DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	R. D. Hodgson	Date 10/31/1994
Project Title/Work Order		EDT No. 609841 KN
Storage Options for Long Length Contaminated Equipment (LLCE) Items, WHC-SD-WM-ES-316, Rev 0		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
M. D. Aichele	T4-04	1			
T. L. Erickson	H5-33	1			
R. J. Giroir	T4-05	1			
T. M. Greager	G6-47	1			
W. S. Josephson	T3-04	1			
W. H. Hamilton, Jr	N3-10	1			
P. L. Hapke	T4-05	1			
D. C. Hetzer	S6-31	1			
K. L. Hladek	H5-33	1			
R. D. Hodgson	H5-71	1			
J. R. Humphreys	G3-15	1			
K. D. Johnson	H5-33	1			
R. B. Laws	H5-71	1			
M. M. McCarthy	N3-13	1			
J. J. Mahoney	G2-03	1			
E. M. Megahed	T4-03	1			
A. G. Miskho	H6-20	1			
D. E. Nester	H5-33	1			
R. D. Pierce	T3-04	1			
D. B. Powell, Jr	T4-03	1			
H. L. Roach	H5-72	1			
R. J. Roberts	N3-13	1			
J. C. Sabin	H5-71	1			
J. M. Thurman	S6-31	1			
P. A. Titzler	H5-68	1			
OSTI (2)	L8-07	2			
Central Files (orig. 2)	L8-04	2			
extra (RD Hodgson) (5)	H5-71	5			

DEC 14 1994
35 SWHON 21

ENGINEERING DATA TRANSMITTAL

1. EDT 609841

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
M. M. McCarthy Restoration and Upgrade Programs	T. L. Erickson Restoration Projects	N/A
5. Proj./Prog./Dept./Div.:	**6. Cog. Engr.:**	**7. Purchase Order No.:**
ML6: RMW/CWC RECEIPT	R. D. Hodgson	N/A
8. Originator Remarks:		**9. Equip./Component No.:**
Approval		N/A
		10. System/Bldg./Facility:
		Solid Waste Storage
11. Receiver Remarks:		**12. Major Assm. Dwg. No.:**
		N/A
		13. Permit/Permit Application No.:
		N/A
		14. Required Response Date:
		12/10/94

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1.	WHC-SD-WM-ES-316		0	Storage Options for Long Length Contaminated Equipment (LLCE) Items	N/A	1	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng. RD Hodgson		12/6/94	H5-71	WS Josephson			T3-04	3	
1	1	Cog. Mgr. TL Erickson		12/13/94	H5-33	JJ Mahoney			G2-03	3	
		QA				AG Miskho			H6-20	3	
		Safety				PA Titzler			H5-68	3	
1	1	~~Env~~ D.B. Powell, Jr	D.B. Powell	12/8/94	74-03						
1	1	MM McCarthy	MM McCarthy	2 Dec 94	43-13						

18.	19.	20.	21. DOE APPROVAL (if required) Ctrl. No.
RD Hodgson 12-2-94 Signature of EDT Originator — Date	MM McCarthy 2 Dec 94 Authorized Representative for Receiving Organization — Date	TL Erickson 12/13/94 Cognizant Manager — Date	[] Approved [] Approved w/comments [] Disapproved w/comments

RELEASE AUTHORIZATION

Document Number:	WHC-SD-WM-ES-316, REV. 0
Document Title:	Storage Options for Long/Length Contaminated Equiptment Items (LLCE)
Release Date:	12/14/94

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Niki Solis — 12/14/94

Niki Solis

SUPPORTING DOCUMENT

1. Total Pages 24

2. Title	3. Number	4. Rev No.
Storage Options for Long Length Contaminated Equipment (LLCE) Items	WHC-SD-WM-ES-316	0

5. Key Words

LLCE, Long Length Contaminated Equipment, Long Equipment Item, Long Equipment Item Containers, Flexible Receivers, Uncovered Storage, Sprung Structures, Butler, Herculite, Outdoor Storage

6. Author

Name: R. D. Hodgson

R D Hodgson 10-31-94
Signature

Organization/Charge Code 87330/ML644

APPROVED FOR PUBLIC RELEASE 12/14/94 D. Sklir

7. Abstract

A review of the Washington state requirements for the storage of long equipment items removed from tanks indicate that if the contaminated materials on the long equipment items are analyzed and determined to be DW, and not EHW, the containers can be stored on an uncovered, RCRA approved, storage pad. Long equipment items contaminated with reportable levels of EHW, or suspected of being contaminated with EHW, must be protected from the elements by means of a building or other protective covering that otherwise allows adequate inspection of the containers. Storage of the long equipment item containers on an uncovered storage pad is recommended and will reduce construction costs for new storage by an estimated 60 percent when compared to construction costs for enclosed storage.

8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

PATENT STATUS - This document is copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.

10. RELEASE STAMP

OFFICIAL RELEASE
BY WHC
DATE DEC 14 1994
35 Station 21

DISCLAIMER

9. Impact Level N/A

STORAGE OPTIONS FOR LONG-LENGTH CONTAMINATED EQUIPMENT ITEMS

November 1994

R. D. Hodgson

Westinghouse Hanford Company
Richland, Washington

This page intentionally left blank.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TERMS

ALARA	As low as reasonably achievable
CWC	Central Waste Complex
DW	Dangerous waste
Ecology	Washington State Department of Ecology
EHW	Extremely hazardous waste
EPA	U.S. Environmental Protection Agency
ICF KH	ICF Kaiser Hanford Company
RCRA	*Resource Conservation and Recovery Act of 1976*
TRU	Transuranic

STORAGE OPTIONS FOR LONG-LENGTH CONTAMINATED EQUIPMENT ITEMS

1.0 OBJECTIVE

1.1 BACKGROUND

An approved storage location, acceptable to the *Resource Conservation and Recovery Act of 1976* (RCRA), will be necessary for the temporary storage of the long-length contaminated equipment (LLCE) item containers after the items have been retrieved from the tanks. Current estimates for retrieval and processing rates of the items from either the single-shell tank (SST) or double-shell tank (DST) systems indicate that storage locations will be required for the accumulation of 10 containers during 1994, 2 containers during 1995, and 17 containers during 1996. These storage facilities will be used as staging locations for the collection and grouping of the different types and sizes of LLCE items to support decontamination treatment and processing of the items at T Plant.

Currently, the only storage facilities available for the temporary storage of LLCE containers are the metal buildings located at the Central Waste Complex (CWC). Outdoor storage of the containers is being considered because of the amount of storage space that will be required in the near term, the relative ease of unobstructed loading and unloading of containers, and the cost savings that can be achieved through outdoor storage. Outdoor storage also is being considered because of the possibility that unscheduled delays in the processing and/or disposal of LLCE items could extend the temporary storage time, which may result in a large increase in the demand for additional storage space.

1.2 PURPOSE

The purpose of this document is to describe details concerning three storage options available for the temporary storage of LLCE containers, to discuss the regulatory requirements for the storage of LLCE containers, and to present the estimated costs of each storage option. Interim storage of LLCE containers is required to provide a staging area to coordinate the removal, decontamination, and disposal activities associated with the LLCE items. This study is needed to establish a basis for comparison of the storage options and to select a preferred storage option based on the comparisons.

1.3 SCOPE

This report considers three options for the storage of LLCE containers and the regulatory requirements for the temporary storage of dangerous waste (DW) and extremely hazardous waste (EHW) as defined by WAC 173-303, the Dangerous Waste Regulations. The three options considered for storage are:

(1) an uncovered storage pad, (2) a Butler-type[1] storage building, and (3) a Sprung Structure[2]. The cost estimates for the storage are preliminary estimates that were prepared by ICF Kaiser Hanford Company (ICF KH) using existing estimates from similar types of construction projects.

2.0 SUMMARY

A review of the requirements for the storage of containerized LLCE items removed from the SST or DST systems indicate that additional requirements are imposed upon waste matrixes that are designated as EHW in Washington State. If the waste is designated as EHW, the containers must be protected from the elements by means of a building or other protective covering (that allow for adequate inspection).

This study is based on an LLCE packaging configuration that has been designed to perform in accordance with the transportation requirements of the Hanford Site. This packaging configuration is effectively tertiary containment when compared to the definitions and requirements in WAC 173-303.

The primary containment barrier for a LLCE item is a flexible receiver, which is a 90-mil thick synthetic material. The LLCE item, encapsulated in the flexible receiver, is placed in a stainless steel trough, called a carriage assembly, which serves as a secondary containment barrier. The outer container provides tertiary containment to contain any liquids that might migrate by evaporation and condensation. These three barriers satisfy the requirements of WAC 173-303-630(7)(a through c) for containment and for collecting and holding spills.

To meet the requirements of WAC 173-303-630(7)(d), EHW containers must be covered in a manner that allow adequate weekly inspections. This covering could be a transparent tarp type covering to facilitate the visual inspections. The prospects of using liquid sensing instrumentation inside the tertiary containment as a substitute for the visual inspections that are required by state regulations is discussed. Acceptance of the outer container vessel as tertiary containment and the substitution of instrumentation for the required visual inspection could eliminate the requirement for covering the container and for storing the container on a storage pad meeting the requirements of WAC 173-303-630(7)(a through c).

Storage of the LLCE containers on an uncovered RCRA compliant storage pad will reduce construction costs for new storage by a minimum of 60 percent when compared to construction costs for enclosed storage. Storage of the LLCE containers on an uncovered non-compliant pad will reduce storage costs by an estimated 70 percent.

---

[1]Butler Manufacturing Company

[2]Sprung Instant Structure, Incorporated

3.0 RECOMMENDATIONS AND CONCLUSIONS

3.1 RECOMMENDATIONS

The recommendation of this study is to construct an uncovered storage pad for the storage of LLCE item containers. A RCRA-compliant storage pad measuring 18 m by 61 m (60 ft by 200 ft) was considered in this study. A storage pad this size would cost approximately $400,000 and would be capable of storing over 20 LLCE containers, depending on the container size distribution and the storage array.

A further recommendation is to petition the Washington State Department of Ecology (Ecology) under WAC 173-303-910(1) to either modify the provision of WAC 173-303-630(7)(d) that requires a LLCE EHW container to have a protective coverings (because of the tertiary containment and because of the design, strength and integrity of the container), and to substitute remote sensing instrumentation for the visual inspection requirements. If the Petition rule-making procedure (WAC 173-303-910(1)) is not desirable, the RCRA Part B Permitting Process (unit manager meetings and Part B Permit Application) for the Central Waste Complex can be used to address this issue on the Hanford Site.

3.2 CONCLUSIONS

The results of this study indicate considerable savings can be realized from the storage of LLCE containers on uncovered, RCRA-compliant storage pads. The lower cost of an uncovered storage pad will expedite the construction and availability of storage facilities by circumventing time delays that can accompany the securing of funding for large value projects. Furthermore, if the adequate weekly inspection issue can be resolved so that the LLCE containers designated as EHW can be placed on an ordinary non-compliant pad because of the tertiary containment packaging configuration, an even higher degree of cost savings can be realized.

4.0 UNCERTAINTIES

The following uncertainties associated with the storage and inspection of LLCE containers are presented to discuss the details associated with each concern. The resolution of these uncertainties could impact the design or operation of the containers and the storage facilities.

1. It is uncertain what "other protective coverings" the Washington State Department of Ecology (Ecology) will permit for the storage of LLCE that is designated EHW. The inspection referred to is located in WAC 173-303-630(6) and is intended to locate leaking on the primary containment (i.e., the inner container) and to discover deterioration before external leaks can occur. A proposal could be

made that the inner Herculite[3] flexible receiver is the primary containment and would be adequately inspected if the inspection requirements could be satisfied by monitoring the air space between the flexible receiver and the outer container. The Herculite flexible receiver will be supported by a carriage assembly that also will serve as secondary containment for any leaks that would occur in the Herculite. With monitoring instrumentation in the air space, capable of detecting the migration of liquids or other chemicals, the tertiary containment of the outer container vessel could be considered the "covering" required by WAC 173-303-630(7)(d).

State regulations for the storage of EHW require "a building or other protective covering that otherwise allows adequate inspection under subsection (6) of this section," and this protective covering could be interpreted as the container itself. The instrumentation would not eliminate the requirement for weekly inspections of the containers as required. The instrumentation would, however, provide early warning of moisture buildup conditions inside the container.

2. The flexible receiver is fabricated from synthetic material and may be subject to degradation from the decay or action of the encapsulated nuclear and/or organic materials. A 20-year accelerated life study under high radiation conditions is to be performed on the Herculite material to determine the time related detrimental affects of radiation on the Herculite. Manufacturer's test on the Herculite indicate that the material is impervious to liquids. The instrumentation to monitor for liquids or vapors in the air space inside the container would serve as an early warning to the affects of the Herculite deterioration.

3. Only one end of each LLCE item removed from the tanks will have high dose rate radiological contamination. Therefore, only a portion of each LLCE container's length contains extra shielding to reduce the dose rate. This design reduces the gross weight of each container. Migration of high dose rate material inside the container could conceivably allow the material to move beyond the shielded portion of the container. For this reason, containers stored on pads in proximity to each other may require remotely controlled or automated inspection devices to prevent unnecessary exposure of inspection personnel.

   Weekly inspections are required by WAC 173-303-630(6). Inspection requirements specified in WAC 173-303-630(6) include: "At least weekly, the owner or operator must inspect areas where containers are stored, looking for leaking containers and for deterioration of containers and the containment system caused by corrosion, deterioration, or other factors." The weekly container inspections would include the utilization of local- or remote-readout sensing instrumentation that would detect leakage inside the outer container. The outer container will be fabricated from Type 304

[3]Herculite Products Incorporated

Stainless Steel and long-term corrosion is not expected to be a problem. The inadvertent migration of hazardous waste from the flexible receiver inside the outer container, most likely would be by evaporation and condensation of moisture resulting from weather changes. Migration resulting from weather extremes also could occur inside an unheated building.

In the event of an inadvertent migration of radioactive material from the flexible receiver to the inside of the outer container, the accumulation of radioactive material at locations inside the outer container could present relatively high dose rates to inspection personnel. The end of the container with the highly radioactive contaminants will be shielded to reduce dose rates, but the other end of the container will not be shielded because of cost and added weight. Therefore, the container should be stored on an incline so any free liquids in the container would gravity flow toward the shielded end. Also, the weekly inspections should be done by remote methods for as low as reasonably achievable (ALARA) reasons. These remote inspection methods should be consistent with the automated inspection methods planned for use at Phase V storage.

The affective radiological monitoring by automated inspection vehicles may be hampered by high background levels. Even though the external dose rate from each container is expected to be maintained below 100 mrem/h, the accumulation of several containers may present background level situations that prevent effective automated radiological inspections.

4. The 91 cm (36 in.) separation between containers applies to drums in rows. Placement of the LLCE item containers also must comply with the requirements of WAC 173-303-340(3), which states "The owner or operator must maintain aisle space to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency, unless it can be demonstrated to the department that aisle space is not needed for any of these purposes."

   If a straddle carrier vehicle is used, container spacing must allow for the spacing and width of the vehicle's wheels. If a single boom crane is used, a heavy, adjustable spreader would be required to distribute the container weight on the single hook. The adjustable spreader would be required to adjust to the center of gravity of an uneven long-length load.

   If an outdoor pad or Sprung-type structure is used, two boom cranes may be necessary to pick and place the containers from a truck bed to the storage location. An adjustable spreader would not be necessary with two cranes but the mobility may be required because the cranes could be required to travel some distance with the load suspended while picking or placing.

For a Butler-type building, dual bridge cranes could space the containers in acceptable arrays to satisfy the isle spacing and inspection requirements.

5. If a physical cover is used over the stored containers (other than a structured roof), the covering would have to be either high enough for inspection to occur or be transparent so the LLCE container can be viewed. Any cover that is draped over the containers would have to be removed during container placement or removal. Any removable covering would probably require a structural support system or a retracting mechanism to facilitate the method of removal and replacement. The Sprung-type structure, the movable Butler-type building and the Butler-type building with a movable roof could satisfy this requirement by moving all, or a portion of the structure, on a rail support mechanism.

6. The amount of storage area that will be required to store LLCE items that are designated as EHW cannot be determined at this time. Records indicate that essentially all underground storage tanks contain chemical constituents that could result in an EHW designation of the tank; however, the concentration of those chemical constituents is undetermined in many cases. Based on the designation steps that are required in WAC 173-303-070, it is believed that most, if not all, of the retrieved LLCE items will not be designated as EHW, since the entire weight of the waste matrix is used to determine the concentration of the chemical constituents. This is the case for every designation step with the exception of "U" and "P" waste codes listed in WAC 173-303-9903. The three LLCE items that presently are stored in the Central Waste Complex are designated as DW. Without information which can identify the specific chemical constituents and the concentration of those chemical constituents in each tank, an accurate forecast of the quantity of EHW designated LLCE items can not be made.

   The designation process as identified in WAC 173-303-070(3), requires waste to be checked against the following sections and in the following order:

   (i) First, Discarded chemical products, WAC 173-303-081;
   (ii) Second, Dangerous waste sources, WAC 173-303-082;
   (iii) Third, Dangerous waste characteristics, WAC 173-303-090; and
   (iv) Fourth, Dangerous waste criteria, WAC 173-303-100.

   The first designation procedure compares the chemical content with the discarded chemical products list, WAC 173-303-9903. The application of any waste codes from the Acutely Dangerous Chemical Product portion of this list would cause an LLCE item to be designated as EHW regardless of concentration of the chemical constituent associated with the waste code. A review of existing Part A Permits for the SST and DST System indicate that "U" and "P" codes are not a concern.

The second designation procedure categorizes dangerous waste sources according to process groupings that would generate the waste listed in WAC 173-303-9904. Of these "F" and "K" waste codes, only F001 and F002 waste codes present a potential EHW designation concern. For these two waste codes, the chemical constituents listed under these codes that exist in the SST and DST System in concentrations greater than 1.0 percent of the total waste volume would cause the waste to be designated as EHW.

The third designation procedure discusses the characteristics which a solid waste might exhibit and which would cause that waste to be a dangerous waste. Any waste exhibiting the properties of ignitability, corrosivity and reactivity will be designated DW and not EHW. Waste exhibiting toxic characteristics, however, includes heavy metals and organics which may exist in the waste in concentrations that require EHW designation.

The fourth designation procedure discusses the criteria for determining if a waste should be designated as EHW because of the toxic, persistent and/or carcinogenic characteristics of the waste. Of these three, only toxicity and persistence can result in an EHW designation. For toxicity, this section compares the percent of toxic waste to the total amount of waste to determine DW or EHW designation from a graph in WAC-173-303-9906. For persistence, the sum of all persistent chemical constituents must be below 100 p/M in order for the waste to be designated as DW and not EHW.

7. WAC 173-303-630(7)(c) indicates that secondary containment need not be provided in certain circumstances based on the type of waste being managed. Of those, the one that is applicable to LLCE is whether free liquids are present in the matrix. If free liquids are present, then this allowance is not applicable.

   Liquid absorbent packets have been designed to be attached to the inside surface of the flexible receiver to absorb all of the liquids that are trapped by the LLCE item during the removal and rinsing of the item. The amount of liquid absorbent material used in the flexible receiver is calculated to be more than the amount required to absorb all of the anticipated amounts of free liquids that will be contained in or on the LLCE item.

   Some of the LLCE items placed into the containers will be contaminated with high dose rate radioactive materials. Of concern is the possible affects that high radiation dose rates will have on the liquid absorbent material and material's ability to retain the absorbed liquids during storage. High dose rate radiation over a period of time might have an affect on the chemical characteristics of the absorbent material, and release the absorbed liquids back into a free state. Surface dose rates of 60 R/h, and possibly higher, are expected on some of the retrieved LLCE items. The affect of high dose rates on the ability of the absorbent material to consistently perform satisfactorily over an extended period of

indicates that the absorbent material will not hold the liquids during the time when the LLCE will be stored, WAC 173-303-630(7)(c) cannot be used in design considerations.

5.0 DESCRIPTION OF ALTERNATIVES AND SOLUTIONS

5.1 CRITERIA

5.1.1 Regulatory Requirements

According to WAC 173-303-630(7)(d), "EHW in containers must be protected from the elements by means of a building or other protective covering that otherwise allows adequate inspection under subsection (6) of this section." The SST and DST Systems Part A permits state in the text that EHW may be contained in the waste that is stored within these tanks. There is a potential that the LLCE removed from these tanks and containerized also might designate as EHW. If this is the case, then these containers will have to be stored in accordance with WAC 173-303-630(7)(d). If it can be demonstrated that the LLCE does not designate as EHW, either by existing tank content records or sample analysis, or both, then WAC 173-303-360(7)(d) would not be applicable and the LLCE item container could be stored on an outdoor storage pad. The weight of each LLCE item can be used in the designation process.

The requirements for storage of LLCE items designated as DW is specified by section WAC 173-303-630(7)(a through c). The section includes the requirements for a bermed or curbed storage area capable of collecting and holding spills and leaks and the capability to hold the additional volume that would result from the precipitation of a maximum 25-year storm of 24-hour duration (WAC 173-303-630(7)(a)), which is 41 mm [1.6 in.] of precipitation (WHC 1988, Chapter 3).

However, WAC 173-303-630(7)(c) states that if no free liquids are present, the waste does not exhibit either the characteristics of ignitability or reactivity, and the waste is not designated as F020, F022, F023, F026, or F027, then the containment system as described in the section is not needed.

The LLCE containers will not contain free liquids because of the liquid absorbent material inside the flexible receiver. The SST and DST waste is not classified as ignitable or reactive, and wastes designated as F020, F022, F023, F026, or F027 are not present in the tanks. Therefore, the containment system described in WAC 173-303-630(7)(a and b) is not needed if one of the two following requirements are met as specified in WAC 173-303-630(7)c)(i and ii)

"(i) The storage area is sloped or is otherwise designed and operated to drain and remove liquid resulting from precipitation; or

(ii) The containers are elevated or are otherwise protected from contact with accumulated liquids."

Based on the above requirement (i), if the LLCE container is designated as DW, the storage area would be sloped to accumulate liquids and a method to effectively drain or remove the accumulated liquids would be required. The alternate requirement (ii) of elevating the containers to protect them from accumulated liquids would require a simple redesign to lengthen the container support structures. If the containers are elevated, the sloped storage area and accumulation point would not be necessary.

5.1.2 Definitions of Waste Types

The waste types to be handled will fall into the general classifications of mixed waste. The mixed waste will contain various quantities of constituents that can be independently designated as DW, or EHW. This section provides the definitions consistent with the use of the various mixed waste terms.

The following definitions were taken from the WAC 173-303-040, Definitions. The U.S. Environmental Protection Agency (EPA) uses the general term "hazardous waste" to describe the materials that the EPA regulates as hazardous and/or mixed waste. Ecology uses the term "dangerous waste" to differentiate the state listing of regulated materials from the Federally regulated listing. The state listing of regulated materials includes the Federal listing, but also contains additional wastes that are state regulated, but not necessarily regulated by the EPA.

> "Hazardous wastes" means those solid wastes designated by 40 CFR Part 261, and regulated as hazardous and/or mixed waste by the United States EPA.
>
> "Dangerous wastes" means those solid wastes designated in WAC 173-303-070 through 173-303-100 as dangerous, or extremely hazardous or mixed waste. As used in this chapter, the words "dangerous waste" will refer to the full universe of wastes regulated by this chapter. The abbreviation "DW" will refer only to that part of the regulated universe which is not EHW.
>
> "Extremely hazardous waste" means those dangerous and mixed wastes designated in WAC 173-303-070 through 173-303-100 as extremely hazardous. The abbreviation "EHW" will be used in this chapter to refer to those dangerous and mixed wastes which are extremely hazardous.
>
> "Mixed waste" means a dangerous, extremely hazardous, or acutely hazardous waste that contains both a non radioactive hazardous component and, as defined by 10 CFR 20.3, source, special nuclear, or by-product material subject to the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.)

5.2 ASSUMPTIONS

The following describes some of the details of container design and special requirements concerning the temporary storage of LLCE item containers.

5.2.1 Storage Space Requirements for Long-Length Contaminated Equipment Item Containers

The quantity and schedule for the removal of LLCE items from the SST and DST systems is still being determined. However, under present plans, a large number of LLCE items must be removed from the SST system before the removal of the tank contents. T Plant Systems Engineering Team estimates indicate that from 40 to 60 LLCE items will be removed from the tanks during the next 8 years.

Questions concerning the viability of outdoor storage have been raised because of the Ecology requirements for the storage of waste in containers that is designated as DW or EHW. The waste in the SST and DST systems may be designated as EHW because of the chemical inventory of the waste streams that were placed into the tanks. Initial determination of the EHW contaminants on retrieved LLCE items will be from tank records.

A principal concern associated with the outdoor storage of LLCE items is the possibility that the length of storage time could be extended because of potential delays to further treat and dispose of the LLCE. Any extension in the storage time would necessarily increase the number of stored items and the amount of storage space that will be required. An extended storage time also would increase the probability that a leak might occur in one or more of the containers. A recent breach of containment occurrence associated with the retrieval and storage of air lances, involving the leakage of contaminated material directly to the environment. To prevent future leakage, the LLCE container has been designed to be superior in structural and containment integrity compared to the containers used for the air lances.

The T Plant Systems Engineering Team has estimated that from 40 to 60 LLCE items are scheduled to be removed from the underground tanks and placed into containers in the near term, from 1994 through 2002. Funding for the decontamination and pre-disposal processing facility, expected to be located at T Plant, will be presented as a 1996 line item. The processing facility is expected to become operational in 1999. After the facility is operational, processing of the items is expected to occur concurrently with the removal of additional items from the tanks.

Currently, the only storage spaces available for the temporary storage of LLCE item containers are the Butler buildings at the Central Waste Complex. These buildings were intended for the storage of drums and boxes and do not easily accommodate the handling of LLCE containers with the sizes and weights of these containers. The sizes and weights of the containers are shown in Table 1.

Table 1. Length, Height, Width, and Weight of Loaded Containers.

Container type	Nominal length of container (m [ft])	Storage height of container with supports (m [in.])	Storage width of container with supports (m [in.])	Nominal container weight with payload and shielding (kg [lb])
1	11 (36)	1.3 (50)	1.3 (50)	20,500 (45,000)
2	15 (52)	1.3 (50)	1.3 (50)	31,000 (68,000)
3	21 (70)	1.3 (50)	1.3 (50)	40,500 (89,000)
4	21 (70)	1.7 (66)	1.7 (66)	53,000 (117,000)
5	15 (52)	2.2 (86)	2.2 (86)	53,000 (117,000)
6	21 (70)	2.2 (86)	2.2 (86)	68,000 (150,000)

5.2.2 Container Design

The six different sizes of LLCE item containers shown in Table 1 will be fabricated for the transportation of the items. The lengths of the six different sizes of containers will be 11, 16, and 21 m (36, 52, and 70 ft) long. The approximate outside diameters of the containers (with supports) will be 127, 168, and 218 cm (50, 66, and 86 in.). From Table 2, an estimated 66 percent of the containers scheduled for the transportation of items will be 21 m (70 ft) long and 122 cm (48 in.) in diameter. An additional 22 percent of the containers will be 21 m (70 ft) long and 168 cm (66 in.) in diameter.

Table 2. Estimated Forecast Usage of LLCE Item Container Sizes.

Container type	Container length			Container diameter			Percent usage*
	11 m (36 ft)	15 m (52-ft)	21 m (70-ft)	1.3 m (48-in.)	1.7 m (66 in.)	2.2 m (86-in.)	
1	X			X			0
2		X		X			6
3			X	X			66
4			X		X		21
5		X				X	5
6			X			X	2

* T Plant Systems Engineering Team estimate.

From Table 2, it also can be seen that 89 percent of the containers that will be used are 21 m (70 ft) long. The diameter distribution of the 89 percent that are 21 m (70 ft) long is: 74 percent are 122 cm (48 in.), 24 percent are 168 cm (66 in.), and 2 percent are 218 cm (86 in.) in diameter. If a 1,114-m^2 (12,000-ft^2) storage pad is built with dimensions 24 m (80 ft) by 46 m (150 ft), the approximate storage capacity of the pad would be either 15 containers that are 218 cm (86 in.) in diameter, 18 containers that are 168 cm (66 in.) in diameter, or 46 containers that are 122 cm (48 in.) in diameter. Actual storage conditions will, however, involve a mix of the different sized containers.

The sequence in which the containers will be received at the storage pad is dictated by the retrieval schedule for the LLCE items. Since weekly inspections of the containers are necessary, the laydown spacing and orientation of the containers on the storage pad must accommodate access for inspection while conserving storage area space. The area required for the lay-down of the containers is shown in Table 3.

The LLCE item containers are designed to be reusable and to have a usable service life of 20 years. The containers will be capable of outdoor storage and will be provided with radiological shielding. The shielding will reduce the radiation levels at the surface of the packaging to less than 100 mrem/h to decrease exposure to personnel during the inspection, transportation, and storage of the containers.

The container package will be capable of both transporting and storing the payload. The transport trailer will be capable of receiving the carriage assembly and LLCE item into the container at the retrieval site. The container package will then be transported to storage or to the treatment site.

Table 3. Lay-Down Area Required for the Storage of Containers.

Container type	Container length (m [ft])	Container width (m [in.])	Container plus aisle width (m [in.])	Container storage footprint (m^2 [ft^2])
1	11 (36)	1.3 (48)	2.2 (86)	24 (258)
2	15 (52)	1.3 (48)	2.2 (86)	34.6 (373)
3	21 (70)	1.3 (48)	2.2 (86)	46.5 (502)
4	21 (70)	1.7 (66)	2.6 (102)	55.3 (595)
5	15 (52)	2.2 (86)	3.1 (122)	49.2 (530)
6	21 (70)	2.2 (86)	3.1 (122)	66.3 (712)

The containers are fabricated from 304 SST and consist of long sections of standard wall pipe with end flanges for closures. The end closures use a

double O-ring elastomer seal with a leak-test port located between the seals. Stiffening rings are installed at intervals along the length of the containers to support and protect the packaging during normal transport conditions and storage. Lay-down supports are provided on each container to maintain the container in an upright position and to distribute the weight of the container on the storage pad. The outside dimensions for the lay-down supports are included in the container width dimensions given in Table 3.

Four different scenarios have been prepared to show the different lay-down patterns that could be utilized for the storage of the containers. These lay-down patterns are shown in Figures 1 through 4. Figures 1, 2, and 3 show the use of a boom crane for moving the containers and Figure 4 shows the use of a straddle carrier. The figures show the relative number of containers that can be stored on a pad, depending on orientation of the array and the method for moving the containers.

5.3 ALTERNATIVES

Three alternative types of storage facilities were considered for use as LLCE item container storage. The three specific types are the Sprung-type structure, the Butler-type building and the open storage pad. The Sprung-type structure and the Butler-type building are in the category of covered storage and would fulfill Ecology's requirements for the storage of EHW since WAC 173-303-630(7)(d) specifically provides for compliance by using a building. The outdoor storage pad alternative also would require a cover over the EHW container if the position is taken that the outer transport container is termed the primary container and is the container surface that requires inspection. However, the description of the cover may not be consistent with a roof cover, but may be subject to interpretation of the term "cover."

5.3.1 Types of Storage Facilities

5.3.1.1 Sprung-Type Structure. The Sprung-type structure is constructed from extruded free-span aluminum arches, integrally connected to a covering that is an all-weather outer membrane of P.V.C. coated polyester. The specific design intended for container storage would be constructed on rails with a structural division at the center support beams to allow either half of the building to be moved on the rail system. Half of the building would be moved (on the rail system) to open that end of the building so a boom crane could access the storage pad locations for placement or retrieval of the containers. The structure would be provided with insulation, lighting, and fire control systems. If a straddle carrier vehicle were used for the placement and retrieval of containers in the building, the rail system could be eliminated.

5.3.1.2 Butler-Type Structures. Butler-type structures are presently in use at CWC for the storage of waste in drums and boxes. These buildings are of metal construction and are provided with insulation, lighting, and fire control systems. Ventilation is provided by unfiltered exhaust fans. Because the roof cannot be removed from this type of building, placement and retrieval of the containers must be done through roll-up doors. The ability to move the

Figure 1. Long-length Storage Facility, Liftcrane Concept, Perpendicular Array.

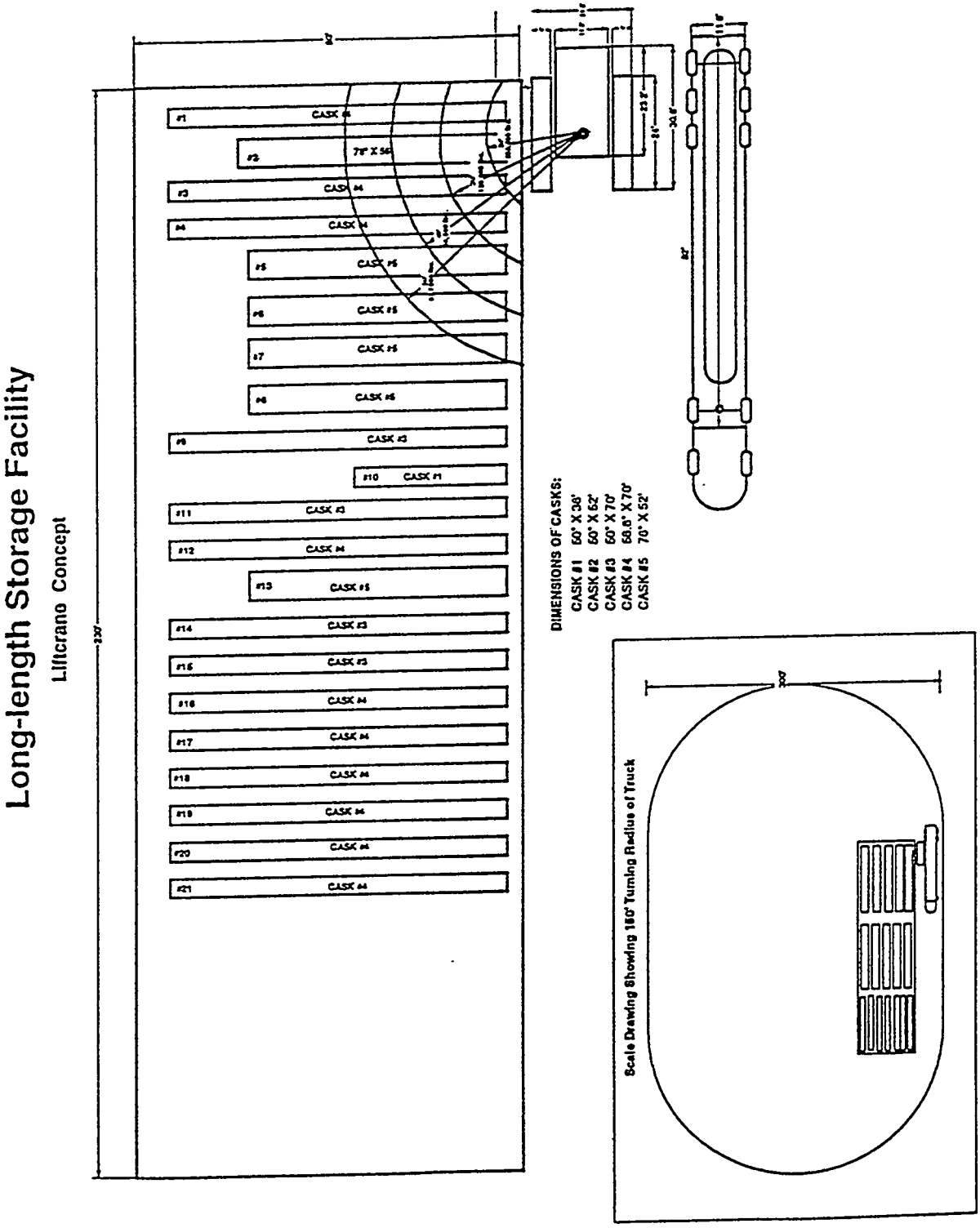


Figure 2. Long-length Storage Facility, Liftcrane Concept, Parallel Array.

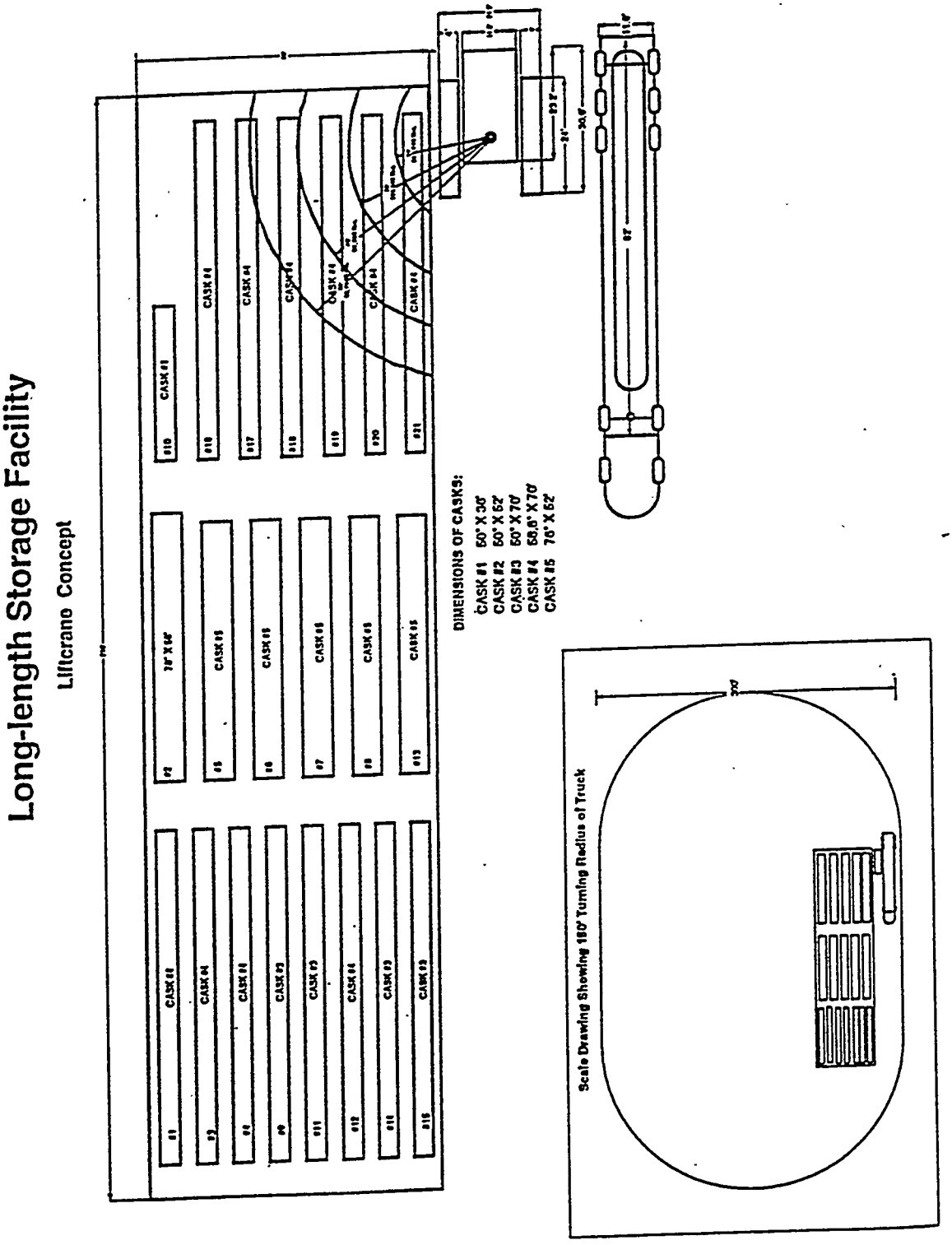


Figure 3. Long-length Storage Facility, Liftcrane Concept, Angular Array.

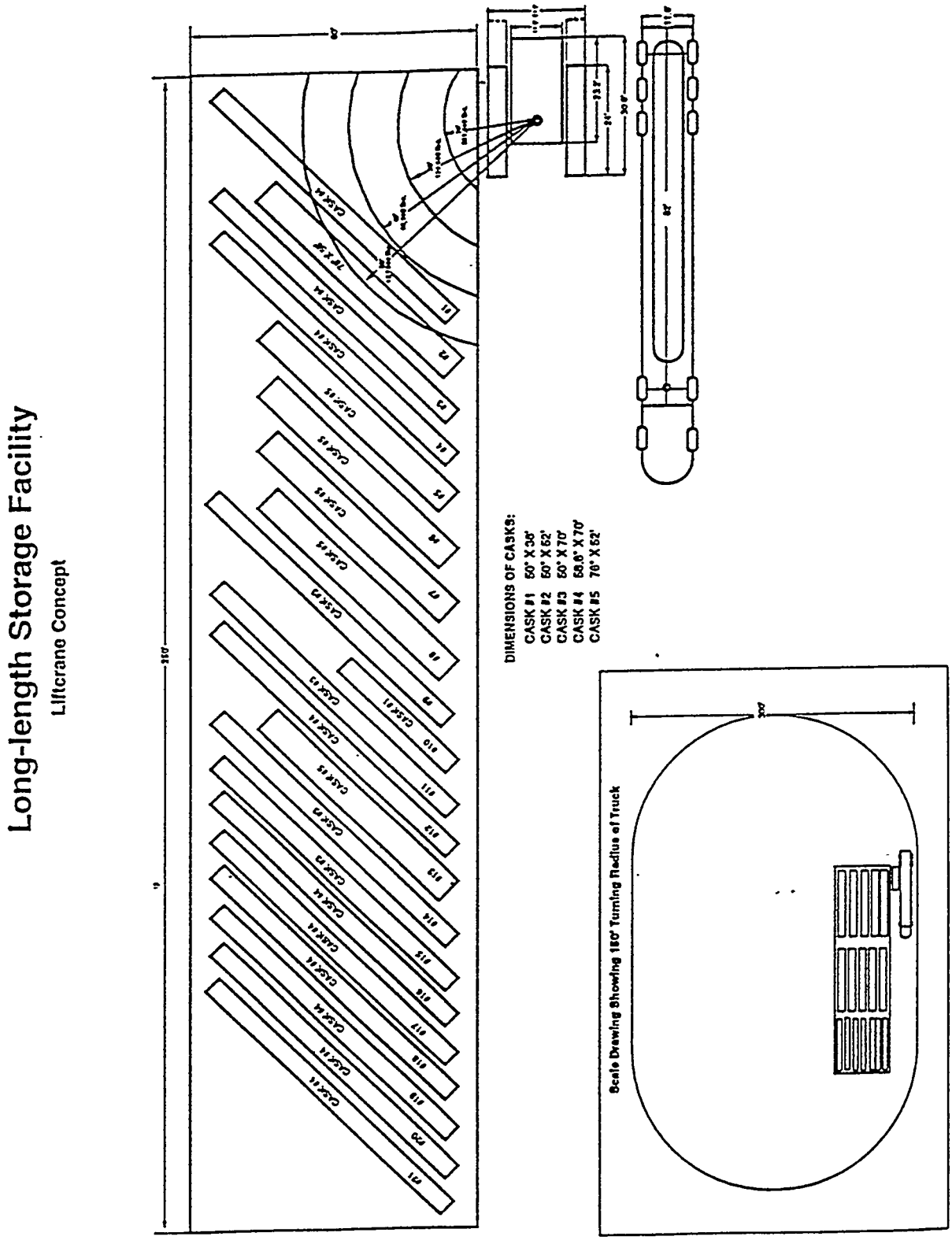
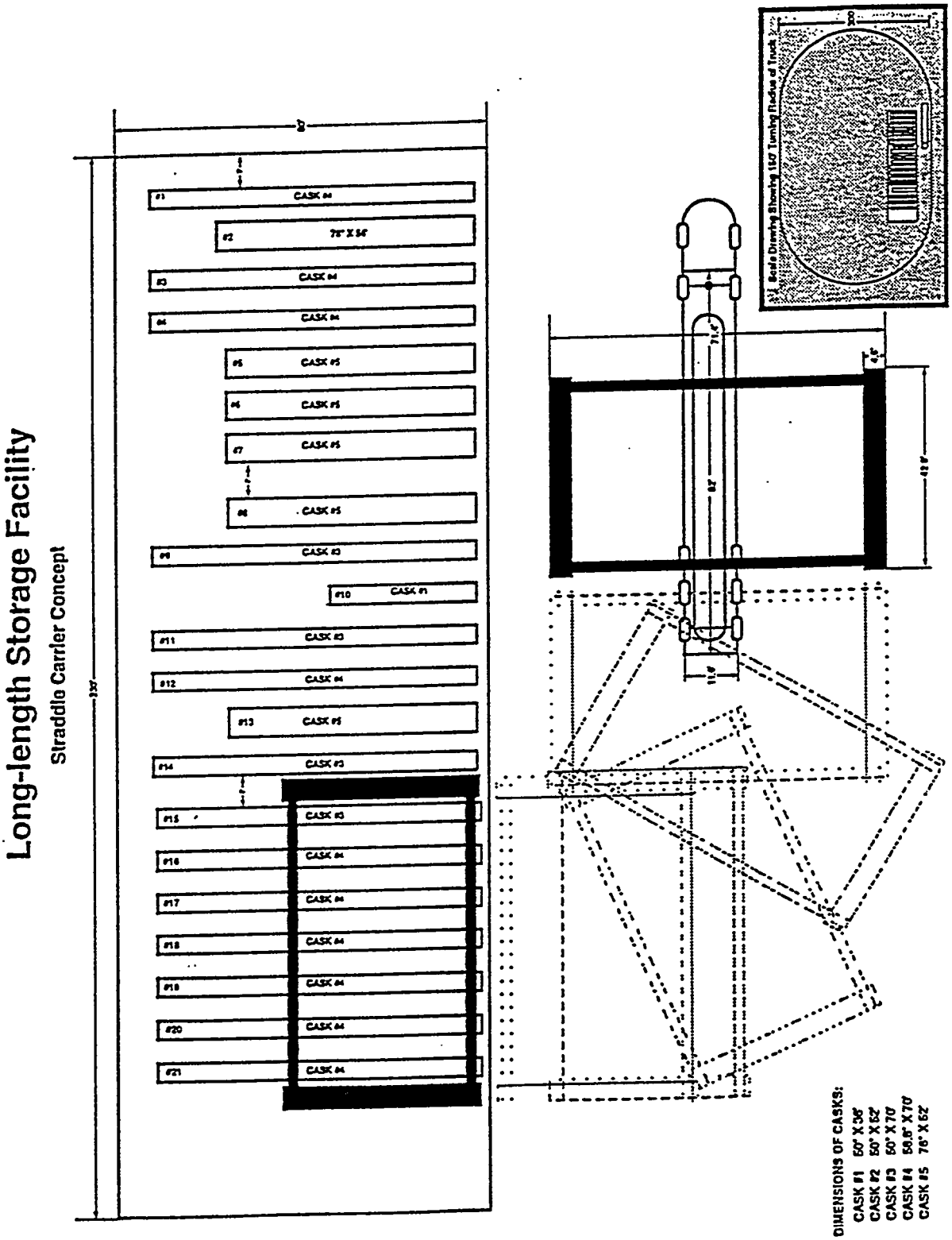


Figure 4. Long-length Storage Facility, Straddle Carrier Concept.



long, heavy containers in and out of the building is seriously restricted by the relatively low roof height of the structure. To efficiently use this type of building, dual bridge cranes, a straddle carrier vehicle, or air operated load modules would be required for the placement and retrieval of containers.

5.3.1.3 Outdoor Storage. If it is determined that the outer transport container is the primary container requiring inspection, the outdoor storage pad for the LLCE item containers will require a bermed, sloped, impervious pad design, capable of containing the precipitation of a maximum twenty-five year storm of twenty-four hours duration. The pad design would be consistent with the design of the pads required for the Butler buildings; however, a higher berm may be required for an outdoor pad. Picking and placing the containers on the outdoor pad could be accomplished with either an boom crane or a straddle carrier vehicle. The berm could present a problem to the movement of a crane or vehicle if travel on and off the pad is required while transporting a container.

If the outer transport container is considered tertiary containment, the requirements for the EHW storage are not applicable. This is because each individual LLCE container meets the requirement of WAC 173-303-630(7). The estimated costs of construction of asphalt and concrete storage pads are about the same. However, a concrete pad would be desirable because of the tonnage of the heavier containers and the tendency for asphalt to deform at high ambient temperatures under heavy loads.

5.3.1.4 Other Types of Structures. Other types of structures considered for the storage of containers with EHW contaminated contents were a moveable Butler-type building on rails and a Butler-type building with a moveable roof. These types of buildings have been looked at for other applications onsite but cost estimates for the buildings are not available. The use and regulatory acceptance of these buildings would be similar to the Sprung-type structure. The costs would be comparable to a moveable Sprung-type structure.

5.3.2 Regulatory Requirement Comparison

The Sprung-type structure and the Butler-type building options provide for compliant storage without question since the regulations specifically state that a building will meet the EHW protective covering requirements. When an open pad is selected while relying on an alternate covering approach, the subjective interpretation of "adequate" comes into play. The CWC only needs to be comfortable defending to Ecology that the protective covering selected for an open pad will meet the requirements.

In addition to the protective covering issue, exactly which packaging component actually requires inspection also is a regulatory issue. When inspecting the outer container, that also is providing tertiary containment in the LLCE packaging configuration, the position must be taken that the outer container becomes the primary container and secondary containment must be provided for the LLCE container package. When the flexible receiver is the primary container requiring inspection, secondary containment for the LLCE outer container package is not required; therefore, Ecology must be approached to address the visual inspection requirements for containers. Without

personnel trained to evaluate the conditions of containers or a visual record such as a video tape to give management a comfort level that the inspection requirement has been met, Ecology will have to be approached via a petition for rule-making or during the permitting process for the CWC.

5.3.3 Cost Comparison

The storage area of 1114 m^2 (12,000 ft^2) was used for construction cost comparisons for the three types of storage facilities. Engineering layouts indicate that approximately 21 LLCE containers of miscellaneous sizes could be stored on a 18 m by 61 m (60 ft by 200 ft) storage pad. A second storage pad of this size would be required in 1996 to store the overflow from the forecasted accumulation of containers. Table 4 contains the estimated costs for the four proposed storage facilities.

5.3.4 Crane Operation

The crane operation for picking and placing of containers on the pad with a boom crane, or a pair of boom cranes, would be simplified with an uncovered storage pad. The center of gravity of some loaded containers will be considerable off-center because of the shape or size of the LLCE items, because of the extra shielding required at one end to reduce dose rates, or both.

The handling of off-balance containers would be equally efficient for either the Sprung-type structure or the uncovered pad because, with the building walls moved out of the way, the load could remain close to the ground during movement. Movement of containers in and out of a Butler-type building would require two boom trucks, two bridge cranes, or air operated load modules.

5.3.5 Maintenance

Maintenance of the uncovered pad and the Butler-type building would be the most economical. Maintenance of the outdoor pad would involve keeping the area clean from wind blown debris and water accumulated resulting from exposure to the weather.

Rain or snow that falls from the atmosphere and collects inside an uncovered, bermed storage area is not considered to be run-on or run-off water. If the storage area is kept clean, and the weekly inspections document that the sump is maintained in a clean, dry condition, then any water from rain or snow that may collect in the sump could be removed and managed in accordance with provisions for removal. Sampling and analysis costs for the management of the water should be minimal if the process and inspection knowledge of the LLCE containers is properly documented and maintained.

Maintenance of the Butler-type building would be minimal except for the crane access doors. Maintenance of the Sprung-type building would depend upon the degree of deterioration cause by the wind, sun and rain. The external covering of the building is expected to last from 5 to 10 years and would probably require either repair or replacement sometime during that time frame.

Table 4. Storage Site Construction Cost Evaluation.

	Description	1,100 m^2 (12,000 ft^2) Sprung-type structure	1,100 m^2 (12,000 ft^2) Butler-type building	1,100 m^2 (12,000 ft^2) RCRA compliant storage slab	1,100 m^2 (12,000 ft^2) concrete storage slab
1	Building Costs	$190,000	$104,000	-	-
2	Concrete Slab (1,100 m^2) [12,000 ft^2])	120,000	120,000	$120,000	$120,000
3	RCRA Compliant	60,000	60,000	60,000	-
4	Erect Building	57,000	90,000	-	-
5	Rail System	12,500	-	-	-
6	End Doors	50,300	-	-	-
7	Electric Service to Building	35,000	35,000	-	-
8	Electric Lighting	incl.	incl.	-	-
9	Fire Protection Service to Building	50,000	50,000	-	-
10	Fire Protection	incl.	incl.	-	-
	ICF KH MRP (10%)	38,500	35,500	18,000	12,000
	ICF KH Adders: $7,500	7,500	7,500	7,500	7,500
	21.4%	92,000	85,000	67,800	46,000
	$31,000	31,000	31,000	-	-
	ICF KH Engineering	130,000	130,000	52,000	35,300
	30% Contingency	204,000	193,200	82,000	66,200
	Total cost	$1,077,100	$941,200	$355,400	$287,000
	Cost per square meter	$980.00	$855.64	$323.10	$261.00
	Cost per square foot	$89.83	$78.43	$29.62	$23.92

ICF KH = ICF Kaiser Hanford Company
RCRA = Resource Conservation and Recovery Act of 1976.
RCRA Compliant = Designed in accordance with WAC 173-303-630(7)

6.0 DISCUSSION OF PREFERRED ALTERNATIVE/SOLUTION

The predominant consideration in the selection of the preferred option is the minimum cost for providing the facility, and the timing for the availability of an operational facility. The cost savings associated with an uncovered storage pad are approximately 60 percent of the cost of a covered building. Funding for the construction of an uncovered pad, which is estimated at to be about $400,000, could be made available from expense or small capital project funds. Funds for a storage building would require congressional appropriated funding that could delay the operational availability of a container storage facility by as much as 5 years.

A petition for a modification of the "cover" requirement, or an agreement of understanding concerning the interpretation of the "cover" requirement for EHW would be required from the state and/or Federal regulatory authorities.

The near-term estimate of the number of LLCE items to be retrieved from the tanks is decreasing, as is the area required to store the items. Even if the storage requirements were reduced such that only two or three storage pads were required, a savings of over $1 million could be realized through the use of uncovered storage.

7.0 NO ACTION ALTERNATIVE

The no action alternative would impact the existing and future storage capability of the CWC by requiring the packaged containers to be stored at facilities intended for the storage of low-level waste contained in drums and boxes. Storage of LLCE items at CWC would be an inefficient use of the planned storage space. The existing design for the CWC storage facilities do not include effective methods for the movement of items that have the length and weight that the LLCE containers will have.

8.0 REFERENCES

Mahoney, J. J., 1994, *Tank Farms Long Length Contaminated Equipment, Conceptual Transportation System from Tank Farms to Storage, Treatment, or Burial*, WHC-SD-TP-DB-002, Westinghouse Hanford Company, Richland, Washington.

Resource Conservation and Recovery Act of 1976, 42 USC 6901 et seq.

Titzler, P. A., 1993, *Disposal of Tank Farm Long-Length Contaminated Equipment: Alternative Options Study and Information*, WHC-SD-WM-ES-265, Westinghouse Hanford Company, Richland, Washington.

Washington State Department of Ecology, *Dangerous Waste Regulations*, Washington Administrative Code 173-303, as amended.

WHC 1988, *Environmental Compliance*, WHC-CM-7-5, Westinghouse Hanford Company, Richland, Washington.