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Accession #: D196050037

Document #: SD-CP-DRD-003

Title/Desc:

VAULT SAFETY & INVENTORY SYSTEM CONCEPTUAL
BASELINE DOCUMENT

2. To: (Receiving Organization) Engineering Configuration Management	3. From: (Originating Organization) Technical Security	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Technical Security/3B400	6. Cog. Engr.: Neil B. Corrigan	7. Purchase Order No.: N/A
8. Originator Remarks: The purpose of this EDT is to approve and release document WHC-SD-CP-DRD-003, the Vault Safety and Inventory System Conceptual Baseline Document.		9. Equip./Component No.: N/A
11. Receiver Remarks:		10. System/Bldg./Facility: Vault Safety and Inventory System/PFP
		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: N/A

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-CP-DRD-003		0	Vault Safety and Inventory System Conceptual Baseline Document	N/A	1	1	6

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 2. Release 3. Information	4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

(G)	(H)	17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)				(G)	(H)
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1	1	Eng. GL Rippy	<i>[Signature]</i>	8/24/95	R3-35	1	1
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18. N.B. Corrigan <i>[Signature]</i> 7/28/95 Signature of EDT Originator Date	19. <i>[Signature]</i> Authorized Representative Date for Receiving Organization	20. <i>[Signature]</i> 7/31/95 Cognizant Manager Date	21. DOE APPROVAL (if required) Ctrl. No. N/A ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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RELEASE AUTHORIZATION

Document Number: WHC-SD-CP-DRD-003, REV 0

Document Title: Vault Safety and Inventory System Conceptual
Baseline Document

Release Date: 9/1/95

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

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz

9/1/95

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SUPPORTING DOCUMENT1. Total Pages **35**

2. Title

Vault Safety and Inventory System Conceptual
Baseline Document

3. Number

WHC-SD-CP-DRD-003

4. Rev No.

0

5. Key Words

Vault Safety and Inventory System
VSIS
Conceptual Baseline Document

6. Author

Name: Neil B. Corrigan

Neil B. Corrigan
Signature

Organization/Charge Code 3B400

7. Abstract

This document defines the baseline scope, schedule, and cost of the replacement computer system for the Vault Safety and Inventory System at the Plutonium Finishing Plant.

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**VAULT SAFETY AND INVENTORY SYSTEM
CONCEPTUAL BASELINE DOCUMENT**

Prepared by:

Neil B. Corrigan
Technical Security
Safeguards and Security

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LIST OF TERMS

ALARA	As Low As Reasonably Achievable
ASCII	American Standard Code for Information Interchange
BCSR	BCS, Richland, Inc.
CMU	Canister monitoring unit
DOE	U.S. Department of Energy
FSAR	Final safety analysis report
LAN	Local area network
MBA	Material balance area
NMSS	Nuclear Materials Safeguards System
PDS	Protected distribution system
PFP	Plutonium Finishing Plant
SAS	Safeguards and Security
SNM	Special nuclear material
TCP/IP	Transport Control Protocol/Internet Protocol
UPS	Uninterruptible power supply
VSIS	Vault Safety and Inventory System
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

The purpose of this project is to replace the computer system for the existing Vault Safety and Inventory System (VSIS) in operation at the Plutonium Finishing Plant (PFP) on the U.S. Department of Energy (DOE) Hanford Site located near Richland, Washington. This system monitors and performs inventories of canisters containing special nuclear material (SNM) stored in the vault at PFP. For material control and accountability, each location in the vault is contained in a material balance area (MBA).

The replacement system, which will be referred to as VSIS in this document for simplification, will use the client/server architecture on a network of Site standard workstations and file servers. The obsolete minicomputer and software in the current system will be replaced, but the existing data acquisition system will be retained until the vault is reconfigured at some point in the future. The functions required to be performed by the replacement system are described in detail in the VSIS requirements specification (WHC 1995e).

VSIS will be a safety class 4 system. Although the replacement system for VSIS will not contain any classified information, it will be considered a classified system because it will run on the same network as the Nuclear Materials Safeguards System (NMSS). This system contains classified information and is also being replaced.

The primary users of the VSIS replacement system will be material control and accountability personnel in Safeguards and Security (SAS) and vault operations personnel in PFP Operations. Patrol personnel in SAS and facility services personnel in PFP Operations will receive alarms from VSIS by way of switch closures on output channels.

To provide background information on the existing system, safeguards personnel in the late 1970s were faced with sharply increasing radiation exposure and labor costs associated with monitoring, controlling, and accounting for the inventory of SNM at the Hanford Site. Before this time, safety questions and solutions had been discussed following a major event involving the costly decontamination of a storage vault. Combining these experiences with the safeguards and security requirements of the period, a design team proposed and implemented VSIS, a real-time computer system for monitoring nuclear material. This system greatly reduced human interaction with the material for both safety and inventory activities, resulting in decreased radiation exposure and labor costs.

VSIS was installed in the 2736-Z Building, a secure concrete storage vault within the PFP Protected Area. Three of the four rooms in the vault are equipped with shielded storage cubicles containing an arrangement of pedestals with instrumentation. A single canister containing plutonium, in either a stable oxide or a metallic form, is placed on a canister monitoring unit (CMU) positioned on a storage pedestal.

In addition to the associated control electronics and wiring in the vault, the data acquisition system of VSIS consists of 6,868 CMUs with sensors

connected to four Motorola 6809 microprocessors with embedded firmware. The existing VSIS computer system is a Prime 2350 minicomputer running software designed to monitor, compare, and report various conditions detected by the data acquisition system. The system retrieves accounting information from NMSS over a network connection and reports analytic results to users. VSIS serves as a backup for NMSS and is used regularly by SAS and PFP Operations personnel.

The monitoring functions performed by VSIS include supervising the presence of canisters and reading electronic identification labels, canister temperatures, air temperatures, and canister bulge sensors. Canister presence sensors are read by the data acquisition system in real time, polled several hundred times per second. VSIS operates as a canister transfer supervisor with the software accepting commands to permit location changes without reporting alarms.

VSIS allows users to set limits necessary to safely and securely monitor canisters in the vault. When the limits are exceeded, alarms are reported to the proper authority. VSIS periodically performs a vault inventory, comparing the physical status of the vault with accounting information from NMSS to produce an inventory report.

2.0 JUSTIFICATION

For reasons including the fact that the existing system is nearing the end of its life expectancy, an engineering study was performed on VSIS (WHC 1995d). The study found that the system has a high risk of failure but determined that the functions provided by VSIS must continue to be performed for the foreseeable future. The existing system must, therefore, be replaced.

Prime, the original manufacturer of the VSIS computer system, is out of business. A successor company now provides mission-critical hardware and software maintenance support for the Prime 2350 minicomputer, but the company's survival is questionable. Employment levels have dropped by nearly half nationally, reducing the staff available to support the VSIS computer system. Necessary training supplied by the company has been reduced below a level considered satisfactory.

Motorola, the manufacturer of the data acquisition hardware for VSIS, has stopped producing critical replacement components. Although the equipment has been reliable and some components are still available, the inability to replace a failed component in a timely manner will adversely affect monitoring capability.

Interviews with onsite software maintenance personnel indicated increased difficulty maintaining a satisfactory level of trained staff. Those with critical skills are seeking employment elsewhere. Because of a limited interest in working on obsolete hardware and software, replacements are difficult to find.

The current situation with hardware, software, and personnel supporting the system led to the conclusion that VSIS has a high risk of complete failure within the next few years. The VSIS computer system has the highest level of risk, with the data acquisition system having a level of risk not quite as high.

Over time, the obsolete Prime 2350 minicomputer and data acquisition system will be replaced with new hardware and software. This replacement will ensure satisfactory canister monitoring performance at a reduced cost over the next 10 to 15 years.

As directed by DOE, the stabilization and interim storage of all plutonium in the Hanford Site inventory must be completed by the year 2002. The conditions for interim storage include the development of a new process specification and a new canister configuration. The new canister configuration will require modification of the vault, as well as the data acquisition system of VSIS.

With the required modification of the data acquisition system in the near future and the existence of a good interface between the VSIS computer system and the data acquisition system, the two systems will be replaced at separate times. The Prime 2350 minicomputer and software, representing the highest risk, will be replaced first. This provides immediate attention to reducing operational risk. Replacement of the data acquisition system,

representing a lower risk, will be completed when the vault is reconfigured at some later time.

The project described in this document provides only for the replacement of the VSIS computer system, which will use the existing data acquisition system. The VSIS replacement system will be designed in such a way as to minimize changes when the data acquisition system is replaced.

3.0 DESCRIPTION OF PROJECT SCOPE

3.1 OVERVIEW

The purpose of VSIS is to monitor and perform periodic inventories of canisters of nuclear material stored in the vault, sending safety and security alarms, as necessary, to indicate the occurrence of certain events in real time. Users will have the ability to transfer canisters in the vault without causing alarms and obtain information from the system in the form of printed reports or on workstations through the graphical user interface. Figure 3-1 shows the context within which the VSIS replacement system will operate on a network of workstations and file servers. Although the data acquisition system is actually part of VSIS, it is considered as external in this diagram because the existing system will be retained for use in the VSIS replacement system.

In its current configuration, the vault has 6,868 locations where canisters can be stored and monitored through a CMU. A CMU is addressable by room, row, cubicle, and position in the vault and is able to detect the presence of a canister. If a canister is present in that location, the CMU is able to read the label identifying the canister, the temperature of the canister, the temperature of the air surrounding the canister, and the bulge status of the canister. In response to commands from VSIS, the data acquisition system will provide this information for one or all locations.

The data acquisition system will also send unsolicited alarms and errors to VSIS. Whenever a canister is removed or inserted in a CMU, VSIS will receive a canister presence alarm for that location. The other types of alarms and errors will occur only while reading information from the data acquisition system; they include canister bulge alarms, label mismatch errors, and read errors. During the performance of a vault inventory, VSIS will use temperatures read from the data acquisition system to determine the occurrence of low temperature alarms and high temperature alarms.

Assuming that alarms are not blocked in the database for performing transfers or maintenance, VSIS will send high temperature alarms and canister bulge alarms to the alarm system to notify PFP Operations of a possible safety problem within a canister. In a similar manner, VSIS will send canister removal alarms and low temperature alarms to SAS through the alarm system to indicate a possible diversion of nuclear material. VSIS will also detect system failures on a file server and login failures by a user on a workstation, sending those types of alarms to SAS.

The database, which will be stored on disk and accessed through a file server, will contain information on canisters, locations, inventories, transfers, tasks, alarms, users, and events. VSIS will store information from the data acquisition system and information entered by users on workstations in the database, maintaining records of all changes made to the database to establish an audit trail. The user interface and various periodic and event-driven tasks, which are the client applications of VSIS, will query the database to retrieve the information they need to perform their functions.

Figure 3-1. Vault Safety and Inventory System Context Diagram.

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VSIS will also query the NMSS database to obtain safeguards information used in forming an inventory of canisters in the vault. Periodic backups of the VSIS database will be produced on tape, and the ability to archive and restore information will be provided by the system.

When logged into the system on a workstation, a user will interact with VSIS through the client application forming the graphical user interface for VSIS. Information will be displayed on a set of forms on the screen to the user, who will respond as required using the mouse or keyboard. When useful for understanding, maps showing the physical arrangement of the vault will be used to display information on the screen. The user will be able to perform only those operations to which the user has been granted access in the database.

VSIS will provide the ability for an authorized user to generate standard inventory and discrepancy reports as well as ad hoc reports. These reports may be viewed on the screen or printed on paper. The user may also generate and print images of the screen at any time.

3.2 HARDWARE CONFIGURATION

As indicated in Figure 3-2, the VSIS replacement system will run on an Ethernet local area network (LAN), consisting of two file servers and multiple workstations and printers. VSIS will share this network with NMSS; and, because of the classified information stored in NMSS, the network will be isolated within the PFP Protected Area. As shown in Figure 3-3, the file servers will be located in the 2736-ZB Building, Room 604, a vault-type room currently holding the obsolete Prime 2350 minicomputer for the operation of VSIS. The workstations and printers will be located as needed in the corridor of the 2736-Z Building and various rooms of the 2736-ZB, 234-5Z, and 2704-Z Buildings. For security of the network, a protected distribution system (PDS) will be used for cabling, with the ability to physically disconnect any workstation from the network.

During normal operation, one file server will run the periodic and event-driven tasks of VSIS, while the other file server will run NMSS tasks and provide access to the VSIS and NMSS databases. If a file server is unavailable for some reason, the remaining file server will have the ability to perform the functions of both VSIS and NMSS. In this way, the two computer systems will serve as backups for each other. An uninterruptible power supply (UPS) will be used for the systems because of the critical role performed by VSIS and NMSS in monitoring and accounting for nuclear material.

The VSIS and NMSS databases will be stored on a redundant array of inexpensive disks located with the file servers in Room 604 of the 2736-ZB Building. A switch will control which file server has access to the databases. The client applications of VSIS and NMSS, consisting of tasks running on file servers and user interfaces running on workstations, will store and retrieve information through the file server providing access to the databases. The redundant storage of information on disk will provide greater reliability and allow operation to continue in the event of a partial failure of the array of disks.

Figure 3-2. Vault Safety and Inventory System Hardware Configuration.

H9507015.1

Figure 3-3. Vault Safety and Inventory System Network.

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For maintenance of the network and establishment of an upgrade path, Site standard file servers, workstations, printers, and network hardware will be used in configuring the network to run VSIS and NMSS. Reliance on the same software environment throughout development will allow the procurement of hardware in compliance with Site standards near the end of development. The file server used will likely be a high speed, high capacity computer system based on the Intel Pentium¹ processor, with a large disk drive, a CD-ROM drive, a tape drive, and a high resolution monitor. At a minimum, a workstation on the network will have an Intel 80486 processor, a removable disk drive, and a high resolution monitor.

Using a switch, the file server running VSIS tasks will be connected to the existing data acquisition system in the 2736-Z Building through RS-232C serial communication lines currently connected to the obsolete Prime 2350 minicomputer. The data acquisition system consists of four Motorola 6809 microprocessors and related equipment monitoring a total of 6,868 locations in the vault through CMUs. Each CMU is able to store a canister of nuclear material and is connected to a single microprocessor.

Each of the four microprocessors will use two serial ports for communication in American Standard Code for Information Interchange (ASCII) text with VSIS, resulting in the use of eight serial ports on the file server for connection to the data acquisition system. The file server will send command messages to the command port on a microprocessor, receiving data messages from that port in response. The file server will also receive unsolicited alarm messages from the alarm port on a microprocessor.

The alarm system, consisting of an output device interfaced to an external multiplexer loop, will be located with the file servers in Room 604 of the 2736-ZB Building. Under control of a switch, the file server running VSIS tasks will be connected to the device through an RS-232C serial communication line. To send an alarm on a particular output channel to PFP Operations or SAS, the file server will send a message to the serial port on the device to close the corresponding switch.

The alarm system will provide 64 output channels for VSIS alarms. Canister removal alarms, low temperature alarms, high temperature alarms, and canister bulge alarms may be sent for each of the three rooms in the vault monitored by VSIS, resulting in the use of 12 channels. System failure alarms will use another channel, and the remaining 51 channels will be available for login failure alarms for workstations on the network.

3.3 SOFTWARE ENVIRONMENT

At the system level, the software environment for VSIS will consist of Site standard software products running on the Ethernet LAN described in Section 3.2. This will make application software easier to maintain and allow system software and hardware to be upgraded with less difficulty following installation. To support the client/server architecture of VSIS, the

¹Intel Pentium is a trademark of Intel Corporation.

Transport Control Protocol/Internet Protocol (TCP/IP) will be used for communication between file servers and workstations on the network. Both file servers will run the Microsoft Windows NT² Server operating system, and each workstation will run an operating system from the Microsoft Windows³ family of products. Software tools provided with the operating system will be used by the system administrator to manage the network and its components.

Windows NT is a multitasking operating system, which will allow the periodic tasks of VSIS to be scheduled and executed on a file server based on priority. Using the same priority scheme, the operating system will also run the VSIS tasks required to respond to events in real time. Running under Windows NT on a file server, the Microsoft SQL Server⁴ relational database management system will be used to provide access to the VSIS database. Functioning as a server for client applications, this system will perform transactions to store and retrieve information from the database as requested by tasks or users through the VSIS user interface. The database administrator will manage the VSIS database using software tools provided with SQL Server.

The graphical user interface for VSIS will be a Microsoft Windows application running on a client workstation. Microsoft Visual Basic or Microsoft Visual C++⁵ will likely be used to develop this application, which will display information on a set of forms on the screen and allow user interaction through the mouse or keyboard in the conventional way. Because the physical arrangement of the vault is important in this application, maps will be used when appropriate to present information on the screen. The VSIS user interface will allow the exchange of information with other Windows applications running on the workstation.

Microsoft Office Professional will be used on a workstation to provide a user with word processing, spreadsheet, business graphics, and personal database capability on information from VSIS. For a user with a good understanding of the VSIS database structure who needs to perform ad hoc queries and generate ad hoc reports, a reporting tool will be provided. Such a user will be able to store report definitions for later execution, allowing other users to generate and view ad hoc reports through the VSIS user interface.

3.4 DEVELOPMENT

To avoid duplication, the majority of hardware and software items required for the network shared between VSIS and NMSS will be procured and installed as part of the NMSS replacement project (WHC 1995b). This includes

²Microsoft Windows NT is a trademark of Microsoft Corporation.

³Microsoft Windows is a trademark of Microsoft Corporation.

⁴Microsoft SQL Server is a trademark of Microsoft Corporation.

⁵Microsoft Visual Basic and Microsoft Visual C++ are trademarks of Microsoft Corporation.

one of the two file servers, the workstations, the printers, the network hardware, the redundant array of inexpensive disks, and the system level software for the file server and workstations. Justification for the procurement of all items for VSIS and NMSS is provided in the joint acquisition plan for the replacement systems (WHC 1995a).

The replacement of VSIS is primarily a software development project. Development will be performed on a network in the 1979 Snyder Building, using a simulated data acquisition system. Only the hardware and software items beyond those required for NMSS will be regarded as part of the VSIS replacement project. These items consist of the second file server, the necessary system level software, the output device comprising the alarm system, and the switches for connection to the data acquisition system and the alarm system. This project will include installing and interfacing the equipment to other systems at PFP following development.

In addition to performing the physical installation in Room 604 of the 2736-ZB Building, replacing VSIS will require procedural changes and transferring some information from the existing system to a file server in the form of ASCII text files. Testing will be performed by the development organization as well as independent organizations. To minimize the amount of time VSIS is not operational during testing, either a file server or the Prime 2350 minicomputer will be connected to the data acquisition system using the switch installed for that purpose in the replacement system. When testing is complete and the system has been accepted, the other file server will be connected to the switch as intended, and the obsolete Prime 2350 minicomputer will be removed from the room.

4.0 METHODS OF PERFORMANCE

4.1 ONSITE ENGINEERING

The VSIS replacement system will be designed and implemented by personnel from the Technical Security organization of Westinghouse Hanford Company (WHC), with support as needed from outside firms and other organizations of WHC, Kaiser Engineers Hanford, and BCS, Richland, Inc. (BCSR), under the direct supervision of Technical Security. VSIS will share an isolated network with NMSS, and network engineering will be performed by the same organization as part of the NMSS replacement project.

4.2 PROCUREMENT STRATEGY

All procurement activities for VSIS and NMSS will be performed by the appropriate organizations of WHC and BCSR under the direction of Technical Security. The majority of hardware and software items required for the network on which VSIS will run at PFP will be procured as part of the NMSS replacement project. The items purchased initially will support the development of both systems in the 1979 Snyder Building, and the items purchased near the end of development will be used in the installation of the replacement systems at PFP.

4.3 ONSITE INSTALLATION

The isolated network shared between VSIS and NMSS will be installed within the PFP Protected Area by personnel from SAS, with support from BCSR. Following installation, the VSIS replacement system will be tested by Technical Security. Material control and accountability personnel from SAS and personnel from PFP Operations will also test the system and will be responsible for final acceptance of the system.

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5.0 REQUIREMENTS AND ASSESSMENTS

5.1 DECONTAMINATION AND DECOMMISSIONING

Following acceptance of the replacement system for VSIS, the obsolete Prime 2350 minicomputer and printer will be removed from Room 604 in the 2736-ZB Building and declared to be surplus equipment. Other unnecessary items connected to the existing system will be removed as part of the NMSS replacement project.

At the end of the lifetime of the VSIS replacement system, all computer equipment, including cabling in a radiation zone, will be surveyed for radioactivity. Any contaminated equipment will be delivered to an approved disposal site. All hardware that is uncontaminated or not in a radiation zone will be declared to be surplus equipment.

5.2 MAINTENANCE AND OPERATION REQUIREMENTS

The hardware and software comprising the VSIS replacement system will be designed to ensure that efficient, cost-effective maintenance can be performed. Site standard file servers, workstations, printers, network hardware, and system level software will be used in configuring the network to run VSIS. Equipment will be installed and mounted in such a way as to provide easy physical access, safe working conditions, and minimal radiation exposure for maintenance activities. Diagnostic software will be provided with the equipment.

Hardware maintenance will be performed by skilled SAS and BCSR computer technicians. As technology changes and equipment becomes obsolete, hardware will be updated in the VSIS replacement system. The path followed will be the same path used to update the Hanford LAN, which will face similar issues throughout its life cycle.

SAS will provide software maintenance personnel skilled in the use of the Windows NT operating system and SQL Server relational database management system. They will perform administrative activities on the network and modify the VSIS application software as needed using tools provided with the replacement system. At the system level, software will be kept current with the versions provided by the software vendors. These updates may require software maintenance personnel to make modifications to the VSIS application software.

5.3 AUTOMATIC DATA PROCESSING AND TELECOMMUNICATIONS EQUIPMENT

As described in the approved acquisition plan for the VSIS and NMSS replacement systems, Site standard hardware and software will be procured for the network on which the two systems will operate. This includes file servers, workstations, printers, network hardware, and system level software for the file servers and workstations. Most of these items will be procured as part of the NMSS replacement project.

5.4 SAFETY CLASSIFICATION

A hazards analysis of the activities, as defined in this document, was performed to determine the hazards and assess the associated risks.

The work is limited to the replacement in kind. This involved craft personnel using common, off-the-shelf tools and components and off-the-shelf equipment removal and installation.

The light industry work is similar to activities involving removal/installation of telephones and personal computers and related accessories. This work does not involve unique hazards, equipment, tools, or activities.

The general industry consensus standards as incorporated in the WHC manual, WHC-CM-4-3, provides the safety criteria for this activity. The manual requires a job safety analysis and a prejob meeting before work activities. Additionally, WHC procedure requirements identify unique environments that require additional controls for hazards elimination or risk reduction. These include hazardous work permits, confined space permits, and lock and tag and radiation work permits.

A review process is in place to determine the effect and update requirements to the *Plutonium Finishing Plant Final Safety Analysis Report* (FSAR) (WHC 1995c) as a result of this activity. No further safety analysis is required.

This work consists of general light industry activity of low hazard potential, it is commonly accepted by the general public within the safety envelope of the PFP FSAR, and meets the definition of acceptable risk.

The component procurement and installation is safety class 4.

5.5 ENVIRONMENTAL COMPLIANCE

An evaluation of VSIS and other SAS replacement projects at PFP for environmental compliance found that the systems qualify for exclusion under the categories of routine maintenance and safety and environmental improvements involving replacement of facility components. This exclusion will remain valid as long as the work scope for replacement does not increase and any wastes generated are recycled or disposed of in an existing waste disposal unit.

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- WHC 1995b, *Conceptual Baseline Document - The Nuclear Materials Safeguards System Replacement*, WHC-SD-CP-DRD-002, Rev. 0, Westinghouse Hanford Company, Richland, Washington.
- WHC 1995c, *Plutonium Finishing Plant Final Safety Analysis Report*, WHC-SD-CP-SAR-021, Rev. 0, Westinghouse Hanford Company, Richland, Washington.
- WHC 1995d, *Plutonium Finishing Plant Safeguards and Security Systems Replacement Study*, WHC-SD-C217-ES-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington.
- WHC 1995e, *Vault Safety and Inventory System Requirements Specification*, WHC-SD-CP-CSRS-012, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A
COST ESTIMATE SUMMARY

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KAISER ENGINEERS HANFORD
Westinghouse Hanford Company
JOB NO. K6124
FILE NO. 2356BAA1

** TEST - INTERACTIVE ESTIMATING **
PFP Sfgds & Scty Sys Repl (VSIS)
Conceptual Estimate - Vault Safety & Inventory System
DOE_R01 - PROJECT COST SUMMARY

PAGE 1 OF 7
DATE 08/11/95 09:47:56
BY JJM

COST CODE =====	DESCRIPTION =====	ESCALATED TOTAL COST =====	CONTINGENCY % =====	TOTAL DOLLARS =====
000	System Design/Development	1,088,000	20	1,306,000
600	Utilities	306,000	16	356,000
	(ADJUSTED TO MEET DOE 5100.4)	0	-2,000	-2,000
	Total Estimated Cost (TEC)	1,394,000	266,000	1,660,000
900	Other Project Costs (OPC)	57,000	0	57,000
	(ADJUSTED TO MEET DOE 5100.4)	3,000	0	3,000
	Total Other Project Cost (OPC)	60,000	0	60,000

Total Project Cost (TPC) 1,454,000 18 266,000 1,720,000

REMARKS:

TYPE OF ESTIMATE Conceptual Estimate 08/11/95

ARCHITECT
ENGINEER

OPERATING
CONTRACTOR

Sanchez
W. J. Huber
W. J. Huber

(ROUNDED/ADJUSTED TO THE NEAREST " 1,000 / 10,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
Westinghouse Hanford Company
JOB NO. K6124
FILE NO. VSIS

** IEST - INTERACTIVE ESTIMATING **
PFP Sfgds & Scty Sys Repl (VSIS)
Conceptual Estimate-Vault Safety & Inventory System
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 2 OF 7
DATE 08/24/95 08:26:02
BY JJM

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
=====	=====	=====	=====	=====	=====	=====	=====	=====
110001	System Design Description	165536	0	165536	2.61	4320	169856	203829
110002	System Design & Development	237000	0	237000	2.61	6186	243186	291823
110003	ECNs, Drawings, PFWR, NEPA	32304	0	32304	2.61	843	33147	39776
110004	Outside Contract Support (BOA)	443520	0	443520	2.61	11576	455096	546115
SUBTOTAL 11	Def Design - Onsite O/C	878360	0	878360	2.61	22925	901285	1081543
120001	Procurement Spec/Order	28294	0	28294	4.10	1160	29454	35345
120002	Field Systems Install Support	53325	0	53325	4.10	2186	55511	66614
120003	ATP & Reporting Support	39105	0	39105	4.10	1603	40708	48850
120004	Engineering Documentation	52140	0	52140	4.10	2138	54278	65133
120005	Data Conversion	16590	0	16590	4.10	680	17270	20724
120006	Operator/Sys Maintenance Training	7110	0	7110	4.11	292	7402	8882
SUBTOTAL 12	Engrng/Insp - Onsite O/C	196564	0	196564	4.10	8059	204623	245548
SUBTOTAL 1	Engineering	1074924	0	1074924	2.88	30984	1105908	1327091
220001	VSIS Equipment & Software	119522	0	119522	2.32	2773	122295	134524
SUBTOTAL 22	Procurement-O/C	119522	0	119522	2.32	2773	122295	134524
330001	VSIS Equipment	15752	0	15752	7.43	1170	16922	21153
SUBTOTAL 33	Installation-O/C	15752	0	15752	7.43	1170	16922	21153
400000	Project Management-O/C	165900	0	165900	3.80	6304	172204	206645
5	Other Project Costs (OPC)	56500	0	56500	0.00	0	56500	56500
PROJECT TOTAL		1,432,598	0	1,432,598	2.88	41,231	1,473,829	1,745,913

KAISER ENGINEERS HANFORD
Westinghouse Hanford Company
JOB NO. K6124
FILE NO. VSIS

** TEST - INTERACTIVE ESTIMATING **
PFP Sfgds & Scty Sys Repl (VSIS) Vault Safety & Inv Sys
Concetual Estimate
DOE_R03 - ESTIMATE BASIS SHEET

PAGE 3 OF 7
DATE 08/11/95 11:28:57
BY JJM

1. DOCUMENTS AND DRAWINGS

=====

DOCUMENTS: #WHC-SD-CP-DRD-003 Draft copy, unchecked Conceptual Baseline Document for Vault Safety and Inventory System.
Unsigned, dated 07/26/95.

DRAWINGS: NONE

2. MATERIAL PRICES

=====

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL. VENDOR INFORMATION WAS OBTAINED FOR THE FOLLOWING ITEMS: Hardware & software costs were received from WHC.

3. LABOR RATES

=====

A.) WHC HOURLY RATES ARE BASED UPON THE FY 1995 PLANNING RATES (REPORT BGHB2001).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

=====

(WHC FUNDED EXPENSE)

A.) ONSITE PLANT FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE APPLIED TO THE BASE LABOR RATE AND INCLUDED IN THE LABOR RATE/HOUR.

5. ESCALATION

=====

ESCALATION PERCENTAGES WERE CALCULATED FROM THE AUGUST 1994 UPDATE OF THE ECONOMIC ESCALATION PRICE CHANGE INDICES FOR DOE CONSTRUCTION PROJECTS AS PUBLISHED BY THE "OFFICE OF INFRASTRUCTURE ACQUISITION" FM-50.

6. ROUNDING

=====

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE 1-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (L1) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

7. REMARKS

=====

- A) O/C labor markups for department overheads & G&A are included with the base labor rate used. G&A % added for this expense project is 17%.
- B) Cost of procured items (WBS 2) were provided by O/C.
- C) O/C supplied manhours for Engineering (WBS 1).
- D) Assume all hardware will be setup temporary, connected, and checked out before removal of old system and permanent installation of new system.
- E) Assume only minor modifications to cable & wiring systems will be needed (minor modifications at CAS, POC, AMOSS). No changes will be made to cabling going to sensors.
- F) Escalation % rates used are per attached schedule.

KAISER ENGINEERS HANFORD
Westinghouse Hanford Company
JOB NO. K6124
FILE NO. VSIS

** IEST - INTERACTIVE ESTIMATING **
PFP Sfgds & Scty Sys Repl (VSIS)
Conceptual Estimate-Vault Safety & Inventory System
DOE_R04 - COST CODE ACCOUNT SUMMARY

PAGE 4 OF 7
DATE 08/24/95 08:26:24
BY JJM

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	SUB TOTAL	CONTINGENCY %	TOTAL	TOTAL DOLLARS
000	System Design/Development								
110001	System Design Description	165536	0	165536	2.61	4320	20	33971	203829
110002	System Design & Development	237000	0	237000	2.61	6186	20	48637	291823
110003	ECHS, Drawings, P&HR, NEPA	32304	0	32304	843	843	20	6629	39776
110004	Outside Contract Support (BOA)	443520	0	443520	2.61	11576	20	91019	546115
120001	Procurement Spec/Order	28294	0	28294	4.10	1160	20	5890	35345
120002	Field Systems Install Support	53325	0	53325	4.10	2186	20	11102	66614
120003	ATP & Reporting Support	39105	0	39105	4.10	1603	20	8142	48850
120004	Engineering Documentation	52140	0	52140	4.10	2138	20	10856	65133
120005	Data Conversion	16590	0	16590	4.10	680	20	3454	20724
120006	Operator/Sys Maintenance Training	7110	0	7110	4.11	292	20	1480	8882
TOTAL 000	System Design/Development	1074924	0	1074924	2.88	30984	20	221180	1327091
600	Utilities								
220001	VSIS Equipment & Software	119522	0	119522	2.32	2773	10	12229	134524
330001	VSIS Equipment	15752	0	15752	7.43	1170	25	4231	21153
400000	Project Management-O/C	165900	0	165900	3.80	6304	20	34441	206645
TOTAL 600	Utilities	301174	0	301174	3.40	10247	16	50901	362322
900	Other Project Costs (OPC)								
5	Other Project Costs (OPC)	56500	0	56500	0.00	0	0	0	56500
TOTAL 900	Other Project Costs (OPC)	56500	0	56500	0.00	0	0	0	56500
PROJECT TOTAL		1,432,598	0	1,432,598	2.88	41,231	18	272,081	1,745,913

KAISER ENGINEERS HANFORD
Westinghouse Hanford Company
JOB NO. K6124
FILE NO. VSIS

** IEST - INTERACTIVE ESTIMATING **
PFP Sfgds & Scty Sys Repl (VSIS)
Conceptual Estimate-Vault Safety & Inventory System
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION

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DATE 08/24/95 08:26:37
BY JJM

CSI	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
=====								
ENGINEERING								
00	Technical Services	443520	0	443520	2.61	11576	455096	546115
15	Mechanical	26923	0	26923	2.61	702	27625	33151
3B	Safeguards and Security	580650	0	580650	3.09	17944	598594	718314
5F	(Description not available)	9830	0	9830	2.61	257	10087	12104
67	Media Services	4667	0	4667	2.61	122	4789	5747
6B	Acquisitions	9334	0	9334	4.10	383	9717	11660
TOTAL ENGINEERING			0			30,984		
		1,074,924		1,074,924	2.88		1,105,908	1,327,091
CONSTRUCTION								
00	Technical Services	56500	0	56500	0.00	0	56500	56500
16	Electrical	135274	0	135274	2.91	3943	139217	155677
19	Project Management	165900	0	165900	3.80	6304	172204	206645
TOTAL CONSTRUCTION			0			10,247		
		357,674		357,674	2.86		367,921	418,822
=====								
PROJECT TOTAL			0			41,231		
		1,432,598		1,432,598	2.88		1,473,829	1,745,913

KAISER ENGINEERS HANFORD
Westinghouse Hanford Company
JOB NO. K6124
FILE NO. VSIS

** TEST - INTERACTIVE ESTIMATING **
PFP Sfgds & Scty Sys Repl (VSIS) Vault Safety & Inv Sys
Conceptual Estimate
DOE_R06 - CONTINGENCY ANALYSIS BASIS SHEET

PAGE 6 OF 7
DATE 08/11/95 11:29:23
BY JJM

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A CONCEPTUAL ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15 TO 25 %.

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

ENGINEERING

Contingency was applied at 20% due to problems which might be encountered during software design and modification.

AVERAGE ENGINEERING CONTINGENCY 20 %

CONSTRUCTION

Procurement contingency was allowed at 10% due to confidence in hardware equipment costs needed for this project and projected software costs.

Construction contingency was allowed at 25% due to difficulties which might be encountered in setting up parallel system with the existing and possible problems in making the changeovers.

O/C Project Management contingency was allowed at 20%.

AVERAGE CONSTRUCTION CONTINGENCY 16 %

AVERAGE PROJECT CONTINGENCY 18 %

KAISER ENGINEERS HANFORD
Westinghouse Hanford Company
JOB NO. K6124
FILE NO. VSIS

** TEST - INTERACTIVE ESTIMATING **
PFP Sfgds & Scty Sys Repl (VSIS)
Conceptual Estimate-Vault Safety & Inventory System
DOE_R07 - ONSITE INDIRECT COSTS BY WBS

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DATE 08/24/95 08:26:55
BY JJM

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	CONTRACT %	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
=====	=====	=====	=====	=====	=====	=====	=====
110001	System Design Description	165536	0.00	0	0	0	0
110002	System Design & Development	237000	0.00	0	0	0	0
110003	ECNs, Drawings, PFMR, NEPA	32304	0.00	0	0	0	0
110004	Outside Contract Support (BOA)	443520	0.00	0	0	0	0
120001	Procurement Spec/Order	28294	0.00	0	0	0	0
120002	Field Systems Install Support	53325	0.00	0	0	0	0
120003	ATP & Reporting Support	39105	0.00	0	0	0	0
120004	Engineering Documentation	52140	0.00	0	0	0	0
120005	Data Conversion	16590	0.00	0	0	0	0
120006	Operator/Sys Maintenance Training	7110	0.00	0	0	0	0
220001	VSIS Equipment & Software	119522	0.00	0	0	0	0
330001	VSIS Equipment	15752	0.00	0	0	0	0
400000	Project Management-O/C	165900	0.00	0	0	0	0
5	Other Project Costs (OPC)	56500	0.00	0	0	0	0

PROJECT TOTAL
===== 1,432,598 ===== 0 ===== 0 ===== 0

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APPENDIX B
SCHEDULES

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APPENDIX C

PLANT FORCES WORK REVIEW

The following is an August 10, 1995 memo from Gary Maxwell, subject Plant Forces Work Review.

Gary,

Four PFWRs that were submitted by G.L. Rippy will not be submitted to the LSB for determination because of the following reasons:

1. The work described on the PFWR has no construction activity associated with the installation of replacement components.
2. Software development and installation of intelligence does not come under the constraints of the Davis-Bacon Act.
3. It's a given that WHC can add to or install drops to an existing HLAN/backbone system without submitting a PFWR.
4. No new conduit installations.

EXCEPTIONS: If new conduit and wire is required or any kind of construction activity becomes part of this activity along with the installation of a new BACKBONE, and major modification to racks and the installation of new cabinets, than a PFWR will be required.

Feel free to call me if you have any questions at 376-1676.

Gary Maxwell
WHC Davis-Bacon Administrator

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APPENDIX D

ASSUMPTIONS

The assumption is made that the majority of hardware and software items required for the network shared between the Vault Safety and Inventory System (VSIS) and the Nuclear Materials Safeguards System (NMSS) will be procured and installed as part of the NMSS replacement project. Redundancy in the VSIS replacement system will be provided through resources shared with NMSS, and the software environments for VSIS and NMSS will be compatible. It is assumed that the NMSS replacement system will be completed on a schedule that will allow VSIS to obtain information from the NMSS database required for an inventory. Existing cabling will be used whenever possible in the replacement of the VSIS computer system.

Another assumption is that the new canister configuration required for the interim storage of plutonium will be developed in the near future. This will allow the existing data acquisition system, which is at risk of failure, to be replaced. Until the vault is reconfigured for the new type of canister, it is assumed that this system will be operational. This includes the four Motorola 6809 microprocessors with embedded firmware, all canister monitoring units with sensors, and the associated control electronics and wiring in the 2736-Z Building.

The assumption is made that Room 604 in the 2736-ZB Building will be available to hold the VSIS and NMSS file servers and will have adequate power, environmental controls, and security provisions in place for those systems. Another assumption is that up to 64 different types of alarms may be sent to Safeguards and Security and Plutonium Finishing Plant Operations from this room through output channels interfaced to an external multiplexer loop. It is assumed that all physical locations on the network will remain valid through at least the year 2002.

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