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Accession #: D195067219

Document #: SD-W378-ES-002

Title/Desc:

FACILITY DESIGN PHILOSOPHY TWRS PROCESS SUPPORT &
INFRASTRUCTURE DEFINITION [SEC 1 OF 4]

Pages: 151

THIS DOCUMENT WAS TOO LARGE TO SCAN AS A SINGLE
DOCUMENT. IT REQUIRED BREAKING INTO SMALLER SECTIONS.

DOCUMENT NUMBER: SD-11378-ES-002

SECTION: 1 OF 4

TITLE: Facility Design Philosophy Jank Waste
Remediation System Process Support & Infrastructure
Definition

AUTHOR: Heach, Galbraith

RECIPIENT:

DATE: 12/11/95

KEYWORDS:

REFERENCES: EDT-613161

DEC 11 1995

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT

No 613161

2. To: (Receiving Organization) TWRS Disposal Program		3. From: (Originating Organization) TWRS Process Design		4. Related EDT No.: NA	
5. Proj./Prog./Dept./Div.: WHC/TWR		6. Cog. Engr.: C. E. Leach 73520/		7. Purchase Order No.: NA	
8. Originator Remarks: Approval/Release				9. Equip./Component No.: NA	
				10. System/Bldg./Facility: NA	
				12. Major Assm. Dwg. No.: NA	
11. Receiver Remarks:				13. Permit/Permit Application No.: NA	
				14. Required Response Date:	

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 Design- ator	Reason for Trans- mittal	Orig- inator Dispo- sition	Receiv- er Dispo- sition
1	WHC-SD-W378-ES-002		0	Facility Design Philosophy: Tank Waste Remediation System Process Support and Infrastructure Definition	N/A	2	2	

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

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)										(G)	(H)
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
2	1	Cog. Eng. CE Leach	<i>CE Leach</i>	11/22/95		J. D. Galbraith	<i>J. D. Galbraith</i>	10/16/95		2	1
2	1	Cog. Mgr. JS Garfield	<i>JS Garfield</i>	11/30/95							
		QA									
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		Env.									

18. CE Leach <i>CE Leach</i> Signature of EDT Originator		19. <i>[Signature]</i> GP Williamson Authorized Representative Date 11-30-95		20. JS Garfield <i>JS Garfield</i> Cognizant/Manager Date 11/30/95		21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments	
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Facility Design Philosophy: Tank Waste Remediation System Process Support and Infrastructure Definition

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U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: 613161 UC: 630
Org Code: 73520 Charge Code: D5226
B&R Code: Total Pages: 583

Key Words: Functions, Infrastructure

Abstract: This report documents the current facility design philosophy for the Tank Waste Remediation System (TWRS) process support and infrastructure definition. The *Tank Waste Remediation System Facility Configuration Study* (FCS) (Boomer et al. 1994) initially documented the identification and definition of support functions and infrastructure essential to the TWRS processing mission. Since the issuance of the FCS, the Westinghouse Hanford Company (WHC) has proceeded to develop information and requirements essential for the technical definition of the TWRS treatment processing programs.

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James Bishop 12/11/95
Release Approval Date

DEC 11 1995		
DATE:	MANFORD RELEASE	ID: 21
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Approved for Public Release

**FACILITY DESIGN PHILOSOPHY:
TANK WASTE REMEDIATION
SYSTEM PROCESS SUPPORT
AND INFRASTRUCTURE
DEFINITION**

November 1995

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ACKNOWLEDGEMENTSStudy Sponsors

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LIST OF TERMS

AF	Analytical Facility
ALARA	As low as reasonably achievable
BCCB	Bulk Cold Chemical Building
BHA	Bulk Cold Chemical Handling Area
DOE	U.S. Department of Energy
CPD	Cyclopentadiene
DCPD	Di-cyclopentadiene
DTU	Distributed Treatment Unit
DWPF	Defense Waste Processing Facility
EGB	Emergency Generator Building
FCS	<i>Tank Waste Remediation System Facility Configuration Study</i>
HEPA	High-efficiency particulate air
HLW	High-level waste
HPS	Health Protection System
HVAC	Heating, ventilating, and air conditioning
HWVP	Hanford Waste Vittrification Plant
IEEE	Institute of Electrical and Electronics Engineers
ILLW	Immobilized low-level waste
INEL	Idaho National Engineering Laboratory
LETF	Liquid Effluent Treatment Facility
LFCM	Liquid Fed Combustion Melter
LLW	Low-level waste
MSM	Master-slave manipulator
MUB	Mechanical Utilities Building
PUREX	Plutonium Uranium Extraction Facility
RAL	Remote Analytical Laboratory
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RMW	Radioactive Mixed Waste
TEC	Total Estimated Cost
TEDF	Treated Effluent Disposal Facility
TRU	Transuranic
TSD	Treatment, storage, and disposal
TWRS	Tank Waste Remediation System
UFD	Utility Flow Diagram
UPS	Uninterruptible Power Supply
WHC	Westinghouse Hanford Company
WPH	Water pumphouse

FACILITY DESIGN PHILOSOPHY: TANK WASTE REMEDiation SYSTEM PROCESS SUPPORT AND INFRASTRUCTURE DEFINITION

1.0 OBJECTIVE

This report documents the current facility design philosophy for the Tank Waste Remediation System (TWRS) process support and infrastructure definition. The *Tank Waste Remediation System Facility Configuration Study* (FCS) (Boomer et al. 1994) initially documented the identification and definition of support functions and infrastructure essential to the TWRS processing mission. The FCS provided the following types of information for consideration in the facility configuration decision (i.e., the decision to house the separations, low-level waste [LLW], and high-level waste [HLW] processing functions in one, two, or three facilities):

- Initial identification and discussion of the utilities, support buildings, and infrastructure required to support the TWRS Treatment Complex
- Initial identification of alternatives for siting the TWRS Treatment facilities and discussion of factors involved in the assessment of alternative sites
- Provision of site layout drawings and cost estimates for alternative sites and facility configurations.

Since the issuance of the FCS, the Westinghouse Hanford Company (WHC) has proceeded to develop information and requirements essential for the technical definition of the TWRS treatment processing programs.

1.1 PURPOSE AND NEED

The need for this work is identified under the TWRS Systems Engineering Architecture titled "Support Immobilize Low-Level Waste (ILLW) Process" (Function 4.2.2.4.4). This report was developed in parallel with other engineering studies called for by the TWRS Systems Engineering process. As such, it has advanced the level of detail originally provided in Appendix K of the FCS and it will aid in developing process support and infrastructure definitions. The principal purposes of this effort are as follows:

- Completely identify the functions necessary to support the Separations, LLW, and HLW processes.

- Identify which of the support functions can be shared between the process facilities and which must be dedicated to each of the process facilities.
- Provide an initial placement of the support and infrastructure functions within the preferred TWRS Treatment Complex site.
- Arrive at an initial identification of facilities and structures that provide support and infrastructure functions and identify which functions are potential candidates for being provided from existing Hanford Site facilities. No effort is being made to identify specific facilities that could be used to provide any of the functions identified herein.
- Provide a cost estimate for the facilities required to provide support and infrastructure functions and compare with FCS cost basis for the same facilities.

The development of process support and infrastructure function definitions allows WHC and the U.S. Department of Energy (DOE) to better understand factors that may affect key decisions. In particular, early cost estimates and identification of the support facilities required for each processing facility needs to be considered when scheduling and defining individual project scopes. Detailed and defensible cost estimates also provide a better understanding of the role of support function cost in assessing the potential merits of Distributed Treatment Units (DTUs) over a large single centralized processing facility. Lastly, the consideration of all necessary support functions in one study is an acknowledgement that there is only one continuous process flowsheet, regardless of the number of facilities that may house segments of the process and regardless of the business and project arrangements that may be used to implement the construction and operation of the TWRS Treatment facilities.

There are a considerable number of options for how the support functions are configured and delivered. This report endeavors to narrow the options on the basis of the following critical evaluation criteria:

- Operability and Maintainability
- Cost Effectiveness
- Radiological Protection (ALARA)
- Safety
- Environmental Regulatory Compliance
- Schedule
- Technical Maturity
- Design Impact.

The intent of the report is to provide a sound basis for project definition that can evolve with the processing facility design efforts. As such, the results presented in this study are preliminary and are expected to change as the design matures and the functions and requirements are finalized.

1.2 BASELINE ASSUMPTIONS

As indicated in the TWRS FCS, the process support and infrastructure functions are essential to the processing mission and represent a significant capital expenditure. There is no question that the configuration of the facilities and structures that provide the support utilities and services will be dependent on specific characteristics of the main processing facilities. Until the processing facility designs are finalized, or nearly so, requirements associated with the support functions could be subject to change. This is true of any major process facility and must not be used as a rationale for delaying the development of a definition for the support functions as early in the TWRS Treatment projects as possible.

The present progress in the identification and definition of support functions is based on the FCS and subsequent engineering trade studies. As parallel engineering and design efforts continue, the validity of the assumptions and their impact on the support function requirements will have to be continuously reevaluated. Despite the probability of adjustment to these baseline assumptions, the findings documented in this report will provide essential initial project definition and a reasonable basis for project planning. Key assumptions to this report include the following:

Melter Technology. This report did not select or discriminate against any of the various melter types being evaluated for LLW or HLW. In particular, any mention of the combustion melter concept in the context of HLW processing is not in any way an endorsement or promotion of that particular melter concept. Melter technology selection is a specific activity in the systems engineering approach to design; this report in no way addresses melter technology selection for either LLW or HLW processing. The task of this study is to define what site infrastructure would be required regardless of the melter type for LLW and HLW. From an infrastructure standpoint, the report uses the "worst case" scenario for each type of melter. Electrical loads for joule-heated melters in conjunction with oxygen and kerosene requirements for combustion melters have been addressed in this study. Each requirement is defined as a possible site function dependent upon the melter type chosen for each of the vitrification facilities.

LLW Glass Form and Disposal Configuration. Consistent with the current TWRS Treatment process flowsheet, glass cullet in a polymer-sulfur cement matrix is assumed. A separate trade study is evaluating a range of engineering alternatives to forming the matrix and transporting it to the onsite LLW storage vaults. As of this writing, the preferred alternative is to combine the cullet and polymer-sulfur cement

in 2 m X 2 m X 8 m casks and transport them through an underground tunnel to the LLW storage vaults.

Staffing Estimates. The size of the support facilities takes into account staffing estimates for each job category or trade that will be required to operate and maintain the TWRS Treatment Complex. Staffing estimates and profiles were initially compiled as part of the FCS and have been further refined for use in this study. The types of facilities, the number of facilities and their placement on the site takes into account the practical aspects of maintenance, operations and movement of personnel. Section 4.1, Regulated TWRS Complex Entry Building, contains a complete breakdown of the staffing profile used in this study.

Facility Configuration. This study assumes the process facility configuration recommended by the WHC TWRS management decision process. Specifically, it is assumed that the Separations process is combined with the LLW process in a common facility (building). The HLW process is assumed to be housed in a separate facility (building). This report includes an indication of whether any of the study conclusions or findings are subject to change if an alternative process facility configuration is implemented. This includes the option to incorporate the HLW processing into the combined Separations/LLW facility. The melter line conversion concept considered briefly in this report (i.e., completion of the LLW processing mission in a combined separations/vitrification facility followed by conversion of the LLW melter line for HLW processing) is fully defined in the draft of the *Tank Waste Remediation System Reduced Cost Strategy*, WHC-SD-WM-TI-694 (WHC 1995).

Dispersed Processing Functions. Consistent with the conclusions reached in the FCS, this study does not consider the possibility of dividing any of the main processing functions (Separations, LLW, and HLW) into multiple DTUs. The FCS concluded that such an approach is not cost effective and poses a scheduling risk. One of the key factors detracting from the cost effectiveness of DTUs is the provision of support functions and services. The cost estimates and layouts provided in this report can be used to make the cost comparison that would validate the FCS conclusion.

Waste Staging and Sampling. The feed sampling and queuing functions for the Separations/LLW facility and the HLW facility are assumed to be provided from in-facility tanks. Therefore, the external 378.5-m³ (100,000-gal) tanks ("six-packs") shown in the FCS are no longer external support facilities and have been eliminated from the site layout.

Siting. This study has assumed that the TWRS Treatment Complex will be located east of Baltimore Street, north and/or south of 4th Street and west of the Plutonium-Uranium Extraction Facility (PUREX) in an area of approximately 220 acres. While results of the study are not dependent on exact siting, it is assumed that any alternative site will be comparable in size, terrain, and viability for excavation

and construction. It is also assumed that the site can accommodate the collocation of all of the processing facilities and support functions; although, provision of support functions and services from locations outside of the complex fence is still an option.

Standalone. The term "standalone" indicates that a particular facility is fully independent and is not functionally integrated with any other facility.

Detached. A detached facility indicates that the facility is not physically attached to any other facility, but is functionally integrated with other facilities.

It must be remembered that this is a first pass effort to evaluate the process support functions and infrastructure to develop configuration definitions. The goal is to determine and address major concerns. Other concerns that may impact the final configuration definition may occur as the design matures. Sufficient effort has been expended to provide a high degree of confidence that the findings documented in this report can be used to develop an actual design for the TWRS Treatment Complex process support facilities and infrastructure.

1.3 METHODOLOGY

The findings presented in this report were developed using the logic process shown in Figure 1-1, Study Methodology.

Each step of the process and definitions of pertinent terms follow:

Step 1. All of the support functions necessary for the operation and maintenance of the main processing functions are identified. See Figure 1-2, TWRS Functional Block Diagram. These functions span the provision of utilities to the provision of radiation protection services.

Step 2. The support functions are divided between those that must remain dedicated to the main processing function or facility it supports and those that may be shared between processing functions. The criteria used to select one choice over another are described in Section 1.4, Evaluation Criteria. This study assumes the following definitions:

Dedicated - A support function that is not shared between the Separations/LLW facility and the HLW facility. If needed by both facilities, the function is provided to each facility separately.

Shared - A support function that is needed by both the Separations/LLW facility and the HLW facility, and which is provided by a common facility or area.

Figure 1-1. Study Methodology.

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- Step 3. Determine the physical relationship (distance) between each function and the process facilities. Each function will be classified as one of the following:
- Internal - The support function is physically located inside a processing facility.
- Annex - The support function is separated from the processing function it supports but is located in a structure immediately adjacent to the outside walls of the processing facility (within approximately 30 m).
- Close External - The support function is physically detached from, but needs to be located fairly close to (within 1,000 m), the processing facility(ies) that it serves.
- External: No Distance Constraint - The support function is physically detached from the processing facility(ies) that it serves. There is no particular constraint on how close by or far away the support function can be located from the processing facility(ies).
- Step 4. Each shared and dedicated support function in its chosen location is examined to determine whether or not it is a candidate for "grouping". "Grouping" considers the possibility that there may be an advantage to collocating similar functions in a common facility or area.
- Step 5. Based on the findings developed in Steps 1 through 4, develop definitions for each support facility or area.
- Step 6. Develop layouts for the support function facilities and areas based on the support facility or area definitions.
- Step 7. Cost estimates are developed for the support facility buildings, areas and equipment.
- Step 8. Indicate any adjustments required to update the Rev 0 FCS cost estimates.
- Step 9. Because a DOE decision on processing facility configuration remains outstanding and because there are parallel engineering studies whose outcomes appear particularly relevant to this study, Step 9 evaluates the following four issues with regards to the results of Steps 1 through 8.

- i. Would the choice of an alternative processing facility configuration (i.e., anything other than a combined Separations/LLW and a detached HLW) change the results of any of the Steps 1 through 8?
- ii. Would the strategy to phase in HLW via LLW melter line conversion change the results of any of the Steps 1 through 8?
- iii. Would the strategy to phase in HLW via staged addition to the Separations/LLW facility change the results of any of the Steps 1 through 8?
- iv. Would the results of any of the Steps 1 through 8 change if alternative melter technologies were implemented?

Step 9 does not include a detailed assessment of the nature of any changes to the results of Steps 1 through 8. Step 9 is provided only as an indication of how sensitive the report findings may be to key decisions that have not been finalized. It also serves as a flag for what support functions need to be revisited once final decisions are made.

1.4 EVALUATION CRITERIA

The evaluation criteria discussed here are common to all of the engineering trade studies currently being performed for the TWRS processing programs. Adjustments on emphasis and detail are tailored, as appropriate, for this study.

1.4.1 Operability and Maintainability

Assessment of operability is a qualitative measure of the inherent complexity of a system with respect to four key factors: (1) physical complexity, (2) the nature of the operator interface and (3) the responsiveness of the system, (4) practicality of design. Physical complexity is influenced by the number of unit operations or equipment pieces involved, the number of control points required (including process samples) and the quantity and type of consumables involved in the operation. Operator interface is influenced by factors such as the level of training required and the degree, type and frequency of operator interaction with the system. System responsiveness is related to the ability of the system to respond to fluctuations or variability in the process flowsheet and to off-normal conditions. Practicality of design refers to a "fit for purpose" design configuration that will efficiently perform its intended function.

The maintainability of a system can be assessed by evaluating the complexity, reliability and repairability of the associated equipment. Complexity is influenced by factors such as the level of training required to perform maintenance on the equipment, the need for

special or unique tools, design qualities such as the ability of the equipment to be repaired, the availability of standardized parts and provisions for troubleshooting. Reliability can be directly measured through failure rate/mean time to failure data, but also is associated with qualitative factors such as the frequency of test, calibration and preventative maintenance procedures. Another key measure of reliability is the impact of failures on the process including recovery or downtime following a failure. Repairability is influenced by work space factors (interferences, confined spaces, etc.), location of the equipment, means of component repair or replacement (remote or contact maintenance), number and type of personnel required to support repairs, pre-maintenance preparation requirements and post-maintenance impacts such as quantities and types of wastes produced and functional test requirements.

1.4.2 Cost Effectiveness

Generally, factors considered in the use of cost effectiveness as a decision making discriminator could include: technical development costs; engineering costs; capital equipment, facility and construction costs; operating costs that include staff loading, consumables and utilities; and spending profile. This study provides quantitative information related to costs for: capital equipment, facilities and construction, and engineering. Operating costs are not explicitly tabulated. Instead, estimated quantities of consumables and utilities are provided. Similarly, while support function provisions and layouts are based in part on anticipated staffing levels, no staff loadings are included in cost estimates. If operating costs are a discriminator, a qualitative rationale is documented under other evaluation criteria such as operability and maintainability. Development costs are related to technical maturity, which was not found to be a discriminator among options for the provision and arrangement of support functions. Therefore, no development costs are provided.

Cost estimates provided in this study are based on layouts and equipment lists developed under a "fit for purpose" philosophy. Specifically, an attempt was made to provide costs for a configuration that is suitable to perform the expected functions using commonly available technology and does not reflect higher costs associated with "state of the art" technology.

1.4.3 Radiological Protection

The radiological protection evaluation criterion is a subset of the safety criterion. It is called out separately because of its prominence as a discriminator or key factor in recommending a configuration for the support functions. The radiological protection criterion refers strictly to maintaining worker dose to "As Low As Reasonably Achievable" (ALARA). Considerations related to accidental releases and exposures are part of the "safety" criterion. With regards to the development of support function configuration definition, the radiological protection criterion considers the minimization of worker contact

with contamination or exposure to shine. It considers strategies to avoid spread of contamination and to simplify operations and maintenance.

1.4.4 Safety

The safety criterion considers hazards (other than occupational radiation exposure) and implications for onsite/offsite safety, in-facility worker safety, and mission and property protection. The configuration chosen to deliver support functions needs to be based on consideration of the potential to introduce or create hazards. If a potential hazard related to the support functions cannot be eliminated by reasonable design measures, the choice of a support function configuration needs to be that which offers the greatest potential for hazard prevention and mitigation.

With regard to the safety of the public and onsite workers, the safety criterion considers several factors. First, impacts on the specification of Safety Class are considered. A scheme that minimizes the need for high Safety Class specification of systems, structures and components is generally preferable. In the same way, a scheme that justifies less stringent Performance Categories or seismic design criteria is generally preferable. These are largely qualitative judgements for this study. Further, this study assumes that all support functions can be designed to comply with the quantitative risk acceptance criteria documented in WHC Safety Analysis Procedures (WHC-CM-4-46). Therefore discriminators between alternatives for support function configuration are captured in the qualitative assessment of ease of hazard prevention and mitigation.

In-facility worker safety considers such factors as minimizing worker exposure to potentially harmful materials and environments. The in-facility worker safety criterion overlaps the operability, maintainability and radiation protection criteria. Nevertheless, it is called out separately to emphasize the importance of process and industrial safety to the overall safety risk profile of the TWRS processing complex.

"Mission and property protection" is included with the safety criterion because a key source for major interruption of mission or damage to property is assumed to be related to accidents. Hence, threats to the health and safety of the public and onsite workers also are threats to the processing mission and capital property. This aspect of the safety criterion considers the potential for accident propagation and implications for recovery from any accidents expected to possibly occur during the lifetime of the facilities or mission.

1.4.5 Environmental Regulatory Compliance

The environmental regulatory impacts of a support function configuration is assessed by evaluating: (1) regulated liquid effluent generation, (2) regulated gaseous effluent generation, (3) secondary dangerous waste generation, and (4) permitting requirements.

Regulated liquid effluent generation is defined as the volume of regulated liquid effluents generated and discharged to the Liquid Effluent Treatment Facility (LETf) and/or the Treated Effluent Disposal Facility (TEDF). Ideally, the volume of liquid effluents should be minimized. The degree of treatment required before discharge to LETf/TEDF is also a factor that is examined, as appropriate, in comparing support facility configuration options.

Regulated gaseous effluent generation is defined as the rate of emission of regulated pollutants, both radioactive and nonradioactive. Ideally, emission rates should be kept ALARA. The degree of treatment required to meet airborne effluent discharge limits is also a factor that is examined, as appropriate, in comparing support facility configuration options.

Secondary dangerous waste generation is defined as the quantity of wastes (including mixed wastes) generated as a result of the primary processing operation. Secondary dangerous waste generation should be minimized as much as possible. The extent of in-plant secondary waste treatment and dangerous waste packaging and storage and accumulation areas are considered, as appropriate, when comparing support function configurations.

Permitting requirements should be evaluated based on the following factors:

- (1) number of permits required, (2) complexity of required permitting documentation,
- (3) potentially required permits or approvals that are unique to the system being examined,
- (4) regulatory obstacles (e.g., applying for an exemption or seeking a different ruling on a regulation, and (5) impacts of permitting activities on the project schedule.

The specific regulatory requirements examined in the evaluation of this criterion for the support function configuration are indicated below. While the regulations are grouped by category, several overlap into one or more categories. In addition, some regulations apply to NRC licensed facilities (e.g., 10 CFR 61 and 10 CFR 71) but may become important to DOE facilities in the future. These were considered but did not mandate design decisions.

1.4.5.1 Hazardous Wastes.

40 CFR 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

WAC 173-303, Dangerous Waste Regulations

WAC 173-360, Underground Storage Tank Regulations.

1.4.5.2 Mixed Wastes.

DOE 5820.2A, Radioactive Waste Management (exemption applied for).

1.4.5.3 Radioactive Wastes.

10 CFR 61, Licensing Requirements for Land Disposal of Radioactive Wastes

10 CFR 71, Packaging and Transportation of Radioactive Material

DOE 5480.3, Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances and Hazardous Wastes

RLID 5820.2A, Radioactive Waste Management (exemption applied for)

WAC 173-325, Low-Level Radioactive Waste Disposal.

1.4.5.4 Air Quality.

40 CFR 61(H), National Emission Standards for Hazardous Air Pollutants

DOE 5400.1, General Environmental Protection Program

WAC 173-400, General Regulations for Air Pollution Sources

WAC 173-401, Operating Permit Regulation

WAC 173-460, Controls for New Sources of Toxic Air Pollutants

WAC 173-480, Ambient Air Quality Standards and Emission Limits for Radionuclides

WAC 246-247, Radiation Protection - Air Emissions.

1.4.5.5 Confinement Systems.

DOE 6430.1A, General Design Criteria.

1.4.5.6 Radiation Protection.

DOE 5400.5, Radiation Protection of the Public and Environment

DOE 5480.11, Radiation Protection for Occupational Workers

DOE/EH-0256T, Rev 1, Radiological Control Manual.

1.4.5.7 Environmental, Safety and Health.

DOE 5480.1B, Environmental, Safety and Health Program for Department of Energy Operations

RLIP 5480.4C, Environmental Protection, Safety, and Health Protection Standards for RL.

1.4.5.8 Miscellaneous.

RLIP 5820.2A, Radioactive Waste Management

WAC 173-216, State Waste Discharge Permit Program

WAC 246-272, Onsite Sewage System.

1.4.6 Schedule

The schedule criterion considers any impact or special needs that a configuration choice may have on design, construction and start-up schedule. As the support functions are not anticipated to be the limiting factor in meeting pre-determined project milestones, schedule does not serve to eliminate any configuration options. At this stage in the engineering studies, important relative advantages of one option over another on the basis of schedule have not been identified.

1.4.7 Technical Maturity

The technical maturity criterion considers whether any aspect of a support function configuration is beyond the state of the art, requires development, is undemonstrated technology, or is not readily available in terms of supply. In general, configurations employing demonstrated and readily supplied technology are preferred. To the level of detail they are provided in this report, layouts, equipment lists and cost estimates for a recommended support function configuration are based on proven, commercially available technology.

1.4.8 Design Impact

The design impact criterion considers the possibility that the choice of support function configuration may impact: (1) the process flowsheet, (2) special requirements or restrictions for siting, and (3) constructibility.

1.5 REPORT ORGANIZATION

The report sections following this introduction are organized as follows:

Section 2.0, Summary of Technical Findings and Conclusions, provides the key findings of the study in convenient tabular format. The remaining sections of the report and the appendices may be viewed as detailed back-up information for that provided in these tables.

Section 3.0, Description and Evaluation of Support Functions, provides a brief description of each of the identified support functions, a summary of the findings for each function, and a brief discussion of the considerations and rationale upon which the findings were based.

Section 4.0, Description of Support Facilities, describes the facilities or areas that house or contain each of the support functions.

Section 5.0, Description of Site Layout and Infrastructure, provides an initial attempt to place the support functions and areas within a 200-acre TWRS Treatment Complex site. This site is being recommended in the *Tank Waste Remediation System Complex Site Evaluation Report* (WHC-SD-WM-SE-021 Rev 0A draft 1995) as the preferred location for the TWRS Treatment Complex. While there may be many ways to arrange the facilities on the prescribed site, this exercise helps to validate the findings documented herein with regard to support function and infrastructure configuration.

Section 6.0, References, lists the documents referenced by this report.

The following appendices contain material used in the evaluation of various support functions and development of the support facility definition:

- A Block Flow Diagrams
- B Utility Flow Diagrams
- C Utility Consumption Tables and Electrical Load List
- D Cold Chemical Consumption Tables
- E1 Support Facility Equipment List
- E2 High-Level Waste Standalone Support Facility Equipment List
- E3 Separations/Low-Level Waste Standalone Support Facility Equipment List
- F Facility Layouts
- G1 Base Case Support Facility Configuration Cost Basis
- G2 Alternate Case Support Facility Configuration Cost Basis
- G3 Tank Waste Remediation System Facility Configuration Study
Facilities Cost Comparison
- H1 Separations/Low-Level Waste Analytical Function Study
- H2 High-Level Waste Analytical Function Study.

2.0 SUMMARY OF TECHNICAL FINDINGS

The TWRS Functional Block Diagram, was reviewed to identify the separations and process support functions. Each support function was evaluated to determine the overall annual utility consumption requirements. Table 2-1, Summary of TWRS Treatment Complex Peak Annual Utility Consumption, summarizes the peak annual utility consumption for each process function. Appendix C, Utility Consumption Tables and Electrical Load List, provides a detailed breakdown of the estimated annual utility consumption requirements and the electrical load requirements.

Each support function was evaluated against the Evaluation Criteria identified in Section 1.4 and a rationale developed to define its configuration. Table 2-2, Factors Influencing Function Configuration, indicates which of the criteria factored most prominently in defining the proposed configuration. Table 2-3, Support Function Definition, defines the proposed configuration for each function. It identifies the function, the facility from where the function is provided, whether it is shared between the process facilities or dedicated to each, if it is grouped with other similar functions, and the physical relationship to the process facilities it serves. It also indicates if the function is a candidate for being provided from an existing Hanford facility.

Also of interest is the impact of resolution of outstanding issues on the proposed configuration. Table 2-4, Impacts to Function Configuration Definition Due to Resolution of Outstanding Issues, indicates which aspects of the configuration definition would be affected by these issues. The issues addressed are the implementation of staged HLW construction, LLW-HLW melter conversion, detached Separations, LLW, and HLW, or an alternate melter technology. It is inherent that these process facility variations would have impacts not only to individual process and process support facility layouts but also to the overall site layout. It was assumed that these process facility variations would not impact the grouping of functions within the process support facilities.

Table 2-5, Support Facility Capital Cost Basis, provides an estimated cost for the TWRS Treatment Complex process support facilities and infrastructure defined in this report. The Total Estimated Cost (TEC) for the facilities and infrastructure required to provide these functions is \$524,842,000. This compares with an estimated value of \$521,836,000 reported in the FCS for support facilities. Appendix G3 contains a detailed comparison between the TWRS Treatment Complex support facility and infrastructure costs and the FCS costs.

When Cost Effectiveness was indicated to have had an influence on a function's configuration, an attempt was made to determine the cost advantage of the chosen configuration. Alternate support facilities are defined in the study as the alternative to the proposed configuration, shared or combined support facilities (a standalone support facility constructed for each of the processing facilities). Table 2-6, Alternate Support Facility Capital Cost Differential, summarizes the overall cost advantage of the proposed configuration over the alternate. The total cost advantage is \$90,211,000.

Table 2-1. Summary of Tank Waste Remediation System Treatment Complex Peak Annual Utility Consumption.⁴

Utilities	Utility steam	Process steam	Raw water	Sanitary water	Plant air ¹	Instrument air ¹	Electrical load ⁵	Cooling tower	Process cooling water	Melter cooling water	Chilled water
Units	MT	M kWh	m ³	m ³	M m ³	M m ³	M kWh	M kWh	M kWh	M kWh	M kWh
Closed Loop or Open System	Open	Closed	Open	Open	Open	Open	Open	Closed	Closed	Closed	Closed
Peak Annual Usage	11,070	222.1	1,650,000	259,200	70.76	13.4	664.6 ⁶	841.9	497.2	12.87	0.454
Separations											
Total	4,443	48.8	0	84,500	2.83	4.47	2.65	73.1	56	0	0
% of Peak	40.1%	22.0%		32.6%	4.0%	33.3%	0.4%	8.7%	11.3%	0%	0%
LLW Treatment											
Total	4,443	152	0	43,600	65.1	4.47	373.2	441.7	378	10.3	0.41
% of Peak	40.1%	68.4%		16.8%	92.0%	33.3%	56.2%	52.5%	76.0%	80.0%	90.3%
HLW Treatment											
Total	2,180	21.3	0	49,200	2.83	4.47	84.7	79.9	63.2	2.57	0.044
% of Peak	19.8%	9.6%		19.0%	4.0%	33.3%	12.7%	9.5%	12.7%	20.0%	9.7%
Support Facilities											
Total	²	0	1,650,000	81,900	²	²	204.0	247.2	0	0	0
% of Peak			100% ³	31.6%			30.7%	29.4%	0%	0%	0%

1. The sum of the Peak Annual use of the Plant Air and Instrument Air is the Annual Compressed Air consumption.

2. Included in the process facility totals.

3. Raw Water consumption is determined from the Cooling Tower make-up requirements.

4. Peak annual usage occurs when all 3 main processing facilities are in operation.

5. Includes an allowance to account for the power required by a HLW joule heated melter.

6. Approximately 35% of Plant Electrical Load is LLW electric generators.

Table 2-2. Factors Influencing Function Configuration. (5 sheets)

Section no.	Function description	Operability/ Maintain- ability	Cost effectiveness	Radiological protection (ALARA)	Safety	Environmental regulatory compliance	Schedule	Technical maturity	Design impact
3.1	Sample Analysis	X	X						
3.2	Collect and Handle Solid Waste System		X	X	X				
3.3.1	Collect and Handle Potentially Radioactive Liquid Waste System			X					
3.3.2	Collect and Handle Nonradioactive Liquid Waste System		X						
3.4.1	Oxygen System		X		X			X	
3.4.2	Cold Chemical Supply System	X	X		X				
3.4.3	Cold Chemical Feed System			X					
3.4.4	Cold Chemical Vent System	X							
3.4.5	Process Facility Vent System			X					
3.4.6	Process Steam and Condensate System	X	X	X	X				
3.4.7	Process Cooling Water System			X					

Table 2-2. Factors Influencing Function Configuration. (5 sheets)

Section no.	Function description	Operability/ Maintain- ability	Cost effectiveness	Radiological protection (ALARA)	Safety	Environmental regulatory compliance	Schedule	Technical maturity	Design impact
3.4.8	Melter Cooling Water System			X					
3.4.9	Process Chilled Water System			X					
3.4.10	Utility Steam System		X						
3.4.11	Compressed Air System		X						
3.4.12	Process Water System		X						
3.4.13	Demineralized Water System	X	X						
3.4.14	Sanitary Water System	X							
3.4.15	Raw Water System	X							
3.4.16	TWRS Treatment Complex Site Fire Water System	X							
3.4.17	Process Facility Fire Water System	X			X				
3.4.18	Waste Condensate Collection System								X
3.4.19	Cooling Tower Water System		X						

Table 2-2. Factors Influencing Function Configuration. (5 sheets)

Section no.	Function description	Operability/Maintainability	Cost effectiveness	Radiological protection (ALARA)	Safety	Environmental regulatory compliance	Schedule	Technical maturity	Design impact
3.4.20	Telecommunications System	X							
3.4.21	Sanitary Sewer System	X							
3.5.1	Normal AC Power System	X							
3.5.2	Emergency Power System	X							
3.5.3	Uninterruptible Power Supply System	X							
3.6.1	Treatment Complex Management and Support System	X							
3.6.2	Regulated TWRS Treatment Complex Entry System	X		X					
3.6.3	Regulated Facility Entry System			X					
3.6.4	Personnel Protection System			X	X				
3.6.5	Employee Support System	X							
3.7.1	Shipping and Receiving System	X							

Table 2-2. Factors Influencing Function Configuration. (5 sheets)

Section no.	Function description	Operability/ Maintain- ability	Cost effectiveness	Radiological protection (ALARA)	Safety	Environmental regulatory compliance	Schedule	Technical maturity	Design impact
3.7.2	Warehousing and Storage System	X							
3.7.3	Storage and Service Yard	X							
3.7.4	Major Equip Assembly	X							
3.7.5	Spare Parts Fabrication	X							
3.7.6	Maintenance and Repair System (MSM and other)	X		X					
3.8.1	Supply Air Treatment System	X							
3.8.2	Exhaust Air Treatment System	X			X				
3.8.3	HVAC Chilled Water System	X	X						
3.9.1	Process Facility Oper Control System	X			X				
3.9.2	Health Protection System Vacuum System			X					

*Dedicated to the Bulk Cold Chemical Building.

Table 2-3. Support Function Definition. (5 sheets)

Section no.	Function description	Location	Shared versus dedicated	Grouped	Internal	Annex	Close External	No Distance Constraint	Potential to use an Existing Facility
3.1	Sample Analysis	Analytical Facility	Dedicated	X			X		
3.4.1	Oxygen System	BHA	Shared					X	X
3.3.2	Collect and Handle Nonradioactive Liquid Waste System	Bulk Cold Chem Bldg/MUB	Shared	X			X		
3.4.2	Cold Chemical Supply System	Bulk Cold Chem Bldg	Shared	X			X		
3.4.4	Cold Chemical Vent System	Bulk Cold Chem Bldg	Dedicated*	X			X		
3.4.19	Cooling Tower Water System	Cooling Tower	Shared					X	X
3.4.20	Telecommunications System	Emerg Response Ctr	Shared	X			X		
3.5.2	Emergency Power System	Emerg Generator Bldg	Dedicated				X		
3.7.4	Major Equip Assembly	Fabrication/Assembly Shop	Shared	X				X	X
3.7.5	Spare Parts Fabrication	Fabrication/Assembly Shop	Shared	X				X	X
3.4.10	Utility Steam System	Mech Utilities Bldg	Shared	X			X		

Table 2-3. Support Function Definition. (5 sheets)

Section no.	Function description	Location	Shared versus dedicated	Grouped	Internal	Annex	Close External	No Distance Constraint	Potential to use an Existing Facility
3.4.11	Compressed Air System	Mech Utilities Bldg/ User Facility	Shared	X		X (Breathing Air Bottles)		X (Plant and Instrument Air)	X (Plant and Instrument Air)
3.4.13	Demineralized Water System	Mech Utilities Bldg	Shared	X				X	X
3.8.3	HVAC Chilled Water System	Mech Utilities Bldg	Shared	X			X		
3.6.1	Treatment Complex Management and Support System	Oper Support Bldg	Shared					X	X
3.6.2	Regulated TWRS Treatment Complex Entry System	Regulated TWRS Complex Entry Bldg	Shared	X			X		
3.6.5	Employee Support System	Regulated TWRS Complex Entry Bldg/various support facilities	Dedicated	X			X		
3.9.1	Process Facility Oper Control System	Regulated TWRS Complex Entry Bldg/Emerg Response Ctr	Dedicated	X			X		
3.5.1	Normal AC Power System	Switchgear Bldg	Dedicated				X		

Table 2-3. Support Function Definition. (5 sheets)

Section no.	Function description	Location	Shared versus dedicated	Grouped	Internal	Annex	Close External	No Distance Constraint	Potential to use an Existing Facility
3.4.21	Sanitary Sewer System	Treatment Complex Site	Shared				X		
3.4.14	Sanitary Water System	TWRS Complex Site	Shared	X			X		
3.4.15	Raw Water System	TWRS Complex Site	Shared	X			X		
3.2	Collect and Handle Solid Waste System	User Facility	Dedicated		X				
3.3.1	Collect and Handle Potentially Radioactive Liquid Waste System	User Facility	Dedicated		X				
3.4.18	Waste Condensate Collection System	User Facility Annex	Dedicated			X			
3.4.3	Cold Chemical Feed System	User Facility	Dedicated		X				
3.4.5	Process Facility Vent System	User Facility	Dedicated		X				
3.4.6	Process Steam and Condensate System	User Facility	Dedicated		X				
3.4.7	Process Cooling Water System	User Facility	Dedicated	X	X				

Table 2-3. Support Function Definition. (5 sheets)

Section no.	Function description	Location	Shared versus dedicated	Grouped	Internal	Annex	Close External	No Distance Constraint	Potential to use an Existing Facility
3.4.8	Melter Cooling Water System	User Facility	Dedicated	X	X				
3.4.9	Process Chilled Water System	User Facility	Dedicated	X	X				
3.5.3	Uninterruptible Power Supply System	User Facility	Dedicated		X				
3.6.3	Regulated Facility Entry System	User Facility	Dedicated			X			
3.6.4	Personnel Protection System	User Facility	Dedicated		X				
3.7.6	Maintenance and Repair System (MSM and other)	User Facility	Dedicated		X				
3.8.1	Supply Air Treatment System	User Facility (Proc Bldg Roof)	Dedicated	X		X			
3.8.2	Exhaust Air Treatment System	User Facility (Fan/Filter Annex and Proc Bldg Roof)	Dedicated	X (Zone II and III Systems)		X			
3.9.2	Health Protection System Vacuum System	User Facility	Dedicated		X				

Table 2-3. Support Function Definition. (5 sheets)

Section no.	Function description	Location	Shared versus dedicated	Grouped	Internal	Annex	Close External	No Distance Constraint	Potential to use an Existing Facility
3.7.1	Shipping and Receiving System	Warehouse	Shared	X				X	X
3.7.2	Warehousing and Storage System	Warehouse	Shared	X				X	X
3.7.3	Storage and Service Yard	Warehouse	Shared	X				X	X
3.4.12	Process Water System	Water Pumphouse	Shared	X				X	X
3.4.16	TWRS Treatment Complex Site Fire Water System	Water Pumphouse/ TWRS Complex Site	Shared	X			X (Under-ground Piping)	X (Pumps and Stor Tank)	X (Pumps and Stor Tank)
3.4.17	Process Facility Fire Water System	Water Pumphouse TWRS Complex Site	Dedicated	X			X (Under-ground Piping)	X (Pumps and Stor Tank)	X (Pumps and Stor Tank)

*Dedicated to the Bulk Cold Chemical Building.

Table 2-4. Impacts to Function Configuration Due to Resolution of Outstanding Issues. (5 sheets)

Legend: S/D - Shared versus Dedicated
G - Grouped/Not Grouped
C ↑ - Capital Cost Up
C ↓ - Capital Cost Down

It is understood that these variations would have impacts to both facility and site layouts, but not impact the grouping of functions within facilities

Sect. no	Function description	Type of func- tion	Perturbations Considered			
			Staged construction	Melter conversion	Three separate process facilities	Melter technology
3.1	Sample Analysis	Dedicated		C ↓, substitution of a HLW melter train for a LLW melter train will reduce the number of process trains being sampled		C ↑, may impact the number and types of samples required
3.2	Collect and Handle Solid Waste System	Dedicated	S/D, C ↓, will share solid waste handling facilities	S/D, C ↓, will share solid waste handling facilities	C ↑, will require an additional solid waste handling facility	C ↑, will impact size of solid waste handling facilities
3.3.1	Collect and Handle Poten- tially Radioactive Liquid Waste System	Dedicated				
3.3.2	Collect and Handle Nonradioactive Liquid Waste System	Shared				
3.4.4	Cold Chemical Vent System	Dedicated to the Bulk Cold Chemical Building				
3.4.5	Process Facility Vent System	Dedicated				

Table 2-4. Impacts to Function Configuration Due to Resolution of Outstanding Issues. (5 sheets)

Legend: S/D - Shared versus Dedicated

G - Grouped/Not Grouped

C ↑ - Capital Cost Up

C ↓ - Capital Cost Down

It is understood that these variations would have impacts to both facility and site layouts, but not impact the grouping of functions within facilities

Sect. no	Function description	Type of function	Perturbations Considered			
			Staged construction	Melter conversion	Three separate process facilities	Melter technology
3.4.2	Cold Chemical Supply System	Shared				C ↑, will increase types and quantities of chemicals required
3.4.3	Cold Chemical Feed System	Dedicated				C ↑, will increase types and quantities of chemical required
3.4.1	Oxygen System	Shared				C ↓, will decrease the amount of oxygen required
3.4.6	Process Steam and Condensate System	Dedicated		S/D, C ↓, will share system	C ↑, will require an additional system	C ↓, will reduce size of system
3.4.10	Utility Steam System	Shared		C ↓, will share system	C ↑, will increase the size of the system	
3.4.12	Process Water System	Shared		C ↓, will share system		
3.4.13	Demineralized Water System	Shared		C ↓, will share system		
3.4.14	Sanitary Water System	Shared				
3.4.15	Raw Water System	Shared				
3.4.16	TWRS Treatment Complex Fire Water System	Shared				

Table 2-4. Impacts to Function Configuration Due to Resolution of Outstanding Issues. (5 sheets)

Legend: S/D - Shared versus Dedicated
 G - Grouped/Not Grouped
 C ↑ - Capital Cost Up
 C ↓ - Capital Cost Down

It is understood that these variations would have impacts to both facility and site layouts, but not impact the grouping of functions within facilities

Sect. no	Function description	Type of function	Perturbations Considered			
			Staged construction	Melter conversion	Three separate process facilities	Melter technology
3.4.17	Process Facility Fire Water System	Dedicated		S/D, C ↓, will share system	C ↑, will require an additional system	
3.4.7	Process Cooling Water System	Dedicated		S/D, C ↓, will share system	C ↑, will require an additional system	C ↑, will require an increase in size of system
3.4.8	Melter Cooling Water System	Dedicated		S/D, C ↓, will share system		C ↑, will increase the size of the system
3.4.9	Process Chilled Water System	Dedicated		S/D, C ↓, will share system	C ↑, will require an additional system	C ↓, will reduce size of size
3.4.19	Cooling Tower Water System	Shared		C ↓, will reduce size of system		C ↑, will increase size of system
3.4.11	Compressed Air System	Shared				
3.4.20	Telecommunications System	Shared		C ↓, will reduce amount of infrastructure	C ↑, will increase amount of infrastructure	
3.4.21	Sanitary Sewer System	Shared		C ↓, will reduce amount of infrastructure	C ↑, will increase amount of infrastructure	
3.5.1	Normal AC Power System	Shared		C ↓, will reduce amount of infrastructure	C ↑, will increase amount of infrastructure	C ↑, will increase size of system

Table 2-4. Impacts to Function Configuration Due to Resolution of Outstanding Issues. (5 sheets)

Legend: S/D - Shared versus Dedicated
 G - Grouped/Not Grouped
 C ↑ - Capital Cost Up
 C ↓ - Capital Cost Down

It is understood that these variations would have impacts to both facility and site layouts, but not impact the grouping of functions within facilities

Sect. no	Function description	Type of function	Perturbations Considered			
			Staged construction	Melter conversion	Three separate process facilities	Melter technology
3.5.2	Emergency Power System	Dedicated		S/D, C ↑, will share system		C ↑, will increase size of system if maintaining a hot melter is a requirement
3.5.3	Uninterruptible Power Supply System	Dedicated		C ↑, will reduce size of system		
3.6.1	Treatment Complex Management and Support System	Shared				
3.6.2	Regulated TWRS Treatment Complex Entry System	Shared		C ↓, will reduce size of system due to reduced staff	C ↑, will increase size of system due to increased staff	
3.6.3	Regulated Facility Entry System	Dedicated	S/D, C ↑, will share system	S/D, C ↑, will share system	C ↑, will require an additional system	
3.6.5	Employee Support System	Dedicated	C ↓, will reduce size of system due to reduced staff	C ↓, will reduce size of system due to reduced staff	C ↑, will increase size of system due to increased staff	
3.6.4	Personnel Protection System	Dedicated	S/D (RFE), C ↑, will share system	S/D (RFE), C ↑, will share system	C ↑, will require an additional system	
3.7.1	Shipping and Receiving System	Shared				

Table 2-4. Impacts to Function Configuration Due to Resolution of Outstanding Issues. (5 sheets)

Legend: S/D - Shared versus Dedicated
G - Grouped/Not Grouped
C ↑ - Capital Cost Up
C ↓ - Capital Cost Down

It is understood that these variations would have impacts to both facility and site layouts, but not impact the grouping of functions within facilities

Sect. no	Function description	Type of func- tion	Perturbations Considered			
			Staged construction	Melter conversion	Three separate process facilities	Melter technology
3.7.2	Warehousing and Storage System	Shared				
3.7.3	Storage and Service Yard	Shared				
3.7.4	Major Equip Assembly	Shared				
3.7.5	Spare Parts Fabrication	Shared				
3.7.6	Maintenance and Repair System	Dedicated	S/D, C ↓, will share system	S/D, C ↓, will share system	C ↑, will require an additional system	
3.8.1	Supply Air Treatment System	Dedicated		S/D, C ↓, will share system	C ↑, will require an additional system	
3.8.2	Exhaust Air Treatment System	Dedicated	C ↓, will share system	S/D, C ↓, will share system	C ↑, will require an additional system	
3.8.3	HVAC Chilled Water System	Shared		C ↓, will reduce size of system	C ↑, will increase size of system	
3.4.18	Waste Condensate Collection System	Dedicated			C ↑, will require an additional system	
3.9.1	Process Facility Oper Control System	Dedicated		C ↓, will reduce size of system	C ↑, will increase size of system	
3.9.2	Health Protection System Vacuum System	Dedicated		C ↓, will share system	C ↑, will increase size of system	

Table 2-5. Support Facility Capital Cost Basis. (2 sheets)

Facility/building	Area (m ²)	Volume (m ³)	Direct cost (\$ M)	Eng/PM/CM ³ (\$ M)	Subtotal (\$ M)	Contingency total ⁴ (\$ M)	TEC total (\$ M)
Regulated TWRS Complex Entry (Structure)	5,580	28,400	9,613.0	6,248.5	15,862	6,345	22,207
Regulated TWRS Complex Entry (Other)	N/A	N/A	1,532.0	995.8	2,528	1,011	3,539
Operation Support Bldg (Structure)	6,510	30,800	9,929.0	6,453.9	16,383	6,553	22,936
Operation Support Bldg (Other)	N/A	N/A	53.0	34.5	88	35	123
Emergency Response Center (Structure)	1,880	11,340	4,467.0	2,903.6	7,371	2,948	10,319
Emergency Response Center (Other)	N/A	N/A	1,802.0	1,171.3	2,973	1,189	4,162
Bulk Cold Chemical Bldg (Structure)	1,680	22,350	3,111.0	2,021.5	5,133	2,053	7,186
Bulk Cold Chemical Bldg (Other)	N/A	N/A	8,713.0	5,663.5	14,377	5,751	20,128
Bulk Handling Area (Pad and Berms)	N/A	N/A	459.0	298.4	757	303	1,060
Bulk Handling Area (Other)	N/A	N/A	9,922.0	6,453.9	16,371.3	6,548.5	22,919.8
Mechanical Utilities Bldg (Structure)	3,000	23,730	3,822.0	2,484.3	6,306	2,522	8,828
Mechanical Utilities Bldg (Other)	N/A	N/A	11,261.0	7,319.7	18,581	7,432	26,013
Water Pump house (Structure)	760	4,670	1,032.0	670.8	1,703	681	2,384
Water Pump house (Other)	N/A	N/A	4,787.0	3,111.6	7,899	3,160	11,059
Analytical Facility (Structure)	7,160	31,750	18,318.0	11,906.7	30,225	12,090	42,315
Analytical Facility (Other)	N/A	N/A	59,401.0	38,610.7	98,012	39,205	137,217
Switchgear Bldg (Structure)	1,080	7,000	1,668.0	1,084.2	2,752	1,101	3,853
Switchgear Bldg (Other)	N/A	N/A	7,702.0	5,006.3	12,708	5,083	17,791

Table 2-5. Support Facility Capital Cost Basis. (2 sheets)

Facility/building	Area (m ²)	Volume (m ³)	Direct cost (\$ M)	Eng/PM/CM ³ (\$ M)	Subtotal (\$ M)	Contingency total ⁴ (\$ M)	TEC total (\$ M)
Cooling Tower	N/A	N/A	5,381.0	3,497.7	8,879	3,552	12,431
Shipping and Receiving (Structure)	1,170	6,120	1,365.0	887.3	2,252	901	3,153
Warehouses (2 total) (Structure)	8,040	52,420	6,701.0	4,355.7	11,057	4,423	15,480
Warehouses (2 total) (Other)	N/A	N/A	209.0	135.9	345	138	483
Fabrication and Assembly Shop (Structure)	4,020	49,600	7,048.0	4,581.2	11,629	4,652	16,281
Fabrication and Assembly Shop (Other)	N/A	N/A	879.0	571.4	1,450	580	2,030
TWRS Treatment Complex Site	80 Hectares	N/A	44,796.0	29,117.4	73,913	29,565	103,478
Feed Transfer Lines	1,140 m	N/A	3,234	2,102.1	5,336	2,134	7,470
Total			227,204	147,682.5	374,887	149,955	524,842

¹Prices are expressed in 1994 dollars.

²Escalation to project centroids is excluded.

³Allowances for eng/pm/cm are: Engineering @ 40% of Direct Cost; Construction Management(cm) @ 10% of Direct Cost; Project Management (PM) @ 10% of Direct Cost + Eng + CM.

⁴Contingency @ 40 %

⁵Costs for buildings listed above include costs for HVAC and other costs associated with the structure.

⁶Site cost includes clearing and grubbing, grading, two miles of roads, security fence, misc. unit substations, 230 kV line, Substation/Switchgear area, area lighting, a sewer lift station, U/G fire water, raw water, sewer, steam and condensate, process water, compressed air, U/G electrical power and communication systems, railroad track, final site grading, walkways and landscaping.

⁷Bulk Cold Chemical Building also includes Chemical Supply System, glass former preparation.

⁸Water Pumphouse also includes fire and bulk water storage tanks, diesel tanks and pumps.

⁹Bulk Handling Area also includes the 130 T/D oxygen plant.

Table 2-6. Alternate Support Facility Capital Cost Differential.

Facility/building	Base case direct cost (\$ M)	Alt case direct cost (\$ M)	Direct cost differential (\$ M)	Eng/PM/CM ³ (\$ M)	Subtotal (\$ M)	Contingency total ⁴ (\$ M)	TEC delta cost total (\$ M)
Bulk Cold Chemical Bldg (Structure and Equip)	11,823.0	17,832.0	6,009	3,906	9,915	3,966	13,881
Bulk Handling Area	10,381.0	12,328.8	1,948	1,266	3,214	1,286	4,500
Mechanical Utilities Bldg	15,083.0	24,609.0	9,526	6,192	15,718	6,287	22,005
Analytical Facility	77,719.0	82,193.0	4,474	2,908	7,382	2,953	10,335
Cooling Tower	5,381.0	6,549.0	1,168	759	1,927	771	2,698
Total Support Facility Costs	120,387	143,512	23,125	15,031	38,156	15,263	53,419
Base case capital costs included in process facility costs; however, alternate facility costs would impact overall facility costs.							
Dedicated Solid Waste Handling System:							
< 100 T/D LLW Liquid Fed Combustion Melter (LFCM)	9,768.0						
< 10 T/D HLW Stirred Melter	4,829.0						
versus Shared Solid Waste Handling System:		30,524.0					
Total Solid Waste Facility Costs	14,597	30,524	15,927	10,353	26,280	10,512	36,792
Total	134,984	174,036	39,052	25,384	64,436	25,775	90,211

1. Prices are expressed in 1994 dollars.

2. Escalation to project centroids is excluded.

3. Allowances for ENG/PM/CM are: Engineering @ 40% of Direct Cost; Construction Management(cm) @ 10% of Direct Cost; Project Management (PM) @ 10% of Direct Cost + Eng + CM.

4. Contingency @ 40%.

Figure 2-1, TWRS Treatment Complex Site Plan, depicts the configuration of the overall site incorporating the findings and conclusions of this report.

Figure 2-1. Tank Waste
Remediation System
Treatment Complex
Site Plan.

LEGEND

AF	ANALYTICAL FACILITY
BCCB	BULK COLD CHEMICAL BUILDING
BHA	BULK HANDLING AREA
EGB	EMERGENCY GENERATOR BUILDING
ERC	EMERGENCY RESPONSE CENTER
FAS	FABRICATION & ASSEMBLY SHOP
HLWVP	HLW VITRIFICATION BUILDING
HCBR	CONTACT FILTER/BLOWER ROOM ANNEX (HL)
HCCA	CONDENSATE COLLECTION ANNEX (HL)
HCHA	CANISTER/CASK HANDLING ANNEX (HL)
HFFA	FAN/FILTER ANNEX (HL)
HRFE	REGULATED FACILITY ENTRY ANNEX (HL)
LLWVP	LLW VITRIFICATION BUILDING (NOTE 2)
LGBR	CONTACT FILTER/BLOWER ROOM ANNEX (LL)
LCCA	CONDENSATE COLLECTION ANNEX (LL)
LCSA	CONTAINER STAGING ANNEX (LL)
LFFA	FAN/FILTER ANNEX (LL)
LRFE	REGULATED FACILITY ENTRY ANNEX (LL)
MUB	MECHANICAL UTILITY BUILDING
OSB	OPERATIONS SUPPORT BUILDING
RCE	REGULATED TWRS COMPLEX ENTRY
SERV/STOR	SERVICE/STORAGE YARD
SGB	SWITCHGEAR BUILDING
SHIP/RECVG	SHIPPING AND RECEIVING BUILDING
WHSE	WAREHOUSE
WPH	WATER PUMPHOUSE

NOTE:

- OVERALL AREA OF THE TWRS TREATMENT COMPLEX IS 200 ACRES.
- LLWVP INCLUDES SEPARATIONS PLANT.

200 EAST AREA

Figure 2.1 - TWRS treatment Complex Site Plan

WHC-SD-W378-ES-002 (Rev 1 september 28, 1995)

REFERENCE DRAWINGS
NEXT USED ON

00 1/16/95 ISSUED FOR 2001 REPORT		28:BM:ACD2:10.C2:SS	
REV	DATE	U.S. DEPARTMENT OF ENERGY	
CRD		Fluor Daniel, Inc.	
		ADVANCED TECHNOLOGY DIVISION	
		TWRS TREATMENT COMPLEX	
		SITE PLAN	
		TANK WASTE REMEDIATION SYSTEM	
		DATE 11-28-94	
		SCALE 1:3000	
		DATE 2001/2011	
		ES-SITEF-2	
		1 1 00	

3.0 DESCRIPTION AND EVALUATION OF SUPPORT FUNCTIONS

This section addresses each function required to support the TWRS Treatment Complex process mission. A narrative discussion is provided for each identified support function. This discussion will provide a brief description of the system providing the function, a summary of the findings, and a brief discussion of the considerations and rationale used to define the system.

The System Description will describe the system, identify who it serves, and where it is located. The Findings portion provides a definition for the system's configuration, identifies the primary considerations that drove the configuration, identifies if the system is grouped with other systems, identifies which systems it is grouped with, and identifies if it is a candidate for being provided from an existing Hanford facility. The Function Configuration Considerations and Rationale address the impact of the Evaluation Criteria identified in Section 1.4 on the configuration of the system. The primary drivers are identified and discussed as well as any other considerations or rationale that was used to develop the definition of the configuration.

3.1 SAMPLE ANALYSIS

3.1.1 System Description

The Sample Analysis function analyzes all of the solid, liquid and gas samples collected within the Separations, LLW, HLW, and support functions. The sample and analytical lab equipment for each mission is considered to be dedicated. Support elements for sample and analytical systems, where practical, are considered to be shared. The following Sample Analysis functions occur within the Analytical Facility (AF):

- Process control, including process diagnosis and history
- Waste form qualification
- Process gas, waste, wastewater, and environmental sample analysis
- Examination of smear test samples.

The samples are taken in the Separations/LLW process facility and the HLW process facility. The samples are transferred to the AF with a pneumatic rabbit system. A sample tracking system records the analytical requirements and results for each sample. The AF contains analytical cells where undiluted, high radiological activity samples are remotely handled. Sample preparation, dilution, and limited sample analysis occurs in analytical cells. Diluted and/or low radiological activity samples are analyzed in analytical laboratories. Analyzers within the laboratories are located in hoods to contain radioactivity. Other rooms within the AF include service rooms, receiving rooms, counting rooms, equipment and stock

rooms, solid waste handling areas, and analytical instrument rooms. Radiological liquid wastes are collected in catch tanks located in the AF basement.

The sample analysis function is required to provide waste form qualification. The waste form qualification for the Separations/LLW facility is assumed to be product qualification. Product qualification requires statistically significant sampling and analysis of the product glass. Any glass that does not meet requirements is recycled. Process qualification with limited product qualification is the assumed basis for HLW waste form qualification. Process qualification requires sampling and analyzing the melter feed and comparing the results to reference compositions that were previously identified. Feed characterization, melter feed envelop determination, equipment qualification and process parameter control are also required for process qualification.

Development of the requirements for the Sample Analysis function has substantially profited from the design of the Hanford Waste Vitrification Plant (HWVP) analytical function. As such, it incorporates the many lessons learned at the Defense Waste Process Facilities (DWPF).

Other Sample Analysis functions occur outside of the AF. On-line stream analysis occurs within the Separations/LLW and HLW facilities to obtain accurate analysis. Radiological protection (ALARA) is an equal concern. Finally, the Bulk Cold Chemical Building (BCCB) contains a dedicated area for bulk cold chemical quality assurance. Analysis of bulk cold chemical samples does not require radiological protection.

See Appendices H1 and H2 for further definition of the AF Sample Analysis function and sample schedules.

3.1.2 Findings

The Sample Analysis function is a dedicated, close-external function. Operability (practicality of design) is the prime consideration for the configuration of the Sample Analysis function. Master-Slave Manipulator (MSM) repair that is dedicated to the Sample Analysis function is also located in the AF. The Sample Analysis function is not a candidate for location in existing Hanford Site facilities.

3.1.3 Functional Configuration Considerations and Rationale

Operability (practicality of design) is the prime consideration for the Sample Analysis function configuration. Due to the number of samples scheduled for analysis and the time constraints for continuous operation, each process facility requires its own dedicated set of analytical equipment. Dedicated analytical equipment for the Separations function, the LLW treatment function, and the HLW treatment function affords independent operation of the process facilities. Therefore, due to operability (practicality of design) this function is

dedicated. The possibility for some of the analytical equipment to be shared has not been determined yet. Further time-motion studies are required to make this determination.

The Sample Analysis function is close-coupled to the Separations/LLW and HLW process facilities. The AF is physically located near the process facilities inside a common complex. The AF is 200 feet (at the closest point) from the Separations/LLW process facility and 600 feet (at the closest point) from the HLW process facility. The sample analysis functions support operating facilities under a common management. The Remote Analytical Laboratory (RAL) at the Idaho Chemical Processing Plant is an example of combining facilities to better utilize staffing equipment and space. The pneumatic rabbit system is proven technology for fast, accurate sample transport. A pneumatic rabbit system at the Idaho National Engineering Lab (INEL) Chemical Processing Plant successfully connects three facilities, which are the 601 Building reprocessing plant, the New Waste Calcine Facility, and the Fluorinel and Storage Facility, to the Remote Analytical Lab. Pneumatic rabbit systems have also been used successfully at other nuclear facilities (e.g., Pamela and Sellafield).

The use of existing Hanford site laboratories, such as 222-S or 325 labs, has been considered. Neither of these labs would be close-coupled to the Separations/LLW or HLW process facilities. Sample transport via truck would be slow. Finally, analytical samples from these facilities would probably not receive the priority required to meet facility TOE objectives.

Even though the Sample Analysis function is defined as dedicated, it is collocated in the AF. Cost and operability are the prime considerations for collocating this equipment in the AF. Collocation of the Sample Analysis function in the AF allows the AF to contain all of the functions required of an analytical facility. This is discussed in further detail in the AF section.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Radiological Protection (ALARA). This study has not identified any radiological protection (ALARA) issues that are unique to the configurations considered for this system. Therefore, radiological protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any safety issues that are unique to any single configuration considered for this system. Therefore, safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any environmental regulatory compliance issues that are unique to any single configuration considered for this system. Therefore, environmental regulatory compliance is not a consideration that was used to determine the configuration of this system. This

analysis has not taken into account the possibility that each facility will require a permit, however, this will not impact our conclusions at this time.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any design impact issues that are unique to any single configuration considered for this system. Therefore, design impact is not a consideration that was used to determine the configuration of this system.

Note: Technical disagreement with these conclusions surfaced in the peer review process. One dissenting position is that the LLW processing function would be penalized by the attempt to integrate HLW requirements in the design of the Analytical Facility due to diverse needs and schedules. In addition, this same source of dissention contends that the present equipment and layout for LLW processing analytical functions are overly designed, causing the implied savings for a combined function to be overstated.

3.2 COLLECT AND HANDLE SOLID WASTE SYSTEM

3.2.1 System Description

The Collect and Handle Solid Waste System collects, surveys, segregates, decontaminates and packages solid waste (failed, used, or spent equipment and materials) generated from within the TWRS Treatment Complex process facilities. This system consists of the facilities and equipment required to collect, survey, segregate, decontaminate, package, assay, and temporarily store solid wastes. This system is located within the TWRS process facilities and provides for temporary storage for eight weeks worth of solid wastes.

Solid wastes are segregated into radioactive and nonradioactive wastes. Radioactive wastes will be further segregated into the following ten categories as defined in *Hanford Site Solid Waste Acceptance Criteria*, WHC-EP-0063:

- High-Level Waste (HLW)
- Transuranic Waste (TRU)
- Low-Level Waste, Category 1 (LLW)

- Low-Level Waste, Category 3
- Low-Level Waste, Greater than Category 3
- Radioactive Mixed Waste Components (RMW) of each of the above five categories.

Solid wastes will be disassembled and packaged in accordance with WHC-EP-0063. Packaged wastes will be decontaminated and assayed to determine the isotope content before shipment to the Treatment, Storage, and Disposal (TSD) facility. The overall system will be designed to prevent the spread of contamination and maintain the waste handling operator's station as a Radiation Zone 1 area.

It is assumed that this system will package solid wastes into 200-L (55-gal) drums and must be able to handle and safely dispose of a failed melter full of glass. The system will be able to accommodate larger packages required for certain wastes (such as the melter), which cannot be cut-up to fit within the 200-L drums.

3.2.2 Findings

The Collect and Handle Solid Waste System is a dedicated internal system. Cost efficiency, Radiological Protection (ALARA), and Safety are the prime considerations used to define this system.

3.2.3 Functional Configuration Considerations and Rationale

Cost Efficiency, Radiological Protection (ALARA), and Safety are the prime considerations for defining the Collect and Handle Solid Waste System. Solid wastes are potentially radiologically contaminated. Therefore appropriate measures must be taken to provide radiological protection for personnel involved in the cut-up, decon, and packaging of solid wastes. With respect to Safety, accidents occurring during the transportation of radiologically contaminated solid wastes to a shared facility, outside the process facilities, could cause the spread of contamination to other areas on the site. Therefore locating dedicated systems within each process facility provides radiological protection for the operators and limits the risk for spread of contamination.

With an appropriate design the radiological and safety considerations associated with an independent, shared, solid waste handling facility can be overcome. However, it would not seem cost effective to do so. To validate this assumption an estimate of the cost for a single shared facility verses two dedicated internal systems including facility cost was developed. The results indicate that the TEC of a single shared facility is \$70,510,000 and the TEC of two dedicated internal facilities is \$33,719,000, thereby providing a \$36,791,000 cost advantage.

Other considerations that were evaluated and found *not to be contributors to the function configuration* are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Environmental Regulatory Compliance. Assuming that RCRA type dangerous wastes regulated by WAC 173-303 will be collected and handled by this system, each facility will require permitting under this regulation. This is not considered to be a significant issue, therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.3 COLLECT AND HANDLE LIQUID WASTE

3.3.1 Collect and Handle Potentially Radioactive Liquid Waste System

3.3.1.1 System Description. The Collect and Handle Potentially Radioactive Liquid Waste System collects and accumulates liquid waste from potentially contaminated areas in both the HLW facility and the Separations/LLW facility. This liquid waste is generated as a part of normal facility operations. Under normal/desirable circumstances the liquid waste is not contaminated. However, due to the fact that the liquid waste is collected from process support areas within the process facility, contamination is possible.

The drain catch tanks and collection headers are designed to segregate incompatible chemical solutions for subsequent treatment and disposal. The Floor Drain Catch Tank and Regulated Drains Catch Tank collect waste water from regulated areas (areas where the entrance and exit are regulated). Liquid wastes from floor and area washdown of regulated areas are collected in floor drains and sent to the Floor Drain Catch Tank. Personnel decontamination wash water and regulated floor drain effluent from the Regulated Facility

Entrance is sent to the Regulated Drains Catch Tank. The liquid waste from these tanks is pumped into the Floor Drain Sampling Tank for analysis. A separate tank is used for analysis to eliminate the possibility of contamination during the analysis period. If the analyses show the tank contents to be radioactive, the liquid waste is transferred to a radioactive process waste collection tank for processing. Otherwise, the liquid waste is transferred to the nonradioactive waste collection tanks for treatment and disposal.

The Organic Acid Drain Catch Tank and Acid Drain Catch Tank collect waste water from nonregulated areas. Liquid wastes that have low pH are collected by the acid drains and sent to the Acid Drain Catch Tank. Organic acids and organic liquid wastes are collected by the organic acid drains and sent to the Organic Acid Drain Catch Tank. The liquid waste stored in these tanks is analyzed for radioactivity. If the analyses show the tank contents to be radioactive, the liquid waste is transferred to a radioactive process waste collection tank for processing. Otherwise, the liquid waste is transferred to the nonradioactive waste collection tanks for treatment and disposal.

This system is designed for collection and analysis only. No treatment of waste is performed.

The system includes drain catch tanks, sumps, transfer pumps, collection headers and piping. Liquid wastes from floor washdown drains, tank overflow piping, tank drain lines, closed-loop cooling water blowdown and personnel decontamination drains are collected by gravity flow into the drain catch tanks located on the tunnel level of each of the process facilities. The HLW facility and the Separations/LLW facility each have their own, dedicated systems to collect and process potentially contaminated liquid wastes.

See page A-2 of Appendix A for the Block Flow Diagram of this system. Drawing UFD-4-01 is a Utility Flow Diagram (see Appendix B) for the Collect and Handle Potentially Radioactive Liquid Wastes System.

3.3.1.2 Findings. The Collect and Handle Potentially Radioactive Liquid Waste System is a dedicated internal system. Radiological Protection (ALARA) is the prime configuration consideration for this system. This function is located in each of the process facilities for radiological protection.

3.3.1.3 Function Configuration Considerations and Rationale. Radiological Protection (ALARA) is the prime consideration for the Collect and Handle Potentially Radioactive Liquid Wastes System configuration. This is a dedicated, internal system. This system provides intermediate holding and analysis of liquid waste generated in potentially contaminated areas. The system may contain radiological materials and, therefore, radiological protection must be provided. This system must be located as close as possible to where the wastes originate. Since the main process facilities also provide radiological protection, they can provide the shielding required for this system. A dedicated system allows the liquid waste from the individual facilities to be sampled and characterized before it is transferred to the treatment facility.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This system is designed to handle RCRA type dangerous wastes regulated by WAC 173-303, and each facility within this system will be permitted under this regulation. This is not considered to be a significant issue; therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.3.2 Collect and Handle Nonradioactive Liquid Waste System

3.3.2.1 System Description. The Collect and Handle Nonradioactive Liquid Waste System collects, receives, stores, neutralizes, and disposes of all nonradioactive liquid waste from sources outside of the process facilities and from the Collect and Handle Potentially Radioactive Liquid Waste System within the process facilities in a safe and environmentally acceptable manner. This system, which is located in the BCCB, includes hold tanks, neutralization tanks, sumps and pumps. The Effluent Discharge Collection Sump, located in

the MUB, and the Water Pumphouse (WPH) Sump, located in the WPH, also are part of this system.

Chemically contaminated liquid wastes are collected and neutralized. Incompatible chemicals are collected separately, to prevent them from mixing. Cooling Tower blowdown and waste water from the Mechanical Utilities Building (MUB) and the WPH are collected in the Effluent Discharge Collection Sump that is located in the MUB. The Effluent Discharge Collection Sump's contents do not require any treatment. All nonradioactive liquid wastes are transferred to the 200 Area TEDF.

The caustic waste and acid waste collection and neutralization tanks are located in the BCCB. These tanks collect area washdown water and chemical spills from the Process Facilities and the BCCB. The liquid waste from the process facilities is routed through the Collect and Handle Potentially Radioactive Liquid Wastes System. The liquid waste is analyzed and ascertained to be nonradioactive before transfer to this system. From here it is transferred directly to the 200 Area TEDF.

See page A-3 of Appendix A for the Block Flow Diagram of this system. Drawing UFD-4-02 is a Utility Flow Diagram (see Appendix B) for the Collect and Handle Nonradioactive Liquid Wastes System.

3.3.1.2 Findings. The Collect and Handle Nonradioactive Liquid Waste System is a shared, close-external system. Cost effectiveness is the prime consideration for the configuration of this system. The hold tanks, neutralization tanks, sumps, and pumps are shared, to take advantage of the economies of scale. This system, except for the WPH Sump and the Effluent Discharge Collection Sump, is grouped with the Cold Chemical Supply System in the BCCB.

3.3.1.3 Function Configuration Considerations and Rationale. Cost Effectiveness is the prime consideration for the Collect and Handle Nonradioactive Liquid Wastes System configuration. The shared facility would consist of a single set of equipment for this system housed in a single facility (with the exception of the Effluent Discharge Sump and the WPH Sump that are located in the MUB and WPH). Because this equipment is common to all of the facilities, the space required for the equipment, and the equipment costs, are also reduced. Two, separate, dedicated systems would require two facilities and two sets of equipment, thereby losing the advantage of the economies of scale. The total engineered cost of a shared Collect and Handle Nonradioactive Liquid Wastes System would be \$3,287,000. The total engineered cost of two dedicated systems for the Separations/LLW and HLW facilities would be \$4,274,000. The shared configuration, which has a single set of equipment, would cost less than dedicated systems with duplicate equipment.

Costs given here represent the mechanical equipment costs and specifically exclude the costs of the building to house the equipment.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This system is designed to handle RCRA type dangerous wastes regulated by WAC 173-303, and each facility within this system will be permitted under this regulation. This is not considered to be a significant issue, therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4 PROCESS SUPPORT

3.4.1 Oxygen System

3.4.1.1 System Description. The function of the Oxygen System is to provide gaseous oxygen (95 to 100 percent pure) to the HLW combustion melter, LLW combustion melters, and Melter Offgas systems in the Process Facilities.

Oxygen is produced by the liquefaction and rectification of air. The Oxygen System includes a vendor supplied cryogenic unit that produces 118 MT/day of 95 to 100 percent pure oxygen, an oxygen storage tank and its associated piping. Oxygen from the storage tank is vaporized (by vendor supplied equipment) and piped as a gas to the process facilities.

The equipment listed below receives gaseous oxygen. The annual consumption of oxygen for each facility is shown on the Summary of Annual Utility and Chemical Consumption table (Appendix C).

Equipment that Receives Oxygen

Description	Equipment No.
HLW Melter	EM-323
LLW Melter	EM-412 A
LLW Melter	EM-412 B
Melter offgas heat exchanger inlet lines	EC-628-3B, EC-628-4 (inlets)

See page A-4 of Appendix A for the Block Flow Diagram of the Oxygen System. Drawing UFD-4-03 is a Utility Flow Diagram (see Appendix B) of the Oxygen System.

3.4.1.2 Findings. The Oxygen System is a shared, no distance constrained, system. Technical Maturity is the prime consideration for the configuration of the Oxygen System. This function could be provided from almost anywhere and is a candidate for being furnished from an existing oxygen plant. For the purposes of this effort the oxygen supply unit is located in the Bulk Handling Area.

3.4.1.3 Functional Configuration Considerations and Rationale. Technical Maturity, in terms of commercially available equipment, is the prime consideration for the Oxygen System configuration. A single cryogenic oxygen plant is selected for the onsite production of oxygen.

The majority of the oxygen consumed onsite is used in the LLW facility. Oxygen plants capable of producing pure oxygen are not available for production rates in the range needed for the HLW facility. The technology required to produce high purity oxygen is well known and has long been available commercially. However, the smallest units available for the production of high purity oxygen are in the 20 to 30 tons per day range. The HLW facility requires only 14 tons per day of pure oxygen for a 20 MT per day glass production rate. Selecting a dedicated unit that may be 40 to 100 percent oversized for the HLW facility is not reasonable as it will increase capital and operating costs. The amount of oxygen needed for the HLW facility is about 10 percent of the total peak requirement for both the HLW and LLW facilities (refer to Appendix D, Cold Chemical Consumption

Tables, for the peak annual consumption of oxygen). Therefore, due to the lack of availability of small commercial units, a shared oxygen plant is selected to serve both the HLW and LLW facilities.

The hazards associated with the production of oxygen (supports combustion, can be explosive) dictate that the oxygen plant be located outdoors, outside of any process or support facilities. A cryogenic plant produces liquid oxygen that is very cold and significantly increases in volume when it vaporizes. Hence, safety demands that any enclosed volume, where liquid could be trapped, must be provided with adequate ventilation or pressure-relief. For this reason, the oxygen plant is located outdoors in the Bulk Handling Area.

The oxygen demand for the HLW combustion melter is about 10 percent of the total oxygen demand. Therefore, potential conversion to a joule heated melter would not have a significant impact to the Oxygen Supply System design.

There is no specific need for this system to be located in close proximity to the process operations. Therefore, this system is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.2 Cold Chemical Supply System

3.4.2.1 System Description. The Cold Chemical Supply System provides the cold chemical receipt, storage, preparation, and distribution functions for the Separations, LLW, and HLW process and support functions. This system is sized to provide a minimum 30 day supply of cold chemicals, except for the storage bins that are located in the Bulk Handling Area. The size of the bulk storage bins is based on the size of the delivery rail car or 16 days of storage, whichever is larger.

The Cold Chemicals Supply System includes all equipment required to receive, store, prepare, and distribute cold (nonradioactive) chemicals. This system serves the process, neutralization, and decontamination functions that are located in various process and support facilities. This system includes the bulk storage tanks, bulk storage bins, chemical make-up tanks, sumps, decontamination solution tanks, and associated transfer pumps and piping. The bulk storage and make-up tanks are located in the BCCB, on a pad adjacent to the BCCB, or in the Bulk Cold Chemical Handling Area (BHA). Table 3-1 shows where each chemical is stored and used.

The cold chemical solutions and decontamination solutions are prepared in make-up tanks that are located inside the BCCB. Except for bulk caustic and nitric acid, which are stored in tanks within the BCCB, the bulk chemicals that are used in large quantities are stored in bins or tanks that are located on the BCCB pad, which is adjacent to the BCCB. Glass former formulations are prepared in mixers in the BCCB, and are subsequently pneumatically conveyed to the process facilities. Automated conveying and mixing of other chemicals, not currently defined, may be needed, depending on the melter technology selected. Cold chemicals that are delivered to the site in bags or drums are stored within the BCCB. The prepared chemical solutions are transferred from the make-up tanks in the BCCB to the cold chemical feed tanks in the Separations/LLW facility and the HLW facility.

See pages A-5 and A-6 of Appendix A for the Block Flow Diagrams for this system. Drawing UFD-4-04 is a Utility Flow Diagram (see Appendix B) for the Cold Chemical System. The annual consumption of cold chemicals is in Appendix C, Utility Consumption Tables and Electrical Load List.

3.4.2.2 Findings. The Cold Chemical Supply System is a shared, close-external system. Cost Effectiveness, Operability and Maintainability, and Safety are considerations for the configuration of Cold Chemical Supply System. This system is grouped with the Collect and Handle Nonradioactive Liquid Waste System in the BCCB.

Table 3-1. Storage and Usage of Chemicals. (2 sheets)

Chemical description	Storage location		Usage
Glass formers			
SiO ₂	Bin, B-1901-C	BCCB pad	Glass former used with the combustion melters (HLW and LLW facilities)
B ₂ O ₃	Bin, B-1904-C	BCCB pad	Glass former used with the combustion melters (HLW and LLW facilities)
Li ₂ O	Bin, B-1905-C	BCCB pad	Glass former used with the combustion melters (HLW and LLW facilities)
CaO	Bin, B-1906-C	BCCB pad	Glass former used with the combustion melters (HLW and LLW facilities)
MgO	Bin, B-1907-C	BCCB pad	Glass former used with the combustion melters (HLW and LLW facilities)
Bulk frit	Bags	BCCB	Filter media (separations facility)
50% nitric acid	Tank, TK-1014-C	BCCB	Equipment decontamination (all facilities) ion exchange (separations)
50% caustic	Tank, TK-1013-C	BCCB	Equipment decontamination, (all facilities) chemical adjustment of process liquid waste (decontaminated condensate), (all facilities) regeneration of ion exchange columns (separations facility)
Ion exchange resin	Drums	LLW vit bldg shipping and receiving	Ion exchange (separations)
Dry KMnO ₄	Drums	BCCB	Equipment decontamination (all facilities)
Dry sodium nitrite	Bin, B-1920-C	BCCB pad	Adjustment of decontaminated process liquid waste before discharge, to reduce corrosiveness of process streams sent to tankage (all facilities)
Dry offgas treatment chemical	Bags or drums	BCCB	Treatment of offgas (all facilities)
Dry oxalic acid	Drums	BCCB	Equipment decontamination (all facilities)
Dry TSP	Bin, B-1921-C	BCCB pad	General equipment and area decontamination, all-purpose cleaning agent (all facilities)
Antifoam solution	Drums	BCCB	In-cell process tanks, possibly melter offgas system (HLW and LLW facilities)

Table 3-1. Storage and Usage of Chemicals. (2 sheets)

Chemical description	Storage location		Usage
Glycolic acid ¹	Bin	BCCB pad	Feed preparation - adjustment of process feed upstream of the melter
Cold chemical no. 1	Bags or drums	BCCB	Usage presently not defined. Space for a make-up tank in the BCCB and a feed tank in the facility have been reserved.
Cold chemical no. 2	Bags or drums	BCCB	Usage presently not defined. Space for a make-up tank in the BCCB and a feed tank in the facility have been reserved.
Cold chemical no. 3	Bags or drums	BCCB	Usage presently not defined. Space for a make-up tank in the BCCB and a feed tank in the facility have been reserved.
Cold chemical no. 4	Bags or drums	BCCB	Usage presently not defined. Space for a make-up tank in the BCCB and a feed tank in the facility have been reserved.
Anhydrous ammonia	Tank, TK-1015-C	BHA	Offgas - NOx abatement (HLW and LLW facilities)
Kerosene ²	Tank, TK-1022-C	BHA	Fuel for combustion melter and claus plant (HLW and LLW facilities)
Oxygen ²	Unit w/tank	Outside ³	Combustion of fuel in melter (HLW and LLW facilities)
Bulk sulfur cement			
Sulfur	Tank, 1007-C	BHA	Disposal matrix for LLW cullet (LLW storage vaults)
DCPD	Tank, 1008-C	BCCB	Sulfur modifier (LLW storage vaults)
CPD oligomer	Tank, 1009-C	BCCB	Sulfur modifier (LLW storage vaults)

BCCB = Bulk Cold Chemical Building
 BHA = Bulk Cold Chemical Handling Area
 HLW = High-level waste
 LLW = Low-level waste

¹Indicated glycolic acid consumption based on joule-heated and induction heated melter systems (HLW vitrification: stirred, liquid fed ceramic-lined, cold crucible; LLW vitrification: stirred, liquid fed ceramic-lined).

²Kerosene and oxygen are used only by the base case combustion melter, and not by the alternate melters.

³The oxygen plant is skid mounted and located near the BCCB.

3.4.2.3 Function Configuration Considerations and Rationale. Cost effectiveness is the prime consideration for defining this system. A majority of the cold chemicals are used in both the Separations/LLW or the HLW facilities. Two dedicated systems could be supplied, but, a majority of the equipment would be duplicated. The total engineered cost of a shared Cold Chemical Supply System would be \$38,203,000. The total engineered cost of two such sets of dedicated cold chemical supply equipment (one dedicated to the Separations/LLW facility and the other dedicated to the HLW facility) would be \$46,870,000. Installing or providing space for a separate future HLW Cold Chemical Supply System is more costly than installing a single Cold Chemical Supply System sized to serve both the Separations/LLW and HLW facilities. Therefore, this system is designated a shared function.

Costs given here represent the mechanical equipment costs and specifically exclude the costs of the building to house the equipment.

The following cold chemicals need to be stored in close proximity to the process facilities where they are consumed:

- Ammonia (Toxic and highly flammable, minimize transfer line leaks)
- Molten Sulfur (Piping requires heating and insulation)
- Bulk Glass Formers (Requires costly conveying/handling equipment)
- Glass Frit (Pumped as a high erosion slurry).

The length of solids transport lines from the BCCB to the users in the process facilities should be minimized, to avoid the problems inherent with solids transport, such as line pluggage and erosion. Therefore, the solid chemical storage bins and solids transport equipment are located in the storage area adjacent to the BCCB, as close as possible to the Separations/LLW facility, which is the main cold chemical user.

Operability and Maintainability are also considerations in determining the configuration for this system. Sharing of the bulk cold chemical storage and make-up functions reduces operator attention requirements. It also provides a common unloading point for the chemicals. The operator can make up solutions for both facilities at the same time, instead of repeatedly making the same solution for each process facility.

There are some maintenance advantages to a shared facility due to the reduced amount of machinery, such as pumps, exhaust blowers, and conveyors, to maintain.

Safety dictates that the Cold Chemical Supply System be located outside of the main processing facilities. Kerosene and ammonia are both highly flammable (and ammonia is toxic as well). These storage vessels should be located far enough away from the process and support facilities to mitigate any possible safety concerns that are based on minor leaks. However, reliability and maintainability dictate that this system be located in close proximity to the end users.

Spilling liquid chemicals due to a pipe leak, tank failure or other accidents could potentially release toxic vapors into the atmosphere. Inadvertent mixing of liquid chemicals due to an accident would increase the amount of toxic vapors released. Measures can be taken to contain spills and prevent accidental mixing of liquid chemicals and minimize the amount of toxic vapors released. Although those are concerns, they are not considered obstacles to being able to develop the configuration as defined above.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.3 Cold Chemical Feed System

3.4.3.1 System Description. There are two dedicated Cold Chemical Feed subsystems. One subsystem is located within the Separations/LLW facility, and the other is located within the HLW process facility. These systems consists of Cold Chemical Feed Tanks and Decontamination Solution Tanks. These systems provide intermediate storage for the chemicals needed to support the in-cell process equipment and decontamination facilities. These systems also provide backflow protection for the cold chemicals within the process facilities.

See page A-7 of Appendix A for the Block Flow Diagram of this system. Drawing UFD-4-04 is a Utility Flow Diagram (see Appendix B) for the Cold Chemical System.

3.4.3.2 Findings. The Cold Chemical Feed System is a dedicated internal system. Radiological Protection (ALARA) is the prime configuration consideration for the Cold Chemical Feed Tank System. This function is located in the process facilities for radiological protection.

3.4.3.3 Function Configuration Considerations and Rationale. Radiological Protection (ALARA) is the prime consideration for defining this system. This is a dedicated, internal system. Located in the process facilities, high enough above in-cell equipment to prevent siphoning, the feed tanks act as break tanks. This is an intrinsically safe method for the prevention of radiological waste leaving the facility through the chemical supply system.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.4 Cold Chemical Vent System

3.4.4.1 System Description. The primary function of the Cold Chemical Vent System is to provide vapor control on the cold chemicals storage and make-up tanks in the BCCB. The system discharges the cold chemical tanks' vent gases to the BCCB Exhaust Stack that releases to an uncontrolled area. An additional function of the Cold Chemical Vent System is to prevent the out-migration of the cold chemicals storage and make-up tanks' vent gases into the BCCB.

The Cold Chemical Vent System includes piping and blowers venting all the bulk cold chemical storage and make-up tanks. Two 100 percent flow capacity, motor driven, vent blowers (one operating and one spare) pull a vacuum on the vent header and exhaust to the BCCB exhaust. A condensate knockout drum is also provided upstream of the vent blowers. The tanks listed in Table 3-2 vent to the Cold Chemical Vent System.

Table 3-2. Tanks That Vent to Bulk Cold Chemical Building Exhaust Stack.

	Description	Equipment identification
1.	Bulk caustic storage tank	TK-1013
2.	Bulk nitric acid storage tank	TK-1014
3.	Caustic waste hold tank	TK-1658
4.	Acid waste hold tank	TK-1660
5.	Organic acid waste hold tank	TK-1661
6.	Caustic waste neutralization tank	TK-1662
7.	Organic waste neutralization tank	TK-1663
8.	Cold chemicals no. 1 make-up tank	TK-1716
9.	Offgas treatment chemicals make-up tank	TK-1717
10.	Cold chemicals no. 2 make-up tank	TK-1718
11.	Nitric acid decon make-up tank	TK-1719
12.	Decon solution make-up tank	TK-1720
13.	MSM decon solution make-up tank	TK-1721

Table 3-2. Tanks That Vent to Bulk Cold Chemical Building Exhaust Stack.

	Description	Equipment identification
14.	Oxalic acid decon make-up tank	TK-1722
15.	Potassium Permanganate make-up tank	TK-1723
16.	Cold chemicals no. 3 make-up tank	TK-1724
17.	Cold chemicals no. 4 make-up tank	TK-1725
18.	Frit slurry make-up tank	TK-1775

See page A-8 of Appendix A for the Block Flow Diagram of this system. Drawing UFD-4-05 is a Utility Flow Diagram (see Appendix B) of the Cold Chemical Vent System.

3.4.1.2 Findings. The Cold Chemical Vent System is a dedicated close-external system grouped together with the Cold Chemical Storage Tanks in the BCCB.

Operability is the prime consideration for the configuration of the Cold Chemical Vent System. The system is dedicated to serve only the tanks located in the BCCB.

3.4.1.3 Function Configuration Considerations and Rationale. Operability is the prime consideration for design of this system. The Cold Chemical Vent System is operationally integral to the Cold Chemical Supply System. The tanks in this system require a vent system for the control of vapors and particulates. This vent system is tied to, and operates in conjunction with, the cold chemical supply system. Therefore, this system is dedicated to the cold chemical tanks within the BCCB.

Because of the low operating pressure (the system operates at a slight vacuum), the vapors vented by the system have a relatively high volume. The piping distances should be minimized, to limit the size of the piping and blowers required. Therefore, the vent system blower should be located in close-proximity to the tanks it serves.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This system is designed to vent waste vapors regulated by WAC 173-303, WAC 173-400, WAC 173-401 and WAC 173-460 and each facility within this system will be permitted under these regulations. This is not considered to be a significant issue, therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.5 Process Facility Vent System

3.4.5.1 System Description. The primary function of the Process Facility Vent System is to provide vapor control in the overhead vent lines from the cold chemical feed tanks, drain catch tanks, and other potentially radioactive sources in the HLW and the Separations/LLW facilities. The detached HLW and combination Separations/LLW facility each have their own separate vent system. Each system discharges the vent gases through HEPA filters to the dedicated HVAC Zone II and III exhaust stack, which releases the gases to the atmosphere. An additional function of the Process Facility Vent System is to prevent the out-migration of the cold chemical feed tanks' vent gases into the operating areas.

The Process Facility Vent System includes piping, HEPA filters, and blowers that vent all the process facilities' cold chemical feed tanks. All tanks connected to this vent system header have overflow piping with a water seal leg so that normally no atmospheric air is pulled into the tanks on a continuous basis. Two, 100 percent flow capacity, motor driven, vent blowers (one operating and one spare) pull a vacuum on the vent header through

two HEPA filters (one operating and one spare). These blowers exhaust to the Process Facility Exhaust Stack for each facility. The HEPA filter removes submicron particulates from the gas stream. A condensate knockout drum is also provided upstream of the vent blowers.

If the loop-seal water is blown out or missing, the vent system would pull atmospheric air through the overflow lines. The vent blower can handle the air flow of several open overflow lines. The tanks listed in Table 3-3 vent to the Process Facility Vent System.

Table 3-3. Tanks That Vent to Process Facility Exhaust Stack.

	Description	Equipment identification
1.	Cesium regen. nitric acid tank	TK-205-4
2.	Startup nitric acid tank	TK-208-4
3.	NaOH regeneration tank	TK-211-4
4.	NaOH regeneration tank	TK-212-4
5.	NaOH neutralizing solution tank	TK-213-4
6.	Head Bin	B-319-3B
7.	Weigh feeder	MF-321-3B
8.	Head Bin	B-408A-4
9.	Head Bin	B-408B-4
10.	Weigh feeder	MF-410A-4
11.	Weigh feeder	MF-410B-4
12.	Scrub solution make-up tank	TK-619-3B/4
13.	Acid drain catch tank	TK-1197-3B/4
14.	Organic acid drain catch tank	TK-1198-3B/4
15.	Floor drain sampling tank	TK-1199-3B/4
16.	Cold chemicals No.1 feed tank	TK-1200-3B/4
17.	Cold chemicals No.4 feed tank	TK-1201-3B/4
18.	Cold chemicals No.2 feed tank	TK-1202-3B/4
19.	Cold chemicals No.3 feed tank	TK-1203-3B/4
20.	50% nitric acid feed tank	TK-1205-3B/4

Table 3-3. Tanks That Vent to Process Facility Exhaust Stack.

	Description	Equipment identification
21.	Nitric acid decon feed tank	TK-1206-3B/4
22.	Oxalic acid decon feed tank	TK-1207-3B/4
23.	Potassium Permanganate feed tank	TK-1208-3B/4
24.	50% caustic feed tank	TK-1209-3B/4
25.	Offgas treatment chemical feed tank	TK-1211-3B/4

See page A-9 of Appendix A for the Block Flow Diagram of this system. Drawing UFD-4-06 is a Utility Flow Diagram (see Appendix B) of the Process Facility Vent System.

3.4.5.2 Findings. The Process Facility Vent System is dedicated and is located in the process facilities for radiological protection. Radiological Protection (ALARA) is the prime configuration consideration for the Process Facility Vent System.

3.4.5.3 Function Configuration Considerations and Rationale. Radiological Protection (ALARA) is the prime consideration for the design of this system. The Process Facility Vent System is operationally integrated with the tanks it serves. In addition to the cold chemical day tanks inside the process facility, the system provides vapor control for the Floor Drain Catch Tank, the Regulated Drains Catch Tank, the Process Condensate Collection Tank, the Process Cooling Water Expansion Tank, and the Melter Cooling Water Expansion Tank. These tanks are all dedicated because they require radiological protection. Therefore, the Process Facility Vent System also requires radiological protection, and, this vent system is a dedicated system.

The radiological considerations that dictate that the tanks be dedicated also apply to the vent system. See the following sections for discussions related to the tanks served by this system:

- Collect and Handle Potentially Radioactive Liquid Wastes System
- ~ Cold Chemical Supply System
- Process Steam and Condensate System
- Melter Cooling Water System
- ~ Process Chilled Water System.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This system is designed to vent waste vapors regulated by WAC 173-303, WAC 173-400, WAC 173-401 and WAC 173-460 and each facility within this system will be permitted under these regulations. This is not considered to be a significant issue, therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.6 Process Steam and Condensate System

3.4.6.1 System Description. The Process Steam and Condensate System supplies steam to various process users in the Separations/LLW facility and the HLW facility. Saturated steam is generated at 1,136 kPa (150 psig) in electric steam generators that are located within a contact maintained shielded area inside each process facility.

The Process Steam and Condensate System consists of two subsystems. One is dedicated to the Separations/LLW facility and the other is dedicated to the HLW facility. Each subsystem consists of electric steam generators and their associated equipment, and the condensate collection equipment that returns the condensate to the steam generators. Each

subsystem is designed as a closed, primary steam distribution loop. The steam generators supply steam directly to in-cell feed evaporators. The process steam condensate from the evaporators is routed to the steam condenser/cooler, accumulated in the collection tank, from where it is pumped back to the steam generator as make-up water.

A total of five steam generators (7.76 MW each) is required for the Separations/LLW facility. Four steam generators are required to meet the maximum demand. One unit is a spare. The HLW facility contains two steam generators (7.76 MW each). One steam generator is required to meet the maximum load, and the other is a spare.

See page A-10 of Appendix A for the Block Flow Diagram of the Process Steam and Condensate System. Drawing UFD-4-07 is a Utility Flow Diagram for the Process Steam and Condensate System (see Appendix B). Refer to Appendix C, Utility Consumption Tables and Electrical Load List, for a listing of the annual Process Steam Consumption.

3.4.6.2 Findings. The Process Steam and Condensate System is a dedicated system and is located within the process facilities. Radiological Protection (ALARA), Cost Effectiveness, Operation and Maintenance, and Safety are configuration considerations for the Process Steam and Condensate System.

3.4.6.3 Functional Configuration Considerations and Rationale. Radiological Protection (ALARA) is the prime consideration for the design of this system. This is a dedicated system with one set of steam generators and condensate return equipment serving the Separations/LLW facility and one serving the HLW process facility. The steam generators and associated equipment are located entirely within the process facilities they serve.

There are three possible alternatives to the selected configuration. They are as follows:

1. Locate the Process Steam Generators in the MUB or an accessible Steam Generator building outside of the process facilities. These shared steam generators would serve both process facilities.
2. Dedicate one set of steam generators to the Separations process and one set to the LLW process, with both sets inside an annex to the Separations/LLW facility. The HLW facility would have its own steam generators.
3. Locate sufficient steam generator capacity inside the Separations/LLW facility to serve the Separations/LLW processes and the HLW process.

Maintenance considerations favor Alternative 1, where the steam generators would be accessible in the MUB. However, Radiological Protection is the prime configuration consideration that eliminates both alternatives 1 and 3. All steam and condensate that has come into direct contact with the HLW or the Separations/LLW processes may become

contaminated with radioactive process fluid and, therefore, must remain within the associated facility.

Secondary steam loops and other backflow prevention measures can be designed into the process to mitigate the backflow of radioactive material from the process cells and from the process facilities. However, it is inherently safer to contain the steam generation subsystems in the facility where the steam is used.

Operational considerations favor having a dedicated Process Steam and Condensate System for the LLW process and another dedicated system for the Separations process, as in Alternative 2. However, cost considerations have a negative impact on Alternative 2. Each process steam and condensate subsystem would require its own steam generators, both operating and spare. This would increase the number of steam generators and the cost over the selected configuration. Alternatives 1 and 3 may also have cost advantages over the selected process steam and condensate configuration. However, the radiological protection consideration once again takes precedence.

Due to a reduction in redundant equipment and the economies of scale there is a cost advantage in combining the Process Steam and Condensate Systems as much as possible. However, radiological protection considerations dictate that a dedicated system be provided for the Separations/LLW facility and a dedicated system be provided for the HLW facility.

The Process Steam and Condensate System is a significant energy source. The amount of steam produced by a dedicated system is much smaller than the amount of steam that would be produced by a shared system. Thus, the amount of energy released by a steam excursion/explosion will be less for a dedicated facility. Therefore, safety considerations favor a dedicated Process Steam and Condensate System.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.7 Process Cooling Water System

3.4.7.1 System Description. The Process Cooling Water System removes heat from the process equipment during normal operation. The process cooling water equipment is located inside the Separations/LLW facility and the HLW facility. The system is capable of maintaining the process tanks at 50 °C (122 °F) or less during normal process operations, idle, or shutdown periods. The system is designed to remove both decay heat from the process stream and frictional heat from agitators. Also, the system provides cooling for the offgas.

The Process Cooling Water System is a closed, recirculating cooling water loop that cools in-cell radioactive and potentially radioactive streams. The heated process cooling water is routed to the Process Cooling Water Cooler where the heat is removed by cooling tower water.

The Process Cooling Water System consists of two complete process cooling water subsystems, one for the Separations/LLW facility and another for the HLW facility.

Each subsystem consists of a process cooling water cooler, an expansion tank, circulation pumps, HEPA filters, a chemical addition tank, and distribution piping. Each subsystem is entirely contained within the facility it serves. Demineralized water is used both as fill and make-up water.

See page A-11 of Appendix A for the Block Flow Diagram of the Process Cooling Water System. Drawings UFD-4-08 (sheet 1 through 3) are the Utility Flow Diagrams (see Appendix B) of the Process Cooling Water System. The annual duty of the Process Cooling Water System is provided in Appendix C, Utility Consumption Tables and Electrical Load List.

3.4.7.2 Findings. The Process Cooling Water System is dedicated and located within the process facilities for radiological protection. This system is grouped with the Melter Cooling Water System and the Process Chilled Water system. Radiological Protection (ALARA) is the prime consideration for defining the configuration of the Process Cooling Water System.

3.4.7.3 Functional Configuration Considerations and Rationale. Radiological Protection (ALARA) is the prime consideration for the design of this system. The Process Cooling Water System is designed as a dedicated system with one set of process cooling water equipment serving the Separations/LLW facility, and another set of process cooling water equipment serving the HLW process facility. Each subsystem is located entirely within the process facility it serves.

There are three possible alternatives to the selected configuration. They are as follows:

1. Locate the Process Cooling Water System equipment in the MUB or an accessible building outside of the process facilities. This single, shared cooling system would serve both process facilities.
2. Dedicate one set of process cooling water equipment to the Separations process and one set to the LLW process, with both sets inside the Separations/LLW facility. The HLW facility would have its own process cooling water equipment.
3. Locate sufficient process cooling capacity inside the Separations/LLW facility to serve the Separations/LLW processes, and the HLW process.

Radiological protection is the prime configuration consideration for the Process Cooling Water System and this eliminates Alternatives 1 and 3. All cooling water that has come into direct contact with the vitrification and separations processes may become contaminated with radioactive process fluids and, therefore, must remain within the respective vitrification or separations facility.

Secondary cooling loops and other backflow prevention measures can be designed into the process to mitigate the backflow of radioactive material from the process cells and from the process facilities. However, it is inherently safer to contain the process cooling subsystems in the facility where the cooling is needed.

The process cooling water equipment requires relatively low maintenance. However, maintenance considerations favor Alternative 1 where the process cooling equipment would be accessible in the MUB. Radiological safety considerations are the primary reason for the elimination of Alternatives 1 and 3.

Operational considerations may favor having dedicated process cooling equipment for the LLW process and dedicated process cooling equipment for the Separations process, as in Alternative 2. However, cost considerations have a negative impact on Alternative 2. Each cooling water subsystem would require its own coolers, both operating and spare. This would lead to four total process cooling water coolers for the Separations/LLW facility as opposed to two for a combined Process Cooling Water System. Alternatives 1 and 3 may

also have cost advantages over the selected process cooling water configuration. However, the radiological protection consideration once again takes precedence.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.8 Melter Cooling Water System

3.4.8.1 System Description. The Melter Cooling Water System removes heat from the Melters during normal process operation. The LLW Melters and the HLW Melter have separate cooling subsystems. Each subsystem is designed with a primary and a secondary cooling loop. The primary melter cooling water loop is a closed system that is designed to cool the various melter components by continuously circulating cooling water in a loop from the melter to the Melter Cooling Water Cooler. The primary loop includes heat exchangers, recirculation pumps, distribution piping, an expansion tank with HEPA filters on the tank vent, and a chemical addition tank.

The secondary cooling water loop is an open system. The secondary cooling water loop uses cooling tower water to remove the heat from the melter cooling water (via the exchanger) and expel it to the atmosphere (through the cooling tower). (Refer to the Cooling Tower Water System section for a system description.)

See page A-12 of Appendix A for the Block Flow Diagram of the Melter Cooling Water System. Drawing UFD-4-09 is a Utility Flow Diagram (see Appendix B) of the Melter Cooling Water System. The annual duty of the Melter Cooling Water System is provided in Appendix C, Utility Consumption Tables and Electrical Load List.

3.4.8.2 Findings. The Melter Cooling Water System is a dedicated system located within the process facilities. This system is grouped with the Process Cooling Water System and the Process Chilled Water System. Radiological Protection (ALARA) is the prime configuration consideration for the Melter Cooling Water System.

3.4.8.3 Functional Configuration Considerations and Rationale. Radiological Protection (ALARA) is the prime consideration for the design of this system. The primary loop of the Melter Cooling Water System is designed as a dedicated utility system, located within the detached and combination process facilities.

There are two possible alternatives to the selected configuration for the Melter Cooling Water System:

1. Locate a single Melter Cooling Water System inside the MUB. This shared cooling system would serve both the LLW and the HLW facilities.
2. Locate a single Melter Cooling Water System inside the Separations/LLW facility with enough capacity to serve both the LLW and the HLW facilities.

Radiological protection, which is the prime configuration consideration here, eliminates both alternatives 1 and 2. All cooling water that has come into direct contact with the process may become contaminated with radioactive process fluids and, therefore, must remain within the facilities.

Secondary cooling loops and other backflow prevention measures can be designed into the process to mitigate the backflow of radioactive material from the cells and from the process facilities. However, it is inherently safer to contain the melter cooling subsystems in the facilities where the cooling is needed.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.9 Process Chilled Water System

3.4.9.1 System Description. The Process Chilled Water System removes heat from the melter offgas during normal operation. The LLW melter offgas system and the HLW melter offgas system have separate chilled water subsystems. Each subsystem is designed with a primary and a secondary cooling loop. The primary chilled water loop is a closed system that is designed to cool the melter offgas by continuously circulating chilled water in a loop from the process water chiller to the melter offgas chiller. The primary loop includes the process water chiller unit that includes: the water chiller, circulation pump, expansion tank, vent HEPA filter, and distribution piping.

The secondary cooling water loop is an open system. The secondary cooling water loop uses cooling tower water to remove the heat from the process chilled water and expel it to the atmosphere (through the cooling tower - Refer to the Cooling Tower Water System).

See page A-13 of Appendix A for the Block Flow Diagram of the Process Chilled Water System. Drawing UFD-4-09 is a Utility Flow Diagram (see Appendix B) of the Process Chilled Water System. The annual duty for the Process Chilled Water System is provided in Appendix C, Utility Consumption Tables and Electrical Load List.

3.4.9.2 Findings. The Process Chilled Water System is a dedicated system, located within the process facilities. This system is grouped with the Process Cooling Water System and the Melter Cooling Water System. Radiological Protection is the prime configuration consideration for the Process Chilled Water System.

3.4.9.3 Functional Configuration Considerations and Rationale. Radiological Protection (ALARA) is the prime consideration for the design of this system. Because radiological protection is required, the primary loop of the Process Chilled Water System is designed as a dedicated utility system that is located within the detached or combination process facility.

There are two possible alternatives to the selected configuration for the Process Chilled Water System:

1. Locate a single Process Chilled Water System inside the MUB. This shared chilled water system would serve both the LLW and the HLW facilities.
2. Locate a single Process Chilled Water System inside the Separations/LLW facility with enough capacity to serve both the LLW and the HLW facilities.

Radiological protection considerations eliminate both alternatives 1 and 2. All cooling water that has come into direct contact with the offgas process may become contaminated with radioactive process fluids and, therefore, must remain within the Process facilities.

Secondary cooling loops and other backflow prevention measures would be designed into the process to mitigate the backflow of radioactive material from the process cells and from the process facilities. However, it is inherently safer to contain the Process Chilled Water Subsystems in the facilities where the cooling is needed.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.10 Utility Steam System

3.4.10.1 System Description. The Utility Steam System produces and distributes steam to various TWRS facility users. Saturated steam is generated at 1,136 kPa (150 psig) in electric steam generators.

The Utility Steam System consists of two shared electric Utility Steam Generators and their associated equipment, the condensate collection system (for condensate trapped from steam distribution piping), and the steam distribution piping. This equipment is located in the MUB.

The system consists of two equally sized steam generators (7.76 MW each). The steam required for continuous users in both process facilities along with the steam required for 60 percent of all intermittent users operating simultaneously, can be supplied by one steam generator. Therefore, the second steam generator is a spare.

The utility steam is supplied to various steam jet pumps in the process system, the process equipment decontamination cell, the radioactive waste treatment sump jet pumps, as well as utility stations in various facilities. The utility steam generators receive make-up water from the demineralized water system.

See page A-14 of Appendix A for the Block Flow Diagram of this system. UFD-4-10 is a Utility Flow Diagram (see Appendix B) for the Utility Steam System. The annual consumption of utility steam is shown on the Configuration 4 Summary of Annual Utility Consumption in Appendix C.

3.4.10.2 Findings. The Utility Steam System is a shared, close-external, system. Cost Effectiveness is the prime consideration for the configuration of the Utility Steam System. The steam produced by the Utility Steam System is shared by the process facilities to take advantage of the economies of scale. This system is grouped with the Compressed Air System, the Demineralized Water System, and the HVAC Chillers in the MUB.

3.4.10.3 Function Configuration Considerations and Rationale. Cost Effectiveness is the prime consideration for the design of this system. The majority of the utility steam users are in the Separations/LLW facilities. The amount of utility steam needed for the HLW facilities is about one-fourth of the total steam demand. The steam generators selected for the Separations/LLW facilities are nearly the same size as the steam generators selected for the entire load, including the HLW facility area. There is no cost savings realized by installing a smaller, dedicated Utility Steam System for the Separations/LLW because an additional dedicated system would need to be installed for the future HLW facility. Installing a single Utility Steam System sized to serve the entire treatment complex is the most cost effective configuration. The total engineered cost of a single Utility Steam System sized to serve the entire facility would be \$6,279,000. The total engineered cost of two individual systems (one sized to serve the Separations/LLW facility and the other sized to serve the HLW facility) would be \$8,286,000. It is clearly more cost effective to install a single Utility Steam System sized to serve all facilities.

Costs given here represent the mechanical equipment costs and specifically exclude the costs of the building to house the equipment.

Due to the heat loss involved with long lengths of piping, the Utility Steam Generators and their associated equipment need to be located on site, close to the process facilities. A remote location for the steam generators would require steam superheating at the steam generator, line tracing, and additional insulation. These features would increase the capital and operating costs.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.11 Compressed Air System

3.4.11.1 System Description. The Compressed Air System provides instrument air for pneumatically controlled components; plant air for spargers, jets, and general maintenance use; and breathing air. The air compressors provide a continuous supply of plant and instrument air at varying flow rates for users throughout the site. Breathing air is supplied from dedicated bottles, as needed.

The Compressed Air System is divided into three subsystems - plant air, instrument air, and breathing air. The plant air subsystem includes compressors, filters, and an air receiver. The instrument air subsystem includes compressors, filters, air dryers, and an air

receiver. The breathing air subsystem includes bottled breathing quality air, filters, manifolds, and carts.

One set of compressors provides both the instrument air and the plant air. Bottled breathing air is purchased from an approved supplier. The compressed air equipment is located in the MUB and the breathing air bottles are located in the breathing air bottle storage area. A set of three 50 percent capacity compressors (two operating and one spare) serves the needs of the Separations/LLW facility, the HLW facility, and the other process support facilities.

See pages A-15 of Appendix A for the Block Flow Diagrams for this system. Drawing UFD-4-11 is a Utility Flow Diagram (see Appendix B) for the Compressed Air System. The annual consumption of compressed air is shown on the Summary of Annual Utility and Chemical Consumption table in Appendix C.

3.4.11.2 Finding. The Compressed Air System is a shared, no distance constrained (with the exception of the breathing air subsystem), system. Cost Effectiveness is the prime consideration for the configuration of the Compressed Air System. The air compressors, plant air filters, plant and instrument air receivers, and instrument air dryers are shared by the process facilities to take advantage of the economies of scale. This system is grouped with the Utility Steam System, the HVAC Chillers, and the Demineralized Water System in the MUB. With the exception of the breathing air subsystem, which must be close-linked and located in a process facility annex, these functions could be provided from almost anywhere and are candidates for being furnished from existing facilities.

3.4.11.3 Function Configuration Considerations and Rationale. Cost Effectiveness is the prime consideration for the Compressed Air System configuration. The majority of the compressed air is used in the Separations/LLW facility and the HLW facility consumes only about one-twelfth of the total air consumed on site. The number and size of the compressors selected for the Separations/LLW facility will have sufficient capacity to serve both the Separations/LLW and the HLW facilities. No additional compressors are needed for the future HLW facility. Therefore, adding future HLW compressors to the system adds extra, unnecessary cost.

Other components of the Compressed Air System, such as the receiver vessels, may be marginally reduced in size if a dedicated system for the HLW facility were installed. However, the duplication of equipment for dedicated systems would more than offset this minimal cost savings. A shared Compressed Air System would have a total engineered cost of \$7,325,000. Two separate, dedicated Compressed Air Systems would have a total engineered cost of \$9,316,000.

Costs given here represent the mechanical equipment costs and specifically exclude the costs of the building to house the equipment.

There is no specific need for this system to be located in close proximity to the process operations. This system is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Radiological Protection (ALARA) This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.12 Process Water System

3.4.12.1 System Description. The Process Water System supplies process water to various users around the facility. The Sanitary Water System is the source of the Process Water. The Process Water System in turn is the source of demineralized water.

The Process Water System consists of the Bulk Water Storage Tank, the Bulk Water Supply Pumps, and the water distribution piping.

Process water is primarily used for feed water to the demineralizer, cold chemical make-up, pump priming and equipment flushing.

The process water is received from the Sanitary Water System. It is stored in the Bulk Water Storage Tank, which is collocated with the fire water tanks outside the WPH. From this storage tank, the process water is distributed on demand to the demineralizer, various cold chemical make-up tanks, and the chemically contaminated liquid waste tanks in the BCCB. The process water is also supplied on demand to various in-cell process tanks, cold chemical feed tanks, the potentially radioactive liquid waste catch tanks (seal legs), the AF, and the Fan/Filter Annexes. All of these process water users are once-through, and the water is consumed in the process.

See pages A-16 and A-17 of Appendix A for the Block Flow Diagrams for the Process Water System. Drawing UFD-4-12 is a Utility Flow Diagram (see Appendix B) for the Process Water System and Demineralized Water System. The annual consumption of process water is in Appendix C, Utility Consumption Tables Electrical Loads List.

3.4.12.2 Findings. The Process Water System is a shared system with no distance constraints. Cost Effectiveness is the prime consideration for the configuration of the Process Water System. The Process Water Tank and pumps are shared by the process facilities to take advantage of the economies of scale. The Process Water Pumps are grouped with the Fire Water Pumps in the WPH. The Process Water Tank is grouped with the Fire Water Tanks that are located near the WPH. The Process Water System functions could be provided from almost anywhere and are candidates for being furnished from existing Hanford facilities.

3.4.12.3 Function Configuration Considerations and Rationale. Cost Effectiveness is the prime function discriminator for the Process Water System. The process water requirement for the HLW facility is about 23 percent of the TWRS site process water usage. The shared Process Water System consists of a single Bulk Water Storage Tank and a set of pumps that are sized to serve the entire TWRS facility. Alternatively, dedicated Process Water Systems would consist of a tank and set of pumps dedicated to serve the Separations/LLW facility and an additional tank and set of pumps dedicated to serve the HLW facility. The total engineered cost of a single process water tank and a set of pumps that are sized to serve the entire facility would be \$349,000. The total engineered cost for two dedicated process water tanks and their associated pumps (one tank with pumps dedicated to the Separations/LLW facility and one tank with pumps dedicated to the HLW facility) would be \$441,000. Sizing a single tank, set of pumps, and header to serve the entire site, with a tie-in for the future HLW facility, is less costly than running a separate line from a separate tank to the HLW facility.

The process water costs given here represent the mechanical equipment costs and specifically exclude the costs of the building to house the equipment.

There are no technical requirements for the close-proximity of the water tanks or WPH to the process or process support facilities. This system is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.13 Demineralized Water System

3.4.13.1 System Description. The Demineralized Water System supplies demineralized water to various users around the facility. The Process Water System supplies water to the demineralizer.

The Demineralized Water System consists of the Demineralizer, the Demineralized Water Storage Tank, the Demineralized Water Supply Pumps and the water distribution piping.

The largest continuous user of demineralized water is the Utility Steam System, which uses the demineralized water as make-up water. Demineralized water is also used for noncontinuous uses, such as fill and make-up of the closed loop water systems - the Process Steam System, the Process Cooling Water System, the Melter Cooling Water System, and the Chilled Water System. Process water is converted to Demineralized Water by the Demineralizer in the MUB, and is stored in the Demineralized Water Storage Tank. The Demineralized Water is distributed on demand to the users listed above.

See page A-18 of Appendix A for the Block Flow Diagram for the Demineralized Water System. Drawing UFD-4-12 is a Utility Flow Diagram (see Appendix B) for the Process Water System and Demineralized Water System. The annual consumption of process water is in Appendix C, Utility Consumption Tables Electrical Loads List.

3.4.13.2 Findings. The Demineralized Water System is a shared system with no distance constraints. Cost Effectiveness and operability are considerations for the configuration of the Demineralized Water System. The Demineralizer, Demineralized Water Storage Tank, and pumps are shared by the process facilities to take advantage of the economies of scale. The Demineralizer, Demineralized Water Storage Tank, and Demineralized Water Pumps are grouped with the Utility Steam System, the HVAC chillers, and the Compressed Air System in the MUB. However, the Demineralized Water System functions could be provided from almost anywhere and are candidates for being furnished from existing Hanford facilities.

3.4.13.2 Function Configuration Considerations and Rationale. Cost Effectiveness is the prime function discriminator for the Demineralized Water System. The demineralized water requirement for the HLW facility is about 17 percent of the total demineralized water usage. Sizing a single, shared Demineralized Water System to serve the entire site, with a tie-in for the future HLW facility, is less costly than reserving space in the MUB and installing a future dedicated Demineralized Water System for the HLW facility. A shared Demineralized Water System would have a total engineered cost \$975,000. The total engineered cost of two, separate, dedicated Demineralized Water Systems would be \$1,268,000.

The demineralized water costs given here represent the mechanical equipment costs and specifically exclude the costs of the building to house the equipment.

Operability is also a consideration for the Demineralized Water System. The Demineralized Water System is operationally integrated with the Utility Steam System. The Utility Steam System requires a continuous supply of demineralized water to make steam. The Utility Steam System is also the largest consumer of demineralized water. The Demineralized Water System can be considered to be an integral part of the Utility Steam System. Therefore, it is logical to make the configuration of the Demineralized Water System match the configuration of the Utility Steam System. A set of dedicated demineralized water units would be mismatched with the shared steam generators. Therefore, a shared Demineralized Water System, grouped with the Utility Steam System, is favored for the operability of the shared Utility Steam System.

There are no technical requirements for the close-proximity of the Demineralizer, Demineralized Water Storage Tank, and pumps to the process or process support facilities. Higher head pumps would need to be provided for this system if a remote location is selected. This system is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.14 Sanitary Water System

3.4.14.1 System Description. The Sanitary Water System supplies water for potable water and utility users, and for HVAC humidifiers. It is also the source for the Process Water System, the TWRS Treatment Complex Site Fire Water Tank, and the Process Facility Fire Water Tanks. All safety showers and eye washes are supplied by the Sanitary Water System. The Sanitary Water System consists of distribution piping installed in a loop around the site. The sanitary water is available at 100 psig from the sanitary water header north of 4th Street.

See page A-19 of Appendix A for the Block Flow Diagrams for this system. Drawing UFD-4-13 is a Utility Flow Diagram (see Appendix B) for the Sanitary Water System. The annual consumption of sanitary water is provided in Appendix C, Utility Consumption Tables and Electrical Load List.

3.4.14.2 Findings. The Sanitary Water System is a shared, close-external system. Operability and Maintainability are the prime considerations for the configuration of the Sanitary Water System. The sanitary water inlet manifold is grouped with the raw water inlet manifold in the WPH. The most significant portion of this system is the underground distribution piping. By definition this must be close external to the facilities being served and runs throughout the complex site.

3.4.14.3 Function Configuration Considerations and Rationale. Operability (practicality of design) and Maintainability are the prime considerations for the configuration of the Sanitary Water System. The sanitary water is supplied to the facility from a single source, and is distributed to the users through underground piping. The sanitary water must be provided (by a piping distribution system) to each building where it is required. Therefore, the piping distribution loop must be by nature close-external. This system is also, by its nature, a shared facility. Dedicated sanitary water systems would require two piping loop systems. These two piping loops would unnecessarily increase the complexity of the system. Therefore, a single shared system is provided.

Tie-in points to the future HLW facility, or any process support facilities that are dedicated to the HLW facility, would be provided in the distribution loop.

Maintainability is also a configuration design consideration for the Sanitary Water System. The main sanitary supply header is designed as a continuous loop around the site. This loop design allows the water to flow in either direction through the header. Sections of the header can be isolated and taken out of service for maintenance without interrupting the supply of sanitary water to the other users. Therefore, a complete loop should be installed to serve the Separations/LLW facilities. The loop should have a "blinded" tie-in point for the line to the deferred HLW facility.

There is no distance constraint on the location of the inlet manifold as long as the pressure and flow requirements are met. However, the distribution loop portion of the Sanitary Water System must be located in close-proximity to the process and process support facilities. This system is defined as being close-external.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.15 Raw Water System

3.4.15.1 System Description. The Raw Water System supplies make-up water for the cooling tower and fire water for the TWRS Treatment Complex site fire water header. The raw water is available at 100 psig from the 200 East Area raw water header north of 4th Street. The Raw Water System consists exclusively of piping (which includes items like flow meters, pressure gages, and temperature gages).

See page A-20 of Appendix A for the Block Flow Diagram of the Raw Water System. Drawing UFD-4-14 is a Utility Flow Diagram (see Appendix B) for the Raw Water and Fire Water System. Refer to the Utility Consumption Tables, Appendix C, for the annual consumption of Raw Water.

3.4.15.2 Findings. The Raw Water System is a shared, close-external system. Operability is the prime consideration for the configuration of the Raw Water System. The Raw Water inlet manifold is grouped with the Sanitary Water manifold in the WPH.

3.4.15.3 Function Configuration Considerations and Rationale. Operability (practicality of design) is the prime consideration for the configuration of the Raw Water System. The raw water is supplied to the facility from a single source and distributed to the users through underground piping. The Raw Water System provides fire water for the site fire water loop, and make-up water for the Cooling Tower. Both of these users are designated as shared functions. This system is, then, by its nature a shared facility. The most significant portion of this system is the underground distribution piping. By definition this must be close external to the facilities being served and runs throughout the complex site.

Tie-in points to any future HLW facility users, or any future process support facilities that are dedicated to the HLW facility, would be provided in the distribution loop.

There is no distance constraint on the location of the inlet manifold as long as the pressure and flow requirements are met. This system is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.16 Tank Waste Remediation System Treatment Complex Site Fire Water System

3.4.16.1 System Description. The TWRS Treatment Complex Site Fire Water System provides water to fire hydrants located throughout the site, and risers and sprinklers in support building facilities. The main fire water header forms a continuous loop around the site. Sectionalizing valves are provided on the main fire water loop. In the event of a leak or line break, a section of the main header can be isolated without interrupting service to the rest of the header.

The TWRS Treatment Complex Site Fire Water System has two independent sources of water, Raw Water and Sanitary Water. Raw water is used to pressurize the main fire water loop. Sanitary water is used to fill the Site Fire Water Storage Tank TK-1612.

An independent source of water from the fire water storage tank increases the reliability of the system to fight fire. The jockey pumps ensure that the fire water headers are pressurized. The fire water pumps supplement the fire water supply when the raw water supply from the 200 East Area cannot meet the demand. The diesel generator supplies power to the fire water pumps when there is a power failure.

The TWRS Treatment Complex Site Fire Water System includes storage tanks, pumps, electric heaters, headers, and distribution piping. Diesel driven fire water pumps are

provided as a backup to the main electric motor driven pumps. The electric heaters and circulation pumps provide freeze protection by heating the water in the outdoor storage tanks.

See page A-20 of Appendix A for the Block Flow Diagram of the TWRS Treatment Complex Site Fire Water System. Drawing UFD-4-14 is a Utility Flow Diagram (see Appendix B) for the Raw Water and TWRS Treatment Complex Site Fire Water System.

3.4.16.2 Findings. The TWRS Treatment Complex Site Fire Water System, with the exception of the underground piping, is a shared, no distance constrained system. The underground piping is considered to be a shared close-external system. Operability and Maintainability are considerations for the configuration of the TWRS Treatment Complex Site Fire Water System. The TWRS Treatment Complex Site Fire Water System is shared by all facilities onsite except the process facilities, which have dedicated fire water systems.

The Fire Water Storage Tank is grouped with the Process Facility Fire Water Tanks and the Process Water Tank in an area adjacent to the WPH. The jockey pumps are grouped with the Process Facility Fire Water Pumps and the Process Water Pumps in the WPH. The underground piping is routed throughout the complex site and is considered close-external to the process facilities.

The TWRS Treatment Complex Site Fire Water storage and pumping functions could be provided from almost anywhere and are candidates for being furnished from existing facilities.

3.4.16.3 Function Configuration Considerations and Rationale. Operability (practicality of design) is the prime consideration for the TWRS Treatment Complex Site Fire Water System configuration. The TWRS Treatment Complex Site Fire Water Systems is designed as a shared system. The site fire water header is looped around the buildings on site and is designed to serve both the Separations/LLW facility support buildings and the future HLW facility support buildings. A "blinded" tie-in point is added in to the fire water loop for the future HLW process support facilities. Two dedicated site fire water systems would require an additional piping loop and pumps. This would unnecessarily increase the physical complexity of the system. Therefore, a single shared system is specified here.

For ease of operation and maintenance, a single pumphouse is used to house all of the fire water pumps and the Process Water Pumps, and to shelter the off-site water supply manifolds. Also, the loop design of the fire water header allows sections of the fire water loop to be isolated for maintenance without impairing the fire protection capability of the system.

Due to the design requirements of the TWRS Treatment Complex Fire Water System, the site fire water tank and loop will be sized the same regardless of whether or not the HLW facility is in place.

This storage and pumping portion of this system is defined as not being distance constrained. Therefore, there are no distance constraints on the location of the Site Fire Water Tank or the WPH. The distribution loop portion of the TWRS Treatment Complex Site Fire Water System must be located in close-proximity to the process and process support facilities that it serves.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.17 Process Facility Fire Water System

3.4.17.1 System Description. The Process Facility Fire Water System provides water for fire suppression for each process facility.

The fire water storage tanks TK-1613 A and B provide fire water to the process facilities through dedicated distribution loops. These tanks are sized to limit the amount of fire water entering each process facility. In cases of mis-operation, the volume of the TWRS Treatment Complex Site Fire Water Tank would potentially flood the process buildings. One tank is dedicated to the sprinkler system within the HLW facility and the other tank is dedicated to the sprinkler system within the Separations/LLW facility. Sanitary Water is used to fill the Process Facility Fire Water Storage Tanks TK-1613 A and B.

Each Process Facility Fire Water System includes a storage tank, pumps, electric heaters, headers and distribution piping. Diesel driven fire water pumps are provided as a backup to the main electric motor driven pumps. The electric heaters and circulation pumps provide freeze protection by heating the water in the outdoor storage tanks.

See page A-21 of Appendix A for the Block Flow Diagram of the Process Facility Fire Water System. Drawing UFD-4-14 is a Utility Flow Diagram (see Appendix B) for the Process Facility Fire Water System.

3.4.17.2 Findings. The Process Facilities Fire Water System with the exception of the underground piping, is a dedicated, no distance constrained system. The underground piping system is considered to be a shared close-external system. Safety and Operability and Maintainability considerations for the configuration of the Process Facilities Fire Water System. To prevent flooding of the process facilities, each process facility has its own, dedicated fire water system. The Process Facilities Fire Water Tanks and Pumps are grouped with the TWRS Treatment Complex Site Fire Water Tank and Pumps. The fire water storage and pumping functions could be provided from almost anywhere and are candidates for being furnished from existing Hanford facilities. However, it must be noted that there is a maximum size limitation for these tanks to prevent flooding. The underground piping is routed through the TWRS Treatment Complex and is considered close-external to the process facilities.

3.4.17.3 Functional Configuration Considerations and Rationale. Safety is the prime consideration for the Process Facilities Fire Water System configuration. The fire water pumps activate automatically, but require an operator to stop them. Therefore, it is possible to empty the entire contents of a fire water tank into a process facility. The dedicated Fire Water Tanks are sized to limit the amount of fire water that can enter a process facility to prevent flooding of the building and the potential damage that flooding can cause. Therefore, the Process Facility Fire Water System is a dedicated system.

Operability and maintainability are also considerations for the Process Facility Fire Water System. For ease of operation a single pumphouse is used to house the all of the Fire Water Pumps and the Process Water Pumps, and to shelter the off-site water supply manifolds. The fire water pumps are automated to deliver water to the required services. The fire water pumps are switched on when the pressure in the fire water line falls below the desired set-point. The pumps, however, do not have an automatic shut-off. An operator is required to shut down the pumps.

Two dedicated fire water piping loops serve the Separations/LLW and HLW Process Buildings only. These loops allow the water to flow in either direction through the headers. Sections of the fire water loop can be isolated for maintenance without impairing the fire protection capability of the system.

The construction of the HLW fire water tank and pumps could be deferred until the HLW facility is constructed. However, plot space onsite for the Fire Water Tank and inside the WPH for the fire water pumps needs to be reserved.

There is no specific need for this system to be located in close-proximity to the process operations. However, higher head pumps would be needed if a remote location is selected. This system is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. - This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.18 Waste Condensate Collection System

3.4.18.1 System Description. The Waste Condensate Collection Systems for the HLW facility and the Separations/LLW facility have essentially the same function. Both systems are located in annexes outside, but adjacent to, the process buildings.

In the HLW process, condensate drains from in-cell evaporators to any one of three condensate collection tanks, where chemical adjustments are made before pumping the condensate to a single pH Adjustment tank, and from there, to the condensate retention basin. Off-spec condensate can be returned to the in-cell feed evaporator tanks for reprocessing.

The function of the condensate collection system for the LLW process is the same as described above for the HLW process with the exception that part of the condensate is recycled for use in the Separations process. The balance of the condensate is pumped to the condensate retention basin.

3.4.18.2 Findings. The Waste Condensate Collection System is a dedicated system located in an annex adjacent to the process facility it serves. Design impact is the prime configuration consideration for the Waste Condensate Collection System.

3.4.18.3 Facility Configuration Considerations and Rationale. Design Impact is the prime consideration for the Waste Condensate Collection System configuration. The condensate collection functions are to be dedicated to the process facilities they serve, i.e., the Separations/LLW and the HLW facilities. Condensate is generated within the processing facilities as a result of evaporating water from the process feeds and then condensing the water from the vapors leaving the evaporators. The condensed water must flow by gravity to the condensate collection tanks. Sloping requirements and the associated depth of excavation is minimized by installing collection tanks dedicated to the building they serve, located at minimum distance from that building.

The process operating conditions and location of the condensate tanks for each facility should be optimized for each facility. Keeping the condensate collection system for the High Level Waste process divorced from the Separations/LLW processes maximizes flow sheet and facility layout design flexibility.

A shared condensate collection system would provide a cost savings associated with economies of scale and consolidation of support functions. For the overall function and associated facility, these cost savings would be at least partially and probably totally offset by the greater depth of excavation required for locating the shared facility at a greater distance from the process facilities. Any cost advantage is outweighed by process flow sheet requirements and flexibility considerations.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This system is designed to handle RCRA type dangerous wastes regulated by WAC 173-303, and each facility within this system will be permitted under this regulation. This is not considered to be a significant issue, therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

3.4.19 Cooling Tower Water System

3.4.19.1 System Description. The Cooling Tower Water System removes heat from normal processing operations and from the various cooling water systems in the process and support facilities, and then rejects that heat via evaporative cooling. The Cooling Tower Water System includes the Cooling Tower, Cooling Tower Water Circulation Pumps, Inhibitor Addition Pump, and distribution piping for the various users. Raw water is used

for cooling tower make-up. The bleedoff from the cooling tower is routed to the 200 Area TEDF.

The Cooling Tower Water System has a recirculating cooling water loop that provides cooling water to out-of-cell equipment including the closed loop Process Cooling Water System and the closed loop Melter Cooling Water System. It consists of three cooling water pumps (two operating and one spare). An electric heater is provided in the basin to prevent the water temperature from falling below 4.4 °C (40 °F).

The Cooling Tower is constructed of multiple cooling cells. Each cell has a fixed cooling capacity. The individual cells can be put into service or removed from service to match the cooling load.

The cooling water is lost from the system on a continuous basis due to evaporation, drift, and bleedoff. Raw water is used as make-up and is regulated by the level control of the cooling tower basin. A corrosion inhibitor is pumped directly from a storage drum to the cooling tower water return header by a metering pump.

See page A-22 of Appendix A for the Block Flow Diagram of this system. Drawing UFD-4-15 is the Utility Flow Diagram (see Appendix B) of the Cooling Tower Water System. The annual duty for the cooling tower is provided in Appendix C, Utility Consumption Tables and Electrical Load List.

3.4.19.2 Findings. The Cooling Tower Water system is a shared, no distance constrained, system. Cost Effectiveness is the prime configuration consideration for the Cooling Water System. The Cooling Tower and Cooling Tower Water Circulation Pumps are shared by the process and support facilities to take advantage of the economies of scale. The Cooling Tower function could be provided from almost anywhere and is a candidate for being furnished from the existing Hanford facilities.

3.4.19.3 Function Configuration Considerations and Rationale. Cost Effectiveness is the prime consideration for the Cooling Tower Water System configuration. Installing a tower, basin, and associated equipment to serve the HLW facility is not warranted. The HLW facility cooling water requirement is about 10 percent of the total cooling water requirement for the site. There is no cost savings realized by installing a marginally smaller Cooling Tower Water System dedicated to the Separations/LLW facility because an additional dedicated system would have to be installed for the future HLW facility. Installing a Cooling Tower Water System sized to serve the entire treatment complex is the most cost effective design.

A shared Cooling Tower Water System that serves various facilities has a single set of equipment. Taking advantage of the economies of scale, this shared configuration costs less than individual dedicated systems with duplicate equipment. The total engineered cost of a shared Cooling Tower Water System would be \$8,011,000. The total engineered cost of two separate, dedicated Cooling Tower Water Systems would be \$9,912,000. Therefore, it is

more cost effective to build a single Cooling Tower Water System designed for the entire site than to build a dedicated Separations/LLW cooling tower and a future HLW cooling tower.

Consideration should be given to the prevailing wind direction when determining the location of the cooling tower. The prevailing wind is from the northwest. The tower should be to the southeast of the TWRS Treatment Complex. Drift from the cooling tower should not be allowed to travel across construction areas, operational facilities, parking lots or operational areas. Condensate plumes should not be allowed to "fog" or obscure visibility along facility road systems.

There is no specific need for this system to be located in close-proximity to the process operations. However, a higher head pump and longer piping would be required if a remote location is selected. This system is defined as being not distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. All sources of air emission, including cooling towers will be permitted for air emissions. Each cooling tower, if more than one were provided would require a permit. However, the cooling tower would be included under the permit for the process facilities. This is not considered a significant issue, therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.20 Telecommunications System

3.4.20.1 System Description. The Telecommunications System consists of all equipment required to provide internal and external communications functions for the TWRS Treatment Complex. The external telecommunications system will provide for telephone, emergency response and data transfer into and out of the TWRS Treatment Complex, while the internal telecommunications system will provide for communications within the complex. This system includes voice, video, spectrum-dependent communications and data communications required to support facility operations, maintenance, management, and emergency response.

Land based trunk lines will enter the Treatment Complex at a single location and be routed to the telecommunications room in the Emergency Response Center. Distribution equipment will then route both hard wired and wireless communications to the various facilities within the complex.

3.4.20.2 Findings. The Telecommunications System is a shared, close-external system. This system is grouped within the Emergency Response Center with the Safety Class 1 safe shutdown portion of the Process Operational Control System.

Operability and Maintainability is the prime consideration used to define the configuration for this system. Centralizing the telecommunications distribution equipment in a one location provides a single point of contact between the TWRS Treatment Complex and the outside world. It also provides an efficient system to route and transfer communications and information within the complex. Additionally, maintenance and repair of the system will be greatly simplified with all the components in a single location.

3.4.20.3 Functional Considerations and Rationale. Operability and Maintainability is the prime consideration for defining the Telecommunications System configuration. Locating the telecommunications distribution equipment in a single location provides for a single point of contact for external communications and provides for fast and efficient internal voice and data transfer. Maintenance and repair will be easier since all the equipment is grouped in a single location. To minimize the length of internal lines of communication this system is located within the TWRS Complex but away from the main process areas. Therefore this system is defined to be a shared, close-external system.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection is not a consideration that was used to determine the configuration for this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration for this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration for this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.4.21 Sanitary Sewer System

3.4.21.1 System Description. The Sanitary Sewer System is designed to convey the domestic sewage from facilities containing restrooms, showers, or sanitary sinks, to a domestic waste water facility for further processing and disposal. The system is comprised of sewer collection mains and a sewage lift station. The system discharges the domestic sewage to the 200 Area Sanitary Sewer System.

The sewer system is provided for disposal of domestic waste only. The sewer collection system will serve a multi-building complex that has a maximum shift population of 779 persons (708 shift plus 10 percent transient personnel). The sanitary sewer collection

system runs throughout the unregulated areas of the facility. Manholes will be located at all places where there are changes in the pipe alignment both horizontal and vertical.

It is assumed that a lift station is required to drain the sewage from all the facilities within the complex. However, whenever possible, the sewage collection system would drain individual building's sewage by gravity, thereby bypassing the lift station. The table below lists the facilities that discharge domestic sewage to the sewer collection main. The sewer collection main drains into the sewage lift station tank that discharges the sewage to the 200 Area Sanitary Sewer System. The following buildings are connected with sewage discharge main:

1. Fabrication and Assembly Shop
2. Warehouses
3. Operations Support Building
4. Regulated TWRS Complex Entry Building
5. Regulated Facility Entry Annex (Separations/LLW facility)
6. Regulated Facility Entry Annex (HLW facility)
7. MUB
8. AF.

See page A-23 of Appendix A for the Block Flow Diagram of this system. Drawing UFD-4-16 is a Utility Flow Diagram (see Appendix B) of the Sanitary Sewer System.

3.4.21.2 Findings. The Sanitary Sewer system is a shared, close-external system. The most significant portion of this system is the underground distribution piping. By definition this must be close external to the facilities being served and is routed throughout the TWRS Treatment Complex.

Operability is the prime consideration for the configuration of the Sanitary Sewer System. Due to the nature of the service provided, the Sanitary Sewer System is shared by all of the office buildings and other nonregulated users that it serves.

3.4.21.3 Function Configuration Considerations and Rationale. Operability (practicality of design) is the prime consideration for the design of this system. The Sanitary Sewer System is system is designed to handle the sanitary sewage from the office buildings and buildings with nonregulated sanitary facilities. These buildings have been designated as shared facilities and will be installed as shared facilities from the outset. The sanitary sewer operates by gravity an must be in close-proximity to the facilities that it serves. Therefore, the sanitary sewer system that serves these facilities must be a shared, close-external system.

If, for any reason, a building becomes dedicated to the HLW facility, a tie-in point for a future sewer line would be provided.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection (ALARA) issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This system will require permitting under either WAC 173-216 or WAC 246-272 depending upon system capacity. The system would tie into a single line connecting to the 200 Area Sanitary Sewer System. Assuming that the initial permits for the 200 Area Sanitary Sewer System includes the capacity to handle the TWRS Treatment Complex, no further permitting is anticipated. These issues are not considered to be significant, therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.5 ELECTRICAL POWER

3.5.1 Normal AC Power System

3.5.1.1 System Description. The Normal AC Power System provides AC power to the TWRS Treatment Complex. It originates from the existing Hanford 230 kV power system. The 230 kV distribution loop, provides the site with power from two independent substations, and giving the normal power a high availability. It is delivered, via overhead

lines, to a Substation/Switchgear Area where it is stepped down to 34.5 kV. The 34.5 kV power is converted to 13.8 kV at the Switchgear Building located within the TWRS Treatment Complex. 13.8 kV power is distributed to individual facilities where unit substations transform it to 4.16 kV or 480 V to meet the specific requirements of each facility.

3.5.1.2 Findings. The Normal AC Power System is a dedicated, close-external system. Operability and Maintainability is the prime consideration used to define the configuration for this system. Transformers for converting the incoming 34.5 kV power to 13.8 kV and switchgear for distributing the power to the process and process support facilities are grouped together at the Switchgear Building. The transformers are located outside of the building.

3.5.1.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for the Normal AC Power System configuration. Providing dedicated 13.8 kV power distribution for each process facility allows each to operate independently. A failure in a shared system could shut down both process facilities. Providing dedicated transformers and distribution allows for continuous operation of one facility while the second is shut down due to a system failure.

There are no technical consideration governing the location of the Substation/Switchyard Area other than it be between the power supply and the TWRS Treatment Complex. Therefore it is not distance constrained. To limit voltage losses and reduce distribution costs the Switchgear Building is located so as to provide easy access from the incoming line and be in close proximity to the process facilities.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory

Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.5.2 Emergency Power System

3.5.2.1 System Description. The Emergency Power System will provide emergency power for the TWRS Treatment Complex. This system provides emergency power to safety class loads required to maintain confinement in the event of a loss of normal AC power. The Emergency Power System will provide 480 V power from redundant Class 1E diesel generators, switchgear, motor control centers, batteries, and Uninterruptible Power Supplies designed to meet Institute of Electrical and Electronics Engineers (IEEE) requirements. The generators are located in dedicated Emergency Generator Bldgs. Switchgear, motor control centers, batteries, and Uninterruptible Power Supplies (UPSs) will be located as required throughout the complex.

3.5.2.2 Findings. The Emergency Power System is a dedicated close-external system. Operability and Maintainability is the prime consideration used to define the configuration for this system. Emergency power is supplied from dedicated redundant 1-E generators located in close proximity to the facility they serve. UPSs adjacent to the equipment they support offers operational and maintenance advantages over a shared facility. Emergency DC power is limited to station batteries supplying emergency switchgear.

3.5.2.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for defining the Emergency Power System configuration. Use of dedicated 1-E power generator sets has the advantage that when one of the process facilities experiences a loss of power, only that portion of the system dedicated to that facility is activated. Supplying power from a generator sized to supply the entire complex places unnecessary wear and tear on the system increases the complexity of the distribution system. Thus dedicated generator sets are a better operational solution to safety requirements.

The Emergency Power System is a Safety Class 1 system. As such, it must be protected from damage and requires periodic inspection and/or testing to verify that its operability has not deteriorated. Therefore the distance between the Emergency Power System and its major users should be kept to a minimum. The major users are the HVAC Zone 1 exhaust fans. This drives the configuration to a close-external system located as close as physically possible to the Fan/Filter Annexes.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.5.3 Uninterruptible Power Supply System

3.5.3.1 System Description. The Uninterruptible Power Supply System provides continuous power to monitoring and control equipment, excluding Life Support Systems, that requires continuous power during short duration power outages. The system consists of rectifiers/battery chargers, inverters, switching components, and batteries.

3.5.3.2 Findings. The Uninterruptible Power Supply (UPS) System is a dedicated internal system. Operability and Maintainability is the prime consideration used to define the configuration for this system. UPSs should be as close to the equipment items they support. The further they are apart the larger the voltage drop, thus increasing the size of the UPS distribution system and the possibility of having the power interrupted due to damage to the connecting wiring.

3.5.3.3 Function Configuration Considerations and Rationale. Operability and maintainability is the prime consideration for the Uninterruptible Power Supply System configuration. The majority of the loads operate at 120 V, which limits the distance between the UPS and the item supported. Combining loads would require distribution at a higher voltage and the use of transformers to break the supply back down to 120 V. Failure in this system would affect larger portions of the facility thereby affecting reliability. Therefore, this system is defined to be a dedicated internal system.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.6 FACILITY MANAGEMENT AND SUPPORT

3.6.1 Treatment Complex Management and Support System

3.6.1.1 System Description. The Treatment Complex Management and Support System provides facilities for the management and support of the TWRS Treatment Complex operations. This system provides office space for management and support personnel as well as facilities postal services, plant records retention, reprographics, training, and public outreach displays. These facilities are located in the Operations Support Building.

3.6.1.2 Findings. The Treatment Complex Management and Support System is a shared, no distance constrained system. Operability and Maintainability is the prime consideration used to define this system. A shared management and support system provides for better management control of the TWRS Treatment Complex. These management and support functions can be provided from almost anywhere and are candidates for being provided from existing Hanford facilities.

3.6.1.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for defining the Treatment Complex Management and Support System. A shared system allows for centralized management and direction of the complex. It also provides for more efficient use of support facilities and eliminates potential duplication of facilities and personnel required to provide required facility support services.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.6.2 Regulated Tank Waste Remediation System Treatment Complex Entry System

3.6.2.1 System Description. The Regulated TWRS Treatment Complex Entry System controls the entry to and exit from the TWRS Treatment Complex. Personnel requiring entry to the complex must first change from their street clothes to a "blues" uniform. Upon exiting, they must remove their blues uniform, shower, change into their street clothes and exit through portal monitors. This system is composed of unregulated change areas, lockers, showers, and radiation monitors. It is located in the Regulated TWRS Complex Entry Building.

3.6.2.2 Findings. The Regulated TWRS Treatment Complex Entry System is a shared close-external system. This system is grouped together with the Employee Support System and the Process Operational Control System in the Regulated TWRS Complex Entry Building.

Operability and Maintainability as well as Radiological Protection are the prime considerations used to define this system. A shared system provides for a single point of

departure for personnel entering or exiting the complex. It also assures that all personnel are screened for radiological contamination before exiting the TWRS Treatment Complex and rejoining the general population. To efficiently provide these functions this system must be located on the edge of the site boundary.

3.6.2.3 Function Configuration Considerations and Rationale. Operability and Maintainability as well as Radiological Protection are the prime considerations for defining the Regulated TWRS Treatment Complex Entry System. A shared system forces all personnel entering and exiting the complex to pass through a central control point. Thus assuring control of all personnel within the complex and that everyone entering the complex complies with the radiological detection and control procedures before exiting.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.6.3 Regulated Facility Entry System

3.6.3.1 System Description. The Regulated Facility Entry System controls the entry to and exit from facilities that pose a threat of radiological contamination to the worker population. Personnel requiring entry to or exit from these facilities must first pass through this system. This system is composed of step off pads, regulated change areas, lockers, hand sinks and showers, full body monitors, hand and foot monitors, and portal monitors.

Personnel that need to visit "blues" areas within the facility are allowed to enter those areas through a controlled entrance. Upon exiting these areas they will be checked by hand and foot monitors and pass through portal monitors before being allowed to exit the facility. Personnel visiting "whites" areas will change to whites before entering those areas through a separate controlled entrance. Upon exiting they will be routed to a step off pad area to remove their potentially contaminated clothing, required to wash or shower, change back into blues, be checked for contamination with hand and foot monitors, and pass through a portal monitor before being allowed to exit the facility. Facilities identified as requiring a regulated entry system are the main process facilities, the Fan/Filter Annexes, and the AF.

3.6.3.2 Findings. The Regulated Facility Entry System is a dedicated annexed system. Radiological Protection is the prime consideration for defining this system. This system is grouped with personnel protection equipment in areas close-linked (annexed) to the facility whose entry they are regulating.

3.6.3.3 Function Configuration Considerations and Rationale. Radiological Protection is the prime consideration for defining the Regulated Facility Entry System. A dedicated system forces all personnel entering and exiting facilities where they can potentially be contaminated to pass through a central control point. Thus assuring control of personnel into and out of each facility and that radiological detection and control procedures to detect and limit the spread of contamination are complied with.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.6.4 Personnel Protection System

3.6.4.1 Systems Description. The Personnel Protection System provides for worker safety within the TWRS Treatment Complex. This system includes emergency exits, fire walls, shield walls, air locks, change areas, step off pads, alarms, radiation monitors, air samplers, and other items required to assure work safety. This system is distributed to all areas within the complex that may pose a threat to the worker population.

3.6.4.2 Findings. The Personnel Protection System is a dedicated internal system. Radiological Protection and Safety are the prime considerations used to define this system. It is distributed throughout each process and process support facility to assure worker safety within the complex.

3.6.4.3 Function Configuration Considerations and Rationale. Radiological Protection (ALARA) and Safety are the prime considerations for defining the Personnel Protection System. The system provides for worker safety within the TWRS Treatment Complex and as such is distributed throughout each facility within the complex.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.6.5 Employee Support System

3.6.5.1 System Description. The Employee Support System provides for amenities required to enhance worker comfort and moral. This system consists of lunch rooms, vending machines, toilet facilities, and any other item aimed at enhancing the work environment.

3.6.5.2 Findings. The Employee Support System is a dedicated close external system. Operability and Maintainability is the prime consideration used to define this system. Distributing this system throughout the TWRS Treatment Complex places amenities near to the actual work areas thereby making them readily available to the facility population.

3.6.5.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for defining the Employee Support System. Distributing this system to the various support facilities in proportion to the permanent staff assigned to each makes this system readily available to the facility population.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.7 MAINTENANCE AND REPAIR

3.7.1 Shipping and Receiving System

3.7.1.1 System Description. The Shipping and Receiving System provides for the receipt, inspection, and inventory control of equipment, spare parts, and miscellaneous goods being delivered to the TWRS Treatment Complex. It also provides for the packaging and distribution of these items to the various process and process support facilities within the TWRS Treatment Complex.

3.7.1.2 Findings. The Shipping and Receiving System is a shared not distance constrained system. Operability and Maintainability is the prime consideration used for defining this system. This system is grouped together with the Warehousing and Storage System and the Storage and Service Yard.

A shared system provides for a single point of delivery to the TWRS Treatment Complex. The only consideration for the location of this system is that it be readily accessible by rail and motor vehicle. Therefore this system is a candidate for being located in an existing Hanford facility.

3.7.1.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for defining this system. A shared system provides for a single point of delivery and distribution for material required to operate and maintain the TWRS Treatment Complex. It also eliminates duplication of equipment and personnel required to operate two dedicated systems. There is no specific need for this system to be located in close proximity to the process operations. Therefore this system is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.7.2 Warehousing and Storage System

3.7.2.1 System Description. The Warehousing and Storage System provides for the environmental protection and storage of equipment, spare parts, and miscellaneous goods required to operate and maintain the TWRS Treatment Complex.

3.7.2.2 Findings. The Warehousing and Storage System is a shared not distance constrained system. Operability and Maintainability is the prime consideration used for defining this system. This system is grouped together with the Shipping and Receiving System and the Storage and Service Yard.

A shared system provides for a single environmentally protected storage area for material required for the operation and maintenance of the TWRS Treatment Complex. The only consideration for the location of this system is that it be readily accessible by rail and motor vehicle. Therefore this system is a candidate for being located in an existing Hanford facility.

3.7.2.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for defining this system. A shared system provides for a single environmentally protected storage area for material required to operate and maintain the TWRS Treatment Complex. It also eliminates duplication of equipment and personnel required to operate two dedicated systems. There is no specific need for this system to be located in close proximity to the process operations. Therefore this system is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. - This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.7.3 Storage and Service Yard

3.7.3.1 System Description. The Storage and Service Yard provides for the storage of equipment, vehicles, and materials required to operate and maintain the TWRS Treatment Complex that do not require environmental protection. It also provides for outside maintenance and repair of vehicles and large equipment items.

3.7.3.2 Findings. The Storage and Service Yard is a shared not distance constrained facility. Operability and Maintainability is the prime consideration used for defining this function. This function is grouped together with the Shipping and Receiving System and Warehousing and Storage System.

A shared function provides for a single storage area for vehicles equipment and materials not requiring environmental protection used for the operation and maintenance of the TWRS Treatment Complex. The only consideration for the location of this function is that it be readily accessible by rail and motor vehicle. Therefore this function is a candidate for being located in an existing Hanford facility.

3.7.3.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for defining this function. A shared function provides for a single outdoor storage area for vehicles, equipment, and materials required to operate and maintain the TWRS Treatment Complex and do not require environmental protection. It also eliminates duplication of equipment and personnel required to operate two dedicated functions. There is no specific need for this function to be located in close proximity to the process operations. Therefore this function is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this function. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this function.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this function. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this function.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this function. Therefore, Safety is not a consideration that was used to determine the configuration of this function.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this function. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this function.

Schedule. The configuration of this function does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this function. Therefore, Technology issues were not a consideration for the configuration of this function.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this function. Therefore, Design Impact is not a consideration that was used to determine the configuration of this function.

3.7.4 Major Equipment Assembly

3.7.4.1 System Description. The Major Equipment Assembly Function provides for the assembly of new in-cell equipment before installation in the process facilities. It consists of an enclosed assembly area, bridge crane and other items and equipment required to assemble new in-cell equipment.

3.7.4.2 Findings. The Major Equipment Assembly Function is a shared not distance constrained function. Operability and Maintainability is the prime consideration used for defining this function. This function is grouped together with the Spare Parts Fabrication Function in the Fabrication and Assembly Shop.

A shared function provides for a single new in-cell equipment assembly area. The only consideration for the location of this function is that it be readily accessible by rail and motor vehicle. Therefore this function is a candidate for being located in an existing Hanford facility.

3.7.4.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for defining this function. A shared function provides for a single new in-cell equipment assembly area. It also eliminates duplication of equipment and personnel required to operate two dedicated functions. There is no specific need for this function to be located in close proximity to the process operations. Therefore this function is defined as not being distance constrained.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this function. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this function.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this function. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this function.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this function. Therefore, Safety is not a consideration that was used to determine the configuration of this function.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this function. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this function.

Schedule. The configuration of this function does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this function. Therefore, Technology issues were not a consideration for the configuration of this function.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this function. Therefore, Design Impact is not a consideration that was used to determine the configuration of this function.

3.7.5 Spare Parts Fabrication

3.7.5.1 System Description. The Spare Parts Fabrication Function provides for the manufacturing and assembling of small equipment items and spare parts required for the operation and maintenance of the TWRS Treatment Complex. It consists of an enclosed area, work benches, tool crib and other items required to assemble or manufacture small equipment items and spare parts.

3.7.5.2 Findings. The Spare Parts Fabrication Function is a shared not distance constrained function. Operability and Maintainability is the prime consideration used to define this system. This function is grouped together with the Major Equipment Assembly function in the Fabrication and Assembly Shop.

A shared function provides for a single small equipment and spare parts manufacturing and assembly area. The only consideration for the location of this function is that it be readily accessible by rail and motor vehicle. Therefore this function is a candidate for being located in an existing Hanford Site facility.

3.7.5.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for defining the Spare Parts Fabrication Function. A shared function provides for a common area in which to manufacture and/or assemble small equipment items and spare parts required for the operation and maintenance of the TWRS Treatment Complex. The only consideration for the location of this function is that it be readily accessible by rail and motor vehicle. Therefore this function is a candidate for being located in an existing Hanford Site facility.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.7.6 Maintenance and Repair System

3.7.6.1 System Description. The Maintenance and Repair System provides for the maintenance and repair of failed noncontaminated equipment, failed contaminated equipment, and failed Master-Slave Manipulators (MSMs). This system consists of washdown and decon areas, repair areas, and tools and equipment required to remove, maintain and repair failed equipment and MSMs.

Failed noncontaminated equipment is defined as failed equipment located in areas that will not be radioactively contaminated and will not require decontamination before it can be contact maintained and/or repaired. This equipment includes large items that can be maintained or repaired in place, or smaller items that can be removed and placed in a shop for bench work. It is assumed that equipment which requires major overhauling will be removed and shipped offsite to a refurbishing contractor. Therefore, there will not be any maintenance and repair facilities to perform this function onsite.

Failed contaminated equipment is defined as failed equipment located in areas that can become contaminated and must be remotely maintained and/or repaired in place, remotely removed and remotely maintained and/or repaired, or be remotely removed, decontaminated and contact maintained and/or repaired. Contaminated equipment that must be remotely maintained and/or repaired includes but is not limited to centrifuges, venturi scrubbers, metal HEPA filters, cyclone separators, and cullet roll crushers. Contact maintained contaminated equipment includes but is not limited to in-cell pumps and agitators.

Master-Slave Manipulators (MSMs) are of a three piece construction where the hot or "contaminated" portion will be removed from the hot side. This portion of the MSM must be removed from its installed position and moved to an area where it can be decontaminated before it is moved to a failed contaminated equipment repair shop within the facility. The MSM cold portion and wall piece would require similar handling, with the exception of decontamination. These pieces can be sent to a failed noncontaminated equipment repair shop within the site.

It is noted that the AF has a dedicated MSM repair shop for contaminated and noncontaminated MSMs. It is assumed that the AF will be the prime onsite user of MSMs. Separations/LLW and the HLW facility are assumed not to require MSMs, but will have the potential to service them in the site failed noncontaminated equipment repair shop and within each of the Separations/LLW and HLW facility's contaminated equipment repair shop.

3.7.6.2 Findings. The Maintenance and Repair System is a dedicated internal system. Radiological Protection and Operability and Maintainability are the prime considerations used to define this system. Failed contaminated equipment and the contaminated portion of the MSMs, even after external decontamination, have the potential to spread contamination. There are operational advantages in repairing failed equipment in or near the facility where they are used.

3.7.6.3 Function Configuration Considerations and Rationale. Radiological Protection and Operability and Maintainability are the prime considerations for defining the Maintenance and Repair System. Any item that has been contaminated has the potential to spread contamination to otherwise clean areas. These items would need to be decontaminated, packaged, and inspected to assure the that the operators are not exposed and that contamination will not be spread to other areas of the complex. Performing maintenance and repair of failed contaminated and noncontaminated equipment within the facility in that they are used would minimize overall down time and increase efficiency.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.8 TREAT VENTILATION AIR

3.8.1 Supply Air Treatment System

3.8.1.1 System Description. The Supply Air Treatment System provides incoming ventilation air for the TWRS Treatment Complex process facilities. Incoming air is first filtered then conditioned before being distributed throughout each process facility.

The Supply Air Treatment System is broken down into two subsystems; a Zone I system and a Zone II and III system. The Zone I system is a once through system and the Zone II and III system is a cascading system. The Supply Air Treatment System is comprised of the following major components:

- Supply Fans
- Roughing Filters
- High Efficiency (95 Percent) Filters
- Pre-heaters
- Chilled Water Coils
- Ductwork
- Controls and Instrumentation.

The supply air fans are located on the roof of the process facility they serve while the controls are distributed throughout the facility.

3.8.1.2 Findings. The Supply Air Treatment System is a dedicated annexed system. This system is grouped with the HVAC Zone II and III Exhaust Air Treatment system on the roof of the process facilities.

Operability and Maintainability is the prime consideration used to define this system. A dedicated supply air treatment system close coupled to each facility allows for better operational control and increases the overall reliability of the system.

3.8.1.3 Function Configuration Considerations and Rationale. Operability and Maintainability is the prime consideration for defining the Supply Air Treatment System configuration. Dedicated systems annexed (placed on the roof) to each process facility allows each facility to operate independently without relying on an independent facility to provide treated air. A failure in a shared system would shutdown both process facilities while a dedicated system would allow continuous operation one facility while the second could be shutdown due to a failure. Locating the supply air treatment equipment on the roof each facility minimizes the pressure drop and reduces the risk of damage to the supply air treatment ductwork due to an accident.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.8.2 Exhaust Air Treatment System

3.8.2.1 System Description. The Exhaust Air Treatment System filters, samples and monitors the air exhausted from the TWRS Treatment Complex process facilities. The Exhaust Air Treatment System is broken down into two subsystems; a Zone I system and a Zone II and III system.

Ventilation air is drawn through the facility then through a double filtration system by means of a negative pressure supplied by the exhaust fans. The filtered air is then exhausted to the atmosphere through an exhaust stack. The main components of the Zone I exhaust system are as follows:

- High Eff. Metal Fiber filters
- HEPA Filters
- Exhaust Fans
- Exhaust Stack.

The main components of the Zone II and III exhaust system are as follows:

- High Eff.(95 Percent) Filters
- 2 Stages of HEPA Filters
- Exhaust Fans
- Exhaust Stack.

The Zone I exhaust filters and fans are located in the Fan/Filter Annexes close coupled (annexed) to each process facility. The exhaust stack is located adjacent to the Fan/Filter building. The Zone II and Zone III exhaust filters and fans are located on the roof of each process facility.

3.8.2.2 Findings. The Exhaust Air Treatment System is a dedicated annexed system. Operability and Maintainability as well as Safety are the prime considerations used to define this system. A dedicated exhaust air treatment system close coupled to each process facility allows for better operational control and increases overall reliability of the system. Close coupling is require to conform to DOE Order 6430.1A requirements that the filtration system be as close as possible to the source of contamination and minimizes the risk of loss of confinement due to a breach in the ductwork connecting the exhaust air treatment equipment and the process facilities.

3.8.2.3 Function Configuration Considerations and Rationale. Operability and Maintainability as well as Safety are the prime considerations for defining this system. Dedicated systems close coupled (annexed) to each process facility allows each facility to operate independently. A failure in a shared system would shutdown both facilities while a dedicated system would allow continuous operation of one facility while the second is shutdown due to a failure or accident.

DOE Order 6430.1A, Section 1550-99.0.2 states that "air filtration units shall be installed as close as possible to the source of contaminants to minimize the contamination of the ventilation system ductwork". This requirement is aimed at minimizing final decontamination and decommissioning costs, but it also results in minimizing the length of ductwork that would need to be protected from damage due to an accident. Any break in the ductwork would threaten the ability of the HVAC system to maintain confinement and therefore could result in an unacceptable release of contaminants.

It must be noted the one disadvantage to dedicated Exhaust Air Treatment Systems would be that multiple air exhaust permits would be required. This is viewed as a administrative consideration and not a technical issue. Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection(ALARA) is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This system is regulated by air emission regulations WAC 173-401, WAC 173-403, and WAC 173-460 and each facility within this system will require permitting under these regulations. This is not considered to be a significant issue, therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.8.3 HVAC Chilled Water

3.8.3.1 System Description. The HVAC Chilled Water System provides chilled water for the process facility Supply Air Treatment System and certain other process support facilities (Regulated Complex Entry Building, BCCB, AF, and MUB). The HVAC Chilled Water System consists of the compressors, evaporators, condensers, pumps, and insulated piping required to provide chilled water to the TWRS Treatment Complex.

The HVAC Chilled Water System is a closed loop system. Circulating water is cooled by the chilled water equipment in the MUB. From there it is routed to the cooling coils in the air handling units at the user facilities. The coils cool and dehumidify the filtered supply air before being introduced into the ventilation air distribution system. Captured heat is then expelled through the condensers in the mechanical Utilities Building to the Cooling Tower System where it is released to the environment.

3.8.3.2 Findings. The HVAC Chilled Water System is a shared close-external system. This system is grouped together with portions of the Nonradioactive Liquid Waste Handling System, Utility Steam System, Process Water and Demineralized Water System and the Compressed Air System in the MUB.

Operability and Maintainability as well as Cost Effectiveness. are the prime considerations used to define this system. Locating this system in a shared close-external facility provides for easier operating and maintenance access and allows the system to take advantage of economies of scale and eliminate duplication of equipment.

3.8.3.3 Function Configuration Considerations and Rationale. Operability and Maintainability as well as Cost Effectiveness are the prime considerations for defining the HVAC Chilled Water System. A shared system located in a common, close-external facility provides for easier access for operations and maintenance personnel thus reducing the effort required to operate and maintain the system. A shared system allows the use of larger more efficient units and eliminates duplication of equipment.

As noted above the HVAC Chilled Water System should be located (for ease of access) outside of the process facilities. However, it should be located in close proximity to the facilities it serves. This is to keep down the amount of heat gained during transport to each facility. Therefore, this system is located as close as possible to the process facilities but out of the main process areas.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This system is regulated by air emission regulations WAC 173-401, WAC 173-403, and WAC 173-460 and each facility within this system will require permitting under these regulations. This is not considered to be a significant issue, therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.9 MONITOR AND CONTROL THE PROCESS

3.9.1 Process Facility Operational Control System

3.9.1.1 System Description. The Process Facility Operational Control System provides operational control of the TWRS Treatment Complex process facilities. This system monitors and controls remote operations (cranes, etc), process operations, melter operation, and canister handling activities. This system also provides for emergency shutdown of the process facilities in the event of an accident and the ability to shutdown the process with the process control system is impaired. This system is composed of control consoles, instruments, connective wiring, transmitters, and other items required to provide monitor and control the process facilities. The safe shutdown portion of the system is considered to be redundant and Safety Class 1.

The operational controls, except for the Safety Class 1 safe shutdown portion of the system, are located in the Control Room in the Regulated TWRS Complex Entry Building. The Safety Class 1 safe shutdown portion of the system is located in the Emergency Response Control Building.

3.9.1.2 Findings. The Process Operational Control System is a dedicated close-external system. The process control equipment for each process facility, with the exception of the safe shutdown equipment, are grouped together with other administrative control functions in the Regulated TWRS Complex Entry Building. The safe shutdown equipment is grouped together with the telecommunications equipment in the Emergency Response Center.

Operability and Maintainability as well as Safety are the prime considerations used to define this system. A shared system provides for better coordination and control of the TWRS Treatment Complex as well improving the maintainability of the system. Locating the process controls and more importantly the Safety Class 1 Safe Shutdown controls outside the main process facilities insures that an accident within a facility will not threaten the operators and the ability to monitor and control the process.

3.9.1.3 Function Configuration Considerations and Rationale. Operability and Maintainability as well as Safety are the prime considerations for defining the Process Operational Control System. Locating all the control equipment together in a single facility improves the communication and coordination between the individual process facility operators and thereby provide better operational control of the complex. This configuration will also provide for easier scheduling and coordination of the maintenance activities associated with this system.

Placing these controls in a facility apart from the main process facilities we achieve additional safety for the operators and protects them from threats originating from within the process facilities. This will assure continued monitoring and control of the process during and after an accident. Placing the safe shutdown controls in a separate Safety Class 1 rated structure assures that these controls are readily accessible and can be used to bring the process operations into a safe shutdown condition after a Design Basis Accident.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration for this system.

Radiological Protection (ALARA). This study has not identified any Radiological Protection issues that are unique to any single configuration considered for this system. Therefore, Radiological Protection (ALARA) is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

3.9.2 Health Protection System Vacuum System

3.9.2.1 System Description. The Health Protection System (HPS) Vacuum System provides a continuous vacuum for the continuous air monitors and samplers at various locations in the Separations/LLW facility and the HLW facility, the Canister/Cask Handling Annex, and the Fan/Filter Annexes. The system discharges to the HVAC Exhaust Plenum. The samples are used to determine the quality (radioactivity) of air that any personnel within the monitored area will breathe.

The HPS Vacuum System includes piping, HEPA filters, and blowers. This blower system provides vacuum for α - β continuous air monitors, β continuous air monitors, and record air samplers. Two, 100 percent flow capacity, motor driven vacuum blowers (one operating and one spare) are provided for each system. The blowers pull a vacuum on the system header through a HEPA filter(s) and send the exhaust to the HVAC Exhaust. The HEPA filter(s) removes submicron particulate from the gas stream.

The HPS Vacuum System consists of the following five dedicated central vacuum subsystems.

1. An HPS Vacuum System for the HLW facility and Regulated Facility Entry Annex.
2. An HPS Vacuum System for the Separations/LLW facility and Regulated Facility Entry Annex.
3. An HPS Vacuum System for the Canister/Cask Handling Annex.
4. An HPS Vacuum System for the HLW Fan/Filter Annex.
5. An HPS Vacuum System for the Separations/LLW Fan/Filter Annex.

Each system performs in a similar manner, and includes air monitor vacuum piping, HEPA filters, and vacuum blowers to provide continuous monitoring at all required locations. The HPS is designed so that no undetected single point failure results in the loss of the monitoring function.

See page A-24 of Appendix A for the Block Flow Diagram of the HPS Vacuum System. Drawings UFD-4-17 (sheets 1 through 8) are the Utility Flow Diagrams (see Appendix B) of the HPS Vacuum System.

3.9.2.2 Findings. The HPS Vacuum System is a dedicated system and is located inside the process facilities. Radiological Protection (ALARA) is the prime configuration consideration for the HPS Vacuum System.

3.9.2.3 Functional Configuration Considerations and Rationale. Radiological Protection (ALARA) is the prime consideration for the HPS Vacuum System configuration. The HPS Vacuum System interfaces with monitors and samplers located in potentially contaminated areas. To ensure complete radiological protection the required HPS Vacuum System equipment is located entirely within each facility that it serves. The air monitors and samplers are designed to keep radioactive particles from entering the vacuum lines. Should accidental contamination of the vacuum headers occur, the HEPA filters provide an addition barrier to prevent radioactive particulate from leaving the facility. Therefore, Radiological Protection (ALARA) is an overriding concern in the determination of a shared or dedicated system and the HPS Vacuum System is designated as a dedicated system.

Other considerations that were evaluated and found not to be contributors to the function configuration are noted below:

Operability and Maintainability. This study has not identified any Operability or Maintainability issues that are unique to any single configuration considered for this system. Therefore, Operability and Maintainability are not considerations that were used to determine the configuration of this system.

Cost Effectiveness. This study has not identified any cost drivers that would override the technical considerations used to define the configuration of this system. Therefore, Cost Effectiveness is not a consideration that was used to determine the configuration of this system.

Safety. This study has not identified any Safety issues that are unique to any single configuration considered for this system. Therefore, Safety is not a consideration that was used to determine the configuration of this system.

Environmental Regulatory Compliance. This study has not identified any Environmental Regulatory Compliance issues that are unique to any single configuration considered for this system. Therefore, Environmental Regulatory Compliance is not a consideration that was used to determine the configuration of this system.

Schedule. The configuration of this system does not impact the schedule for the design, construction, or startup of the TWRS Treatment Complex.

Technical Maturity. Commercially demonstrated technology is used in the design of this system. Therefore, Technology issues were not a consideration for the configuration of this system.

Design Impact. This study has not identified any Design Impact issues that are unique to any single configuration considered for this system. Therefore, Design Impact is not a consideration that was used to determine the configuration of this system.

4.0 DISCUSSION AND EVALUATION OF SUPPORT FACILITIES

This section describes the support facilities required to provide the close-external and no distance constrained functions identified in Section 2.0. A narrative is provided for each support facility identifying the size of the facility, type of construction, and functions provided. The narrative addresses the benefits of the particular grouping of functions within each facility and identifies any considerations that will impact where each facility is to be located with regard to the other process and process support facilities.

4.1 REGULATED TANK WASTE REMEDIATION SYSTEM COMPLEX ENTRY BUILDING

The Regulated TWRS Complex Entry Building is a 45.7 m by 61 m two story steel frame structure. It provides office and office support facilities for 66 people, facilities to regulate and control the flow of up to 620 people who may need to enter and exit the TWRS Treatment Complex on any given day, and facilities for the control of remote operations of the TWRS Treatment Complex process facilities. These functions (Regulated TWRS Treatment Complex Entry and Process Operational Control) are grouped together to enhance the overall operation of the TWRS Treatment Complex and minimize the amount of effort required to maintain the facilities providing these functions. In addition Employee Support facilities in the form of changerooms, lunchrooms, etc., are located in this building.

The population flowing through this facility is based on the following:

Day Shift	348
A Shift	72
Training	72
Back Shift	72
Sub-Total	564
Potential transient personnel	x 10%
Total capacity	620

It is assumed that this worker population will be 65 percent male and 35 percent female. A breakdown of the allocated space is provided below:

Offices	514 m ²
Toilet Facilities	39 m ²
Unregulated change rooms	236 m ²
Unregulated toilet facilities	110 m ²
Unregulated shower areas	257 m ²
Lunch/Staging areas	710 m ²
Health Protection areas, corridors, stairways, and other common areas	1,846 m ²
HVAC/Elect equipment room	916 m ²
Control Room	307 m ²

All personnel entering and exiting the TWRS Treatment Complex must pass through this facility. It is preferred that the walking distance between the parking areas and this building and between this building and the processing facilities be minimized. Therefore this building is located near the automobile and bus parking areas and as close as possible to the process facilities.

4.2 OPERATIONS SUPPORT BUILDING

The Operations Support Building is a 45.7 meter by 61 meter two story steel frame structure with a mechanical penthouse for its dedicated HVAC and electrical distribution systems. It houses the TWRS Treatment Complex Management and Support System. Office space is provided for up to 216 people. In addition, space is provided for postal services, record retention, reprographics, training, and public outreach displays. A breakdown of the allocated space is provided below:

Offices	1834 m ²
Record retention and reprographics	116 m ²
Display and conference areas	116 m ²
Computer maintenance	30 m ²
Training areas	558 m ²
Postal services	70 m ²
Lunch rooms and toilet facilities	581 m ²
stairways, corridors, storage, loading dock, and other common areas	2,269 m ²
HVAC/Elect equipment penthouse	929 m ²

There are no technical consideration governing the location of this facility. The function provided by this facility can be provided from almost anywhere, including existing Hanford facilities. For the purposes of this study the Operations Support Building is located adjacent to the parking areas.

4.3 EMERGENCY RESPONSE CENTER

The Emergency Response Center is a 27.43 m by 38.1 m single story structure with a mechanical penthouse for its dedicated HVAC system. The outer walls are cast-in-place concrete while the roof and interior columns are fabricated from structural steel.

The Telecommunications Center and the safe shutdown portion of the Process Facility Operational Control System for each process facility are grouped together in this structure. The safe shutdown portion of the Process Facility Operational Control System provides redundant controls to bring each process facility into a safe shutdown condition in the event of an Design Basis Accident. In addition it provides for the monitoring of the shutdown process to assure that the shutdown is actually occurring. The Telecommunications Center is collocated with these systems to assure that the personnel involved with shutting down the process facilities can communicate with emergency personnel located elsewhere on or off the Hanford site.

The personnel assigned to staff the Emergency Response Center normally work in the Regulated TWRS Complex Entry Building. Therefore the Emergency Response Center is located adjacent to the Regulated TWRS Complex Entry Building but far enough away not to be impacted by a structural failure of the Regulated TWRS Treatment Complex Entry Building.

NOTE: During the peer review process, a concern surfaced that the remote configuration of the ERC presented in this study could be difficult to implement due to the rigor of Safety Class 1 instrumentation and control requirements.

4.4 BULK COLD CHEMICAL BUILDING/BULK HANDLING AREA

The BCCB is a one story, steel frame structure 37.8 m wide by 43.3 m long. The Bulk Handling Area is an area located adjacent to the BCCB used to unload bulk chemicals and provide storage for those that do not require environmental protection. The BCCB/Bulk Handling Area houses the Cold Chemical Supply System, the Cold Chemical Vent System, and the Collect and Handle Nonradioactive Liquid Waste System.

Storing all the cold chemicals in a single facility will provide for a single delivery point for the receipt of these consumables, and will simplify the logistics of scheduling shipments on and off the site.

Collocating the storage facilities with the mixing facilities will reduce the problems (mainly plugging and erosion) associated with transporting the solids from storage to the mixing tanks. Also, the length of the solids transport lines to reduce the potential for plugging and erosion and the length of the liquid transport lines must be minimized to reduce the potential for leakage of toxic chemicals from the liquid transport lines. Therefore, the BCCB should be located in close proximity to both of the process facilities and preferably closest to the primary user, the Separations/LLW process facility.

4.5 MECHANICAL UTILITIES BUILDING

The MUB is a one story, steel frame structure 45.1 m wide by 52.7 m long. It houses the Compressed Air, Utility Steam, and the HVAC Chilled Water Systems and the Demineralized Water Subsystem. It also provides space for electrical and mechanical repair shops for noncontaminated, support facility equipment located in this building as well as conference rooms, office, and restrooms for the operation and maintenance staff.

The machinery associated with the utilities systems housed in the MUB has a relatively high noise and heat output. Failure of air and refrigeration compressors, as well as low pressure steam generators, poses a threat of internally generated missiles (such as failed equipment parts, fan belts, etc.). Therefore, the air, steam, demineralized water, and chiller systems are located together in one building, where operators will have limited exposure to these threats. This shared facility reduces the need for operator entry for routine checkout and panel readings, provides an operational advantage, and enhances operator safety.

These utility systems located in the MUB are defined as shared, close-external functions and, from a process standpoint, would be desirable to locate it as close as possible

to the main process facilities. Therefore, the MUB should be located in close proximity to both of the process facilities.

4.6 WATER PUMPHOUSE

The WPH is a one story, steel frame structure 15.2 m wide by 45.9 m long. It houses pumps for the TWRS Treatment Complex Site Fire Water System, the Process Facilities Fire Water System, and the Process Water Subsystem. It also provides space for a maintenance room and a field operating station.

The WPH provides a single point for the inlet and distribution of all of the water used on site. The water systems have several interfaces and contain common types of equipment, i.e., water pumps. Therefore, there is an operational and maintenance advantage to collocate these functions.

The water systems have been defined as shared and grouped, no distance constraints functions. Therefore, the WPH is a candidate for being provided from an existing Hanford Site facility.

4.7 ANALYTICAL FACILITY

The AF is a two story structure with a partial basement for waste catch tanks. It has steel frame structure except for the analytical cells and MSM decontamination and repair, which have concrete walls, floors, beams, and columns for shielding.

The AF houses the following functions:

- Analytical cells for remote sample preparation, dilution, and analysis of radioactive samples from the Separations/LLW and HLW process facilities.
- Analytical laboratories for contact sample analysis.
- Lag storage for contaminated MSMs.
- Areas for decontaminating MSMs.
- Lag storage for decontaminated MSMs.
- Repair Shop for MSMs.
- Lag storage of repaired MSMs.
- Offices for an MSM repair shop, labs and health physics.

- Storage areas for an MSM repair shop and labs.
- HVAC and electrical equipment.
- Regulated and unregulated change rooms.
- Waste collection tanks.

Even though the Sample Analysis function is defined as dedicated, the function is collocated in the AF. Cost and operability are the prime considerations for collocating this equipment in the AF. Collocation of the Sample Analysis function in the AF allows the AF to contain all of the functions required of an analytical facility. For example, the AF contains all of the service rooms, receiving rooms, counting rooms, equipment and stock rooms, analytical instrument rooms, solid and liquid waste handling, and MSM repair required to fully support the function in a single facility. Collocation of functions in the AF also allows for a sharing of personnel, which may also improve productivity.

The initial layouts are based on performing remote analysis in the AF analytical cells. Further analysis may indicate that some remote analysis can be performed in the process facilities.

Radiological protection (ALARA) is not a consideration in collocating the Sample Analysis function in the AF. Failure of an analytical cell shield window does not significantly impact the AF operating efficiency. The alpha shield located inside the shield window provides an air flow barrier to control contamination spread. Materials with a high source term would be removed from the analytical cell during window replacement. Radioactive shine would probably prevent operation of that cell plus one cell on either side for the day required to replace the shield window.

A shared analytical and MSM repair facility serving the Separations/LLW and HLW facilities allows consolidation of support functions (electrical, HVAC, decontamination equipment, etc.) and support rooms (regulated entrance, offices, etc.). Therefore, a shared facility has a smaller footprint than two facilities. Taking advantage of the economies of scale, and the elimination of the duplication of equipment and rooms, provides a cost advantage for a shared AF over separate dedicated facilities.

Maintainability and radiological protection are the key reasons for collocating the analytical laboratories with the MSM decontamination and repair operations. The majority, if not all, of the MSMs on the TWRS Treatment site are used for the analytical hot cells. Collocating the MSM decontamination and repair facilities with the AF will enhance the logistics of maintenance and repair operations. This collocation will also eliminate the need to transport MSMs between facilities, and therefore, eliminate the radiological protection problems that would be associated with the transport.

The total engineered cost of a shared AF with analytical equipment and support equipment is \$179,531,000. The total engineered cost of two dedicated facilities including equipment is \$189,865,800.

Reports that provide the basis for the sizing of the AF, including sample schedules, are provided in Appendix H1 and H2.

4.8 SWITCHGEAR BUILDING

The Switchgear Building is a 15.24 m by 45.72 m single story steel frame structure with an 8.84 m by 39.17 m by 3.96 m deep underground cable vault. It houses cables and other equipment required to transform the 34.5 kV incoming feed to 13.8 kV power for the Separations/LLW process facility, the HLW process facility, and the process support facilities. The transformers are located outside, adjacent to the building.

Redundant 34.5 kV power enters the Switchgear Building where it is broken down into dedicated 13.8 kV power supply for the process and process support facilities. Locating all the switchgear in a single location simplifies the maintenance of the Normal AC Power System. To reduce the amount of and complexity of the underground electrical distribution system, this facility is located in an area that affords easy access to the incoming 34.5 kV line and is in close proximity to both process facilities.

4.9 WAREHOUSES/SHIPPING AND RECEIVING BUILDING

The Warehouses and Shipping and Receiving Building are single story steel framed structures. Together they provide approximately 8,030 m² of storage area and 1,600 m² of receiving, packaging, and inventory control area. These facilities provide single point of control for small equipment, spare parts, and consumables required to operate and maintain the TWRS Treatment Complex.

There are no technical considerations governing the location of these facilities and as such are not distance constrained. Existing Hanford facilities could be used to provide these functions. It should be kept in mind that these facilities could be used to support construction activities and in that case should be located in an area designated for construction support.

4.10 FABRICATION AND ASSEMBLY SHOP

The Fabrication and Assembly Shop is a 45.72 m by 87.78 m single story steel frame structure with a 15.24 m wide by 22.9 m high center bay. The center high bay is equipped with a bridge crane used in assembling the larger heavier components such as a melter.

The spare parts fabrication and major equipment assembly functions are grouped together in this facility. Also provided are office areas, tool cribs, shipping/receiving areas, lunch/conference areas, and toilet facilities. There are no technical considerations governing the location of this facility and as such is not distance constrained. Existing Hanford facilities could be used to provide these functions. It should be kept in mind that this facility could be used to support construction activities and in that case should be located in an area designated for construction support.

4.11 EMERGENCY GENERATOR BUILDINGS

The dedicated Emergency Generator Buildings are 30.5 m by 38.1 m single story steel frame structures with mechanical penthouses for their dedicated HVAC systems. They house redundant dedicated Emergency Power Systems for each of the TWRS Treatment Complex process systems. Housed are emergency generators, transformers, batteries, and any other equipment required to supply emergency power in the event of a loss of power.

The primary load for the Emergency Power Systems are the HVAC Zone I exhaust fans located in the Fan/Filter Annexes for each process facility. Therefore these buildings are located as close as possible to the Fan/Filter Annex they support. The cost for the EGB and equipment is reflected in the separations and vitrification facilities.

4.12 SITE INFRASTRUCTURE

The TWRS Treatment Complex site infrastructure consists of the following:

- Earthwork and Grading
- Site Roads (3.3 km)
- Rail Line (2.7 km)
- Security Fencing
- Area Lighting
- U/G Fire Water Piping
- U/G Raw Water Piping
- A/G Steam and Condensate Piping
- U/G Process Water Piping
- A/G Compressed Air Piping
- U/G Electrical Ductbanks
- U/G Telecommunications Cable
- U/G Sanitary Sewer System (includes Lift Station)
- Unit Substations
- 230 kV Pole Line (3 km) and Substation
- 4 Feed Transfer Lines (1.12 km each).

These items represent the above ground and below ground infrastructure required to operate the TWRS Treatment Complex. The cost basis for some of these items (roads, rail line, pole line etc.) are based on estimated quantities while others are based on a factored cost per hectare.

The factored cost for earthwork and grading was applied to an 80 hectare site while the factored costs for the underground mechanical utilities was based on a 60 hectare site. This acknowledges the fact that the process and process support functions do not occupy the entire site but leaves approximately 20 hectares for construction support and laydown as well as allows future expansion.

It should be noted that although the interconnecting process piping, 230 kV pole line, 230 kV Substation and sewage lift station has been considered as part of the site infrastructure, the feed transfer lines have not. It has been identified as a separate cost item in Table 2-5.

The utility interface points are assumed to be as follows:

1.	Raw Water	At the existing raw water line at 4th Street.
2.	Sanitary Water	At the existing sanitary water line at 4th Street.
3.	Electrical Power	Bonneville Power Administration (Existing 230 kV power loop), located north of the 200 E Area.
4.	Feed Transfer lines	Tie into Project W-058, Cross-Site Transfer System, Diversion Box 3.
5.	Sewer system	No tie in point identified. Assumed that to be connected at site boundary to the proposed 200 Area Sanitary Sewer System (L-116).

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5.0 SITE ARRANGEMENT

The TWRS Treatment Complex occupies approximately 81 hectares. It is situated north of Route 4 South and between Baltimore Ave and the PUREX Plant. There is rail access from an existing rail line and vehicle access from the existing Hanford road system.

A site arrangement (Figure 2-1) has been developed that shows the arrangement and location of the TWRS Treatment Complex process facilities, process support facilities, permanent and interim product storage facilities, and infrastructure on the site. The Arrangement clusters the Separations/LLW facility and its associated annexes together in one location and the HLW facility and its annexes in another. The support facilities, storage areas, and infrastructure are arranged so as to provide optimal support of the process mission.

The overall arrangement provides for a phased construction effort. That is, construction of the Separations/LLW facility would begin several years before the construction of the HLW facility. This is in concert with the specified *Hanford Federal Facility and Consent Order* (Tri-Party Agreement) (Ecology et al. 1994) start up dates for these facilities.

It is assumed that the tie-ins to the Hanford power grid would be from the east side of the site and that most of the utility water and steam tie-ins would be at the existing lines located at the west side of the site, near 4th Street. The process feed would originate from a diversion box placed at the new cross-site transfer line (W-058) on the north side of the site.

The process and utility supply facilities are arranged to facilitate the connection between these tie-in points and the treatment complex. The Separations/LLW and HLW facilities are located on the north end of the site to be near the cross-site transfer lines and the existing rail line. The Switchgear Building is on the east side to be near the electrical supply system and the WPH is on the west side to be near the utility tie-in points.

The Emergency Generator Buildings provide dedicated emergency power to the HVAC Zone I exhaust fans. To minimize the length of Safety Class 1 ductbank and the potential for damage due to an accident these buildings are located adjacent to the Fan/Filter Annexes they serve. The AF, MUB, BCCB, BHA, Regulated TWRS Complex Entry Building, and the Emergency Response Center are all shared, close-external facilities. Therefore they have been positioned in locations that are central to both the main process facilities. The LLW storage vaults and the HLW cask pads are located in an area that is easily accessible from their associated process facility.

The remaining support facilities (Warehouses, Shipping and Receiving Bldg, Storage and Service Yard, Fabrication and Assembly Shop, Cooling Tower and the Operations Support Building) are shared, no distance constraint facilities. That is, there are no overwhelming considerations that drive the location of these facilities.

The Operations Support Building houses management personnel so it is located away from the operations areas but near to the parking area. The Cooling Tower gives off moisture into the atmosphere and is located downwind from the rest of the complex. The Warehouses, Shipping and Receiving Building, Storage and Service Yard, and the Fabrication and Assembly Shop are located away from the operations area but within easy road and rail access. Space has been left between the buildings to provide for plant roads and utility corridors within the complex. Space for construction laydown, spoils, and potential expansion of the storage areas has been provided on southern portion of the site.

It is noted that the High Level Condensate Collection Facility and the Low Level Condensate Collection Facility, although shown as separate facilities, are considered to be annexes to their respective process facilities and are included in the discussion of the arrangement of the process facilities.

6.0 REFERENCES

- Boomer, K. D., J. M. Colby, T. W. Crawford, J. S. Garfield, J. D. Galbraith, C. E. Golberg, C. E. Leach, D. E. Mitchell, F. D. Nankani, E. J. Slaathaug, L. M. Swanson, T. L. Waldo, and C. M. Winkler, 1994, *Tank Waste Remediation System Facility Configuration Study*, WHC-ED-WM-ES-295, Rev 0, Westinghouse Hanford Company, Richland, Washington.
- Ecology, EPA, and DOE, 1994, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and the U.S. Department of Energy, Olympia, Washington.
- Resource Conservation and Recovery Act of 1976*, 42 USC 6901 et seq.
- Shord, A. L., 1995, *Tank Waste Remediation System Complex Site Evaluation Report*, WHC-SD-WM-SE-021, Rev 0, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995, *Tank Waste Remediation System Reduced Cost Strategy*, WHC-SD-WM-TI-694, Draft, Westinghouse Hanford Company, Richland, Washington.
- Willis, N. P., 1993, *Hanford Site Solid Waste Acceptance Criteria*, WHC-EP-0063, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A

BLOCK FLOW DIAGRAMS

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**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
NON-RADIOACTIVE LIQUID WASTES SYSTEM
(BULK COLD CHEMICAL BUILDING)**

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Accession #: D195067260

Document #: SD-W378-ES-002

Title/Desc:

FACILITY DESIGN PHILOSOPHY TWRS PROCESS SUPPORT &
INFRASTRUCTURE DEFINITION [SEC 2 OF 4]

Pages: 151

THIS DOCUMENT WAS TOO LARGE TO SCAN AS A SINGLE
DOCUMENT. IT REQUIRED BREAKING INTO SMALLER SECTIONS.

DOCUMENT NUMBER: SD-W378-ES-002

SECTION: 2 OF 4

TITLE: Facility Design Philosophy Jank Waste
Remediation System Process Support & Infrastructure
Definition

AUTHOR: Heach, Gallbraith

RECIPIENT:

DATE: 12/11/95

KEYWORDS:

REFERENCES: EDT-613161

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
OXYGEN SYSTEM**

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
COLD CHEMICAL BULK STORAGE**

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
CHEMICAL MAKE-UP SYSTEMS
COMMON FACILITIES ACID AND CAUSTIC WASTE COLLECTION**

TYPICAL FOR:

ACID WASTE SUMP TANK
CAUSTIC WASTE SUMP TANK

TYPICAL FOR:

NITRIC ACID DECON
POTASSIUM PERMANGANATE
COLD CHEMICAL No. 3
COLD CHEMICAL No. 4

MAKE-UP SYSTEMS

TYPICAL FOR:

COLD CHEMICAL No. 1
OFFGAS TREATMENT CHEMICAL
COLD CHEMICAL No. 2
DECON SOLUTION
MSM DECON SOLUTION
OXALIC ACID DECON

MAKE-UP SYSTEMS

**BLOCK FLOW DIAGRAM
CONFIGURATION 4 (SEP/LLW, DETACHED HLW)
COLD CHEMICAL FEED SYSTEM
(DEDICATED FUNCTION)**

**BLOCK FLOW DIAGRAM
COLD CHEMICAL VENT SYSTEM
(DEDICATED FUNCTION)**

**BLOCK FLOW DIAGRAM
CONFIGURATION 4 (SEP/LLW, DETACHED HLW)
PROCESS FACILITY VENT SYSTEM
(DEDICATED FUNCTION)**

TYPICAL FOR:
SEPARATIONS/LOW LEVEL WASTE,
DETACHED HIGH LEVEL WASTE
VITRIFICATION BUILDINGS

**BLOCK FLOW DIAGRAM
CONFIGURATION 4 (SEP/LLW, DETACHED HLW)
PROCESS STEAM AND CONDENSATE SYSTEM
(DEDICATED FUNCTION)**

TYPICAL FOR:
SEPARATIONS/LOW LEVEL WASTE,
DETACHED HIGH LEVEL WASTE
VITRIFICATION BUILDINGS

**BLOCK FLOW DIAGRAM
CONFIGURATION 4 (SEP/LLW, DETACHED HLW)
PROCESS COOLING WATER SYSTEM
(DEDICATED FUNCTION)**

TYPICAL FOR:
SEPARATIONS/LOW LEVEL WASTE;
DETACHED HIGH LEVEL WASTE
VITRIFICATION BUILDINGS

**BLOCK FLOW DIAGRAM
CONFIGURATION 4 (SEP/LLW, DETACHED HLW)
MELTER COOLING WATER SYSTEM
(DEDICATED UTILITY)**

**TYPICAL FOR:
SEPARATIONS/LOW LEVEL WASTE,
DETACHED HIGH LEVEL WASTE
VITRIFICATION BUILDINGS**

**BLOCK FLOW DIAGRAM
CONFIGURATION 4 (SEP/LLW, DETACHED HLW)
PROCESS CHILLED WATER SYSTEM
(DEDICATED FUNCTION)**

**TYPICAL FOR:
SEPARATIONS/LOW LEVEL WASTE,
DETACHED HIGH LEVEL WASTE
VITRIFICATION BUILDING^c**

BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
UTILITY STEAM AND CONDENSATE SYSTEM

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
COMPRESSED AIR SYSTEM
PLANT AND INSTRUMENT AIR SUBSYSTEMS**

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
PROCESS WATER SYSTEM**

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
LOW PRESSURE PROCESS WATER**

**TYPICAL FOR:
SEPARATIONS/LOW LEVEL WASTE,
DETACHED HIGH LEVEL WASTE
VITRIFICATION BUILDINGS**

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
DEMINERALIZED WATER SYSTEM**

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
SANITARY WATER SYSTEM**

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
RAW WATER SYSTEM
TWRS TREATMENT COMPLEX SITE FIRE WATER SYSTEM**

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
PROCESS FACILITY FIRE WATER SYSTEM**

**BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
COOLING TOWER WATER SYSTEM**

BLOCK FLOW DIAGRAM
SHARED SUPPORT FUNCTION
SANITARY SEWER SYSTEM

**BLOCK FLOW DIAGRAM
CONFIGURATION 4 (SEP/LLW, DETACHED HLW)
HPS VACUUM SYSTEM
(DEDICATED FUNCTION)**

TABLE 1

SOURCE	EXHAUST
SEPARATIONS/LOW LEVEL WASTE BUILDING	PROCESS FACILITY EXHAUST STACK
HIGH LEVEL WASTE BUILDING	PROCESS FACILITY EXHAUST STACK
CONTAINER STAGING ANNEX	CONTAINER STAGING ANNEX EXHAUST STACK
CANISTER/CASK HANDLING ANNEX	CANISTER/CASK HANDLING ANNEX EXHAUST STACK
FAN/FILTER ANNEXES	FAN/FILTER ANNEXES HVAC EXHAUST STACKS

**BLOCK FLOW DIAGRAM
CONFIGURATION 4 (LLW/PT, DETACHED HLW)
POTENTIALLY RADIOACTIVE LIQUID WASTES SYSTEM
(SEPARATIONS/LOW LEVEL WASTE AND HIGH LEVEL WASTE VITRIFICATION BUILDINGS)
(DEDICATED FUNCTION)**

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APPENDIX B

UTILITY FLOW DIAGRAMS

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WHC-SD-W378-ES-002
Revision 0

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Figure B-3. Oxygen System.

[illegible]

Figure B-4. Cold Chemical System.
(Sheet 1 of 3)

NOTES:

- ① AVERAGE FLOWS ARE IN PARENTHESES.
- ② TOTAL AVERAGE FLOW FROM STORAGE BIN.
- ③ DRY BASIS.

[illegible]

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Figure B-4. Cold Chemical System.
(Sheet 3 of 3)

Figure B-5. Cold Chemical Vent System.

Figure B-6. Process Facility Vent System. (Sheet 1 of 2)

[illegible]

Figure B-6. Process Facility
Vent System. (Sheet 2 of 2)

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REV		DATE	PROCESS FAC. VENT SYS. UTILITY FLOW DIAGRAM TWRS STUDIES RICHLAND, WASHINGTON
REV		DATE	WASTE VENTILATION PLANT
REV		DATE	4363
REV		DATE	8/3/94
REV		DATE	NONE
REV		DATE	NONE
REV		DATE	ES-UFD-4-06
REV		DATE	2 2 00

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001	2/2/97	ENGINEERING RELEASE
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Figure B-7. Process Steam System.

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UTILITY FLOW DIAGRAM	
TWRS STUDIES	
RICHLAND, WASHINGTON	
PROJECT TITLE	
MANFORD WASTE VERIFICATION PLANT	
PROJECT NO.	
4363	
DATE	
8/28/94	
NONE	
NOT REQD	
ES-UFD-4-07	
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Figure B-8. Process Cooling Water System. (Sheet 1 of 3)

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1	06/09	WJR	ISSUED FOR 2001 REPORT	00000001
CONTRACT: LF DA08-1 ENGINEERING RELEASE				
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1	06/09	WJR	ISSUED FOR 2001 REPORT	00000001
U.S. DEPARTMENT OF ENERGY FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION PROCESS COOLING WTR SYS UTILITY FLOW DIAGRAM TWMRS STUDIES RICHLAND, WASHINGTON SHEET TITLE: WASTE VITRIFICATION PLANT DRAWING NUMBER: W-3553 DATE: 03-1-88 SCALE: AS SHOWN NO. OF SHEETS: 10 SHEET NO.: 10				
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END							
DESCRIPTION		DATE		<div style="text-align: center;"> <p>FLUOR DANIEL INC. ADVANCED TECHNOLOGY DIVISION</p> <p>PROCESS COOLING WTR SY UTILITY FLOW DIAGRAM TWRs STUDIES RICHLAND, WASHINGTON</p> </div>			
PROJECT #							
PROJECT DESCRIPTION							
PROJECT #							
OFFICE #							
COUNCILMAN #							
REPORTER							
TITLE/PROJECT							
PROJECT TITLE							
CROSSER							
RELAY		AIR SERVICE #		DATE #			
DATE		TIME		DATE #			
J DATTE		2/25/79		NONE			
Comments							
NONE		NOT RECD		ES-UFD-4-08		3 3 00	

Figure B-9. Melter Cooling Water and Processing Chilled Water System.

① AVERAGE FLOWS ARE IN PARENTHESES

DATE	ISSUED FOR 2001 REPORT
REV	DATE
00	8/22/94
1	8/22/94
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100	8/22/94

00	8/22/94	ISSUED FOR 2001 REPORT
REV	DATE	REVISION DESCRIPTION
00	8/22/94	ISSUED FOR 2001 REPORT
1	8/22/94	ISSUED FOR 2001 REPORT
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98	8/22/94	ISSUED FOR 2001 REPORT
99	8/22/94	ISSUED FOR 2001 REPORT
100	8/22/94	ISSUED FOR 2001 REPORT

Figure B-10. Utility Steam System.
(Sheet 2 of 2)

NO.	100	ISSUED FOR 2001 REPORT	REVISED	DATE	BY	DATE	BY	DATE	BY
PROJECT		UFD-410-2		ENGINEERING		RELEASE		2818MAC/212/CISS	
REV		DATE		REV		DATE		REV	
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2		10/10/01		2		10/10/01		2	
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REV	DATE	BY	DESCRIPTION
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Figure B-12. Process Water/Demineralized Water System. (Sheet 3 of 3)

00 3/2/92 ISSUED FOR 2001 REPORT	
REV. NO.	DATE
001	3/2/92
U.S. DEPARTMENT OF ENERGY	
FLUOR DANIEL, INC.	
ADVANCED TECHNOLOGY DIVISION	
PROCESS WATER/DEMINERALIZED WATER SYSTEM	
UFD TWRS, STUDIES	
RICHLAND, WASHINGTON	
MANHATTAN WASTE VITRIFICATION PLANT	
4363	
J. DATE	
3/2/92	
NOT REQD	
ES-UFD-4-12	
3 3 00	

REFERENCE DRAWINGS	
NEXT USED ON	

Figure B-13. Sanitary Water System.

Notes:

1. AVERAGE FLOWS ARE IN PARENTHESES
2. THIS DWG. MAY NOT BE CONSISTENT WITH SITE LAYOUTS INCLUDED IN THIS STUDY. THIS DWG. WILL BE UPDATED IN THE NEXT PHASE OF THE STUDY.

Project Information:

U.S. DEPARTMENT OF ENERGY
 FLUOR DANIEL, INC.
 ADVANCED TECHNOLOGY DIVISION
 SANITARY WATER SYSTEM
 UTILITY FLOW DIAGRAM
 TWRS STUDIES
 RICHLAND, WASHINGTON

Engineering Release:

DATE: 2/21/13
 BY: [Signature]
 FOR: [Signature]

Revision History:

NO.	DESCRIPTION	DATE	BY	CHKD
1	ISSUED FOR 2001 REPORT	2/21/13	[Signature]	[Signature]

Reference Drawings:

NO.	DESCRIPTION	DATE	BY	CHKD
1	REFERENCE DRAWINGS	2/21/13	[Signature]	[Signature]

Next Used On:

DATE: 2/21/13
 BY: [Signature]
 FOR: [Signature]

Figure B-13. Sanitary Water System.

NOTES:

1. AVERAGE FLOWS ARE IN PARENTHESES
2. THIS DWG. MAY NOT BE CONSISTENT WITH SITE LAYOUTS INCLUDED IN THIS STUDY. THIS DWG. WILL BE UPDATED IN THE NEXT PHASE OF THE STUDY.

00	ISSUED FOR 2001 REPORT		
REV NO	DATE	REV	DATE
00000	12/14/12	00000	12/14/12
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY	
LITERATURE		FLUOR DANIEL, INC.	
PATENT		ADVANCED TECHNOLOGY DIVISION	
END		SANITARY WATER SYSTEM	
REVISION		UTILITY FLOW DIAGRAM	
DATE		TWR STUDIES	
		RICHLAND, WASHINGTON	
		PROJECT TITLE	
		HAWTHORN WASTE VITRIFICATION PLANT	
		PROJECT NO.	
		PROJECT NAME	
		PROJECT DATE	
		PROJECT LOCATION	
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		PROJECT COST	
		PROJECT TYPE	
		PROJECT SIZE	
		PROJECT DATE	
		PROJECT LOCATION	
		PROJECT STATUS	
		PROJECT DEDICATED	
		PROJECT COST	
		PROJECT TYPE	
		PROJECT SIZE	
		PROJECT DATE	
		PROJECT LOCATION	
		PROJECT STATUS	
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		PROJECT COST	
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		PROJECT SIZE	
		PROJECT DATE	
		PROJECT LOCATION	
		PROJECT STATUS	
		PROJECT DEDICATED	

Figure B-14. Raw and Fire Water System.

Revision 0

DISTRIBUTION CODE:

Figure B-16. Sanitary Sewer System.

① LOCATION: SHELTER

② IT IS ASSUMED THAT ALL BUILDING SEWAGE DRAINS ARE CONNECTED WITH DISCHARGE HEADER LEADING TO THE SEWAGE LIFT STATION. IF GRAVITY DRAIN IS USED, SEWAGE LIFT STATION MAY BE REDUCED IN SIZE OR ELIMINATED.

③ PUMP TRANSFER RATE : TBD

④ THIS DWG. MAY NOT BE CONSISTENT WITH SITE LAYOUTS INCLUDED IN THIS STUDY. THIS DWG. WILL BE UPDATED IN THE NEXT PHASE OF THE STUDY.

[illegible]

Revision 0

Figure 1 consists of five schematic diagrams, each representing a different air monitoring configuration. Each diagram shows a horizontal row of four rectangular boxes connected by a common horizontal line. The boxes are labeled as follows:

- Box 1: β CONTINUOUS AIR MONITOR
- Box 2: β CONTINUOUS AIR MONITOR
- Box 3: RECORD AIR SAMPLER
- Box 4: RECORD AIR SAMPLER

Arrows indicate the flow of air from the monitors to the samplers. In all configurations, the air from the first monitor flows into the first sampler. The air from the second monitor flows into the second sampler. The air from the third monitor flows into the third sampler. The air from the fourth monitor flows into the fourth sampler.

FIRST FLOOR HEADS

SECOND FLOOR HEADER

① LOCATION: SEPARATIONS/LLW
FAN/FILTER ANNEX

00		2/24/94		ISSUED FOR 2001 REPORT			
REV NO.		DATE		REVISION DESCRIPTION		APPROVAL INITIALS	
PART NO.		LF D417-4		CAGE CODE		2B18MACD212C1SS	
ENGINEERING RELEASE							
REV		DATE		U.S. DEPARTMENT OF ENERGY			
END							
DRAWING		DATE		<p>Release Field Office EC - ACHS-WAL-9403</p>			
TRAIL NO.							
FILE NO.				<p>S FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION</p>			
SUPERSEDED SPECIFY FILE							
PROJECT FILE				<p>HPS VACUUM SYSTEM UTILITY FLOW DIAGRAM TWR STUDIES RICHLAND, WASHINGTON</p>			
OFFICE FILE							
CORRESPONDENCE FILE				<p>PROJECT TITLE HAFORD WASTE VITRIFICATION PLANT</p>			
TOWNSHIP FILE							
FEDERAL OFFICES				PROJECT NO.		4363	
DESIGN				PLANT CATEGORY NO.		NONE	
MATERIAL		8/31/94		DATE FILED		DATE FILED	
M. PATEL				NONE			
COMMENTS				PROJECT NO.		4	
NONE		NOT REQ'D		ES-UFD-4-17		00	

Figure B-17. HPS Vacuum System.
(Sheet 6 of 7)

NOTE: (1) LOCATION: HLW VITRIFICATION BUILDING

REV	DATE	BY	CHKD	APP'D	DESCRIPTION
1	11/17/83	W. J. BROWN	W. J. BROWN	W. J. BROWN	2818MAC/2818E/ISS
ENGINEERING RELEASE					
REV	DATE	BY	CHKD	APP'D	DESCRIPTION
1	11/17/83	W. J. BROWN	W. J. BROWN	W. J. BROWN	2818MAC/2818E/ISS
U.S. DEPARTMENT OF ENERGY					
FLUOR DANIEL, INC.					
ADVANCED TECHNOLOGY DIVISION					
HPS VACUUM SYSTEM					
UTILITY FLOW DIAGRAM					
TWRS STUDIES					
RICHLAND, WASHINGTON					
WASTE TREATMENT VITRIFICATION PLANT					
PROJECT NO. 2818					
SHEET NO. 6					
TOTAL SHEETS 6					
NOT RECD					
ES-UFD-4-17 6 00					
ACAD					
MAT					
B-63/B-64

NOTE: (1) LOCATION: HLW FAN/FILTER ANNEX

[illegible]

APPENDIX C

**UTILITY CONSUMPTION TABLES
AND ELECTRICAL LOAD LIST**

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Configuration 4: Low-Level Waste/Pretreatment Combination Building with Detached High-Level Waste Vitrification Building

Summary of annual utility consumption (based on 365 operating days per year)					
Utility	Detached high-level waste vit building	Combined pretreatment low-level waste vit building	Support buildings	Total for Tank Waste Remediation System treatment complex	
Compressed Air					
Instrument Air ¹	4,470,000 m ³ (158 MM scf)	8,950,000 m ³ (316 MM scf)	(Accounted for in totals for "Other Users")	13,420,000 m ³ (474 MM scf)	
Cullet transfer (Lag Sto. Bin to Cullet Sto. Bin) ¹		32,800,000 m ³ (1,160 MM scf)		32,800,000 m ³ (1,160 MM scf)	
Cullet transfer (Cullet Sto. Bin to Day Bin) ²		29,500,000 m ³ (1,041 MM scf)		29,500,000 m ³ (1,041 MM scf)	
Other Users (Intermittent Utility Air) ³	2,830,000 m ³ (100 MM scf)	5,660,000 m ³ (200 MM scf)		8,490,000 m ³ (300 MM scf)	
Total ⁴	7,300,000 m ³ (258 MM scf)	77,000,000 m ³ (2,720 MM scf)		84.2 MM m ³ (2,980 MM scf)	
Utility Steam					
Supernatant Evaporator (EV-139) Jet Pump ^{1,5}		4,080 MT (9,000,000 lb)	(Accounted for in totals for "General Maintenance")	4,080 MT (9,000,000 lb)	
HLW Feed Evaporator (EV-311) Jet Pump ^{1,5}	1,820 MT (4,000,000 lb)			1,820 MT (4,000,000 lb)	
LLW Feed Evaporator (EV-402) Jet Pump ^{1,5}		4,080 MT (9,000,000 lb)		4,080 MT (9,000,000 lb)	
Sump Jets, Equipment Decon, and General Maintenance Users (All Intermittent) ⁶	363 MT (800,000 lb)	726 MT (1,600,000 lb)		1,089 MT (2,400,000 lb)	
Total	2,180 MT (4,800,000 lb)	8,890 MT (19,600,000 lb)		11,100 MT (24,400,000 lb)	

Configuration 4: Low-Level Waste/Pretreatment Combination Building with Detached High-Level Waste Vitrification Building

Summary of annual utility consumption (based on 365 operating days per year)				
Utility	Detached high-level waste vit building	Combined pretreatment low-level waste vit building	Support buildings	Total for Tank Waste Remediation System treatment complex
Process Steam				
EV-139 Supernatant Evaporator		30.8 MM kWh (105,000 MM Btu)		30.8 MM kWh (105,000 MM Btu)
EV-224 Cs IX Concentrator		18.0 MM kWh (61,300 MM Btu)		18.0 MM kWh (61,300 MM Btu)
EV-402 LLW Feed Evaporator		152 MM kWh (517,000 MM Btu)		152 MM kWh (517,000 MM Btu)
EV-311 HLW Feed Evaporator	21.3 MM kWh (72,700 MM Btu)			21.3 MM kWh (72,700 MM Btu)
Total	21.3 MM kWh (72,700 MM Btu)	200.8 MM kWh (683,300 MM Btu)		222 MM kWh (756,000 MM Btu)
Cooling Tower Water				
EC-1102 Process Steam Condenser Cooler ⁷	14.1 MM kWh (48,000 MM Btu)	70 MM kWh (239,000 MM Btu)		84.1 MM kWh (287,000 MM Btu)
EC-1103 Process Cooling Water Cooler ⁷	63.2 MM kWh (216,000 MM Btu)	434 MM kWh (1,480,000 MM Btu)		497.2 MM kWh (1,696,000 MM Btu)
EC-1104 Melter Cooling Water Cooler ⁷	2.57 MM kWh (8,760 MM Btu)	10.3 MM kWh (35,000 MM Btu)		12.87 MM kWh (43,760 MM Btu)
EC-1570 A and B WSP Process Cooling Water Cooler			9.2 MM kWh (31,500 MM Btu)	9.2 MM kWh (31,500 MM Btu)
EC-1215 Process Water Chiller ⁷	0.044 MM kWh (150 MM Btu)	0.410 MM kWh (1,400 MM Btu)		0.454 MM kWh (1,550 MM Btu)

Configuration 4: Low-Level Waste/Pretreatment Combination Building with Detached High-Level Waste Vitrification Building

Summary of annual utility consumption (based on 365 operating days per year)				
Utility	Detached high-level waste vit building	Combined pretreatment low-level waste vit building	Support buildings	Total for Tank Waste Remediation System treatment complex
Other Users ^a			238 MM kWh (813,000 MM Btu)	238 MM kWh (813,000 MM Btu)
Total	79.9 MM kWh (273,000 MM Btu)	514.7 MM kWh (1,755,000 MM Btu)	247 MM kWh (844,500 MM Btu)	841.8 MM kWh (2,873,000 MM Btu)
Process Cooling Water				
EC-140 Condenser		27.2 MM kWh (92,700 MM Btu)		27.2 MM kWh (92,700 MM Btu)
EC-223 Condenser		17.5 MM kWh (59,800 MM Btu)		17.5 MM kWh (59,800 MM Btu)
EC-312 Condenser	20.5 MM kWh (70,100 MM Btu)			20.5 MM kWh (70,100 MM Btu)
EC-403 Evaporator Overhead Condenser		123 MM kWh (420,000 MM Btu)		123 MM kWh (420,000 MM Btu)
EC-417 A and B Condenser		10.2 MM kWh (34,900 MM Btu)		10.2 MM kWh (34,900 MM Btu)
EC-419 A and B LLW Recycle Water Cooler		24.1 MM kWh (82,300 MM Btu)		24.1 MM kWh (82,300 MM Btu)
EC-428 A and B Condenser		18.5 MM kWh (63,200 MM Btu)		18.5 MM kWh (63,200 MM Btu)
EC-601 Cooler	21.4 MM kWh (73,200 MM Btu)			21.4 MM kWh (73,200 MM Btu)
EC-610 A and B Cooler		156 MM kWh (531,000 MM Btu)		156 MM kWh (531,000 MM Btu)

Configuration 4: Low-Level Waste/Pretreatment Combination Building with Detached High-Level Waste Vitrification Building

Summary of annual utility consumption (based on 365 operating days per year)				
Utility	Detached high-level waste vit building	Combined pretreatment low-level waste vit building	Support buildings	Total for Tank Waste Remediation System treatment complex
EC-636 Cooler ⁷	0.249 MM kWh (850 MM Btu)	2.5 MM kWh (8,620 MM Btu)		2.75 MM kWh (9,470 MM Btu)
Other Users ⁹	21.1 MM kWh (72,000 MM Btu)	55.5 MM kWh (189,000 MM Btu)		76.6 MM kWh (261,000 MM Btu)
Total	63.2 MM kWh (216,000 MM Btu)	434 MM kWh (1,480,000 MM Btu)		497.2 MM kWh (1,696,000 MM Btu)
Melter Cooling Water				
EC-1104 HLW Melter Cooling Water Cooler ¹⁰	2.57 MM kWh (8,760 MM Btu)			2.57 MM kWh (8,760 MM Btu)
EC-1104 LLW Melter Cooling Water Cooler ¹⁰		10.3 MM kWh (35,000 MM Btu)		10.3 MM kWh (35,000 MM Btu)
Total	2.57 MM kWh (8,760 MM Btu)	10.3 MM kWh (35,000 MM Btu)		12.9 MM kWh (43,800 MM Btu)
Sanitary Water				
Personnel ¹¹			21,500 m ³ (5.69 MM gal)	21,500 m ³ (5.69 MM gal)
HVAC	7,025 m ³ (1.86 MM gal)	12,400 m ³ (3.28 MM gal)	36,100 m ³ (9.54 MM gal)	55,500 m ³ (14.68 MM gal)
Process Water	40,200 m ³ (10.61 MM gal)	111,700 m ³ (29.5 MM gal)	24,300 m ³ (6.428 MM gal)	176,200 m ³ (46.54 MM gal)

Configuration 4: Low-Level Waste/Pretreatment Combination Building with Detached High-Level Waste Vitrification Building

Summary of annual utility consumption (based on 365 operating days per year)				
Utility	Detached high-level waste vit building	Combined pretreatment low-level waste vit building	Support buildings	Total for Tank Waste Remediation System treatment complex
Utility Water	2,000 m ³ (0.526 MM gal)	3,970 m ³ (1.05 MM gal)	(Accounted for in totals for HLW and PT/LLW)	5,970 m ³ (1.576 MM gal)
Total	49,200 m ³ (13 MM gal)	128,070 m ³ (33.83 MM gal)	81,900 m ³ (21.658 MM gal)	259,200 m ³ (68.49 MM gal)
Raw Water				
Cooling Tower Make-up (CT-1561-C)				
			1,650,000 m ³ (436 MM gal)	1,650,000 m ³ (436 MM gal)
Chilled Water				
EC-604-3B	0.0437 MM kWh (150 MM Btu)			0.0437 MM kWh (150 MM Btu)
EC-617A-4		0.205 MM kWh (700 MM Btu)		0.205 MM kWh (700 MM Btu)
EC-617B-4		0.205 MM kWh (700 MM Btu)		0.205 MM kWh (700 MM Btu)
Total	0.0437 MM kWh (150 MM Btu)	0.410 MM kWh (1,400 MM Btu)		0.454 MM kWh (1,550 MM Btu)

Configuration 4: Low-Level Waste/Pretreatment Combination Building with Detached High-Level Waste Vitrification Building

Summary of annual utility consumption (based on 365 operating days per year)				
Utility	Detached high-level waste vit building	Combined pretreatment low-level waste vit building	Support buildings	Total for Tank Waste Remediation System treatment complex

1. The annual consumption values listed are based on 100 percent of the maximum flow rate for this item occurring on a continuous basis.
2. The annual consumption is based on the maximum flow rate occurring for 60 percent of the time.
3. The annual consumption of intermittent utility air is assumed to be 10 percent of the total air consumers being in operation, with one third consumed in the HLW Facility and two-thirds consumed in the PT/LLW Facility.
4. This total is an average annual rate. It does not reflect the maximum simultaneous flow or the additional 30 percent margin that is used to size the compressors.
5. Fluor Daniel, Inc., determined that a steam jet or pump is required to transfer the liquid from the evaporators to the downstream tanks. For this study, a steam jet was chosen for this service. The choice of a steam jet will be confirmed in a later trade study.
6. The annual consumption of intermittent utility steam is assumed to be 10 percent of the total steam consumers being in operation, with one third consumed in the HLW Facility and two-thirds consumed in the PT/LLW Facility.
7. There are two equipment items associated with the equipment number listed, one in the Pretreatment/LLW Building and one in the HLW Vitrification Building.
8. The other users are HVAC chillers, air compressors and miscellaneous equipment.
9. Cooling coils in the process tanks.
10. The melter cooling duties are estimates that may need future refinement.
11. Based on a Facility population of 708 people.

Configuration 4: Low-Level Waste/Pretreatment Combination Building with Detached High-Level Waste Virification Building

Process water load list			
Equipment number	Equipment description	Peak annual flow m ³ /year	Maximum simultaneous flow rate m ³ /h
TK-206-4	Cs IX ACID REGEN FEED TANK	62,735	7.162
TK-211-4	NaOH REGEN TANK	7,689	0.878
TK-212-4	NaOH REGEN TANK	4,174	0.476
TK-503 A-4	RECYCLE CULLET CATCH TANK	2,149	0.245
TK-503 B-4	RECYCLE CULLET CATCH TANK	2,149	0.245
FS-422 A-4	SCREEN	4,467	0.510
FS-422 B-4	SCREEN	4,467	0.510
FM-347A1/B1/A2/B2-4	METAL HEPA FILTER	7.23	0.001
FP-907A1/B1-4	METAL PREFILTER	9,080	1.037
XXX-3B	TOTAL DECON WATER USAGE		
	(INCLUDES BOTH PRELIMINARY AND FINAL DECONS)	6,485	37.472
XXX-3B	TOTAL DECON WATER USAGE		
	(FOR CASK DECONTAMINATION)	2,646	11.582
XXX	PRETREATMENT STORAGE TANK FLUSHING	4.54	0.003
XXX	HLW STORAGE TANK FLUSHING	4.54	0.003
DM-1591-C	DEMINEALIZER SYSTEM	50,912	8.607
CX-1502 A/B-C	INSTRUMENT/PLANT AIR COMPRESSORS	0.00	263
P-1592-C	ZONE I EXHAUST STACK FLUSH SYSTEM BOOSTER PUMP	92	17.033
TK-1195-3B	FLOOR DRAIN CATCH TANK (SEAL LEG)	0.61	4.542

Configuration 4: Low-Level Waste/Pre-treatment Combination Building with Detached High-Level Waste Vitrification Building

Process water load list			
Equipment number	Equipment description	Peak annual flow m ³ /year	Maximum simultaneous flow rate m ³ /h
TK-1196-3B	REGULATED DRAIN CATCH TANK (SEAL LEG)	0.61	4.542
TK-1197-3B	ACID DRAIN CATCH TANK (SEAL LEG)	0.61	4.542
TK-1198-3B	ORGANIC ACID DRAIN CATCH TANK (SEAL LEG)	0.61	4.542
TK-1199-3B	FLOOR DRAIN SAMPLING TANK (SEAL LEG)	0.61	4.542
TK-1195-4	FLOOR DRAIN CATCH TANK (SEAL LEG)	1.21	4.542
TK-1196-4	REGULATED DRAIN CATCH TANK (SEAL LEG)	1.21	4.542
TK-1197-4	ACID DRAIN CATCH TANK (SEAL LEG)	1.21	4.542
TK-1198-4	ORGANIC ACID DRAIN CATCH TANK (SEAL LEG)	1.21	4.542
TK-1199-4	FLOOR DRAIN SAMPLING TANK (SEAL LEG)	1.21	4.542
TK-1658-C	CAUSTIC WASTE HOLD TANK	24.48	4.542
TK-1660-C	ACID WASTE HOLD TANK	9.48	4.542
TK-1661-C	ORGANIC ACID WASTE HOLD TANK	13.01	4.542
TK-1662-C	CAUSTIC WASTE NEUTRALIZATION TANK	6.71	4.542
TK-1663-C	ORGANIC ACID WASTE NEUTRALIZATION TANK	13.01	4.542
SU-1653-C	MECHANICAL UTILITIES BUILDING SUMP	0.00	4.542
TK-1200-3B	COLD CHEMICAL FEED TANK	1.32	6.813
TK-1201-3B	COLD CHEMICAL FEED TANK	1.45	6.813
TK-1202-3B	COLD CHEMICAL FEED TANK	1.32	6.813
TK-1203-3B	COLD CHEMICAL FEED TANK	1.45	6.813

Configuration 4: Low-Level Waste/Pretreatment Combination Building with Detached High-Level Waste Vitrification Building

Process water load list			
Equipment number	Equipment description	Peak annual flow m ³ /year	Maximum simultaneous flow rate m ³ /h
TK-1205-3B	50% NITRIC ACID FEED TANK	1.45	6.813
TK-1206-3B	NITRIC ACID DECON FEED TANK	2.63	6.813
TK-1207-3B	OXALIC ACID DECON FEED TANK	1.32	6.813
TK-1208-3B	POTASSIUM PERMANGANATE FEED TANK	1.45	6.813
TK-1209-3B	50% CAUSTIC FEED TANK	1.32	6.813
TK-1210-3B	FLUSH WATER FEED TANK	27.25	14.989
TK-1211-3B	OFFGAS TREATMENT CHEMICAL FEED TANK	1.32	6.813
TK-1200-4	COLD CHEMICAL FEED TANK	2.89	6.813
TK-1201-4	COLD CHEMICAL FEED TANK	2.89	6.813
TK-1202-4	COLD CHEMICAL FEED TANK	2.63	6.813
TK-1203-4	COLD CHEMICAL FEED TANK	2.89	6.813
TK-1205-4	50% NITRIC ACID FEED TANK	2.89	6.813
TK-1206-4	NITRIC ACID DECON FEED TANK	5.27	6.813
TK-1207-4	OXALIC ACID DECON FEED TANK	2.63	6.813
TK-1208-4	POTASSIUM PERMANGANATE FEED TANK	2.89	6.813
TK-1209-4	50% CAUSTIC FEED TANK	2.63	6.813
TK-1210-4	FLUSH WATER FEED TANK	54.50	14.989
TK-1211-4	OFFGAS TREATMENT CHEMICAL FEED TANK	2.63	6.813
TK-1716-C	COLD CHEMICAL No. 1 MAKEUP TANK	500	13.626
TK-1717-C	OFFGAS TREATMENT CHEMICAL MAKEUP TANK	174	13.626
TK-1718-C	COLD CHEMICAL No. 2 MAKEUP TANK	500	13.626

Configuration 4: Low-Level Waste/Pre-treatment Combination Building with Detached High-Level Waste Vitritification Building

Process water load list			
Equipment number	Equipment description	Peak annual flow m ³ /year	Maximum simultaneous flow rate m ³ /h
TK-1719-C	NITRIC ACID DECON MAKEUP TANK	286	13.626
TK-1720-C	DECON SOLUTION MAKEUP TANK	257	13.626
TK-1721-C	MSM DECON SOLUTION MAKEUP TANK	7,767	13.626
TK-1722-C	OXALIC ACID DECON MAKEUP TANK	408	13.626
TK-1723-C	POTASSIUM PERMANGANATE MAKEUP TANK	427	13.626
TK-1724-C	COLD CHEMICAL No. 3 MAKEUP TANK	500	13.626
TK-1725-C	COLD CHEMICAL No. 4 MAKEUP TANK	500	13.626
TK-1775-C	FSMT MAKEUP TANK	235	2.271
XXX-3B	LIQUID and GAS SAMPLING MODULES - PROCESS SAMPLING	829	2.271
XXX-3B	LIQUID and GAS SAMPLING MODULES - ANALYTICAL FACILITIES	829	2.271
XXX-4	LIQUID and GAS SAMPLING MODULES - PROCESS SAMPLING	1,658	2.271
XXX-4	LIQUID and GAS SAMPLING MODULES - ANALYTICAL FACILITIES	1,658	2.271
XXX-3B	DECON #1 LANCES	526	13.626
	DECON #2 SINK A	132	3.407
	DECON #2 SINK B	132	3.407
XXX-3B	RAD LIQUID WASTE TANK FLUSH	0.00	34.065
	RAD LIQUID WASTE	0.00	6.813
	(FLUSH OVERFLOW)		

Configuration 4: Low-Level Waste/Pre-treatment Combination Building with Detached High-Level Waste Vitritification Building

Process water load list			
Equipment number	Equipment description	Peak annual flow m ³ /year	Maximum simultaneous flow rate m ³ /h
XXX-3B	POT RAD LIQUID WASTE	0.00	6.813
	(WATER ADDITION)		
XXX-3B	POT RAD LIQUID WASTE	0.00	34.065
	(FLUSH OVERFLOW)		
XXX-4	DECON #1 LANCES	1,053	13.626
	DECON #2 SINK A	263	3.407
	DECON #2 SINK B	263	3.407
XXX-4	RAD LIQUID WASTE TANK FLUSH	0.00	34.065
	RAD LIQUID WASTE	0.00	6.813
	(FLUSH OVERFLOW)		
XXX-4	POT RAD LIQUID WASTE	0.00	6.813
	(WATER ADDITION)		
XXX-4	POT RAD LIQUID WASTE	0.00	34.065
	(FLUSH OVERFLOW)		
	TOTAL PROCESS WATER DEMAND	176,157	348.81

Normal Electrical Load List

This electrical load list was developed for the proposed combined Separations/Low-Level Waste Treatment plant, High-Level Waste Treatment plant and all the required support facilities described in this study. The process loads for the and Common Utilities were derived from equipment lists provided by Process. The HVAC loads for the main process facilities are factored from HWVP by the HVAC group. The HVAC for the support facilities are based on watts/ft² values derived from similar buildings on the HWVP. Mechanical loads are an allowance to account for non-process loads such as cranes, elevators, etc. and are not broken out by facility. Electrical loads are based on watts/ft² values derived from HWVP for the process and support facilities. An allowance was made for control loads served from UPS's.

It was assumed that the joule heated melter adds 3 MVA to the process load. No allowance was made for spare or future loads. All loads were rounded off to the nearest 100kVA.

Normal Electrical Load Summary Table

			Joule Heated High Level Melter			
3B+4C	Main Process Facilities		Support Facilities		Total	
	Oper (kVA)	Conn (kVA)	Oper (kVA)	Conn (kVA)	Oper (kVA)	Conn (kVA)
Process Equipment	55591	74770	23289	30716	78880	105486
HVAC Equipment	4430	5538	3464	4330	7894	9868
Mechanical Equipment	0	2000	800	1000	800	3000
Electrical Equipment	1063	1329	2115	2644	3178	3973
Total	61085	83637	29668	38690	90800	122300

A breakout of the HVAC and Electrical equipment loads per facility is provided on the next page.

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HVAC and Electrical Equipment Normal Loads

Facility	Case 3B+4C	Sq FT	HVAC W/Ft ²	HVAC Equip Load(kVA)	Elect W/Ft ²	Elect Equip Load(kVA)
Warehouse #2	1	43,200	2	86.4	0.5	21.6
Warehouse #1	1	43,200	2	86.4	0.5	21.6
Regulated Entrance Building	1	60,000	5	300	2	120
Operation Support	1	70,000	5	350	2.5	175
Mock-up Shop	1	43,200	5	216	2.5	108
Fab Shop	1	43,200	5	216	2.5	108
Emergency Generator	1	12,500	1	12.5	1	12.5
Mech Utilities	1	26,250	2	52.5	0.5	13.125
Switchgear	1	7,500	2	15	0.5	3.75
Analytical Facility	1	243,600	4.5	1096.2	3	730.8
Operations Cont	1	22,500	5	112.5	3	67.5
Load/Unload	1	160,000	0	0	0.5	80
Bulk Cold Chem	1	18,750	5	93.75	1	18.75
Chem Handling	1	25,200	0	0	1	25.2
Parking Lot	1	600,000	0	0	0.5	300
Fire Water Pumphouse	1	7,500	1	7.5	1	7.5
Low Level Grout Vaults	1	324,000	0	0	0.5	162
Receiving and Storage	1	15,500	0	0	0.5	7.75
WSSF 12 pack	1	92,500	2	185	1	92.5
Fan Filter Bldg HLW	1	80,000	3	240	1	80
Fan Filter Bldg LLW	1	80,000	3	240	1	80
Vit Regulated Entrance	1	50,000	5	250	2	100
Vit Regulated Entrance	1	57,000	5	285	2	114
Canister Staging	1	97,000	5	485	2	194
Total Conn (Support Fac)				4,329.75		2,643.575
Total Oper (Support Fac)				3,463.8		2,114.86
Sep/Low-Level Waste Treat	1	180,000	12.5	2,250	3	540
High-Level Waste Treat	1	263,000	12.5	3,287.5	3	789
Total Connected				5,537.5		1,329
Total Operating				4,430		1,063.2

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APPENDIX D

COLD CHEMICAL CONSUMPTION TABLES

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Summary of Annual Utility and Chemical Consumption for
Collocated Configuration 4 [Case 3B (Detached High-Level Waste),
Case 4C (Pretreatment/Low-Level Waste)] Support Facilities

Utility/chemical description	HLW vit building (Case 3B)	Pretreatment/LLW vit building (Case 4C)	Support buildings	Total
Sanitary water ²	49,200 m ³ (13,000,000 gal)	128,070 m ³ (33,800,000 gal)	81,900 m ³ (21,658,000 gal)	259,200 m ³ (68,490,000 gal)
Raw water ³			1,650,000 m ³ (436,000,000 gal)	1,650,000 m ³ (436,000,000 gal)
Sanitary sewer			21,500 m ³ (5,690,000 gal)	21,500 m ³ (5,690,000 gal)
Glass formers				
SiO ₂	4,268 MT (9,410,000 lb)	40,550 MT (89,400,000 lb)		44,818 MT (98,810,000 lb)
B ₂ O ₃	862 MT (1,900,000 lb)	8,165 MT (18,000,000 lb)		9,027 MT (19,900,000 lb)
Li ₂ O	305 MT (672,000 lb)	2,903 MT (6,400,000 lb)		3,208 MT (7,072,000 lb)
CaO	61 MT (135,000 lb)	590 MT (1,300,000 lb)		651 MT (1,435,000 lb)
MgO	61 MT (135,000 lb)	590 MT (1,300,000 lb)		651 MT (1,435,000 lb)
Bulk frit		10 MT (22,000 lb)		10 lb (22,000 lb)
Ion exchange resin		16m ³ (565 ft ³)		16m ³ (565 ft ³)
50 percent nitric acid	45.4 m ³ (12,000 gal)	700 m ³ (185,000 gal)		745.4 m ³ (197,000 gal)
50 percent caustic	19 m ³ (5,000 gal)	1,022 m ³ (270,000 gal)		1,041 m ³ (275,000 gal)
Dry KMnO ₄	1.2 MT (2,600 lb)	2.4 MT (5,200 lb)		3.6 MT (7,800 lb)
Dry sodium nitrite	Not Defined	1,043 MT (2,307,000 lb) ⁴		1,043 MT (2,307,000 lb)
Dry offgas treatment chemical	Not Defined	Not Defined	Not Defined	Not Defined
Dry oxalic acid	2.3 MT (5,100 lb)	4.6 MT (10,200 lb)		6.9 MT (15,300 lb)
Dry TSP	136 MT (300,000 lb)	273 MT (601,000 lb)		409 MT (901,000 lb)
Antifoam solution	Not Defined	Not Defined	Not Defined	Not Defined
Anhydrous ammonia	76 m ³ (20,000 gal)	2,771 m ³ (732,000 gal)		2,847 m ³ (752,000 gal)

**Summary of Annual Utility and Chemical Consumption for
Collocated Configuration 4 [Case 3B (Detached High-Level Waste),
Case 4C (Pretreatment/Low-Level Waste)] Support Facilities**

Utility/chemical description	HLW vit building (Case 3B)	Pretreatment/LLW vit building (Case 4C)	Support buildings	Total
Sanitary water ²	49,200 m ³ (13,000,000 gal)	128,070 m ³ (33,800,000 gal)	81,900 m ³ (21,658,000 gal)	259,200 m ³ (68,490,000 gal)
Raw water ³			1,650,000 m ³ (436,000,000 gal)	1,650,000 m ³ (436,000,000 gal)
Kerosene ⁴	1,670 m ³ (440,000 gal)	13,630 m ³ (3,600,000 gal)		15,300 m ³ (4,070,000 gal)
Oxygen ⁵	4,400 MT (9,700,000 lb)	36,450 MT (80,400,000 lb)		40,850 MT (90,100,000 lb)
Bulk sulfur cement				
Sulfur		24,040 MT (53,000,000 lb)		24,040 MT (53,000,000 lb)
DCPD		640 MT (1,410,000 lb)		640 MT (1,410,000 lb)
CPD Oligomer		640 MT (1,410,000 lb)		640 MT (1,410,000 lb)

m³ Cubic meters

MT Metric tons

N/A Not applicable

¹ The annual consumptions are based on 365 operating days per year.

² The major sanitary water consumers are process and utility, HVAC, and site personnel users.

³ The raw water consumption listed is cooling tower makeup.

⁴ The sodium nitrite usage is based on whc material balance information.

⁵ Kerosene and oxygen are used only by the base case combustion melter, and not by the alternate melters.

APPENDIX E1

SUPPORT FACILITY EQUIPMENT LIST

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ABBREVIATIONS
EQUIPMENT IDENTIFICATION CODE

B = Storage bin	FH = HEPA filter	MQ = Quench flume
DE = Demister	FM = Metal HEPA filter	P = Pumps
DY = Dryer	FP = Prefilter, metal prefilter	R = Absorber, reactor, regenerator, reducer
E = Heater, cracker	FS = Screen	S = Separator (vapor/liquid)
EB = Chamber, incinerator	G = Centrifuge	SC = Scrubber
EC = Condenser, chiller, cooler	M = Rotary star feeder	T = Towers
EM = Melter	MB = Blower	TK = Tanks
EV = Evaporator or concentrator	MC = Roll crusher	TR = Trap
F = Filter, frit filter, scrub filter	MF = Feeders	
FC = Cyclone filter	MM = Mixers	

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
ONE LOT MACHINE SHOP EQUIPMENT SMALL MONORAILS and JIB CRANES						
REPAIR SHOP EQUIPMENT 1 LOT (WELDER, - BAND SAW GRINDER, ETC. NO LARGE MACHINE TOOLS)						
BULK SULFUR STORAGE TANK	TK-1007	1,000 m ³	10 m ID X 13 m H	CARBON STEEL		ADJACENT TO BCCB
BULK DCPD STORAGE TANK	TK-1008	70 m ³	4 m ID X 5.5 m T/T	304L SS	BCCB	

BUILDING:

BCCB = BULK COLD CHEMICAL BUILDING
MUB = MECHANICAL UTILITIES BUILDING
WPH = WATER PUMP HOUSE
DB4:NEWEQLST:CASE4C:CONF4:CONF4

Equipment list
 Configuration 4 Revision 13, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
BULK CPD OLIGOMER STORAGE TANK	TK-1009	70 m ³	4 m ID X 5.5 m T/T	304L SS	BCCB	
SULFUR TRANSFER PUMP	P-1010A	28 m ³ /hr, 690 kPa		316L SS	BCCB	100% CAPACITY
SULFUR TRANSFER PUMP	P-1010B	28 m ³ /hr, 690 kPa		316L SS	BCCB	100% CAPACITY
DCPD TRANSFER PUMP	P-1011	2.3 m ³ /hr, 690 kPa		316L SS	BCCB	
CPD TRANSFER PUMP	P-1012	2.3 m ³ /hr, 690 kPa		316L SS	BCCB	
BULK NaOH STORAGE TANK	TK-1013	170 m ³	6 m ID X 6.5 m H	316L SS	BCCB	
BULK HNO3 STORAGE TANK	TK-1014	115 m ³	5 m ID X 6 m T/T	304L SS	BCCB	
BULK ANHYDROUS NH3 STORAGE TANK	TK-1015		480 m ³	7.5 m ID X 11 m T/T	CARBON STEEL (OUTSIDE)	

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
NaOH TRANSFER PUMP	P-1016	4.8 m ³ /hr, 214 kPa		316L SS	BCCB	
NaOH TRANSFER PUMP	P-1017	4.8 m ³ /hr, 110 kPa		304L SS	BCCB	
BULK WATER STORAGE TANK	TK-1019	340 m ³	9 m ID X 6 m H	CARBON STEEL	(OUTSIDE)	
BULK KEROSENE STORAGE TANK	TK-1022	2,025 m ³	15.5 m X 11 m H	CARBON STEEL	(OUTSIDE)	
KEROSENE TRANSFER PUMP	P-1022A	23 m ³ /hr, 690 kPa		316L SS	(OUTSIDE)	100% CAPACITY
KEROSENE TRANSFER PUMP	P-1022B	23 m ³ /hr, 690 kPa		316L SS	(OUTSIDE)	100% CAPACITY
BULK WATER FEED PUMP	P-1023A	340 m ³ /hr, 690 kPa		CARBON STEEL	WPH	100% CAPACITY
BULK WATER FEED PUMP	P-1023B	340 m ³ /hr, 690 kPa		CARBON STEEL	WPH	100% CAPACITY

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DB4:NEWEQLST:CASE4C:CONF4:CONF4

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Equipment list
Configuration 4 Revision 13, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
CRYOGENIC OXYGEN PLANT	AS-1025	118 TONS/DAY	6 m x 15 m		OUTSIDE BCCB	
SULFUR UNLOADING PUMP	P-1100A	28 m ³ /hr, 345 kPa	316L SS		OUTSIDE BCCB	
SULFUR UNLOADING PUMP	P-1100B	28 m ³ /hr, 345 kPa	316L SS		OUTSIDE BCCB	
KEROSENE UNLOADING PUMP	P-1101A	23 m ³ /hr, 690 kPa	316L SS		OUTSIDE BCCB	
KEROSENE UNLOADING PUMP	P-1101B	23 m ³ /hr, 690 kPa	316L SS		OUTSIDE BCCB	
BREATHING AIR CART (LLW FACILITY)	BX-1501A	11.2 sm ³ /hr	304L SS		WAREHOUSE	
BREATHING AIR CART (HLW FACILITY)	BX-1501B	11.2 sm ³ /hr	304L SS		WAREHOUSE	

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DB4:NEWEQLST:CASE4C:CONF4:CONF4

Equipment list
Configuration 4 Revision 13, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
BREATHING AIR CART (HLW FACILITY)	BX-1501C	11.2 sm ³ /hr	304L SS		WAREHOUSE	
BREATHING AIR CART (LLW FACILITY)	BX-1501D	11.2 sm ³ /hr	304L SS		WAREHOUSE	
BREATHING AIR CART (HLW FACILITY)	BX-1501E	11.2 sm ³ /hr	304L SS		WAREHOUSE	
INSTRUMENT/PLANT AIR COMPRESSOR	CX-1502	11,900 sm ³ /hr, 960 kPa	6 m X 2.4 m X 3 m H	CARBON STEEL	MUB	50% CAPACITY
INSTRUMENT/PLANT AIR COMPRESSOR	CX-1502B	11,900 sm ³ /hr, 960 kPa	6 m X 2.4 m X 3 m H	CARBON STEEL	MUB	50% CAPACITY
INSTRUMENT/PLANT AIR COMPRESSOR	CX-1502C	11,900 sm ³ /hr, 960 kPa	6 m X 2.4 m X 3 m H	CARBON STEEL	MUB	50% CAPACITY
INSTRUMENT AIR DRYER	DY-1503A	1,990 sm ³ /hr	3.4 m X 3.7 m	CARBON STEEL	MUB	100% CAPACITY
INSTRUMENT AIR DRYER	DY-1503B	1,990 sm ³ /hr	3.4 m X 3.7 m	CARBON STEEL	MUB	100% CAPACITY

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Equipment list
Configuration 4 Revision 13, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
PLANT AIR FILTER	FL-1504A	24,600 sm ³ /hr	0.6 m	CARBON STEEL	MUB	100% CAPACITY
PLANT AIR FILTER	FL-1504B	24,600 sm ³ /hr	0.6 m	CARBON STEEL	MUB	100% CAPACITY
INSTRUMENT AIR RECEIVER	VX-1505	44 m ³	3.5 m ID X 5 m T/T	CARBON STEEL	MUB	
PLANT AIR RECEIVER	VX-1506	380 m ³	6 m ID X 13.5 m T/T	CARBON STEEL	MUB	
UTILITY STEAM GENERATOR	EV-1520A	7.76 MW	11.3 m X 6 m X 8.8 m H	CARBON STEEL	MUB	Capacity 100 percent users plus 60 percent of non-continuous
UTILITY STEAM GENERATOR	EV-1520B	7.76 MW	11.3 m X 6 m X 8.8 m H	CARBON STEEL	MUB	Capacity 100 percent continuous users 60 percent of non-continuous users (spare)
STANDBY ELECTRIC HEATER	E-1521A	40.0 KW	STEAM GENERATOR (INTERNAL)	N/A	MUB	INCLUDED W/EV-1520A

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DB4:NEWEQ1ST:CASE4C:CONF4:CONF4

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
STANDBY ELECTRIC HEATER	E-1521B	40.0KW	STEAM	N/A	MUB	INCLUDED W/EV-1520B GENERATOR (INTERNAL)
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522A	680 m ³ /hr, 69 kPa	INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100% CAPACITY EV-1520A
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522B	680 m ³ /hr, 69 kPa	INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100% CAPACITY EV-1520A (SPARE)
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522C	680 m ³ /hr, 69 kPa	INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100% capacity EV-1520B
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522D	680 m ³ /hr, 69 kPa	INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100%CAPACITY EV-1520B (SPARE)
STEAM GEN FEED WATER CHEMICAL INJECTION PUMP	P-1523A	0.23 m ³ /hr, 1,370 kPa	INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520A
STEAM GEN FEED WATER CHEMICAL INJECTION PUMP	P-1523B	0.23 m ³ /hr, 1,370 kPa	INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520B

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 DB4:NEWEQLST:CASE4C:CONF4:CONF4

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Equipment list
Configuration 4 Revision 13, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
CHEMICAL ADDITION TANK	TK-1524A	1 m ³	(INCLUDED W/STM GEN FOOTPRINT	304L SS	MUB	EV-1520A
CHEMICAL ADDITION TANK	TK-1524B	1 m ³	(INCLUDED W/STM GEN FOOTPRINT	304L SS	MUB	EV-1520B
UTILITY CONDENSATE PUMP	P-1525A	14 m ³ /hr, 1,380 kPa		304L SS	MUB	100% CAPACITY
UTILITY CONDENSATE PUMP	P-1525B	14 m ³ /hr, 1,380 kPa		304L SS	MUB	100% CAPACITY (SPARE)
UTILITY CONDENSATE PUMP	P-1525C	14 m ³ /hr, 1,380 kPa		304L SS	MUB	100% CAPACITY EV-1520B
UTILITY CONDENSATE PUMP	P-1525D	14 m ³ /hr, 1,380 kPa		304L SS	MUB	100% CAPACITY EV-1520B (SPARE)
UTILITY STEAM CONDENSATE CONDENSER COOLER	EC-1526	1,990 MJ/HR	304L SS	MUB		
UTILITY STEAM FLASH DRUM	TK-1528	0.28 m ³	0.6 m ID X 1 m T/T	304L SS	MUB	

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Equipment list
Configuration 4 Revision 13, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
UTILITY STEAM CONDENSATE COLLECTION TANK	TK-1529	11.5 m ³	2.5 m Id x 2.5 m T/T	304L SS	MUB	
PARTICULATE FILTER - ION EXCHANGE UNIT	P-1551	14 m ³ /hr		304L SS	Warehouse (storage)	Used for closed loop heating and cooling systems
COOLING TOWER	CT-1561	344,000 MJ/hr	15 m x 60 m		Cooling tower	
TOWER WATER PUMP	P-1562A	5,010 m ³ /hr, 600 kPa		Carbon steel	Cooling tower	50 % capacity
TOWER WATER PUMP	P-1562B	5,010 m ³ /hr, 600 kPa		Carbon steel	Cooling tower	50 % capacity
TOWER WATER PUMP	P-1562C	5,010 m ³ /hr, 600 kPa		Carbon steel	Cooling tower	50 % capacity (spare)
INHIBITOR ADDITION PUMP	P-1563	1 m ³ /hr, 140 kPa		304L SS	At cooling tower	
DEMINEALIZER	DM-1591	7 m ³ /hr	3 m x 5 m	304L SS	MUB	

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Equipment list
Configuration 4 Revision 13, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
DEMINEALIZED WATER MAKE-UP PUMP	P-1593A	40 m ³ /hr, 310 kPa	(INCLUDED IN DEMIN FOOTPRINT)	304L SS	MUB	100% CAPACITY
DEMINEALIZED WATER MAKE-UP PUMP	P-1593B	40 m ³ /hr, 310 kPa	(INCLUDED IN DEMIN FOOTPRINT)	304L SS	MUB	100% CAPACITY (SPARE)
DEMINEALIZED WATER STORAGE TANK	TK-1594	28 m ³	3.5 m ID X 3.5 m T/T	304L SS	MUB	
FIRE WATER TANK HEATER (SITE)	HT-1602	66 kW		CARBON STEEL	WPH	100% CAPACITY TK-1612
FIRE WATER TANK HEATER (LLW)	HT-1603A	66 kW		CARBON STEEL	WPH	100% CAPACITY TK-1613A
FIRE WATER TANK HEATER (HLW)	HT-1603B	66 kW		CARBON STEEL	WPH	100% CAPACITY TK-1613B
FIRE WATER PUMP (SITE)	P-1605A	1,020 m ³ /hr, 820 kPa		CARBON STEEL	WPH	100% CAPACITY TK-1612

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Equipment list
Configuration 4 Revision 13, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
FIRE WATER PUMP (SITE)	P-1605B	1,020 m ³ /hr, 820 kPa		CARBON STEEL	WPH	100% CAPACITY TK-1612 (DIESEL DRIVEN, SPARE)
FIRE WATER PUMP (SITE)	P-1606	7 m ³ /hr, 160 kPa		CARBON STEEL	WPH	TK-1612
JOCKEY PUMP (SITE)	P-1607	10 m ³ /hr, 740 kPa		CARBON STEEL	WPH	TK-1612
FIRE WATER PUMP (LLW)	P-1608A	340 m ³ /hr, 855 kPa		CAST IRON	WPH	100% CAPACITY TK-1613A
FIRE WATER PUMP (LLW)	P-1608B	340 m ³ /hr, 855 kPa		CAST IRON	WPH	100% CAPACITY TK-1613A (DIESEL DRIVEN, SPARE)
FIRE WATER PUMP (HLW)	P-1608C	340 m ³ /hr, 855 kPa		CAST IRON	WPH	100% CAPACITY TK-1613B
FIRE WATER PUMP (HLW)	P-1608D	340 m ³ /hr, 855 kPa		CAST IRON	WPH	100% CAPACITY TK-1613B (DIESEL DRIVEN, SPARE)
JOCKEY PUMP (LLW)	P-1609A	10 m ³ /hr, 820 kPa		CARBON STEEL	WPH	TK-1613A

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Equipment list

Configuration 4 Revision 13, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
JOCKEY PUMP (HLW)	P-1609B	10 m ³ /hr, 820 kPa		CARBON STEEL	WPH	TK-1613B
FIRE WATER HEATER PUMP (LLW)	P-1610A	7 m ³ /hr, 7 kPa		CAST IRON	WPH	TK-1613A
FIRE WATER HEATER PUMP (HLW)	P-1610B	7 m ³ /hr, 7 kPa		CAST IRON	WPH	TK-1613B
DIESEL FUEL TRANSFER PUMP	P-1611	9 m ³ /hr, 140 kPa		CARBON STEEL	OUTSIDE WPH	
FIRE WATER STORAGE TANK	TK-1612	2,500 m ³	17 m ID x 12 m H	CARBON STEEL	OUTSIDE WPH	
FIRE WATER STORAGE TANK (LLW)/TK-1613A		1,710 m ³	17 m ID x 10 m H	CARBON STEEL	OUTSIDE WPH	
FIRE WATER STORAGE TANK (HLW)/TK-1613B		1,710 m ³	17 m ID x 10 m H	CARBON STEEL	OUTSIDE WPH	
DIESEL FUEL STORAGE TANK UNDERGROUND	TK-1614A	70 m ³	4 m ID x 5.5 m T/T	FIBERGLASS DOUBLE WALL	OUTSIDE WPH	

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
DIESEL FUEL STORAGE TANK UNDERGROUND	TK-1614B	70 m ³	4 m ID x 5.5 m T/T	FIBERGLASS DOUBLE WALL	OUTSIDE WPH	
DIESEL FUEL DAY TANK	TK-1615	1 m ³	1 m ID	CARBON STEEL	WPH	
SEWAGE LIFT STATION	LS-1631				(SHELTER)	
SUBMERSIBLE GRINDER PUMP	P-1632A	51 m ³ /hr, 101 kPa		304L SS	SEWAGE LIFT STATION	100% CAPACITY
SUBMERSIBLE GRINDER PUMP	P-1632B	51 m ³ /hr, 101 kPa		304L SS	SEWAGE LIFT STATION	100% CAPACITY (SPARE)
ORGANIC ACID WASTE HOLD TANK HEGA FILTER	FG-1641	0.6 TON/HR		304L SS	BCCB	
CAUSTIC WASTE HOLD TANK TRANSFER PUMP	P-1642	27 m ³ /hr, 69 kPa	304L SS	BCCB		

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DB4:NEWWEQLST:CASE4C:CONF4:CONF4

Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
CAUSTIC WASTE NEUT TANK TRANSFER PUMP	P-1643	68 m ³ /hr, 283 kPa		304L SS	BCCB	
ACID WASTE HOLD TANK TRANSFER PUMP	P-1644	27 m ³ /hr, 69 kPa		304L SS	BCCB	
ORGANIC ACID WASTE NEUT TANK TRANSFER PUMP	P-1645	68 m ³ /hr, 283 kPa		304L SS	BCCB	
ORGANIC ACID WASTE HOLD TANK SUMP PUMP	P-1646	7 m ³ /hr, 124 kPa		304L SS	BCCB	
ORGANIC ACID WASTE HOLD TANK TRANSFER PUMP	P-1647	27 m ³ /hr, 124 kPa		304L SS	BCCB	
WATER PUMPHOUSE SUMP PUMP	P-1648	48 m ³ /hr, 210 kPa		304L SS	WPH	100 % CAPACITY
EFFLUENT DISCHARGE SUMP PUMP	P-1649A	100 m ³ /hr, 175 kPa		304L SS	MUB	
EFFLUENT DISCHARGE SUMP PUMP	P-1649B	100 m ³ /hr, 175 kPa		304L SS	MUB	100% CAPACITY (SPARE)

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WATER PUMPHOUSE SUMP	SU-1653	11.5 m ³		CONCRETE W/ 7 MIL EPOXY COATING	WPH	
ORGANIC ACID WASTE SUMP	SU-1654	4.5 m ³		CONCRETE	BCCB	
EFFLUENT DISCHARGE COLLECTION SUMP	SU-1655	36 m ³		CONCRETE W/ 7 MIL EPOXY COATING	MUB	
CAUSTIC WASTE HOLD TANK	TK-1658	45 m ³	3.5 m ID X 5 m T/T	304L SS	BCCB	
ACID WASTE HOLD TANK	TK-1660	45 m ³	3.5 m ID X 5 m T/T	304L SS	BCCB	
ORGANIC ACID WASTE HOLD TANK	TK-1661	45 m ³	3.5 m ID X 5 m T/T	304L SS	BCCB	
CAUSTIC WASTE NEUTRALIZATION TANK	TK-1662	11.5 m ³	2.5 m ID X 3 m T/T	304L SS	BCCB	
ORGANIC ACID WASTE NEUTRALIZATION TANK	TK-1663	11.5 m ³	2.5 m ID X 3 m T/T	304L SS	BCCB	

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ORGANIC ACID WASTE SUMP TANK	TK-1664	2.8 m ³	1.5 m ID X 2 m T/T	316L SS	BCCB	
DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	F-1691	280 m ³ /hr		304L SS	BCCB	
OXALIC ACID DECON MAKE-UP TANK ROUGHING FILTER	F-1692	280 m ³ /hr		304L SS	BCCB	
MSM DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	F-1693	280 m ³ /hr		304L SS	BCCB	
POTASSIUM PERMANGANATE MAKE-UP TANK ROUGHING FILTER		F-1694	280 m ³ /hr	304L SS	BCCB	
COLD CHEMICAL No. 3 MAKE-UP TANK ROUGHING FILTER	F-1695	280 m ³ /hr		304L SS	BCCB	
COLD CHEMICAL No. 1 MAKE-UP TANK ROUGHING FILTER	F-1696	280 m ³ /hr		304L SS	BCCB	

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OFF-GAS TREATMENT MAKE-UP TANK ROUGHING FILTER	P-1697	280 m ³ /hr	304L SS	BCCB		
COLD CHEMICAL No. 2 MAKE-UP TANK ROUGHING FILTER	P-1698	280 m ³ /hr		304L SS	BCCB	
NITRIC ACID DECON MAKE-UP TANK ROUGHING FILTER	P-1699	280 m ³ /hr		304L SS	BCCB	
COLD CHEMICAL No.1 TRANSFER PUMP	P-1700	4.8 m ³ /hr, 575 kPa		304L SS	BCCB	
OFFGAS TREATMENT CHEMICAL TRANSFER PUMP	P-1701	24 m ³ /hr, 345 kPa		316L SS	BCCB	
COLD CHEMICAL No.2 TRANSFER PUMP	P-1702	24 m ³ /hr, 345 kPa		316L SS	BCCB	
50% NITRIC ACID UNLOADING PUMP	P-1703	37 m ³ /hr, 330 kPa		304L SS	BCCB	
ACID WASTE SUMP PUMP	P-1704	19 m ³ /hr, 110 kPa		316L SS	BCCB	

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
NITRIC ACID DECON TRANSFER PUMP	P-1705	24 m ³ /hr, 510 kPa		304L SS	BCCB	
DECON SOLUTION TRANSFER PUMP	P-1706	24 m ³ /hr, 540 kPa		316L SS	BCCB	
MSM DECON SOLUTION TRANSFER PUMP	P-1707	24 m ³ /hr, 540 kPa		316L SS	BCCB	
OXALIC ACID DECON TRANSFER PUMP	P-1708	24 m ³ /hr, 495 kPa		316L SS	BCCB	
POTASSIUM PERMANGANATE TRANSFER PUMP	P-1709	24 m ³ /hr, 360 kPa		304L SS	BCCB	
COLD CHEMICAL No.3 TRANSFER PUMP	P-1710	24 m ³ /hr, 410 kPa		304L SS	BCCB	
50% CAUSTIC UNLOADING PUMP	P-1711	37 m ³ /hr, 415 kPa		316L SS	BCCB	
CAUSTIC WASTE SUMP PUMP	P-1712	19 m ³ /hr, 110 kPa	316L SS	BCCB		

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COLD CHEMICAL No.4 TRANSFER PUMP	P-1713	24 m ³ /hr, 410 kPa		316L SS	BCCB	
ACID WASTE SUMP	SU-1714	34 m ³		CONCRETE LINED W/304L SS	BCCB	
CAUSTIC WASTE SUMP	SU-1715	34 m ³		CONCRETE LINED W/ 304L SS	BCCB	
COLD CHEMICAL No. 1 MAKE-UP TANK	TK-1716	6 m ³	2 m ID x 2.25 m T/T	304L SS	BCCB	
OFFGAS TREATMENT CHEMICAL MAKE-UP TANK	TK-1717	6 m ³	2 m ID x 2.25 m T/T	304L SS	BCCB	
COLD CHEMICAL No. 2 MAKE-UP TANK	TK-1718	6 m ³	2 m ID x 2.25 m T/T	316L SS	BCCB	
NITRIC ACID DECON MAKE-UP TANK	TK-1719	6 m ³	2 m ID x 2.25 m T/T	304L SS	BCCB	

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DECON SOLUTION MAKE-UP TANK	TK-1720	6 m ³	2 m ID x 2.25 m T/T	316L SS	BCCB	
MSM DECON SOLUTION MAKE-UP TANK	TK-1721	23 m ³	3 m ID x 3.5 m T/T	304L SS	BCCB	
OXALIC ACID DECON MAKE-UP TANK	TK-1722	6 m ³	2 m ID x 2.25 m T/T	316L SS	BCCB	
POTASSIUM PERMANGANATE MAKE-UP TANK	TK-1723	6 m ³	2 m ID x 2.25 m T/T	304L SS	BCCB	
COLD CHEMICAL No. 3 MAKE-UP TANK	TK-1724	6 m ³	2 m ID x 2.25 m T/T	304L SS	BCCB	
COLD CHEMICAL No. 4 MAKE-UP TANK	TK-1725	6 m ³	2 m ID x 2.25 m T/T	316L SS	BCCB	
ACID WASTE SUMP TANK	TK-1726	6 m ³	2 m ID x 2.25 m T/T	304L SS	BCCB	
CAUSTIC WASTE SUMP TANK	TK-1727	6 m ³	2 m ID x 2.25 m T/T	304L SS	BCCB	

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ACID VENT BLOWER	MB-1761A	765 sm ³ /hr		304L SS	BCCB	100% CAPACITY
ACID VENT BLOWER	MB-1761B	765 sm ³ /hr		304L SS	BCCB	100% CAPACITY (SPARE)
FSMT VENT FILTER	F-1771	74 m ³ /hr		304L SS	BCCB	
FSMT TRANSFER PUMP	P-1772	4.5 m ³ /hr, 400 kPa		316L SS	BCCB	
FSMT SAMPLE PUMP	P-1773	4 m ³ /hr, 140 kPa		316L SS	BCCB	
FRIT SLURRY SUMP	SU-1774	0.3 m ³	0.5 m x 0.5 m x 1 m D	CONCRETE LINED WITH 304L SS	BCCB	
FRIT SLURRY MAKE-UP TANK (FSMT)	TK-1775	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
SAND STORAGE BIN	B-1901	156 m ³	5 m X 5 m X 12.5 m H	CARBON STEEL	BCCB PAD	

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
SAND RAIL CAR UNLOADER	XE-1902				BCCB PAD	
TRUCK UNLOADER	XE-1903				BCCB PAD	
B2O3 STORAGE BIN	B-1904	125 m ³	4 m X 5 m X 6.5 m H	CARBON STEEL	BCCB PAD	
Li2 CO3 STORAGE BIN	B-1905	153 m ³ , 2 EA	5 m X 5 m X 11 m H	CARBON STEEL	BCCB PAD	
CaO STORAGE BIN	B-1906	48 m ³	3 m X 3 m X 10.5 m H	CARBON STEEL	BCCB PAD	
MgO STORAGE BIN	B-1907	48 m ³	3 m X 3 m X 10.5 m H	CARBON STEEL	BCCB PAD	
HLW BATCH MIXER	MM-1908				BCCB PAD	

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LLW BATCH MIXER	MM-1909				BCCB PAD	
CONVEYOR BIN TO MIXERS	XE-1914				BCCB PAD	
LLW GLASS FORMER CONVEYOR	XE-1915				BCCB	
HLW GLASS FORMER CONVEYOR	XE-1916				BCCB	
SODIUM NITRITE STORAGE BIN	B-1920	125 m ³	4 m X 5 m X 6.5 m H	CARBON STEEL	BCCB PAD	USED AS CORROSION INHIBITOR FOR SEPARATIONS EFFLUENT TO TANK FARM
TSP STORAGE BIN	B-1921	125 m ³	4 m X 5 m X 6.5 m H	CARBON STEEL	BCCB PAD	USED FOR EQUIPMENT DECON
CRANE	CN-2900	90 TON, 15 m SPAN	CARBON STEEL			

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
SHIELD WINDOWS	SZ-2910	15 EACH	SIMILAR TO SZ-2204-3		ANALY FACILITY	
MSM 3 PIECE	MS-2911	30 EACH	SIMILAR TO MS-2202-3B		ANALY FACILITY	
DIESEL FUEL TANK	TK-2914	4 EACH 26.5 m ³	m ID X 3.25 m T/T	CARBON STEEL	ADJACENT TO EMER GEN BLDG	
DAY DIESEL FUEL TANK	TK-2915	4 EACH 2.3 m ³	m ID X 1.6 m T/T	CARBON STEEL	EMER GEN BLDG	
EMERGENCY GENERATOR	DG-2916	4 EACH 1 MW	2 m X 2 m X 2.5 m H	EMER GEN BLDG		

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APPENDIX E2

HIGH-LEVEL WASTE STANDALONE SUPPORT FACILITY EQUIPMENT LIST

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Equipment list

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ABBREVIATIONS
EQUIPMENT IDENTIFICATION CODE

B = Storage bin	FH = HEPA filter	MQ = Quench flume
DE = Demister	FM = Metal HEPA filter	P = Pumps
DY = Dryer	FP = Prefilter, metal prefilter	R = Absorber, reactor, regenerator, reducer
E = Heater, cracker	FS = Screen	S = Separator (vapor/liquid)
EB = Chamber, incinerator	G = Centrifuge	SC = Scrubber
EC = Condenser, chiller, cooler	M = Rotary star feeder	T = Towers
EM = Melter	MB = Blower	TK = Tanks
EV = Evaporator or concentrator	MC = Roll crusher	TR = Trap
F = Filter, frit filter, scrub filter	MF = Feeders	
FC = Cyclone filter	MM = Mixers	

E2-3

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
REPAIR SHOP EQUIPMENT 1 LOT (WELDER, - BAND SAW, GRINDER, ETC. NO LARGE MACHINE TOOLS)						
BULK NaOH STORAGE TANK	TK-1013	4 m ³	1.5 m ID X 2.5 m T/T	316L SS	BCCB	
BULK HNO ₃ STORAGE TANK	TK-1014	8 m ³	2.5 m ID X 2.5 m T/T	304L SS	BCCB	
BULK ANHYDROUS NH ₃ STORAGE TANK	TK-1015	14.5 m ³	2.6 m ID X 3 m T/T	CARBON STEEL	(OUTSIDE)	

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
NaOH TRANSFER PUMP	P-1016	1.6 m ³ /hr, 214 kPa		316L SS	BCCB	
HNO3 TRANSFER PUMP	P-1017	1.6 m ³ /hr, 214 kPa		304L SS	BCCB	
BULK WATER STORAGE TANK	TK-1019	70 m ³	5.3 m ID X 3.7 m H	CARBON STEEL	(OUTSIDE)	
BULK KEROSENE STORAGE TANK	TK-1022	220 m ³	6 m ID X 8 m H	CARBON STEEL	(OUTSIDE)	
KEROSENE TRANSFER PUMP	P-1022A	2.5 m ³ /hr, 690 kPa		316L SS	(OUTSIDE)	100 % CAPACITY
KEROSENE TRANSFER PUMP (SPARE)	P-1022B	2.5 m ³ /hr, 690 kPa		316L SS	(OUTSIDE)	100 % CAPACITY
BULK WATER FEED PUMP	P-1023A	70 m ³ /hr, 690 kPa		CARBON STEEL	WPH	100 % CAPACITY
BULK WATER FEED PUMP (SPARE)	P-1023B	70 m ³ /hr, 690 kPa		CARBON STEEL	WPH	100 % CAPACITY

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BREATHING AIR CART	BX-1501B	11.2 sm ³ /hr		304L SS	WAREHOUSE	
BREATHING AIR CART	BX-1501C	11.2 sm ³ /hr		304L SS	WAREHOUSE	
BREATHING AIR CART	BX-1501E	11.2 sm ³ /hr		304L SS	WAREHOUSE	
INSTRUMENT/PLANT AIR COMPRESSOR	CX-1502A	1,700 sm ³ /hr, 960 sm ³ /hr	1.8 m X 2 m H	CARBON STEEL	MUB	50% CAPACITY
INSTRUMENT/PLANT AIR COMPRESSOR	CX-1502B	1,700 sm ³ /hr, 960 sm ³ /hr	1.8 m X 2 m H	CARBON STEEL	MUB	50% CAPACITY
INSTRUMENT/PLANT AIR COMPRESSOR	CX-1502C	1,700 sm ³ /hr, 960 sm ³ /hr	1.8 m X 2 m H	CARBON STEEL	MUB	50% CAPACITY (SPARE)
INSTRUMENT AIR DRYER	DY-1503A	510 sm ³ /hr	2 m X 3.7 m	CARBON STEEL	MUB	100% CAPACITY
INSTRUMENT AIR DRYER (SPARE)	DY-1503B	510 sm ³ /hr	2 m X 3.7 m	CARBON STEEL	MUB	100% CAPACITY

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
PLANT AIR FILTER	FL-1504A	3,400 sm ³ /hr	0.6 m ID	CARBON STEEL	MUB	100% CAPACITY
PLANT AIR FILTER (SPARE)	FL-1504B	3,400 sm ³ /hr	0.6 m ID	CARBON STEEL	MUB	100% CAPACITY
INSTRUMENT AIR RECEIVER	VX-1505	15 m ³	2 m ID X 5 m T/T	CARBON STEEL	MUB	
PLANT AIR RECEIVER	VX-1506	57 m ³	3 m ID X 8 m T/T	CARBON STEEL	MUB	
UTILITY STEAM GENERATOR	EV-1520A	1.94 MW	11.3 m X 6 m X 8.8 m H	CARBON STEEL	MUB	100% CAPACITY
UTILITY STEAM GENERATOR	EV-1520B	1.94 MW	11.3 m X 6 m X 8.8 m H	CARBON STEEL	MUB	100% CAPACITY (SPARE)
STANDBY ELECTRIC HEATER	E-1521A	10.0 KW	STEAM GENERATOR (INTERNAL)	N/A	MUB	EV-1520A

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
STANDBY ELECTRIC HEATER	E-1521B	10.0 KW	STEAM GENERATOR (INTERNAL)	N/A	MUB	EV-1520B
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522A	170 m ³ /hr, 69 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100% CAPACITY EV-1520A
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522B	170 m ³ /hr, 69 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100% CAPACITY EV-1520A (SPARE)
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522C	170 m ³ /hr, 69 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100% CAPACITY EV-1520B
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522D	170 m ³ /hr, 69 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100% CAPACITY EV-1520B (SPARE)
STEAM GEN FEED WATER CHEMICAL INJECTION PUMP	AP-1523A	0.23 m ³ /hr, 1,370 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520A
STEAM GEN FEED WATER CHEMICAL INJECTION PUMP	AP-1523B	0.23 m ³ /hr, 1,370 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520B
CHEMICAL ADDITION TANK	TK-1524A	1 m ³	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520A

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CHEMICAL ADDITION TANK	TK-1524B	1 m ³	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520B
UTILITY CONDENSATE PUMP	P-1525A	3.4 m ³ /hr, 1,380 kPa		304L SS	MUB	100% CAPACITY EV-1520A
UTILITY CONDENSATE PUMP	P-1525B	3.4 m ³ /hr, 1,380 kPa		304L SS	MUB	100% CAPACITY EV-1520A (SPARE)
UTILITY CONDENSATE PUMP	P-1525C	3.4 m ³ /hr, 1,380 kPa		304L SS	MUB	100% CAPACITY EV-1520B
UTILITY CONDENSATE PUMP	P-1525D	3.4 m ³ /hr, 1,380 kPa		304L SS	MUB	100% CAPACITY EV-1520B (SPARE)
UTILITY STEAM CONDENSATE CONDENSER COOLER	EC-1526	528 MJ/hr		304L SS	MUB	
UTILITY STEAM FLASH DRUM	TK-1528	0.3 m ³	0.6 m ID X 1 m T/T	304L SS	MUB	
UTILITY STEAM CONDENSATE COLLECTION TANK	TK-1529	2.8 m ³	1.2 m ID X 2.5 m T/T	304L SS	MUB	

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COOLING TOWER	CT-1561	42.5 GJ/hr			COOLING TOWER	
TOWER WATER PUMP	P-1562A	620 m ³ /hr, 600 kPa		CARBON STEEL	COOLING TOWER	50% CAPACITY
TOWER WATER PUMP	P-1562B	620 m ³ /hr, 600 kPa		CARBON STEEL	COOLING TOWER	50% CAPACITY
TOWER WATER PUMP	P-1562C	620 m ³ /hr, 600 kPa		CARBON STEEL	COOLING TOWER	50% CAPACITY (SPARE)
INHIBITOR ADDITION PUMP	P-1563	1 m ³ /hr, 140 kPa		304L SS	AT COOLING TOWER	
DEMINEALIZER	DM-1591	2.3 m ³ /hr	3 m X 5 m	304L SS	MUB	
DEMINEALIZED WATER MAKE-UP PUMP	P-1593A	12.3 m ³ /hr, 310 kPa	(INCLUDED IN DEMIN FOOTPRINT)	304L SS	MUB	100% CAPACITY

BUILDING:

BCCB = BULK COLD CHEMICAL BUILDING
MUB = MECHANICAL UTILITIES BUILDING
WPH = WATER PUMP HOUSE
DB4-CASE4C:CONP4:HLW_ALT

Equipment list
Configuration 4 Revision 02, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
DEMINERALIZED WATER MAKE-UP PUMP	P-1593B	12.3 m ³ /hr, 310 kPa	(INCLUDED IN DEMIN FOOTPRINT)	304L SS	MUB	100% CAPACITY (SPARE)
DEMINERALIZED WATER STORAGE TANK	TK-1594	8.7 m ³	2.6 m ID X 2 m T/T	304L SS	MUB	
FIRE WATER TANK HEATER	HT-1603B	66 kW		CARBON STEEL	WPH	TK-1613B
FIRE WATER PUMP	P-1608C	340 m ³ /hr, 855 kPa		CAST IRON	WPH	100% CAPACITY
FIRE WATER PUMP	P-1608D	340 m ³ /hr, 855 kPa		CAST IRON	WPH	100% CAPACITY (DIESEL DRIVEN SPARE)
JOCKEY PUMP	P-1609B	10 m ³ /hr, 820 kPa		CARBON STEEL	WPH	TK-1613B
FIRE WATER HEATER PUMP	P-1610B	7 m ³ /hr, 69 kPa		CAST IRON	WPH	TK-1613B
DIESEL FUEL TRANSFER PUMP	P-1611	9 m ³ /hr, 140 kPa		CARBON STEEL	OUTSIDE WPH	

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DB4:CASE4C:CONF4:HLW_ALT

Equipment list
Configuration 4 Revision 02, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
FIRE WATER STORAGE TANK	TK-1613B	1,710 m ³	17 m ID X 10 m H	CARBON STEEL	OUTSIDE WPH	
DIESEL FUEL STORAGE TANK UNDERGROUND	TK-1614A	22.7 m ³	2.4 m ID X 5 m T/T	FIBERGLASS DOUBLE WALL	OUTSIDE WPH	
DIESEL FUEL STORAGE TANK UNDERGROUND	TK-1614B	22.7 m ³	2.4 m ID X 5 m T/T	FIBERGLASS DOUBLE WALL	OUTSIDE WPH	
DIESEL FUEL DAY TANK	TK-1615	1 m ³	1 m ID	CARBON STEEL	WPH	
ORGANIC ACID WASTE HOLD TANK HEGA FILTER	FG-1641	195 kg/hr		304L SS	BCCB	
CAUSTIC WASTE HOLD TANK TRANSFER PUMP	P-1642	9 m ³ /HR, 69 kPa		304L SS	BCCB	
CAUSTIC WASTE NEUT TANK TRANSFER PUMP	P-1643	23 m ³ /hr, 285 kPa		304L SS	BCCB	
ACID WASTE HOLD TANK TRANSFER PUMP	P-1644	9 m ³ /hr, 69 kPa		304L SS	BCCB	

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DB4:CASE4C:CONF4:HLW_ALT

Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
ORGANIC ACID WASTE NEUT TANK TRANSFER PUMP	P-1645	23 m ³ /hr, 285 kPa		304L SS	BCCB	
ORGANIC ACID WASTE HOLD TANK SUMP PUMP	P-1646	23 m ³ /hr, 124 kPa		304L SS	BCCB	
ORGANIC ACID WASTE HOLD TANK TRANSFER PUMP	P-1647	9 m ³ /hr, 124 kPa		304L SS	BCCB	
WATER PUMPHOUSE SUMP PUMP	P-1648	16 m ³ /hr, 210 kPa		304L SS	WPH	100 % CAPACITY
EFFLUENT DISCHARGE SUMP PUMP	P-1649A	34 m ³ /hr, 175 kPa		304L SS	MUB	100 % CAPACITY
EFFLUENT DISCHARGE SUMP PUMP	P-1649B	34 m ³ /hr, 175 kPa		304L SS	MUB	(SPARE)
WATER PUMPHOUSE SUMP	SU-1653	4 m ³		CONCRETE W/7 MIL EPOXY COATING	WPH	

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
ORGANIC ACID WASTE SUMP	SU-1654	1.5 m ³		CONCRETE	BCCB	
EFFLUENT DISCHARGE COLLECTION SUMP	SU-1655	12 m ³		CONCRETE W/ 7 MIL EPOXY COATING	MUB	
CAUSTIC WASTE HOLD TANK	TK-1658	15 m ³	2.5 m ID X 3.5 m T/T	304L SS	BCCB	
ACID WASTE HOLD TANK	TK-1660	15 m ³	2.5 m ID X 3.5 m T/T	304L SS	BCCB	
ORGANIC ACID WASTE HOLD TANK	TK-1661	15 m ³	2.5 m ID X 3.5 m T/T	304L SS	BCCB	
CAUSTIC WASTE NEUTRALIZATION TANK	TK-1662	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
ORGANIC ACID WASTE NEUTRALIZATION TANK	TK-1663	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
ORGANIC ACID WASTE SUMP TANK	TK-1664	1 m ³	1 m ID X 2 m T/T	316L SS	BCCB	
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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	F-1691	94 m ³ /hr		304L SS	BCCB	
OXALIC ACID DECON MAKE-UP TANK ROUGHING FILTER	F-1692	94 m ³ /hr		304L SS	BCCB	
MSM DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	F-1693	94 m ³ /hr		304L SS	BCCB	
POTASSIUM PERMANGANATE MAKE-UP TANK ROUGHING FILTER	F-1694	94 m ³ /hr		304L SS	BCCB	
COLD CHEMICAL No. 3 MAKE-UP TANK ROUGHING FILTER	F-1695	94 m ³ /hr		304L SS	BCCB	
COLD CHEMICAL No. 1 MAKE-UP TANK ROUGHING FILTER	F-1696	94 m ³ /hr		304L SS	BCCB	
OFF-GAS TREATMENT MAKE-UP TANK ROUGHING FILTER	F-1697	94 m ³ /hr		304L SS	BCCB	
COLD CHEMICAL No. 2 MAKE-UP TANK ROUGHING FILTER	F-1698	94 m ³ /hr		304L SS	BCCB	

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
NITRIC ACID DECON MAKE-UP TANK ROUGHING FILTER	P-1699	94 m ³ /hr		304L SS	BCCB	
COLD CHEMICAL No.1 TRANSFER PUMP	P-1700	1.6 m ³ /hr, 575 kPa		304L SS	BCCB	
OFFGAS TREATMENT CHEMICAL TRANSFER PUMP	P-1701	8 m ³ /hr, 345 kPa		316L SS	BCCB	
COLD CHEMICAL No.2 TRANSFER PUMP	P-1702	8 m ³ /hr, 600 kPa		316L SS	BCCB	
50 PERCENT NITRIC ACID UNLOADING PUMP	P-1703	12.5 m ³ /hr, 331 kPa		304L SS	BCCB	
ACID WASTE SUMP PUMP	P-1704	6.4 m ³ /hr, 110 kPa		316L SS	BCCB	
NITRIC ACID DECON TRANSFER PUMP	P-1705	8 m ³ /hr, 510 kPa		304L SS	BCCB	

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DECON SOLUTION TRANSFER PUMP	P-1706	8 m ³ /hr, 540 kPa		316L SS	BCCB	
MSM DECON SOLUTION TRANSFER PUMP	P-1707	8 m ³ /hr, 540 kPa		316L SS	BCCB	
OXALIC ACID DECON TRANSFER PUMP	P-1708	8 m ³ /hr, 495 kPa		316L SS	BCCB	
POTASSIUM PERMANGANATE TRANSFER PUMP	P-1709	8 m ³ /hr, 360 kPa		304L SS	BCCB	
COLD CHEMICAL No.3 TRANSFER PUMP	P-1710	8 m ³ /hr, 410 kPa		304L SS	BCCB	
50 PERCENT CAUSTIC UNLOADING PUMP	P-1711	12.5 m ³ /hr, 415 kPa		316L SS	BCCB	
CAUSTIC WASTE SUMP PUMP	P-1712	6.4 m ³ /hr, 110 kPa		316L SS	BCCB	
COLD CHEMICAL No.4 TRANSFER PUMP	P-1713	8 m ³ /hr, 410 kPa		316L SS	BCCB	

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
ACID WASTE SUMP	SU-1714	11.5 m ³		CONCRETE LINED W/304L SS	BCCB	
CAUSTIC WASTE SUMP	SU-1715	11.5 m ³		CONCRETE LINED W/ 304L SS	BCCB	
COLD CHEMICAL No. 1 MAKE-UP TANK	TK-1716	2 m ³	1.2 m ID X 2 m T/T	304L SS	BCCB	
OFFGAS TREATMENT CHEMICAL MAKE-UP TANK	TK-1717	2 m ³	1.2 m ID X 2 m T/T	304L SS	BCCB	
COLD CHEMICAL No. 2 MAKE-UP TANK	TK-1718	2 m ³	1.2 m ID X 2 m T/T	316L SS	BCCB	
NITRIC ACID DECON MAKE-UP TANK	TK-1719	2 m ³	1.2 m ID X 2 m T/T	304L SS	BCCB	
DECON SOLUTION MAKE-UP TANK	TK-1720	2 m ³	1.2 m ID X 2 m T/T	316L SS	BCCB	
MSM DECON SOLUTION MAKE-UP TANK	TK-1721	8 m ³	2 m ID X 3 m T/T	304L SS	BCCB	

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
OXALIC ACID DECON MAKE-UP TANK	TK-1722	2 m ³	1.2 m ID X 2 m T/T	316L SS	BCCB	
POTASSIUM PERMANGANATE MAKE-UP TANK	TK-1723	2 m ³	1.2 m ID X 2 m T/T	304L SS	BCCB	
COLD CHEMICAL No. 3 MAKE-UP TANK	TK-1724	2 m ³	1.2 m ID X 2 m T/T	304L SS	BCCB	
COLD CHEMICAL No. 4 MAKE-UP TANK	TK-1725	2 m ³	1.2 m ID X 2 m T/T	316L SS	BCCB	
ACID WASTE SUMP TANK	TK-1726	m ³	1.2 m ID X 2 m T/T	304L SS	BCCB	
CAUSTIC WASTE SUMP TANK	TK-1727	2 m ³	1.2 m ID X 2 m T/T	304L SS	BCCB	
ACID VENT BLOWER	MB-1761A	255 sm ³ /hr		304L SS	BCCB	100% CAPACITY

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
ACID VENT BLOWER	MB-1761B	255 sm ³ /hr		304L SS	BCCB	100% CAPACITY (SPARE)
SAND STORAGE BIN	B-1901	125 m ³	4 m X 5 m X 6.5 m H	CARBON STEEL	BCCB PAD	
SAND RAIL CAR UNLOADER	XE-1902				BCCB PAD	
TRUCK UNLOADER	XE-1903				BCCB PAD	
B2O3 STORAGE BIN	B-1904	48 m ³	3 m X 3 m X 10.5 m H	CARBON STEEL	BCCB PAD	
Li2O STORAGE BIN	B-1905	34 m ³	3 m X 3 m X 9 m H	CARBON STEEL	BCCB PAD	
CaO STORAGE BIN	B-1906	34 m ³	3 m X 3 m X 9 m H	CARBON STEEL	BCCB PAD	
MgO STORAGE BIN	B-1907	34 m ³	3 m X 3 m X 9 m H	CARBON STEEL	BCCB PAD	

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
HLW BATCH MIXER	MM-1908				BCCB PAD	
CONVEYOR BIN TO MIXERS	XE-1914				BCCB PAD	
HLW GLASS FORMER CONVEYOR	XE-1916	BCCB				
TSP STORAGE BIN	B-1921	42 m ³		CARBON STEEL	BCCB PAD	USED FOR EQUIPMENT DECON
SHIELD WINDOWS	SZ-2910	8 EACH	SIMILAR TO SZ-2204-3		ANALY FACILITY	
MSM 3 PIECE	MS-2911	16 EACH	SIMILAR TO SZ-2202-3B		ANALY FACILITY	
DIESEL FUEL TANK	TK-2914	2 EACH 26.5 m ³	ID X 3.25 m T/T	CARBON STEEL	ADJACENT TO EMER GEN BLDG	
DAY DIESEL FUEL TANK	TK-2915	2 EACH 2.3 m ³	ID X 1.6 m T/T	CARBON STEEL	EMER GEN BLDG	

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
EMERGENCY GENERATOR	DG-2916	2 EACH 1 MW	5.2 m X 2 m X 2.5 m H		EMER GEN BLDG	

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APPENDIX E3

SEPARATIONS/LOW-LEVEL WASTE STANDALONE SUPPORT FACILITY EQUIPMENT LIST

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Equipment list
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ABBREVIATIONS
EQUIPMENT IDENTIFICATION CODE

B	=	Storage bin	FH	=	HEPA filter	MQ	=	Quench flume
DE	=	Demister	FM	=	Metal HEPA filter	P	=	Pumps
DY	=	Dryer	FP	=	Prefilter, metal prefilter	R	=	Absorber, reactor, regenerator, reducer
E	=	Heater, cracker	FS	=	Screen	S	=	Separator (vapor/liquid)
EB	=	Chamber, incinerator	G	=	Centrifuge	SC	=	Scrubber
EC	=	Condenser, chiller, cooler	M	=	Rotary star feeder	T	=	Towers
EM	=	Melter	MB	=	Blower	TK	=	Tanks
EV	=	Evaporator or concentrator	MC	=	Roll crusher	TR	=	Trap
F	=	Filter, frit filter, scrub filter	MP	=	Feeders			
FC	=	Cyclone filter	MM	=	Mixers			

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
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REPAIR SHOP EQUIPMENT 1 LOT (WELDER, BAND SAW, GRINDER, ETC. NO LARGE MACHINE TOOLS)

BULK SULFUR STORAGE TANK	TK-1007	1,000 m ³	10 m ID X 13 m H	CARBON STEEL	BCCB PAD	
BULK DCPD STORAGE TANK	TK-1008	70 m ³	4 m ID X 5.5 m T/T	304L SS	BCCB	
BULK CPD OLIGOMER STORAGE TANK	TK-1009	70 m ³	4 m ID X 5.5 m T/T	304L SS	BCCB	

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DB4:CASE4C:CONF4:LLW_DED

Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
SULFUR TRANSFER PUMP	P-1010A	28 m ³ /hr, 690 kPa		316L SS	BCCB	100% CAPACITY
SULFUR TRANSFER PUMP	P-1010B	28 m ³ /hr, 690 kPa		316L SS	BCCB	100% CAPACITY (SPARE)
DCPD TRANSFER PUMP	P-1011	2.3 m ³ /hr, 690 kPa		316L SS	BCCB	
CPD TRANSFER PUMP	P-1012	2.3 m ³ /hr, 690 kPa		316L SS	BCCB	
BULK NaOH STORAGE TANK	TK-1013	170 m ³	6 m ID X 6.5 m H	316L SS	BCCB	
BULK HNO ₃ STORAGE TANK	TK-1014	115 m ³	5 m ID X 6 m T/T	304L SS	BCCB	
BULK ANHYDROUS NH ₃ STORAGE TANK	TK-1015	480 m ³	7.5 m ID X 11 m T/T	CARBON STEEL	(OUTSIDE)	
NaOH TRANSFER PUMP	P-1016	3.2 m ³ /hr, 214 kPa		316L SS	BCCB	

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DB4:CASE4C:CONF4:LLW_DED

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
HNO3 TRANSFER PUMP	P-1017	3.2 m ³ /hr, 110 kPa		304L SS	BCCB	
BULK WATER STORAGE TANK	TK-1019	270 m ³	8.4 m ID X 5.6 m H	CARBON STEEL	(OUTSIDE)	
BULK KEROSENE STORAGE TANK	TK-1022	1,800 m ³	15 m ID X 11 m H	CARBON STEEL	(OUTSIDE)	
KEROSENE TRANSFER PUMP	P-1022A	20 m ³ /hr, 690 kPa		316L SS	(OUTSIDE)	100% CAPACITY
KEROSENE TRANSFER PUMP	P-1022B	20 m ³ /hr, 690 kPa		316L SS	(OUTSIDE)	100% CAPACITY (SPARE)
BULK WATER FEED PUMP	P-1023A	270 m ³ /hr, 690 kPa		CARBON STEEL	FWPH	100% CAPACITY
BULK WATER FEED PUMP	P-1023B	270 m ³ /hr, 690 kPa		CARBON STEEL	FWPH	100% CAPACITY (SPARE)
CRYOGENIC OXYGEN PLANT	AS-1025	118 TONS/DAY	6 m X 15 m		OUTSIDE BCCB	

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Equipment list

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SULFUR UNLOADING PUMP	P-1100A	28 m ³ /hr, 345 kPa		316L SS	OUTSIDE BCCB	
SULFUR UNLOADING PUMP	P-1100B	28 m ³ /hr, 345 kPa		316L SS	OUTSIDE BCCB	
KEROSENE UNLOADING PUMP	P-1101A	23 m ³ /hr, 690 kPa		316L SS	OUTSIDE BCCB	
KEROSENE UNLOADING PUMP	P-1101B	23 m ³ /hr, 690 kPa		316L SS	OUTSIDE BCCB	
BREATHING AIR CART	BX-1501A	11.2 sm ³ /hr		304L SS	WAREHOUSE	
BREATHING AIR CART	BX-1501D	11.2 sm ³ /hr		304L SS	WAREHOUSE	
INSTRUMENT/PLANT AIR COMPRESSOR	CX-1502A	11,900 sm ³ /hr, 960 kPa	6 m X 2.4 m X 3 m H	CARBON STEEL	MUB	50% CAPACITY

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INSTRUMENT/PLANT AIR COMPRESSOR	CX-1502B	11,900 sm ³ /hr, 960 kPa	6 m X 2.4 m X 3 m H	CARBON STEEL	MUB	50% CAPACITY
INSTRUMENT/PLANT AIR COMPRESSOR	CX-1502C	11,900 sm ³ /hr, 960 kPa	6 m X 2.4 m X 3 m H	CARBON STEEL	MUB	50% CAPACITY (SPARE)
INSTRUMENT AIR DRYER	DY-1503A	1,325 sm ³ /hr	3.4 m X 3.7 m	CARBON STEEL	MUB	100% CAPACITY
INSTRUMENT AIR DRYER	DY-1503B	1,325 sm ³ /hr	3.4 m X 3.7 m	CARBON STEEL	MUB	100% CAPACITY (SPARE)
PLANT AIR FILTER	FL-1504A	20,700 scfm, 3 micron	0.6 m ID	CARBON STEEL	MUB	100% CAPACITY
PLANT AIR FILTER	FL-1504B	20,700 scfm, 3 micron	0.6 m ID	CARBON STEEL	MUB	100% CAPACITY (SPARE)
INSTRUMENT AIR RECEIVER	VX-1505	29 m ³	2.5 m ID X 6.25 m T/T	CARBON STEEL	MUB	
PLANT AIR RECEIVER	VX-1506	335 m ³	6 m ID X 12 m T/T	CARBON STEEL	MUB	

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
UTILITY STEAM GENERATOR	EV-1520A	5.90 MW	11.3 X 6 m X 8.8 m H	CARBON STEEL	MUB	100 % CAPACITY
UTILITY STEAM GENERATOR	EV-1520B	5.90 MW	11.3 X 6 m X 8.8 m H	CARBON STEEL	MUB	100 % CAPACITY (SPARE)
STANDBY ELECTRIC HEATER	E-1521A	30.0 \$X\$AM	GENERATOR (INTERNAL)	N/A	MUB	EV-1520A
STANDBY ELECTRIC HEATER	E-1521B	30.0 \$X\$AM	GENERATOR (INTERNAL)	N/A	MUB	EV-1520B
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522A	522 m ³ /hr, 69 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100 % CAPACITY EV-1520A
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522B	522 m ³ /hr, 69 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100 % CAPACITY EV-1520A (SPARE)
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522C	522 m ³ /hr, 69 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100 % CAPACITY EV-1520B
UTILITY STEAM GENERATOR CIRCULATING PUMP	P-1522D	522 m ³ /hr, 69 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	100 % CAPACITY EV-1520B (SPARE)

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DB4:CASE4C:CONF4:LLW_DED

Equipment list
Configuration 4 Revision 02, Issued on 02/16/95

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
FEED WATER CHEMICAL INJECTION PUMP	P-1523A	0.23 m ³ /hr, 1,370 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520A
FEED WATER CHEMICAL INJECTION PUMP	P-1523B	0.23 m ³ /hr, 1,370 kPa	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520B
CHEMICAL ADDITION TANK	TK-1524A	1 m ³	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520A
CHEMICAL ADDITION TANK	TK-1524B	1 m ³	(INCLUDED W/STM GEN FOOTPRINT)	304L SS	MUB	EV-1520B
UTILITY CONDENSATE PUMP	P-1525A	11 m ³ /hr, 1,380 kPa		304L SS	MUB	100 % CAPACITY EV-1520A
UTILITY CONDENSATE PUMP	P-1525B	11 m ³ /hr, 1,380 kPa		304L SS	MUB	100 % CAPACITY EV-1520A (SPARE)
UTILITY CONDENSATE PUMP	P-1525C	11 m ³ /hr, 1,380 kPa		304L SS	MUB	100 % CAPACITY EV-1520B

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UTILITY CONDENSATE PUMP	P-1525D	11 m ³ /hr, 1,380 kPa		304L SS	MUB	100% CAPACITY EV-1520B (SPARE)
UTILITY STEAM CONDENSATE CONDENSER COOLER	EC-1526	1.6 GJ/hr		304L SS	MUB	
UTILITY STEAM FLASH DRUM	TK-1528	0.28 m ³	0.6 m ID X 1 m T/T	304L SS	MUB	
UTILITY STEAM CONDENSATE COLLECTION TANK	TK-1529	8.7 m ³	2.1 m ID X 2.5 m T/T	304L SS	MUB	
PARTICULATE FILTER - ION EXCHANGE UNIT	F-1551	14 m ³ /hr		304L SS	WAREHOUSE (STORAGE)	
COOLING TOWER	CT-1561	302 GJ/hr		COOLING TOWER		
TOWER WATER PUMP	P-1562A	4,390 m ³ /hr, 600 kPa	CARBON STEEL	COOLING TOWER	50% CAPACITY	
TOWER WATER PUMP	P-1562B	4,390 m ³ /hr, 600 kPa	CARBON STEEL	COOLING TOWER	50% CAPACITY	

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TOWER WATER PUMP	P-1562C	4,390 m ³ /hr, 600 kPa		CARBON STEEL	COOLING TOWER	50% CAPACITY (SPARE)
INHIBITOR ADDITION PUMP	P-1563	1 m ³ /hr, 140 kPa		304L SS	AT COOLING TOWER	
DEMINEALIZER	DM-1591	4.5 m ³ /hr	3 m X 4.9 m	304L SS	MUB	
DEMINEALIZED WATER MAKE-UP PUMP	P-1593A	28.6 m ³ /hr, 310 kPa	(INCLUDED IN DEMIN FOOTPRINT)	304L SS	MUB	100% CAPACITY
DEMINEALIZED WATER MAKE-UP PUMP	P-1593B	28.6 m ³ /hr, 310 kPa	(INCLUDED IN DEMIN FOOTPRINT)	304L SS	MUB	100% CAPACITY (SPARE)
DEMINEALIZED WATER STORAGE TANK	TK-1594	20 m ³	3 m ID X 3.2 m T/T	304L SS	MUB	
FIRE WATER TANK HEATER	HT-1602	66 kW		CARBON STEEL	WPH	100% CAPACITY TK-1612
FIRE WATER TANK HEATER	HT-1603A	66 kW		CARBON STEEL	WPH	100% CAPACITY TK-1613A

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
FIRE WATER PUMP	P-1605A	1,020 m ³ /hr, 820 kPa		CARBON STEEL	WPH	100% CAPACITY
FIRE WATER PUMP	P-1605B	1,020 m ³ /hr, 820 kPa		CARBON STEEL	WPH	100% CAPACITY (DIESEL DRIVEN SPARE)
FIRE WATER HEATER PUMP	P-1606	7 m ³ /hr, 160 kPa		CARBON STEEL	WPH	TK-1612
JOCKEY PUMP	P-1607	10 m ³ /hr, 740 Kpa		CARBON STEEL	WPH	TK-1612
FIRE WATER PUMP	P-1608A	340 m ³ /hr, 855 kPa		CAST IRON	WPH	100% CAPACITY TK-1613A
FIRE WATER PUMP	P-1608B	340 m ³ /hr, 855 kPa		CAST IRON	WPH	100% CAPACITY TK-1613A (DIESEL DRIVEN, SPARE)
JOCKEY PUMP	P-1609A	10 m ³ /hr, 820 kPa		CARBON STEEL	WPH	TK-1613A

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Equipment list
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FIRE WATER HEATER PUMP	P-1610A	7 m ³ /hr, 69 kPa		CAST IRON	WPH	TK-1613A
DIESEL FUEL TRANSFER PUMP	P-1611	9 m ³ /hr, 140 kPa		CARBON STEEL	OUTSIDE WPH	
FIRE WATER STORAGE TANK	TK-1612	2,500 m ³	17 m ID X 12 m H	CARBON STEEL	OUTSIDE WPH	
FIRE WATER STORAGE TANK	TK-1613A	1,710 m ³	17 m ID X 10 m H	CARBON STEEL	OUTSIDE WPH	
DIESEL FUEL STORAGE TANK UNDERGROUND	TK-1614A	45 m ³	3m ID X 6.5 m	FIBERGLASS DOUBLE WALL		OUTSIDE WPH
DIESEL FUEL STORAGE TANK UNDERGROUND	TK-1614B	45 m ³	3m ID X 6.5 m	FIBERGLASS DOUBLE WALL		OUTSIDE WPH
DIESEL FUEL DAY TANK	TK-1615	1 m ³	1 m ID	CARBON STEEL	WPH	
SEWAGE LIFT STATION	LS-1631				(SHELTER)	

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
SUBMERSIBLE GRINDER PUMP	P-1632A	51 m ³ /hr, 101 kPa		304L SS	SEWAGE LIFT STATION	100% CAPACITY
SUBMERSIBLE GRINDER PUMP	P-1632B	51 m ³ /hr, 101 kPa		304L SS	SEWAGE LIFT STATION	100% CAPACITY (SPARE)
ORGANIC ACID WASTE HOLD TANK HEGA FILTER	FG-1641	390 kg/hr		304L SS		
CAUSTIC WASTE HOLD TANK TRANSFER PUMP	P-1642	18 m ³ /hr, 69 kPa		304L SS	BCCB	
CAUSTIC WASTE NEUT TANK TRANSFER PUMP	P-1643	45.5 m ³ /hr, 283 kPa	304L SS	BCCB		
ACID WASTE HOLD TANK TRANSFER PUMP	P-1644	18 m ³ /hr, 69 kPa		304L SS	BCCB	
ORGANIC ACID WASTE NEUT TANK TRANSFER PUMP	P-1645	45.5 m ³ /hr, 283 kPa		304L SS	BCCB	
ORGANIC ACID WASTE HOLD TANK SUMP PUMP	P-1646	4.6 m ³ /hr, 124 kPa		304L SS	BCCB	

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Equipment list
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ORGANIC ACID WASTE HOLD TANK TRANSFER PUMP	P-1647	18 m ³ /hr, 124 kPa		304L SS	BCCB	
WATER PUMPHOUSE SUMP PUMP	P-1648	32 m ³ /hr, 210 kPa		304L SS	WPH	
EFFLUENT DISCHARGE SUMP PUMP P-1649A	P-1649A	68 m ³ /hr, 175 kPa		304L SS	MUB	100% CAPACITY
EFFLUENT DISCHARGE SUMP PUMP P-1649B	P-1649B	68 m ³ /hr, 175 kPa		304L SS	MUB	100% CAPACITY (SPARE)
WATER PUMPHOUSE SUMP	SU-1653	8 m ³		CONCRETE W/7 MIL EPOXY COATING	WPH	
ORGANIC ACID WASTE SUMP	SU-1654	3 m ³		CONCRETE	BCCB	
EFFLUENT DISCHARGE COLLECTION SUMP	SU-1655	24 m ³	CONCRETE W/7 MIL EPOXY COATING	MUB		

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E3-16

EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
CAUSTIC WASTE HOLD TANK	TK-1658	30 m ³	3 m ID X 4.5 m T/T	304L SS	BCCB	
ACID WASTE HOLD TANK	TK-1660	30 m ³	3 m ID X 4.5 m T/T	304L SS	BCCB	
ORGANIC ACID WASTE HOLD TANK	TK-1661	30 m ³	3 m ID X 4.5 m T/T	304L SS	BCCB	
CAUSTIC WASTE NEUTRALIZATION TANK	TK-1662	8 m ³	2 m ID X 3 m T/T	304L SS	BCCB	
ORGANIC ACID WASTE NEUTRALIZATION TANK	TK-1663	8 m ³	2 m ID X 3 m T/T	304L SS	BCCB	
ORGANIC ACID WASTE SUMP TANK	TK-1664	1.9 m ³	1.2 m ID X 2 m T/T	316L SS	BCCB	
DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	F-1691	187 m ³ /hr		304L SS	BCCB	
OXALIC ACID DECON MAKE-UP TANK ROUGHING FILTER	F-1692	187 m ³ /hr		304L SS	BCCB	

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Equipment list

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
MSM DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	F-1693	187 m ³ /hr		304L SS	BCCB	
POTASSIUM PERMANGANATE MAKE-UP TANK ROUGHING FILTER	F-1694	187 m ³ /hr	304L SS	BCCB		
COLD CHEMICAL No 3 MAKE-UP TANK ROUGHING FILTER	F-1695	187 m ³ /hr	304L SS	BCCB		
COLD CHEMICAL No. 1 MAKE-UP TANK ROUGHING FILTER	F-1696	187 m ³ /hr		304L SS	BCCB	
OFF-GAS TREATMENT MAKE-UP TANK ROUGHING FILTER	F-1697	187 m ³ /hr		304L SS	BCCB	
COLD CHEMICAL No. 2 MAKE-UP TANK ROUGHING FILTER	F-1698	187 m ³ /hr		304L SS	BCCB	
NITRIC ACID DECON MAKE-UP TANK ROUGHING FILTER	F-1699	187 m ³ /hr		304L SS	BCCB	
COLD CHEMICAL No.1 TRANSFER PUMP	P-1700	3.2 m ³ /hr, 575 kPa		304L SS	BCCB	

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
OFFGAS TREATMENT CHEMICAL TRANSFER PUMP	P-1701	16 m ³ /hr, 345 kPa		316L SS	BCCB	
COLD CHEMICAL No.2 TRANSFER PUMP	P-1702	16 m ³ /hr, 600 kPa		316L SS	BCCB	
50 PERCENT NITRIC ACID UNLOADING PUMP	P-1703	25 m ³ /hr, 331 kPa		304L SS	BCCB	
ACID WASTE SUMP PUMP	P-1704			316L SS	BCCB	
NITRIC ACID DECON TRANSFER PUMP	P-1705	13 m ³ /hr, 510 kPa		304L SS	BCCB	
DECON SOLUTION TRANSFER PUMP	P-1706	13 m ³ /hr, 540 kPa		316L SS	BCCB	
MSM DECON SOLUTION TRANSFER PUMP	P-1707	13 m ³ /hr, 540 kPa		316L SS	BCCB	

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Equipment list
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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
OXALIC ACID DECON TRANSFER PUMP	P-1708	13 m ³ /hr, 495 kPa		316L SS	BCCB	
POTASSIUM PERMANGANATE TRANSFER PUMP	P-1709	13 m ³ /hr, 360 kPa		304L SS	BCCB	
COLD CHEMICAL No.3 TRANSFER PUMP	P-1710	13 m ³ /hr, 360 kPa		304L SS	BCCB	
50 PERCENT CAUSTIC UNLOADING PUMP	P-1711	25 m ³ /hr, 415 kPa			316L SS	BCCB
CAUSTIC WASTE SUMP PUMP	P-1712	13 m ³ /hr, 110 kPa		316L SS	BCCB	
COLD CHEMICAL No.4 TRANSFER PUMP	P-1713	13 m ³ /hr, 410 kPa			316L SS	BCCB
ACID WASTE SUMP	SU-1714	23 m ³		CONCRETE LINED W/304L SS	BCCB	
CAUSTIC WASTE SUMP	SU-1715	23 m ³		CONCRETE LINED W/304L SS	BCCB	

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
COLD CHEMICAL No. 1 MAKE-UP TANK	TK-1716	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
OFFGAS TREATMENT CHEMICAL MAKE-UP TANK	TK-1717	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
COLD CHEMICAL No. 2 MAKE-UP TANK	TK-1718	4 m ³	1.5 m ID X 2.5 m T/T	316L SS	BCCB	
NITRIC ACID DECON MAKE-UP TANK	TK-1719	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
DECON SOLUTION MAKE-UP TANK	TK-1720	4 m ³	1.5 m ID X 2.5 m T/T	316L SS	BCCB	
MSM DECON SOLUTION MAKE-UP TANK	TK-1721	15 m ³	2.6 m ID X 3 m T/T	304L SS	BCCB	
OXALIC ACID DECON MAKE-UP TANK	TK-1722	4 m ³	1.5 m ID X 2.5 m T/T	316L SS	BCCB	
POTASSIUM PERMANGANATE MAKE-UP TANK	TK-1723	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	

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COLD CHEMICAL No. 3 MAKE-UP TANK	TK-1724	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
COLD CHEMICAL No. 4 MAKE-UP TANK	TK-1725	4 m ³	1.5 m ID X 2.5 m T/T	316L SS	BCCB	
ACID WASTE SUMP TANK	TK-1726	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
CAUSTIC WASTE SUMP TANK	TK-1727	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
ACID VENT BLOWER	MB-1761A	510 sm ³ /hr		304L SS	BCCB	100% CAPACITY
ACID VENT BLOWER	MB-1761B	510 sm ³ /hr		304L SS	BCCB	100% CAPACITY (SPARE)
FSMT VENT FILTER	F-1771	73 m ³ /hr		304L SS	BCCB	

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
FSMT TRANSFER PUMP	P-1772	4.5 m ³ /hr, 400 kPa		316L SS	BCCB	
FSMT SAMPLE PUMP	P-1773	4 m ³ /hr, 140 kPa		316L SS	BCCB	
FRIT SLURRY SUMP	SU-1774	0.3 m ³	0.5 m X 0.5 m X 1 m D	CONCRETE LINED W/304L SS	BCCB	
FRIT SLURRY MAKE-UP TANK (FSMT)	TK-1775	4 m ³	1.5 m ID X 2.5 m T/T	304L SS	BCCB	
SAND STORAGE BIN	B-1901	156 m ³	5 m X 5 m X 12.5 m	CARBON STEEL	BCCB PAD	
SAND RAIL CAR UNLOADER	XE-1902				BCCB PAD	
TRUCK UNLOADER	XE-1903				BCCB PAD	
B203 STORAGE BIN	B-1904	125 m ³ , 4 EA	4 m X 5 m X 6.5 m H	CARBON STEEL	BCCB PAD	

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EQUIPMENT DESCRIPTION	EQUIPMENT ID	CAPACITY/ FLOWRATE	PHYSICAL SIZE	MATERIAL	BLDG	COMMENTS
Li2 O STORAGE BIN	B-1905	153 m ³ , 2 EA	5 m X 5 m X 11 m H	CARBON STEEL	BCCB PAD	
CaO STORAGE BIN	B-1906	43 m ³	3 m X 3 m X 10 m H	CARBON STEEL	BCCB PAD	
MgO STORAGE BIN	B-1907	43 m ³	3 m X 3 m X 10 m H	CARBON STEEL	BCCB PAD	
LLW BATCH MIXER	MM-1909				BCCB PAD	
CONVEYOR BIN TO MIXER	XE-1914				BCCB PAD	
LLW GLASS FORMER CONVEYOR	XE-1915				BCCB	
SODIUM NITRITE STORAGE BIN	B-1920	125 m ³	4 m X 5 m X 6.5 m H	CARBON STEEL	BCCB PAD	USED AS CORROSION INHIBITOR FOR SEPARATIONS EFFLUENT TO TANK FARM

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TSP STORAGE BIN	B-1921	94 m ³	4.5 m X 4.5 m X 10 m H	CARBON STEEL	ADJACENT TO BCCB	
SHIELD WINDOWS	SZ-2910	7 EACH	SIMILIAR TO SZ-2204-3		ANALY FACILITY	
MSM 3 PIECE	MS-2911	14 EACH	SIMILIAR TO SZ-2202-3B		ANALY FACILITY	
DIESEL FUEL TANK	TK-2914	2 EACH, 26.5 m ³	m ID X 3.25 m T/T	CARBON STEEL	ADJACENT TO EMER GEN BLDG	
DAY DIESEL FUEL TANK	TK-2915	2 EACH, 2.3 m ³	2 m ID X 1.6 m T/T	CARBON STEEL	EMER GEN BLDG	
EMERGENCY GENERATOR	DG-2916	2 EACH, 1 MW	2 m X 2 m X 2.5 m H	EMER GEN BLDG		

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Accession #: D195067281

Document #: SD-W378-ES-002

Title/Desc:

FACILITY DESIGN PHILOSOPHY TWRS PROCESS SUPPORT &
INFRASTRUCTURE DEFINITION [SEC 3 OF 4]

Pages: 151

THIS DOCUMENT WAS TOO LARGE TO SCAN AS A SINGLE DOCUMENT. IT REQUIRED BREAKING INTO SMALLER SECTIONS.

DOCUMENT NUMBER: SD-W378-ES-002

SECTION: 3 OF 4

TITLE: Facility Design Philosophy, Tank Waste
Remediation Systems Process Support & Infrastructure
Definition

AUTHOR: Leach, Gallraith

RECIPIENT:

DATE: 12/11/95

KEYWORDS:

REFERENCES: EDT-613161

APPENDIX F

SUPPORT FACILITY LAYOUTS

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Figure F-2. Utility
Distribution Plan.

LEGEND

- AF ANALYTICAL FACILITY
BCCB BULK COLD CHEMICAL BUILDING
BHA BULK HANDLING AREA
EGE EMERGENCY GENERATOR BUILDING
ERC EMERGENCY RESPONSE CENTER
FAS FABRICATION & ASSEMBLY SHOP
HLWVP HLW VITRIFICATION BUILDING
HCBR CONTACT FILTER/BLOWER ROOM ANNEX (HL)
HCCA CONDENSATE COLLECTION ANNEX (HL)
HCHA CANISTER/CASK HANDLING ANNEX (HL)
HFFA FAN/FILTER ANNEX (HL)
HFFE REGULATED FACILITY ENTRY ANNEX (HL)
LLWVP LLW VITRIFICATION BUILDING (NOTE 3)
LCBR CONTACT FILTER/BLOWER ROOM ANNEX (LL)
LCCA CONDENSATE COLLECTION ANNEX (LL)
LCSA CONTAINER STAGING ANNEX (LL)
LFFA FAN/FILTER ANNEX (LL)
LFFE REGULATED FACILITY ENTRY ANNEX (LL)
MUB MECHANICAL UTILITY BUILDING
OSB OPERATIONS SUPPORT BUILDING
RCE REGULATED TWRX COMPLEX ENTRY
SERV/STOR SERVICE/STORAGE YARD
SCB SWITCHGEAR BUILDING
SHIP/RECVG SHIPPING AND RECEIVING BUILDING
WHSE WAREHOUSE
WPH WATER PUMPHOUSE
PRIMARY UNDERGROUND ELECTRICAL
PRIMARY ABOVE AND UNDERGROUND
PROCESS AND UTILITY PIPING
- AF BCCB BHA EGE ERC FAS HLWVP HCBR HCCA HCHA HFFA HFFE LLWVP LCBR LCCA LCSA LFFA LFFE MUB OSB RCE SERV/STOR SCB SHIP/RECVG WHSE WPH

NOTE:

1. RAW WATER AND SANITARY WATER ARE ASSUMED TO TIE INTO EXISTING UNDERGROUND LINES AT 4TH STREET.
2. NO ON-SITE SEWAGE TREATMENT. THE SEWAGE SYSTEM IS ASSUMED TO TIE INTO THE PROPOSED (L-116) 200 AREA SANITARY SEWER SYSTEM.
3. LLWVP INCLUDES SEPARATIONS PLANT.

REFERENCE DRAWINGS

NOT USED ON

DISTRIBUTION CODE

00 DATE ISSUED FOR 2001 REPORT		REVISIONS		REVISIONS	
REV	DATE	DESCRIPTION	DATE	DESCRIPTION	DATE
ENGINEERING RELEASE					
REV	DATE	DESCRIPTION	DATE	DESCRIPTION	DATE
END					
U.S. DEPARTMENT OF ENERGY					
FLUOR DANIEL, INC.					
ADVANCED TECHNOLOGY DIVISION					
TWRS TREATMENT COMPLEX					
UTILITY DISTRIBUTION PLAN					
TANK WASTE REGENERATION SYSTEM					
2001/2011					
1" = 200'					
NOT RECD					
ALT-SITE-2					
1 1 00					

Figure F-3. Site Plan.

NOTE:

1. OVERALL COMPLETION
2. LLWVP

[illegible]

200 EAST AREA

Figure 2.1 - TWRS treatment Complex Site Plan

WHC-SD-W378-ES-002 (Rev 1 september 28, 1995)

DATE		TIME	

NEXT USED ON	

DRAWING TITLE	
FENCE DRAWINGS	

DRAWING NO.	
2	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	12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Figure F-4. Analytical Facility -
First Floor Plan. (Sheet 1 of 5)

- NOTES:
- BUILDING CONSTRUCTION
 - CONCRETE FLOOR SLAB & FOUNDATIONS
 - STEEL FRAME STRUCTURE EXCEPT AT ANALYTICAL AREA & MSM DECON & REPAIR AREA
 - CONCRETE COLUMNS & BEAMS AT ANALYTICAL AREA & MSM DECON & REPAIR AREA
 - CONCRETE/METAL DECK FLOORS
 - INSULATED METAL SIDING
 - MEMBRANE ROOFING SUPPORTED BY STEEL DECKING & INSULATION BOARD

FIRST FLOOR
EL. 0.00M (0'-0")

REFERENCE DRAWINGS

CD 7/1/94	ISSUED FOR 2001 REPORT	PROJECT 231814ACD210-CE-SS
REV NO.	DATE	DESCRIPTION
1	7/1/94	ANALYTICAL FACILITY
2	7/1/94	ANALYTICAL FACILITY
3	7/1/94	ANALYTICAL FACILITY
4	7/1/94	ANALYTICAL FACILITY
5	7/1/94	ANALYTICAL FACILITY
6	7/1/94	ANALYTICAL FACILITY
7	7/1/94	ANALYTICAL FACILITY
8	7/1/94	ANALYTICAL FACILITY
9	7/1/94	ANALYTICAL FACILITY
10	7/1/94	ANALYTICAL FACILITY
11	7/1/94	ANALYTICAL FACILITY
12	7/1/94	ANALYTICAL FACILITY
13	7/1/94	ANALYTICAL FACILITY
14	7/1/94	ANALYTICAL FACILITY
15	7/1/94	ANALYTICAL FACILITY
16	7/1/94	ANALYTICAL FACILITY
17	7/1/94	ANALYTICAL FACILITY
18	7/1/94	ANALYTICAL FACILITY
19	7/1/94	ANALYTICAL FACILITY
20	7/1/94	ANALYTICAL FACILITY
21	7/1/94	ANALYTICAL FACILITY
22	7/1/94	ANALYTICAL FACILITY
23	7/1/94	ANALYTICAL FACILITY
24	7/1/94	ANALYTICAL FACILITY
25	7/1/94	ANALYTICAL FACILITY
26	7/1/94	ANALYTICAL FACILITY
27	7/1/94	ANALYTICAL FACILITY
28	7/1/94	ANALYTICAL FACILITY
29	7/1/94	ANALYTICAL FACILITY
30	7/1/94	ANALYTICAL FACILITY
31	7/1/94	ANALYTICAL FACILITY
32	7/1/94	ANALYTICAL FACILITY
33	7/1/94	ANALYTICAL FACILITY
34	7/1/94	ANALYTICAL FACILITY
35	7/1/94	ANALYTICAL FACILITY
36	7/1/94	ANALYTICAL FACILITY
37	7/1/94	ANALYTICAL FACILITY
38	7/1/94	ANALYTICAL FACILITY
39	7/1/94	ANALYTICAL FACILITY
40	7/1/94	ANALYTICAL FACILITY
41	7/1/94	ANALYTICAL FACILITY
42	7/1/94	ANALYTICAL FACILITY
43	7/1/94	ANALYTICAL FACILITY
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96	7/1/94	ANALYTICAL FACILITY
97	7/1/94	ANALYTICAL FACILITY
98	7/1/94	ANALYTICAL FACILITY
99	7/1/94	ANALYTICAL FACILITY
100	7/1/94	ANALYTICAL FACILITY

Figure F-4. Analytical Facility -
Mezzanine Floor Plan. (Sheet 2 of 5)

[illegible]

SECOND FLOOR
EL. 6.10M (20'-0")

FIG. NO.	FIGURE TITLE
REFERENCE DRAWINGS	
NEXT USED ON	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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F-15/F-16

WHC-SD-W378-ES-002
Revision 0

Figure F-4. Analytical Facility -
Section A. (Sheet 5 of 5)

SECTION A
SHTS 1,2,3,4

REFERENCE DRAWINGS
NEXT USED ON

00	7/04	ISSUED FOR 2001 REPORT	2818ACD210.C2/SS
01	01	ANFAC2E	2818ACD210.C2/SS
02	01	ANFAC2E	2818ACD210.C2/SS
03	01	ANFAC2E	2818ACD210.C2/SS
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06	01	ANFAC2E	2818ACD210.C2/SS
07	01	ANFAC2E	2818ACD210.C2/SS
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96	01	ANFAC2E	2818ACD210.C2/SS
97	01	ANFAC2E	2818ACD210.C2/SS
98	01	ANFAC2E	2818ACD210.C2/SS
99	01	ANFAC2E	2818ACD210.C2/SS
100	01	ANFAC2E	2818ACD210.C2/SS

Plan at 0.00M. (Sheet 1 of 2)

Figure F-5. Bulk Cold Chemical Building
Plan at 9.14M. (Sheet 2 of 2)

PLAN @ EL. 9.14M (30'-0")

[illegible]

Figure F-6. Bulk Handling Area.

[illegible]

Figure F-7. Emergency Response Center.

 

1

Figure F-10. Operation
Support Building.

FIRST
FLOOR

- NOTES:
- BUILDING CONSTRUCTION
 - CONCRETE FLOOR SLAB AND FOUNDATIONS
 - STEEL FRAME STRUCTURE
 - CONCRETE/METAL DECK FLOORS
 - INSULATED METAL SIDING
 - MEMBRANE ROOF SUPPORTED BY STEEL DECKING AND INSULATION BOARD

00	1/1/01	ISSUED FOR 2001 REPORT	REPORT NUMBER	2838JNACD210.C72.SS
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4	4	1/1/01	END	
5	5	1/1/01	DATE	
6	6	1/1/01	REV	
7	7	1/1/01	END	
8	8	1/1/01	DATE	
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100	100	1/1/01	END

NEXT USED ON	REFERENCE DRAWINGS
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SECOND
FLOOR

SECTION
A
SHT 1

1

DISTRIBUTION CODE

Figure F-11. Shipping and Receiving.

- CONCRETE FLOOR SLAB AND FOUNDATIONS
- STEEL FRAME STRUCTURE
- INSULATED METAL SIDING
- MEMBRANE ROOFING SUPPORTED BY STEEL DECKING AND INSULATION BOARD

[illegible]

Job no.	Worksheet No.
REFERENCE DRAWINGS	
NEXT USED ON	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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Figure F-12. Switchgear Building

SECTION A-A

- NOTES:
- BUILDING CONSTRUCTION
- CONCRETE VAULT WALLS, FLOOR AND ROOF
 - CONCRETE FLOOR SLAB AND FOUNDATIONS
 - STEEL FRAME STRUCTURE
 - INSULATED METAL SIDING
 - MEMBRANE ROOF SUPPORTED BY STEEL DECKING AND INSULATION BOARD

DETACHED PLAN 'A'

ROOF EL. 3.66M (12'-0")

REFERENCE DRAWINGS

DATE: 10/1/88

BY: J. SMITH

SCALE: 1/8" = 1'-0"

NOT RECD

ES-SWG-1

1 1 1 00

DISTRIBUTION CODE

ACAD

INITIALS

DATE

F-37/F-38

KEY PLAN

WHC-SD-W378-ES-002
Revision 0

Figure F-13. Warehouse.

- NOTES:**
- BUILDING CONSTRUCTION**
- CONCRETE FLOOR SLAB AND FOUNDATIONS
 - STEEL FRAME STRUCTURE
 - INSULATED METAL SIDING
 - MEMBRANE ROOFING SUPPORTED BY STEEL
 - DECKING AND INSULATION BOARD
 - TWO REQUIRED

SECTION _____
NONE

DO	1/1/04	ISSUED FOR 2001 REPORT	REPORT NUMBER	2001-01
REV	01	DATE	1/1/04	1/1/04
REV	02	DATE	1/1/04	1/1/04
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REV	73	DATE	1/1/04	1/1/04
REV	74	DATE	1/1/04	1/1/04
REV	75	DATE	1/1/04	1/1/04
REV	76	DATE	1/1/04	1/1/04

APPENDIX G1

BASE CASE SUPPORT FACILITY CONFIGURATION COST BASIS

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Mr. R. A. Smith,
Westinghouse Hanford Company
DPC-2 (G6-51)
Post Office Box 1970
2355 Stevens Drive
Richland, WA 99352

FLUOR DANIEL, INC.

Date: July 1, 1994

Reference: Hanford Waste Vitrification Plant
WHC P.O. TVW-SVV-370252
Fluor Contract 4363

Transmittal No.: FRT-2531

Dear Mr. Smith:

TRANSMITTAL

We enclose 1 copy of the items listed below. This is issued for:

☐ Approval ☐ Reference ☐ Review and Comment ☒ Other Final Issue

Response due to Fluor: N/A

Responds to: N/A

Number	Rev.	Date	Title
		06-17-94	Centralized Support Facilities, (Rev. 1)
			Reports:
			DOE R01 (Summary)
			DOE R02 (Summary)
			DOE R04 (Summary)
			DOE R05 (Summary)
			DOE R08 (Estimate)

Distribution:

M. D. Talbot, WHC-RL, w/1
K. Boomer, WHC-RL, w/1
J. Garfield, WHC-RL, w/1
T. Waldo, WHC-RL, w/1
J. Galbraith, WHC-RL, w/1

Very truly yours,

R. S. Poulter
Project Director

RSP:LAG:sd

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

DOE TEST - INTERACTIVE ESTIMATING **
TMR5-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R01 - PROJECT COST SUMMARY

PAGE 1 OF 1
DATE 06/17/96 06:57:00
BY JFD/PCA/RLJ/AAF

COST CODE	DESCRIPTION	ESCALATED TOTAL COST	CONTINGENCY X	TOTAL	TOTAL DOLLARS
000	ENGINEERING	90,000,000	40	36,000,000	126,000,000
400	IMPROVEMENTS TO LAND	15,850,000	40	6,340,000	22,190,000
501	BUILDINGS	136,440,000	40	54,576,000	191,010,000
600	UTILITIES	53,720,000	40	21,490,000	75,210,000
700	SPECIAL EQUIP/PROCESS SYSTEMS	74,890,000	40	29,960,000	104,850,000
	(ADJUSTED TO MEET DOE 5100.4)				
	PROJECT TOTAL	370,900,000	40	148,360,000	519,260,000

REMARKS:	
TYPE OF ESTIMATE	S T U D Y
ARCHITECT ENGINEER	FLUOR DANIEL
OPERATING CONTRACTOR	WESTINGHOUSE HANFORD COMPANY
COSTS ARE EXPRESSED IN CURRENT YEAR (1994) DOLLARS. ESCALATION TO PROJECT CENTROID IS EXCLUDED.	
(ROUNDED/ADJUSTED TO THE NEAREST * 10,000 / 100,000 * - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)	

FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436302

*** TEST - INTERACTIVE ESTIMATING ***
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE OF
DATE 06/17/94 06:57:56
BY JFD/PCA/RLJ/AAF

WBS DESCRIPTION	ESTIMATE SUBTOTAL	ON-SITE INDIRECTS	SUB TOTAL	ESCALATION %	SUB TOTAL	CONTINGENCY %	TOTAL DOLLARS
111 ENGINEERING	90000000	0	90000000	0.00	0	40	126000000
SUBTOTAL 11 ENGINEERING	90000000	0	90000000	0.00	0	40	126000000
SUBTOTAL 1 ENGINEERING	90000000	0	90000000	0.00	0	40	126000000
292 CENTRALIZED FACILITY EQUIPMENT	40880831	0	40880831	0.00	0	40	57233165
SUBTOTAL 29 CENTRALIZED FACILITIES	40880831	0	40880831	0.00	0	40	57233165
SUBTOTAL 2 PROCUREMENT	40880831	0	40880831	0.00	0	40	57233165
33A VIT REGULATED ENTRANCE BUILDING	26568542	0	26568542	0.00	0	40	37195959
33B OPERATIONS SUPPORT BUILDING	6600000	0	6600000	0.00	0	40	9240000
33C REGULATED ENTRANCE BUILDING	7700000	0	7700000	0.00	0	40	10780000
33D OPERATIONS CONTROL BUILDING	2475000	0	2475000	0.00	0	40	3465000
33E COLD CHEMICAL BUILDING	5906050	0	5906050	0.00	0	40	8268470
33F MECHANICAL UTILITIES BUILDING	5906050	0	5906050	0.00	0	40	8268470
33G SWITCHGEAR GENERATOR BUILDING	23123880	0	23123880	0.00	0	40	32373432
33H FABRICATION SHOP	2459647	0	2459647	0.00	0	40	3443506
33I MOCK-UP SHOP	2459647	0	2459647	0.00	0	40	3443506
33J WAREHOUSES	5872081	0	5872081	0.00	0	40	8220913
33K FEED AND EFFLUENT TRANSFER LINES	3279599	0	3279599	0.00	0	40	4591439
33L SWITCHYARD & POWER LINES	9752592	0	9752592	0.00	0	40	13653629
33M SHARED UTILITIES	43865025	0	43865025	0.00	0	40	61411034
SUBTOTAL 33 CENTRALIZED FACILITIES	145968113	0	145968113	0.00	0	40	204355358
340 SITEWORK	39054440	0	39054440	0.00	0	40	54676216
SUBTOTAL 34 SITEWORK	39054440	0	39054440	0.00	0	40	54676216
SUBTOTAL 3 CONSTRUCTION	185022553	0	185022553	0.00	0	40	259031574
411 CONSTRUCTION MANAGEMENT	20000000	0	20000000	0.00	0	40	28000000
SUBTOTAL 41 CONSTRUCTION MANAGEMENT	20000000	0	20000000	0.00	0	40	28000000

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TMS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE OF
DATE 06/17/94 06:57:57
BY JFD/PCA/RLJ/AAF

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION X TOTAL	SUB TOTAL	CONTINGENCY X TOTAL	TOTAL DOLLARS
SUBTOTAL 4	CONSTRUCTION MANAGEMENT	20000000	0	20000000	0.00	0	20000000	40 8000000 28000000
511	PROJECT MANAGEMENT	35000000	0	35000000	0.00	0	35000000	40 14000000 49000000
SUBTOTAL 51	PROJECT MANAGEMENT	35000000	0	35000000	0.00	0	35000000	40 14000000 49000000
SUBTOTAL 5	PROJECT MANAGEMENT	35000000	0	35000000	0.00	0	35000000	40 14000000 49000000

PROJECT TOTAL		370,903,384	0	370,903,384	0.00	0	370,903,384	40 148,361,355 519,264,739

G1-6

WHC-SD-W378-ES-002
Revision 0

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R04 - COST CODE ACCOUNT SUMMARY

PAGE 06/17/94 06:58:12
OF
DATE
BY JFD/PCA/RLJ/AAF

COST CODE/UBS	DESCRIPTION	ESTIMATE SUBTOTAL	ON-SITE INDIRECTS	SUB TOTAL	ESCALATION %	SUB TOTAL	CONTINGENCY %	SUB TOTAL	TOTAL DOLLARS
000	ENGINEERING								
111	ENGINEERING	90000000	0	90000000	0.00	0	40	36000000	126000000
411	CONSTRUCTION MANAGEMENT	0	0	0	0.00	0	0	0	0
511	PROJECT MANAGEMENT	0	0	0	0.00	0	0	0	0
TOTAL 000	ENGINEERING	90000000	0	90000000	0.00	0	40	36000000	126000000
460	IMPROVEMENTS TO LAND								
340	SITEWORK	12743668	0	12743668	0.00	0	40	5097467	17841135
411	CONSTRUCTION MANAGEMENT	1130000	0	1130000	0.00	0	40	452000	1582000
511	PROJECT MANAGEMENT	1975000	0	1975000	0.00	0	40	790000	2765000
TOTAL 460	IMPROVEMENTS TO LAND	15848668	0	15848668	0.00	0	40	6339467	22188135
501	BUILDINGS								
33A	VIT REGULATED ENTRANCE BUILDING	26568542	0	26568542	0.00	0	40	10627417	37195959
33B	OPERATIONS SUPPORT BUILDING	6600000	0	6600000	0.00	0	40	2640000	9240000
33C	REGULATED ENTRANCE BUILDING	7700000	0	7700000	0.00	0	40	3080000	10780000
33D	OPERATIONS CONTROL BUILDING	2475000	0	2475000	0.00	0	40	990000	3465000
33E	COLD CHEMICAL BUILDING	5906050	0	5906050	0.00	0	40	2362420	8268470
33F	MECHANICAL UTILITIES BUILDING	5906050	0	5906050	0.00	0	40	2362420	8268470
33G	SWITCHGEAR GENERATOR BUILDING	23123880	0	23123880	0.00	0	40	9249552	32373432
33H	FABRICATION SHOP	2459647	0	2459647	0.00	0	40	983859	3443506
33I	MOCK-UP SHOP	2459647	0	2459647	0.00	0	40	983859	3443506
33J	WAREHOUSES	5872081	0	5872081	0.00	0	40	2348832	8220913
340	SITEWORK	20651190	0	20651190	0.00	0	40	8260476	28911666
411	CONSTRUCTION MANAGEMENT	9715000	0	9715000	0.00	0	40	3886000	13601000
511	PROJECT MANAGEMENT	17000000	0	17000000	0.00	0	40	6800000	23800000
TOTAL 501	BUILDINGS	136437087	0	136437087	0.00	0	40	54574835	191011922
600	UTILITIES								
292	CENTRALIZED FACILITY EQUIPMENT	23460891	0	23460891	0.00	0	40	9384356	32845247

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R04 - COST CODE ACCOUNT SUMMARY

PAGE 06
DATE 06/17/94 06:58:13
BY JFD/PCA/RLJ/AAF

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
33L	SWITCHYARD & POWER LINES	9752592	0	9752592	0.00	0	40	13653629
33N	SHARED UTILITIES	4329705	0	4329705	0.00	0	40	6061587
340	SITEWORK	5659582	0	5659582	0.00	0	40	7923415
411	CONSTRUCTION MANAGEMENT	3825000	0	3825000	0.00	0	40	5355000
511	PROJECT MANAGEMENT	6695000	0	6695000	0.00	0	40	9373000
TOTAL 600	UTILITIES	53722770	0	53722770	0.00	0	40	75211878
700	SPECIAL EQUIP/PROCESS SYSTEMS							
292	CENTRALIZED FACILITY EQUIPMENT	17419940	0	17419940	0.00	0	40	24387918
33K	FEED AND EFFLUENT TRANSFER LINES	3279599	0	3279599	0.00	0	40	4591439
33N	SHARED UTILITIES	39535320	0	39535320	0.00	0	40	55349447
411	CONSTRUCTION MANAGEMENT	5330000	0	5330000	0.00	0	40	7462000
511	PROJECT MANAGEMENT	9330000	0	9330000	0.00	0	40	13062000
TOTAL 700	SPECIAL EQUIP/PROCESS SYSTEM	74894859	0	74894859	0.00	0	40	104852804
PROJECT TOTAL		370,903,384	0	370,903,384	0.00	0	40	519,264,739

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION

PAGE OF
DATE 06/17/94 06:58:26
BY JFD/PCA/RLJ/AAF

CSI DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	SUB TOTAL	CONTINGENCY %	TOTAL DOLLARS
ENGINEERING							
91 ENGINEERING AND DESIGN	90000000	0	90000000	0.00	0	40	126000000
92 CONSTRUCTION MANAGEMENT	0	0	0	0.00	0	0	0
93 PROJECT MANAGEMENT	0	0	0	0.00	0	0	0
TOTAL ENGINEERING	90,000,000	0	90,000,000	0.00	0	36,000,000	126,000,000
CONSTRUCTION							
01 GENERAL REQUIREMENTS	91239672	0	91239672	0.00	0	40	127735541
02 SITE WORK	33394858	0	33394858	0.00	0	40	46752801
11 EQUIPMENT	17419940	0	17419940	0.00	0	40	24387918
15 MECHANICAL	40646144	0	40646144	0.00	0	40	56904601
16 ELECTRICAL	43202770	0	43202770	0.00	0	40	60483878
92 CONSTRUCTION MANAGEMENT	20000000	0	20000000	0.00	0	40	28000000
93 PROJECT MANAGEMENT	35000000	0	35000000	0.00	0	40	49000000
TOTAL CONSTRUCTION	280,903,384	0	280,903,384	0.00	0	112,361,355	393,264,739
PROJECT TOTAL	370,903,384	0	370,903,384	0.00	0	148,361,355	519,264,739

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TWS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK. REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 1
DATE 06/17/94 06:59:23
BY JFD/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	ON&P / 8 & 1	TOTAL DOLLARS
111000	ENGINEERING									
111000.9110001	ENGINEERING: TITLE 1,11,111 DESIGN ESTIMATED @ 40% OF TOTAL DIRECT COSTS.	000	1 LOT	0	0	0	0 900000000	0	0	0 900000000

TOTAL WBS 111000 ENGINEERING				0	0	0	90,000,000	0	0	90,000,000

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 2
DATE 06/17/94 06:59:23
BY JFD/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	DN&P / B & I	TOTAL DOLLARS
292320	NORMAL ELECTRICAL DISTRIBUTION										
292320.16	ELECTRICAL										
292320.1661001	SG-1801-C SWITCHGEAR SWITCHGEAR/GENRTR 13.8KV	600	1 EA	0	0	0	0	0	500000	25000	525000
292320.1661005	SG-1802,-1803-C EMERGENCY SWITCHGEAR 480 V	600	2 EA	0	0	0	0	0	200000	10000	210000
292320.1661010	SG-1804-C SWITCHGEAR-LLW FACILITY 13.8 KV	600	1 EA	0	0	0	0	0	500000	25000	525000
292320.1661015	SG-1805-C SWITCHGEAR-LLW FACILITY 13.8 KV	600	1 EA	0	0	0	0	0	500000	25000	525000
292320.1661020	SG-1806-C SWITCHGEAR-PRETREAT FACILITY 13.8 KV	600	1 EA	0	0	0	0	0	500000	25000	525000
292320.1661025	SG-1807-C SWITCHGEAR-ANCILLARY FACIL- ITIES 13.8 KV	600	1 EA	0	0	0	0	0	500000	25000	525000
292320.1661030	KT-1808,-1809-C EMERGENCY TRANSFORMERS 13.8-.48 KV	600	2 EA	0	0	0	0	0	1060000	53000	1113000
292320.1661035	LC-1810-C UNIT SUBSTA-COOLING TOWER 13.8-4.16 KV	600	1 EA	0	0	0	0	0	1060000	53000	1113000
292320.1661040	LC-1811-C UNIT SUBSTA-MECH/UTIL 13.8-4.16 KV	600	1 EA	0	0	0	0	0	1060000	53000	1113000
292320.1661045	LC-1812-C UNIT SUBSTA-FAB HOUSE 13.8-4.16 KV	600	1 EA	0	0	0	0	0	1060000	53000	1113000
292320.1661050	LC-1813-C UNIT SUBSTA-WAREHOUSES 13.8-.48 KV	600	1 EA	0	0	0	0	0	530000	26500	556500
292320.1661055	LC-1814-C UNIT SUBSTA-FAB SHOP 13.8-.48 KV	600	1 EA	0	0	0	0	0	530000	26500	556500
292320.1661060	LC-1815-C UNIT SUBSTA-COLD CNEM 13.8-.48 KV	600	1 EA	0	0	0	0	0	530000	26500	556500

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FLUOR DANIEL INC.
WESTINGHOUSE MANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE ROB - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 3
DATE 06/17/94 06:59:24
BY JFD/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
292320.1661065	LC-1816-C UNIT SUBSTA-OP CONT BLDG 13.8-.48 KV	600	1 EA	0	0	0	0	0	530000	26500	556500
292320.1661070	LC-1817-C UNIT SUBSTA-REG ENT BLDG 13.8-.48 KV	600	1 EA	0	0	0	0	0	530000	26500	556500
292320.1661075	LC-1818-C UNIT SUBSTA-OPS SUPPORT BLDG 13.8-.48 KV	600	1 EA	0	0	0	0	0	530000	26500	556500
292320.1661080	LC-1819-1820-C UNIT SUBSTA-MECH/UTIL 13.8-.48 KV	600	2 EA	0	0	0	0	0	1060000	53000	1113000
292320.1661085	1 E GENERATORS W/DAY TANKS,PUMPS & PANELS 1 MW	600	1 LOT	0	0	0	0	0	7098000	354900	7452900
292320.1661090	MCC'S ASSOCIATED W/SG	600	120 EA	0	0	0	0	0	2449000	122450	2571450
SUBTOTAL ELECTRICAL											
SALES TAX 7.80 X											
ON&P (ON MARKUPS ONLY)											
COST CODE 60016											
WBS 292320											
(ESCALATION 0.00% - CONTINGENCY 40.00 X)											
TOTAL											
20,727,000											
1616706											
80835											
21,763,350											
1,117,185											
23,460,891											
TOTAL WBS 292320 NORMAL ELECTRICAL DISTRIBUTION											
0											
1,117,185											
23,460,891											

PAGE 4
DATE 06/17/94 06:59:25
BY JED/PCA/RLJ/AAF

** TEST - INTERACTIVE ESTIMATING **
THRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R06 - ESTIMATE DETAIL BY WBS / COST CODE

FLUOR DANIEL INC.
WESTINGHOUSE MANFORD COMPANY
JOB NO. 436302

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ORHP / B & I	TOTAL DOLLARS
292410	COMPRESSED AIR										
292410.11	EQUIPMENT										
292410.1142001	VX-1505 INSTRUMENT AIR RECEIVER 1,542 FT3	700	1 EA	0	0	0	0	0	51000	2550	53550
292410.1142002	VX-1506 PLANT AIR RECEIVER 13,390 FT3	700	1 EA	0	0	0	0	0	366000	18300	384300
292410.1143001	CX-1502A/B INSTRUMENT/PLANT AIR COMPRESSOR 11,500 SCFM	700	2 EA	0	0	0	0	0	630000	31500	661500
292410.1147001	DY-1503A/B INSTRUMENT AIR DRYER 1,170 SCFM	700	2 EA	0	0	0	0	0	92000	4600	96600
292410.1147002	FL-1504A/B PLANT AIR FILTER 11,200 SCFM	700	2 EA	0	0	0	0	0	22000	1100	23100
292410.1148001	BX-1501A THRU E BREATHING AIR CART 6.6 SCFM	700	5 EA	0	0	0	0	0	65000	3250	68250

SUBTOTAL	EQUIPMENT			0	0	0	0	0	61,300		1,287,300
	SALES TAX 7.80 %								1,226,000		95628
	ORHP (ON MARKUPS ONLY)									4781	4781

TOTAL	COST CODE 70011										
	WBS 292410										
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)								1,321,628	66,081	1,387,709

TOTAL WBS 292410	COMPRESSED AIR			0	0	0	0	0	1,321,628	66,081	1,387,709

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
THRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 5
DATE 06/17/94 06:59:26
BY JED/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	ONHP / 8 & 1	TOTAL DOLLARS
292420	ION EXCHANGE									
292420.11	EQUIPMENT									
292420.1147001	F-1551 PARTICULATE FILTER 60 GPM	700	1 EA	0	0	0	0	68000	3400	71400

SUBTOTAL	EQUIPMENT			0	0	0	0	68,000	3,400	71,400
	SALES TAX 7.80 %							5304		5304
	ONHP (ON MARKUPS ONLY)								265	265

TOTAL	COST CODE 70011			0	0	0	0	73,304	3,665	76,969
	WBS 292420									
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)									

TOTAL WBS 292420 ION EXCHANGE				0	0	0	0	73,304	3,665	76,969

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 6
DATE 06/17/94 06:59:27
BY JFD/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OM&P / 8 & 1	TOTAL DOLLARS
292440	COOLING TOWER										
292440.11	EQUIPMENT										
292440.1144001	CT-1561	700	1 EA	0	0	0	0	0	927000	46350	973350
	COOLING TOWER										
	442 MM BTU/HR										
292440.1146001	P-1562A/B/C	700	3 EA	0	0	0	0	0	375000	18750	393750
	TOWER WATER PUMP										
	22,050 GPM, 87 PSI										
292440.1146002	P-1563	700	1 EA	0	0	0	0	0	44000	2200	46200
	INHIBITOR ADDITION PUMP										
	4 GPM, 20 PSI										

SUBTOTAL	EQUIPMENT			0	0	0	0	0	1,346,000	67,300	1,413,300
	SALES TAX 7.00 %								104988		104988
	OM&P (ON MARKUPS ONLY)								5249		5249

TOTAL	COST CODE 70011										
	WBS 292440								1,450,988	72,549	1,523,537
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										

TOTAL WBS 292440	COOLING TOWER			0	0	0	0	0	1,450,988	72,549	1,523,537

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

**** TEST - INTERACTIVE ESTIMATING ****
TMRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R06 - ESTIMATE DETAIL BY WBS / COST CODE

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BY JFD/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
292480	DEMINERALIZER										
292480.11	EQUIPMENT										
292480.1142001	TK-1594 DEMINERALIZED WATER STORAGE TANK 7,500 GAL	700	1 EA	0	0	0	0	0	71000	3550	74550
292480.1146001	P-1592 ZONE 1 EXHAUST STACK FLUSH SYSTEM BOOSTER PUMP 75 GPM, 53 PSI	700	1 EA	0	0	0	0	0	38000	1900	39900
292480.1146002	P-1593A/B DEMINERALIZED WATER MAKE-UP PUMP 100 GPM, 45 PSI	700	2 EA	0	0	0	0	0	8000	400	8400
292480.1147001	DM-1591 DEMINERALIZER SYSTEM 7 GPM	700	1 EA	0	0	0	0	0	48000	2400	50400
SUBTOTAL	EQUIPMENT			0	0	0	0	0		8,250	
	SALES TAX 7.80 %						0		165,000		173,250
	OH&P (ON MARKUPS ONLY)						0		12870		12870
										643	643
TOTAL	COST CODE 70011 WBS 292480 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			0	0	0	0	0	177,870	8,893	186,763
TOTAL WBS 292480	DEMINERALIZER			0	0	0	0	0	177,870	8,893	186,763

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TUBS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY MBS / COST CODE

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BY JFD/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONMP / B & I	TOTAL DOLLARS
292490	SANITARY WATER										
292490.11	EQUIPMENT										
292490.1141001	TK-1019	700	1 EA	0	0	0	0	0	55000	2750	57750
	BULK WATER STORAGE TANK										
	90,000 GAL										
292490.1146001	P-1023A/B	700	2 EA	0	0	0	0	0	2000	100	2100
	BULK WATER FEED PUMP										
	50 GPM, 100 PSI										
SUBTOTAL	EQUIPMENT										
				0	0	0	0	0	57,000	2,850	59,850
	SALES TAX 7.80 X								4,446		4,446
	ONMP (ON MARKUPS ONLY)									222	222
TOTAL	COST CODE 70011										
	MBS 292490										
	(ESCALATION 0.00X - CONTINGENCY 40.00 X)			0	0	0	0	0	61,446	3,072	64,518
TOTAL MBS 292490	SANITARY WATER			0	0	0	0	0	61,446	3,072	64,518

FLUOR DANIEL INC. WESTINGHOUSE HANFORD COMPANY JOB NO. 436302			** TEST - INTERACTIVE ESTIMATING ** TMR5-FACILITY CONFIGURATION EVALUATION CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1 DOE_ROB - ESTIMATE DETAIL BY WBS / COST CODE										PAGE DATE 06/17/94 06:59:49 BY JFD/PCA/RLJ/AAF
ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / 8 & 1	TOTAL DOLLARS		
292500	RAW WATER/FIRE WATER												
292500.11	EQUIPMENT												
292500.1141001	TK-1612 FIRE AND PROCESS WATER STORAGE TANK 660,900 GAL	700	1 EA	0	0	0	0	0	180000	9000	189000		
292500.1141002	TK-1613A/B FIRE WATER STORAGE TANK 453,000 GAL	700	2 EA	0	0	0	0	0	288000	14400	302400		
292500.1142001	TK-1614 DIESEL FUEL STORAGE TANK UNDERGROUND 18,000 GAL	700	1 EA	0	0	0	0	0	31000	1550	32550		
292500.1142002	TK-1615 DIESEL FUEL DAY TANK 300 GAL	700	1 EA	0	0	0	0	0	12000	600	12600		
292500.1143001	GD-1601 DIESEL GENERATOR 3.75 MW	700	1 EA	0	0	0	0	0	491000	24550	515550		
292500.1145001	HT-1602 FIRE WATER TANK HEATER 66 KW	700	1 EA	0	0	0	0	0	4000	200	4200		
292500.1145002	HT-1603A/B FIRE WATER TANK HEATER 66 KW	700	2 EA	0	0	0	0	0	8000	400	8400		
292500.1146001	P-1604A/B RAW WATER BOOSTER PUMP 4,500 GPM, 95 PSI	700	2 EA	0	0	0	0	0	132000	6600	138600		
292500.1146002	P-1605A/B FIRE WATER PUMP 4,500 GPM, 119 PSI	700	2 EA	0	0	0	0	0	140000	7000	147000		
292500.1146003	P-1606 FIRE WATER HEATER PUMP 30 GPM, 119 PSI	700	1 EA	0	0	0	0	0	11000	550	11550		
292500.1146004	P-1607 JOCKEY PUMP 45 GPM, 107 PSI	700	1 EA	0	0	0	0	0	5000	250	5250		
292500.1146005	P-1608A/B FIRE WATER PUMP 1,500 GPM, 124 PSI	700	2 EA	0	0	0	0	0	66000	3300	69300		
292500.1146006	P-1609A/B JOCKEY PUMP	700	2 EA	0	0	0	0	0	10000	500	10500		

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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*** TEST - INTERACTIVE ESTIMATING ***
TUES-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	ONHP / B & I	TOTAL DOLLARS
292500.1146007	45 GPM, 119 PSI P-1610A/B FIRE WATER HEATER PUMP 30 GPM, 10 PSI	700	2 EA	0	0	0	0	20000	1000	21000
292500.1146008	P-1611 DIESEL FUEL TRANSFER PUMP 40 GPM, 20 PSI	700	1 EA	0	0	0	0	16000	800	16800

SUBTOTAL	EQUIPMENT			0	0	0	0	0	70,700	1,484,700
	SALES TAX 7.80 %							1,414,000		110292
	ONHP (ON MARKUPS ONLY)							110292	5514	5514

TOTAL	COST CODE 70011							0	76,214	1,600,506
	WBS 292500							1,524,292		
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)									

TOTAL WBS 292500	RAW WATER/FIRE WATER			0	0	0	0	0	76,214	1,600,506

FLUOR DANIEL INC.
WESTINGHOUSE MANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TMS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OR&P / B & I	TOTAL DOLLARS
292510	SANITARY SEWER										
292510.11	EQUIPMENT										
292510.1146001	P-1632A/B LIFT STATION SUBMERSIBLE GRINDER PUMP	700	2 EA	0	0	0	0	0	10000	500	10500
292510.1149001	LS-510-001 SEWAGE LIFT STATION	700	1 EA	0	0	0	0	0	36000	1800	37800
SUBTOTAL	EQUIPMENT			0	0	0	0	0	46,000	2,300	48,300
	SALES TAX 7.00 %						0		3588		3588
	OR&P (ON MARKUPS ONLY)									179	179
TOTAL	COST CODE 70011 WBS 292510 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			0	0	0	0	0	49,588	2,479	52,067
TOTAL WBS 292510	SANITARY SEWER			0	0	0	0	0	49,588	2,479	52,067

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE ROB - ESTIMATE DETAIL BY MBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOUS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	OHEP / B & I	TOTAL DOLLARS
292530	NON-RADIOACTIVE LIQUID WASTE PROC									
292530.11	EQUIPMENT									
292530.1141001	TK-1659	700	1 EA	0	0	0	0	362000	18100	380100
	SOLAR EVAPORATION TANK									
292530.1142001	363,000 GAL	700	1 EA	0	0	0	0	0	0	0
	MECH/DLEC SERVICE BUILDING									
	SUMP									
292530.1142002	3,000 GAL	700	1 EA	0	0	0	0	0	0	0
	ORGANIC ACID WASTE HOLD									
	TANK SUMP									
292530.1142003	1,200 GAL	700	1 EA	0	0	0	0	0	0	0
	EFFLUENT DISCHARGE									
	COLLECTION SUMP									
292530.1142004	9,600 GAL	700	2 EA	0	0	0	0	0	0	0
	EFFLUENT DISCHARGE									
	COLLECTION SUMP									
292530.1142005	405 GAL	700	1 EA	0	0	0	0	94000	4700	98700
	CAUSTIC WASTE HOLD TANK									
	12,000 GAL									
292530.1142006	TK-1660	700	1 EA	0	0	0	0	94000	4700	98700
	ACID WASTE HOLD TANK									
	12,000 GAL									
292530.1142007	TK-1661	700	1 EA	0	0	0	0	94000	4700	98700
	ORGANIC ACID WASTE HOLD TANK									
	12,000 GAL									
292530.1142008	TK-1662	700	1 EA	0	0	0	0	17000	850	17850
	CAUSTIC WASTE NEUT TANK									
	3,000 GAL									
292530.1142009	TK-1663	700	1 EA	0	0	0	0	38000	1900	39900
	ORGANIC ACID WASTE NEUT TANK									
	3,000 GAL									
292530.1142010	TK-1664	700	1 EA	0	0	0	0	11000	550	11550
	ORGANIC ACID WASTE HOLD TANK									
	750 GAL									
292530.1146001	P-1642	700	1 EA	0	0	0	0	37000	1850	38850
	CAUSTIC WASTE HOLD TANK									

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEMORE, REV 1
DOE_R08 - ESTIMATE DETAIL BY VBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
292530.1146002	TRANSFER PUMP 120 GPM, 10 PSI	700	1 EA	0	0	0	0	8000	400	8400
292530.1146003	CAUSTIC WASTE NEUT TANK TRANSFER PUMP 300 GPM, 41 PSI	700	1 EA	0	0	0	0	37000	1850	38850
292530.1146004	ACID WASTE HOLD TANK TRANSFER PUMP 120 GPM, 10 PSI	700	1 EA	0	0	0	0	8000	400	8400
292530.1146005	ORGANIC ACID WASTE NEUT TANK TRANSFER PUMP 300 GPM, 41 PSI	700	1 EA	0	0	0	0	37000	1850	38850
292530.1146006	ORGANIC ACID WASTE HOLD TANK SUMP PUMP 30 GPM, 18 PSI	700	1 EA	0	0	0	0	37000	1850	38850
292530.1146007	ORGANIC ACID WASTE HOLD TANK TRANSFER PUMP 120 GPM, 18 PSI	700	1 EA	0	0	0	0	22000	1100	23100
292530.1146008	MECH/ELEC SERVICE BUILDING SUMP PUMP 210 GPM, 30 PSI	700	2 EA	0	0	0	0	48000	2400	50400
292530.1146009	EFFLUENT DISCHARGE SUMP PUMP 450 GPM, 25 PSI	700	3 EA	0	0	0	0	15000	750	15750
292530.1147001	EFFLUENT DISCHARGE SUMP PUMP 30 GPM, 25 PSI	700	1 EA	0	0	0	0	3000	150	3150
	ORGANIC ACID WASTE HOLD TANK HEGA FILTER 1,290 LB/HR									

SUBTOTAL	EQUIPMENT			0	0	0	0	962,000	48,100	1,010,100
	SALES TAX 7.80 %							75036		75036

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEMARK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
	OH&P (ON MARKUPS ONLY)									3751	3751
TOTAL	COST CODE 70011			0		0		0		51,851	
	WBS 292530				0		0		1,037,036		1,088,887
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
TOTAL	WBS 292530 NON-RADIOACTIVE LIQUID WASTE PROC			0		0		0	1,037,036	51,851	1,088,887

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** IEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_ROB - ESTIMATE DETAIL BY UBS / COST CODE

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONHP / B & I	TOTAL DOLLARS
292540	CHEMICAL RECEIPT AND MAKE-UP										
292540.11	EQUIPMENT										
292540.1141001	TK-1007	700	1 EA	0	0	0	0	0	120000	6000	126000
	BULK SULFUR STORAGE TANK										
	270,000 GAL										
292540.1141002	TK-1008	700	1 EA	0	0	0	0	0	114000	5700	119700
	BULK DCPD STORAGE TANK										
	17,750 GAL										
292540.1141003	TK-1009	700	1 EA	0	0	0	0	0	114000	5700	119700
	BULK CPD OLIGOMER STORAGE										
	TANK										
	17,750 GAL										
292540.1141004	TK-1013	700	1 EA	0	0	0	0	0	478000	23900	501900
	BULK MAOM STORAGE										
	TANK										
	45,000 GAL										
292540.1141005	TK-1014	700	1 EA	0	0	0	0	0	77000	3850	80850
	BULK HMO3 STORAGE										
	TANK										
	30,000 GAL										
292540.1141006	TK-1015	700	1 EA	0	0	0	0	0	67000	3350	70350
	BULK ANHYDROUS NH3 STORAGE										
	TANK										
	126,000 GAL										
292540.1141007	TK-1022	700	1 EA	0	0	0	0	0	159000	7950	166950
	BULK KEROSENE STORAGE										
	TANK										
	535,000 GAL										
292540.1142001	SU-1714	700	1 EA	0	0	0	0	0	0	0	0
	ACID WASTE SUMP										
	9,000 GAL										
292540.1142002	SU-1715	700	1 EA	0	0	0	0	0	0	0	0
	CAUSTIC WASTE SUMP										
	9,000 GAL										
292540.1142003	TK-1716	700	1 EA	0	0	0	0	0	12000	600	12600
	COLD CHEMICAL NO. 1 MAKE-UP										
	TANK										
	1,500 GAL										
292540.1142004	TK-1717	700	1 EA	0	0	0	0	0	12000	600	12600
	OFF-GAS TREATMENT CHEMICAL										
	MAKE-UP TANK										

FLUOR DANIEL INC.
WESTINGHOUSE MANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEMARK, REV 1
DOE_R08 - ESTIMATE DETAIL BY UBS / COST CODE

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BY JFD/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
292540.1142005	1,500 GAL TK-1718 COLD CHEMICAL NO. 2 MAKE-UP TANK	700	1 EA	0	0	0	0	0	15000	750	15750
292540.1142006	1,500 GAL TK-1719 NITRIC ACID DECON MAKE-UP TANK	700	1 EA	0	0	0	0	0	12000	600	12600
292540.1142007	1,500 GAL TK-1720 DECON SOLUTION MAKE-UP TANK	700	1 EA	0	0	0	0	0	15000	750	15750
292540.1142008	1,500 GAL TK-1721 MSM DECON SOLUTION MAKE-UP TANK	700	1 EA	0	0	0	0	0	28000	1400	29400
292540.1142009	6,000 GAL TK-1722 OXALIC ACID DECON MAKE-UP TANK	700	1 EA	0	0	0	0	0	15000	750	15750
292540.1142010	1,500 GAL TK-1723 POTASSIUM PERMANGANATE MAKE-UP TANK	700	1 EA	0	0	0	0	0	12000	600	12600
292540.1142011	1,500 GAL TK-1724 COLD CHEMICAL NO. 3 MAKE-UP TANK	700	1 EA	0	0	0	0	0	12000	600	12600
292540.1142012	1,500 GAL TK-1725 COLD CHEMICAL NO. 4 MAKE-UP TANK	700	1 EA	0	0	0	0	0	15000	750	15750
292540.1142013	1,500 GAL TK-1726 ADIC WASTE SUMP TANK	700	1 EA	0	0	0	0	0	12000	600	12600
292540.1142014	1,500 GAL TK-1727 CAUSTIC WASTE SUMP TANK	700	1 EA	0	0	0	0	0	12000	600	12600
292540.1146001	1,500 GAL P-1010 SULFER TRANSFER PUMP 125 GPM, 100 PSI	700	1 EA	0	0	0	0	0	5000	250	5250

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BY JED/PCA/RLJ/AAF

TEST - INTERACTIVE ESTIMATING
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEMARK, REV 1
DOE_R06 - ESTIMATE DETAIL BY MBS / COST CODE

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
292540.1146002	P-1011 DCPD TRANSFER PUMP 10 GPM, 100 PSI	700	1 EA	0	0	0	0	0	2000	100	2100
292540.1146003	P-1012 CPD OLIGOMER TRANSFER PUMP 10 GPM, 100 PSI	700	1 EA	0	0	0	0	0	2000	100	2100
292540.1146004	P-1016 50X CAUSTIC TRANSFER PUMP 21 GPM, 31 PSI	700	1 EA	0	0	0	0	0	10000	500	10500
292540.1146005	P-1017 50X NITRIC ACID TRANSFER PUMP 21 GPM, 16 PSI	700	1 EA	0	0	0	0	0	8000	400	8400
292540.1146006	P-1022A/B KEROSENE FEED PUMP 15 GPM, 100 PSI	700	2 EA	0	0	0	0	0	5000	250	5250
292540.1146007	P-1700 COLD CHEMICAL NO. 1 TRANSFER PUMP 21 GPM, 83 PSI	700	1 EA	0	0	0	0	0	14000	700	14700
292540.1146008	P-1701 OFF-GAS TREATMENT CHEMICAL TRANSFER PUMP 105 GPM, 50 PSI	700	1 EA	0	0	0	0	0	8000	400	8400
292540.1146009	P-1702 COLD CHEMICAL NO. 2 TRANSFER PUMP 105 GPM, 87 PSI	700	1 EA	0	0	0	0	0	8000	400	8400
292540.1146010	P-1703 50X NITRIC ACID UNLOADING PUMP 165 GPM, 48 PSI	700	1 EA	0	0	0	0	0	9000	450	9450
292540.1146011	P-1704 ACID WASTE SUMP PUMP 84 GPM, 16 PSI	700	1 EA	0	0	0	0	0	12000	600	12600
292540.1146012	P-1705 NITRIC ACID DECON TRANSFER PUMP 105 GPM, 74 PSI	700	1 EA	0	0	0	0	0	8000	400	8400
292540.1146013	P-1706 DECON SOLUTION TRANSFER PUMP	700	1 EA	0	0	0	0	0	8000	400	8400

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** IEST - INTERACTIVE ESTIMATING **
THRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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BY JFO/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANROURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONRP / B & I	TOTAL DOLLARS
292540.1146014	105 GPM, 78 PSI P-1707 MSW DECON SOLUTION TRANSFER PUMP	700	1 EA	0	0	0	0	0	8000	400	8400
292540.1146015	105 GPM, 78 PSI P-1708 OXALIC ACID DECON TRANSFER PUMP	700	1 EA	0	0	0	0	0	8000	400	8400
292540.1146016	105 GPM, 72 PSI P-1709 POTASSIUM PERMANGANATE TRANSFER PUMP	700	1 EA	0	0	0	0	0	8000	400	8400
292540.1146017	105 GPM, 52 PSI P-1710 COLD CHEMICAL NO. 3 TRANSFER PUMP	700	1 EA	0	0	0	0	0	8000	400	8400
292540.1146018	105 GPM, 59 PSI P-1711 50% CAUSTIC UNLOADING PUMP	700	1 EA	0	0	0	0	0	9000	450	9450
292540.1146019	165 GPM, 60 PSI P-1712 CAUSTIC WASTE SUMP PUMP	700	1 EA	0	0	0	0	0	36000	1800	37600
292540.1146020	84 GPM, 16 PSI P-1713 COLD CHEMICAL NO. 4 TRANSFER PUMP	700	1 EA	0	0	0	0	0	8000	400	8400
292540.1147001	105 GPM, 59 PSI F-1691 DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	700	1 EA	0	0	0	0	0	9000	450	9450
292540.1147002	165 ACFM F-1692 OXALIC ACID DECON MAKE-UP ROUGHING FILTER	700	1 EA	0	0	0	0	0	9000	450	9450
292540.1147003	165 ACFM F-1693 MSW DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	700	1 EA	0	0	0	0	0	9000	450	9450
292540.1147004	165 ACFM F-1694 POTASSIUM PERMANGANATE MAKE-UP TANK ROUGHING FILTER	700	1 EA	0	0	0	0	0	9000	450	9450

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
292540.1147005	165 ACFM F-1695 SODIUM NITRITE MAKE-UP TANK ROUGHING FILTER	700	1 EA	0	0	0	0	0	9000	450	9450
292540.1147006	165 ACFM F-1696 COLD CHEMICAL NO. 1 MAKE-UP TANK ROUGHING FILTER	700	1 EA	0	0	0	0	0	9000	450	9450
292540.1147007	165 ACFM F-1697 OFF-GAS TREATMENT MAKE-UP TANK ROUGHING FILTER	700	1 EA	0	0	0	0	0	9000	450	9450
292540.1147008	165 ACFM F-1698 COLD CHEMICAL NO. 2 MAKE-UP TANK ROUGHING FILTER	700	1 EA	0	0	0	0	0	9000	450	9450
292540.1147009	165 ACFM F-1699 NITRIC ACID DECON MAKE-UP TANK ROUGHING FILTER	700	1 EA	0	0	0	0	0	9000	450	9450
SUBTOTAL	EQUIPMENT			0	0	0	0	0		78,300	
	SALES TAX 7.80 %						0		1,566,000		1,644,300
	OH&P (ON MARKUPS ONLY)						0		122148		122148
										6107	6107
TOTAL	COST CODE 70011			0		0	0	0		84,407	
	WBS 292540				0		0		1,688,148		1,772,555
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
TOTAL WBS 292540 CHEMICAL RECEIPT AND MAKE-UP				0	0	0	0	0		84,407	
									1,688,148		1,772,555

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANMOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
292550	BULK COLD CHEMICAL VENT SYSTEM										
292550.11	EQUIPMENT										
292550.1143001	MB-1661A/B ACID VENT BLOWER 450 SCFM	700	2 EA	0	0	0	0	0	20000	1000	21000
	SUBTOTAL EQUIPMENT			0	0	0	0	0	20,000	1,000	21,000
	SALES TAX 7.80 %						0		1560		1560
	OH&P (ON MARKUPS ONLY)									78	78
TOTAL	COST CODE 70011 WBS 292550 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			0	0	0	0	0	21,560	1,078	22,638
TOTAL WBS 292550	BULK COLD CHEMICAL VENT SYSTEM			0	0	0	0	0	21,560	1,078	22,638

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOUS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONEP / 8 & 1	TOTAL DOLLARS
292580	GLASS FORMER PREPARATION										
292580.11	EQUIPMENT										
292580.1142001	SU-1774	700	1 EA	0	0	0	0	0	0	0	0
	FRIT SLURRY SUNP										
	90 GAL										
292580.1142002	TK-1775	700	1 EA	0	0	0	0	0	29000	1450	30450
	FRIT SLURRY MAKE-UP TANK										
	1,000 GAL										
292580.1142003	B-1901-C	700	8 EA	0	0	0	0	0	160000	80000	168000
	SAND STORAGE BINS										
292580.1142004	B-1904-C	700	4 EA	0	0	0	0	0	648000	32400	680400
	82 O3 STORAGE BINS										
292580.1142005	B-1905-C	700	2 EA	0	0	0	0	0	400000	20000	420000
	L12 C03 STORAGE BINS										
292580.1142006	B-1906-C	700	1 EA	0	0	0	0	0	102000	5100	107100
	QAO STORAGE BINS										
292580.1142007	B-1907-C	700	1 EA	0	0	0	0	0	88000	4400	92400
	MGO STORAGE BINS										
292580.1146001	P-1772	700	1 EA	0	0	0	0	0	2000	100	2100
	FSMT SAMPLE PUMP										
	20 GPM, 50 PSI										
292580.1146002	P-1773	700	1 EA	0	0	0	0	0	2000	100	2100
	FSMT TRANSFER PUMP										
	7 GPM, 20 PSI										
292580.1147001	F-1771	700	1 EA	0	0	0	0	0	5000	250	5250
	FSMT VENT FILTER										
	43 ACFM										
292580.1148001	XE-1902-C	700	1 EA	0	0	0	0	0	600000	30000	630000
	SAND TRUCK UNLOADER										
292580.1148002	XE-1903-C	700	1 EA	0	0	0	0	0	400000	20000	420000
	BORON TRIOXIDE TRUCK										
	UNLOADER										
292580.1148003	XE-1910-C	700	1 EA	0	0	0	0	0	400000	20000	420000
	LITRIUM CARBONATE TRUCK										
	UNLOADER										
292580.1148004	XE-1911-C	700	1 EA	0	0	0	0	0	400000	20000	420000
	CALCIUM OXIDE TRUCK										
	UNLOADER										
292580.1148005	XE-1912-C	700	1 EA	0	0	0	0	0	400000	20000	420000
	MAGNESIUM OXIDE TRUCK										
	UNLOADER										

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** TEST - INTERACTIVE ESTIMATING **
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ACCOUNT
NUMBER

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONHP / B & I	TOTAL DOLLARS
292580.1148006	XE-1913-C	700	1 EA	0	0	0	0	0	400000	20000	420000
	SAND CONVEYOR TO MIXER										
292580.1148007	XE-1914-C	700	1 EA	0	0	0	0	0	400000	20000	420000
	CONVEYOR TO MIXER										
292580.1148008	XE-1915-C	700	1 EA	0	0	0	0	0	400000	20000	420000
	LLW GLASS FORMERS CONVEYOR										
292580.1148009	XE-1916-C	700	1 EA	0	0	0	0	0	400000	20000	420000
	HLW GLASS FORMERS CONVEYOR										
292580.1148010	MM-1908-C	700	1 EA	0	0	0	0	0	35000	1750	36750
	HLW BATCH MIXER										
292580.1148011	MM-1909-C	700	1 EA	0	0	0	0	0	135000	6750	141750
	LLW BATCH MIXER										

SUBTOTAL EQUIPMENT

SALES TAX 7.80 %
ONHP (ON MARKUPS ONLY)

TOTAL

COST CODE 70011
WBS 292580
(ESCALATION 0.00% - CONTINGENCY 40.00 %)

TOTAL WBS 292580 GLASS FORMER PREPARATION

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** TEST - INTERACTIVE ESTIMATING **
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
292590	CRYOGENIC OXYGEN										
292590.11	EQUIPMENT										
292590.1149001	AS-1025 OXYGEN PLANT 130T/D	700	1 LOT	0	0	0	0	0	1112000	55600	1167600

SUBTOTAL	EQUIPMENT			0	0	0	0	0	1,112,000	55,600	1,167,600
	SALES TAX 7.00 %								86736		86736
	OH&P (ON MARKUPS ONLY)								4336		4336

TOTAL	COST CODE 70011										
	VBS 292590			0	0	0	0	0	1,198,736	59,936	1,258,672
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										

TOTAL VBS 292590	CRYOGENIC OXYGEN			0	0	0	0	0	1,198,736	59,936	1,258,672

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DOE_R08 - ESTIMATE DETAIL BY MBS / COST CODE

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
292620	NPS VACUUM SYSTEM										
292620.11	EQUIPMENT										
292620.1143001	MB-1784A/B WMT BLDG NPS VACUUM BLOWER	700	2 EA	0	0	0	0	0	158000	7900	165900
292620.1143002	90 SCFM CASK STORAGE BLDG NPS VACUUM BLOWER	700	2 EA	0	0	0	0	0	158000	7900	165900
292620.1143003	50 SCFM MB-1786A/B FAN HOUSE NPS VACUUM BLOWER	700	2 EA	0	0	0	0	0	158000	7900	165900
292620.1147001	130 SCFM FAN BLDG NPS VAC SYSTEM NEPA FILTER	700	2 EA	0	0	0	0	0	12000	600	12600
292620.1147002	90 SCFM FAN-1782A/B CASK STORAGE BLDG NPS VAC SYSTEM NEPA FILTER	700	2 EA	0	0	0	0	0	12000	600	12600
292620.1147003	50 SCFM FAN-1783A/B FAN HOUSE NPS VAC SYSTEM NEPA FILTER	700	2 EA	0	0	0	0	0	12000	600	12600
SUBTOTAL	EQUIPMENT			0	0	0	0	0	510,000	25,500	535,500
	SALES TAX 7.80 %								39780		39780
	OH&P (ON MARKUPS ONLY)									1989	1989
TOTAL	COST CODE 70011										
	WBS 292620										
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
				0	0	0	0	0	549,780	27,489	577,269
TOTAL WBS 292620	NPS VACUUM SYSTEM			0	0	0	0	0	549,780	27,489	577,269

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONHP / B & I	TOTAL DOLLARS
292720	SYSTEM 72 COLD HANDLING										
292720.11	EQUIPMENT										
292720.1148001	MR-720-005/006	700	2 EA	0	0	0	0	0	18000	900	18900
292720.1148002	MONORAIL HOIST #5 & #6	700	1 EA	0	0	0	0	0	7000	350	7350
292720.1148003	MONORAIL HOIST #1	700	2 EA	0	0	0	0	0	14000	700	14700
292720.1148004	MR-720-002/003	700	1 EA	0	0	0	0	0	13000	650	13650
292720.1148004	MONORAIL HOIST #2 & #3										
292720.1148004	MONORAIL HOIST #4										
SUBTOTAL	EQUIPMENT			0	0	0	0	0	52,000	2,600	54,600
	SALES TAX 7.80 X								4056	202	4056
	ONHP (ON MARKUPS ONLY)										202
TOTAL	COST CODE 70011										
	WBS 292720										
	(ESCALATION 0.00X - CONTINGENCY 40.00 X)										
				0	0	0	0	0	56,056	2,802	58,858
TOTAL WBS 292720	SYSTEM 72 COLD HANDLING			0	0	0	0	0	56,056	2,802	58,858

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OHEP / B & I	TOTAL DOLLARS
338010	STRUCTURES										
338010.01	GENERAL REQUIREMENTS										
338010.0100000	OPERATIONS SUPPORT BUILDING (OSB) 60000 SF	501	1 LOT	0	0	0	0	6000000	0	600000	6600000
SUBTOTAL	GENERAL REQUIREMENTS										
					0	0	0	6,000,000	0	600,000	6,600,000
TOTAL	COST CODE 50101 WBS 338010 (ESCALATION 0.00X - CONTINGENCY 40.00 X)				0	0	0	6,000,000	0	600,000	6,600,000
TOTAL WBS 338010	STRUCTURES				0	0	0	6,000,000	0	600,000	6,600,000

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
33C010	STRUCTURES										
33C010.01	GENERAL REQUIRMENTS										
33C010.0100000	REGULATED ENTRANCE BUILDING (REB) 70000 SF	501	1 LOT	0	0	0	0	7000000	0	700000	7700000
SUBTOTAL	GENERAL REQUIRMENTS			0	0	0	0	7,000,000	0	700,000	7,700,000
TOTAL	COST CODE 50101 WBS 33C010 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			0	0	0	0	7,000,000	0	700,000	7,700,000
TOTAL WBS 33C010 STRUCTURES				0	0	0	0	7,000,000	0	700,000	7,700,000

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
330010	STRUCTURES										
330010.01	GENERAL REQUIRMENTS										
330010.0100000	OPERATIONS CONTROL BUILDING (OCB) 22500 SF	501	1 LOT	0	0	0	0	2250000	0	225000	2475000
	SUBTOTAL GENERAL REQUIRMENTS			0	0	0	0	2,250,000	0	225,000	2,475,000
	TOTAL COST CODE 50101 WBS 330010 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			0	0	0	0	2,250,000	0	225,000	2,475,000
	TOTAL WBS 330010 STRUCTURES			0	0	0	0	2,250,000	0	225,000	2,475,000

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONEP / 8 & 1	TOTAL DOLLARS
33E010	STRUCTURES										
33E010.01	GENERAL REQUIREMENTS										
33E010.0100000	COLD CHEMICAL BUILDING (CCB) 90000 SF	501	1 LOT	54000	1701000	0	1800000	0	0	991530	4492530
	SUBTOTAL GENERAL REQUIREMENTS			54,000	1,701,000	0	1,800,000	0	0	991,530	4,492,530
	SALES TAX 7.80 X						140400		0		140400
	ONEP (ON MARKUPS ONLY)								0	7020	7020
	TOTAL			54,000	1,701,000	0	1,940,400	0	0	998,550	4,639,950
	COST CODE 50101										
	WBS 33E010										
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
	TOTAL WBS 33E010 STRUCTURES			54,000	1,701,000	0	1,940,400	0	0	998,550	4,639,950

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33E020	FIRE PROTECTION,HVAC AND LIGHTING										
33E020.01	GENERAL REQUIRMENTS										
33E020.0100001	COLD CHEMICAL BUILDING (S/C ALLOWANCE FOR FIRE PROT HVAC AND LIGHTING)	501	1 LOT	0	0	0	0	1151000	0	115100	1266100
SUBTOTAL	GENERAL REQUIRMENTS			0	0	0	0	1,151,000	0	115,100	1,266,100
TOTAL	COST CODE 50101 WBS 33E020 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			0	0	0	0	1,151,000	0	115,100	1,266,100
TOTAL WBS 33E020	FIRE PROTECTION,HVAC AND LIGHTING			0	0	0	0	1,151,000	0	115,100	1,266,100

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33F010	STRUCTURES									
33F010.01	GENERAL REQUIREMENTS									
33F010.0100000	MECHANICAL UTILITIES BLDG	501	1 LOT	54000	1701000	0	1800000	0	991530	4492530
	(MUB)									
	90000 SF									
SUBTOTAL	GENERAL REQUIREMENTS									
	SALES TAX 7.80 X									
	OH&P (ON MARKUPS ONLY)									
TOTAL	COST CODE 50101									
	WBS 33F010									
	(ESCALATION 0.00% - CONTINGENCY 40.00 X)									
TOTAL WBS 33F010	STRUCTURES									

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONHP / B & I	TOTAL DOLLARS
33F020	FIRE PROTECTION, HVAC AND LIGHTING										
33F020.01	GENERAL REQUIREMENTS										
33F020.0100001	MECHANICAL UTILITIES BLDG (S/C ALLOWANCE FOR FIRE PROT HVAC AND LIGHTING)	501	1 LOT	0	0	0	0	1151000	0	115100	1266100

SUBTOTAL	GENERAL REQUIREMENTS			0	0	0	0	1,151,000	0	115,100	1,266,100

TOTAL	COST CODE 50101 WBS 33F020 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			0	0	0	0	1,151,000	0	115,100	1,266,100

TOTAL WBS 33F020	FIRE PROTECTION, HVAC AND LIGHTING			0	0	0	0	1,151,000	0	115,100	1,266,100

FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
336010	STRUCTURES									
336010.01	GENERAL REQUIREMENTS									
336010.010000	SWITCHGEAR GENERATOR BLDG 90000 SF	501	90000 SF	261000	8221500	0	3150000	0	4514895	15886395
				261,000	8,221,500	0	3,150,000	0	4,514,895	15,886,395
							245700	0	12285	245700
										12285
	SUBTOTAL GENERAL REQUIREMENTS									
	SALES TAX 7.80 X									
	OH&P (ON MARKUPS ONLY)									
				261,000	8,221,500	0	3,395,700	0	4,527,180	16,144,380
	TOTAL									
	WBS 336010									
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)									
				261,000	8,221,500	0	3,395,700	0	4,527,180	16,144,380
	TOTAL WBS 336010 STRUCTURES									

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
33G020	FIRE PROTECTION, NVAC AND LIGHTING									
33G020.01	GENERAL REQUIREMENTS	501	1 LOT	0	0	0	6345000	0	634500	6979500
33G020.0100001	SWITCNGEAR GENERATOR BLDG (S/C ALLOWANCE FOR FIRE PROT HVAC AND LIGHTING)									
SUBTOTAL	GENERAL REQUIREMENTS									
				0	0	0	6,345,000	0	634,500	6,979,500
TOTAL				0	0	0	6,345,000	0	634,500	6,979,500
	COST CODE 50101 WBS 33G020 (ESCALATION 0.00% - CONTINGENCY 40.00 X)									
TOTAL WBS 33G020	FIRE PROTECTION, NVAC AND LIGHTING			0	0	0	6,345,000	0	634,500	6,979,500

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33N010	STRUCTURES										
33N010.01	GENERAL REQUIRMENTS										
33N010.0100000	FABRICATION SHOP 45000 SF	501	1 LOT	22500	708750	0	1215000	0	0	436388	2360138
	SUBTOTAL GENERAL REQUIRMENTS			22,500	708,750	0	1,215,000	0	0	436,388	2,360,138
	SALES TAX 7.80 %						94770		0		94770
	OH&P (ON MARKUPS ONLY)									4738	4738
TOTAL	COST CODE 50101 WBS 33N010 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			22,500	708,750	0	1,309,770	0	0	441,126	2,459,646
	TOTAL WBS 33N010 STRUCTURES			22,500	708,750	0	1,309,770	0	0	441,126	2,459,646

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FLUOR DANIEL INC.
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*** TEST - INTERACTIVE ESTIMATING ***
TURS-FACILITY CONFIGURATION EVALUATION
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / 8 & 1	TOTAL DOLLARS
331010	STRUCTURES										
331010.01	GENERAL REQUIREMENTS	501	1 LOT	22500	708750		0 1215000	0	0	436388	2360138
331010.0100000	MOCK-UP SHOP 45000 \$F										
	SUBTOTAL GENERAL REQUIREMENTS			22,500	708,750		0 1,215,000	0	0	436,388	2,360,138
	SALES TAX 7.80 %						94,770		0		94,770
	OH&P (ON MARKUPS ONLY)									4738	4738
	TOTAL			22,500	708,750		0 1,309,770	0	0	441,126	2,459,646
	COST CODE 50101										
	WBS 331010										
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
	TOTAL WBS 331010 STRUCTURES			22,500	708,750		0 1,309,770	0	0	441,126	2,459,646

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** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEMARK, REV 1
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33K800	FEED AND EFFLUENT TRANSFER										
33K800.15	MECHANICAL										
33K800.1500001	ALLOWANCE FOR DECONTAMINATED PROCESS LIQUID WASTE TRANS- FER LINES FROM THE PLANT TO RETENTION POND (7000 LF)	700	1 LOT	30800	970200	0	1586000	0	0	593506	3149706
33K800.1500005	ALLOWANCE INCLUDES 6" 304SS STAINLESS PIPE ENCASED IN 10" 304LSS PIPE,	700	0	0	0	0	0	0	0	0	0
SUBTOTAL	MECHANICAL			30,800	970,200	0	1,586,000	0	0	593,506	3,149,706
	SALES TAX 7.80 %						123708		0		123708
	OH&P (ON MARKUPS ONLY)									6185	6185
TOTAL	COST CODE 70015			30,800	970,200	0	1,709,708	0	0	599,691	3,279,599
	WBS 33K800 (ESCALATION 0.00% - CONTINGENCY 40.00 %)										
TOTAL WBS 33K800 FEED AND EFFLUENT TRANSFER				30,800	970,200	0	1,709,708	0	0	599,691	3,279,599

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** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY VBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	ONEP / 8 & 1	TOTAL DOLLARS
331310	PRIMARY ELECTRICAL DISTRIBUTION									
331310.16	ELECTRICAL									
331310.1600001	SWITCHYARD ALLOWANCE:	600	1 LOT	56300	1773450	0	4273000	0	0	1153579 7200029
331310.1600005	HVWP SWITCH YARD X 1.5 ALLOWANCE FOR 230 KV POWER LINE: 2 PARALLEL LINES, 5000 LF, TOTAL 10000LF	600	1 LOT	4400	138600	0	401000	0	0	93508 633108
331310.1600010	ALLOWANCE FOR 13.8KV POWER LINE: 5000 LF	600	1 LOT	13800	434700	0	770000	0	0	268891 1473591
SUBTOTAL	ELECTRICAL			74,500	2,346,750	0	5,444,000 424632	0	1,515,978 0	9,306,728 424632 21231
TOTAL	SALES TAX 7.80 % ONEP (ON MARKUPS ONLY) COST CODE 60016 VBS 331310 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			74,500	2,346,750	0	5,868,632	0	1,537,209 0	9,752,591
TOTAL VBS 331310	PRIMARY ELECTRICAL DISTRIBUTION			74,500	2,346,750	0	5,868,632	0	1,537,209 0	9,752,591

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** TEST - INTERACTIVE ESTIMATING **
TMS-FACILITY CONFIGURATION EVALUATION
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33N099	CONSTRUCTION ACCEPTANCE TESTING										
33N099.01	GENERAL REQUIRMENTS										
33N099.0100001	CONSTRUCTION ACCEPTANCE TESTING 23% OF DIRECT LABOR	700	1 LOT	45000	1417500	0	0	0	0	751275	2168775
	SUBTOTAL GENERAL REQUIRMENTS			45,000	1,417,500	0	0	0	0	751,275	2,168,775
	TOTAL COST CODE 70001 WBS 33N099 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			45,000	1,417,500	0	0	0	0	751,275	2,168,775
	TOTAL WBS 33N099 CONSTRUCTION ACCEPTANCE TESTING			45,000	1,417,500	0	0	0	0	751,275	2,168,775

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** TEST - INTERACTIVE ESTIMATING **
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33W320	NORMAL ELECTRICAL DISTRIBUTION										
33W320.16	ELECTRICAL										
33W320.1661001	SG-1801-C SWITCHGEAR SWITCHGEAR/GENRTR 13.8KV	600	1 EA	2000	63000	0	0	0	0	33390	96390
33W320.1661005	SG-1802,-1803-C EMERGENCY SWITCHGEAR 480 V	600	2 EA	1000	31500	0	0	0	0	16695	48195
33W320.1661010	SG-1804-C SWITCHGEAR-LLW FACILITY 13.8 KV	600	1 EA	2000	63000	0	0	0	0	33390	96390
33W320.1661015	SG-1805-C SWITCHGEAR-HLM FACILITY 13.8 KV	600	1 EA	2000	63000	0	0	0	0	33390	96390
33W320.1661020	SG-1806-C SWITCHGEAR-PRETREAT FACILITY 13.8 KV	600	1 EA	2000	63000	0	0	0	0	33390	96390
33W320.1661025	SG-1807-C SWITCHGEAR-ANCILLARY FACIL- ITIES 13.8 KV	600	1 EA	2000	63000	0	0	0	0	33390	96390
33W320.1661030	XT-1808,-1809-C EMERGENCY TRANSFORMERS 13.8-.48 KV	600	2 EA	4000	126000	0	0	0	0	66780	192780
33W320.1661035	LC-1810-C UNIT SUBSTA-COOLING TOWER 13.8-4.16 KV	600	1 EA	4000	126000	0	0	0	0	66780	192780
33W320.1661040	LC-1811-C UNIT SUBSTA-MECH/UTIL 13.8-4.16 KV	600	1 EA	4000	126000	0	0	0	0	66780	192780
33W320.1661045	LC-1812-C UNIT SUBSTA-FAN HOUSE 13.8-4.16 KV	600	1 EA	4000	126000	0	0	0	0	66780	192780
33W320.1661050	LC-1813-C UNIT SUBSTA-WAREHOUSES 13.8-.48 KV	600	1 EA	2000	63000	0	0	0	0	33390	96390
33W320.1661055	LC-1814-C UNIT SUBSTA-FAB SHOP 13.8-.48 KV	600	1 EA	2000	63000	0	0	0	0	33390	96390
33W320.1661060	LC-1815-C UNIT SUBSTA-COLD CHEN 13.8-.48 KV	600	1 EA	2000	63000	0	0	0	0	33390	96390

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*** TEST - INTERACTIVE ESTIMATING ***
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

ACCOUNT
NUMBER

33N320.1661065

DESCRIPTION

LC-1816-C
UNIT SUBSTA-OP CONT BLDG
13.8--48 KV

600

QUANTITY

MANHOURS

LABOR

EQUIP
USAGE

MATERIAL

SUB-
CONTRACT

EQUIP-
MENT

OH&P
/ B & I

TOTAL
DOLLARS

33N320.1661070

LC-1817-C
UNIT SUBSTA-REG ENT BLDG
13.8--48 KV

600

1 EA

2000

63000

0

0

0

0

33390

96390

33N320.1661075

LC-1818-C
UNIT SUBSTA-OPS SUPPORT BLDG
13.8--48 KV

600

1 EA

2000

63000

0

0

0

0

33390

96390

33N320.1661080

LC-1819-1820-C
UNIT SUBSTA-MECH/UTIL
13.0--48 KV

600

2 EA

4000

126000

0

0

0

0

66780

192780

33N320.1661085

1 E GENERATORS
W/DAY TANKS,PUMPS & PANELS
1 MW

600

1 LOT

1800

56700

0

0

0

0

30051

86751

33N320.1661090

INSTALLATION OF MCC'S &
ASSOCIATED CABLES

600

120 EA

42900

1351350

0

91000

0

0

720766

2163116

SUBTOTAL ELECTRICAL

87,700

2,762,550

0

91,000

7098

0

1,468,702

0

4,322,252

7098

354

TOTAL

87,700

2,762,550

0

98,098

0

1,469,056

0

4,329,704

0

4,329,704

TOTAL WBS 33N320 NORMAL ELECTRICAL DISTRIBUTION

87,700

2,762,550

0

98,098

0

1,469,056

0

4,329,704

0

4,329,704

FLUOR DANIEL INC.
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** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
33N410	COMPRESSED AIR										
33N410.15	MECHANICAL										
33N410.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM & EQUIPMENT.	700	1 LOT	32800	1033200	0	717000	0	0	583446	2333646

SUBTOTAL	MECHANICAL			32,800		0		0		583,446	
	SALES TAX 7.80 %				1,033,200		717,000		0		2,333,646
	ON&P (ON MARKUPS ONLY)						55926		0		55926
										2796	2796

TOTAL	COST CODE 70015			32,800		0		0		586,242	
	WBS 33N410				1,033,200		772,926		0		2,392,368
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										

TOTAL WBS 33N410 COMPRESSED AIR				32,800		0		0		586,242	
					1,033,200		772,926		0		2,392,368

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33N430	ION EXCHANGE										
33N430.15	MECHANICAL										
33N430.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 43 EQUIPMENT.	700	1 LOT	900	28350	0	12000	0	0	15626	55976
	SUBTOTAL MECHANICAL			900	28,350	0	12,000	0	0	15,626	55,976
	SALES TAX 7.00 %						936		0		936
	OH&P (ON MARKUPS ONLY)									46	46
	TOTAL COST CODE 70015			900	28,350	0	12,936	0	0	15,672	56,958
	WBS 33N430 (ESCALATION 0.00% - CONTINGENCY 40.00 %)										
	TOTAL WBS 33N430 ION EXCHANGE			900	28,350	0	12,936	0	0	15,672	56,958

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	MATERIAL	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
33W440	COOLING TOWER										
33W440.15	MECHANICAL										
33W440.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 44 EQUIPMENT.	700	1 LOT	37300	1174950	0	0	942000	0	669824	2786774

SUBTOTAL	MECHANICAL			37,300	1,174,950	0	0	942,000	0	669,824	2,786,774
	SALES TAX 7.80 %							73476		0	73476
	ON&P (ON HARKUPS ONLY)									3673	3673

TOTAL	COST CODE 70015			37,300	1,174,950	0	0	1,015,476	0	673,497	2,863,923
	WBS 33W440										
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										

TOTAL WBS 33W440	COOLING TOWER			37,300	1,174,950	0	0	1,015,476	0	673,497	2,863,923

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33N480	DEMINERALIZER										
33N480.15	MECHANICAL										
33N480.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 48 EQUIPMENT.	700	1 LOT	2600	81900	0	65000	0	0	46657	193557
	SUBTOTAL MECHANICAL			2,600	81,900	0	65,000	0	0	46,657	193,557
	SALES TAX 7.80 X						5070		0		5070
	OH&P (ON MARKUPS ONLY)									253	253
	TOTAL COST CODE 70015			2,600	81,900	0	70,070	0	0	46,910	198,880
	WBS 33N480 (ESCALATION 0.00% - CONTINGENCY 40.00 %)										
	TOTAL WBS 33N480 DEMINERALIZER			2,600	81,900	0	70,070	0	0	46,910	198,880

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANMOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
33N490	SANITARY WATER										
33N490.15	MECHANICAL										
33N490.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 49 EQUIPMENT.	700	1 LOT	900	28350	0	23000	0	0	16176	67526
	SUBTOTAL MECHANICAL			900	28,350	0	23,000	0	0	16,176	67,526
	SALES TAX 7.80 %						1794		0		1794
	ON&P (ON MARKUPS ONLY)									89	89
	TOTAL			900	28,350	0	24,794	0	0	16,265	69,409
	COST CODE 70015 WBS 33N490 (ESCALATION 0.00% - CONTINGENCY 40.00 %)										
	TOTAL WBS 33N490 SANITARY WATER			900	28,350	0	24,794	0	0	16,265	69,409

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** TEST - INTERACTIVE ESTIMATING **
TURNS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HAMHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33N500	RAW WATER/FIRE WATER										
33N500.15	MECHANICAL										
33N500.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM SO EQUIPMENT.	700	141500 MM	141500	4457250	0	3034043	0	0	2514045	10005338
	SUBTOTAL MECHANICAL			141,500	4,457,250	0	3,034,043	0	0	2,514,045	10,005,338
	SALES TAX 7.80 %						236655		0		236655
	OH&P (ON MARKUPS ONLY)									11832	11832
	TOTAL COST CODE 70015			141,500	4,457,250	0	3,270,698	0	0	2,525,877	10,253,826
	WBS 33N500 (ESCALATION 0.00% - CONTINGENCY 40.00 %)										
	TOTAL WBS 33N500 RAW WATER/FIRE WATER			141,500	4,457,250	0	3,270,698	0	0	2,525,877	10,253,826

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** IEST - INTERACTIVE ESTIMATING **												
YURS-FACILITY CONFIGURATION EVALUATION												
CENTRALIZED SUPPORT FACILITIES AND SITEMORK, REV 1												
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE												
FLUOR DANIEL INC.	ACCOUNT		DESCRIPTION	COST	QUANTITY	MANHOURS	LABOR	EQUIP	SUB-	EQUIP-	ON&P	TOTAL
WESTINGHOUSE WARFORD COMPANY	NUMBER			CODE				USAGE	CONTRACT	MENT	/ B & I	DOLLARS
JOB NO. 436302												
NON-RADIOACTIVE LIQUID WASTE PROC												
33W530												
33W530.15			MECHANICAL									
33W530.1500001			ALLOWANCE FOR LABOR AND	700	1 LOT	24800	781200	0	604000	0	444236	1829436
BULK MATERIALS ASSOCIATED												
WITH THE INSTALLATION OF THE												
SYSTEM 53 EQUIPMENT.												

SUBTOTAL												
MECHANICAL												
SALES TAX 7.80 %												
ON&P (ON MARKUPS ONLY)												

TOTAL												
COST CODE 70015												
WBS 33W530												
(ESCALATION 0.00% - CONTINGENCY 40.00 %)												

TOTAL WBS 33W530 NON-RADIOACTIVE LIQUID WASTE PROC												
24,800 781,200 0 651,112 0 446,591 1,878,903												

1,829,436												
47112												
2355												

1,878,903												

1,878,903												

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FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33N540	CHEMICAL RECEIPT AND MAKE-UP										
33N540.15	MECHANICAL										
33N540.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 54 EQUIPMENT.	700	1 LOT	50100	1578150	0	1603000	0	0	916570	4097720

SUBTOTAL	MECHANICAL			50,100	1,578,150	0	1,603,000	0	0	916,570	4,097,720
	SALES TAX 7.80 %						125034		0		125034
	OH&P (ON MARKUPS ONLY)									6251	6251

TOTAL	COST CODE 70015			50,100	1,578,150	0	1,728,034	0	0	922,821	4,229,005
	WBS 33N540										
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										

TOTAL WBS 33N540	CHEMICAL RECEIPT AND MAKE-UP			50,100	1,578,150	0	1,728,034	0	0	922,821	4,229,005

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

*** TEST - INTERACTIVE ESTIMATING ***
TMS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33N550	BULK COLD CHEMICAL VENT SYSTEM									
33N550.15	MECHANICAL	700	1 LOT	2100	66150	0	119000	0	41010	226160
33N550.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 'S' EQUIPMENT.									
SUBTOTAL	MECHANICAL			2,100	66,150	0	119,000	0	41,010	226,160
TOTAL	SALES TAX 7.00 % OH&P (ON MARKUPS ONLY)						9282	0	464	9282 464
	COST CODE 70015 WBS 33N550 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			2,100	66,150	0	128,282	0	41,474	235,906
TOTAL WBS 33N550	BULK COLD CHEMICAL VENT SYSTEM			2,100	66,150	0	128,282	0	41,474	235,906

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANMOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33W580	GLASS FORMER PREPARATION										
33W580.15	MECHANICAL										
33W580.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 58 EQUIPMENT.	700	104300 MM	104300	3285450	0	2635974	0	0	1873087	7794511
SUBTOTAL	MECHANICAL			104,300	3,285,450	0	2,635,974	0	0	1,873,087	7,794,511
	SALES TAX 7.80 %						205605		0		205605
	OH&P,(ON MARKUPS ONLY)									10280	10280
TOTAL	COST CODE 70015 WBS 33W580 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			104,300	3,285,450	0	2,841,579	0	0	1,883,367	8,010,397
TOTAL WBS 33W580 GLASS FORMER PREPARATION				104,300	3,285,450	0	2,841,579	0	0	1,883,367	8,010,397

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE ROB - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33N590	CRYOGENIC OXYGEN										
33N590.15	MECHANICAL										
33N590.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 59 EQUIPMENT.	700	1 LOT	21800	686700	0	625000	0	0	395201	1706901
	SUBTOTAL MECHANICAL			21,800	686,700	0	625,000	0	0	395,201	1,706,901
	SALES TAX 7.80 %						48750		0		48750
	OH&P (ON MARKUPS ONLY)									2437	2437
	TOTAL COST CODE 70015			21,800	686,700	0	673,750	0	0	397,638	1,758,088
	WBS 33N590										
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
	TOTAL WBS 33N590 CRYOGENIC OXYGEN			21,800	686,700	0	673,750	0	0	397,638	1,758,088

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FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33N600	SHARED FAC UTILITY PIPING										
33N600.15	MECHANICAL										
33N600.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 60EQUIPMENT.	700	1 LOT	73000	2299500	0	1524000	0	0	1294935	5118435
SUBTOTAL	MECHANICAL			73,000	2,299,500	0	1,524,000	0	0	1,294,935	5,118,435
	SALES TAX 7.80 %						118872		0		118872
	OH&P (ON MARKUPS ONLY)								0	5943	5943
TOTAL	COST CODE 70015			73,000	2,299,500	0	1,642,872	0	0	1,300,878	5,243,250
	WBS 33N600								0		
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
TOTAL WBS 33N600 SHARED FAC UTILITY PIPING				73,000	2,299,500	0	1,642,872	0	0	1,300,878	5,243,250

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FLUOR DANIEL INC.
WESTINGHOUSE MANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
33N620	NPS VACUUM SYSTEM										
33N620.15	MECHANICAL										
33N620.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM & EQUIPMENT.	700	1 LOT	900	28350	0	50000	0	0	17526	95876
	SUBTOTAL MECHANICAL			900		0		0		17,526	
	SALES TAX 7.80 %				28,350		50,000		0		95,876
	ON&P (ON MARKUPS ONLY)						3900		0		3900
										195	195
	TOTAL COST CODE 70015			900		0		0		17,721	
	WBS 33N620				28,350		53,900		0		99,971
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
	TOTAL WBS 33N620 NPS VACUUM SYSTEM			900		0		0		17,721	
					28,350		53,900		0		99,971

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONHP / B & I	TOTAL DOLLARS
33N720	SYSTEM 72 COLD HANDLING										
33W720.15	MECHANICAL	700	1 LOT	400	12600	0	2000	0	0	6778	21378
33N720.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF THE SYSTEM 72EQUIPMENT.										
	MECHANICAL			400	12,600	0	2,000 156	0	0	6,778	21,378 156
	SALES TAX 7.80 %									7	7
	ONHP (ON MARKUPS ONLY)										
	COST CODE 70015			400	12,600	0	2,156	0	0	6,785	21,541
	WBS 33N720 (ESCALATION 0.00% - CONTINGENCY 40.00 X)										
	SUBTOTAL										
	TOTAL										
	TOTAL WBS 33N720 SYSTEM 72 COLD HANDLING			400	12,600	0	2,156	0	0	6,785	21,541

FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
340010	SITEWORK										
340010.02	SITE WORK										
340010.0200001	CLEAR & GRUB MED BRUSH	460	370 AC	3700	116550	0	0	0	0	61772	178322
340010.0200005	SITE GRADING CUT & FILL (3259000 CY)	460	***** CY	0	0	0	0	4888500	0	488850	5377350
340010.0200010	ALLOWANCE FOR 2 MILES OF SITE ROADS.	460	1 LOT	1400	44100	0	321000	0	0	39423	404523
340010.0200015	ALLOWANCE FOR SECURITY FENCE.	460	1 LOT	9100	286650	0	217000	0	0	162775	666425
340010.0200020	ALLOWANCE FOR AREA SECURITY LIGHTING.	460	1 LOT	9700	305550	0	307000	0	0	177292	789842
340010.0200101	ALLOWANCE FOR FINAL SITE WORK. (ALLOWANCE INCLUDES RESTORATION OF PERMANENT ROADS, INSTALLATION OF SIDE- WALKS, COMPLETE GRADING, SURFACE STABILIZATION AND LANDSCAPING.	460	370 AC	0	0	0	0	3700000	0	370000	4070000
340010.0200105	ALLOWANCE FOR 9000 LF RAIL- ROAD TRACK FROM SITE BOUND- ARY TO PLANT WASTE PROCESS- ING FACILITIES.	460	0	0	0	0	0	0	0	0	0
340010.0205001	ALLOWANCE FOR 9000 LF RAIL- ROAD TRACK FROM SITE BOUND- ARY TO PLANT WASTE PROCESS- ING FACILITIES.	460	9000 LF	0	0	0	0	1080000	0	108000	1188000
SUBTOTAL	SITE WORK			23,900	752,850	0	845,000 65910	9,668,500	0	1,408,112 3295	12,674,462 3295
TOTAL	COST CODE 46002 WBS 340010 (ESCALATION 0.00% - CONTINGENCY 40.00 %)			23,900	752,850	0	910,910	9,668,500	0	1,411,407	12,743,667
340010.02	SITE WORK										
340010.0200025	ALLOWANCE FOR SITE U/G FIRE WATER, RAW WATER, COMPRESSED AIR, STEAM, PROCESS STEAM AND CONDENSATE, PROCESS WATER, & SANITARY WATER.	501	250000 MH	250000	7875000	0	7600000	0	0	4553750	20028750
340010.0200030	SANITARY WATER.	501	0	0	0	0	0	0	0	0	0
SUBTOTAL	SITE WORK			250,000	7,875,000	0	7,600,000	0	0	4,553,750	20,028,750

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** IEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
	SALES TAX 7.80 %						592800		0		592800
	OH&P (ON MARKUPS ONLY)									29640	29640
TOTAL	COST CODE 50102			250,000		0		0		4,583,390	
	WBS 340010				7,875,000		8,192,800		0		20,651,190
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
340010.16	ELECTRICAL										
340010.1662001	ALLOWANCE FOR UNDERGROUND ELECTRICAL POWER AND COMMUN- ICATION	600	154000 MM	0	0	0	5000072	0	0	250004	5250076
SUBTOTAL	ELECTRICAL			0		0		0		250,004	
	SALES TAX 7.80 %					0	5,000,072		0		5,250,076
	OH&P (ON MARKUPS ONLY)						390005		0		390005
										19500	19500
TOTAL	COST CODE 60016			0		0		0		269,504	
	WBS 340010				0		5,390,077		0		5,659,581
	(ESCALATION 0.00% - CONTINGENCY 40.00 %)										
TOTAL WBS 340010 SITEWORK				273,900		0		9,668,500		6,264,301	
					8,627,850		14,493,787		0		39,054,439

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FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
THRS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONR- / 8 & 1	TOTAL DOLLARS
411000	CONSTRUCTION MANAGEMENT										
411000.9210001	CONSTRUCTION MANAGEMENT ESTIMATED @ 10% OF TOTAL DIRECT COSTS.	000	1 LOT	0	0	0	0	0	0	0	0
411000.9210005	THE FOLLOWING IS A PRORATE OF THE CONSTRUCTION MANAGE- MENT ESTIMATE TO THE DOE COST CODE OF ACCOUNTS: CONSTRUCTION MANAGEMENT: (PRORATED TO DOE COST CODE 460--IMPROVEMENTS TO LAND*) CONSTRUCTION MANAGEMENT: (PRORATED TO DOE COST CODE 501--BUILDINGS*) CONSTRUCTION MANAGEMENT: (PRORATED TO DOE COST CODE 600--UTILITIES*) CONSTRUCTION MANAGEMENT: (PRORATED TO DOE COST CODE 700--SPECIAL EQUIPMENT/PROC- ESS SYSTEMS*)	000	0	0	0	0	0	0	0	0	0
411000.9210010		000	0	0	0	0	0	0	0	0	0
411000.9210015		460	1 LOT	0	0	0	0	1130000	0	0	1130000
411000.9210020		501	1 LOT	0	0	0	0	9715000	0	0	9715000
411000.9210030		600	1 LOT	0	0	0	0	3625000	0	0	3625000
411000.9210035		700	1 LOT	0	0	0	0	5330000	0	0	5330000
TOTAL WBS 411000 CONSTRUCTION MANAGEMENT											
0 0 0 0 20,000,000 0 20,000,000											

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TMR5-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
511000	PROJECT MANAGEMENT										
511000.9310001	PROJECT MANAGEMENT ESTIMATED @ 10% OF TOTAL DIRECT COSTS, PLUS CONSTRU- TION MANAGEMNT & ENGINEERING	000	0	0	0	0	0	0	0	0	0
511000.9310005	THE FOLLOWING IS A PRORATE OF THE PROJECT MANAGEMENT ESTIMATE TO THE DOE COST	000	0	0	0	0	0	0	0	0	0
511000.9310010	CODE OF ACCOUNTS:	000	0	0	0	0	0	0	0	0	0
511000.9310020	PROJECT MANAGEMENT: (PRORATED TO DOE COST CODE 460-"IMPROVEMENT TO LAND")	460	1 LOT	0	0	0	0	1975000	0	0	1975000
511000.9310020	PROJECT MANAGEMENT: (PRORATED TO DOE COST CODE 501-"BUILDINGS")	501	1 LOT	0	0	0	0	17000000	0	0	17000000
511000.9310030	PROJECT MANAGEMENT: (PRORATED TO DOE COST CODE 600-"UTILITIES")	600	1 LOT	0	0	0	0	6695000	0	0	6695000
511000.9310035	PROJECT MANAGEMENT: (PRORATED TO DOE COST CODE 700-"SPECIAL EQUIPMENT/PROC- ESS SYSTEMS")	700	1 LOT	0	0	0	0	9330000	0	0	9330000

TOTAL WBS 511000 PROJECT MANAGEMENT				0	0	0	35,000,000	0	0	0	35,000,000

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FLUOR DANIEL INC.
VESTINGHOUSE HANFORD COMPANY
JOB NO. 436302

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
CENTRALIZED SUPPORT FACILITIES AND SITEWORK, REV 1
DOE_R08 - ESTIMATE DETAIL BY WBS / COST CODE

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BY JFD/PCA/RLJ/AAF

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS

REPORT TOTAL				1,893,147		0	178,565,500		39,616,986		
				59,634,131		56,152,639		38,934,126			370,903,382

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APPENDIX G2

ALTERNATE CASE SUPPORT FACILITY CONFIGURATION COST BASIS

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17-Feb-95

COMPARISON—BASE CASE VERSUS STANDALONE

[illegible]

NOTES:

- 1) PRICES ARE EXPRESSED IN 1994 DOLLARS
2) ESCALATION TO PROJECT CENTROIDS IS EXCLUDED
3) ALLOWANCES FOR ENG/PM/CM ARE:
ENGINEERING @ 40% OF DIRECT COST
CONSTRUCTION MANAGEMENT (CM) @ 10% OF DIRECT COST
PROJECT MANAGEMENT (PM) @ 10% OF DIRECT COST + ENG + CM
4) CONTINGENCY @ 40 %

- 6) BASE CASE SWITCHGEAR BLDG. EXCLUDES GENERATOR & EMERGENCY SWITCHGEAR & EMERGENCY TRANSFORMERS.

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 WBS, 2001

INTEGRATED VS DISTRIBUTED
SUPPORT FUNCTIONS

BY: PCA/MAF

17-Feb-95

HLW ALTERNATE CASE
(STANDALONE)

FACILITY/BUILDING	AREA (M2)	VOLUME (M3)	DIRECT COST (\$ M)	ENG/ PM/CM(\$) (\$ M)	SUB TOTAL (\$ M)	CONT TOTAL(\$) (\$ M)	TEC TOTAL (\$ M)
BULK COLD CHEMICAL BLDG.	1,384	18,957	7,339.8	4,770.9	12,110.7	4,844.3	16,954.9
BULK HANDLING AREA	649	N/A	1,782.0	1,158.3	2,940.3	1,176.1	4,116.4
MECHANICAL UTILITIES BLDG	2,632	20,524	10,276.0	6,679.4	16,955.4	6,782.2	23,737.6
ANALYTICAL FACILITY	3,070	18,170	37,248.0	24,211.2	61,459.2	24,583.7	86,042.9
COOLING TOWER	NA	NA	1,576.0	1,024.4	2,600.4	1,040.2	3,640.6
TOTAL	7,735.0	57,651.0	58,221.8	37,844.2	96,066.0	38,426.4	134,492.4

NOTES:

- 1) PRICES ARE EXPRESSED IN 1994 DOLLARS
- 2) ESCALATION TO PROJECT CENTROIDS IS EXCLUDED
- 3) ALLOWANCES FOR ENG/PM/CM ARE:
ENGINEERING @ 40% OF DIRECT COST
CONSTRUCTION MANAGEMENT(CM) @ 10% OF DIRECT COST
PROJECT MANAGEMENT(PM) @10% OF DIRECT COST + ENG + CM
- 4) CONTINGENCY @ 40 %

17-Feb-95

BY:PCA/AAF

FACILITY/BUILDING	AREA (M ²)	VOLUME (M ³)	DIRECT COST (\$ M)	ENG/ PM/CM(3) (\$ M)	SUB TOTAL (\$ M)	CONT TOTAL(4) (\$ M)	TEC TOTAL (\$ M)
BULK COLD CHEMICAL BUILDING	1,735	22,992	10,492.0	6,819.8	17,311.8	6,924.7	24,236.5
BULK HANDLING AREA	6,490	N/A	10,547.0	6,855.6	17,402.6	6,961.0	24,363.6
MECHANICAL UTILITIES BLDG	2,981	23,674	14,333.0	9,316.5	23,649.5	9,459.8	33,109.2
ANALYTICAL FACILITY	3,070	16,170	44,945.0	29,214.3	74,159.3	29,663.7	103,823.0
COOLING TOWER	NA	NA	4,973.0	3,232.5	8,205.5	3,282.2	11,487.6
TOTAL	14,276.0	64,836.0	85,290.0	55,438.5	140,728.5	56,291.4	197,019.9

1) PRICES ARE EXPRESSED IN 1994 DOLLARS
2) ESCALATION TO PROJECT CENTROIDS IS EXCLUDED
3) ALLOWANCES FOR ENG/PM/CM ARE:
ENGINEERING @ 40% OF DIRECT COST
CONSTRUCTION MANAGEMENT (CM) @ 10% OF DIRECT COST
PROJECT MANAGEMENT (PM) @ 10% OF DIRECT COST + ENG + CM
4) CONTINGENCY @ 40 %

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Current Support Facility Versus FCS Facility Cost Comparison^{1,2}

Facility/building	Currently defined as a support facility	FCS support facility	FCS process facility	Current direct cost basis (\$M)	FCS support facility direct cost basis (\$M)	FCS process facility direct cost basis (\$M)	FCS facility cost adjustment (\$M)	ENG/PM/CM ³ (\$M)	Subtotal (\$M)	Contingency total* (\$M)	Total estimated cost (\$M)
Cooling Tower	Yes (CT)	Yes (CT)	No	5,381	3,931	0	1,450	943	2,393	957	3,350
Shipping and Receiving (Structure)	Yes (SHIP/REC/V*G)	No (incl w/W-HSE)	No	1,365	0	0	1,365	887	2,252	901	3,153
Warehouses (total costs)	Yes (2 req)	Yes (3 req)	No	6,910	6,011	0	899	584	1,483	593	2,076
Fabrication and Assembly Shop	Yes (FAS)	Yes (Fab and Mock-up Shops)	No	7,927	5,347	0	2,580	1,677	4,257	1,703	5,960
TWRS Treatment Complex Site (Earthwork and U/G utilities)	Yes	Yes	No	44,796	39,054	0	5,742	3,732	9,474	3,790	13,264
Feed Transfer Lines	Yes	Yes	No	3,234	3,280	0	-46	-30	-76	-30	-106
Pole Line and 230 kV Substation	Yes (incl w/site)	Yes	No	0	9,753	0	-9,753	-6,339	-16,092	-6,437	-22,529
Inter Facility Transfer Lines	Yes (incl w/site)	Yes	No	0	41,001	0	-41,001	-26,651	-67,652	-27,061	-94,713
							0			0	0
TOTAL	-	-	-	227,204	225,903	67,823	-66,522	-43,239	-109,761	-43,904	-153,665

Current Support Facility Versus FCS Facility Cost Comparison^{1, 2}

Facility/building	Currently defined as a support facility	FCS support facility	FCS process facility	Current direct cost basis (\$M)	FCS support facility direct cost basis (\$M)	FCS process facility direct cost basis (\$M)	FCS facility cost adjustment (\$M)	ENG/PM/CM ³ (\$M)	Subtotal (\$M)	Contingency total ⁴ (\$M)	Total estimated cost (\$M)
-------------------	---	----------------------	----------------------	---------------------------------	--	--	------------------------------------	------------------------------	----------------	--------------------------------------	----------------------------

Case 3B FCS TEC Cost Adjustment (\$M) = -66,221
Case 4C FCS TEC Cost Adjustment (\$M) = -90,450
Support Facility FCS TEC Cost Adjustment (\$M) = 3,006
Total FCS TEC Cost Adjustment (\$M) = -153,665

FCS = Tank Waste Remediation System Facility Configuration Study (Boomer et al. 1994)
HLW = High-level waste
LLW = Low-level waste
TEC = Total estimated cost
TWRS = Tank Waste Remediation System

¹Prices are expressed in 1994 dollars.

²Escalation to project centroids is excluded.

³Allowances for eng/pm/cm are: Engineering at 40 percent of Direct Cost, Construction Management(cm) at 10 percent of Direct Cost, Project Management(pm) at 10 percent of Direct Cost + Eng + CM.

⁴Contingency at 40 percent.

⁵Costs for buildings include costs for HVAC and other costs associated with the structure.

⁶Site cost includes clearing and grubbing, grading, two miles of roads, security fence, misc. unit substations, 230 kV line, Substation/Switchgear area, area lighting, a sewer lift station, U/G fire water, raw water, sewer, steam and condensate, process water, compressed air, U/G electrical power and communication systems, railroad track, final site grading, walkways and landscaping.

⁷BCCB also includes Chemical Supply System, glass former preparation.

⁸Water Pumphouse also includes fire and bulk water storage tanks, diesel tanks and pumps.

⁹Bulk Handling Area also includes the 130 T/D oxygen plant.

2001 Analysis
2001 versus FCS

Sheet 1

	2001	FCS	2001 (\$M)	FCS (\$M)	Δ (\$M)	
BCCB	Yes	Yes	11,823	9,331	2,492	
BHA	Yes	W/BCCB	10,831	W/BCCB	10,831	
S-T			22,204	9,331	12,873	(1)
OSB	Yes	Yes	9,982	6,618	3,364	(2)
REC	Yes	Yes (REB)	11,145	8,533	2,612	
ERC	Yes	No (in OCB)	6,269	W/OCB	6,269	
OCB	No	Yes	0	3,035	<3,035>	
S-T			17,414	11,568	5,846	
MUB	Yes	Yes	15,083	9,376	5,707	
FAAS	Yes	Yes (Fab and Mock)	7,927	5,347	2,580	
WHSS	Yes	Yes	6,910	6,011	899	
S&R	Yes	W/WHSS	1,365	0	1,365	
S-T DFC			8,275	6,011	2,264	(6)

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2001 Analysis
2001 versus FCS

Sheet 2

	2001	FCS	2001 (\$M)	FCS (\$M)	Δ (\$M)	
SGB	Yes	Yes	9,370	38,083	<28,713>	(7)
CT	Yes	Yes	5,381	3,931	1,450	(8)
PH	Yes	No	5,819	0	5,819	(9)
EGB	Yes	No	28,114	0	28,114	(10)
AF	Yes	No (in VREB)	77,719	0	77,719	
VREB	No	Yes	0	42,550	<42,550>	
S-T			77,719	42,550	35,169	(11)
Total			207,288	132,815	74,473	
Transf Lines	No	Yes	0	3,280	<3,280>	(12)
Power Lines	No	Yes	0	9,753	<9,753>	(13)
Shared Utilities	No	Yes	0	41,001	<41,001>	(14)
Site	Yes	Yes	44,796	39,054	5,742	(15)
Total DFC			252,084	225,903	26,181	

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Sheet No. 1

2001 Analysis
2001 versus FCS

	2001	Cost	Δ
1) Equip	130,694	40,881	89,813
2) Construction			
a) Common	44,744 (32,600 SF)	62,890 (632,000 SF)	< 18,146 >
b) Added	31,850 (149,300 SF)		31,850
c) Deleted	--	83,078 (146,100 SF)	< 83,078 >
Total	76,594 (470,900 SF) 163 \$/SF	145,968 (778,100 SF) 188 \$/SF	< 69,374 >
3) Site	44,796	39,054	5,742
Total	252,084	225,903	26,181

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Sheet 2

1) Equipment	89,813
--------------	--------

a)	Analytical Facilites	59,401
----	----------------------	--------

b)	EGB	21,905
----	-----	--------

81,306

$$81,300/89,813 = 91\%$$

2) Structures

From 778,100 SF to 470,900 SF

$$(470,900/778,100) \times 145,968 = 88,340$$

88,340 vs 76,594 87%

3) Site	5,742
---------	-------

Addition of Unit substations, etc.

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APPENDIX H1

SEPARATIONS/LOW-LEVEL WASTE
ANALYTICAL FUNCTION STUDY

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**APPENDIX H1
SEPARATIONS/LOW-LEVEL WASTE
ANALYTICAL FUNCTION STUDY**

1.0 OBJECTIVE

This appendix presents a simplified time and motion study of the analytical capabilities associated with the Separations/low-level waste (LLW) combined analytical function. The analytical requirements, developed in this appendix, are used to develop the requirements for analytical cells, analytical laboratories, and other associated rooms. For the purpose of this appendix, the following definitions are used:

Analytical Cells. This term refers to the areas where undiluted, high radiological activity samples are remotely handled. Sample preparation, dilution, and limited sample analysis occurs in analytical cells.

Analytical Laboratories. This term refers to the areas where diluted and/or low radiological activity samples are analyzed. Analyzers within the laboratories are located in hoods to contain radioactivity.

Other Associated Rooms. This term refers to the miscellaneous support areas that are outside of the analytical cells and analytical laboratories. These rooms include service rooms, receiving rooms, counting rooms, equipment and stock rooms, waste handling areas, and analytical instrument rooms.

This appendix identifies the critical sample analyses required to support the process, such as process control and waste form qualification. Supplemental analyses, such as offgas and environmental samples, are also addressed. Limited on-line sample analyses assumed to occur within the process facility are identified. Potential analytical needs associated with incoming waste safety issues, such as criticality, have not been considered here.

This appendix has profitted substantially from the design of the Hanford Waste Vittrification Plant (HWVP) analytical function. As such, it incorporates lessons learned at the Defense Waste Process Facilities (DWPF).

2.0 SUMMARY

This appendix develops the technical requirements for the Separations/LLW analytical function. The initial step is to establish a sample schedule to support process control and waste form qualification. For purposes of developing the analytical laboratory requirements, the schedule also includes offgas and environmental samples.

A simplified time and motion study is then performed to develop the requirements for the analytical cells and analytical laboratories. Major equipment and instrumentation items are identified and major plant utilities and service interfaces are established. Initial analytical cell and analytical laboratory arrangements are developed to support Analytical Facility (AF) layouts.

The requirements are developed separately for the Separations and LLW function in this appendix and then summed. Appendix H2 develops the requirements for the high-level waste (HLW) function. This approach highlights the requirements attributable to each function and the potential areas of consolidation. Some consolidation is expected even though the appendixes do not evaluate the impact of consolidation. The AF layouts are based on the assumption that a 20 percent reduction in the analytical laboratories can be achieved by combining the Separations, LLW, and HLW analytical functions. Additional study is required to validate this assumption.

3.0 TECHNICAL FINDINGS AND CONCLUSIONS

The simplified time and motion study for the analytical cells indicates that six analytical cells are required for the Separations/LLW combined function. The time and motion study is based on 70 percent staff availability, 100 percent Total Operating Efficiency (TOE) in the process facility, and product glass sampling to confirm product quality. The staff availability is based on operator breaks, meetings, scheduled training, etc. The analytical requirements do not rely on slack time caused by operating inefficiencies in the process facility. Further evaluation of the bases may indicate that more or less analytical cells are required.

The simplified time and motion study also indicates that three analytical laboratories are required to support the Separations/LLW combined analytical function. The study includes an assessment of the equipment requirements, the space requirements for each piece of equipment, and the resulting total analytical laboratory space requirements. Redundant spare equipment and instruments are included in the analytical laboratory requirements. Further evaluation should confirm the redundancy requirements and also the analytical laboratory space requirements.

Product qualification, rather than process qualification, is the assumed method of LLW waste form qualification. Statistically significant sampling of the LLW product glass cullet is required to ensure product quality. This appendix assumes that a method of frequently sampling glass cullet can be developed. Further study is required to confirm this assumption.

4.0 INITIAL ESTIMATES OF ANALYTICAL REQUIREMENTS

The results of this appendix are presented in a series of tables as discussed below. Separate series of tables are provided for the (a) Separations and (b) LLW functions. Unless otherwise stated, the table numbers refer to both Separations and LLW tables.

- Samples that require processing through the analytical cells and analytical laboratory are identified in Table H1-1. Sample frequency (occasions), sample purpose and analysis required are also given in Table H1-1.
- Table H1-2 define the analyses that are performed in an analytical cell and those that are analyzed in an analytical laboratory. For those functions that are combined in the combined Separations/LLW facility, the samples and analyses are shown on the Table H1-1B associated with LLW. Initial estimates of process gas samples and other waste/wastewater and environmental samples are also included. These values could change greatly depending on future requirements for additional sample analyses.
- The daily analytical requirements for analyses performed in an analytical cell are identified in Table H1-3. The requirements for each type of analysis are totaled, and the total analytical demand is also indicated.
- Table H1-4 summarizes the time requirements for analyses performed in the analytical cells. Total analysis requirements from Table H1-3 are multiplied by the time required for each analysis and the total time is indicated.
- Table H1-5 defines the analyses that occur in the analytical laboratories, but that require the sample preparation time in the analytical cells. The total analytical cell sample preparation time required is indicated.
- Table H1-6 provides the total analytical cell time requirements. The requirements include the analyses performed in the analytical cells and the sample preparation time for those performed in the analytical laboratories. Additional requirements for sample reruns and standards and estimated sample load-out times as well as credit for parallel testing are also included.

- Analytical cell availability is calculated in Table H1-7. The availability is based on an assumed staff availability of 70 percent, manipulator downtime, cleanup time and equipment availability. Analytical cell availability at 100 percent staff availability is also indicated.
- In Table H1-8 the number of analytical cells is determined by dividing the total time required by the available time per analytical cell. The base case evaluation is based on 70 percent staff availability and 100 percent process facility TOE. Table H1-8 also provides a sensitivity analysis of staff availability and TOE.
- Table H1-9 provides estimates of the time requirements for analyses performed in the analytical laboratory.
- Table H1-10 provides initial estimates of sample turnaround time requirements and equipment reliability. This table will assist in developing duplicate and spare equipment needs.
- Table H1-11 provides approximate space requirements and plant utility interfaces required to support the analytical laboratory equipment.
- Table H1-12 lists additional equipment requirements for safe and efficient operation of the AF. These items do not directly impact the initial AF layouts or cost, however, they must be considered so that space can be allocated and supporting services can be planned.
- Table H1-13 presents the estimated space requirements for the various working areas of the Analytical facility. The space requirements of the Separations function are given in the column headed "SEP." The space requirements for the Separations and LLW are summed and are given in the column headed "SEP+LLW." The HLW space requirements, that are provided in Appendix H2, is indicated, and the requirements for the three functions are summed. These cells, rooms and laboratories are included in the layout of a combined Separations/LLW/HLW AF. The facility AF layout is based on the assumption that a 20 percent reduction in the analytical laboratories can be achieved by combining the Separations, LLW, and HLW analytical functions.
- Table H1-14B, provided for LLW only, provides an estimate of the number of analytical laboratory hoods required to support the LLW function. The estimated 18 hoods are located in several laboratories.

5.0 DISCUSSION OF ALTERNATIVES

5.1 ASSUMPTIONS AND UNCERTAINTIES

This section identifies the assumptions made for this appendix. A brief discussion of each is given to illustrate the importance and uncertainties of each assumption.

- The sample schedule is based on the process flow diagrams (PFDs) for the combined Separations/LLW facility and the detached HLW facility from the Facility Configuration Study, (Boomer et al. 1994). The PFDs are used to identify sample locations, frequencies of sample collection, and the types of analyses required. The sample schedule is designed to support process diagnosis, control and history and waste form qualification. Emphasis is placed on the use of on-line analyzers and Inductively Coupled Plasma-Mass Spectrometer (ICP-MS) analysis to reduce the load on analytical cells and laboratories. Laser ablation is assumed to prepare ICP-MS samples, where appropriate. In addition, no process time and motion analysis has been performed on the process itself. Any changes in the number of sample locations and particularly in the frequencies of sampling and type of analyses could impact the analytical cell and laboratory needs.
- Product glass waste form qualification is based on sampling the product glass cullet and recycling any offspec glass produced (i.e., product qualification, rather than process qualification). Providing statistically significant sampling and analysis of the product glass results in a large number of glass cullet samples. Changes to the waste form qualification method or the number of samples required to provide statistically significant analysis impacts the number of analytical cells required.
- This appendix assumes that the AF receives samples around the clock, rather than simultaneously. The analytical cell requirements include no allowances for concurrent analysis and/or sample preparation of all of the samples.
- Analytical cell operations are to be fully supported by the analytical laboratory. Although no complete time and motion study in the main laboratory is available, it is assumed this laboratory is self sufficient and that adequate laboratory capacity is available so as not to limit analytical cell throughput.
- The number of analytical hot cells and associated facilities is based on the liquid, slurry, and solid (cullet) samples. The layouts for the analytical laboratory and other contact areas are based on both the samples from the hot cells and additional contact-handled samples. The contact-handled samples

include process gas samples and environmental samples. Layouts for the Bulk Cold Chemical Building include space for cold chemical testing.

- AF waste handling (both liquid and solid) is extremely important. Personnel, equipment, and facilities must be provided to sort, combine, absorb, package and stage waste for transfer to a treatment, storage or disposal facility. Space must be provided for load-out from the analytical cells and other laboratory and counting room areas.
- Analytical facilities outside the TWRS complex are assumed to be not available. As a result, enough overlap and redundancy must be built into the laboratory design so that analytical results are available to support plant operations. It is also assumed that the AF is not required to support other Hanford Site operations.
- Table H1-1 identifies the samples that must be processed through the analytical cells. Any additional samples not included in Table H1-1 would increase analytical cell requirements. Samples which may be borderline for analytical cell processing due to radioactivity are included in Table H1-1 to be conservative.
- Several properties are assumed to be inferred from the ICP-MS analysis, thereby reducing the number of samples and analyses required. In particular, the rates of disintegration and emitted energies of radionuclides may be inferred from the measured isotopic composition. Also, the crystallinity, density, and PCT properties of the product glass are assumed to be inferred from the measured composition and the glass phase diagram. Correlation of the glass composition with the phase diagram is assumed to occur in nonradioactive laboratories outside the AF.
- Analytical cell analysis requirements are identified in Table H1-2. Determination of the sample solids content and rheology and sample preparation (including dissolutions and separations) are assumed to be performed in the analytical cells. Elemental and anion analyses as well as radionuclide counting are assumed to be performed in the analytical laboratory, rather than analytical cell.
- Analyses and sample preparation time requirements are as identified in Table H1-4 and Table H1-5. Some are estimates but most are based on Hanford and other analytical laboratory experience.
- Staff availability is assumed to be 70 percent for the base case. This figure is derived from Hanford experience of chemical technologist availability of 5.5 hours per 8 hour shift. This operator availability is based on operator breaks,

meetings, scheduled training, etc. A sensitivity study examines the 100 percent staff availability case (Table H1-8)

- Manipulator availability is assumed to be 93 percent, that is the same as the Hanford experience with the CRL Model F MSM. Although manipulator availability could be improved with the System 50 manipulator, that is expected to be used in the AF, the availability is not now known. When a manipulator fails, a replacement is assumed to be ready for installation. The AF layouts include a manipulator repair/replacement system to support manipulator failure and recycle.
- A 6 percent downtime is assumed for dedicated cell cleanup. This is based on experience where 30 minutes per eight hour shift is used for cleaning. Maintaining a "clean-cell" policy has been found to be extremely effective in maintaining continuity of operations.
- A 10 percent downtime is assumed for equipment failure. For equipment or procedures requiring newly developed equipment this assumption may need to be increased.
- Additional time for standards (10 percent) and reruns (5 percent) is assumed. Additional quality control related analyses (blanks, duplicates, spikes) may be necessary due to equipment requirements and/or environmental protocols.
- Sample load-outs into rabbit containers from the analytical cells is assumed to require five minutes each. This assumes that multiple load-out techniques are possible.
- The size of the analytical laboratory is based on the space requirements for individual equipment and instruments. The analytical laboratory requirements benefit from detailed layouts that was developed during HWVP. However, additional study is required to validate this assumption.
- The requirements are developed separately for the Separations and LLW function in this appendix and then summed. Appendix H2 develops the requirements for the HLW function. Some consolidation is expected even though the appendices do not evaluate the impact of consolidation. The facility AF layouts are based on the assumption that a 20 percent reduction in the analytical laboratories can be achieved by combining the Separations, LLW, and HLW analytical functions. Additional study is required to validate this assumption.

5.2 SUMMARY OBSERVATIONS

Some specific observations on the number of analytical cells required and the needs of the analytical laboratory are presented below.

Tables H1-1 through H1-3 indicate that a wide variety of analytical analyses are required. The largest sample demands involve the analyses of the final waste form, glass cullet (24 of the 51.7 LLW samples taken per day). The product qualification method of ensuring glass quality requires sampling and analysis of a statistically significant portion of the glass product. In consideration of the reduced residence time in the combustion melter, it is initially assumed that the glass product should be sampled at least once every 2 hours for each melter train.

The baseline analytical cell availability is determined to be 55 percent (Table H1-7). This includes 7 percent downtime for manipulators, 6 percent downtime dedicated to cell clean-up and 10 percent downtime for equipment failures. The major variable is the 70 percent work force availability factor; at 100 percent work force availability, the cell availability increases to 79 percent. By addressing this staffing issue, the analytical cell requirements could be reduced (Table H1-8).

Table H1-8 indicates that six analytical cells are sufficient for the Separations/LLW combined function, particularly if the staff availability can be increased or the process facility TOE can be considered.

Tables H1-9 through H1-11 provide initial estimates of the number of samples, approximate size/space and plant utility interfaces required to support the Analytical Laboratory equipment for the Separations-LLW combined function. Equipment requirements will need to be revised as additional (or new) measurement methods are identified and developed. Analyses and analytical methods, and therefore equipment, will also be a function of the required detection levels and turnaround times.

Table H1-12 lists some additional items that need to be considered since these contribute to the safe and efficient operation of the analytical facility. An additional item of importance to be considered is the waste handling operations for both solids and liquids. Facilities and personnel need to be provided to sort, combine, absorb, package and stage wastes from the analytical cells, the analytical laboratories and counting rooms for transfer to a treatment, storage or disposal facility.

The design with respect to waste handling, particularly solids and organic liquid handling, is discussed only to a level that shows allocation of space and interfaces between waste handling and other AF activities. There are many details to waste handling that have yet to be investigated, which may have significant impacts on the layout of laboratory operating areas. An additional effort will be needed to determine further details of design to fully accommodate the waste handling tasks, e.g. special handling of hazardous and radioactive mixed wastes.

6.0 REFERENCES

Boomer, K. D., J. M. Colby, T. W. Crawford, J. S. Garfield, J. D. Galbraith, C. E. Golberg, C. E. Leach, D. E. Mitchell, F. D. Nankani, E. J. Slaathaug, L. M. Swanson, T. L. Waldo, C. M. Winkler, June 1994, *Tank Waste Remediation System Facility Configuration Study* WHC-SD-WM-ES-295, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table H1-1A. Process Liquid and Process Solid
Sampling Frequency Separations Function.
(Low Cs DF Mode of Operation)

Sample Point	Grab Sample Frequency	Samples/Day	Sample Purpose	Analyses Required
1. Receipt/Sample Tanks (TK-131A, B, C, D, E & F)	Once every 10 days/tank	2 (worst case in one day)*	PC (Verify Tank Farm Analyses)	SpG, TDS, TSS, pH and/or acid demand, Elements and Radionuclides (ICP-MS)
2. Evaporator Feed Tank (TK-135)	Not required on routine basis	--		
3. Process Condensate from Condenser (EC-140)	Not applicable	--	PD	Continuous on-line analysis for radioactivity
4. Concentrated Supernatant Catch Tank (TK-141)	Not required on routine basis	--		
5. Concentrated Supernatant Sample Tank (TK-143)	One sample every 24 hours	1	PC	SpG, Elements and Radionuclides (ICP-MS), pH and/or acid demand, anions
6. Transfer Tank (TK-146)	One sample every 24 hours	1	PC	pH and/or acid demand and anion (NO_3^- , NO_2^-)
7. Cs Ion Exchange Feed Adjust Tank (TK-136)	One sample every 24 hours	1	PC	pH and/or acid demand, cations (Na^+), and certain anions (free OH^-)
8. Cs IX Feed Tank (TK-200)	Not required on routine basis	--		
9. Filter Bed Catch Tank (TK-203)	Sample once per operating cycle; 1/week	--	PH	pH and/or acid demand, TSS, TDS, Elements and Radionuclides (ICP-MS)
10. Cs IX Acid Regen Feed Tank (TK-206)	Not applicable	--	PD	Continuous on-line analysis for radioactivity
11. Acid Recycle Tank (TK-210)	One sample every 24 hours	1	PC	pH, cations (ICP-MS), anions
12. Cs IX Caustic Regen Feed Tank (TK-214)	Not required on routine basis	--		(cold tank)
13. Cs IX Columns Loading/Regeneration	Not applicable	--	PC	Continuous on-line analyses of treated effluent stream (Cs-137/Ba-137)
14. Solid Product/Spent Resins	One sample per week	--	PH	Elements and Radionuclides (ICP-MS)
15. Cs IX Eluant Catch Tank (TK-1531)	Not required on routine basis	--		
16. Cs IX Concentration Catch Tank	One sample every 24 hours	1	PC	pH and/or acid demand, TSS, TDS, anions (NO_3^- , NO_2^-), Elements and Radionuclides (ICP-MS)
17. Cs IX Waste Tank (TK-1502)	Not required on routine basis	--		
18. Cs IX Waste Sample Tank (TK-1504)	One sample every 24 hours	1	PC	pH and/or acid demand, TSS, TDS, Elements and Radionuclides (ICP-MS)
TOTAL		8		

Notes: PC=Process ControlTDS=Total Dissolved Solids

PD=Process DiagnosticTSS=Total Suspended Solids

PH=Process HistoryICP-MS=Inductively Coupled Plasma-Mass Spectrometer

SpG=Specific GravitypH=Acid Content or Demand

* Assumes two tanks are analyzed in one day when fresh feed is introduced in the plant.

Table H1-2A. Location of Analyses
Serparations Function

<u>ANALYTICAL CELL</u> (Undiluted samples)	<u>ANALYTICAL LABORATORY</u> (Diluted/low level and cold samples)
pH SpG	OTR pH SpG
Solids-work: TSD, TDS, TSS	Solids-work: TSD, TDS, TSS
Elements and Radionuclides: ICP-MS closely coupled to the Analytical Cells allowing processing of undiluted or slightly diluted (1:10) samples	Anions: HPLC, Dionex Elements: ICP-MS ICP-AES AAS Spectrophotometer Fluorometer Radionuclide Separations (prior to radionuclide analyses): Extractions Precipitations HPLC Ion Exchange
Anions: Sample preparation Dilution	Radionuclide Analysis: IPC-MS Total Alpha AEA Total Beta GEA Beta Sci
PCT (Product Consistency Test) Crystallinity/Density	Titration Gas Chromatography

Sample Analysis	Equipment Description	Receptl/ Sample Tank	Conc Super Sample Tank	Transfer Tank	Cs IX Feed Adjust Tank	Acid Recycle Tank	Cs IX Concent. Tank	Cs IX Waste Sample Tank	Totals /Day	Totals /Week
pH	pH meter, electrode	2	1	1	1	1	1	1	8	56
SpG	Balance/graduated centrifuge cone	2	1						3	21
TSD (Dried)	Microwave, balance									
TDS Total	Filtration, microwave, balance	2					1	1	4	28
TSS Total	Filtration, microwave, balance	2					1	1	4	28
Crystallinity	X-Ray diffraction									
Density	Balance									
PCT	DW/X/Grinder/ Glassware									
Elements and Radionuclides	ICP-MS	2	1		1	1	1	1	7	49
Anions	Ion Chromatography; Dionex		1		1	1	1	1	5	35
TOTALS		10	4	2	3	3	5	4	31	217

Table H1-4A. Time Per Week for Analytical Cell
Sample Analysis Separations Function.
(Low Cs DF Mode of Operation)

Type of Analysis	Number of Determinations Per Week	Time/Analysis (Hours)	Total Analysis Time (Hours/Week)
pH	56	0.5	28
SpG	21	0.5	10.5
TSD (Dried)		1.0	
TDS	28	1.12	31.4
TSS	28	1.12	31.4
Crystallinity			
PCT			
TOTALS	133		101.3

Table H1-5A. Analytical Cell Time Required for Sample Preparation for
Analytical Laboratory Analysis Separations Function.
(Low Cs DF Mode of Operation)

Type of Analysis	Number of Analyses Per Week	Analytical Cell Preparation Time (Hours)	Total Preparation Time (Hours/Week)
Elements and Radionuclides	49	0.3	14.7
Anions	35	1.5	52.5
Mixing (Homogenize)			
Splits			
Dissolutions			
Dilutions			
Separations			
TOTALS	84		67.2

Table H1-6A. Analytical Cell Sample Analysis
and Preparation Time Separations Function.
(Low Cs DF Mode of Operation)

	Factor	Hours Per Week
Analysis Time	Table Value	101.3
Add time for reruns	5 %	5.1
Add time for standards	10 %	10.1
	Subtotal	116.5

Sample Preparation Time	Table Value	67.2
Add time for reruns	5 %	3.4
Add time for standards	10 %	6.7
Add time for sample load-out	5 min./sample	2.9
	Subtotal	80.2

Total Analysis and Preparation Time		196.7
Credit for Parallel Tests	Less 9 %	17.7

TOTAL		179.0
-------	--	-------

Table H1-7A. Analytical Cell Availability.

	Factor	Hours/Week
Hours available per week per cell	7 X 24	168.0
Workforce available (percent)	70	117.6
Manipulators available (percent)	93	109.4
Not devoted to cleanup (percent)	94	102.8
Equipment available (percent)	90	92.5

Note: $92.5/168 (100) = 55$ percent availability

	Factor	Hours/Week
Hours available per week per cell	7 X 24	168
Workforce available (percent)	100	168
Manipulator available (percent)	93	156.2
Not devoted to cleanup (percent)	94	146.9
Equipment available (percent)	90	132.2

Note: $132.2/168 (100) = 79$ percent availability

Table H1-8A. Simplified Time and Motion Study of
Analytical Cell Requirements Separations Function.
(Low Cs DF Mode of Operation)

Case	Analysis Per Week	Analysis Time Required (H)	Analytical Cell Prep Time (H)	Total Analytical Cell Analysis Time (H)	Total Analytical Cells Prep Time (H)	Total Analytical Cells Time Required (H)	Analytical Cell Availability (H)	Number of Analytical Cells Required
Separations (Base Case)	217	101.3	67.2	116.5	80.2	179.0	92.5	1.94
Assume 100 percent Manpower	217	101.3	67.2	116.5	80.2	179.0	132.2	1.35
Assume Steady State Operation (70 percent of Plant Capacity)	152	70.9	47.0	81.6	56.1	125.3	92.5	1.35
Assume 100 percent Manpower and 70 percent IOE	152	70.9	47.0	81.6	56.1	125.3	132.2	0.95

Table H1-9A. Simplified Time and Motion Study -
Analytical Laboratory Separations Function.
(Low Cs DF Mode of Operation)

Type of Analyses	Samples from Analytical Cells Per Week	Process Gas Samples, Other Waste/Wastewater and Environmental Samples	Hours/Analysis	Total Hours Per Week
OTR	35	10	0.1	4.5
pH		15	0.25	3.8
SpG		20	0.25	5.0
Visual:				
Color		10	0.1	1.0
Percent Settled Solids		10	1.0	10.0
Percent Centrifuged Solid				
TSD (Dried)		15	1.0	15
TSC (Calcined)			1.25	
TDS			1.12	
TSS			1.12	
TOC/Total Carbon			2.0	
Control Elements				
Elements and Radionuclides		10	0.1	1.0
Isotopes				
Anions	35	15	0.5	25
GEA		10	0.5	5
Total Alpha		35	0.5	17.5
AEA			0.5	
Total Beta		35	0.5	17.5
Beta Sci			0.5	
Soluble Cs-137			0.5	
Soluble Sr-90			0.5	
GC		5	1.0	5
Titrations		18	0.5	9
SUBTOTAL				119.3
Add time for reruns (5 percent)				6.0
Add time for standards (10 percent)				11.9
TOTAL	70	208		137.2

Table H1-10A. Equipment Requirements/Assessment
Separations Function.
(Low Cs DF Mode of Operation)

Analysis	Frequency (# Determinations/Week)		Turnaround Time Required (Hours)	Equipment Description	Estimated On-Line Time (%)	Spare Needed
	Analytical Cell	Analytical Laboratory				
OTR		45	4	Fixed Detector (Shielded)	100 %	Yes
pH	56	15	4	pH Meter, Electrode	100	Yes (meter, electrode)
SpG	21	20	4	Balance/graduated centrifuge cone	90	Yes
Visual: Color % Settled Solids % Centrifiged Solids		10	4	Boroscope	100	Yes
		10	4	Glassware, Cone	100	Yes
				Cone, Centrifuge	100	Yes
TSD (Dried)		15	8	Microwave, balance	90	Yes
TSC (Calcined)			8	Furnace, balance	90	Yes
TDS	28		8	Glassware, microwave, balance	100	Yes
TSS	28		8	Glassware, microwave, balance	100	Yes
COD (Reducing potential)			8	Autotitrator	90	Spare
OH Equivalent			4	Autotitrator	90	Spare
TOC/Total Carbon			8	TOC Analyzer	70	Yes
Yield Stress/Viscosity			4	Viscometer	90	Yes
Fe ²⁺ /Fe ³⁺			8	Furnace, UV-Visual Spectrophotometer	90	No
Crystallinity			(8 days)	X-Ray Diffraction	90	No
PCT			(8 days)	DWX/Grinder/ Glassware	100	Yes
Elements and Radionuclides	49	10	8	ICP-MS	85	
Anions		50	8	Ion Chromatography (Dionex)	80	Column
GEA		10	24	Gamma Scintillation (HPGE)	100	Detector

Table H1-10A. Equipment Requirements/Assessment
 Separations Function. (Low Cs DF Mode of Operation)
 (continued)

Analysis	Frequency (# Determinations/Week)		Turnaround Time Required (Hours)	Equipment Description	Estimated On-Line Time (%)	Spare Needed
	Analytical Cell	Analytical Laboratory				
Total Alpha		35	24	Alpha Proportional Counter	100	
AEA			24	Alpha spectrometer	100	
Total Beta		35	24	Beta Proportional	100	
Beta Sci			24	Beta Scintillation	100	
Soluble Cs-137			8	Gamma Scintillation (HPGE)	100	Detector
Soluble Sr-90			8	Beta Proportional	100	
Gas Chromatograph		5	8	Gas Chromatograph	90	Columns
Titration		18	8	Autotitrator	90	Spare

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
S1 - ESTIMATE SUMMARY BY WBS

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WBS	DESCRIPTION	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIPMENT	OVERHEAD & PROFIT	TOTAL DOLLARS
23A	BULK COLD CHEM. BLDG. EQ.	0	0	0	0	0	2301623	115085	2416708
23E	MECHANICAL UTIL. BLDG. EQ.	0	0	0	0	0	3576925	178846	3755771
23G	BULK HANDLING AREA EQUIP.	88800	2797200	0	969569	0	4562096	1759101	10087966
23L	COOLING TOWER EQUIPMENT	36100	1137150	0	834043	0	2245485	756666	4973344
SUBTOTAL 23	MECHANICAL	124900	3934350	0	1803612	0	12686129	2809698	21233789
SUBTOTAL 2	MECHANICAL	124900	3934350	0	1803612	0	12686129	2809698	21233789
33A	BULK COLD CHEMICAL BUILDING	93437	2943234	0	3253833	0	148225	1730016	8075308
33E	MECHANICAL UTILITIES BUILDING	114369	3602594	0	4823399	0	0	2150546	10576539
33G	BULK HANDLING AREA	6760	212877	0	127267	0	0	119187	459331
33R	ANALYTICAL FACILITY	258101	8130150	0	5353305	0	25604722	5856884	44945061
SUBTOTAL 33	STRUCTURAL	472667	14888855	0	13557804	0	25752947	9856633	64056239
SUBTOTAL 3	STRUCTURAL/SITWORK	472667	14888855	0	13557804	0	25752947	9856633	64056239
PROJECT TOTAL		597,567	18,823,205	0	15,361,416	0	38,439,076	12,666,331	85,290,028

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FLUOR DANIEL INC.
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** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
S1 - ESTIMATE SUMMARY BY WBS

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WBS	DESCRIPTION	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIPMENT	OVERHEAD & PROFIT	TOTAL DOLLARS
23A530	LIQUID WASTE PROCESSING	0	0	0	0	0	435247	21763	457010
23A540	CHEMICAL RECEIPT & MAKEUP	0	0	0	0	0	1340635	67035	1407670
23A550	BULK COLD CHEMICAL VENT SYSTEM	0	0	0	0	0	16925	846	17771
23A580	GLASS FORMER PREPARATION	0	0	0	0	0	472164	23608	495772
23A720	COLD HANDLING	0	0	0	0	0	36652	1833	38485
	SUBTOTAL 23A BULK COLD CHEM. BLDG. EQ.	0	0	0	0	0	2301623	115085	2416708
23E320	NORMAL ELECTRICAL DISTRIBUTION	0	0	0	0	0	1142680	57134	1199814
23E410	COMPRESSED AIR	0	0	0	0	0	1170676	58533	1229209
23E420	ION EXCHANGE	0	0	0	0	0	1070455	53523	1123978
23E480	DEMINERALIZER	0	0	0	0	0	169398	8470	177868
23E530	LIQUID WASTE PROCESSING	0	0	0	0	0	23716	1186	24902
	SUBTOTAL 23E MECHANICAL UTIL. BLDG. EQ.	0	0	0	0	0	3576925	178846	3755771
23G540	CHEM RECEIPT, MAKE UP & DISTR	0	0	0	0	0	382690	19135	401825
23G580	FRIT RECEIPT & MAKE UP	0	0	0	0	0	2980670	149034	3129704
23G590	(Description not available)	0	0	0	0	0	1198736	59937	1258673
23GX00	BULK HANDLING AREA	88800	2797200	0	969569	0	0	1530995	5297764
	SUBTOTAL 23G BULK HANDLING AREA EQUIP.	88800	2797200	0	969569	0	4562096	1759101	10087966
23L320	NORMAL ELECTRICAL DISTRIBUTION	0	0	0	0	0	1055362	52768	1108130
23L440	COOLING TOWER EQUIPMENT	0	0	0	0	0	1190123	59507	1249630
23LXX0	ERECTION/BULKS	36100	1137150	0	834043	0	0	644391	2615584
	SUBTOTAL 23L COOLING TOWER EQUIPMENT	36100	1137150	0	834043	0	2245485	756666	4973344
	SUBTOTAL 23 MECHANICAL	124900	3934350	0	1803612	0	12686129	2809698	21233789
	SUBTOTAL 2 MECHANICAL	124900	3934350	0	1803612	0	12686129	2809698	21233789
33A010	STRUCTURES	34437	1084734	0	1315626	0	148225	648101	3196686
33AXX0	EQUIPMENT LABOR/BULKS	59000	1858500	0	1938207	0	0	1081915	4878622
	SUBTOTAL 33A BULK COLD CHEMICAL BUILDING	93437	2943234	0	3253833	0	148225	1730016	8075308

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** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
S1 - ESTIMATE SUMMARY BY WBS

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WBS	DESCRIPTION	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIPMENT	OVERHEAD & PROFIT	TOTAL DOLLARS
33E010	STRUCTURES	45669	1438544	0	1536577	0	0	839258	3814379
33E030	CENTRAL REFRIGERATION	20700	652050	0	1928542	0	0	442014	3022606
33EXX0	EQUIPMENT LABOR/BULKS	48000	1512000	0	1358280	0	0	869274	3739554
	SUBTOTAL 33E MECHANICAL UTILITIES BUILD	114369	3602594	0	4823399	0	0	2150546	10576539
33G010	STRUCTURES	4611	145215	0	68777	0	0	80403	294395
33G011	BCCB PAD	2149	67662	0	58490	0	0	38784	164936
	SUBTOTAL 33G BULK HANDLING AREA	6760	212877	0	127267	0	0	119187	459331
33R010	STRUCTURES	258101	8130150	0	5353305	0	25604722	5856884	44945061
	SUBTOTAL 33R ANALYTICAL FACILITY	258101	8130150	0	5353305	0	25604722	5856884	44945061
	SUBTOTAL 33 STRUCTURAL	472667	14888855	0	13557804	0	25752947	9856633	64056239
	SUBTOTAL 3 STRUCTURAL/SITEWORK	472667	14888855	0	13557804	0	25752947	9856633	64056239
	PROJECT TOTAL	597,567	18,823,205	0	15,361,416	0	38,439,076	12,666,331	85,290,028

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** IEST - INTERACTIVE ESTIMATING **
TMS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
01 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ORAP / B & I	TOTAL DOLLARS
23A530	LIQUID WASTE PROCESSING										
23A530.1142002	SU-1654 ORGANIC ACID WASTE HOLD TANK SUMP 1,200 GAL	700A	1 EA	0	0	0	0	0	0	0	0
23A530.1142005	TK-1658 CAUSTIC WASTE HOLD TANK 8000 GAL	700A	1 EA	0	0	0	0	0	79436	3972	83410
23A530.1142006	TK-1660 ACID WASTE HOLD TANK 8000 GAL	700A	1 EA	0	0	0	0	0	79444	3972	83416
23A530.1142007	TK-1661 ORGANIC ACID WASTE HOLD TANK 8000 GAL	700A	1 EA	0	0	0	0	0	79444	3972	83416
23A530.1142008	TK-1662 CAUSTIC WASTE NEUT TANK 2,000 GAL	700A	1 EA	0	0	0	0	0	14368	718	15086
23A530.1142009	TK-1663 ORGANIC ACID WASTE NEUT TANK 2,000 GAL	700A	1 EA	0	0	0	0	0	32116	1606	33722
23A530.1142010	TK-1664 ORGANIC ACID WASTE HOLD TANK 500 GAL	700A	1 EA	0	0	0	0	0	9297	465	9762
23A530.1146001	P-1642 CAUSTIC WASTE HOLD TANK TRANSFER PUMP 80 GPM,10 PSI	700A	1 EA	0	0	0	0	0	31271	1563	32834
23A530.1146002	P-1643 CAUSTIC WASTE NEUT TANK TRANSFER PUMP 200 GPM,41 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A530.1146003	P-1644 ACID WASTE HOLD TANK TRANSFER PUMP 80 GPM,10 PSI	700A	1 EA	0	0	0	0	0	31271	1563	32834
23A530.1146004	P-1645 ORGANIC ACID WASTE NEUT TANK TRANSFER PUMP 200 GPM,41 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A530.1146005	P-1646 ORGANIC ACID WASTE HOLD TANK	700A	1 EA	0	0	0	0	0	31271	1563	32834

FLUOR DANIEL INC.
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** TEST - INTERACTIVE ESTIMATING **
THRS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OR&P / 8 & 1	TOTAL DOLLARS
23A530.1146006	SUMP PUMP 20 GPM, 18 PSI ORGANIC ACID WASTE HOLD TANK TRANSFER PUMP 80 GPM, 18 PSI	700A	1 EA	0	0	0	0	0	31271	1563	32834
23A530.1147001	ORGANIC ACID WASTE HOLD TANK HEGA FILTER 860 LB/HR	700A	1 EA	0	0	0	0	0	2535	127	2662

SUBTOTAL 23A530 LIQUID WASTE PROCESSING				0	0	0	0	0	435,248	21,760	457,008
23A540	CHEMICAL RECEIPT & MAKEUP										
23A540.1141001	TK-1007 BULK SULFUR STORAGE TANK 270,000 GAL	700A	1 EA	0	0	0	0	0	129360	6468	135828
23A540.1141002	TK-1008 BULK DCPD STORAGE TANK 17,750 GAL	700A	1 EA	0	0	0	0	0	122892	6145	129037
23A540.1141003	TK-1009 BULK CPD OLIGOMER STORAGE TANK 17,750 GAL	700A	1 EA	0	0	0	0	0	122892	6145	129037
23A540.1141004	TK-1013 BULK MAON STORGE TANK 45,000 GAL	700A	1 EA	0	0	0	0	0	515284	25764	541048
23A540.1141005	TK-1014 BULK HNO3 STORAGE TANK 30,000 GAL	700A	1 EA	0	0	0	0	0	83006	4150	87156
23A540.1142001	SU-1714 ACID WASTE SUMP 9,000 GAL	700A	1 EA	0	0	0	0	0	0	0	0
23A540.1142002	SU-1715 CAUSTIC WASTE SUMP 9,000 GAL	700A	1 EA	0	0	0	0	0	0	0	0
23A540.1142003	TK-1716 COLD CHEMICAL NO. 1 MAKE-UP TANK	700A	1 EA	0	0	0	0	0	10142	507	10649

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TWS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
01 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
23A540.1142004	1,000 GAL TK-1717 OFF-GAS TREATMENT CHEMICAL MAKE-UP TANK	700A	1 EA	0	0	0	0	0	10142	507	10649
23A540.1142005	1,000 GAL TK-1718 COLD CHEMICAL NO. 2 MAKE-UP TANK	700A	1 EA	0	0	0	0	0	12677	634	13311
23A540.1142006	1,000 GAL TK-1719 NITRIC ACID DECON MAKE-UP TANK	700A	1 EA	0	0	0	0	0	10142	507	10649
23A540.1142007	1,000 GAL TK-1720 DECON SOLUTION MAKE-UP TANK	700A	1 EA	0	0	0	0	0	12677	634	13311
23A540.1142008	1,000 GAL TK-1721 MSM DECON SOLUTION MAKE-UP TANK	700A	1 EA	0	0	0	0	0	23664	1184	24848
23A540.1142009	4,000 GAL TK-1722 OXALIC ACID DECON MAKE-UP TANK	700A	1 EA	0	0	0	0	0	12677	634	13311
23A540.1142010	1,000 GAL TK-1723 POTASSIUM PERMANGANATE MAKE-UP TANK	700A	1 EA	0	0	0	0	0	10142	507	10649
23A540.1142011	1,000 GAL TK-1724 COLD CHEMICAL NO. 3 MAKE-UP TANK	700A	1 EA	0	0	0	0	0	10142	507	10649
23A540.1142012	1,000 GAL TK-1725 COLD CHEMICAL NO. 4 MAKE-UP TANK	700A	1 EA	0	0	0	0	0	12677	634	13311
23A540.1142013	1,000 GAL TK-1726 ADIC WASTE SUMP TANK	700A	1 EA	0	0	0	0	0	10142	507	10649
23A540.1142014	1,000 GAL TK-1727 CAUSTIC WASTE SUMP TANK	700A	1 EA	0	0	0	0	0	10142	507	10649

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TWRS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
23A540.1146001	1,000 GAL P-1010 SULFUR TRANSFER PUMP 125 GPM, 100 PSI	700A	1 EA	0	0	0	0	0	5390	270	5660
23A540.1146002	P-1011 DCPD TRANSFER PUMP 10 GPM, 100 PSI	700A	1 EA	0	0	0	0	0	2156	108	2264
23A540.1146003	P-1012 CPD OLIGOMER TRANSFER PUMP 10 GPM, 100 PSI	700A	1 EA	0	0	0	0	0	2156	108	2264
23A540.1146004	P-1016 50% CAUSTIC TRANSFER PUMP 14 GPM, 31 PSI	700A	1 EA	0	0	0	0	0	8452	423	8875
23A540.1146005	P-1017 50% NITRIC ACID TRANSFER PUMP 14 GPM, 16 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A540.1146007	P-1700 COLD CHEMICAL NO. 1 TRANSFER PUMP 14 GPM, 83 PSI	700A	1 EA	0	0	0	0	0	11832	592	12424
23A540.1146008	P-1701 OFF-GAS TREATMENT CHEMICAL TRANSFER PUMP 70 GPM, 50 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A540.1146009	P-1702 COLD CHEMICAL NO. 2 TRANSFER PUMP 70 GPM, 87 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A540.1146010	P-1703 50% NITRIC ACID UNLOADING PUMP 110 GPM, 48 PSI	700A	1 EA	0	0	0	0	0	7606	381	7987
23A540.1146011	P-1704 ACID WASTE SUMP PUMP 56 GPM, 16 PSI	700A	1 EA	0	0	0	0	0	10142	507	10649
23A540.1146012	P-1705 NITRIC ACID DECON TRANSFER PUMP 70 GPM, 74 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A540.1146013	P-1706 DECON SOLUTION TRANSFER	700A	1 EA	0	0	0	0	0	6761	338	7099

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
23A540.1146014	PUMP 70 GPM, 78 PSI P-1707 NSM DECON SOLUTION TRANSFER PUMP 70 GPM, 78 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A540.1146015	P-1708 OXALIC ACID DECON TRANSFER PUMP 70 GPM, 72 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A540.1146016	P-1709 POTASSIUM PERMANGANATE TRANSFER PUMP 70 GPM, 52 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A540.1146017	P-1710 COLD CHEMICAL NO. 3 TRANSFER PUMP 70 GPM, 59 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A540.1146018	P-1711 50% CAUSTIC UNLOADING PUMP 110 GPM, 60 PSI	700A	1 EA	0	0	0	0	0	7606	381	7987
23A540.1146019	P-1712 CAUSTIC WASTE SUHP PUMP 56 GPM, 16 PSI	700A	1 EA	0	0	0	0	0	30425	1521	31946
23A540.1146020	P-1713 COLD CHEMICAL NO. 4 TRANSFER PUMP 70 GPM, 59 PSI	700A	1 EA	0	0	0	0	0	6761	338	7099
23A540.1147001	F-1691 DECON SOLUTION MAKE-UP TANK ROUGHING FILTER 110 ACFM	700A	1 EA	0	0	0	0	0	7606	381	7987
23A540.1147002	F-1692 OXALIC ACID DECON MAKE-UP ROUGHING FILTER 110 ACFM	700A	1 EA	0	0	0	0	0	7606	381	7987
23A540.1147003	F-1693 NSM DECON SOLUTION MAKE-UP TANK ROUGHING FILTER 110 ACFM	700A	1 EA	0	0	0	0	0	7606	381	7987
23A540.1147004	F-1694 POTASSIUM PERMANGANATE	700A	1 EA	0	0	0	0	0	7606	381	7987

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
23A540.1147005	MAKE-UP TANK ROUGHING FILTER 110 ACFM F-1695	700A	1 EA	0	0	0	0	0	7606	381	7987
23A540.1147006	SODIUM NITRITE MAKE-UP TANK ROUGHING FILTER 110 ACFM F-1696	700A	1 EA	0	0	0	0	0	7606	381	7987
23A540.1147007	COLD CHEMICAL NO. 1 MAKE-UP TANK ROUGHING FILTER 110 ACFM F-1697	700A	1 EA	0	0	0	0	0	7606	381	7987
23A540.1147008	OFF-GAS TREATMENT MAKE-UP TANK ROUGHING FILTER 110 ACFM F-1698	700A	1 EA	0	0	0	0	0	7606	381	7987
23A540.1147009	COLD CHEMICAL NO. 2 MAKE-UP TANK ROUGHING FILTER 110 ACFM F-1699	700A	1 EA	0	0	0	0	0	7606	381	7987
SUBTOTAL 23A540 CHEMICAL RECEIPT & MAKEUP											
23A550	BULK COLD CHEMICAL VENT SYSTEM			0	0	0	0	0	1,340,629	67,041	1,407,670
23A550.1143001	MB-1761A/B ACID VENT BLOWER 300 SCFM	700A	2 EA	0	0	0	0	0	16925	846	17771
SUBTOTAL 23A550 BULK COLD CHEMICAL VENT SYS											
23A580	GLASS FORMER PREPARATION			0	0	0	0	0	16,925	846	17,771
23A580.1142001	SU-1774 FRIT SLURRY SUMP 90 GAL	700A	1 EA	0	0	0	0	0	0	0	0
23A580.1142002	TK-1775 FRIT SLURRY MAKE-UP TANK 1,000 GAL	700A	1 EA	0	0	0	0	0	31262	1563	32825
23A580.1146001	P-1772 FSMT SAMPLE PUMP	700A	1 EA	0	0	0	0	0	2156	108	2264

FLUOR DANIEL INC.
VESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / 8 & 1	TOTAL DOLLARS
23A580.1146002	20 GPM, 58 PSI FSMT TRANSFER PUMP 7 GPM, 20 PSI	700A	1 EA	0	0	0	0	0	2156	108	2264
23A580.1147001	FSMT VENT FILTER 43 ACFM	700A	1 EA	0	0	0	0	0	5390	270	5660
23A580.1148008	XE-1915-C LLW GLASS FORMERS CONVEYOR	700A	1 EA	0	0	0	0	0	431200	21560	452760
SUBTOTAL 23A580 GLASS FORMER PREPARATION											
23A720	COLD HANDLING			0	0	0	0	0	472,164	23,609	495,773
23A720.1146002	MR-720-001 MONORAIL HOIST #1	700A	1 EA	0	0	0	0	0	7546	377	7923
23A720.1146003	MR-720-002/003 MONORAIL HOIST #2 & #3	700A	2 EA	0	0	0	0	0	15092	755	15847
23A720.1148004	MR-720-004 MONORAIL HOIST #4	700A	1 EA	0	0	0	0	0	14014	701	14715
SUBTOTAL 23A720 COLD HANDLING											
				0	0	0	0	0	36,652	1,833	38,485
SUBTOTAL 23A BULK COLD CHEN. BLDG. EQ.											
				0	0	0	0	0	2,301,618	115,089	2,416,707
23E320	NORMAL ELECTRICAL DISTRIBUTION										
23E320.1661040	LC-1811-C UNIT SUBSTA-MECH/UTIL 13.8-4.16 KV	600A	1 EA	0	0	0	0	0	1142680	57134	1199814
SUBTOTAL 23E320 NORMAL ELECTRICAL DISTRIBUT											
23E410	COMPRESSED AIR										
23E410.1142001	VX-1505 INSTRUMENT AIR RECEIVER 1,030 FT3	700A	1 EA	0	0	0	0	0	43064	2153	45217
23E410.1142002	VX-1506 PLANT AIR RECEIVER	700A	1 EA	0	0	0	0	0	366141	18307	384448

** TEST - INTERACTIVE ESTIMATING **											
TMR5-FACILITY CONFIGURATION EVALUATION											
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT											
D1 - ESTIMATE DETAIL BY WBS											
ACCOUNT	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	ONEP / B & I	TOTAL DOLLARS
23E410.1143001	11,830 FT3 CX-1502A/B/-C INSTRUMENT/PLANT AIR COMPRESSOR 7000 SCFM	700A	3 EA	0	0	0	0	0	658546	32927	691473
23E410.1147001	DY-1503A/B INSTRUMENT AIR DRYER 780 SCFM	700A	2 EA	0	0	0	0	0	77952	3898	81850
23E410.1147002	FL-1504A/B PLANT AIR FILTER 12,200 SCFM	700A	2 EA	0	0	0	0	0	24973	1248	26221

SUBTOTAL 23E410 COMPRESSED AIR				0	0	0	0	0	1,170,676	58,533	1,229,209
23E420	ION EXCHANGE										
23E420.1142001	TK-1528-C UTILITY STEAM FLASH DRUM 75 GALLONS, 304LSS	700A	1 EA	0	0	0	0	0	10780	539	11319
23E420.1142002	TK-1529-C UTILITY STEAM CONDENSATE COLLECTION TANK 2300 GALLONS, 304LSS	700A	1 EA	0	0	0	0	0	83678	4184	87862
23E420.1142003	TK-1524A/B-C CHEMICAL ADDITION TANKS (INCL W/EV-1520A/B-C)	700A	2 EA	0	0	0	0	0	0	0	0
23E420.1145001	EV-1520A/B-C ELECTRIC UTILITY SYSTEM GENERATORS(5.90 MW)	700A	2 EA	0	0	0	0	0	804447	40222	844669
23E420.1145002	E-1521A/B-C STANDBY ELECTRIC HEATERS 40 KW(INCL W/EV-1520A/B-C)	700A	2 EA	0	0	0	0	0	0	0	0
23E420.1145003	EC-1526-C UTILITY STEAM CONDENSATE CONDENSER COOLER 1.50 MMBTU/MR	700A	1 EA	0	0	0	0	0	13145	658	13803
23E420.1146001	P-1522A/B/C/D-C UTILITY SYSTEM GENERATOR CIRCULATING PUMPS(INCL W/ EV-1520A/B-C)	700A	4 EA	0	0	0	0	0	0	0	0
23E420.1146002	P-1523A/B-C BOILER FEED WATER CHEMICAL	700A	2 EA	0	0	0	0	0	0	0	0

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / 8 & 1	TOTAL DOLLARS
23E420.1146003	INJECTION PUMPS(INCL W/ EV-1520A/B-C) UTILITY CONDENSATE PUMPS 50 GPM	700A	4 EA	0	0	0	0	0	158406	7920	166326

SUBTOTAL 23E420	ION EXCHANGE			0	0	0	0	0	1,070,456	53,523	1,123,979
23E480	DENIMERALIZER	700A	1 EA	0	0	0	0	0	61766	3088	64854
23E480.1142001	TK-1594 DENIMERALIZED WATER STORAGE TANK 5,250 GAL	700A	2 EA	0	0	0	0	0	10439	522	10961
23E480.1146002	P-1593A/B DENIMERALIZED WATER MAKE-UP PUMP 126 GPM, 45 PSI	700A	1 EA	0	0	0	0	0	97192	4860	102052
23E480.1147001	DM-1591 DENIMERALIZER SYSTEM 20 GPM			0	0	0	0	0			

SUBTOTAL 23E480	DENIMERALIZER			0	0	0	0	0	169,397	8,470	177,867
23E530	LIQUID WASTE PROCESSING	700A	1 EA	0	0	0	0	0	0	0	0
23E530.1142001	SU-1653 MECH/ELEC SERVICE BUILDING SUMP 3,000 GAL	700A	1 EA	0	0	0	0	0	23716	1186	24902
23E530.1146007	P-1648 MECH/ELEC SERVICE BUILDING SUMP PUMP 210 GPM, 30 PSI			0	0	0	0	0			

SUBTOTAL 23E530	LIQUID WASTE PROCESSING			0	0	0	0	0	23,716	1,186	24,902

SUBTOTAL 23E	MECHANICAL UTIL. BLDG. EQ.			0	0	0	0	0	3,574,925	178,046	3,755,771

** IEST - INTERACTIVE ESTIMATING **											
TWRS-FACILITY CONFIGURATION EVALUATION											
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT											
D1 - ESTIMATE DETAIL BY WBS											
ACCOUNT	DESCRIPTION	COST	QUANTITY	HANHOUS	LABOR	EQUIP	MATERIAL	SUB-	EQUIP-	ONEP	TOTAL
NUMBER		CODE				USAGE		CONTRACT	MENT	/ B & I	DOLLARS
=====											
236540	CHEM RECEIPT, MAKE UP & DISTR										
236540.1141001	TK-1007	700A	1 EA	0	0	0	0	0	129360	6468	135828
	BULK SULFUR STORAGE TANK										
	270,000 GAL										
236540.1141006	TK-1015	700A	1 EA	0	0	0	0	0	72226	3611	75837
	BULK ANHYDRUS NH3 STORAGE										
	TANK										
236540.1141007	TK-1022	700A	1 EA	0	0	0	0	0	159544	7977	167521
	126000 GAL										
	BULK KEROSENE STORAGE										
	TANK										
236540.1146001	P-1010	700A	1 EA	0	0	0	0	0	5390	270	5660
	SULFUR TRANSFER PUMP										
	125 GPM, 100 PSI										
236540.1146006	P-1022A/B-C	700A	2 EA	0	0	0	0	0	16170	809	16979
	KEROSENE FEED PUMPS										
	89 GPM, 100 PSI										

SUBTOTAL 236540 CHEM RECEIPT, MAKE UP & DIS											
236580	FRIT RECEIPT & MAKE UP										
236580.1142003	B-1901-C	700A	8 EA	0	0	0	0	0	415030	20752	435782
	SAND STORAGE BINS										
236580.1142004	B-1904-C	700A	4 EA	0	0	0	0	0	174636	8732	183368
	B203 STORAGE BINS										
236580.1142005	B-1905-C	700A	2 EA	0	0	0	0	0	123970	6199	130169
	L120 STORAGE BINS										
236580.1142006	B-1906-C	700A	1 EA	0	0	0	0	0	34496	1725	36221
	CAO STORAGE BIN										
236580.1142007	B-1907-C	700A	1 EA	0	0	0	0	0	30184	1509	31693
	HGO STORAGE BIN										
236580.1142008	B-1920-C	700A	1 EA	0	0	0	0	0	58212	2911	61123
	SODIUM NITRATE STORAGE BIN										
236580.1142009	B-1921-C	700A	1 EA	0	0	0	0	0	58212	2911	61123
	TSP STORAGE BIN										
236580.1148001	XE-1902-C	700A	1 EA	0	0	0	0	0	646800	32340	679140
	SAND TRUCK UNLOADER										
236580.1148002	XE-1903-C	700A	1 EA	0	0	0	0	0	431200	21560	452760
	BORON TRIOXIDE TRUCK										

FLUOR DANIEL INC.
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
23G580.1148007	UNLOADER XE-1914-C CONVEYOR TO MIXER	700A	1 EA	0	0	0	0	0	431200	21560	452760
23G580.1148008	XE-1915-C LLW GLASS FORMERS CONVEYOR	700A	1 EA	0	0	0	0	0	431200	21560	452760
23G580.1148011	NM-1909-C LLW BATCH MIXER	700A	1 EA	0	0	0	0	0	145530	7277	152807
SUBTOTAL 23G580 FRIT RECEIPT & MAKE UP				0	0	0	0	0	2,980,670	149,036	3,129,706
23G590	(Description not available)										
23G590.1149001	AS-1025 OXYGEN PLANT 130 T/D	700A	1 EA	0	0	0	0	0	1198736	59937	1258673
SUBTOTAL 23G590 (Description not available)				0	0	0	0	0	1,198,736	59,937	1,258,673
23GXX0	BULK HANDLING AREA										
23GXX0.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF BULK HANDLING AREA EQUIP	700A	68900 HR	68900	2170350	0	528684	0	0	1176720	3875754
23GXX0.1500002	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF OXYGEN PLANT	700A	19900 HR	19900	626850	0	440886	0	0	354275	1422011
SUBTOTAL 23GXX0 BULK HANDLING AREA				88,800	2,797,200	0	969,570	0	0	1,530,995	5,297,765
SUBTOTAL 23G BULK HANDLING AREA EQUIP.				88,800	2,797,200	0	969,570	0	0	1,759,103	10,087,969
23L320	NORMAL ELECTRICAL DISTRIBUTION										
23L320.1661035	LC-1810-C UNIT SUBSTA-COOLING TOWER 13.8-4.16 KV	600A	1 EA	0	0	0	0	0	1055362	52768	1108130
SUBTOTAL 23L320 NORMAL ELECTRICAL DISTRIBUTION				0	0	0	0	0	1,055,362	52,768	1,108,130

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ACCOUNT NUMBER		DESCRIPTION		COST CODE		QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS																		
COOLING TOWER EQUIPMENT																																
23L440	23L440.1144001	CT-1561	COOLING TOWER	700A	1 EA	0	0	0	0	0	0	768614	38431	807045																		
		286 MW BTU/MR																														
23L440.1146001	P-1562A/B/C	TOWER WATER PUMP		700A	3 EA	0	0	0	0	0	0	374077	18704	392781																		
		19,320 GPM, 87 PSI																														
23L440.1146002	P-1563	INHIBITOR ADDITION PUMP		700A	1 EA	0	0	0	0	0	0	47432	2372	49804																		
		4 GPM, 20 PSI																														
SUBTOTAL 23L440 COOLING TOWER EQUIPMENT																																
23LXX0	ERECTION/BULKS																															
23LXX0.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF COOLING TOWER EQUIPMENT																															
SUBTOTAL 23LXX0 ERECTION/BULKS																																
SUBTOTAL 23L COOLING TOWER EQUIPMENT																																
SUBTOTAL 23 MECHANICAL																																
SUBTOTAL 2 MECHANICAL																																
STRUCTURES																																
33A010	33A010.0100000	BULK COLD CHEMICAL BUILDING	501A	1 LOT	1	0	0	0	0	0	0	0	0	0																		
		18660 SF, 821130 CF																														
		1735 M2, 22992 M3																														
33A010.0200000	SITEWORK																															
33A010.0300000	CONCRETE																															
	435 M3																															

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
33A010.0500000	METALS (STRUCTURAL STEEL, METAL DECK, & ENBEDS) 380 MT	501A	11820 MM	11820	372330	0	595750	0	0	227122	1195202
33A010.0600000	WOODS & PLASTICS	501A	700 MM	700	22050	0	7546	0	0	12064	41660
33A010.0700000	THERMAL & MOISTURE PROT.	501A	4090 MM	4090	128835	0	211864	0	0	78874	419553
33A010.0800000	DOORS & WINDOWS	501A	312 MM	312	9828	0	21323	0	0	8275	37426
33A010.0900000	FINISHES	501A	928 MM	928	29232	0	20104	0	0	16498	65834
33A010.1000000	SPECIALTIES	501A	70 MM	70	2205	0	7546	0	0	1546	11297
33A010.1100000	EQUIPMENT	501A	400 MM	400	12600	0	0	0	107800	12068	132468
33A010.1200000	FURNISHINGS (OFFICE FURNITURE & COUNTER TOP)	501A	10 MM	10	315	0	539	0	0	194	1048
33A010.1400000	MONORAIL (3EA)	501A	180 MM	180	5670	0	0	0	40425	5026	51121
33A010.1500000	PLBG, HVAC & FIRE PROT.	501A	7856 MM	7856	267464	0	287650	0	0	145539	680653
33A010.1600000	LIGHTING, TELECOM., & D.C. POWER	501A	4516 MM	4516	142254	0	82473	0	0	79518	304245

SUBTOTAL 33A010 STRUCTURES			36,437		1,084,734	0	1,315,626	0	148,225	648,101	3,196,686
33AXX0	EQUIPMENT LABOR/BULKS										
33AXX0.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF BULK COLD CHEM. BLDG. EQUIP.	700A	59000 MM	59000	1858500	0	1938207	0	0	1081915	4878622

SUBTOTAL 33AXX0 EQUIPMENT LABOR/BULKS			59,000		1,858,500	0	1,938,207	0	0	1,081,915	4,878,622

SUBTOTAL 33A	BULK COLD CHEMICAL BUILDING		93,437		2,943,234	0	3,253,833	0	148,225	1,730,016	8,075,308
33E010	STRUCTURES										
33E010.0100000	MECHANICAL UTILITIES BLDG. 32050 SF, 845500 CF 2981 M2, 23674 M3	501A	1 LOT	1	0	0	0	0	0	0	0
33E010.0200000	SITEWORK	501A	717 MM	717	22586	0	0	0	0	11971	34557
33E010.0300000	CONCRETE 2410 M3	501A	15760 MM	15760	496440	0	427519	0	0	284489	1208448

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Accession #: D195067282

Document #: SD-W378-ES-002

Title/Desc:

FACILITY DESIGN PHILOSOPHY TWRS PROCESS SUPPORT &
INFRASTRUCTURE DEFINITION [SEC 4 OF 4]

Pages: 85

THIS DOCUMENT WAS TOO LARGE TO SCAN AS A SINGLE
DOCUMENT. IT REQUIRED BREAKING INTO SMALLER SECTIONS.

DOCUMENT NUMBER: SD-W378-ES-002

SECTION: 4 OF 4

TITLE: facility Design Philosophy Jank Waste
Remediation System Process Support & Infrastructure
Definition

AUTHOR: Reach, Galbraith

RECIPIENT:

DATE: 12/11/95

KEYWORDS:

REFERENCES: EDT-613161

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 W092001

** TEST - INTERACTIVE ESTIMATING **
TWRB-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOUS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
33E010.0500000	METALS 220 MT	501A	6075 MM	6075	191363	0	392558	0	0	121050	704971
33E010.0600000	WOOD & PLASTICS	501A	500 MM	500	15750	0	5390	0	0	8618	29758
33E010.0700000	THERMAL & MOISTURE PROT.	501A	4320 MM	4320	136080	0	217596	0	0	83002	436678
33E010.0800000	DOORS & WINDOWS	501A	196 MM	196	6174	0	14100	0	0	3977	24251
33E010.0900000	FINISHES	501A	1278 MM	1278	40257	0	34184	0	0	23046	97487
33E010.1000000	SPECIALITIES	501A	99 MM	99	3119	0	13798	0	0	2343	19260
33E010.1200000	FURNISHINGS	501A	24 MM	24	754	0	6468	0	0	724	7948
33E010.1500000	PLSG.,HVAC & FIRE PROT.	501A	4763 MM	4763	213035	0	238400	0	0	124828	576263
33E010.1600000	LIGHTING, TELECOM., UPS & D.C. POWER	501A	9936 MM	9936	312984	0	186564	0	0	175210	674758
SUBTOTAL 33E010 STRUCTURES				45,469	1,438,544	0	1,536,577	0	0	839,258	3,814,379
33E030	CENTRAL REFRIGERATION										
33E030.1500001	CENTRAL REFRIGERATION	501A	1 LOT	20700	652050	0	1928542	0	0	442014	3022606
SUBTOTAL 33E030 CENTRAL REFRIGERATION				20,700	652,050	0	1,928,542	0	0	442,014	3,022,606
33EXX0	EQUIPMENT LABOR/BULKS										
33EXX0.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF MECHAN./UTIL BLDG. EQUIP.	700A	48000 MM	48000	1512000	0	1358280	0	0	869274	3739554
SUBTOTAL 33EXX0 EQUIPMENT LABOR/BULKS				48,000	1,512,000	0	1,358,280	0	0	869,274	3,739,554
SUBTOTAL 33E MECHANICAL UTILITIES BUILD				114,369	3,602,594	0	4,823,399	0	0	2,150,546	10,576,539
33G010	STRUCTURES										
33G010.0100000	BCCB TANK BERN 15480 SF	501A	1 LOT	1	0	0	0	0	0	0	0
33G010.0200000	1440 M2 SITEWORK	501A	440 MM	440	13860	0	0	0	0	7346	21206
33G010.0300000	4370 M3 CONCRETE (GUNITE - 50 MM) 4090 M3	501A	4170 MM	4170	131355	0	68777	0	0	73057	273189

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FLUOR DANIEL INC.
WESTINGHOUSE MANFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / O & I	TOTAL DOLLARS

SUBTOTAL 336010 STRUCTURES				4,611		0		0		80,403	
336011	BCCB PAD				145,215		68,777		0		294,395
336011.0100001	BULK COLD CHEMICAL PAD	501A	1 LOT	1	0	0	0	0	0	0	0
	15480 SF										
	1440 M2										
336011.0200001	SITWORK	501A	232 MM	232	7308	0	6985	0	0	4222	18515
336011.0300001	CONCRETE	501A	1710 MM	1710	53865	0	45944	0	0	30845	130654
	260 M3										
336011.0900001	FINISHES	501A	206 MM	206	6489	0	5561	0	0	3717	15767
SUBTOTAL 336011 BCCB PAD				2,149		0		0		38,784	
					67,662		58,490		0		164,936
SUBTOTAL 336 BULK HANDLING AREA				6,760		0		0		119,187	
					212,877		127,267		0		459,331

33R010	STRUCTURES										
33R010.0100000	ANALYTICAL FACILITY	501A	1 LOT	1	0	0	0	0	0	0	0
	648,888 CF 33,000 SF										
	18,170 M3 3,070 M2										
33R010.0200000	SITWORK	501A	700 MM	700	22050	0	0	0	0	11687	33737
33R010.0300000	CONCRETE	501A	43700 MM	43700	1376550	0	614861	0	0	760314	2751725
33R010.0500000	METALS	501A	18100 MM	18100	570150	0	1196249	0	0	361992	2128391
33R010.0600000	WOOD & PLASTICS	501A	400 MM	400	12600	0	7690	0	0	7043	27353
33R010.0700000	THERMAL & MOISTURE PROT.	501A	2900 MM	2900	91350	0	152259	0	0	56029	299638
33R010.0800000	DOORS & WINDOWS	501A	1340 MM	1340	42210	0	793369	0	0	62040	897619
33R010.0900000	FINISHES	501A	5600 MM	5600	176400	0	123181	0	0	99651	399232
33R010.1000000	SPECIALITIES	501A	400 MM	400	12600	0	54738	0	0	9415	76745
33R010.1100000	EQUIPMENT	501A	133300 MM	133300	4198950	0	930297	0	25604722	3552195	34286164
33R010.1200000	FURNISHINGS	501A	60 MM	60	1890	0	15010	0	0	1752	18652
33R010.1300000	SPECIAL CONSTRUCTION	501A	18900 MM	18900	595350	0	129825	0	0	322027	1047202
33R010.1400000	CONVEYING SYSTEMS	501A	500 MM	500	15750	0	0	0	0	8348	24098

33R010.1500000	PLBG.,HVAC & FIRE PROT.	501A	22000 MM	22000	693000	0	1144060	0	0	424493	2261553
	GFE EQUIPT. & INSTALLATION										
33R010.1600000	ELECTRICAL & TELECON.	501A	10200 MM	10200	321300	0	191774	0	0	179878	692952
SUBTOTAL 33R010 STRUCTURES				258,101		0		0		5,856,884	
					8,130,150		5,353,305		25,604,722		44,945,061

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FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TUES-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - LOW LEVEL WASTE/PT
01 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	ONHP / B & I	TOTAL DOLLARS
SUBTOTAL 35R	ANALYTICAL FACILITY		258,101	8,130,150	0	5,353,305	0	25,604,722	5,856,884	44,945,061
SUBTOTAL 33	STRUCTURAL		472,667	14,888,855	0	13,557,804	0	25,752,947	9,856,633	64,056,239
SUBTOTAL 3	STRUCTURAL/SITEWORK		472,667	14,888,855	0	13,557,804	0	25,752,947	9,856,633	64,056,239
PROJECT TOTAL			597,567	18,023,205	0	15,361,417	0	38,439,071	12,666,337	85,290,030

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 WBS2061

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
S1 - ESTIMATE SUMMARY BY WBS

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WBS	DESCRIPTION	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIPMENT	OVERHEAD & PROFIT	TOTAL DOLLARS
23A	BULK COLD CHEM BLDG. EQ.	0	0	0	0	0	1499482	74989	1574471
23E	MECHANICAL UTIL. BLDG. EQ.	0	0	0	0	0	2265476	113273	2378749
23G	BULK HANDLING AREA EQUIP.	7400	239400	0	58259	0	1246168	192103	1735950
23L	COOLING TOWER EQUIPMENT	11200	352800	0	258761	0	727651	236305	1575517
SUBTOTAL 23	GFE EQUIPMENT	18600	592200	0	317020	0	5738977	616670	7264867
SUBTOTAL 2	PROCUREMENT	18600	592200	0	317020	0	5738977	616670	7264867
33A	BULK COLD CHEMICAL BUILDING	65718	2070066	0	2325959	0	148225	1220856	5765126
33E	MECHANICAL UTILITIES BUILDING	81260	2559668	0	3791012	0	0	1546172	7896844
33G	BULK HANDLING AREA	680	21420	0	12720	0	0	11989	46129
33R	ANALYTICAL FACILITY	239771	7552755	0	5721604	0	18747474	5226405	37248038
SUBTOTAL 33	CENTRALIZED FACILITIES	387429	12203921	0	11851095	0	18895699	8005422	50956137
SUBTOTAL 3	CONSTRUCTION	387429	12203921	0	11851095	0	18895699	8005422	50956137
PROJECT TOTAL		406,229	12,796,121	0	12,168,115	0	24,634,676	8,622,092	58,221,004

FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TMS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
S1 - ESTIMATE SUMMARY BY WBS

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WBS	DESCRIPTION	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIPMENT	OVERHEAD & PROFIT	TOTAL DOLLARS
23A530	LIQUID WASTE PROCESSING	0	0	0	0	0	287023	14349	301372
23A540	COLD CHEMICAL	0	0	0	0	0	689506	34482	723988
23A550	BULK COLD CHEMICAL VENT SYSTEM	0	0	0	0	0	14337	717	15054
23A580	COLD CHEMICAL	0	0	0	0	0	472164	23608	495772
23A720	COLD HANDLING	0	0	0	0	0	36652	1833	38485
	SUBTOTAL 23A BULK COLD CHEM BLDG. EQ.	0	0	0	0	0	1499682	74989	1574671
23E320	NORMAL ELECTRICAL DISTRIBUTION	0	0	0	0	0	1142680	57134	1199814
23E410	COMPRESSED AIR	0	0	0	0	0	412146	20607	432753
23E420	ION EXCHANGE	0	0	0	0	0	598812	29540	628352
23E480	DEMINERALIZER	0	0	0	0	0	107577	5379	112956
23E530	LIQUID WASTE PROCESSING	0	0	0	0	0	12261	613	12874
	SUBTOTAL 23E MECHANICAL UTIL. BLDG. EQ.	0	0	0	0	0	2265476	113273	2378749
23G540	COLD CHEMICAL	0	0	0	0	0	57565	2878	60443
23G580	COLD CHEMICAL	0	0	0	0	0	1188603	59430	1248033
23GXX0	BULK HANDLING AREA	7600	239400	0	58259	0	0	129795	427454
	SUBTOTAL 23G BULK HANDLING AREA EQUIP.	7600	239400	0	58259	0	1244168	192103	1735930
23L320	NORMAL ELECTRICAL DISTRIBUTION	0	0	0	0	0	326634	16332	342966
23L440	COOLING TOWER EQUIPMENT	0	0	0	0	0	401017	20051	421068
23LXX0	ERECTION/BULKS	11200	352800	0	258761	0	0	199922	811483
	SUBTOTAL 23L COOLING TOWER EQUIPMENT	11200	352800	0	258761	0	727651	236305	1575517
	SUBTOTAL 23 GFE EQUIPMENT	18800	592200	0	317020	0	5738977	616670	7264867
	SUBTOTAL 2 PROCUREMENT	18800	592200	0	317020	0	5738977	616670	7264867
33A010	STRUCTURES	29418	926636	0	1149399	0	148225	554999	2759259
33AXX0	EQUIPMENT LABOR/BULKS	36300	1143450	0	1196560	0	0	665857	3005867
	SUBTOTAL 33A BULK COLD CHEMICAL BUILDING	65718	2070086	0	2325959	0	148225	1220856	5765126
33E010	STRUCTURES	41460	1305960	0	1401084	0	0	762215	3469259

FLUOR DANIEL INC.
WESTINGHOUSE MANFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TWS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
S1 - ESTIMATE SUMMARY BY WBS

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WBS	DESCRIPTION	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIPMENT	OVERHEAD & PROFIT	TOTAL DOLLARS
33E030	CENTRAL REFRIGERATION	19000	598500	0	1774308	0	0	405924	2778812
33EXX0	EQUIPMENT LABOR/BULKS	20800	655200	0	615540	0	0	378033	1648773
SUBTOTAL 33E	MECHANICAL UTILITIES BUILDI	81260	2559660	0	3791012	0	0	1546172	7896844
33GXX0	BCC AREA	680	21420	0	12720	0	0	11989	46129
SUBTOTAL 33G	BULK HANDLING AREA	680	21420	0	12720	0	0	11989	46129
33B010	STRUCTURES	239771	7552755	0	5721404	0	18747474	5226405	37248038
SUBTOTAL 33B	ANALYTICAL FACILITY	239771	7552755	0	5721404	0	18747474	5226405	37248038
SUBTOTAL 33	CENTRALIZED FACILITIES	387429	12203921	0	11851095	0	18895699	8005422	50956137
SUBTOTAL 3	CONSTRUCTION	387429	12203921	0	11851095	0	18895699	8005422	50956137
PROJECT TOTAL		406,229	12,796,121	0	12,168,115	0	24,634,676	8,622,092	58,221,004

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FLUOR DANIEL INC.
WESTINGHOUSE BARNFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TMSR-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
01 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
23A530	LIQUID WASTE PROCESSING										
23A530.1142002	SU-1654 ORGANIC ACID WASTE HOLD TANK SUMP 1,200 GAL	700A	1 EA	0	0	0	0	0	0	0	0
23A530.1142005	TK-1658 CAUSTIC WASTE HOLD TANK 4,000 GAL	700A	1 EA	0	0	0	0	0	52389	2620	55009
23A530.1142006	TK-1660 ACID WASTE HOLD TANK 4,000 GAL	700A	1 EA	0	0	0	0	0	52389	2620	55009
23A530.1142007	TK-1661 ORGANIC ACID WASTE HOLD TANK 4,000 GAL	700A	1 EA	0	0	0	0	0	52389	2620	55009
23A530.1142008	TK-1662 CAUSTIC WASTE NEUT TANK 1,000 GAL	700A	1 EA	0	0	0	0	0	9475	473	9948
23A530.1142009	TK-1663 ORGANIC ACID WASTE NEUT TANK 1,000 GAL	700A	1 EA	0	0	0	0	0	21178	1059	22237
23A530.1142010	TK-1664 ORGANIC ACID WASTE HOLD TANK 250 GAL	700A	1 EA	0	0	0	0	0	6131	306	6437
23A530.1146001	P-1642 CAUSTIC WASTE HOLD TANK TRANSFER PUMP 40 GPM, 10 PSI	700A	1 EA	0	0	0	0	0	20621	1031	21652
23A530.1146002	P-1643 CAUSTIC WASTE NEUT TANK TRANSFER PUMP 100 GPM, 41 PSI	700A	1 EA	0	0	0	0	0	4459	223	4682
23A530.1146003	P-1644 ACID WASTE HOLD TANK TRANSFER PUMP 40 GPM, 10 PSI	700A	1 EA	0	0	0	0	0	20621	1031	21652
23A530.1146004	P-1645 ORGANIC ACID WASTE NEUT TANK TRANSFER PUMP 100 GPM, 41 PSI	700A	1 EA	0	0	0	0	0	4459	223	4682
23A530.1146005	P-1646 ORGANIC ACID WASTE HOLD TANK	700A	1 EA	0	0	0	0	0	20621	1031	21652

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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*** TEST - INTERACTIVE ESTIMATING ***
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONR / E & I	TOTAL DOLLARS
23A530.1146006	SUMP PUMP 10 GPM, 18 PSI P-1647 ORGANIC ACID WASTE HOLD TANK TRANSFER PUMP 40 GPM, 18 PSI	700A	1 EA	0	0	0	0	0	20621	1031	21652
23A530.1147001	ORGANIC ACID WASTE HOLD TANK MEGA FILTER 430 LB/HR	700A	1 EA	0	0	0	0	0	1672	84	1756
SUBTOTAL 23A530 LIQUID WASTE PROCESSING											
23A540	COLD CHEMICAL			0	0	0	0	0	287,025	14,352	301,377
23A540.1141001	TK-1007 BULK SULFUR STORAGE TANK 270,000 GAL	700A	1 EA	0	0	0	0	0	129360	6468	135828
23A540.1141002	TK-1008 BULK DCPD STORAGE TANK 17,750 GAL	700A	1 EA	0	0	0	0	0	122892	6165	129037
23A540.1141003	TK-1009 BULK CPD OLIGOMER STORAGE TANK 17,750 GAL	700A	1 EA	0	0	0	0	0	122892	6165	129037
23A540.1141004	TK-1013 BULK WASH STORAGE TANK 1000 GAL	700A	1 EA	0	0	0	0	0	52559	2628	55187
23A540.1141005	TK-1014 BULK HNO3 STORAGE TANK 2000 GAL	700A	1 EA	0	0	0	0	0	16352	817	17169
23A540.1142001	SU-1716 ACID WASTE SUMP 9,000 GAL	700A	1 EA	0	0	0	0	0	0	0	0
23A540.1142002	SU-1715 CAUSTIC WASTE SUMP 9,000 GAL	700A	1 EA	0	0	0	0	0	0	0	0
23A540.1142003	TK-1716 COLD CHEMICAL NO. 1 MAKE-UP TANK	700A	1 EA	0	0	0	0	0	16688	334	7022

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
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BY JFD/PKA/AAF/CO

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONSP / B & I	TOTAL DOLLARS
23A540.1142004	500 GAL TK-1717 OFF-GAS TREATMENT CHEMICAL MAKE-UP TANK	700A	1 EA	0	0	0	0	0	6688	334	7022
23A540.1142005	500 GAL TK-1718 COLD CHEMICAL NO. 2 MAKE-UP TANK	700A	1 EA	0	0	0	0	0	8360	418	8778
23A540.1142006	500 GAL TK-1719 NITRIC ACID DECON MAKE-UP TANK	700A	1 EA	0	0	0	0	0	6688	334	7022
23A540.1142007	500 GAL TK-1720 DECON SOLUTION MAKE-UP TANK	700A	1 EA	0	0	0	0	0	8360	418	8778
23A540.1142008	500 GAL TK-1721 NSM DECON SOLUTION MAKE-UP TANK	700A	1 EA	0	0	0	0	0	15605	780	16385
23A540.1142009	2,000 GAL TK-1722 OXALIC ACID DECON MAKE-UP TANK	700A	1 EA	0	0	0	0	0	8360	418	8778
23A540.1142010	500 GAL TK-1723 POTASSIUM PERMANGANATE MAKE-UP TANK	700A	1 EA	0	0	0	0	0	6688	334	7022
23A540.1142011	500 GAL TK-1724 COLD CHEMICAL NO. 3 MAKE-UP TANK	700A	1 EA	0	0	0	0	0	6688	334	7022
23A540.1142012	500 GAL TK-1725 COLD CHEMICAL NO. 4 MAKE-UP TANK	700A	1 EA	0	0	0	0	0	8360	418	8778
23A540.1142013	500 GAL TK-1726 ADIC WASTE SUMP TANK	700A	1 EA	0	0	0	0	0	6688	334	7022
23A540.1142014	500 GAL TK-1727 CAUSTIC WASTE SUMP TANK	700A	1 EA	0	0	0	0	0	6688	334	7022

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
THRS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- RENT	ONEP / B & I	TOTAL DOLLARS
23A540.1146001	500 GAL P-1010 SULFUR TRANSFER PUMP 125 GPM, 100 PSI	700A	1 EA	0	0	0	0	0	5390	270	5660
23A540.1146002	P-1011 DCPD TRANSFER PUMP 10 GPM, 100 PSI	700A	1 EA	0	0	0	0	0	2156	108	2264
23A540.1146003	P-1012 CPD OLIGOMER TRANSFER PUMP 10 GPM, 100 PSI	700A	1 EA	0	0	0	0	0	2156	108	2264
23A540.1146004	P-1014 50X CAUSTIC TRANSFER PUMP 7 GPM, 31 PSI	700A	1 EA	0	0	0	0	0	5573	279	5852
23A540.1146005	P-1017 50X NITRIC ACID TRANSFER PUMP 7 GPM, 16 PSI	700A	1 EA	0	0	0	0	0	4459	223	4682
23A540.1146007	P-1700 COLD CHEMICAL NO. 1 TRANSFER PUMP 7 GPM, 83 PSI	700A	1 EA	0	0	0	0	0	7803	390	8193
23A540.1146008	P-1701 OFF-GAS TREATMENT CHEMICAL TRANSFER PUMP 35 GPM 30 PSI	700A	1 EA	0	0	0	0	0	4459	223	4682
23A540.1146009	P-1702 COLD CHEMICAL NO. 2 TRANSFER PUMP 35 GPM, 87 PSI	700A	1 EA	0	0	0	0	0	4459	223	4682
23A540.1146010	P-1703 50X NITRIC ACID UNLOADING PUMP 55 GPM, 48 PSI	700A	1 EA	0	0	0	0	0	5016	251	5267
23A540.1146011	P-1704 ACID WASTE SUMP PUMP 28 GPM, 16 PSI	700A	1 EA	0	0	0	0	0	6688	334	7022
23A540.1146012	P-1705 NITRIC ACID DECON TRANSFER PUMP 35 GPM, 74 PSI	700A	1 EA	0	0	0	0	0	4459	223	4682
23A540.1146013	P-1706 DECON SOLUTION TRANSFER	700A	1 EA	0	0	0	0	0	4459	223	4682

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TMS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
23A540.1146014	PUMP 35 GPM, 78 PSI P-1707 NSH DECON SOLUTION TRANSFER PUMP	700A	1 EA	0	0	0	0	0	4459	223	4682
23A540.1146015	PUMP 35 GPM, 78 PSI P-1708 OXALIC ACID DECON TRANSFER PUMP	700A	1 EA	0	0	0	0	0	4459	223	4682
23A540.1146016	PUMP 35 GPM, 72 PSI P-1709 POTASSIUM PERMANGANATE TRANSFER PUMP	700A	1 EA	0	0	0	0	0	4459	223	4682
23A540.1146017	PUMP 35 GPM, 52 PSI P-1710 COLD CHEMICAL NO. 3 TRANSFER PUMP	700A	1 EA	0	0	0	0	0	4459	223	4682
23A540.1146018	PUMP 35 GPM, 59 PSI P-1711 SOX CAUSTIC UNLOADING PUMP	700A	1 EA	0	0	0	0	0	5016	251	5267
23A540.1146019	PUMP 55 GPM, 40 PSI P-1712 CAUSTIC WASTE SUMP PUMP	700A	1 EA	0	0	0	0	0	28064	1004	21068
23A540.1146020	PUMP 28 GPM, 16 PSI P-1713 COLD CHEMICAL NO. 4 TRANSFER PUMP	700A	1 EA	0	0	0	0	0	4459	223	4682
23A540.1147001	PUMP 35 GPM, 59 PSI F-1691 DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	700A	1 EA	0	0	0	0	0	5016	251	5267
23A540.1147002	PUMP 55 ACFM F-1692 OXALIC ACID DECON MAKE-UP ROUGHING FILTER	700A	1 EA	0	0	0	0	0	5016	251	5267
23A540.1147003	PUMP 55 ACFM F-1693 NSH DECON SOLUTION MAKE-UP TANK ROUGHING FILTER	700A	1 EA	0	0	0	0	0	5016	251	5267
23A540.1147004	PUMP 55 ACFM F-1694 POTASSIUM PERMANGANATE	700A	1 EA	0	0	0	0	0	5016	251	5267

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FLUOR DANIEL INC.
 WESTINGHOUSE BARNFORD COMPANY
 JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
 TMS-FACILITY CONFIGURATION EVALUATION
 DELTA COST ALTERNATE - HIGH LEVEL WASTE
 D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OR&P / B & I	TOTAL DOLLARS
23A540.1147005	MAKE-UP TANK ROUGHING FILTER 55 ACFM F-1695	700A	1 EA	0	0	0	0	0	5016	251	5267
23A540.1147006	SODIUM NITRITE MAKE-UP TANK ROUGHING FILTER 55 ACFM F-1696	700A	1 EA	0	0	0	0	0	5016	251	5267
23A540.1147007	COLD CHEMICAL NO. 1 MAKE-UP TANK ROUGHING FILTER 55 ACFM F-1697	700A	1 EA	0	0	0	0	0	5016	251	5267
23A540.1147008	OFF-GAS TREATMENT MAKE-UP TANK ROUGHING FILTER 55 ACFM F-1698	700A	1 EA	0	0	0	0	0	5016	251	5267
23A540.1147009	COLD CHEMICAL NO. 2 MAKE-UP TANK ROUGHING FILTER 55 ACFM F-1699	700A	1 EA	0	0	0	0	0	5016	251	5267
	NITRIC ACID DECON MAKE-UP TANK ROUGHING FILTER 55 ACFM										
SUBTOTAL 23A540 COLD CHEMICAL				0	0	0	0	0	689,512	34,477	723,989
23A550	BULK COLD CHEMICAL VENT SYSTEM										
23A550.1143001	MB-1741A/B ACID VENT BLOWER 150 SCFM	700A	2 EA	0	0	0	0	0	14337	717	15054
SUBTOTAL 23A550 BULK COLD CHEMICAL VENT SYS				0	0	0	0	0	14,337	717	15,054
23A580	COLD CHEMICAL										
23A580.1142001	SU-1774 FRIT SLURRY SUMP 90 GAL	700A	1 EA	0	0	0	0	0	0	0	0
23A580.1142002	TK-1775 FRIT SLURRY MAKE-UP TANK 1,000 GAL	700A	1 EA	0	0	0	0	0	31262	1563	32825
23A580.1146001	P-1772 FSMT SAMPLE PUMP	700A	1 EA	0	0	0	0	0	2156	108	2264

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 WBS2001

**** TEST - INTERACTIVE ESTIMATING ****
TURNS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- RENT	ON&P / B & I	TOTAL DOLLARS
23A580.1146002	20 GPM, 58 PSI P-1773 FSMT TRANSFER PUMP	700A	1 EA	0	0	0	0	0	2156	108	2264
23A580.1147001	7 GPM, 28 PSI P-1771 FSMT VENT FILTER	700A	1 EA	0	0	0	0	0	5390	270	5660
23A580.1148009	43 ACFM XS-1916-C HLM GLASS FORMERS CONVEYOR	700A	1 EA	0	0	0	0	0	431200	21560	452760
SUBTOTAL 23A580 COLD CHEMICAL				0	0	0	0	0	472,164	23,609	495,773
23A720	COLD HANDLING										
23A720.1148002	NR-720-001 MONORAIL HOIST #1	700A	1 EA	0	0	0	0	0	7546	377	7923
23A720.1148003	NR-720-002/003 MONORAIL HOIST #2 & #3	700A	2 EA	0	0	0	0	0	15092	755	15847
23A720.1148004	NR-720-004 MONORAIL HOIST #4	700A	1 EA	0	0	0	0	0	14014	701	14715
SUBTOTAL 23A720 COLD HANDLING				0	0	0	0	0	36,652	1,833	38,485
SUBTOTAL 23A BULK COLD CHEM BLDG. EQ.				0	0	0	0	0	1,499,690	74,988	1,574,678
23E320	NORMAL ELECTRICAL DISTRIBUTION										
23E320.1661040	LC-1811-C UNIT SUBSTA-MECH/UTIL 13.8-4.16 KV	600A	1 EA	0	0	0	0	0	1142680	57134	1199814
SUBTOTAL 23E320 NORMAL ELECTRICAL DISTRIBUTION				0	0	0	0	0	1,142,680	57,134	1,199,814
23E410	COMPRESSED AIR										
23E410.1142001	VX-1505 INSTRUMENT AIR RECEIVER 514 FT3	700A	1 EA	0	0	0	0	0	28424	1421	29845
23E410.1142002	VX-1506 PLANT AIR RECEIVER	700A	1 EA	0	0	0	0	0	126255	6313	132568

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FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- RENT	ONLP / B & I	TOTAL DOLLARS
23E410.1143001	2,000 FT3 CX-1502A/B/-C INSTRUMENT/PLANT AIR COMPRESSOR	700A	3 EA	0	0	0	0	0	205165	10258	215423
23E410.1147001	1,000 SCFM DY-1503A/B INSTRUMENT AIR DRYER	700A	2 EA	0	0	0	0	0	43836	2192	46028
23E410.1147002	300 SCFM FL-1504A/B PLANT AIR FILTER	700A	2 EA	0	0	0	0	0	8467	424	8891
	2,000 SCFM										
SUBTOTAL 23E410 COMPRESSED AIR				0	0	0	0	0	412,147	20,608	432,755
23E420	ION EXCHANGE										
23E420.1142001	TK-1528-C UTILITY STEAM FLASH DRUM 75 GALLONS, 304LSS	700A	1 EA	0	0	0	0	0	18780	539	11319
23E420.1142002	TK-1529-C UTILITY STEAM CONDENSATE COLLECTION TANK 750 GALLONS, 304LSS	700A	1 EA	0	0	0	0	0	83678	4184	87862
23E420.1142003	TK-1524A/B-C CHEMICAL ADDITION TANKS (INCL W/EV-1520A/B-C)	700A	2 EA	0	0	0	0	0	0	0	0
23E420.1145001	EV-1520A/B ELECTRIC UTILITY SYSTEM GENERATORS(1.94 MW)	700A	2 EA	0	0	0	0	0	412658	20633	433291
23E420.1145002	E-1521A/B-C STANDBY ELECTRIC HEATERS 40 KW(INCL W/EV-1520A/B-C)	700A	2 EA	0	0	0	0	0	0	0	0
23E420.1145003	EC-1526-C UTILITY STEAM CONDENSATE CONDENSER COOLER 0.5 MMTU/HR	700A	1 EA	0	0	0	0	0	6791	340	7131
23E420.1146001	P-1522A/B/C/D-C UTILITY SYSTEM GENERATOR CIRCULATING PUMPS(INCL W/ EV-1520A/B-C)	700A	4 EA	0	0	0	0	0	0	0	0
23E420.1146002	P-1523A/B-C BOILER FEED WATER CHEMICAL	700A	2 EA	0	0	0	0	0	0	0	0

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 W882001

*** TEST - INTERACTIVE ESTIMATING ***
TWSS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
DT - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONMP / S & I	TOTAL DOLLARS
INJECTION PUMPS(INCL W/ EV-1520A/B-C) UTILITY CONDENSATE PUMPS 15 GPM											
23E420.1146003		700A	4 EA	0	0	0	0	0	76905	3845	80750
SUBTOTAL 23E420 ION EXCHANGE											
23E430	DEMINERALIZER										
23E480.1142001	TK-1504 DEMINERALIZED WATER STORAGE TANK	700A	1 EA	0	0	0	0	0	37197	1860	39057
23E480.1146002	2,250 GAL P-1503A/B DEMINERALIZED WATER MAKE-UP PUMP	700A	2 EA	0	0	0	0	0	6287	315	6602
23E480.1147001	54 GPM, 45 PSI SM-1591 DEMINERALIZER SYSTEM 10 GPM	700A	1 EA	0	0	0	0	0	64092	3205	67297
SUBTOTAL 23E480 DEMINERALIZER											
23E530	LIQUID WASTE PROCESSING										
23E530.1142001	SU-1653 MECH/OLEC SERVICE BUILDING SUMP	700A	1 EA	0	0	0	0	0	0	0	0
23E530.1146007	3,000 GAL P-1648 MECH/ELEC SERVICE BUILDING SUMP PUMP 70 GPM, 30 PSI	700A	1 EA	0	0	0	0	0	12261	613	12874
SUBTOTAL 23E530 LIQUID WASTE PROCESSING											
SUBTOTAL 23E MECHANICAL UTIL. BLDG. EQ.											
				0	0	0	0	0	12,261	613	12,874
				0	0	0	0	0	2,265,476	113,276	2,378,752

** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
01 - ESTIMATE DETAIL BY WBS

ACCOUNT	DESCRIPTION	COST	EQUIP	SUB-	EQUIP-	ONLF	TOTAL
NUMBER		QUANTITY	MANHOURS	LABOR	MATERIAL	CONTRACT	MENT / & I DOLLARS

236540	COLD CHEMICAL						
236540.1141006	TK-1015 BULK ANHYDROUS NH3 STORAGE TANK 3020 GAL	1 EA	0	0	0	0	9055
236540.1141007	TK-1022 BULK KEROSENE STORAGE TANK 50,000 GAL	1 EA	0	0	0	0	46408
236540.1146006	P-1022A/B KEROSENE FEED PUMP 11 GPM, 100 PSI	2 EA	0	0	0	0	4980
SUBTOTAL 236540 COLD CHEMICAL							
236580	COLD CHEMICAL						
236580.1142003	B-1901-C SAND STORAGE BIN	1 EA	0	0	0	0	47426
236580.1142004	B-1904-C B203 STORAGE BIN	1 EA	0	0	0	0	25695
236580.1142005	B-1905-C LIZCOS STORAGE BIN	1 EA	0	0	0	0	26373
236580.1142006	B-1906-C OAO STORAGE BINS	1 EA	0	0	0	0	31241
236580.1142007	B-1907-C MGO STORAGE BINS	1 EA	0	0	0	0	27392
236580.1142009	B-1921-C TSP NITRATE STORAGE BIN	1 EA	0	0	0	0	31580
236580.1144001	XE-1902-C SAND RAIL CAR UNLOADER	1 EA	0	0	0	0	565950
236580.1144002	XE-1903-C TRUCK UNLOADER	1 EA	0	0	0	0	226380
236580.1144007	XE-1914-C CONVEYOR DIR TO MIXER	1 EA	0	0	0	0	226380
236580.1148010	NM-1908-C MLV BATCH MIXER	1 EA	0	0	0	0	39617
SUBTOTAL 236580 COLD CHEMICAL							
236XX0	BULK HANDLING AREA						
236XX0.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED	7600 MM	259400	0	58259	0	427454

7600							
259400							
0							
58259							
0							
0							
1,188,603							
59,431							
1,248,034							

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*** TEST - INTERACTIVE ESTIMATING ***
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
D1 - ESTIMATE DETAIL BY NBS

FLUOR DANIEL INC.
WESTINGHOUSE MANFORD COMPANY
JOB NO. 430303 W022001

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONSP / B & I	TOTAL DOLLARS
W/ THE INSTALLATION OF BULK HANDLING AREA EQUIP											
SUBTOTAL 230XX0	BULK HANDLING AREA		7,600	239,400	0	58,259	0	0	129,795		427,454
SUBTOTAL 230	BULK HANDLING AREA EQUIP.		7,600	239,400	0	58,259	0	0	192,104		1,735,931
NORMAL ELECTRICAL DISTRIBUTION											
23L320	23L320.1661035 LC-1810-C UNIT SUBSTA-COOLING TOWER 13.8-4.16 KV	6001	1 EA	0	0	0	0	0	326634	16332	342966
SUBTOTAL 23L320	NORMAL ELECTRICAL DISTRIBUT		0	0	0	0	0	0	326,634	16,332	342,966
COOLING TOWER EQUIPMENT											
23L440.1144001	CT-1561 COOLING TOWER 40 MM BTU/HR	700A	1 EA	0	0	0	0	0	238238	11912	250150
23L440.1146001	P-1562A/B/C TOWER WATER PUMP 2,730 GPM, 87 PSI	700A	3 EA	0	0	0	0	0	115347	5767	121114
23L440.1146002	P-1563 INHIBITOR ADDITION PUMP 4 GPM, 20 PSI	700A	1 EA	0	0	0	0	0	47432	2372	49804
SUBTOTAL 23L440	COOLING TOWER EQUIPMENT		0	0	0	0	0	0	401,017	20,051	421,068
23LXX0	ERECTION/BULKS										
23LXX0.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF COOLING TOWER EQUIPMENT	700A	11200 HR	352800	0	258761	0	0	199922		811483
SUBTOTAL 23LXX0	ERECTION/BULKS		11,200	352,800	0	258,761	0	0	199,922		811,483
SUBTOTAL 23L	COOLING TOWER EQUIPMENT		11,200	352,800	0	258,761	0	0	236,305		1,575,517

FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436303 WBS2001

** TEST - INTERACTIVE ESTIMATING **
TMR-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
01 - ESTIMATE DETAIL BY WBS

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WBS DESCRIPTION	ESTIMATE SUBTOTAL	ON SITE INDIRECTS	SUB TOTAL	ESCALATION %	TOTAL	SUB TOTAL	CONTINGENCY %	TOTAL	DOLLARS
SUBTOTAL 23 GFE EQUIPMENT	18,800		592,200	0	317,020	0	616,673	7,264,878	
SUBTOTAL 2 PROCUREMENT	18,800		592,200	0	317,020	0	616,673	7,264,878	
33A010 STRUCTURES									
33A010-0100000 BULK SOLID CHEMICAL BUILDING	501A	1 LOT	1	0	0	0	0	0	0
14880 SF, 677040 CF									
1384 M2, 18957 M3									
33A010-0200000 SITEWORK	501A	160 MN	160	0	0	0	0	2671	7711
33A010-0300000 CONCRETE	501A	2950 MN	2950	0	70942	0	0	52798	216665
382 M3									
33A010-0500000 METALS	501A	10370 MN	10370	0	522813	0	0	199267	1048735
(STRUCTURAL STEEL, METAL BECK, & ENDS)									
336 MT									
33A010-0600000 WOODS & PLASTICS	501A	700 MN	700	0	7546	0	0	12064	41660
33A010-0700000 THERMAL & MOISTURE PROT.	501A	3590 MN	3590	0	185908	0	0	49231	368224
33A010-0800000 DOORS & WINDOWS	501A	312 MN	312	0	21323	0	0	6275	37426
33A010-0900000 FINISHES	501A	810 MN	810	0	17836	0	0	16405	57556
33A010-1000000 SPECIALTIES	501A	70 MN	70	0	7546	0	0	1546	11297
33A010-1100000 EQUIPMENT	501A	400 MN	400	0	12600	0	107800	12068	132448
33A010-1200000 FURNISHINGS	501A	10 MN	10	0	539	0	0	194	1048
(OFFICE FURNITURE & COUNTER TOP)									
33A010-1400000 MONORAIL (CIS)	501A	180 MN	180	0	0	0	40425	5026	51121
33A010-1500000 PLEB, MVAC & FIRE PROT.	501A	6264 MN	6264	0	229379	0	0	116047	542742
33A010-1600000 LIGHTING, TELECON., & D.C. POWER	501A	3601 MN	3601	0	65767	0	0	63407	242606
SUBTOTAL 33A010 STRUCTURES			29,418	0	1,129,399	0	554,999	2,759,259	
33AXX0 EQUIPMENT LABOR/BULKS			926,636						
33AXX0-1500000 ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF	700A	36300 MN	36300	0	1194560	0	0	665857	3005867

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 WBS2001

*** TEST - INTERACTIVE ESTIMATING ***
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONAP / B & I	TOTAL DOLLARS
BULK COLD CHEM. BLDG. EQUIP.											
SUBTOTAL 33AXX0	EQUIPMENT LABOR/BULKS		36,300		1,143,450	0	1,196,560	0	0	665,857	3,005,867
SUBTOTAL 33A	BULK COLD CHEMICAL BUILDING		65,718		2,070,086	0	2,325,939	0	146,225	1,220,856	5,765,126
STRUCTURES											
33E010.0100000	MECHANICAL UTILITIES BLDG.	501A	1 LOT	1	0	0	0	0	0	0	0
	28300 SF, 733000 CF										
	2632 M2, 20524 M3										
33E010.0200000	SITING	501A	660 MM	660	20790	0	0	0	0	11019	31809
33E010.0300000	CONCRETE	501A	14500 MM	14500	456750	0	393307	0	0	261743	1111800
33E010.0500000	NETALS	501A	5590 MM	5590	176085	0	361152	0	0	111383	648620
	197 MT										
33E010.0600000	WOOD & PLASTICS	501A	500 MM	500	15750	0	5390	0	0	8618	29758
33E010.0700000	THERMAL & MOISTURE PROT.	501A	3970 MM	3970	125055	0	200166	0	0	76288	401529
33E010.0800000	DOORS & WINDOWS	501A	196 MM	196	6176	0	14300	0	0	3977	24251
33E010.0900000	FURNISHES	501A	1176 MM	1176	37044	0	31445	0	0	21204	89495
33E010.1000000	SPECIALTIES	501A	99 MM	99	3119	0	13798	0	0	2343	19260
33E010.1200000	FURNISHINGS	501A	24 MM	24	756	0	6468	0	0	724	7948
33E010.1500000	PLBG, HVAC & FIRE PROT.	501A	5971 MM	5971	180087	0	210501	0	0	110212	508800
33E010.1600000	LIGHTING, TELECOM., UPS & D.C. POWER	501A	8773 MM	8773	276350	0	164737	0	0	154702	595789
SUBTOTAL 33E010	STRUCTURES		41,460		1,385,960	0	1,401,084	0	0	762,215	3,469,259
33E030	CENTRAL REFRIGERATION										
33E030.1500001	CENTRAL REFRIGERATION	501A	1 LOT	19000	598500	0	1774388	0	0	405924	2778812
SUBTOTAL 33E030	CENTRAL REFRIGERATION		19,000		598,500	0	1,774,388	0	0	405,924	2,778,812
33EXX0	EQUIPMENT LABOR/BULKS										
33EXX0.1500001	ALLOWANCE FOR LABOR AND BULK MATERIALS ASSOCIATED WITH THE INSTALLATION OF	760A	20800 MM	20800	655200	0	615540	0	1	378033	1648773

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
01 - ESTIMATE DETAIL BY WBS

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
	MECHAN./UTIL BLDG. EQUIP.										
SUBTOTAL 33EXX0	EQUIPMENT LABOR/BULKS		20,800		655,200	0	615,540	0	0	378,033	1,648,773
SUBTOTAL 33E	MECHANICAL UTILITIES BUILD		81,260		2,559,660	0	3,791,012	0	0	1,546,172	7,896,844
33GX0	BCC AREA										
33GX0.0100001	ALLOWANCE FOR LABOR AND BULK MATERIAL ASSO. WITH SCCB TK. BERN AND SCCB PAD (BLW) ESTIMATED @ 10% OF LOW LEVEL	501A	680 MN	680	21,420	0	12,720	0	0	11,989	46,129
SUBTOTAL 33GX0	BCC AREA		680		21,420	0	12,720	0	0	11,989	46,129
SUBTOTAL 33G	BULK HANDLING AREA		680		21,420	0	12,720	0	0	11,989	46,129
33R010	STRUCTURES										
33R010.0100000	ANALYTICAL FACILITY 648,800 CF 33,000 SF 18,170 M3 3,070 M2	501A	1 LOT	1	0	0	0	0	0	0	0
33R010.0200000	SITEMORE	501A	800 MN	800	25200	0	0	0	0	13354	38554
33R010.0300000	CONCRETE	501A	49800 MN	49800	1568700	0	700904	0	0	866456	3136060
33R010.0400000	METALS	501A	20600 MN	20600	648960	0	1343720	0	0	412103	2424723
33R010.0500000	WOOD & PLASTICS	501A	440 MN	440	14490	0	8771	0	0	8119	31380
33R010.0600000	THERMAL & MOISTURE PROT.	501A	3300 MN	3300	103950	0	173500	0	0	63773	341303
33R010.0700000	DOORS & WINDOWS	501A	1530 MN	1530	48195	0	904440	0	0	70765	1023400
33R010.0800000	FINISHES	501A	6400 MN	6400	201680	0	140433	0	0	113870	455903
33R010.0900000	SPECIALTIES	501A	440 MN	440	14490	0	42390	0	0	10800	87680
33R010.1000000	EQUIPMENT	501A	97500 MN	97500	3071250	0	679189	0	18747474	2599096	25997009
33R010.1100000	FURNISHINGS	501A	70 MN	70	2205	0	17110	0	0	2026	21330
33R010.1200000	SPECIAL CONSTRUCTION	501A	21550 MN	21550	678825	0	148004	0	0	367177	1194006
33R010.1300000	CONVEYING SYSTEMS	501A	570 MN	570	17955	0	0	0	0	9516	27471
33R010.1400000	PLBG., HVAC & FIRE PROT. GFE EQUIPT. & INSTALLATION	501A	25100 MN	25100	790650	0	1304240	0	0	484256	2579146

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
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** TEST - INTERACTIVE ESTIMATING **
TURS-FACILITY CONFIGURATION EVALUATION
DELTA COST ALTERNATE - HIGH LEVEL WASTE
D1 - ESTIMATE DETAIL BY VBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS	
33R010.1400000	ELECTRICAL & TELECOM.	501A	11630	MM	11630	366345	0	218623	0	0	205094	790042
SUBTOTAL 33R010	STRUCTURES				239,771		0		0	5,226,405		
					7,552,755		5,721,404		18,747,474		37,248,038	
SUBTOTAL 33R	ANALYTICAL FACILITY				239,771		0		0	5,226,405		
					7,552,755		5,721,404		18,747,474		37,248,038	
SUBTOTAL 33	CENTRALIZED FACILITIES				387,429		0		0	8,005,422		
					12,203,921		11,851,095		18,895,699		50,956,137	
SUBTOTAL 3	CONSTRUCTION				387,429		0		0	8,005,422		
					12,203,921		11,851,095		18,895,699		50,956,137	
PROJECT TOTAL					406,229		0		0	8,622,095		
					12,796,121		12,148,115		24,634,684		58,221,015	

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436304 MBS 7001

**** IEST - INTERACTIVE ESTIMATING ****
ALTERNATIVE MELTER SYSTEMS ASSESSMENT
10T STIRRED MELTER CUT UP CELL - CASE F
DOE_R01 - PROJECT COST SUMMARY

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COST CODE *****	DESCRIPTION *****	ESCALATED TOTAL COST *****	CONTINGENCY % *****	TOTAL *****	TOTAL DOLLARS *****
501	BUILDINGS	2,677,221	0	0	2,677,221
700	SPECIAL EQUIP/PROCESS SYSTEMS	2,149,587	0	0	2,149,587

PROJECT TOTAL		4,826,808	0	0	4,826,808

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TYPE OF ESTIMATE	REMARKS:
ARCHITECT ENGINEER	
OPERATING CONTRACTOR	

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436304 WBS 7001

**** TEST - INTERACTIVE ESTIMATING ****
ALTERNATIVE MELTER SYSTEMS ASSESSMENT
10T STIRRED MELTER CUT UP CELL - CASE F
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
221710	REMOTE HANDLING EQUIPMENT										
221710.1300001	CUTUP CELL SHIELD WINDOWS AND FRAMES	700	2 EA	0	0	0	0	0	357896	17895	375791
221710.1400001	CUTUP CELL NSM'S	700	2 EA	0	0	0	0	0	116424	5821	122245
SUBTOTAL 221710 REMOTE HANDLING EQUIPMENT				0	0	0	0	0		23,716	
221850	MELTER CUT UP CELL EQUIPMENT								474,320		498,036
221850.1149101	MECHANICAL SAW	700	1 EA	0	0	0	0	0	1078	54	1132
221850.1149105	ABRASIVE SAW	700	1 EA	0	0	0	0	0	1078	54	1132
221850.1149110	LARGE SHEAR	700	1 EA	0	0	0	0	0	99176	4959	104135
221850.1149115	PIPE SHEAR	700	1 EA	0	0	0	0	0	5390	270	5660
221850.1149120	PLASMA TORCH SYSTEM	700	1 EA	0	0	0	0	0	43120	2156	45276
221850.1149125	ARC SAW SYSTEM	700	1 EA	0	0	0	0	0	249500	13475	282975
221850.1149130	EXPLOSIVE CUTTING EQUIPMENT	700	1 EA	0	0	0	0	0	10780	539	11319
221850.1149135	ELECTRO MECHANICAL MANIP- ULATOR	700	1 EA	0	0	0	0	0	808500	40425	848925
221850.1149140	SHREDDER	700	1 EA	0	0	0	0	0	53900	2695	56595
221850.1149145	STUD WELDER	700	1 EA	0	0	0	0	0	53900	2695	56595
221850.1149150	POWERED GRAPPLE	700	1 EA	0	0	0	0	0	53900	2695	56595
SUBTOTAL 221850 MELTER CUT UP CELL EQUIPMEN				0	0	0	0	0		70,017	
SUBTOTAL 221 IN-CELL EQUIPMENT				0	0	0	0	0		93,733	
SUBTOTAL 22 GFE PROCUREMENT				0	0	0	0	0		93,733	
SUBTOTAL 2 PROCUREMENT				0	0	0	0	0		93,733	
312010	STRUCTURES										
312010.0300001	CUTUP CELL CONCRETE SLAB ON GRADE	501A	416 CY	2496	78624	0	56504	0	0	44496	179624
312010.0300002	CUTUP CELL CONCRETE ELEVATED SLAB	501A	416 CY	4992	157248	0	63231	0	0	86503	306982

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FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436304 MBS 7001

** IEST - INTERACTIVE ESTIMATING **
ALTERNATIVE MELTER SYSTEMS ASSESSMENT
10T STIRRED MELTER CUT UP CELL - CASE F
D1 - ESTIMATE DETAIL BY MBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
312010.0300003	CUTUP CELL CONCRETE WALLS	501A	1414 CY	21210	468115	0	266751	0	0	367438	1302304
312010.0500001	CUTUP CELL FLOOR LINER 1/4" 304	501A	1500 SF	3975	125213	0	28783	0	0	67802	221798
312010.0500002	CUTUP CELL WALL LINER 3/16" 304	501A	5200 SF	11180	352170	0	74947	0	0	190397	617514
312010.0900001	CUTUP CELL FINISHES	501A	3255 SF	352	11088	0	5334	0	0	6143	22565
312010.1600001	CUTUP CELL LIGHTING	501A	1500 SF	428	13482	0	5530	0	0	7422	26434
SUBTOTAL 312010 STRUCTURES				44,633		0		0		770,201	
312710	REMOTE HANDLING EQUIPMENT				1,405,940		501,080		0		2,677,221
312710.1300001	INSTALL CUTUP CELL SHIELD WINDOWS AND FRAMES	700	2 EA	400	12600	0	0	0	0	6678	19278
312710.1400001	INSTALL CUTUP CELL NSN'S	700	2 EA	160	5040	0	0	0	0	2671	7711
SUBTOTAL 312710 REMOTE HANDLING EQUIPMENT				560		0		0		9,349	
312850	MELTER CUT UP EQUIPMENT				17,640		0		0		26,989
312850.1149100	INSTALL MELTER CUT UP EQUIPMENT	700	3200 NH	3200	100800	0	0	0	0	53424	154224
SUBTOTAL 312850 MELTER CUT UP EQUIPMENT				3,200		0		0		53,424	
					100,800		0		0		154,224
SUBTOTAL 312 VITRIFICATION BUILDING				48,393		0		0		832,974	
					1,524,380		501,080		0		2,858,434
SUBTOTAL 31 PROCESS FACILITY				48,393		0		0		832,974	
					1,524,380		501,080		0		2,858,434
SUBTOTAL 3 CONSTRUCTION				48,393		0		0		832,974	
					1,524,380		501,080		0		2,858,434
PROJECT TOTAL				48,393		0		0		926,707	
					1,524,380		501,080		1,874,642		4,826,809

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FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436304, WBS 7001

** TEST - INTERACTIVE ESTIMATING **
ALTERNATIVE MELTER SYSTEMS ASSESSMENT
10T LFCN MELTER CUT UP CELL - CASE E
DOE_R01 - PROJECT COST SUMMARY

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COST CODE	DESCRIPTION	ESCALATED TOTAL COST	CONTINGENCY X	TOTAL	TOTAL DOLLARS
501	BUILDINGS	4,834,914	0	0	4,834,914
700	SPECIAL EQUIP/PROCESS SYSTEMS	4,932,680	0	0	4,932,680
PROJECT TOTAL					
		9,767,594	0	0	9,767,594

TYPE OF
ESTIMATE
ARCHITECT
ENGINEER
OPERATING
CONTRACTOR

REMARKS:

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436304 WBS

**** TEST - INTERACTIVE ESTIMATING ****
ALTERNATIVE MELTER SYSTEMS ASSESSMENT
10T LFCM MELTER CUT UP CELL - CASE E
D1 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ON&P / B & I	TOTAL DOLLARS
221710	REMOTE HANDLING EQUIPMENT										
221710.1300001	CUTUP CELL SHIELD WINDOWS AND FRAMES	700	6 EA	0	0	0	0	0	1073688	53684	1127372
221710.1400001	CUTUP CELL WSM'S	700	6 EA	0	0	0	0	0	349272	17464	366736
SUBTOTAL 221710 REMOTE HANDLING EQUIPMENT				0	0	0	0	0		71,148	
221850	MELTER CUT UP CELL EQUIPMENT								1,422,960		1,494,108
221850.1149101	MECHANICAL SAW	700	1 EA	0	0	0	0	0	1078	54	1132
221850.1149105	ABRASIVE SAW	700	1 EA	0	0	0	0	0	1078	54	1132
221850.1149110	LARGE SHEAR	700	1 EA	0	0	0	0	0	99176	4959	104135
221850.1149115	PIPE SHEAR	700	1 EA	0	0	0	0	0	5390	270	5660
221850.1149120	PLASMA TORCH SYSTEM	700	1 EA	0	0	0	0	0	43120	2156	45276
221850.1149125	ARC SAW SYSTEM	700	1 EA	0	0	0	0	0	249500	13475	282975
221850.1149130	EXPLOSIVE CUTTING EQUIPMENT	700	1 EA	0	0	0	0	0	10780	539	11319
221850.1149135	ELECTRO MECHANICAL MANIP- ULATOR	700	1 EA	0	0	0	0	0	808500	40425	848925
221850.1149140	SHREDDER	700	1 EA	0	0	0	0	0	53900	2695	56595
221850.1149145	STUD WELDER	700	1 EA	0	0	0	0	0	53900	2695	56595
221850.1149150	POWERED GRAPPLE	700	1 EA	0	0	0	0	0	53900	2695	56595
SUBTOTAL 221850 MELTER CUT UP CELL EQUIPMENT				0	0	0	0	0		70,017	
SUBTOTAL 221 IN-CELL EQUIPMENT				0	0	0	0	0		141,165	
SUBTOTAL 22 GFE PROCUREMENT				0	0	0	0	0		141,165	
SUBTOTAL 2 PROCUREMENT				0	0	0	0	0		141,165	
312010	STRUCTURES										
312010.0300001	CUTUP CELL CONCRETE SLAB ON GRADE	501A	801 CY	4806	151389	0	108798	0	0	85676	345063
312010.0300002	CUTUP CELL CONCRETE ELEVATED SLAB	501A	801 CY	9612	302778	0	121750	0	0	166559	591087

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FLUOR DANIEL INC.
WESTINGHOUSE HAMFORD COMPANY
JOB NO. 436304 WBS 7001

** TEST - INTERACTIVE ESTIMATING **
ALTERNATIVE MELTER SYSTEMS ASSESSMENT
10T LFCH MELTER CUT UP CELL - CASE E
01 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-RENT	ONEP / B & I	TOTAL DOLLARS
312010-030003	CUTUP CELL CONCRETE WALLS	501A	2445 CY	36675	1155263	0	461249	0	0	635352	2251864
312010-0500001	CUTUP CELL FLOOR LINER 1/4" 304	501A	3030 SF	8030	252945	0	58141	0	0	136968	448054
312010-0500002	CUTUP CELL WALL LINER 3/16" 304	501A	9280 SF	19952	628486	0	133752	0	0	339786	1102026
312010-0900001	CUTUP CELL FINISHES	501A	6160 SF	645	20948	0	18093	0	0	11608	42649
312010-1600001	CUTUP CELL LIGHTING	501A	3030 SF	864	27216	0	11171	0	0	14903	53370
				80,604		0		0	1,390,932		4,834,913
	SUBTOTAL 312010 STRUCTURES			2,539,027			984,954		0		
312050	NVAC										
312050-1540000	NVAC COST IMPACT	700A	1200 HRS	1200	37800	0	1595436	0	0	99806	1733042
				1,200		0		0	99,806		
	SUBTOTAL 312050 NVAC			37,800			1,595,436		0		1,733,042
312710	REMOTE HANDLING EQUIPMENT										
312710-1300001	INSTALL CUTUP CELL SHIELD WINDOWS AND FRAMES	700	6 EA	1200	37800	0	0	0	0	20034	57834
312710-1400001	INSTALL CUTUP CELL HSN'S	700	6 EA	480	15120	0	0	0	0	8014	23134
				1,680		0		0	28,048		
	SUBTOTAL 312710 REMOTE HANDLING EQUIPMENT			52,920			0		0		80,968
312850	MELTER CUT UP EQUIPMENT										
312850-1140100	INSTALL MELTER CUT UP EQUIPMENT	700	3200 MH	3200	100800	0	0	0	0	53424	154224
				3,200		0	0	0	53,424		154,224
	SUBTOTAL 312850 MELTER CUT UP EQUIPMENT			86,684			0		0		
				2,730,547			2,500,390		1,572,210		6,803,147
	SUBTOTAL 312 VITRIFICATION BUILDING			86,684			0		0		
				2,730,547			2,500,390		1,572,210		6,803,147
	SUBTOTAL 31 PROCESS FACILITY			86,684			0		0		
				2,730,547			2,500,390		1,572,210		6,803,147
	SUBTOTAL 3 CONSTRUCTION			86,684			0		0		
				2,730,547			2,500,390		1,572,210		6,803,147

FLUOR DANIEL INC.
WESTINGHOUSE HANFORD COMPANY
JOB NO. 436304 WBS 7001

*** TEST - INTERACTIVE ESTIMATING ***
ALTERNATIVE MELTER SYSTEMS ASSESSMENT
10T LFCM MELTER CUT UP CELL - CASE E
01 - ESTIMATE DETAIL BY WBS

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	SUB- CONTRACT	EQUIP- MENT	OMIP / B & I	TOTAL DOLLARS

86,684 2,730,547 0 2,500,390 0 1,713,375 9,767,594										

PROJECT TOTAL										

FLUOR DANIEL INC.
VESTINGHOUSE HANFORD COMPANY
JOB NO. 436303 WBS2001

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EST - INTERNAL...VE ESTIMATING
TURS-FACILITY CONFIGURATION EVALUATION
INTEGRATED VS DISTRIBUTED SUPPORT FUNCTIONS
D1 - ESTIMATE DETAIL BY WBS

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	ONEP / B & I	TOTAL DOLLARS
33N010	STRUCTURES										
33N010.0100000	SOLID WASTE HANDLING FAC 49170 SF, 1299760 CF 4570 M2, 36140 M3	501A	1 LOT	1	0	0	0	0	0	0	0
33N010.0200000	SITEWORK	501A	4150 MM	4150	130725	0	0	0	0	69284	200009
33N010.0300000	CONCRETE	501A	172910 MM	172910	544665	0	2256894	0	0	2999577	10703136
33N010.0500000	100310 M3 METALS	501A	16140 MM	16140	508410	0	1012061	0	0	320060	1840531
33N010.0600000	500 MT WOOD & PLASTICS	501A	908 MM	908	28350	0	18326	0	0	15942	42618
33N010.0700000	THERMAL & HUMIDITY PROT.	501A	3915 MM	3915	123323	0	196454	0	0	75184	394961
33N010.0800000	DOORS & WINDOWS	501A	1972 MM	1972	42118	0	483352	0	0	57080	600670
33N010.0900000	FINISHES	501A	3783 MM	3783	119145	0	84808	0	0	67398	271363
33N010.1000000	SPECIALTIES	501A	149 MM	149	4694	0	28427	0	0	3909	37030
33N010.1100000	EQUIPMENT	501A	11100 MM	11100	349450	0	3760061	0	0	373317	4483028
33N010.1200000	FURNISHINGS	501A	85 MM	85	2678	0	8942	0	0	1846	13486
33N010.1300000	CELL LINING PLATE	501A	19865 MM	19865	625748	0	136345	0	0	338443	1180556
33N010.1400000	CONVEYING SYSTEMS	501A	2766 MM	2766	87129	0	5527955	0	0	322576	5937660
33N010.1500000	PLAC. & FIRE PROT.	501A	5315 MM	5315	167423	0	143998	0	0	95934	407347
33N010.1500050	HVAC	501A	25300 MM	25300	796950	0	803958	0	1466082	539886	3686876
33N010.1600000	LIGHTING, TELECOM., UPS AND D.C. POWER	501A	11091 MM	11091	349367	0	238369	0	0	197080	784756
SUBTOTAL 33N010 STRUCTURES			279,442	8,802,395		0	14,778,074	0	1,466,082	5,477,476	30,524,027
SUBTOTAL 33N	SOLID WASTE HANDLING BLOS.		279,442	8,802,395		0	14,778,074	0	1,466,082	5,477,476	30,524,027
SUBTOTAL 33	CENTRALIZED FACILITIES		279,442	8,802,395		0	14,778,074	0	1,466,082	5,477,476	30,524,027
SUBTOTAL 3	CONSTRUCTION		279,442	8,802,395		0	14,778,074	0	1,466,082	5,477,476	30,524,027
PROJECT TOTAL			279,442	8,802,395		0	14,778,074	0	1,466,082	5,477,476	30,524,027

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APPENDIX G3
FCS FACILITY COST COMPARISON

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Current Support Facility Versus FCS Facility Cost Comparison^{1,2}

Facility/building	Currently defined as a support facility	FCS support facility	FCS process facility	Current direct cost basis (\$M)	FCS support facility direct cost basis (\$M)	FCS process facility direct cost basis (\$M)	FCS facility cost adjustment (\$M)	ENG/FM/CMF (\$M)	Subtotal (\$M)	Contingency total (\$M)	Total estimated cost (\$M)
Regulated TWRS	Yes (RCH)	Yes (RFB)	No	11,823	9,331	0	2,492	1,620	4,112	1,645	5,757
Complex Entry Bldg	Yes (OSB)	Yes (OSB)	No	9,982	6,618	0	3,364	2,187	5,551	2,220	7,771
Emergency Response Center	Yes (ERC)	No (incl w/OCB)	No	6,269	0	0	6,269	4,075	10,344	4,138	14,482
Operations Control Bldg	No	Yes (OCB)	No	0	3,035	0	-3,035	-1,973	-5,008	-2,003	-7,011
Hot Cold Chemical Bldg	Yes (BCCB)	Yes (BCCB)	No	11,823	9,331	0	2,492	1,620	4,112	1,645	5,757
Hot Handling Area	Yes (BHA)	No (incl w/BCCB)	No	10,831	0	0	10,831	7,040	17,871	7,148	25,019
Mechanical Utilities Bldg	Yes (MUB)	Yes (M/E)	No	15,083	9,376	0	5,707	3,710	9,417	3,767	13,184
Water Pumphouse (Structure)	Yes (WPH)	No (incl w/V-RFB)	No	5,819	0	0	5,819	3,782	9,601	3,840	13,441
Analytical Facility	Yes (AF)	No (incl w/V-RFB)		77,719	0	0	77,719	50,517	128,236	51,294	179,530
HLW Analytical Equip	Yes (incl w/AF)	No	Yes	0	0	28,667	-28,667	-18,634	-47,301	-18,920	-66,221
Sep/LLW Analytical Equip	Yes (incl w/AF)	No	Yes	0	0	39,156	-39,156	-25,451	-64,607	-25,843	-90,450
Regulated Facility Entry (formerly VAREB, now called RFB)	No (incl w/process facilities)	Yes (VAREB)	No	0	42,550	0	-42,550	-27,658	-70,208	-28,083	-98,291
Switchgear Bldg	Yes (SGB)	Yes (SGB)	No	9,370	38,083	0	-28,713	-18,663	-47,376	-18,950	-66,326

**Table H1-11A. Analytical Laboratory Equipment Requirements
Separations Function.
(Low Cs DF Mode of Operation)**

Equipment/Instrumentation	Space	Utilities/Service Required
Equipment Storage	2' X 8'	
Inductively Coupled Plasma (ICP)	3' X 8'	Liquid argon
ICP Hood	3' X 4'	Waste jet, hot water drain, water
ICP Computer Terminal	3' X 3'	Power
Bench with deionized water system	3' X 4'	Sanitary water
Dionex hood	3' X 4'	Hot water drain
Dionex bench and cabinets	3' X 4'	Air
Actinide and other radiochemical separations hood	3' X 4'	Hot waste drain
Solids, visual, microwave, filtration, other hood	3' X 4'	Hot waste drain
Autotitration bench/cabinet	3' X 4'	Drain
pH meter and bench	3' X 4'	Power
Balance w/marble table	3' X 4'	Power
Organic storage	3' X 4'	
Utility/General purpose bench/cabinet	3' X 6'	Deionized water
Centrifuge	2' X 2'	
Microwave	2' X 2'	Power
Furnace	2' X 2'	Power
Fluorometer	3' X 4'	Power
Shielded radiation detector	3' X 3'	Power
Spectrometer	3' X 3'	Power
Gas Chromatograph	3' X 4'	Power, carrier gas

Table H1-12A. Additional Analytical Equipment
Consideration Separations Function.
(Low Cs DF Mode of Operation)

- Space must be allocated and/or supporting services should be planned.
- Sample and material transfer (handling) carts
- Approved containers for laboratory waste
- Pneumatic lift for handling (lead) sample pigs (containers)
- Area Radiation Monitors (ARMs); wall mounted 2'x2'x2'
- Record Air Samplers (RAS); wall mounted 1'x1'x1'
- Continuous Air Monitors (CAMs); floor mounted 2'x4'x5'
- Hand and Foot Monitor (HFM); floor mounted 2'x4'x6'
- General Laboratory HVAC. Sufficient space between hoods, benches and desks for HEPA filter exchange.
- Central sink with process water, deionized water, hot water supply, and appropriate drainage system.
- Safety shower and eyewash station.
- Trouble alarms at selected working places.
- Main double door access.
- Space for computer terminals and communal work stations.

Table H1-13A. Analytical Facility
Estimated Space Requirements.

AREA	SEP/LLW			HLW	COMBINED TOTAL
	SEP	LLW	SEP+LLW		
Analytical Cells					
Number	2	4	6	7	13
Area, ft ²	208	416	624	728	1,352
Sample Transfer Room, ft ²	--	--	286	286	572
Analytical Cell Service Room, ft ²	44	132	176	220	396
Analytical Laboratories					
Rooms, no.	1	2	3	2	5
Total Area, ft ²	925	1,740	2,665	1,740	4,405
Sample Receiving Room, ft ²	--	--	180	180	360
Sample Counting					
Rooms, no.	1	1	2	1	3
Total Area, ft ²	300	160	460	160	620
Counting Equipment Room, ft ²	--	--	--	--	240
Stock Room, ft ²	--	--	--	--	600
Office/Data Processing Area, ft ²	--	--	--	--	1,350
Waste Handling Areas, ft ²	--	--	--	--	1,240
Equipment Utility Room, ft ²	--	--	--	--	300
Analytical Instrument Room, ft ²	--	--	--	--	440
Health Physics Area, ft ²	--	--	--	--	300
Instrument Utility Room, ft ²	--	--	--	--	300
Standard Prep Laboratory, ft ²	--	--	--	--	625
Total Area, ft ²	1,477	2,448	4,391	3,314	13,100

Table H1-1B. Process Gas, Liquid and Solid Sampling
Frequency Low-Level Waste Function.

Sample Location	Grab Sample Frequency	Samples/Day	Sample Purpose	Analyses Required
1. LLW Evaporator Feed Tank (TK-400)	Once every 8 hrs	3	PC	SpG, TSS, TDS
2. LLW Melter Feed Adjustment Tanks (TK-404A, B, C & D)	Once every 18 hrs/tank	5.3	PC (possibly WFQ also)	SpG, TSS, TDS Elemental Composition}From ICP-MS Radionuclides
3. LLW Melter Feed Tanks (TK-406A, B, C & D)	Not required on routine basis	--		
4. LLW Cullet Catch Tanks (TK-416A & B)	Not required on routine basis	--		
5. LLW Quench Water Recycle Tanks (TK-421A & B)	Not required on routine basis	--		On-line pH analysis and TDS
6. LLW Cullet Day Lag Storage (B-427A & B)	Once every 2 hrs/bin	24	PC & WFQ	Elemental Composition}From ICP-MS Radionuclides PCT? Fraction of Fine Particulates Present? Crystallinity/Density - Infrequent
7. LLW Filter Catch Tanks (TK-426 A & B)	Once every 24 hrs/tank	2	PC	TSS, TDS
8. LLW Condensate Catch Tanks (TK-429 A & B)	Once a week/tank	--	PC	Elemental Composition}From ICP-MS Radionuclides
9. Filter Wash Catch Tank (TK-455)	Infrequent	--	PC	
10. Recovered Sulfur Storage Tank (TK-436)	Not required	--		
11. LLW Recycle Cullet Catch Tanks (TK-503A & B)	Assume once every 8 hrs for only 1 tank)	3	PC	Elemental Composition}From ICP-MS Radionuclides
12. LLW Metal Filter Wash Catch Tank (TK-626)		--		
13. LLW Scrub Filter Tank (TK-611)	Not required on routine basis	--		
14. LLW Scrub Solution Tanks (TK-614 A & B)	Once every 24 hrs/tank	2	PC	pH, TSS, TDS Elemental Composition}From ICP-MS Radionuclides

**Table H1-1B. Process Gas, Liquid and Solid Sampling
Frequency Low-Level Waste Function.
(continued)**

Sample Location	Grab Sample Frequency	Samples/Day	Sample Purpose	Analyses Required
15. LLW Process Condensate Recycle Tanks (TK-800 A, B & C)	Once every 20 hrs for each of 2 tanks only	2.4	PC	pH Elemental Composition } From ICP-MS Radionuclides
16. pH Adjustment Tank (TK-803)	Not applicable	—	PC	pH (on-line analysis)
17. Process Condensate from Condenser (EC-140)	Not applicable	—	PD	Continuous on-line analysis for activity
20. Gas Outlet from LLW Separator (S-616A & B)	Once every 24 hrs/separator	2	PD	Particulates Radionuclides (ICP-MS)
21. Gas Outlet from LLW Mist Eliminator (DE-618A & B)	Once every 24 hrs/train	2	PD	Particulates Radionuclides (ICP-MS)
22. Gas Outlet from MOG Metal HEPA Filter (FM-625A2, B2 & C2)	Once every 24 hrs for each of 2 trains only	2	PD	Particulates Radionuclides (ICP-MS)
23. VOG System Filter Inlet Stream	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
24. VOG System Discharge Stream	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
25. CVOG System Discharge Stream	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
26. CVOG System Discharge Stream	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
TOTAL		51.7		Particulates Radionuclides (ICP-MS)

- The Separations sample schedule indicates that the process effluent from Separations is sampled and fully characterized before being sent as feed to LLW.
- It is assumed that combustion melters will be used for LLW vitrification, and that the melter feed streams will not require any kind of chemical adjustment in the upstream LLW Melter Feed Adjustment Tanks.
- It is assumed that the LLW glass product will be qualified using the product qualification technique rather than the process qualification technique.

Notes: PC = Process Control TSS = Total Suspended Solids
PD = Process Diagnostic TDS = Total Dissolved Solids
PH = Process History ICP-MS = Inductively Coupled Plasma-Mass Spectrometer
SpG = Specific Gravity pH = Acid Content or Demand
WFQ = Waste Form Qualification

Table H1-2B. Location of Analyses
Low-Level Waste Function.

<u>ANALYTICAL CELL</u> (Undiluted samples)	<u>ANALYTICAL LABORATORY</u> (Diluted/low level and cold samples)
pH SpG	OTR (Over-the-Top Reading) pH SpG
Solids-work: TSD, TDS, TSS	Solids-work: TSD, TDS, TSS
Elements and Radionuclides: ICP-MS closely coupled to the Analytical Cells allowing processing of undiluted or slightly diluted (1:10) samples	Anions: HPLC, Dionex Elements: ICP-MS ICP-AES AAS Spectrophotometer Fluorometer Radionuclide Separations (prior to radionuclide analyses): Extractions Precipitations HPLC Ion Exchange
Anions: Sample preparation Dilution	Radionuclide Analysis: IPC-MS Total Alpha AEA Total Beta GEA Beta Sci
Particulates PCT (Product Consistency Test) Crystallinity/Density	Titration Gas Chromatography Particulates

**Table H1-3B. Average Process Sampling Frequency
Low-Level Waste Function.**

[illegible]

Table H1-4B. Time Per Week for Analytical Cell
Sample Analyses Low-Level Waste Function.

Type of Analysis	Number of Determinations per Week	Time/Analysis (Hours)	Total Analysis Time (Hours/Week)
pH	30.8	0.5	15.4
SpG	58.1	0.5	29.0
TSD (dried)		1.0	
TDS	86.1	1.12	96.4
TSS	86.1	1.12	96.4
COD		0.5	
OH Equivalent		0.5	
TOC/Total Carbon		1.0	
Fe ²⁺ /Fe ³⁺		2.0	
Crystallinity/Density		2.0	
PCT		2.0	
Particulates	70	0.5	35
Elements and Radionuclides		0.3	
TOTALS	331.1		272.2

Table H1-5B. Analytical Cell Time Required for
Sample Preparation Analytical Laboratory Analysis
Low-Level Waste Function.

Type of Analysis	Number of Analyses Per Week	Analytical Cell Preparation Time (Hours)	Total Preparation Time (Hours/Week)
Elements and Radionuclides	326.9	0.3	98.1
Anions		1.5	
Total Organic Carbon/Total Carbon		1.0	
Mixing (Homogenize)			
Splits			
Dissolutions			
Dilutions			
Separations			
TOTALS	326.9		98.1

Table H1-6B. Analytical Cell Sample Analysis
and Preparation Time Low-Level Waste Function.

	Factor	Hours Per Week
Analysis Time	Table Value	272.2
Add time for reruns	5%	13.6
Add time for standards	10%	27.2
	Subtotal	313.0
Sample Preparation Time	Table Value	98.1
Add time for reruns	5%	4.9
Add time for standards	10%	9.8
Add time for sample load-out	5 min./sample	
	Subtotal	112.8
Total Analysis and Preparation Time		425.8
Credit for Parallel Tests	Less 9%	38.3
	TOTAL	387.5

Table H1-7B. Analytical Cell Availability.

	Factor	Hours/Week
Hours available per week per cell	7 X 24	168.0
Workforce available (percent)	70	117.6
Manipulators available (percent)	93	109.4
Not devoted to cleanup (percent)	94	102.8
Equipment available (percent)	90	92.5

Note: $92.5/168 (100) = 55$ percent availability

	Factor	Hours/Week
Hours available per week per cell	7 X 24	168
Workforce available (percent)	100	168
Manipulator available (percent)	93	156.2
Not devoted to cleanup (percent)	94	146.9
Equipment available (percent)	90	132.2

Note: $132.2/168 (100) = 79$ percent availability

Table H1-8B. Simplified Time and Motion Study of Analytical Cell Requirements Low-Level Waste Function.

Case	Analysis Per Week	Analysis Time Required (H)	Analytical Cell Prep Time (H)	Total Analytical Cell Analysis Time (H)	Total Analytical Cells Prep Time (H)	Total Analytical Cells Time Required (H)	Analytical Cell Availability (H)	Number of Analytical Cells Required
LLW (Base Case)	658.0	272.2	98.1	313.0	112.8	387.5	92.5	4.2
Assume 100 percent Manpower	658.0	272.2	98.1	313.0	112.8	387.5	132.2	2.9
Assume Steady State Operation (70 percent of Plant Capacity)	460.6	190.5	68.7	219.1	79.0	271.3	92.5	2.9
Assume 100 percent Manpower and 70 percent TOE	460.6	190.5	68.7	219.1	79.0	271.3	132.2	2.1

**Table H1-9B. Simplified Time and Motion Study -
Analytical Laboratory Low-Level Waste Function.**

Type of Analyses	Samples from Analytical Cells Per Week	Process Gas Samples, Other Waste/Wastewater and Environmental Samples	Hours/Analysis	Total Hours Per Week
OTR		110	0.1	11.0
pH		60	0.25	15
SpG		80	0.25	20
Visual:				
Color		40	0.1	4
Percent Settled Solids		40	1.0	40
Percent Centrifuged Solid				
TSD (Dried)		60	1.0	60
TSC (Calcined)			1.25	
TDS			1.12	
TSS			1.12	
TOC/Total Carbon			2.0	
Control Elements				
Elements and Radionuclides		40	0.1	4.0
Isotopes				
Particulates	70		0.5	35
Anions		60	0.5	30
GEA		110	0.5	55
Total Alpha		140	0.5	70
AEA			0.5	
Total Beta		140	0.5	70
Beta Sci			0.5	
Soluble Cs-137			0.5	
Soluble Sr-90			0.5	
GC		20	1.0	20
Titration		72	0.5	36
SUBTOTAL				470
Add time for reruns (5 percent)				23.5
Add time for standards (10 percent)				47.0
TOTAL	70	972		540.5

Table H1-10B. Equipment Requirements/Assessment
Low-Level Waste Function.

Analysis	Frequency # of Determinations /Wk		Turnaround Time Required (Hours)	Equipment Description	Estimated On-Line Time (%)	Spare Needed
	(In-Cell)	(Anal Lab)				
OTR		110	4	Fixed Detector (Shielded)	100 %	Yes
pH	30.8	60	4	pH Meter, Electrode	100	Yes (meter, electrode)
SpG	58.1	80	4	Balance/graduated centrifuge cone	90	Yes
Visual: Color % Settled Solids % Centrifuged Solids		40	4	Boroscope	100	Yes
		40	4	Glassware, Cone	100	Yes
			4	Cone, Centrifuge	100	Yes
TSD (Dried)		60	8	Microwave, balance	90	Yes
TSC (Calcined)			8	Furnace, balance	90	Yes
TDS	86.1		8	Glassware, microwave, balance	100	Yes
TSS	86.1		8	Glassware, microwave, balance	100	Yes
COD (Reducing potential)			8	Autotitrator	90	Spare
OH Equivalent			4	Autotitrator	90	Spare
TOC/Total Carbon			8	TOC Analyzer	70	Yes
Yield Stress/Viscosity			4	Viscometer	90	Yes

Table H1-10B. Equipment Requirements/Assessment
Low-Level Waste Function.
(continued)

Analysis	Frequency # of Determinations /Wk (In-Cell) (Anal Lab)		Turnaround Time Required (Hours)	Equipment Description	Estimated On-Line Time (%)	Spare Needed
Re ²⁺ /Fe ³⁺			8	Furnace, UV-Visual Spectrophotometer	90	No
Crystallinity			(8 days)	X-Ray Diffraction	90	No
PCT			(8 days)	DWX/Grinder/Glassware	100	Yes
Particulates	70	70	8	Balance	90	Yes
Elements and Radionuclides	326.9	40	8	Separations; ICP-MS	85	
Anions		60	8	Ion Chromatography (Dionex)	80	Columns
GEA		110	24	Gamma Scintillation (HPGE)	100	Detector
Total Alpha		140	24	Alpha Proportional Counter	100	
AEA			24	Alpha spectrometer	100	
Total Beta		140	24	Beta Proportional	100	
Beta Sci			24	Beta Scintillation	100	No
Soluble Cs-137			8	Gamma Scintillation (HPGE)	100	Detector
Soluble Sr-90			8	Beta Proportional	100	
Gas Chromatograph		20	8	Gas Chromatograph	90	Columns
Titration		72	8	Autotitrator	90	Spare
Density			4	Balance	90	Yes

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Table H1-11B. Analytical Laboratory/Instrument Room
Equipment Requirements Low-Level Waste Function.

Equipment/Instrumentation	Number Required	Space	Utilities/Service Required
Shielded Radiation Detector	2	3' x 3'	power
pH Meter and Bench	2	3' x 4'	power
Balance w/marble table	1	3' x 4'	power
Centrifuge	1	2' x 2'	power
Microwave	1	2' x 2'	power
Furnace	1	3' x 3'	power
Balance	2	2' x 2'	power
Inductively Coupled Plasma (ICP) Spectrometer	2	3' x 8'	liquid argon
ICP Computer Terminal	2	3' x 3'	power
Bench with deionized water	2	3' x 4'	Sanitary water
Dionex bench and cabinets	1	3' x 4'	air
Atomic Absorption (AA, flame)	1	3' x 4'	nitrous oxide, acetylene, hot waste drain
AA Computer terminal	1	3' x 3'	power
Fluorometer	1	3' x 4'	power
Spectrophotometer, IR	1	3' x 4'	power
Spectrophotometer, UV and Visible	1	3' x 4'	power
Gas Chromatograph	1	3' x 4'	power, carrier gas
Equipment Storage	2	2' x 8'	
Organic Storage	2	3' x 4'	
Utility/general purpose bench/cabinets	5	3' x 6'	de-ionized water
Auto-titration bench/cabinet	2	3' x 4'	drains

Table H1-12B. Additional Analytical Equipment Consideration
Low-Level Waste Function.

- Space must be allocated and/or supporting services planned for the following items:
 - Sample and material transfer (handling) carts
 - Approved containers for laboratory waste
 - Pneumatic lift for handling (lead) sample pigs (containers)
 - Area Radiation Monitors (ARMs); wall mounted 2'x2'x2'
 - Record Air Samplers (RASs); wall mounted 1'x1'x1'
 - Continuous Air Monitors (CAMs); floor mounted 2'x4'x5'
 - Hand and Foot Monitors (HFMs); floor mounted 2'x4'x6'
 - General Laboratory HVAC. Sufficient space between hoods, benches and desks for HEPA filter exchange.
 - Central sinks with process water, deionized water, hot water supply, and appropriate drainage system.
 - Safety shower and eyewash stations.
 - Trouble alarms at selected working places.
 - Main double door access.
 - Space for computer terminals and communal work stations.

Table H1-13B. Analytical Facility Estimated Space Requirements.

AREA	SEP/LLW			HLW	COMBINED TOTAL
	SEP	LLW	SEP + LLW		
Analytical Cells					
Number	2	4	6	7	13
Area, ft ²	208	416	624	728	1,352
Sample Transfer Room, ft ²	—	—	286	286	572
Analytical Cell Service Room, ft ²	44	132	176	220	396
Analytical Laboratories					
Rooms, no.	1	2	3	2	5
Total Area, ft ²	925	1,740	2,665	1,740	4,405
Sample Receiving Room, ft ²	—	—	180	180	360
Sample Counting					
Rooms, no.	1	1	2	1	3
Total Area, ft ²	300	160	460	160	620
Counting Equipment Room, ft ²	—	—	—	—	240
Stock Room, ft ²	—	—	—	—	600
Office/Data Processing Area, ft ²	—	—	—	—	1,350
Waste Handling Areas, ft ²	—	—	—	—	1,240
Equipment Utility Room, ft ²	—	—	—	—	300
Analytical Instrument Room, ft ²	—	—	—	—	440
Health Physics Area, ft ²	—	—	—	—	300
Instrument Utility Room, ft ²	—	—	—	—	300
Standard Prep Laboratory, ft ²	—	—	—	—	625
Total Area, ft ²	1,477	2,448	4,391	3,314	13,100

**Table H1-14B. Hood Requirements for Analytical Facility
Rooms Low-Level Waste Function.**

General Function	Analysis per Week	Hood Requirements
Analytical Laboratory		
OTR, pH, SpG, Visual, Other	330	2
Microwave, Filtration	60	1
Autotitrator	72	1
Actinide Separations	N/A	
TOC/Total Carbon	N/A	
Cold Chemical	N/A	
Gas Chromatograph	20	1
Extraction	N/A	
Fluorometer	N/A	
IR Spectrophotometer	N/A	
I-129 Separation	N/A	
Beta Separation #1	N/A	
Beta Separation #2	N/A	1
AT Flame Hood	N/A	
Spare	N/A	1
Ion Chromatography (Dionex)	N/A	1
	Subtotal	8
Instrument Room		
AA Hood	N/A	1
ICP Hoods	N/A	2
Eluent/Separation Hood	N/A	1
Waste and Utility Hood	N/A	1
	Subtotal	5
Sample Receiving Room		
Sample Storage Hood	N/A	1
Sample Preparation Hood	N/A	1
Sample Preparation Hood	N/A	
Decontamination Hood	N/A	1
Waste Collection Hood	N/A	1
	Subtotal	4
Analytical Cells Service Room		
Decontamination and Cell Service Hoods	N/A	1
Total Hoods		18

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APPENDIX H2

HIGH-LEVEL WASTE ANALYTICAL FUNCTION STUDY

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APPENDIX H2
HIGH-LEVEL WASTE
ANALYTICAL FUNCTION STUDY

1.0 OBJECTIVE

This appendix presents a simplified time and motion study of the analytical capabilities associated with the High-Level Waste (HLW) function. The analytical requirements, which are developed in this appendix, are used to develop the requirements for analytical cells, analytical laboratories, and other associated rooms. For the purpose of this appendix, the following definitions are used:

Analytical Cells. This term refers to the areas where undiluted, high radiological activity samples are remotely handled. Sample preparation, dilution, and limited sample analysis occurs in analytical cells.

Analytical Laboratories. This term refers to the areas where diluted and/or low radiological activity samples are analyzed. Analyzers within the laboratories are located in hoods to contain radioactivity.

Other Associated Rooms. This term refers to the miscellaneous support areas that are outside of the analytical cells and analytical laboratories. These rooms include service rooms, receiving rooms, counting rooms, equipment and stock rooms, waste handling areas, and analytical instrument rooms.

This appendix identifies the critical sample analyses required to support the process, such as process control and waste form qualification. Supplemental analyses, such as offgas and environmental samples, are also addressed. Limited on-line sample analyses assumed to occur within the process facility are identified and are not developed further here. Potential analytical needs associated with incoming waste safety issues, such as criticality, have not been considered here.

This appendix has substantially profited from the design of the Hanford Waste Vitrification Plant (HWVP) analytical function. As such, it incorporates lessons learned at the Defense Waste Process Facilities (DWPF).

2.0 SUMMARY

This appendix develops the technical requirements for the HLW function. The initial step is to establish a sample schedule to support process control and waste form qualification. The schedule also includes offgas and environmental samples.

A simplified time and motion study is then performed to develop the requirements for the analytical cells and analytical laboratories. Major equipment and instrumentation items are identified and major plant utilities and service interfaces are established. Initial analytical cell layouts are developed to support Analytical Facility (AF) layouts. Analytical laboratory space requirements are based on space requirements for individual equipment and instruments.

The requirements are developed for the HLW function in this appendix. Appendix H1 develops separate requirements for the Separations and low-level waste (LLW) functions. This approach highlights the requirements attributable to each function and the potential areas of consolidation. Some consolidation is expected even though the appendixes do not evaluate the impact of consolidation. The AF layouts are based on the assumption that a 20 percent reduction in the analytical laboratories can be achieved by combining the Separations, LLW, and HLW analytical functions. Additional study is required to validate this assumption.

3.0 TECHNICAL FINDINGS AND CONCLUSIONS

The simplified time and motion study for the analytical cells indicates that seven analytical cells are required for the HLW function. The time and motion study is based on 70 percent staff availability, 100 percent Total Operating Efficiency (TOE) in the process facility, and process qualification to confirm product quality. The staffing availability is based on operator breaks, meetings, scheduled training, etc. The analytical requirements do not rely on slack time caused by operating inefficiencies in the process facility. Further evaluation of the bases may indicate that more or less analytical cells are required.

The simplified time and motion study also indicates that two analytical laboratories are required to support the HLW analytical function. The study includes an assessment of the equipment requirements, the space requirements for each piece of equipment, and the resulting total analytical laboratory space requirements. Redundant spare equipment and instruments are included in the analytical laboratory requirements. Further evaluation should confirm the redundancy requirements and also the analytical laboratory space requirements.

Process qualification, rather than product qualification, is the assumed method of HLW waste form qualification. Process qualification requires sampling and analyzing the melter feed and comparing the results to reference compositions. Feed characterization, melter feed envelop determination, equipment qualification, and process parameter control are also required for process qualification.

4.0 INITIAL ESTIMATES OF ANALYTICAL REQUIREMENTS

The results of this appendix are presented in a series of tables discussed as follows:

- Samples which require processing through the analytical cells and analytical laboratory are identified in Table H2-1. Sample frequency (occasions), sample purpose and analysis required are also given in Table H2-1. Initial estimates of process gas samples and other waste/wastewater and environmental samples are also included. These values could change greatly depending on future requirements for additional sample analyses.
- Table H2-2 defines the analyses that are performed in an analytical cell and those that are analyzed in an analytical laboratory.
- The daily analytical requirements for analyses performed in an analytical cell are identified in Table H2-3. The requirements for each type of analysis are totalled, and the total analytical demand is also indicated.
- Table H2-4 summarizes the time requirements for analyses performed in the analytical cells. Total analysis requirements from Table H2-3 are multiplied by the time required for each analysis and the total time is indicated.
- Table H2-5 defines the analyses that occur in the analytical laboratories, but that require the sample preparation time in the analytical cells. The total analytical cell sample preparation time required is indicated.
- Table H2-6 provides the total analytical cell time requirements. The requirements include the analyses performed in the analytical cells and the sample preparation time for those performed in the analytical laboratories. Additional requirements for sample reruns and standards and estimated sample load-out times as well as credit for parallel testing are also included.
- Analytical cell availability is calculated in Table H2-7. The availability is based on an assumed staff availability of 70 percent, manipulator downtime,

cleanup time and equipment availability. Analytical cell availability at 100 percent staffing availability is also indicated.

- In Table H2-8 the number of analytical cells is determined by dividing the total time required by the available time per analytical cell. The base case evaluation is based on 70 percent staff availability and 100 percent process facility TOE. Table H2-8 also provides a sensitivity analysis of staff availability and TOE.
- Table H2-9 provides estimates of the time requirements for analyses performed in the analytical laboratory.
- Table H2-10 provides initial estimates of sample turnaround time requirements and equipment reliability. This table will assist in developing duplicate and spare equipment needs.
- Table H2-11 estimates the number of hoods required to support the Sample Analysis function for HLW. The estimated 18 hoods are located in several areas.
- Table H2-12 provides approximate space requirements and plant utility interfaces required to support the analytical laboratory equipment.
- Table H2-13 lists additional equipment requirements for safe and efficient operation of the AF. These items do not directly impact the initial AF layouts or cost, however, they must be considered so that space can be allocated and supporting services can be planned.
- Table H2-14 presents the estimated space requirements for the various working areas of the Analytical facility. The space requirements of the Separations function, which are provided in Appendix H1, are given in the column headed "SEP." The space requirements for the Separations and LLW, also from Appendix H1, are summed and are given in the column headed "SEP+LLW." The HLW space requirements are indicated, and the requirements for the three functions are summed. These cells, rooms, and laboratories are included in the layout of a combined Separations/LLW/HLW AF. Note that the facility AF layout is based on the assumption that a 20 percent reduction in the analytical laboratories can be achieved by combining the Separations, LLW, and HLW analytical functions.

5.0 DISCUSSION OF ALTERNATIVES

5.1 ASSUMPTIONS AND UNCERTAINTIES

This section identifies the assumptions made for this appendix. A brief discussion of each is given to illustrate the importance and uncertainties of each assumption.

- The sample schedule is based on the process flow diagrams (PFDs) for the combined Separations/LLW facility and the detached HLW facility from the Facility Configuration Study (Boomer et al. 1994). The PFDs are used to identify sample locations, frequencies of sample collection, and the types of analyses required. The sample schedule is designed to support process diagnosis, control and history and waste form qualification. Emphasis is placed on the use of on-line analyzers and Inductively Coupled Plasma-Mass Spectrometer (ICP-MS) analysis to reduce the load on analytical cells and laboratories. Laser ablation is assumed to prepare ICP-MS samples, where appropriate. In addition, no process time and motion analysis has been performed on the process itself. Any changes in the number of sample locations and particularly in the frequencies of sampling and type of analyses could impact the analytical cell and laboratory needs.
- Product glass waste form qualification is based on process qualification, rather than product qualification. Process qualification requires sampling and analyzing the melter feed and comparing the results to reference compositions that were previously identified. Feed characterization, melter feed envelop determination, equipment qualification, and process parameter control are also required for process qualification. Changes to the waste form qualification method impacts the number of analytical cells required.
- This appendix assumes that the AF receives samples around the clock, rather than simultaneously. The analytical cell requirements include no allowances for concurrent analysis and/or sample preparation of all of the samples.
- Analytical cell operations are to be fully supported by the analytical laboratory. Although no complete time and motion study in the analytical laboratory is available, it is assumed this laboratory is self sufficient and that adequate laboratory capacity is available so as not to limit analytical cell throughput.
- The number of analytical hot cells and associated facilities is based on the liquid and slurry samples. The layouts for the analytical laboratory and other contact areas are based on both the samples from the hot cells and additional contact-handled samples. The contact-handled samples include process gas

samples and environmental samples. Layouts for the Bulk Cold Chemical Building include space for cold chemical testing.

- AF waste handling (both liquid and solid) is extremely important. Personnel, equipment, and facilities must be provided to sort, combine, absorb, package, and stage waste for transfer to a treatment, storage, or disposal facility. Space must be provided for load-out from the analytical cells and other laboratory and counting room areas.
- Analytical facilities outside the TWRS complex are assumed to be not available. As a result, enough overlap and redundancy must be built into the laboratory design so that analytical results are available to support plant operations. It is also assumed that the AF is not required to support other Hanford Site operations.
- Table H2-1 identifies the samples that must be processed through the analytical cells. Any additional samples not included in Table H2-1 would increase analytical cell requirements. Samples which may be borderline for analytical cell processing due to radioactivity are included in Table H2-1 to be conservative.
- Properties are assumed to be inferred from the ICP-MS analysis, thereby reducing the number of samples and analyses required. In particular, the rates of disintegration and emitted energies of radionuclides may be inferred from the measured isotopic composition.
- Analytical cell analysis requirements are identified in Table H2-2. Determination of the sample solids content and rheology and sample preparation (including dissolutions and separations) are assumed to be performed in the analytical cells. Elemental and anion analyses as well as radionuclide counting are assumed to be performed in the analytical laboratory, rather than analytical cell.
- Analyses and sample preparation time requirements are as identified in Table H2-4 and Table H2-5. Some are estimates but most are based on Hanford Site and other analytical laboratory experience.
- Staffing availability is assumed to be 70 percent for the base case. This figure is derived from Hanford Site experience of chemical technologist availability of 5.5 hours per 8 hour shift. This operator availability is based on operator breaks, meetings, scheduled training, etc. A sensitivity study examines the 100 percent staff availability case (Table H2-8).

- Manipulator availability is assumed to be 93 percent, which is the same as the Hanford Site experience with the CRL Model F MSM. Although manipulator availability could be improved with the System 50 manipulator, that is expected to be used in the AF, the availability is not now known. When a manipulator fails, a replacement is assumed to be ready for installation. The AF layouts include a manipulator repair/replacement system to support manipulator failure and recycle.
- A 6 percent downtime is assumed for dedicated cell cleanup. This is based on experience where 30 minutes per eight hour shift is used for cleaning. Maintaining a "clean-cell" policy has been found to be extremely effective in maintaining continuity of operations.
- A 10 percent downtime is assumed for equipment failure. For equipment or procedures requiring newly developed equipment this assumption may need to be increased.
- Additional time for standards (10 percent) and reruns (5 percent) is assumed. Additional quality control related analyses (blanks, duplicates, spikes) may be necessary due to equipment requirements and/or environmental protocols.
- Sample load-outs into rabbit containers from the analytical cells is assumed to require five minutes each. This assumes that multiple load-out techniques are possible.
- The size of the analytical laboratory is based on the space requirements for individual equipment and instruments. The analytical laboratory requirements benefit from detailed layouts that was developed during HWVP. However, additional study is required to validate this assumption.
- The requirements are developed separately for the Separations and LLW function in Appendix H2 and then summed. This appendix develops the requirements for the HLW function. Some consolidation is expected even though the appendixes do not evaluate the impact of consolidation. The facility AF layouts are based on the assumption that a 20 percent reduction in the analytical laboratories can be achieved by combining the Separations, LLW, and HLW analytical functions. Additional study is required to validate this assumption.

5.2 SUMMARY OBSERVATIONS

Some specific observations on the number of analytical cells required and the needs of the analytical laboratory are presented below.

Tables H2-1 through H2-3 indicate that a wide variety of analytical analyses are required.

The baseline analytical cell availability is determined to be 55 percent (Table H2-7). This includes 7 percent downtime for manipulators, 6 percent downtime dedicated to cell clean-up and 10 percent downtime for equipment failures. The major variable is the 70 percent work force availability factor, at 100 percent work force availability, the cell availability increases to 79 percent. By addressing this staffing issue, the analytical cell requirements could be reduced (Table H2-8).

Table H2-8 indicates that seven analytical cells are sufficient for the HLW function.

Tables H2-9 through H2-11 provide initial estimates of the number of samples, approximate size/space and plant utility interfaces required to support the Analytical Laboratory equipment for the HLW function. Equipment requirements will need to be revised as additional (or new) measurement methods are identified and developed. Analyses and analytical methods, and therefore equipment, will also be a function of the required detection levels and turnaround times.

Table H2-12 lists some additional items which need to be considered since these contribute to the safe and efficient operation of the analytical facility. An additional item of importance to be considered is the waste handling operations for both solids and liquids. Facilities and personnel need to be provided to sort, combine, absorb, package, and stage wastes from the analytical cells, the analytical laboratories, and counting rooms for transfer to a treatment, storage, or disposal facility.

The design with respect to waste handling, particularly solids and organic liquid handling, is discussed only to a level that shows allocation of space and interfaces between waste handling and other AF activities. There are many details to waste handling that have yet to be investigated, which may have significant impacts on the layout of laboratory operating areas. An additional effort will be needed to determine further details of design to fully accommodate the waste handling tasks, e.g., special handling of hazardous and radioactive mixed wastes.

6.0 REFERENCES

Boomer, K.D., J. M. Colby, T. W. Crawford, J. S. Garfield, J. D. Galbraith, C. E. Golberg, C. E. Leach, D. E. Mitchell, F. D. Nankani, E. J. Slaathaug, L. M. Swanson, T. L. Waldo, Cm. M. Winkler, June 1994, *Tank Waste Remediation System Facility Configuration Evaluation*, WHC-SD-WM-ES-295, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table H2-1. Process Gas Liquid and Process Solid Sampling Frequency High-Level Waste Function.

Sample Point	Grab Sample Frequency	Samples/Day	Sample Purpose	Analyses Required
1. Receipt/Sample Tanks (TK-300A, B, C, D, E and F)	Once every 10 days/tank	2 (worst case day)	PC	SpG, Total Solids pH Elemental Composition } From ICP-MS Radionuclides OH Eq? Anions? TOC? Reducing Potential?
2. Centrifuge Feed Tank (TK-302A and B)	Not required on routine basis	--	PC	
3. Centrifuge Solids Catch Tanks (TK-304A and B)	Once every 17 hrs (for only 1 tank)	1.4	PC	SpG, TDS, TSS
4. Centrate Catch Tanks (TK-307A and B)	Once every 8 hrs (for only 1 tank)	3	PC	TSS
5. HLW Evaporator Feed Tank (TK-309)	Once every 8 hrs	3	PD	TSS, TDS pH
6. Process Condensate from Condenser (EC-312)	Not applicable	--	PC	Continuous on-line analysis for activity
7. HLW Evaporator Catch Tank (TK-313)	Once every 17 hrs	1.4	PC	TSS, TDS pH
8. HLW Melter Feed Adjustment Tanks (TK-315A and B)	2 times every 34 hrs/tank	3	PC & WFQ	SpG, TSS, TDS pH Elemental Composition } From ICP-MS Radionuclides OH Eq? Anions? TOC? Reducing Potential? Fe ⁺⁺ /Fe ⁺⁺⁺ ?
9. HLW Melter Feed Tanks (TK-317A and B)	Once every 34 hrs/tank	1.5	PH	SpG, TSS, TDS pH Elemental Composition } From ICP-MS Radionuclides OH Eq? Anions? TOC? Reducing Potential? Fe ⁺⁺ /Fe ⁺⁺⁺ ?
10. Molten Glass Pour from Melters (Assume 2 Melters)	Infrequent	--	PH	Elemental Composition } From ICP-MS Radionuclides Crystallinity Fe ⁺⁺ /Fe ⁺⁺⁺ PCT

Table H2-1. Process Gas Liquid and Process Solid
Sampling Frequency High-Level Waste Function. (continued)

Sample Point	Grab Sample Frequency	Samples/Day	Sample Purpose	Analyses Required
11. CVOG/VOG Filter Wash Catch Tank (TK-702)	Infrequent	--	PC	SpG, TSS, TDS pH Elemental Composition } From ICP-MS Radionuclides
12. HLW Scrub Solution Tank (TK-608)	Once every 24 hrs	1	PC	TSS, TDS pH Elemental Composition } From ICP-MS Radionuclides
13. HLW Process Condensate Recycle Tanks (TK-800A, B and C)	Once every 20 hrs for each of 2 tanks only	2.4	PC	pH Elemental Composition } From ICP-MS Radionuclides
14. pH Adjustment Tank (TK-803)	Not applicable	--	PC	pH (on-line analysis)
20. Gas Outlet from HLW Separator (S-603)	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
21. Gas Outlet from HLW Mist Eliminator (DE-605)	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
22. Gas Outlet from MOG Metal HEPA Filter (FM-622A2 & B2)	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
23. CVOG System Filter Inlet Stream	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
24. VOG System Discharge Stream	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
25. CVOG System Filter Inlet Stream	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
26. CVOG System Discharge Stream	Once every 24 hrs	1	PD	Particulates Radionuclides (ICP-MS)
TOTAL		25.7		

It is assumed that the HLW vitrification facility will produce monolithic glass in canisters.

It is assumed that the HLW vitrification facility will operate in the process qualification method of waste form qualification.

The indicated HLW Feed Preparation System sampling frequency can accommodate two liquid-fed ceramic melters (LFCMs) operating in parallel.

Notes:	PC = Process Control	TSS = Total Suspended Solids
	PD = Process Diagnostic	TDS = Total Dissolved Solids
	PH = Process History	ICP-MS = Inductively Coupled Plasma-Mass Spectrometer
	WFQ = Waste Form Qualification	pH = Acid Content or Demand
	SpG = Specific Gravity	

Table H2-2. Location of Analyses.

ANALYTICAL CELL (Undiluted samples)	ANALYTICAL LABORATORY (Diluted/low level and cold samples)
pH SpG	OTR (Over-the-Top Reading) pH SpG
Solids-work: TSD, TDS, TSS	Solids-work: TSD, TDS, TSS
Reducing Potential (COD) OH Equivalent $\text{Fe}^{2+}/\text{Fe}^{3+}$	TOC/Total Carbon Anions: HPLC, Dionex
Elements and Radionuclides: ICP-MS closely coupled to the Analytical Cells allowing processing of undiluted or slightly diluted (1:10) samples	Elements: ICP-MS ICP-AES AAS Spectrophotometer Fluorometer
	Radionuclide Separations (prior to radionuclide analyses): Extractions Precipitations HPLC Ion Exchange
Anions: Sample preparation Dilution	Radionuclide Analysis: ICP-MS Total Alpha AEA Total Beta GEA Beta Sci
Particulates PCT (Product Consistency Test) Crystallinity/Density	Titrations Gas Chromatography Particulates

H2-17

[illegible]

Table H2-4. Time Per Week for Analytical Cell Sample Analyses
High-Level Waste Function.

Type of Analysis	Number of Determinations per Week	Time/Analysis (Hours)	Total Analysis Time (Hours/Week)
pH	100.1	0.5	50.0
SpG	55.3	0.5	27.6
TSD (dried)		1.0	
TDS	93.1	1.12	104.3
TSS	114.1	1.12	127.8
COD	45.5	0.5	22.8
OH Equivalent	45.5	0.5	22.8
TOC/Total Carbon			
Fe ²⁺ /Fe ³⁺	31.5	2.0	63.0
Crystallinity/Density		2.0	
PCT		2.0	
Particulates	49	0.5	24.5
TOTALS	534.1		442.8

Table H2-5. Analytical Cell Time Required for Sample Preparation for Analytical Laboratory Analysis High-Level Waste Function.

Type of Analysis	Number of Analyses Per Week	Analytical Cell Preparation Time (Hours)	Total Preparation Time (Hours/Week)
Elements and Radionuclides	118.3	0.3	35.5
Anions	45.5	1.5	68.2
Total Organic Carbon/Total Carbon	45.5	1.0	45.5
Mixing (Homogenize)			
Splits			
Dissolutions			
Dilutions			
Separations			
TOTALS	209.3		149.2

Table H2-6. Analytical Cell Sample Analysis and
Preparation Time High-Level Waste Function.

	Factor	Hours Per Week
Analysis Time	Table Value	442.8
Add time for reruns	5%	22.1
Add time for standards	10%	44.3
	Subtotal	509.2
Sample Preparation Time	Table Value	149.2
Add time for reruns	5%	7.5
Add time for standards	10%	14.9
Add time for sample loadout	5 min./sample	7.6
	Subtotal	179.2
Total Analysis and Preparation Time		688.4
Credit for Parallel Tests	Less 9%	62.0
	TOTAL	626.4

Table H2-7. Analytical Cell Availability.

	<u>Factor</u>	<u>Hours/Week</u>
Hours available per week per cell	7 X 24	168.0
Workforce available (percent)	70	117.6
Manipulators available (percent)	93	109.4
Not devoted to cleanup (percent)	94	102.8
Equipment available (percent)	90	92.5

Note: $92.5/168 (100) = 55$ percent availability

	Factor	Hours/Week
Hours available per week per cell	7 X 24	168
Workforce available (percent)	100	168
Manipulator available (percent)	93	156.2
Not devoted to cleanup (percent)	94	146.9
Equipment available (percent)	90	132.2

Note: $132.2/168 (100) = 79$ percent availability

Table H2-8. Simplified Time and Motion Study of Analytical Cell Requirements High-Level Waste Function.

Case	Analysis Per Week	Analysis Time Required (H)	Analytical Cell Prep Time (H)	Total Analytical Cell Analysis Time (H)	Total Analytical Cells Prep Time (H)	Total Analytical Cells Time Required (H)	Analytical Cell Availability (H)	Number of Analytical Cells Required
HLW (Base Case)	743.4	442.8	149.2	509.2	179.2	626.4	92.5	6.8
Assume 100 percent Staff	743.4	442.8	149.2	509.2	179.2	626.4	132.2	4.7
Assume Steady State Operation (70 percent of Plant Capacity)	520.4	310.0	104.4	356.4	125.4	438.5	92.5	4.7
Assume Steady State Operation 60 percent TOE	446.0	265.7	89.5	305.5	107.5	375.8	92.5	4.1
Assume 100 percent Staff and 60 percent TOE	446.0	265.7	89.5	305.5	107.5	375.8	132.2	2.8
Assume 100 percent Staff and 70 percent TOE	520.4	310.0	104.4	356.4	125.4	438.5	132.2	3.3

Table H2-9. Time and Motion Study - Analytical Laboratory
High-Level Waste Function

Type of Analyses	Samples from Analytical Cells Per Week	Process Gas Samples, Other Waste/Wastewater and Environmental Samples	Hours/Analysis	Total Hours Per Week
OTR		89	0.1	8.9
pH		60	0.25	15
SpG		80	0.25	20
Visual:				
Color		40	0.1	4.0
Percent Settled Solids		40	1.0	40.0
Percent Centrifuged Solid				
TSD (Dried)		60	1.0	60
TSC (Calcined)			1.25	
TDS			1.12	
TSS			1.12	
TOC/Total Carbon	45.5		0.5	22.8
Elements		40	0.1	4.0
Particulates	49		0.5	24.5
Anions	45.5	60	0.5	52.8
GEA		40	0.5	20
Total Alpha		140	0.5	70
AEA			0.5	
Total Beta		140	0.5	70
Beta Sci			0.5	
Soluble ¹³⁷ Cs			0.5	
Soluble ⁹⁰ Sr			0.5	
GC		20	1.0	20
Titrations		72	0.5	36
SUBTOTAL				468.0
Add time for reruns (5 percent)				23.4
Add time for standards (10 percent)				46.8
TOTAL	140	881		538.2

Table H2-10. Equipment Requirements/Assessment
High-Level Waste Function. (continued)

Analysis	Frequency (# Determinations/Week)		Turnaround Time Required (Hours)	Equipment Description	Estimated On-Line Time (%)	Spare Needed
	Analytical Cell	Analytical Laboratory				
Total Alpha		140	24	Alpha Proportional Counter	100	
AEA			24	Alpha Spectrometer	100	
Total Beta		140	24	Beta Proportional	100	
Beta Sci			24	Beta Scintillation	100	No
Soluble ¹³⁷ Cs			8	Gamma Scintillation (HPGE)	100	Detector
Soluble ⁹⁰ Sr			8	Beta Proportional	100	
Gas Chromatograph		20	8	Gas Chromatograph	90	Columns
Titrations		72	8	Autotitrator	90	Spare

Table H2-11. Hood Requirements for Analytical Facility
High-Level Waste Function

General Function	Analysis per Week	Hood Requirements
Analytical Laboratory		
OTR, pH, SpG, Visual, Other	309	2
Microwave, Filtration	60	1
Autotitrator	72	1
Actinide Separations		
TOC/Total Carbon	74	1
Cold Chemical		
Gas Chromatograph	20	1
Extraction		
Fluorometer		
IR Spectrophotometer		
I-129 Separation		
Beta Separation #1		
Beta Separation #2		1
AT Flame Hood		
Spare		
Ion Chromatography (Dionex)		1
Subtotal		8
Instrument Room		
Atomic Absorption		1
Eluent/Separation		1
ICP		2
Wash and Utility	N/A	1
Subtotal		5
Sample Receiving Room		
Sample Preparation	N/A	1
Sample Preparation	N/A	1
Sample Storage	N/A	
Decontamination	N/A	1
Waste Collection	N/A	1
Subtotal		4
Analytical Cells Service Room		
Decontamination and Cell Service	N/A	1
Total Hoods		18

Table H2-12. Analytical Laboratory/Instrument Room Equipment Requirements
High-Level Waste Function.

Equipment/Instrumentation	Number Required	Space	Utilities/Service Required
Shielded Radiation Detector	2	3'x3'	power
pH Meter	2	2'x2'	power
Balance	2	2'x2'	power
Centrifuge	1	2'x2'	power
Microwave	1	2'x2'	power
Furnace	1	3'x3'	power
Balance w/Marble Table	1	3'x4'	power
Autotitrator	1	2'x2'	power
TOC Analyzer	1	3'x4'	power
Inductively Coupled Plasma (ICP) Spectrometer (ICP-AES and ICP-MS)	2	3'x8'	power, liquid argon
ICP computer terminal	2	3'x3'	power
Ion Chromatograph (Dionex)	1	3'x4'	power, sanitary water
Atomic Absorption (AA, Flame)	1	3'x4'	nitrous oxide, acetylene, hot waste drain
AA Computer Terminal	1	3'x3'	power
Gas Chromatograph	1	3'x4'	power, carrier gas
Fluorometer	1	3'x4'	power
IR Spectrometer	1	3'x4'	power
UV-Visible Spectrometer	1	3'x3'	power
X-Ray Diffraction Spectrometer	1	3'x4'	power
Equipment Storage Units	2	3'x8'	
Organic Chemical Storage Units	2	3'x4'	Ventilation
Utility/General Purpose Bench/Cabinets, etc.	4		de-ionized water, hot water, sanitary water, drains

Table H2-13. Additional Analytical Equipment Consideration
High-Level Waste Function.

Space must be allocated and/or supporting services should be planned.

- Sample and material transfer (handling) carts
- Approved containers for laboratory waste
- Pneumatic lift for handling (lead) sample pigs (containers)
- Area Radiation Monitors (ARMs); wall mounted 2'x2'x2'
- Record Air Samplers (RAS); wall mounted 1'x1'x1'
- Continuous Air Monitors (CAMs); floor mounted 2'x4'x5'
- Hand and Foot Monitor (HFM); floor mounted 2'x4'x6'
- General Laboratory HVAC. Sufficient space between hoods, benches and desks for HEPA filter exchange.
- Central sink with process water, deionized water, hot water supply, and appropriate drainage system.
- Safety shower and eyewash station.
- Trouble alarms at selected working places.
- Main double door access.
- Space for computer terminals and communal work stations.

Table H2-14. Analytical Facility Estimated Space Requirements.

AREA	SEP/LLW			HLW	COMBINED TOTAL
	SEP	LLW	SEP+LLW		
Analytical Cells					
Number	2	4	6	7	13
Area, ft ²	208	416	624	728	1,352
Sample Transfer Room, ft ²	--	--	286	286	572
Analytical Cell Service Room, ft ²	44	132	176	220	396
Analytical Laboratories					
Rooms, no.	1	2	3	2	5
Total Area, ft ²	925	1,740	2,665	1,740	4,405
Sample Receiving Room, ft ²	--	--	180	180	360
Sample Counting					
Rooms, no.	1	1	2	1	3
Total Area, ft ²	300	160	460	160	620
Counting Equipment Room, ft ²	--	--	--	--	240
Stock Room, ft ²	--	--	--	--	600
Office/Data Processing Area, ft ²	--	--	--	--	1,350
Waste Handling Areas, ft ²	--	--	--	--	1,240
Equipment Utility Room, ft ²	--	--	--	--	300
Analytical Instrument Room, ft ²	--	--	--	--	440
Health Physics Area, ft ²	--	--	--	--	300
Instrument Utility Room, ft ²	--	--	--	--	300
Standard Prep Laboratory, ft ²	--	--	--	--	625
Total Area, ft ²	1,477	2,448	4,391	3,314	13,100

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