnects and fuses prewired, as much of the construction project as possible is done by outside sources. The equipment will be installed in a radiological contaminated zone and will require the services of ICF-KH since many hours of radiation training would be required of an outside contractor for this relatively small job. The pumps will eliminate the discharge to the process sewer and will isolate the process sewer from the potential contaminants in the laboratory vacuum system. Since PNNL is charged for water and process sewer on a per person basis the realized cost savings for this work will be seen through reductions of water and process sewage by the landlord groups in the 300 Area. Some cost savings will also be realized by new premium efficiency 20 hp motors that will be specified with the vacuum pumps (approximately \$250 per year).

## Procedure, Schedule (Assume start date May 1, 1995), Cost:

Procedure	Schedule	Cost
1. Specification and procurement of vacuum pumps	9/30/95	76,000
2. Install vacuum pumps	11/30/95	27,770
3. Start operation of vacuum pumps	12/31/95	N/A

## Waste Quantity Reduced (m3 or kgs)

Annual = 8,958 cubic meters of process water

## Return on investment calculation:

\*Annual Operating Costs, Before (B) =

Process water (4.5 gpm) (525,960 min/year) (.03\$/gal)	= \$71,000
Power	= \$3,381

Total (B) = \$74,381

\*Annual Operating Costs (A) =

Power	Total (A) = \$3,116
-------	---------------------

\*Initial Capital Investment (C) =

Vacuum Pump Assemble	= \$70,000
Specification, procurement and layout	= \$6,000
PNNL Construction oversight 2%	= \$280

Total (C) = \$76,300

\*Expense Installation Costs (E) =

RCT (120 hrs) (70\$/hr)	= \$8,400
Construction (ICF-KH)	
Laborer (80 hrs) (37\$/hr)	= \$2,960
Electrician (40 hrs) (48\$/hr)	= \$1,920
Pipefitter (80 hrs) (51\$/hr)	= \$4,080
Insulator (20 hrs) (48\$/hr)	= \$960
Materials (wire, insulation, pipe, etc.)	= \$4,220

Subtotal = \$14,140

KEH Construction administration 35%	= \$4,950
PNL Construction oversight 2%	= \$280
Total Construction	= \$19,370

Total (E) = \$27,770

\*Useful life, in years, of capital and expensed costs (L) = 15 years

Annual Cost Savings:  $B - A - (C + E)/L = \$74,381 - 3,116 - (76,000 + 27,770)/15 = \$64,350$

Percent Return on Investment (ROI%)  $((74,380 - 3,116)/(76,000 + 27,770) - 1/15) \times 100 = 62.0\%$

Pay Back in Years:  $= 15 (76,000 + 27,770) / (15(74,381 - 3,116) - (76,000 + 27,770)) = 1.61 \text{ Years}$



## Microchemical Instrumentation for 222-S ROI Project Proposal

**Title:** Microchemical Instrumentation for 222-S

**Project Manager:** S. G. Metcalf

**Duration:** FY 1995

**Funding Level:** \$80K

**Narrative:**

**Purpose:** Generation of mixed laboratory wastes will be reduced by replacing macroscale chemical instrumentation (ion chromatography, high performance liquid chromatography, spectrophotometry, etc.) with microscale instrumentation (capillary electrophoresis) thus, reducing waste handling and operating costs.

**Scope:** The new microchemical instrument and analytical methods will be developed and implemented at the 222-S laboratory, but will generally be applicable to most DOE laboratories. In addition, related microchemical method developed at other DOE labs, especially PNNL, will be implemented at 222-S.

**Procedure:** The commercially available instruments will be reviewed for their applicability to analyze radioactive samples while minimizing the generation of mixed radioactive/hazardous waste. It is expected that the instrument will need to be modified to accommodate the radioactive and chemically aggressive nature of Hanford samples. The instrument will be installed in 222-S and microchemical analytical methods will be implemented. Selection of microchemical methods and instrumentation will be coordinated with on going work at 222-S, PNL, and other DOE laboratories.

**Task 1: Issue Purchase Order for Microchemical Instrumentation**

**Funding:**

March 1, 1995 to June 30, 1995

**Deliverable:**

Purchase Order

**Description of Work:**

A review of commercially available microchemical instruments will be conducted. Special attention will be given to applicability and adaptability to analyze mixed radioactive/hazardous waste, while minimizing generation of mixed laboratory waste. The best available instrument will be purchased.

**Subtask 1.1: Review available instrumentation**

**Funding:**

March 1 to May 15, 1995

**Deliverable:**

None

**Description of Work:**

Commercially available microchemical instruments will be reviewed for ability to analyze mixed radioactive/hazardous waste with minimal generation of mixed laboratory waste.

**Subtask 1.2: Issue Purchase Requisition**  
Funding:  
Duration: May 15 to 19, 1995  
Deliverable: Purchase requisition  
Description of Work: After review of the available instrumentation and consideration of the findings of the mixed waste study at 222-S (Y3R2A), a purchase requisition will be issued by Organic Chemistry.

**Subtask 1.3: Issue Purchase Order**  
Funding:  
Duration: May 22 to June 30, 1995  
Deliverable: Purchase Order  
Description of Work: Bids will be reviewed and a purchase order will be placed.

**Task 2: Receive and Install Instrumentation**  
Funding:  
Duration: July 1 to August 31, 1995  
Deliverable: Microchemical Instrumentation available for use.  
Description of Work: The instrumentation ordered will be modified, as needed, to accommodate radioactive samples and installed in the 222-S laboratory. The responsible scientist and other staff will be trained. An instrument operating procedure will be written.

**Subtask 2.1: Receive Instrument**  
Funding:  
Duration: July 1 to August 1, 1995  
Deliverable: Instrument at 222-S  
Description of Work: The microchemical instrumentation will be received by the 222-S laboratory. All site preparation will be completed.

**Subtask 2.2: Modify and Install Instrumentation**  
Funding:  
Duration: August 1 to August 31, 1995  
Deliverable: Installed instrumentation.  
Description of Work: The instrumentation will be modified, as needed, to accommodate radioactive samples and installed in the 222-S laboratory.

**Subtask 2.3: Write Instrument Operation Procedure and Train Staff**  
Funding: \$2,94K  
Duration: July 31 to August 31, 1995  
Deliverable: Instrument operation procedure.  
Description of Work: An instrument operation procedure will be written and staff will receive instrument operation training.

**Task 3: Initiate Sample Analysis using Microchemical Instrumentation**  
Funding:  
Duration: August 31 to September 29, 1995  
Deliverable: Microchemical instrumentation available for sample analysis.  
Description of Work: The responsible scientist will review all preparations, make any needed modifications, and initiate sample analysis using microchemical instrumentation.





# **Appendix E ROI Project Proposal Form**



U.S. DEPARTMENT OF ENERGY

HIGH RETURN ON INVESTMENT POLLUTION PREVENTION

PROJECT PROPOSAL

Project Title:

Facility Name:

We certify that the information provided herein is accurate to the best of our knowledge.

The Operations Office, and the above identified Facility, commit to operate the proposed project in the years following the original implementation period, so long as cost savings continue to be realized

DOE Manager  
Responsible  
for Project  
Implementation: \_\_\_\_\_

Operations  
Office WMin/PP  
Coordinator: \_\_\_\_\_

U.S. DEPARTMENT OF ENERGY POLLUTION PREVENTION  
 EXECUTIVE BOARD  
 HIGH RETURN ON INVESTMENT POLLUTION PREVENTION  
 PROJECTS  
 PROJECT SUMMARY DATA SHEET

**Project title:** \_\_\_\_\_ Serial Number: \_\_\_\_\_  
 (HQ Assigned)

Location/Site:    /Hanford Site Implementing CSO:

Operations Office: Richland Operations Office (RL)

Site Contact: \_\_\_\_\_ Phone/Fax:

**Project Summary:**

Provide 3-5 bullets to describe the project, including:

1. Statement of existing process/activity condition
2. Statement of proposed change to process/activity
3. Description of resulting waste/pollutant reductions

Project Duration (months): \_\_\_\_\_ Useful Project Life (Years): \_\_\_\_\_ (L)

**Performance indicators:**

$$ROI = \frac{(B-A) - [(C+E+D)/L]}{(C+E+D)} * 100 = \dots\dots\dots\%$$

O&M Annual Recurring Costs:  
 (i.e., Total Annual Operating Costs)

Annual Costs, Before = \_\_\_\_\_ (B)

Annual Costs, After = \_\_\_\_\_ (A)

Project Funding Requirements:

(i.e., One-Time Implementation Costs)

Capital Investment = \_\_\_\_\_ (C)

Installation Operating Expense = \_\_\_\_\_ (E)

Net Annual Savings =

Total Project Funds = (C) + (E) =

Estimated Project Termination / Disassembly Cost (if applicable) \_\_\_\_\_ (D)  
 (Only for Projects where L < 5 years; D=0 if L > 5 years)



**Waste/Pollutant Quantity Reductions:**

Prevented Waste: (List type and amount in kg or m<sup>3</sup> per year)

**Comments:** Use, as necessary, to qualify relevant aspects of the project not included above.

**ROI PROJECT TITLE**

**1. Project Description**

Attach additional pages as needed to present the relevant information.

**2. Description of Benefit(s)**

Attach additional pages as needed to present the relevant information.

**3. Basis of Data Presented (PPOAs)**

Attach additional pages as needed to present the relevant information.

**4. Project Schedule, Milestones, and Deliverables**

Attach additional pages as needed to present the relevant information.

**5. System/Process Flow Diagrams**

## Worksheet 1: Operating & Maintenance Annual Recurring Costs

Expense Cost Items	Before Annual Costs	After Annual Costs
1. Equipment		
2. Purchased raw materials and supplies		
3. Process Operation Costs: Utility Costs (see Table 2) Labor Costs Routine maintenance costs for processes		
4. PPE & related health/ safety supply costs		
5. Waste Management Costs: Waste container costs Treatment/Storage Disposal costs (see Table 1) Inspection/Compliance costs		
6. Recycling Costs Material collection/separation/ preparation a. Material and supply costs b. Operations and maintenance labor costs Vendor costs for recycling		
7. Administrative/other Costs		
<b>Total Annual Cost: Before (B) =</b>		<b>After (A) =</b>

## Worksheet 2: Itemized Project Funding Requirements

(i.e., One Time Implementation Costs)

Category	Cost \$
<b>Initial Capital Investment</b> GPE:    GPP:    (mark, as applicable) 1. Design 2. Purchase 3. Installation 4. Other capital investments (explain)	
<b>Subtotal: Capital Investment = (C)</b>	
<b>Installation Operating Expenses</b> 1. Planning/ Procedure development 2. Training 3. Miscellaneous supplies 4. Startup/Testing 5. Readiness reviews/ Management assessment/ Administrative Costs 6. Other installation operating Expenses (explain)	
<b>Subtotal: Installation Operating Expense = (E)</b>	
<b>TOTAL PROJECT FUNDING REQUIREMENTS = (C + E)</b>	
<b>Useful Project Life = (L) ___ Years      Time to Implement : ___ Months</b>	
Estimated Project Termination/Disassembly Cost (if applicable) = (D)  (Only for Projects where L < 5 years; D = 0 if L > 5 years)	
<b>Return on Investment Calculation</b>	
$\text{Return on Investment (ROI) \%} = \frac{(\text{Before-After}) - [(\text{Total Project Funding Requirements} + \text{Project Termination}) / \text{Useful Life}]}{(\text{Total Project Funding Requirements} + \text{Project Termination})} \times 100$	
$\text{ROI\%} = \frac{(\text{B-A}) - [(C+E+D)/L]}{(C+E+D)} \times 100 = \dots\%$	
Notes: Before (B) and After (A) are Operating & Maintenance Annual Recurring Costs from Worksheet 1.	



# **Appendix F**

## **Return on Investment**

### **Waste Cost Guide**



## Return on Investment Waste Cost Guide

This guide provides a simplified method to determine waste related costs to be used in calculating return on investment for waste minimization and pollution prevention projects. Available cost information was researched to provide the generator with figures that can be used and supported. This guide provides the cost figures to allow you to determine if a project meets the eligibility requirements. In order to provide consistent products, all generators should use the figures provided herein for proposals.

It is important to note the difference between an avoidable cost and the total cost for an activity. The avoidable cost is that cost which is not incurred due to an action. Many costs are not avoidable. For example, many of the costs related to solid waste disposal and storage site operations are not reduced if less waste is sent to that site. While an individual generator may see less costs because of a reduction in waste, the Hanford Site as a whole will see only a percentage of that cost savings while the remainder of the costs are shifted onto other waste generators as higher per unit fees.

*The ROI Waste  
Cost Guide was  
published  
July 13, 1995,  
and is still used  
today.*

The purpose and appropriate use of these cost figures is for return on investment (ROI) calculations for DOE proposals. These costs represent the total costs for the Department of Energy for waste related activities. The costs may occur over a number of years and at different locations. It is not appropriate to use these costs to estimate specific facility or site savings for other than ROI proposals.

For each waste type a flow chart is provided. Each block has a related cost where available. Where documented and defensible Hanford Site costs were available, those costs and their source are referenced. For other blocks, estimated costs are provided based on costs from other DOE sites or the breakdown of events of which that step is composed. Some costs are not provided on the charts. That is because those costs are highly variable and depend on individual generator conditions or were not available. Costs are provided in fiscal year 1996 dollars per cubic meter of waste unless specifically stated otherwise. A modest escalation rate was used to assure conservative estimates of return on investment.

A project may prevent the generation of a waste. In that case, all avoidable costs related to that waste are eliminated and the sum of all avoidable costs for that type of waste would be used in your calculation. Figure 1 provides the sum of avoidable waste costs for each waste type. Other projects may affect the costs related to one or two of the processes for a waste type such as treatment or disposal. In those cases, refer to the flow charts on pages 68-73 to determine which costs are eliminated.

**Figure 1: Sum of Avoidable Cost by Waste Type**

Waste Type	Avoidable Cost
Low Level	\$ 1,900/cubic meter
Low Level Mixed	Debris w/o Incineration \$13,800 Non-Debris w/o Incineration \$14,500 \$14,400/cubic meter w/ Incineration
Hazardous	\$ 9,600/cubic meter
TRU	\$45,800/cubic meter
Solid Sanitary (Trash)	\$35/metric ton

**Liquid Effluent and Air Emissions:**

The costs for pre-treatment of liquid effluent and treatment of air emissions are highly facility specific. No attempt has been made to provide a general estimate of these costs.

Waste Related Conversions		
1	Cubic Meter	= 35.315 Cubic Feet
1	55 Gallon Drum	= 9.2 Cubic Feet**
		= .26 Cubic Meters
1	4 x 4 x 8 Foot Box	= 144 Cubic Feet**
		= 4.08 Cubic Meters

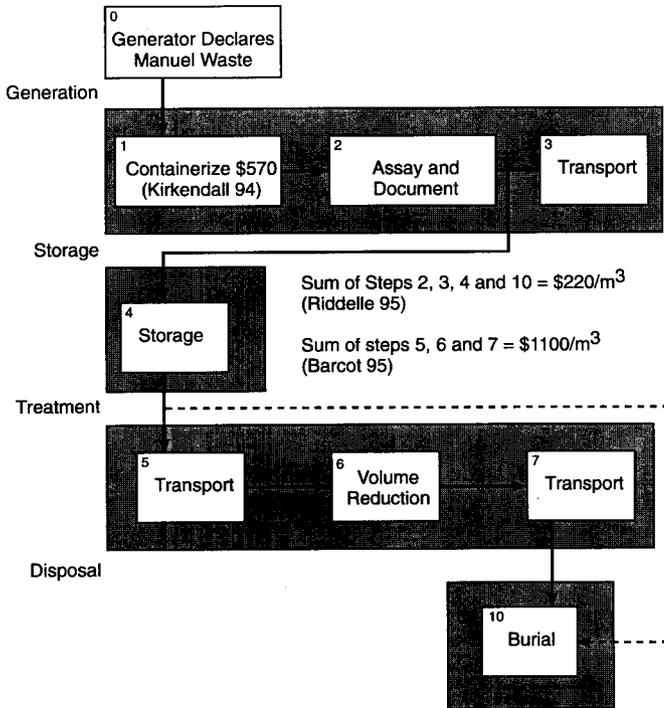
\*\* Solid Waste Disposal uses the outside dimension of the container to establish costs for handling and burial. These conversions should be used in determining avoidable costs rather than the internal capacity of the container.

**Waste Handling and Treatment Personnel Costs**

Job Description	dollars/hr
Operator	44
Rad Tech	46
Engineer	58
Scheduler	45
QC Inspector	65
Acceptance Reviewer	54
Truck Driver	48
Rigger & Crane	117

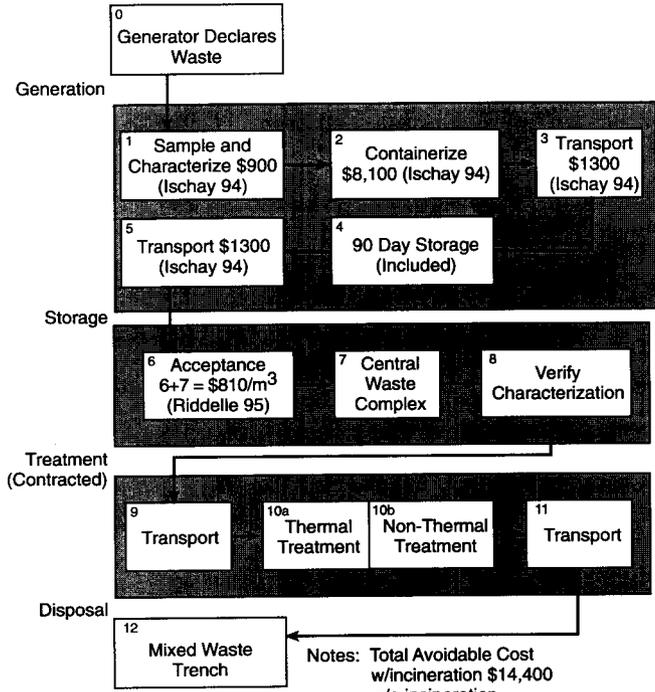
# Flow Charts for Avoidable Waste Costs

## Low Level



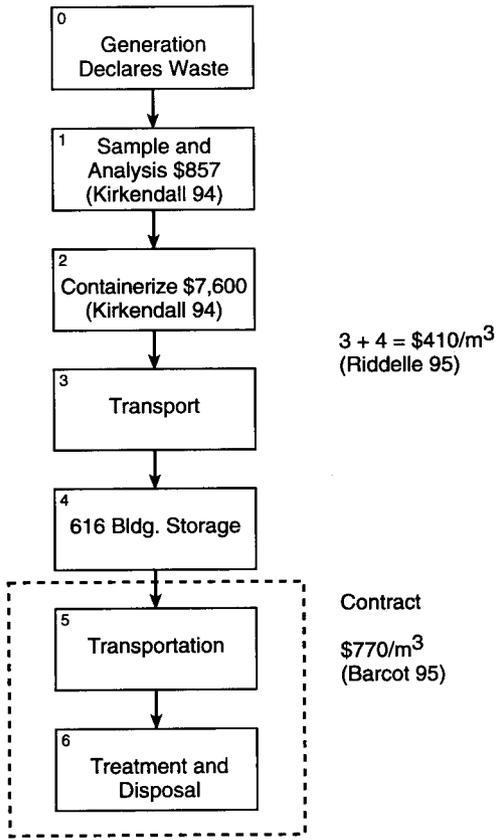
Total Avoidable Cost = \$1900/m<sup>3</sup>

Low Level Mixed



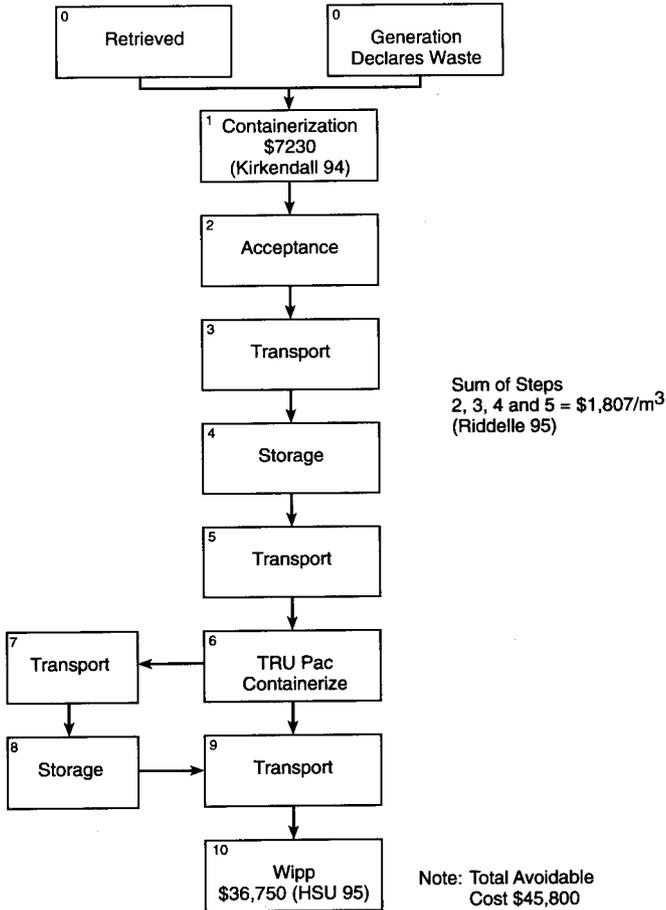
Notes: Total Avoidable Cost w/incineration \$14,400  
 w/o incineration  
 - Debris \$13,800  
 - Non-debris \$14,500  
 10b \$2100/m<sup>3</sup> for non-debris  
 \$1400/m<sup>3</sup> for debris  
 (Rice 95)  
 9+10a+11 = \$5000/m<sup>3</sup>

# Hazardous

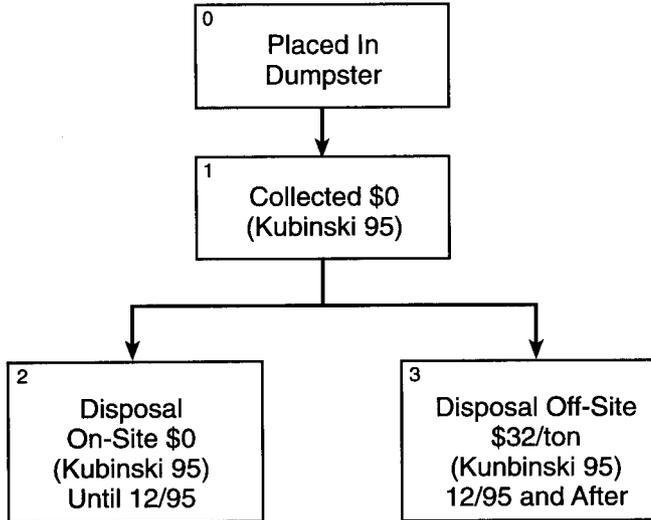


Total Avoidable Cost = \$9,600/m<sup>3</sup>

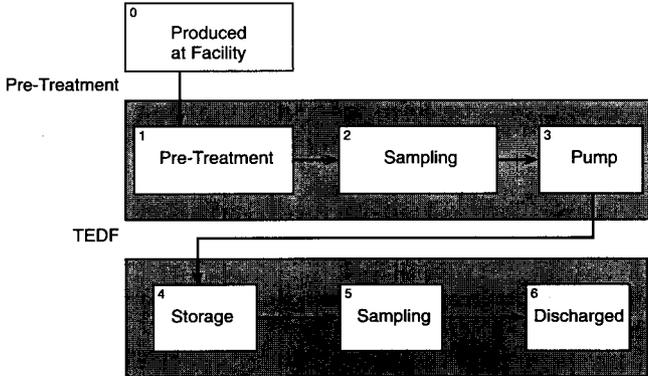
TRU



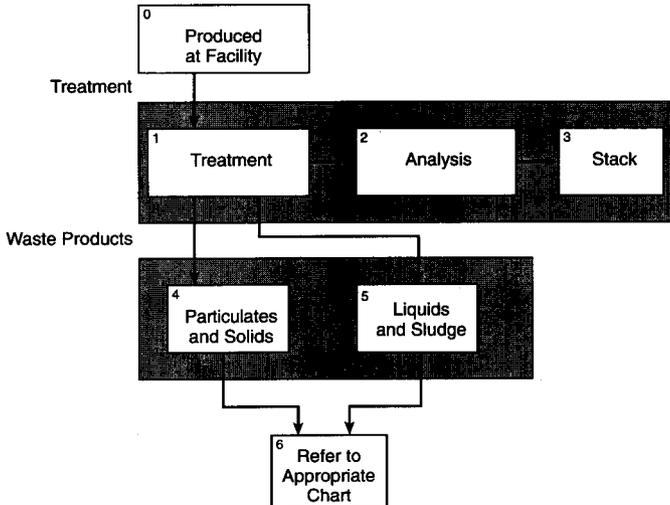
## Solid Sanitary (trash)



Liquid Effluent



Air Emissions





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EG&G 1994, Determination of Avoidable Waste Management Costs draft dated August 1994, author not stated, Prepared by: EG&G Idaho, Inc.

Hsu 1995, Avoidable Waste Management Costs, Idaho National Engineering Laboratory, January 1995, INEL-94/0205, Hus et. al

Ischay 1994, Avoidable Waste Management Costs Report for Fiscal Year 1994 - CPI-35-94 from Chris Ischay, Pollution Prevention Unit, Idaho National Engineering Laboratory to Jill Engel Dated November 7, 1994

Kirkendall 1994, Letter titled Spreadsheets and Flow Diagrams for the Avoidable Waste Management Cost Project, 9455377, from J. R. Kirkendall to K. Hsu dated August 4, 1994

Riddelle 1995, DSI From Jeff Riddelle to Donna Merry titled Avoidable Costs from Waste Minimization Projects dated 7/13/95.

WHC 1995, Budget Guideline Handbook, 02/06/95, Section 8, Rate Guidance for ADS Development