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Immobilized High-Level Waste Interim Storage Alternative Generation and Analysis and Decision Report - Second Generation Implementing Architecture

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Abstract:

Two alternative approaches were previously identified to provide second-generation interim storage of Immobilized High-Level Waste (IHLW). One approach was retrofit modification of the Fuel and Materials Examination Facility (FMEF) to accommodate IHLW. The results of the evaluation of the FMEF as the second-generation IHLW interim storage facility and subsequent decision process are provided in this document.

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Immobilized High-Level Waste Interim Storage Alternative Generation and Analysis, and Decision Report - Second-Generation Implementing Architecture

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

CH2MHILL

Hanford Group, Inc.

Richland, Washington

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC06-99RL14047

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Immobilized High-Level Waste Interim Storage Alternative Generation and Analysis, and Decision Report - Second-Generation Implementing Architecture

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EXECUTIVE SUMMARY

E1.0 PROBLEM STATEMENT

Two alternate approaches were previously identified that provide for immobilized high-level waste (IHLW) interim storage once the Canister Storage Building (CSB) is filled to capacity. These second-generation alternatives are Fuels and Materials Examination Facility (FMEF) retrofit, and new construction. Based on various programmatic objectives (e.g., life-cycle cost, technical risk), determine which approach is the preferred architecture for inclusion in the River Protection Project (RPP) multi-year work plan (MYWP).

E2.0 BACKGROUND

Retrofit of the CSB was selected as the implementing architecture to provide initial Phase 1 IHLW interim storage capacity (HNF-3899, *Immobilized High-Level Waste Interim Storage Alternative Generation and Analysis and Decision Report**). However, the CSB interim storage capacity is limited to about 880 IHLW canisters, whereas the total Phase 1 IHLW canister production is estimated to be approximately 1,100. Additional interim storage capacity, upwards of 12,000 IHLW canisters, also may be required for Phase 2 production.

To provide additional interim storage capacity, the MYWP reflects time-phased construction of several new facilities, termed storage modules. Each storage module would provide interim storage capacity for 2,640 IHLW canisters.

During the decision process that selected CSB retrofit as the initial implementing architecture, FMEF retrofit was identified as a potentially cost-effective alternative (HNF-3899). The FMEF, located in the Hanford Site 400 Area, could provide interim storage capacity for approximately 1,000 IHLW canisters. This capacity was sufficient to complete Phase 1 and to provide a transition into Phase 2.

The FMEF retrofit was not selected for implementation primarily because the scope of facility modifications necessary to execute this alternative was judged immature. Therefore, programmatic risk associated with the alternative was high. However, the alternative was sufficiently attractive that the decision process recommended further concept development.

An effort was completed in fiscal year 2000 that more fully defined the technical scope and cost associated with an FMEF retrofit for IHLW interim storage (LMHC96WO-0006/

*HNF-3899, 1999, *Immobilized High-Level Waste Interim Storage Alternative Generation and Analysis and Decision Report*, Rev. 0, Fluor Daniel Hanford, Inc., Richland, Washington.

CO-00-RPP-363, *Feasibility Study – Fuels and Materials Examination Facility Immobilized High-Level Waste Interim Storage*^{*}). The effort addressed a broad range of technical issues including civil/structural; heating, ventilation, and air-conditioning; mechanical; electrical; and shielding. Based on this information, a decision process was initiated to reassess whether FMEF retrofit has compelling attributes that would warrant its inclusion in the MYWP. The following section discusses the results of the decision process.

E3.0 ALTERNATE ARCHITECTURES

The competing architectures evaluated in this decision process are as follows:

- Alternative 1 – FMEF Retrofit
- Alternative 2 – New Construction.

Information for Alternative 1 was based on a thorough technical evaluation and concept development completed in fiscal year 2000. This information includes a concept description (e.g., discussion of salient structural and equipment features, required facility modifications), implementation schedule (i.e., project definition, validation, design, construction, and permitting), and implementation cost estimate. In addition, the influence of ancillary factors, such as a Staging and Load-Out Facility siting, was explored.

The Alternative 2 information was based upon information embodied in the MYWP. Supplemental information also was extracted from a prior Alternative Generation and Analysis (AGA) (HNF-3899). This supplemental information provided insight on the influence of alternate new construction concepts and capacity on estimated cost.

Once the concepts were fully developed, each alternative was assessed with respect to evaluation criteria. The evaluation criteria included schedule risk; unit life-cycle cost; health, safety, and environmental risk; stakeholder confidence; and technical performance.

E4.0 ALTERNATIVE EVALUATION RESULTS

The following presents the salient results of the evaluation:

- The total project cost for alternatives ranges from \$97 million (FMEF retrofit lower-bound) to \$175 million (new construction upper-bound), with Alternative 1

^{*}LMHC96WO-0006/CO-00-RPP-363, 2000, *Feasibility Study – Fuels and Materials Examination Facility Immobilized High-Level Waste Interim Storage*, External Letter (J. L. Ruud to K. C. Burgard, CH2M HILL Hanford Group, Inc.), July 5, Fluor Federal Services, Richland, Washington.

(FMEF Retrofit) being the most cost-effective and Alternative 2 (New Construction) being the most expensive in all cases (both upper- and lower-bound estimates).

Table ES-1 summarizes the upper-bound unit life-cycle cost for the alternatives. The CSB cost (Project W-464) and large-capacity new construction cost from the MYWP are provided for comparison.

Table ES-1. Summary of Unit Life-Cycle Cost for the Alternatives.

Evaluation criteria	CSB	Mod1	Alternative ^a	
			1 FMEF Retrofit ^b	2 New Construction ^b
Total project cost	103,740	365,082	97,874	175,481
Unit total project cost	118	138	100	179
Life-cycle cost ^c	89,945	202,496	59,274	101,704
Capacity	880	2,640	982	982
Unit life-cycle cost	102	77	60	104

^aAll costs are in thousands of dollars.

^bCost is based on the upper-bound estimate.

^cPresent value is indexed to October 1, 2000.

CSB = Canister Storage Building.

FMEF = Fuels and Materials Examination Facility.

Mod1 = Module 1 baseline from multi-year work plan.

- Neither alternative's implementation schedule poses significant risk to the ability of the IHLW Interim Storage Program to support the overall RPP schedule provided project activities (e.g., validation, design, construction) are initiated in a timely manner.
- Health, safety, and environmental risks associated with both alternatives are judged to be relatively low.
- Siting the Staging and Load-Out Facility adjacent to the FMEF could enhance operational efficiencies and modestly reduce its cost.
- Alternative 1 is a fixed-capacity option (982-canister maximum storage capacity). This represents a reasonable capacity for a Phase 2 that begins in 2018. If Phase 2 is initiated in 2012, however, the associated high IHLW canister production rate would quickly exhaust the FMEF storage capacity.
- Alternative 2 could be constructed with any desired capacity, but was fixed at 982 canisters to avoid biasing a comparison with the FMEF retrofit. The 982-canister capacity is sensible for the 4X Phase 2 scenario, but would be economically inefficient for other Phase 2 scenarios. The primary risk is that the capacity baselined into design and construction may not be optimum once the facility is required for service (i.e., may represent either an under capacity or over capacity).

E5.0 DECISION PROCESS CONCLUSIONS

The key item of interest to the decision board during deliberation of each alternative's relative merit was the influence various programmatic parameters and assumptions exert on the practicality of a modest-capacity (982-canister) second-generation interim storage facility. These parameters are Phase 2 start date, Phase 2 production rate, and early shipping. The decision board also inquired whether proceeding with the FMEF retrofit was economically practical if a large-capacity (2,640-canister) third-generation interim storage facility would be required relatively soon after the FMEF commenced hot operations.

The timing and production rate associated with Phase 2 essentially defines the duration over which a second-generation interim storage facility of a given capacity will accommodate IHLW production. Under some IHLW production scenarios, the available capacity of a 982-canister facility (i.e., FMEF retrofit or modest-capacity new construction) would be depleted in approximately one year. Even under the best-case scenario, a 982-canister facility only could accommodate about three years of IHLW production. Therefore, the most important aspect in selecting a preferred architecture is the actual IHLW production profile that will be in effect when the second-generation interim storage facility is commissioned. Figure ES-1 illustrates this facet.

Figure ES-1. Immobilized High-Level Waste Production Profile.

The IHLW production profiles depicted are referred to as Early Phase 2, Late Phase 2, and 4X Phase 2. Early Phase 2 refers to the case where Phase 1 commences in 2009 with a 120 canister per year production rate and Phase 2 begins in 2012 with a 750 canister per year production rate. Late Phase 2 refers to the case where Phase 1 continues until 2018 at which time Phase 2 commences with a 1,128 canister per year production rate. The 4X Phase 2 is similar to Late Phase 2, but the Phase 2 production rate is limited to 480 canisters per year. Phase 2 duration in this latter case would extend into 2043, rather than being completed in 2028 as with the other cases.

Also included in the IHLW production profiles are the affects of offsite shipping on the interim storage inventory. Late Ship refers to the baseline planning where offsite shipment of IHLW to the repository is to begin sometime in the 2023 to 2030 time frame. An alternate offsite shipping scenario under discussion is where limited quantities of IHLW (about 30 canisters per year) could be shipped beginning in 2010 with the quantities substantially increasing after 2014. This latter scenario is referred to as Early Ship.

The uncertainty in the specific IHLW production profile that must be accommodated by the second-generation interim storage facility is expected to be partially alleviated once the U.S. Department of Energy, Office of River Protection (ORP) selects the River Protection Project – Waste Treatment Plant (RPP-WTP) contractor and concludes contract negotiation. The new contractor then will have an opportunity to evaluate the technical, cost, and schedule baseline and propose modifications. This process will not be finalized until mid-2001 under current planning for contractor acquisition. Formulating a decision on a second-generation architecture before this process is completed may not be prudent.

To fully eliminate uncertainty in the production profile, a firm commitment would be required on early shipping by the U.S. Department of Energy, Office of Civilian Radioactive Waste Management. Such a commitment is not anticipated within the next few years. A second-generation interim storage facility architecture will most likely have to be selected and initiated long before an early shipping decision is established.

To address the decision board's second query, expenditure profiles covering project definition (i.e., conceptual design and validation) and implementation (i.e., design, procurement, construction, and startup) were developed for several cases. The first case (termed FMEF/Mod* staggered) is where implementing activities associated with the FMEF retrofit and a large-capacity third-generation interim storage facility are staggered such that there is no overlap of the individual project's procurement/construction efforts (i.e., FMEF retrofit construction has terminated before third-generation facility procurement is initiated). The second case (termed FMEF/Mod* parallel) is similar to the first case except each individual project is implemented in an essentially parallel manner. The final case (termed Mod1 standalone) is where a single, large-capacity (2,640-canister) facility is constructed for the second-generation interim storage mission. This latter case is identical to that reflected in the MYWP. To avoid biasing the comparison, the combined capacity of the FMEF retrofit and third-generation facility was set equivalent to a single large-capacity facility (i.e., each option represents storage capacity for 2,640 canisters). The resultant summary costs and expenditure profiles are presented in Table ES-2 and Figure ES-2, respectively.

Table ES-2. Summary Costs for Large-Capacity Options.

Evaluation criteria	Implementation case ^a		
	FMEF/Mod* staggered	FMEF/Mod* parallel	Mod1 standalone
Total capacity	2,640	2,640	2,640
TPC	375,007	375,007	365,082
Unit TPC (cost per canister)	142	142	138
Present-value TPC ^b	222,336	244,296	235,162
Present-value unit TPC ^b	84	93	89

^aAll costs are in thousands of dollars.^bPresent value is indexed to the start of conceptual design.

FMEF = Fuels and Materials Examination Facility.

Mod* = 1,658-canister capacity new construction.

Mod1 = 2,640-canister capacity new construction.

TPC = total project cost.

Figure ES-2. Expenditure Profiles for Large-Capacity Options.

Several observations can be drawn from the preceding information. The FMEF/Mod* combination is more expensive than a single facility of equal capacity (Mod1 standalone) by about \$10 million. Moreover, implementing the FMEF/Mod* combination in a parallel manner results in a higher peak expenditure in 2006 and 2007 than a standalone Mod1. The relative magnitude of these differences in 2006 and 2007 are about \$15 million and \$3 million, respectively. The FMEF/Mod* staggered combination pushes the peak expenditure out to 2009.

Given that the FMEF construction cost is relatively modest (about 25 percent of capital cost), Mod* procurement could be initiated immediately after FMEF procurement has been completed. This also allows the Mod* project to be initiated and completed one year earlier than the case where Mod* procurement is tied to completion of FMEF construction. The funding profile, as depicted in Figure ES-3, is also comparatively level.

Figure ES-3. Alternate Funding Profile for Large-Capacity Options.

After considerable deliberation, as summarized earlier, the decision board formulated the following conclusions:

- The FMEF retrofit alternative is more cost-effective than new construction of a similar-capacity interim storage facility.
- Although slightly more expensive, implementation of the FMEF retrofit and large-capacity new facility in a closely coupled time frame is competitive with implementing a single new facility of equivalent capacity. In particular, a close-coupled

implementation can yield a more level funding profile if activities are appropriately sequenced.

- The process of acquiring an RPP-WTP contractor creates a reasonable probability for baseline modifications that would influence the selection of the second-generation interim storage facility implementing architecture. Given that contractor acquisition impacts should be clarified at least a year before implementation of the second-generation architecture must be initiated, a decision on preferred second-generation architecture is not prudent at this time.

E6.0 RECOMMENDED DECISION

Based on the preceding discussions, the decision board recommended the following path forward as the most success-oriented and cost-effective approach:

- A decision on the second-generation interim storage facility architecture, particularly with respect to FMEF use, should be deferred until after the new RPP-WTP contractor has been selected and concluded its evaluation of the technical, cost, and schedule baseline.
- To avoid unnecessary perturbations to the IHLW Interim Storage Program, baseline planning should retain new construction of a large-capacity interim storage facility as depicted in the MYWP.

The rationale for recommending this path forward is that deferring a decision on FMEF retrofit use would allow completion of the rebaselining process inherent to acquiring an RPP-WTP contractor. Evaluations completed in support of this decision process indicate that a decision can be deferred for about two years without compromising the ability to attain a 2014 hot commissioning of the second-generation interim storage facility. Furthermore, deferring a decision avoids modification to the IHLW Interim Storage Program baseline (i.e., MYWP) that ultimately could be premature.

E7.0 DECISION CLASS

A decision to change the baseline to reflect FMEF retrofit in lieu of new facility construction is a Level 2 decision requiring a Level 1 manager as the decision maker (HNF-IP-0842, *River Protection Project Administration*, Section 2.7, "Decision Management"*). A Level 2 decision

*HNF-IP-0842, 2000, *River Protection Project Administration*, Lockheed Martin Hanford Corporation, Richland, Washington.

assignment is warranted if the baseline change requires a Class 1 baseline change request (HNF-IP-0842, Volume VIII, "Program Administration;" Section 1.1, "Baseline Change Control") or has an impact at work breakdown structure (WBS) Level 4. Addition of FMEF retrofit into the MYWP requires a Class 1 change request (impact >\$3 million; cost reduction or increase) and creates a new WBS Level 6 activity. Currently, the CSB and new construction facilities are at WBS Level 6.

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LIST OF TERMS

AGA	Alternative Generation and Analysis
CSB	Canister Storage Building
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
FMEF	Fuels and Materials Examination Facility
HEPA	high-efficiency particulate air
IHLW	immobilized high-level waste
MYWP	multi-year work plan
NEPA	<i>National Environmental Policy Act of 1969</i>
ORP	Office of River Protection
RFP	request for proposal
RPP	River Protection Project
RPP-WTP	River Protection Project – Waste Treatment Plant
TPC	total project cost
WVDP	West Valley Demonstration Project

**IMMOBILIZED HIGH-LEVEL WASTE INTERIM STORAGE
ALTERNATIVE GENERATION AND ANALYSIS, AND DECISION REPORT –
SECOND-GENERATION IMPLEMENTING ARCHITECTURE**

1.0 INTRODUCTION

Selection of the initial immobilized high-level waste (IHLW) interim storage architecture to support the River Protection Project (RPP) Phase 1 was based on a thorough decision process (HNF-3899, *Immobilized High-Level Waste Interim Storage Alternative Generation and Analysis and Decision Report*). The results of this decision process are reflected in the RPP multi-year work plan (MYWP). The Canister Storage Building (CSB) will provide initial IHLW interim storage capacity. Because the CSB cannot accommodate the entire Phase 1 IHLW production, the MYWP includes construction of a new interim storage facility as the second-generation implementing architecture. The MYWP also depicts construction of additional interim storage modules in a time-phased manner to support the overall Phase 2.

During the decision process that selected the CSB, Fuels and Materials Examination Facility (FMEF) retrofit was identified as a potentially cost-effective alternative for acquiring additional Phase 1 IHLW interim storage capacity. The FMEF retrofit was not adopted because the decision board judged the programmatic risk associated with this alternative to be unacceptable. The high programmatic risk was primarily a consequence of the FMEF interim storage concept development being relatively immature.

Since the decision process, the FMEF retrofit alternative has undergone further technical evaluation and scope definition (LMHC96WO-0006/CO-00-RPP-363, *Feasibility Study – Fuels and Materials Examination Facility Immobilized High-Level Waste Interim Storage*). The FMEF retrofit alternative is now sufficiently developed that a decision can be rendered relative to its merits versus the MYWP baseline (i.e., new construction). Upon completion of an alternate architecture evaluation, a decision board was convened to select the preferred architecture.

Although the alternate architecture evaluations were sufficiently developed to allow a decision, the decision process revealed that several programmatic parameters exert a strong influence on selection of the preferred second-generation implementing architecture. These parameters are the Phase 1 and Phase 2 IHLW production profiles and the Phase 2 start date. The decision board consensus was that substantial uncertainty exists relative to the specific values that constitute the baseline for these parameters. The decision board concluded that the most prudent path forward was deferral of a decision until the parameters are more firmly established.

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2.0 OBJECTIVE AND SCOPE

The purpose of this effort is to evaluate alternatives for Phase 1 IHLW interim storage once the CSB is filled to capacity. Furthermore, this effort summarizes the decision-process results (i.e., decision methodology and decision board deliberations and conclusions). Excluded from the scope are the interim storage facilities that may be needed to accommodate the bulk of Phase 2 production (i.e., beyond second-generation interim storage).

To maintain a cost-effective approach, this effort builds on architectural and programmatic evaluations associated with prior Alternative Generation and Analyses (AGA) (WHC-SD-WM-SP-011, *Solidified High-Level Waste Interim Storage Alternative Analysis and Path Forward Recommendation* and HNF-3899). The primary focus is to determine whether the FMEF retrofit, after undergoing additional technical development, has sufficient positive attributes to supplant new construction in the MYWP baseline. In a previous AGA, the FMEF retrofit alternative appeared to embody a positive cost attribute, but the concept was judged to be technically immature and, therefore, programmatically risky.

The FMEF retrofit evaluation and subsequent decision process was performed in two phases. The first phase was a thorough engineering evaluation of the FMEF retrofit to fully develop its technical scope and cost. The results of this effort are documented elsewhere (LMHC96WO-0006/CO-00-RPP-363). The second phase compared the FMEF retrofit alternative to new construction with respect to established evaluation criteria (i.e., technical scope, implementation schedule, and cost). When the evaluation criteria did not represent a discriminatory factor between alternatives, significant resources were not expended to quantify an alternative's attributes relative to the criteria. The evaluation in these cases was limited to a qualitative judgment.

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3.0 ALTERNATE ARCHITECTURE FUNCTIONAL CRITERIA

The IHLW Interim Storage System's functions, performance requirements, and constraints are documented in a Level 1 specification (RPP-6222, *System Specification for Immobilized High-Level Waste Interim Storage*). Of these criteria, only a limited number are germane to development of acceptable IHLW interim storage concepts (i.e., the degree of specificity is well beyond that which would be relevant to an evaluation at a concept level). The following sections present essential programmatic and technical criteria that are pertinent to concept development. Non-relevant programmatic and technical criteria are not listed.

Functions, performance requirements, constraints, and assumptions are used to formulate alternate concepts. A postulated concept, to be acceptable, must adhere to these bounding parameters. Evaluation criteria are then used to assess the degree to which a concept provides for IHLW interim storage in an optimum manner relative to a competing alternative.

3.1 FUNCTIONS

Functions allocated to the IHLW interim storage system include the following: transport IHLW from the River Protection Project – Waste Treatment Plant (RPP-WTP) to an interim storage facility, isolate IHLW for an extended period in a controlled environment (i.e., safely store IHLW in an interim storage facility), retrieve IHLW from storage and stage for offsite transportation, and load IHLW into an offsite transportation cask. An additional main function is general support of facilities and operations associated with the IHLW interim storage system.

The second-generation interim storage alternatives need not directly address inter-area transportation (i.e., conveyance from the production facility to the storage facility) or staging and load-out for offsite shipping. Project W-464 (CSB retrofit) will provide the onsite transportation system. Staging and load-out is being deferred until the timing and requirements of offsite shipment are better defined. However, these functions are ancillary factors that may influence the alternative's perceived attractiveness.

3.2 PERFORMANCE REQUIREMENTS

Performance requirements are internally derived criteria. If sufficient justification is developed (e.g., program cost minimization, schedule improvement), these criteria can be modified. The following identify key performance requirements:

- Storage capacity: The IHLW interim storage function (Phase 1 and Phase 2) must be capable of providing interim storage for about 12,600 canisters. The maximum Phase 1 IHLW production is 1,120 canisters of which the CSB can accommodate 880 canisters.
- Maintenance, operations, and design philosophy: The interim storage facility shall be designed to minimize monitoring and maintenance.

- Storage availability: The interim storage facility shall support the scheduled operation of the RPP.
- Canister rework: If primary containment (i.e., stainless steel canister shell) is breached during interim storage, the IHLW canister shall be overpacked. An overpacked IHLW canister may violate the repository waste acceptance specification for external dimension and, as such, the overpacked canister shall be addressed under the non-standard waste form clause (DOE/RW-0351P, *Waste Acceptance System Requirements Document [WASRD]*). Included in canister rework are closure of the overpack, verification of overpack closure, testing of the overpack's external surfaces to ensure that removal contamination is within prescribed limits, and overpack decontamination if needed.

3.3 CONSTRAINTS

Constraints are externally imposed criteria and are fully documented in the Level 1 specification (RPP-6222). In limited instances, modification to or waiver from constraints might be possible, but such an occurrence requires negotiation with external agencies. Regardless of justification, institutional impediments could prevent implementation of an otherwise attractive idea. Therefore, this activity does not assume relaxation of any constraints in concept development and evaluation.

3.4 ASSUMPTIONS

The following assumptions are embodied in the development of alternate architectures:

- The receipt of IHLW for interim storage during Phase 1 begins in April 2009 and is completed in February 2018.
- The Phase 1 production rate is 120 canisters per year.
- The second-generation IHLW interim storage facility must be available for service by 2014.
- At least four months are required for conceptual design preparation and the conceptual design must be available for an April validation submittal. The period between the April validation submittal and authorization of line item funds is at least 18 months.
- *National Environmental Policy Act of 1969* (NEPA) documentation must be prepared for any second-generation alternative. An environmental impact statement represents the most constrictive form of NEPA documentation because it must be initiated approximately 36 months before the start of construction.
- Canister rework capabilities will be provided by the CSB and need not be included in the second-generation interim storage facility.

- The onsite transportation system provided by Project W-464 will be suitable for IHLW conveyance to the second-generation interim storage facility.

Although these assumptions represent a reasonable basis upon which to assess an architecture for second-generation interim storage, the second-generation facility need date is based on ambiguous programmatic parameters. In particular, conflicting bases exist for the Phase 2 start date and production rate.

The U.S. Department of Energy, Office of River Protection (ORP) planning guidance specifies a Phase 2 duration from 2012 to 2028. This duration translates into a Phase 2 production rate of about 750 canisters per year. However, the MYWP depicts Phase 1 extending until 2018. Assuming that Phase 2 is not initiated until Phase 1 is completed, a 1,200-canister per year Phase 2 production rate would be required to complete Phase 2 in 2028. The RPP-WTP request for proposal (RFP) (*Waste Treatment and Immobilization Plant Solicitation No. DE-RP27-00RV14136*) represents a third possible case. The RFP also presents Phase 1 extending to 2018, but implies a maximum Phase 2 production rate of 480 canisters per year. The RFP requires that the RPP-WTP contain the flexibility to expand production from two to four times the required minimum average Phase 1 production rate of 120 canisters per year. Section 7.0 discusses the influence of these conflicting programmatic parameters on the decision process.

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4.0 EVALUATION CRITERIA

The previous AGA used a multi-attribute decision analysis (modified Kepner-Trego) to evaluate the various alternate architectures. A multi-attribute decision analysis allows a simultaneous evaluation of proposed alternatives against several major programmatic and technical objectives. The purpose is to establish a ranking among alternatives from most to least desirable.

Multi-attribute decision analysis evaluation criteria used in the previous AGA were life-cycle cost; schedule risk; health, safety, and environmental risks; stakeholder confidence; and technical performance. Criteria definitions, as used in this evaluation, are summarized as follows:

- Unit life-cycle cost: The overall program cost associated with an alternative carries considerable weight in a decision process. Life-cycle cost encompasses design, construction, operation, and decontamination and decommissioning (D&D) of a facility for IHLW interim storage. Because alternatives may entail different storage capacities, the life-cycle cost is normalized on a unit cost basis. Alternate concepts with low unit life-cycle costs are rated favorably relative to this evaluation criterion.
- Schedule risk: While all viable alternate concepts must support the program schedule, some concepts entail less schedule risk. Many factors can induce schedule risk, but it is principally caused by a complicated technical scope and/or implementation approach. Alternatives that reflect simple design concepts and unambiguous implementation efforts are considered "low risk."
- Health, safety, and environmental risks: All alternatives must furnish a fundamental degree of public, worker, and environment protection. However, some alternatives may inherently provide a greater degree of protection or risk reduction. For example, an alternative may embody facility siting that is close to public access zones. Even if the dose consequences from an accident are within established guidelines, a more remote facility siting would be preferable. Alternate concepts that exhibit a low potential to inflict occupational and public hazards, and environmental impacts are viewed auspiciously.
- Stakeholder confidence: The confidence of stakeholders in the safety and potential success of an alternative should be considered in the decision process. Confidence is increased by the inclusion of stakeholder values, as determined from efforts such as the Future Site Uses Working Group and Tank Waste Task Force (*The Future of Hanford: Uses and Cleanup--The Final Report of the Future Site Uses Working Group* and the *Final Report: Hanford Tank Waste Task Force*). This is primarily a desire to locate the IHLW interim storage facility in the Hanford Site 200 East Area. Alternate concepts that reflect these stakeholder values are, therefore, rated high relative to this criterion.
- Technical performance: An alternative's technical risk should be considered in the decision process. Factors influencing technical risk include a concept's complexity and maturity, operability and maintainability aspects, etc. For this evaluation, the fundamental issue of new construction versus existing facility retrofit also should be

considered. Remodeling/refurbishing efforts are susceptible to scope creep (i.e., discovery during construction of an additional item that must be upgraded or repaired). Alternate concepts that exhibit reduced technical risk are rated favorably relative to this criterion.

5.0 ALTERNATE ARCHITECTURES

The following summarizes the salient features of alternatives presented to the decision board. This information includes a concept description, implementation schedule (e.g., project definition, validation, design, construction, and permitting), and cost estimate (capital and life-cycle). Also discussed are any ancillary factors that could potentially influence an alternative's implementation, such as the Staging and Load-Out Facility siting. Specific alternatives included in the evaluation are as follows:

- Alternative 1 – FMEF
- Alternative 2 – New Construction.

5.1 ALTERNATIVE DESCRIPTION

The following provides a conceptual specification for the alternatives. All alternatives are based on a remote operation and contact maintenance approach for the activities related to removing an IHLW canister from the onsite transportation cask and its emplacement into interim storage.

5.1.1 Alternative 1 (Fuels and Materials Examination Facility Retrofit)

The FMEF was designed in the late 1970's and constructed in the early 1980's. Its original mission was to support nondestructive and destructive examination of liquid-metal, fast breeder reactor fuel. However, once constructed, the FMEF was never commissioned. Over the ensuing years, numerous new missions for the FMEF have been proposed and continue to be postulated. However, it remains an idle, surplus facility.

The existing FMEF is a hot-cell structure that is one of the most modern facilities on the Hanford Site. The FMEF design reflected the highest safety standards in effect during its development. The facility was constructed and inspected to the highest quality level. Review of pertinent documentation indicates that the design and construction comply with DOE Order 6430.1A, *General Design Criteria*. The FMEF has not been contaminated and a cursory evaluation indicated that it has the space to accommodate a large number of IHLW canisters (HNF-3899). Therefore, the FMEF is an excellent candidate for an IHLW interim storage mission.

Many functional aspects of the original FMEF mission are consistent with the functions necessary to effect an IHLW interim storage mission. The FMEF was designed to accept a shielded transportation cask containing irradiated nuclear fuel and to extract the fuel from the cask into a hot cell environment. The hot cells, being remotely operated and potentially contaminated areas, include provisions for decontamination and repair of contaminated equipment. To address contamination confinement and control, the FMEF features an extensive ventilation system with high-efficiency particulate air (HEPA) filtration of the discharge.

The FMEF, as retrofit for an IHLW interim storage mission, is depicted in Figures 5-1 and 5-2. The IHLW canisters are stored in racks located in the storage cell, formerly known as the nondestructive examination cell. The rack system is similar to that used at the West Valley Demonstration Project (WVDP) in West Valley, New York (DOE/NE/44138-85, *High-Level Waste Canister Storage, Final Design, Installation, and Testing*). To effect this option, the following paragraphs describe the general concept for an FMEF retrofit.

Concept Description – Receipt of the onsite transportation system entails transport to the FMEF via existing roadways. Roadways are in place to effect the conveyance between the 200 East Area, site of the RPP-WTP, and the 400 Area, site of the FMEF. The onsite transportation system (tractor/trailer) is inspected and surveyed upon arrival at the FMEF. After the transportation system is secured in the shipping and receiving area, the shield cask is unloaded using a 70-ton crane and taken to the cask unloading station where the cask is prepared for IHLW canister removal. Release of the onsite transportation system (containing an empty shield cask) is essentially the reverse of the receipt process.

The cask unloading station consists of the existing FMEF Hatch #5 into which a removable stand is placed to support the onsite transportation cask. Integrated into the cask unloading station is the receiving hatch shield gate. The onsite transportation cask is lowered into the cask unloading station by the 70-ton crane. The cask lid is removed after a cask lid flask is positioned over the cask unloading station. The receiving hatch shield gate is closed and a rolling transfer cask replaces the cask lid flask. The IHLW canister is extracted from the onsite transportation cask into the rolling transfer cask. The rolling transfer cask is then positioned over the entry tunnel hatch and the canister is transferred to the entry tunnel canister transfer machine that is located in the entry tunnel. The rolling transfer cask remains in place to provide shielding until IHLW canister removal from the entry tunnel is complete.

After the IHLW canister is placed in the entry tunnel canister transfer machine, the entry tunnel canister transfer machine is positioned under a penetration that goes into the decon cell. The penetration is clear for transfer after a shield plug is removed by the decon cell transfer crane, located in the decon cell. The decon cell transfer crane then extracts the IHLW canister from the entry tunnel canister transfer machine into the decon cell. The decon cell transfer crane, with the IHLW canister, traverses the decon cell to a penetration located above the canister transfer cell. The decon cell transfer crane lowers the IHLW canister through the penetration and into the storage cell canister transfer machine.

The storage cell canister transfer machine moves the IHLW canister from a position beneath the decon cell to a position beneath the storage cell. The storage cell transfer crane extracts the canister through a penetration in the canister transfer cell ceiling and places the canister into a storage rack. Retrieval of an IHLW canister from the storage cell to the receiving area is the reverse of the steps described above.

Figure 5-1. Fuels and Materials Examination Facility Retrofit (Plan View).

Figure 5-2. Fuels and Materials Examination Facility Retrofit (Section View).

The concept for IHLW canister storage within the storage cell is based on a proven approach implemented at the WVDP. The WVDP provides for IHLW canister storage in an open-bay, hot-cell structure that is conceptually identical to the FMEF storage cell. The WVDP hot-cell retrofit had to be effected remotely. High radiation levels prevented personnel entry into the WVDP storage cell. Installation of similar features in the FMEF should be considerably easier given that personnel access is possible during installation of storage cell modifications.

The storage system is a series of interlocking racks that are two-tiered. Movement within the storage cell and emplacement of an IHLW canister into the storage rack is effected with the storage cell transfer crane.

The existing FMEF provides essentially all the features required to support facility operations and personnel (e.g., repair shops, offices, change rooms, health physics areas). Ample excess facility floor space is available should additional capabilities be identified.

With the exception of the storage cell, removal of all radioactive sources (i.e., IHLW canisters) from FMEF hot cells is conceptually possible. Therefore, maintenance activities in these areas can be based on personnel access. However, once the first IHLW canister is introduced into the storage cell, personnel access is not possible for the duration of the storage mission. To provide for storage cell transfer crane maintenance, a shielded and isolated crane maintenance area is created in the east portion of the storage cell.

Civil/Structural – To use the FMEF for IHLW interim storage, structural modifications to some cells are required. Load-bearing walls are installed underneath the storage cell to strengthen the cell floor. For viewing purposes, two shield windows are installed in the storage cell and the decon cell. The remaining multiple shield window penetrations in the cells (23 in the storage cell and 3 in the decon cell) are sealed with monolithic concrete, which is poured in place.

The transfer of IHLW canisters from the decon cell to the storage cell is effected via the canister transfer tunnel. This tunnel is created by demolition of a short wall separating two existing cells.

A 30 cm thick steel shielding wall is installed in the storage cell. The wall is supported from storage cell shear walls spanning the east-west direction. The purpose of this shielding wall is to protect personnel servicing the storage cell transfer crane from radiation emitted by canisters in storage. The shielding wall has a shield door to allow the storage cell transfer crane to pass through. Closing the shield door completely isolates the crane maintenance area from the storage cell, thereby providing protection for maintenance personnel to service the equipment. Maintenance platforms are provided in the crane maintenance area to facilitate equipment access. In addition, a new opening (3 by 3 m) with a shielded cover is installed in the crane maintenance area ceiling to allow personnel and equipment access.

A storage rack system is installed on the storage cell floor to contain IHLW canisters. The storage rack system is similar to the WVDP concept, but is modified to accommodate the taller 4.5 m canister. Because the storage cell is free from contamination, the rack system does not have to be assembled remotely. Consequently, the rack system is not modular and consists of welded-in-place truss panels. This design maximizes the number of canisters stored in the storage cell. The cell floor slab and cell walls support the rack system. The walls provide lateral

stability during a seismic event. A removable stand also is installed in the existing Hatch #5 of the shipping and receiving area to support the onsite shield cask unloading state.

Ventilation System – The FMEF-occupied rooms and cells require ventilation for zone pressure control and human comfort during the IHLW interim storage mission. Activation of the existing main process facility ventilation system provides for supply of air to and exhaust of air from occupied spaces. Individual air-handling units and HEPA filter systems, such as the system serving the decon cell, are either refurbished or replaced with new equipment.

The storage cell is furnished with a new ventilation system that is designed to recirculate air through the cell. The system provides for canister cooling and maintains a negative cell pressure. The ventilation and cooling equipment consists of redundant centrifugal fans, redundant HEPA filter modules with cooling coils, redundant cooling towers, and a pumped liquid circuit connecting the cooling coils and cooling towers.

Mechanical – Various mechanisms are installed to effect IHLW canister movement within the FMEF. A crane is installed in both the storage cell and the decon cell. These cranes are a top-running, double-girder type with the main hoist rated at 10 tons (single-failure-proof) and an auxiliary hoist rated at 2 tons. Attached to the main hoist of each crane is a mechanically-actuated canister grapple similar to that used at the WVDP.

Although the shipping and receiving area has an installed 75-ton crane, this crane does not possess single-failure-proof features and does not meet the latest design standards. Although it may be possible to upgrade the existing crane, the cost estimate reflects the purchase of a new, certified 70-ton crane. At this stage of design development, there is a higher confidence in cost data for a new crane than in a cost estimate for upgrading an existing crane.

Installed in the entry tunnel and the canister transfer tunnel is a bogie-type carriage with a canister support tube. The trolley and carrier are rated at 6 tons. The electrical feed is a reel-type with a cable drawback system to position the trolley if a failure occurs. These mechanisms are furnished with ancillary features, such as proximity switch locators and seismic restraint rail clamps, as necessary.

Electrical – The existing 13.8 kV, 480/277 V normal power distribution system and electrical equipment at the FMEF are more than adequate to provide the required power for the IHLW storage mission. The existing normal power electrical distribution system provides 480 V, 3-phase, 60-Hz electrical power for all storage cooling/ventilation systems, cranes, and miscellaneous items. Power is rerouted to centrally locate electrical equipment stations for the cooling system motor control, crane power disconnecting means, and any support items.

Use of the existing backup power system to support the IHLW storage mission is not practical. To ensure continuous operation of the cooling/ventilation system, a backup diesel-generator system is provided. The diesel generator unit is self-contained in an outdoor enclosure. Fuel storage capacity of the unit is sufficient to allow for 24-hour operation without having to refuel. The generator is sized to handle the cooling/ventilation system electrical starting load in one step.

5.1.2 Alternative 2 (New Construction)

The new construction alternative could be based on any one of three general technologies. These technologies are the spent nuclear fuel-type facility (sealed-tube, natural convection system), the Savannah River Site-type facility (open-tube, forced-air ventilation system), and the West Valley Site-type facility (open-bay, hot-cell, forced-air ventilation system). A previous AGA extensively evaluated the relative merits and disadvantages of these general technologies and their influence on life-cycle cost (HNF-3899). The West Valley Site-type facility appeared to reflect the most cost-effective technology, but all three technologies were similar in overall cost. For a 1,200-canister storage capacity, the unit life-cycle cost ranged from \$152,000 to \$208,000 per canister. For comparison, the CSB retrofit unit life-cycle cost for an 880-canister capacity was \$126,000 per canister. Although capital cost increases as capacity increases, unit life-cycle cost always decreases as capacity increases. Given these considerations, the new construction concept is based on a West Valley Site-type.

While the new construction storage capacity could be specified such that it would accommodate the entire life-cycle (Phase 1 and Phase 2) quantity of IHLW canisters, this would require an extremely large initial capital expenditure. A previous AGA determined that a storage module with a capacity of about 3,000 IHLW canisters provides the optimum balance between minimizing capital expenditure while accommodating a reasonable production period (WHC-SD-WM-SP-011). However, the FMEF retrofit storage capacity is limited to about 982 IHLW canisters. To avoid biasing the evaluation, the new construction alternative capacity also was fixed at 982 IHLW canisters.

As depicted in Figures 5-3 and 5-4, this option entails new construction of an IHLW interim storage facility that is similar in concept to that in operation at the WVDP. This option is based on a open-bay, hot-cell approach for IHLW canister storage. The IHLW canisters are emplaced in a rack assembly. Cell cooling is via forced-air convection. The cell structure and ventilation system provide safety class confinement. The following paragraphs describe the major technical attributes of this alternative.

Concept Description – Receipt of the onsite transportation system entails conveyance to the storage facility via existing roadways. The presumed siting of the new facility is in the 200 East Area, site of the RPP-WTP. The onsite transportation system is inspected and surveyed in the truck bay upon arrival at the storage facility. The onsite transportation trailer is then positioned in the load-in/load-out cell with the shield cask centered beneath a closed ceiling portal. After the transportation system trailer is de-coupled from the tractor and secured in the load-in/load-out cell, the cell shield doors are closed.

Figure 5-3. New Construction Facility (Plan View).

Figure 5-4. New Construction Facility (Section View).

Once the load-in/load-out cell is evacuated and isolated, a shield plug in the ceiling portal is removed by the storage cell crane, thereby creating an open penetration between the two cells. The storage cell crane lowers a remotely-operated cask lid-unbolting machine to engage the cask lid. Following the unbolting operation, the cask lid unbolting machine is withdrawn and the storage cell crane removes the cask lid. The storage cell crane then extracts the canister into the storage cell using a mechanically-actuated grapple.

The storage cell crane traverses the storage cell to an appropriate location in the storage racks and emplaces the canister into storage. The storage system is a series of interlocking racks that are identical in concept to that presented for the FMEF retrofit alternative. After releasing the canister, the storage cell crane returns to the transfer portal, returns the cask lid to the cask, and replaces the shield plug.

Maintenance in the load-in/load-out cell is undertaken during periods when the cell is operating in personnel-access mode (i.e., shield plug is in the transfer portal). Maintenance of the storage cell crane is performed in a crane maintenance area. Following closure of the crane maintenance shield door, the crane maintenance area is fully isolated from the storage cell, thereby allowing access by maintenance personnel.

Civil/Structural – The main structural features include a hot-cell structure (heavily shielded, reinforced concrete), a ventilation intake wing and exhaust wing, a truck bay, and an operations support building. The hot-cell structure encompasses three main areas: the crane maintenance area, the load-in/load-out cell, and the storage cell. The structure is constructed of 1.5 m thick (minimum) reinforced concrete for shielding. The overall footprint is about 970 m². A rack system is provided for storage of 982 canisters.

The storage cell internal dimensions are 28.0 m long by 13.4 m wide by 19.8 m high. A loft area adjacent to the storage cell and above the load-in/load-out cell is 7.3 m long by 13.4 m wide by 8.5 m high. This area has a shield plug in its floor that allows IHLW canisters to be extracted from the load-in/load-out cell, via the crane, into the storage cell. At the far end of the storage cell is the crane maintenance area with dimensions of 4.5 m long by 15.4 m wide by 3.5 m high. The crane maintenance area is separated from the storage cell by a 0.3 m thick steel shield door, thereby allowing personnel entry for contact maintenance. The load-in/load-out cell internal dimensions are 10.4 m long by 29.0 m wide by 7.4 m high.

The truck bay is a butler-type building on a 1 m thick concrete slab. The overall structural dimensions are 30.5 m long by 9.1 m wide by 13.7 m high. The truck bay serves as an air lock between the environment and the load-in/load-out cell. The truck bay and the load-in/load-out cell are separated by a 0.3 m thick steel shield door.

The ventilation intake wing and ventilation exhaust wing are butler-type buildings on 1 m thick concrete slabs. The ventilation intake wing overall structural dimensions are 29.5 m long by 6.0 m wide by 9.0 m high. The ventilation exhaust wing is 29.5 m long by 7.5 m wide by 9.0 m high. These structures serve to house the Safety Class 1 ventilation system that provides for canister cooling and storage cell confinement.

The operations support annex is a butler-type building on a 0.3-m thick concrete slab. The overall structural dimensions are 7.6 m long by 32 m wide by 12.2 m high. The building is two stories high. The bottom story houses the control room, change rooms, and health physics area. The second story houses the heating, ventilation, and air conditioning system that services occupied areas of the facility.

Ventilation System – The storage cell is provided with a once-through ventilation system for canister cooling and confinement control. The ventilation system is 100 percent redundant with one full-capacity train operating and a second full-capacity train in standby. The ventilation system capacity is 650 m³/min. Air is introduced into the storage cell via intake ports located along the base of the shield wall and exits via ports in the upper portion of the opposite shield wall. Before introduction, the air is conditioned through a bank of roughing filters to remove particulate matter. The cell exhaust is filtered through two stages of HEPA filtration before discharge.

A second ventilation system is provided for occupied areas of the facility. This system is located on the second floor of the operations support annex. The system consists of three parallel trains of single-stage HEPA filters and blowers (two operating and one standby). Intake air is conditioned through pre-filters and heating/cooling units. Each HEPA filter/blower train is rated at 284 m³/min. Because a large fraction of the ventilation air is recirculated, the intake and exhaust portions of the system have a rated capacity of about 140 m³/min.

Mechanical – The storage cell crane is a top-running, double-girder type with the main hoist rated at 10 tons (single-failure-proof) and an auxiliary hoist rated at 2 tons. Attached to the main hoist of each crane is a mechanically-actuated canister grapple similar to that used at the WVDP. The crane is fully remote with a closed-circuit television and high-intensity lighting that is used for positioning.

Electrical – A normal power distribution system is provided to supply 480 V, 3-phase, 60-Hz electrical power for all storage cooling/ventilation system, cranes, and miscellaneous items. Power is routed to centrally locate electrical equipment stations for the cooling system motor control, crane power disconnecting means, and any support items.

To ensure continuous operation of the cooling/ventilation system, a backup diesel-generator system is provided. The diesel generator unit is self-contained in an outdoor enclosure. Fuel storage capacity of the unit is sufficient to allow for 24-hour operation without having to refuel. The generator is sized to handle the cooling/ventilation system electrical starting load in one step.

5.2 IMPLEMENTATION SCHEDULE

The implementation schedules for the various alternate architectures are provided in Figures 5-5 through 5-8. The figures present schedules that are based on an October 1, 2000, initiation of implementing activities. This date represents the earliest that programmatic activities

Figure 5-5. Alternative 1, Aggressive Implementation.

Figure 5-6. Alternative 1, Conservative Implementation.

Figure 5-7. Alternative 2, Aggressive Implementation.

Figure 5-8. Alternative 2, Conservative Implementation.

could be reprogrammed for a new approach. If the schedule depicts a hot operations start before 2014, the alternative's implementation is viable. Any lag between the depicted hot operations start and 2014 represents schedule float. Initiation of implementing activities could be deferred for the duration of the schedule float without jeopardizing the alternative's viability.

Figures 5-5 and 5-6 represent an aggressive and conservative implementation schedule, respectively, for the FMEF retrofit. The primary difference between these schedules is the sequencing and duration of design and construction, the sequencing of NEPA documentation, and minimum acceptable schedule float. For the conservative case, three months were added to the duration of detail design and construction and the overlap of these activities was shortened. Although NEPA documentation must be finalized before construction is initiated, the conservative case was predicated on this occurring before any capital dollars are expended (i.e., before initiation of preliminary design). Finally, the conservative case sets a minimum one-year float between when the FMEF is operationally ready and the commencement of hot operations.

Figures 5-7 and 5-8 represent an aggressive and conservative implementation schedule, respectively, for new construction. The primary difference between the FMEF retrofit and the new construction schedule is that the latter includes an additional 26 weeks for preliminary design, 13 weeks for detail design, and 39 weeks for construction. The increased duration of tasks is warranted because the scope of new construction activities is much greater than retrofit activities. The variation between the aggressive and conservative new construction schedules is essentially identical to those identified for the FMEF retrofit.

5.3 COST ESTIMATE

This section provides the estimated cost for the various alternatives. Included are direct cost, total project cost (TPC), and unit life-cycle cost.

5.3.1 Direct Cost

The estimated direct costs are based primarily on the cost for similar equipment, components, or structures as extracted from historical Hanford Site cost estimates (e.g., Project W-464, IHLW Interim Storage Facility; Project W-379, Spent Nuclear Fuel Interim Storage Facility; Project W-059, B Plant Ventilation Upgrade; and Project B-595, Hanford Waste Vitrification Plant). The historical cost estimates were parametrically adjusted to reflect the present cost of equipment, components, or structures described in Section 5.1. The resultant direct cost estimates are summarized in Table 5-1.

The upper-bound estimate for Alternative 1 is taken from a recent engineering evaluation (LMHC96WO-0006/CO-00-RPP-363). The lower-bound value for Alternative 1 assumes that various cost savings can be realized. For example, concept optimization may be able to eliminate the rolling transfer cask by inserting the onsite transportation cask directly into the entry tunnel. If this optimization item is achieved, the direct cost savings would be about \$3,500,000.

Table 5-1. Alternative Facility Direct Cost Summary.

Cost estimate	Alternative*	
	1 FMEF Retrofit	2 New Construction
Lower-bound	31,747	32,907
Upper-bound	36,663	72,836

*All costs are in thousands of dollars with no contingency or escalation.

FMEF = Fuels and Materials Examination Facility.

The lower-bound cost for Alternative 2 was extracted from a previous AGA (HNF-3899) and parametrically adjusted to reflect a 982-canister storage capacity. This AGA also indicated that, depending on the specific concept adopted, new construction cost could be upwards of 1.45 times greater than the estimated cost for the concept adopted herein (i.e., open-bay hot cell with forced-air ventilation). However, extrapolation of the cost estimate embodied in the MYWP for a large-capacity second-generation interim storage facility yields a higher estimate. Therefore, the extrapolated value for a 982-canister capacity interim storage facility is used as a rough basis for specifying an upper-bound value for Alternative 2.

5.3.2 Total Project Cost

Based on the direct cost estimates, the TPC was developed for each alternative. The upper-bound TPC for Alternative 1 was taken from the FMEF retrofit engineering report (LMHC96WO-0006/CO-00-RPP-363). A large fraction of the Alternative 1 cost information also was used as a basis for Alternative 2. For example, project integration and other project costs are common to both alternatives. Table 5-2 presents the TPC for the alternatives. The CSB retrofit TPC (Project W-464) is included for reference.

Table 5-2. Alternative Total Project Cost Summary.

Cost estimate	CSB retrofit	Alternative*	
		1 FMEF Retrofit	2 New Construction
Lower-bound	--	86,561	100,099
Upper-bound	103,740	97,874	175,481

*All costs are in thousands of dollars.

CSB = Canister Storage Building.

FMEF = Fuels and Materials Examination Facility.

For Alternative 2, engineering was assumed to be 25 percent of direct cost for the lower-bound case and 30 percent of direct cost for the upper-bound case. Escalation, contingency, and site allocation for Alternative 2 was approximately 31, 34, and 17 percent, respectively. These factors are equivalent to those reflected in the Alternative 1 cost estimate. Project integration and contingency were 7 and 10 percent, respectively. These factors are essentially equivalent to that embodied in the CSB retrofit (Project W-464) cost estimate. Other project costs were assumed identical to those reflected in the Alternative 1 cost estimate. Appendix A provides details of the factors used in the TPC estimates.

5.3.3 Life-Cycle Cost

To render a suitable basis for comparison of alternatives, life-cycle costs were generated for each alternative. The life-cycle costs were transformed to present value by discounting the various time-phased costs (regardless of type of appropriation or source of funds). This approach is consistent with that prescribed by the U.S. Department of Energy (DOE) for life-cycle asset management (GPG-FM-003, *Engineering Tradeoff Studies, Good Practice Guide* and GPG-FM-032A, *Life-Cycle Cost, Good Practice Guide*). These costs are based on a 7 percent annual discount rate. Present-value costs are indexed to fiscal year 2001. Table 5-3 summarizes the life-cycle costs for alternatives. The life-cycle cost for the CSB retrofit is included for reference.

Table 5-3. Present-Value Cost Summary.

Cost element	CSB retrofit	Alternative ^{a, b}	
		1 FMEF Retrofit	2 New Construction
Lower-bound			
Life-cycle cost	--	53,378	61,570
Capacity	--	982	982
Unit cost (\$/canister)	--	54	63
Upper-bound			
Life-cycle cost	89,945	59,274	101,704
Capacity	880	982	982
Unit cost (\$/canister)	102	60	104

^aAll costs are in thousands of dollars.

^bPresent value is indexed to the start of fiscal year 2001.

CSB = Canister Storage Building.

FMEF = Fuels and Materials Examination Facility.

The present-value life-cycle cost for alternatives is predicated on the CSB retrofit providing initial Phase 1 storage capacity for seven years. Therefore, the present value of alternatives is discounted over a longer period. Because future dollars are worth less, the initial implementing

architecture always will reflect a higher cost than the second-generation architecture unless the follow-on costs are substantially greater. To present the alternatives cost on an equal basis with the CSB retrofit, Table 5-4 presents life-cycle costs in constant dollars (i.e., no time-phased discounting).

Table 5-4. Constant-Dollar Cost Summary.

Cost element	CSB retrofit	Alternative*	
		1 FMEF Retrofit	2 New Construction
Lower-bound			
Life-cycle cost	--	137,369	159,907
Capacity	--	982	982
Unit cost (\$/canister)	--	140	163
Upper-bound			
Life-cycle cost	140,064	148,682	234,253
Capacity	880	982	982
Unit cost (\$/canister)	159	151	239

*All costs are in thousands of dollars.

CSB = Canister Storage Building.

FMEF = Fuels and Materials Examination Facility.

The life-cycle costs are based on an assumption that active receipt of IHLW canisters will occur over a three-year period. Once all the IHLW canisters have been emplaced in storage, the facility will require little more than surveillance and occasional maintenance. This passive storage period is assumed to last about 24 years. At the completion of passive storage, the interim storage facility is assumed to undergo a two-year D&D. Appendix B provides additional details on the methodology used to estimate life-cycle costs.

Implementing either alternative requires preparation of a conceptual design. This cost is assumed at a fixed \$1 million.

The Project W-464 conceptual design report (HNF-2298, *Conceptual Design Report for Immobilized High-Level Waste Interim Storage Facility [Phase 1]*) estimated an annual operation and maintenance cost of \$3,424,000. Regardless of the implementing architecture, operation and maintenance activities should be similar to this value for either alternative during the active receipt period. Therefore, the \$3,424,000 cost is assumed for all alternatives. In addition to this cost, an active ventilation system would have a higher electrical consumption than the CSB. The annual cost of this additional electricity is estimated at about \$37,000.

The historical operating and maintenance cost for FMEF during the period when it was kept in idle status was about \$1,200,000 per year. Because the FMEF has never contained radioactive material, its operations and maintenance did not have to address periodic HEPA filter

replacement or other radiation zone maintenance activities. Therefore, an additional \$100,000 annual cost is assumed to account for periodic blower maintenance, HEPA filter replacement, etc. Given the similarity of concepts, a \$1,300,000 operating and maintenance cost during passive storage is a reasonable assumption for each alternative.

For Alternative 2, a \$15 million D&D cost is assumed. Given that Alternative 1 is an existing facility, decommissioning is a sunk cost (i.e., will have to be expended regardless of whether the alternative is selected for the interim storage mission). However, the FMEF has never been exposed to radioactive material. To account for decontamination activities caused by an interim storage mission, the D&D cost is assumed to be \$6 million.

5.4 STAGING AND LOAD-OUT FACILITY

An important consideration in the decision process for the second-generation IHLW interim storage system is the eventual implementation of the staging and load-out function. The relevant factors are the timing of offsite shipments and the siting of a staging and load-out facility. The following sections discuss these factors and their significance to second-generation interim storage.

5.4.1 Offsite Shipping Schedule

Offsite shipment of IHLW to the repository is planned to begin sometime in the 2023 to 2030 time frame. However, discussions have occurred relative to “early shipping” of Hanford Site IHLW and spent nuclear fuel. Under early shipping, limited quantities (about 30 canisters per year) could be shipped beginning in 2010 with the quantities substantially increasing after 2014. The impact of early shipment on the need for interim storage capacity is illustrated in Figure 5-9.

Depicted in Figure 5-9 are three IHLW canister production scenarios: Early Phase 2, Late Phase 2, and 4X Phase 2. Early Phase 2 refers to the case where Phase 1 commences in 2009 with a 120-canister per year production rate and Phase 2 begins in 2012 with a 750-canister per year production rate. Late Phase 2 refers to the case where Phase 1 continues until 2018 at which time Phase 2 commences with a 1,128-canister per year production rate. The 4X Phase 2 is similar to Late Phase 2, but the Phase 2 production rate is limited to 480 canisters per year. Phase 2 duration in this latter case would extend into 2043, rather than being completed in 2028 as with the other cases.

Figure 5-10 presents the canister production scenarios during the production period of most interest to this evaluation (i.e., the first 4,000 to 5,000 canisters). For Early Phase 2, the combined CSB and FMEF storage capacity would be quickly exhausted even with early shipping. Indeed, the FMEF provides little more than one year of storage capacity. New construction would be required very early in Phase 2 and practical considerations would dictate that its capacity be about 3,000 canisters. For this case, the FMEF retrofit capacity may be so small as to be essentially impractical. The more sensible second-generation approach most likely would be a large-capacity new construction.

Figure 5-9. Storage Capacity Requirements.

Figure 5-10. Near-Term Storage Capacity Requirements.

For Late Phase 2, the FMEF would provide about two years of storage capacity over that provided by the CSB. With early shipping, the need date for FMEF would be delayed about three years, but its capacity would be rapidly depleted. Early shipping could again make new construction of a large-capacity facility the more prudent approach.

For 4X Phase 2, the FMEF would provide about three years of storage capacity. Early shipping not only significantly defers the FMEF need date, but also renders the combined CSB and FMEF storage capacity sufficient to accommodate the entire Phase 1/Phase 2 mission (see Figure 5-9). The FMEF capacity provides ample contingency should moderate shipping delays or production increases occur. Regardless of when offsite shipping is initiated under the 4X Phase 2 case, the FMEF retrofit appears to be a sound second-generation approach.

The uncertainty regarding which Phase 2 production and offsite shipping scenario will actually occur creates significant risk. For two potential scenarios (Early Phase 2 and Late Phase 2 – Early Ship), the FMEF capacity is consumed so quickly as to render this alternative economically ineffective. Conversely, if a large-capacity facility is installed and 4X Phase 2 – Early Ship materializes, substantial unused capacity would result.

5.4.2 Staging and Load-Out Facility Siting

Definition of the repository transportation system has progressed to a point that conveyance by rail appears to be firmly established. However, the Hanford Site rail system north of the Energy Northwest, Columbia Generating Station has been decommissioned. Reactivation of this portion of the Hanford Site rail would be prohibitively costly. This facet virtually ensures that the Hanford Site staging and load-out facility will be sited south of the Wye Barricade.

The FMEF presently has rail access into its shipping and receiving area. Although the rail terminates approximately 198 m north of the facility, it could be connected with the rail system maintained by the Port of Benton Authority through installation of only 477 m of new rail. Given the FMEF site's favorable rail access, the viability of an integrated interim storage, staging, and load-out mission for this facility was investigated (LMHC96WO-0006/CO-00-RPP-363). The technical assessment concluded that such an integrated mission possessed some moderate advantages.

6.0 ALTERNATIVE ASSESSMENT

Based on the fully developed concepts, as specified in Section 5.0, each alternative is assessed with respect to the evaluation criteria described in Section 4.0. The following sections discuss the result of this assessment.

6.1 SCHEDULE RISK

The schedules presented in Section 5.2 suggest that implementation of either alternative is possible with little risk to a 2014 commencement of hot operations. Although initiation of implementing activities could be deferred for a few years, the conservative schedules (approximate one-year float before operations) indicated that a conceptual design should be initiated in fiscal year 2002 at the latest. Initiation of a conceptual design under the aggressive schedules could be deferred until 2004.

An additional factor that should be considered in this evaluation is the confidence that the FMEF will be available when it is needed. The FMEF is currently idle, but numerous missions have been postulated for this facility over the ensuing years since its construction. Given that the IHLW Interim Storage Program need is several years away, the potential exists that the FMEF could be allocated to a more compelling and immediate use. However, the risk of an occurrence could be minimized if the DOE were to formally allocate the FMEF to the IHLW Interim Storage Program (e.g., issue a memorandum of agreement).

6.2 UNIT LIFE-CYCLE COST

Table 6-1 summarizes the implementation costs for alternatives. The CSB retrofit cost information is provided for reference. This information suggests that FMEF retrofit is a cost-effective approach to furnishing storage capacity.

6.3 HEALTH, SAFETY, AND ENVIRONMENTAL RISK

As observed in the previous AGA, differences in health, safety, and environmental risks among alternatives tend to be subtle. The IHLW product is essentially a sealed radioactive source that contains a relatively non-dispersible material. In addition, external constraints mandate that all alternatives embody a basic degree of safety and environmental protection. The major safety and environmental risk is restricted to low-probability accidents. Therefore, evaluations with respect to this criterion are limited to qualitative judgments.

Table 6-1. Implementation Cost Summary.

Evaluation criteria	CSB retrofit	Alternative ^a	
		1 FMEF Retrofit ^b	2 New Construction ^b
Total project cost	103,740	97,874	175,481
Present-value life-cycle cost ^c	89,945	59,274	101,704
Capacity	880	982	982
Unit life-cycle cost	102	60	104

^aAll costs are constant value in thousands of dollars.

^bCosts are based on upper-bound estimates.

^cPresent value is indexed to the start of fiscal year 2001.

CSB = Canister Storage Building.

FMEF = Fuels and Materials Examination Facility.

Use of the FMEF for interim storage will result in IHLW canisters being transported over a road accessible to the public (Route 4 between the Wye Barricade and the 400 Area). This road could be temporarily closed to the public during inter-area transfers (between the production facility and the FMEF), thereby avoiding any transportation issues different from those associated with new construction. However, routine road closures would be cumbersome and increase transportation costs.

The need for road closures could be avoided if the onsite transportation cask is licensed by the U.S. Department of Transportation. However, there is currently no plan to license the onsite transportation system being procured as part of the CSB retrofit (Project W-464). While the safety analysis report for packaging process should yield a cask design that is essentially compliant with U.S. Department of Transportation and U.S. Nuclear Regulatory Commission safety standards, additional time and funding would be required for the license application and approval process. Design and licensing of a cask is estimated to cost \$4 million and to take five years (WHC-SA-2491-FP, *Packaging and Transportation of Radioactive Liquid at the U.S. Department of Energy Hanford Site*). Furthermore, transportation with concurrent public use would create the potential for increased radiation doses and a transportation accident would entail greater consequence. The dose consequences and accident probabilities would, however, be within U.S. Nuclear Regulatory Commission standards.

Conversely, the scope of construction for the FMEF retrofit is significantly smaller than that for a new facility. The new construction alternative will necessitate a larger work force and more extensive construction activities. These factors can be expected to translate into increased risk to construction workers and greater environmental impacts (e.g., fugitive dust emissions).

6.4 STAKEHOLDER CONFIDENCE

Alternative 1 is not in the Hanford Site 200 East Area, contrary to a stakeholder value. Although new construction is presumed to be sited in the 200 East Area, this may not be a sound assumption. As discussed in Section 5.4, the Staging and Load-Out Facility almost certainly will be sited south of the Wye Barricade. There are some modest benefits in co-locating interim storage with staging and load-out. For example, canisters need only be transported over Hanford Site roadways once. The difference between two trips and only one could become appreciable considering the several thousand canisters that could be involved.

While locating the interim storage facility in the 200 East Plateau represents a major stakeholder value, the underlying objective is presumed to be avoiding contaminating new land. The FMEF retrofit avoids disturbing any new lands for the second-generation interim storage mission. New construction will cause a land disturbance even if it is located in the 200 East Area.

6.5 TECHNICAL PERFORMANCE

Both alternatives represent relatively mature technical concepts. The FMEF retrofit has undergone an extensive technical evaluation (LMHC96WO-0006/CO-00-RPP-363). The scope of modifications (civil/structural, HVAC, mechanical, electrical, and safety) have been sufficiently developed that a high confidence exists in this alternative's viability. For new construction, an extensive history and experience exists within the DOE nuclear complex relative to radioactive material storage.

As identified in a previous AGA, a consideration in the technical performance evaluation is that existing facilities have a larger body of available information upon which to judge their attributes. Although new construction can be viewed as being unbounded by physical constraints and, therefore, able to yield any required performance, there exists little tangible evidence to support this assertion.

The principal technical issue associated with these alternatives is related to storage capacity. Alternative 1 is a fixed-capacity option (982-canister maximum storage capacity). Although Alternative 2 could be constructed with any desired capacity, it was fixed at 982 canisters to avoid biasing a comparison with the FMEF retrofit. This represents a reasonable capacity for a Phase 2 that begins in 2018. If Phase 2 is initiated in 2012, however, the high IHLW canister production rate would quickly exhaust the modest capacity of these alternatives.

A 982-canister capacity is sensible if Phase 2 is limited to a 480-canister production rate (4X Phase 2) and early shipping to the repository materializes. However, previous efforts have demonstrated that installation of several discrete new-construction modules, each with a storage capacity in the range of 3,000 IHLW canisters, is the most economically sensible for the high production rates (750 to 1,128 canisters per year) associated with several Phase 2 scenarios. The primary risk for Alternative 2 is that the design/construction capacity baseline may not be optimum (i.e., either an under capacity or over capacity) when the facility is actually required for service.

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7.0 SUMMARY EVALUATION

Based on the considerations summarized in Section 6.0, the decision board discussed the relative merits of each alternative. These discussions primarily centered on the influence various programmatic parameters and assumptions exert on the practicality of a modest-capacity (982 canister) second-generation interim storage facility. The key parameters are Phase 2 start date, Phase 2 production rate, and early shipping. The decision board also inquired whether proceeding with the FMEF retrofit was economically practical if a large-capacity (2,640-canisters) third-generation interim storage facility would be required relatively soon after the FMEF commenced hot operations.

As discussed in Section 5.4.1, the timing and production rate associated with Phase 2 essentially defines the duration over which a second-generation interim storage facility of a given capacity will accommodate IHLW production. Under some cases, the available capacity of a 982-canister facility (i.e., FMEF retrofit or modest-capacity new construction) would be depleted in approximately one year. Even under the best-case scenario, a 982-canister facility could only accommodate about three years of IHLW production.

A reasonable assumption is that the RFP represents the present baseline for IHLW production (i.e., supercedes earlier DOE planning guidance). The RFP specifies that Phase 1 IHLW production begins in February 2008 and extends to 2018 with an annual production rate of 120 canisters per year. The RFP also requires that the RPP-WTP contain the flexibility to expand production from two to four times the required minimum Phase 1 production rate. This implies that Phase 2 begins in 2018 with a maximum Phase 2 production rate of 480 canisters per year. These parameters are, however, subject to change.

The RFP contains a clause that allows the new RPP-WTP contractor a period of time after notice to proceed to evaluate the technical, cost, and schedule baseline and propose modifications. A reasonable potential exists that the ORP and RPP-WTP contractor could negotiate modifications that would change programmatic parameters relevant to a decision on selecting the second-generation interim storage facility architecture. Under current planning for contractor acquisition, the extent and detail of potential modifications will not be finalized until mid-2001. Formulating a decision on a second-generation architecture before the potential for modifications is resolved may not be prudent.

The potential for early shipping of IHLW canisters to the repository also could be an important factor in the decision process. For the case where Phase 2 entails an IHLW production rate of 480 canisters per year, early shipping would eliminate the need for any large-capacity interim storage facility. A modest-capacity facility, such as that provided by the FMEF retrofit, could provide adequate storage capabilities during the entire Phase 2 life cycle. However, a firm commitment on early shipping by the U.S. Department of Energy, Office of Civilian Radioactive Waste Management is not anticipated within the next few years. A second-generation interim storage facility architecture will most likely have to be selected and initiated long before an early shipping decision is established.

To address the decision board's second query, expenditure profiles covering project definition (i.e., conceptual design and validation) and implementation (i.e., design, procurement, construction, and startup) were developed for several cases. The first case (termed FMEF/Mod* staggered) is where implementing activities associated with the FMEF retrofit and a large-capacity third-generation interim storage facility are staggered such that there is no overlap of the individual project's procurement/construction efforts (i.e., FMEF retrofit construction has terminated before third-generation facility procurement is initiated). The second case (termed FMEF/Mod* parallel) is similar to the first case except each individual project is implemented in an essentially parallel manner. The final case (termed Mod1 standalone) is where a single, large-capacity (2,640-canister) facility is constructed for the second-generation interim storage mission. This latter case is identical to that reflected in the MYWP. To avoid biasing the comparison, the combined capacity of the FMEF retrofit and third-generation facility was set equivalent to a single large-capacity facility (i.e., each case represents storage capacity for 2,640 canisters). The resultant summary costs and expenditure profiles are presented in Table 7-1 and Figure 7-1, respectively.

Table 7-1. Second- and Third-Generation Project Cost Summary.

Evaluation criteria	Implementation Case ^a		
	FMEF/Mod* staggered	FMEF/Mod* parallel	Mod1 standalone
Total capacity	2,640	2,640	2,640
TPC	375,007	375,007	365,082
Unit TPC (cost per canister)	142	142	138
Present-value TPC ^b	222,336	244,296	235,162
Present-value unit TPC ^b	84	93	89

^aAll costs are in thousands of dollars.

^bPresent value is indexed to the start of conceptual design.

FMEF = Fuels and Materials Examination Facility.

Mod* = 1,658-canister capacity new construction.

Mod1 = 2,640-canister capacity new construction.

TPC = total project cost.

Figure 7-1. Annual Project Expenditure Profile.

The costs presented in Table 7-1 and Figure 7-1 encompass project definition and implementation activities. Costs for the large-capacity facilities (Mod* and Mod1) were extrapolated from the large-capacity second-generation interim storage facility estimate contained in the MYWP. Costs for operation and decommissioning were not included because they are not a significant discriminator in the overall Phase 1/Phase 2 life-cycle expenditure profile. Additional cost estimation and schedule details are available in Appendix C.

Several observations can be drawn from the information presented in Table 7-1 and Figure 7-1. The FMEF/Mod* combination is more expensive than a single facility of equal capacity (Mod1 standalone) by about \$10 million. Moreover, implementing the FMEF/Mod* combination in a parallel manner results in a higher peak expenditure in 2006 and 2007 than a standalone Mod1. The relative magnitude of these differences in 2006 and 2007 is about \$15 million and \$3 million, respectively. Implementing the FMEF/Mod* combination in a staggered manner pushes the peak expenditure out to 2009, but this approach imparts a minimum 3.5-year separation between when the respective interim storage facilities (FMEF and Mod*) are available for hot commissioning. This fixed separation must be considered in determining when the overall effort must be initiated. For some of the IHLW production scenarios, this could require that the FMEF retrofit be completed upwards of three years before it is needed.

There is a second possible approach to implementing the staggered FMEF/Mod* combination. Because procurement represents approximately 75 percent of the FMEF capital cost, Mod* procurement could be initiated immediately after FMEF procurement has been completed. This also allows the Mod* project to be initiated and completed one year earlier than the case where

Mod* procurement is tied to completion of FMEF construction. The result is a separation of only 2.5 years between when the FMEF and Mod* are available for hot commissioning. The funding profile, as depicted in Figure 7-2, is also comparatively level.

Figure 7-2. Annual Project Expenditure Profile.

After considerable deliberation, as summarized earlier, the decision board formulated the following conclusions:

- The FMEF retrofit alternative is more cost-effective than new construction of a similar-capacity interim storage facility.
- Although slightly more expensive, implementation of the FMEF retrofit and large-capacity new facility in a closely coupled time frame is competitive with implementing a single new facility of equivalent capacity. In particular, a close-coupled implementation can yield a more level funding profile if activities are appropriately sequenced.
- The process of acquiring an RPP-WTP contractor creates a reasonable probability for baseline modifications that would influence the selection of the second-generation interim storage facility implementing architecture. Given that contractor acquisition impacts should be clarified at least a year before implementation of the second-generation architecture must be initiated, a decision on preferred second-generation architecture is not prudent at this time.

Based on these general conclusions, the decision board recommended the following path forward as the most success-oriented and cost-effective approach:

- A decision on the second-generation interim storage facility architecture, particularly with respect to FMEF use, should be deferred until after the new RPP-WTP contractor has been selected and concluded its evaluation of technical, cost, and schedule baseline.
- To avoid unnecessary perturbations to the IHLW Interim Storage Program, baseline planning should retain new construction of a large-capacity interim storage facility as depicted in the MYWP.

The rationale for recommending this path forward is that deferring a decision on FMEF retrofit use would allow completion of the rebaselining process inherent to acquiring a new RPP-WTP contractor. Evaluations completed in support of this decision process indicate that a decision can be deferred for about two years without compromising the ability to attain a 2014 hot commissioning of the second-generation interim storage facility. Furthermore, deferring a decision avoids modification to the IHLW Interim Storage Program baseline (i.e., MYWP) that ultimately could be premature.

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APPENDIX A
PARAMETRIC COST ESTIMATE

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8/31/00 7:45	CSB	FMEF		New		New		
	Retrofit	Retrofit		Construction ³		Construction ⁴		
		Lower	Upper	Lower	Upper	Mod**	Mod*	Mod1
Capacity	880	982	982	982	982	982	1,658	2,640
Unit Total Project Cost	118	88	100	102	139	179	167	138
Total Project Cost	103,740	86,561	97,874	100,099	136,052	175,481	277,133	365,082
Total Estimated Cost	79,540	71,173	82,486	77,011	109,695	163,981	265,633	353,582
Capital Cost	39,599	38,096	44,176	41,134	58,756	87,403	141,709	188,524
Direct Cost	31,127	31,747	36,663	32,907	45,197	72,836	118,091	157,104
Procurement	19,406	22,923	26,973	6,275	9,099	27,459	54,632	69,061
Construction	11,721	8,824	9,690	21,035	30,500	39,779	57,861	82,445
Infrastructure	0	0	0	5,598	5,598	5,598	5,598	5,598
Indirect Cost	8,472	6,349	7,513	8,227	13,559	14,567	23,618	31,421
Engineering	8,472	6,349	7,513	8,227	13,559	14,567	23,618	31,421
Escalation	12,181	11,656	13,493	12,953	18,466	27,431	44,241	59,050
Contingency	16,925	12,381	14,335	13,163	18,531	28,406	46,055	61,270
Site Allocation	6,736	6,480	7,514	6,997	9,994	14,867	24,105	32,068
Project Integration	4,100	2,560	2,969	2,764	3,948	5,873	9,523	12,669
Project Contingency	6,900	0	0	7,701	10,970	0	0	0
Other Project Cost	17,300	15,387	15,387	15,387	15,387	11,500	11,500	11,500

Notes:

1. All costs are in thousands of dollars.
2. Infrastructure cost is based on Burbank, D. A., and M. J. Klem, *Analysis of Alternatives for Immobilized Low-Activity Waste Disposal*, HNF-SD-TWR-AGA-004, Rev. 0, Fluor Daniel Hanford, Inc., Richland, Washington.
3. Based cost estimate for a West Valley Site-type Facility.
4. Based on the Readiness to Proceed cost estimate for a Cansiter Storage Building-type Facility.

Total Project Cost Estimation Assumptions

Total Project Cost (TPC) = Total Estimated Cost (TEC) + Project Contingency (PC)
+ Other Project Cost (OPC)

Total Estimated Cost (TEC) = Capital Cost (CC) + Escalation (ESC) + Contingency (CON)
+ Site Allocation (SAL) + Project Integration (PI)

Capital Cost (CC) = Direct Cost (DC) + Indirect Cost (IC)

Direct Cost (DC) = Procurement (PRO) + Construction (CONST)
+ Infrastructure (INF)

Indirect Cost (IC) = Engineering (ENGR)

Engineering (ENGR) = Preliminary Design + Detail Design
+ Engineering & Inspection during construction

Project Contingency (PC) = General project contingency not related to design/construction

Other Project Cost (OPC) = Cost associated with permitting, safety analyses, etc.

FMEF Retrofit	<u>Lower</u>	<u>Upper</u>
Procurement (PRO)	Adjusted from upper estimate	Taken from FMEF study estimate
Construction (CONST)	Adjusted from upper estimate	Taken from FMEF study estimate
Infrastructure (INF)	Assumed same as upper estimate	Taken from FMEF study estimate
Engineering (ENGR)	20% of DC	Taken from FMEF study estimate (~20% of DC)
Escallation (ESC) ¹	27.42% of IC + 30.25% of PRO + 33.78% of CONST + 30.25% of INF	27.42% of IC + 30.25% of PRO + 33.78% of CONST + 30.25% of INF
Contingency (CON) ¹	20% of IC + 35% of DC	20% of IC + 35% of DC
Site Allocation (SAL) ¹	17.01% of CC	17.01% of CC
Project Integration (PI) ¹	6.72% of CC	6.72% of CC
Project Contingency (PC)	Assumed zero	Assumed zero
Other Project Cost (OPC)	Assumed same as upper estimate	Taken from FMEF study estimate

¹Factors based on FMEF study cost estimate

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**982-Canister Capacity New
Construction**

	<u>Lower</u>	<u>Upper</u>
Procurement (PRO)	Taken from AGA study estimate	Assumed 1.5X lower estimate
Construction (CONST)	Taken from AGA study estimate	Assumed 1.5X lower estimate
Infrastructure (INF)	Taken from Project W-520	Taken from Project W-520
Engineering (ENGR)	25% of DC	30% of DC
Escallation (ESC)	27.42% of IC + 30.25% of PRO + 33.78% of CONST + 30.25% of INF	27.42% of IC + 30.25% of PRO + 33.78% of CONST + 30.25% of INF
Contingency (CON)	20% of IC + 35% of DC	20% of IC + 35% of DC
Site Allocation (SAL)	17.01% of CC	17.01% of CC
Project Integration (PI)	6.72% of CC (same factor as FMEF upper)	6.72% of CC (same factor as FMEF upper)
Project Contingency (PC)	10% of TEC	10% of TEC
Other Project Cost (OPC)	Assumed same as FMEF upper	Assumed same as FMEF upper

**Large-Capacity New
Construction**

	<u>982</u>	<u>1,658</u>	<u>2,640</u>
Procurement (PRO)	Adjusted RTP estimate	Adjusted RTP estimate	Taken from Readiness to Proceed (RTP) estimate
Construction (CONST)	Adjusted RTP estimate	Adjusted RTP estimate	Taken from RTP estimate
Infrastructure (INF)	Taken from Project W-520	Taken from Project W-520	Taken from Project W-520
Engineering (ENGR)	20% of DC	20% of DC	20% of DC
Escallation (ESC)	27.42% of IC + 30.25% of PRO + 33.78% of CONST + 30.25% of INF	27.42% of IC + 30.25% of PRO + 33.78% of CONST + 30.25% of INF	27.42% of IC + 30.25% of PRO + 33.78% of CONST + 30.25% of INF
Contingency (CON)	20% of IC + 35% of DC	20% of IC + 35% of DC	20% of IC + 35% of DC
Site Allocation (SAL)	17.01% of CC	17.01% of CC	17.01% of CC
Project Integration (PI)	6.72% of CC (same factor as FMEF upper)	6.72% of CC (same factor as FMEF upper)	6.72% of CC (same factor as FMEF upper)
Project Contingency (PC)	Assumed zero	Assumed zero	Assumed zero
Other Project Cost (OPC)	Assumed same as 2,640 case	Assumed same as 2,640 case	Adjusted to yield a \$365M TPC as depicted in RTP estimate

RPP-6970 REV 0

CSB Retrofit	BA/BO	Lower	Upper
Total Project Cost	103,740	103,740	0
Total Estimated Cost	79,540	79,540	0
Capital Cost	75,440	39,599	0
Direct Cost	59,300	31,127	0
Procurement	36,970	19,406	0
Construction	22,330	11,721	0
Infrastructure	0	0	
Indirect Cost	16,140	8,472	0
Engineering	16,140	8,472	0
Escalation	0	12,181	0
Contingency	0	16,925	0
Site Allocation	0	6,736	0
Project Integration	4,100	4,100	0
Project Contingency	6,900	6,900	0
Other Project Cost	17,300	17,300	0

Notes:

1. All costs are in thousands of dollars.
2. Cost basis is Project W-464 Budget Authority/Budget Outlays funding profile as of June 2000.

RPP-6970 REV 0

FMEF Retrofit	Lower	Upper
Total Project Cost	86,561	97,874
Total Estimated Cost	71,173	82,486
Capital Cost	38,096	44,176
Direct Cost	31,747	36,663
Procurement	22,923	26,973
Construction	8,824	9,690
Sitework	30	30
Installation	1,464	1,630
Structural	6,972	7,667
Electrical	358	363
Infrastructure	0	0
Indirect Cost	6,349	7,513
Engineering	6,349	7,513
Escalation	11,656	13,493
Contingency	12,381	14,335
Site Allocation	6,480	7,514
Project Integration	2,560	2,969
Project Contingency	0	0
Other Project Cost	15,387	15,387

Notes:

1. All costs are in thousands of dollars.
2. Cost basis is Fluor, 2000, *FMEF Feasibility Report*, Letter, J. L. Ruud, Fluor Global Services to K. C. Burgard, CH2M Hill Hanford Group, Inc., LMHC96WO-0006, CO-OO-RPP-363, dated July 5, 2000.

RPP-6970 REV 0

New Construction	Lower	Upper
Total Project Cost	100,099	136,052
Total Estimated Cost	77,011	109,695
Capital Cost	41,134	58,756
Direct Cost	32,907	45,197
Procurement	6,275	9,099
Construction	21,035	30,500
Sitework	86	124
Installation	6,302	9,138
Structural	12,593	18,260
Electrical	2,054	2,978
Infrastructure	5,598	5,598
Indirect Cost	8,227	13,559
Engineering	8,227	13,559
Escalation	12,953	18,466
Contingency	13,163	18,531
Site Allocation	6,997	9,994
Project Integration	2,764	3,948
Project Contingency	7,701	10,970
Other Project Cost	15,387	15,387

1. All costs are in thousands of dollars.
2. Cost basis is R. B. Calmus, 2000, *Immobilized HighLevel Waste Interim Storage Alternative Generation and Analysis, and Decision Report- Second Generation Implementing Architecture*, RPP-XXX, Rev. A., CH2M Hill Hanford Group, Inc., Richland, Washington.

RPP-6970 REV 0

	Mod**	Mod*	Mod1
New Construction	982	1,658	2,640
Total Project Cost	175,481	277,133	365,082
Total Estimated Cost	163,981	265,633	353,582
Capital Cost	87,403	141,709	188,524
Direct Cost	72,836	118,091	157,104
Procurement	27,459	54,632	69,061
Construction	39,779	57,861	82,445
Sitework	0	0	0
Installation	0	0	0
Structural	0	0	0
Electrical	0	0	0
Infrastructure	5,598	5,598	5,598
Indirect Cost	14,567	23,618	31,421
Engineering	14,567	23,618	31,421
Escalation	27,431	44,241	59,050
Contingency	28,406	46,055	61,270
Site Allocation	14,867	24,105	32,068
Project Integration	5,873	9,523	12,669
Project Contingency	0	0	0
Other Project Cost	11,500	11,500	11,500

Notes:

1. All costs are in thousands of dollars.
2. Cost basis is IHLW Module 1, Project W-XXX, Readiness to Proceed estimate as of August 2000.

RPP-6970 REV 0

Project Name
Project Number
Lucas Inc Estimating Log Number
Estimate File Number

Estimate Type
WORK BREAKDOWN STRUCTURE SUMMARY

WBS Description	Estimate Subtotal	Escalation		Subtotal	Contingency		Total Dollars
		%	Total		%	Total	
ALT #2 NEW CONSTRUCTION	\$64,789,266		\$0	\$64,789,266		\$0	\$64,789,266
-- 11 DESIGN	\$6,119,139		\$0	\$6,119,139		\$0	\$6,119,139
-- 11000 PRELIMINARY DESIGN	\$1,912,231		\$0	\$1,912,231		\$0	\$1,912,231
-- 11002 DEFINITIVE DESIGN	\$4,206,908		\$0	\$4,206,908		\$0	\$4,206,908
-- 12 E & I DURING CONSTRUCTION	\$5,354,247		\$0	\$5,354,247		\$0	\$5,354,247
-- 120002 E & I DURING CONSTRUCTION	\$5,354,247		\$0	\$5,354,247		\$0	\$5,354,247
-- 20 CHG PROCUREMENT	\$6,275,000		\$0	\$6,275,000		\$0	\$6,275,000
-- 32 CONSTRUCTION	\$21,034,540		\$0	\$21,034,540		\$0	\$21,034,540
-- 320 GENERAL REQUIREMENTS	\$990,000		\$0	\$990,000		\$0	\$990,000
-- 321 ANNEX	\$1,363,302		\$0	\$1,363,302		\$0	\$1,363,302
-- 322 INTAKE WING	\$491,491		\$0	\$491,491		\$0	\$491,491
-- 323 EXHAUST WING	\$614,130		\$0	\$614,130		\$0	\$614,130
-- 324 TRUCK BAY	\$842,012		\$0	\$842,012		\$0	\$842,012
-- 325 HOT CELL	\$15,779,906		\$0	\$15,779,906		\$0	\$15,779,906
-- 326 STACK	\$953,700		\$0	\$953,700		\$0	\$953,700
-- 40 PROJECT INTEGRATION	\$4,206,908		\$0	\$4,206,908		\$0	\$4,206,908
-- 400 OTHER COST AND FEES	\$4,206,908		\$0	\$4,206,908		\$0	\$4,206,908
-- 50 OTHER PROJECT COST	\$21,799,432		\$0	\$21,799,432		\$0	\$21,799,432
-- 500 OTHER COST AND FEES	\$21,799,432		\$0	\$21,799,432		\$0	\$21,799,432

RPP-6970 REV 0

Project Name
Project Number
Lucas Inc Estimating Log Number
Estimate File Number

RPP-6970 REV 0

LEVEL REPORT 2

<u>LEVEL DESCRIPTION</u>	<u>QTY</u>	<u>UNIT</u>	<u>UNIT COST</u>	<u>TOTAL</u>
- ALT #2 NEW CONSTRUCTION	1		----	\$64,789,266
- 11 DESIGN	1	LS	----	\$6,119,139
11000 PRELIMINARY DESIGN	1		----	\$1,912,231
11002 DEFINITIVE DESIGN	1	ls	----	\$4,206,908
- 12 E & I DURING CONSTRUCTION	1	LS	----	\$5,354,247
120002 E & I DURING CONSTRUCTION	1	LS	----	\$5,354,247
20 CHG PROCUREMENT	1	LS	----	\$6,275,000
- 32 CONSTRUCTION	1	LS	----	\$21,034,540
- 320 GENERAL REQUIREMENTS	1	LS	----	\$990,000
320.01 GENERAL REQUIREMENTS	1	LS	----	\$990,000
- 321 ANNEX	1	LS	----	\$1,363,302
321.02 SITEWORK	1	LS	----	\$2,316
321.03 CONCRETE	1	LS	----	\$107,811
321.13 SPECIAL CONSTRUCTION	1	LS	----	\$1,253,175
- 322 INTAKE WING	1	LS	----	\$491,491
322.02 SITEWORK	1	LS	----	\$1,551
322.03 CONCRETE	1	LS	----	\$26,862
322.13 SPECIAL CONSTRUCTION	1	LS	----	\$463,078
- 323 EXHAUST WING	1	LS	----	\$614,130
323.02 SITEWORK	1	LS	----	\$1,887
323.03 CONCRETE	1	LS	----	\$33,396
323.13 SPECIAL CONSTRUCTION	1	LS	----	\$578,848
- 324 TRUCK BAY	1	LS	----	\$842,012
324.02 SITEWORK	1	LS	----	\$2,492
324.03 CONCRETE	1	LS	----	\$123,420
324.13 SPECIAL CONSTRUCTION	1	LS	----	\$716,100

LUCAS INCORPORATED

Project Name
 Project Number
 Lucas Inc Estimating Log Number
 Estimate File Number

RPP-6970 REV 0

LEVEL REPORT 2

<u>LEVEL DESCRIPTION</u>	<u>QTY</u>	<u>UNIT</u>	<u>UNIT COST</u>	<u>TOTAL</u>
- 325 HOT CELL	1	LS	-----	\$15,779,906
325.02 SITEWORK	1	LS	-----	\$77,330
325.03 CONCRETE	1	LS	-----	\$7,602,427
325.05 STRUCTURAL/ ARCH	1	LS	-----	\$4,680,249
325.06 HVAC/MECH	1	LS	-----	\$1,366,200
325.07 ELECTRICAL	1	LS	-----	\$2,053,700
- 326 STACK	1	LS	-----	\$953,700
326.03 CONCRETE	1	LS	-----	\$18,700
326.05 STACK	1	ILS	-----	\$935,000
- 40 PROJECT INTEGRATION	1	Is	-----	\$4,206,908
400 OTHER COST AND FEES	1	LS	-----	\$4,206,908
- 50 OTHER PROJECT COST	1	LS	-----	\$21,799,432
500 OTHER COST AND FEES	1	LS	-----	\$21,799,432

LUCAS INCORPORATED

07/27/2000

WBS (ITEM) DESCRIPTION	WBS QTY	UOM	LABOR COST	EQP COST	MATERIAL COST	OTHER1 COST	OTHER2 COST	OTHER3 COST	TOTAL COST	UNIT COST
PRELIMINARY DESIGN	1	LS	0.00	0.00	0.00	1302544.80	0.00	0.00	1302544.80	1085454.00
ALLOWANCE FOR DESIGN RECONSTITUTION	1	LS	0.00	0.00	0.00	1200000.00	0.00	0.00	1200000.00	1000000.00
DEFINITIVE DESIGN	1	LS	0.00	0.00	0.00	2865600.00	0.00	0.00	2865600.00	2388000.00
E & I DURING CONSTRUCTION	1	LS	0.00	0.00	0.00	3039272.00	0.00	0.00	3039272.00	3039272.00
ROLLING GATE CANISTER TRANSFER MACHI	1	EA	0.00	0.00	0.00	3780000.00	0.00	0.00	3780000.00	3500000.00
CASK LID FLASK ASSY	1	EA	0.00	0.00	0.00	2160000.00	0.00	0.00	2160000.00	2000000.00
BRIDGE CFRANE 70 TON 80' SPAN	1	EA	0.00	0.00	0.00	1728000.00	0.00	0.00	1728000.00	1600000.00
CANISTER GUIDE	1	EA	0.00	0.00	0.00	108000.00	0.00	0.00	108000.00	100000.00
YOKE FOR 70 TON CRANE	1	EA	0.00	0.00	0.00	108000.00	0.00	0.00	108000.00	100000.00
REMOTE/AUTOMATIC BOLTING MACHINE(IHL	2	EA	0.00	0.00	0.00	378000.00	0.00	0.00	378000.00	175000.00
CCTV SECURITY/MONITORING	1	EA	0.00	0.00	0.00	3726000.00	0.00	0.00	3726000.00	3450000.00
CASK RECEIVING HATCH SUPORT & GUIDE A	1	EA	0.00	0.00	0.00	135000.00	0.00	0.00	135000.00	125000.00
BRIDGE CRANE 10 TON 40' SPAN, 25 FT HOIS	2	EA	0.00	0.00	0.00	1512000.00	0.00	0.00	1512000.00	700000.00
GRAPPLE FOR HLW (DCTC)	2	EA	0.00	0.00	0.00	1620000.00	0.00	0.00	1620000.00	750000.00
TUNNEL TRANSPORTER, 10 TON (FRECEIVIN	1	EA	0.00	0.00	0.00	540000.00	0.00	0.00	540000.00	500000.00
SHIELDED POWER FEED AND EMERGENCY	1	EA	0.00	0.00	0.00	54000.00	0.00	0.00	54000.00	50000.00
CCTV SECURITY/MONITORING AND CONTRO	1	EA	0.00	0.00	0.00	2484000.00	0.00	0.00	2484000.00	2300000.00
BRIDGE CRANE 10 TON 40' SPAN, 25 FT HOIS	1	EA	0.00	0.00	0.00	756000.00	0.00	0.00	756000.00	700000.00
GRAPPLE FOR HLW (SCTC)	1	EA	0.00	0.00	0.00	810000.00	0.00	0.00	810000.00	750000.00
TUNNEL TRANSPORTER, 10 TON (DECON TO	1	EA	0.00	0.00	0.00	540000.00	0.00	0.00	540000.00	500000.00
SHIELDED POWER FEED AND EMERGENCY	2	EA	0.00	0.00	0.00	108000.00	0.00	0.00	108000.00	50000.00
STORAGE RACKS 982 STANDARD HLW CANI	34	EA	0.00	0.00	0.00	3672000.00	0.00	0.00	3672000.00	100000.00
CCTV SECURITY/MONITORING AND CONTRO	1	EA	0.00	0.00	0.00	2484000.00	0.00	0.00	2484000.00	2300000.00
BRIDGE CRANE 7-1/2 TON 40' SPAN, 30 FT H	1	EA	0.00	0.00	0.00	2700000.00	0.00	0.00	2700000.00	2500000.00
GRADING 6" CRUSHED ROCK, 3" CL-B ASPHA	15000	SF	0.00	0.00	0.00	20250.00	0.00	0.00	20250.00	1.35
DRAINAGE ALLOW	1	LS	0.00	0.00	0.00	10000.00	0.00	0.00	10000.00	10000.00
RAIL ROAD TRACKS TO SWITCH COMPLETE	2000	LF	0.00	0.00	0.00	320000.00	0.00	0.00	320000.00	160.00
RAIL ROAD SWITCH	1	EA	0.00	0.00	0.00	50000.00	0.00	0.00	50000.00	50000.00
DEMO AND REMOVE EXISTING RECEIVING B	1	LS	0.00	0.00	0.00	120000.00	0.00	0.00	120000.00	120000.00
DEMO AND REMOVE EXISTING RECEIVING B	1	LS	0.00	0.00	0.00	8000.00	0.00	0.00	8000.00	8000.00
MANIFEST STATION FOR SHIPPING & RECEI	120	SF	0.00	0.00	0.00	27000.00	0.00	0.00	27000.00	225.00
RECEIVING AREA SECURITY CRASH GATE	1	EA	0.00	0.00	0.00	500000.00	0.00	0.00	500000.00	500000.00
PAINT CRASH GATE	1	EA	0.00	0.00	0.00	800.00	0.00	0.00	800.00	800.00
ENTRY TUNNEL RAIL	295	LF	0.00	0.00	0.00	17700.00	0.00	0.00	17700.00	60.00
TRANSFER TUNNEL RAIL	100	LF	0.00	0.00	0.00	6000.00	0.00	0.00	6000.00	60.00
DECON CELL RAIL	160	LF	0.00	0.00	0.00	9600.00	0.00	0.00	9600.00	60.00
STORAGE CELL RAIL	420	LF	0.00	0.00	0.00	25200.00	0.00	0.00	25200.00	60.00
MAINTENANCE CELL RAIL	116	LF	0.00	0.00	0.00	6960.00	0.00	0.00	6960.00	60.00
RECEIVING CELL RAIL	160	LF	0.00	0.00	0.00	9600.00	0.00	0.00	9600.00	60.00
SHIELDED VEWING WINDOWS	5	EA	0.00	0.00	0.00	1000000.00	0.00	0.00	1000000.00	200000.00
SHIELDED MANDLOOR, FRAME & HARDWARE	4	EA	0.00	0.00	0.00	30000.00	0.00	0.00	30000.00	7500.00

74	CY	0.00	0.00	0.00	0.00	148000.00	0.00	148000.00	0.00	2000.00
27	EA	0.00	0.00	0.00	0.00	405000.00	0.00	405000.00	0.00	15000.00
28	EA	0.00	0.00	0.00	0.00	420000.00	0.00	420000.00	0.00	15000.00
1	LS	0.00	0.00	0.00	0.00	500000.00	0.00	500000.00	0.00	500000.00
1	LS	0.00	0.00	0.00	0.00	250000.00	0.00	250000.00	0.00	250000.00
27	CY	0.00	0.00	0.00	0.00	405000.00	0.00	405000.00	0.00	15000.00
1	LS	0.00	0.00	0.00	0.00	250000.00	0.00	250000.00	0.00	250000.00
9	EA	0.00	0.00	0.00	0.00	2700.00	0.00	2700.00	0.00	300.00
1800	SF	0.00	0.00	0.00	0.00	9000.00	0.00	9000.00	0.00	5.00
1	LS	0.00	0.00	0.00	0.00	7000.00	0.00	7000.00	0.00	7000.00
1	LS	0.00	0.00	0.00	0.00	100000.00	0.00	100000.00	0.00	100000.00
79	CY	0.00	0.00	0.00	0.00	197500.00	0.00	197500.00	0.00	2500.00
3500	SF	0.00	0.00	0.00	0.00	262500.00	0.00	262500.00	0.00	75.00
576	SF	0.00	0.00	0.00	0.00	25920.00	0.00	25920.00	0.00	45.00
756	SF	0.00	0.00	0.00	0.00	113400.00	0.00	113400.00	0.00	150.00
500	SF	0.00	0.00	0.00	0.00	87500.00	0.00	87500.00	0.00	175.00
57	RISERS	0.00	0.00	0.00	0.00	12825.00	0.00	12825.00	0.00	225.00
1	LS	0.00	0.00	0.00	0.00	50000.00	0.00	50000.00	0.00	50000.00
1	LS	0.00	0.00	0.00	0.00	1500000.00	0.00	1500000.00	0.00	1500000.00
1	LS	0.00	0.00	0.00	0.00	125000.00	0.00	125000.00	0.00	125000.00
2	EA	0.00	0.00	0.00	0.00	30000.00	0.00	30000.00	0.00	15000.00
1	LS	0.00	0.00	0.00	0.00	30000.00	0.00	30000.00	0.00	30000.00
1	EA	0.00	0.00	0.00	0.00	30000.00	0.00	30000.00	0.00	30000.00
1	LS	0.00	0.00	0.00	0.00	200000.00	0.00	200000.00	0.00	200000.00
62	CY	0.00	0.00	0.00	0.00	99200.00	0.00	99200.00	0.00	1600.00
3	EA	10432.98	750.00	2430.00	0.00	0.00	0.00	13612.98	0.00	4477.66
1	LS	5216.00	500.00	1080.00	0.00	0.00	0.00	6796.00	0.00	6716.00
1	LS	3478.00	500.00	2700.00	0.00	0.00	0.00	6678.00	0.00	6478.00
1	LS	13910.00	1500.00	3240.00	0.00	0.00	0.00	18650.00	0.00	18410.00
1	LS	10433.00	1500.00	2160.00	0.00	0.00	0.00	14093.00	0.00	13933.00
1	LS	26082.00	2500.00	36450.00	0.00	0.00	0.00	65032.00	0.00	62332.00
1	LS	17388.00	2500.00	37800.00	0.00	0.00	0.00	57688.00	0.00	54888.00
1	LS	5216.00	1500.00	5400.00	0.00	0.00	0.00	12116.00	0.00	11716.00
2	EA	1043.00	300.00	0.00	0.00	0.00	0.00	1343.00	0.00	671.50
2	EA	2087.00	200.00	0.00	0.00	0.00	0.00	2287.00	0.00	1143.50
2	EA	1043.00	200.00	0.00	0.00	0.00	0.00	1243.00	0.00	621.50
2	EA	696.00	200.00	0.00	0.00	0.00	0.00	1243.00	0.00	621.50
4	EA	4173.00	1000.00	1080.00	0.00	0.00	0.00	896.00	0.00	448.00
1	LS	10433.00	500.00	5400.00	0.00	0.00	0.00	6253.00	0.00	1543.25
1	LS	10868.00	750.00	4320.00	0.00	0.00	0.00	16333.00	0.00	15933.00
1	EA	44508.00	8000.00	10800.00	0.00	0.00	0.00	15938.00	0.00	15618.00
1	EA	22254.00	6000.00	5400.00	0.00	0.00	0.00	63308.00	0.00	62508.00
1	EA	29672.00	7000.00	6480.00	0.00	0.00	0.00	33654.00	0.00	33254.00
1	EA							43152.00	0.00	42672.00

INSTALL CADK LID FLASK AAAA.	1	EA	18545.00	4000.00	3240.00	0.00	0.00	0.00	0.00	25785.00	25545.00
ROLLING SEAL HATCH	1	EA	0.00	0.00	0.00	125000.00	0.00	0.00	0.00	125000.00	125000.00
CASK IMPACT ABSORBER	1	EA	0.00	0.00	0.00	110000.00	0.00	0.00	0.00	110000.00	110000.00
CASK SUPPORT & GUIDES ECT.	1	EA	0.00	0.00	0.00	120000.00	0.00	0.00	0.00	120000.00	120000.00
REMOTE AUTOMATIC BOLTING MACHINE (IH	2	EA	2044.00	300.00	0.00	0.00	0.00	0.00	0.00	2344.00	1172.00
DECON CELL SHIELD HATCH W/ENTRY PLUG	1	EA	2044.00	750.00	54000.00	0.00	0.00	0.00	0.00	56794.00	52794.00
STORAGE CELL SHIELD HATCH	1	EA	2044.00	750.00	54000.00	0.00	0.00	0.00	0.00	56794.00	52794.00
CANISTER TRANSFER CRANE 10 TON 40' SP	2	EA	17036.00	8000.00	0.00	0.00	0.00	0.00	0.00	25036.00	12518.00
GRAPLE FOR HLW	2	EA	4089.00	200.00	0.00	0.00	0.00	0.00	0.00	4289.00	2144.50
CANISTER TRANSFER MACHINE 10 TON (ET	1	EA	8518.00	5000.00	0.00	0.00	0.00	0.00	0.00	13518.00	13518.00
SHIELDED POWER FEED & EMERGENCY CAB	1	EA	7227.00	200.00	0.00	0.00	0.00	0.00	0.00	7427.00	7427.00
CANISTER TRANSFER MACHINE 10 TON (SC	1	EA	8518.00	5000.00	0.00	0.00	0.00	0.00	0.00	13518.00	13518.00
SHIELDED POWER FEED & EMERGENCY CAB	1	EA	7227.00	200.00	0.00	0.00	0.00	0.00	0.00	7427.00	7427.00
GRAPLE FOR HLW	1	EA	2044.00	100.00	0.00	0.00	0.00	0.00	0.00	2144.00	2144.00
STORAGE RACKS IN GROUPS OF 30 POSITIO	34	EA	695068.97	102000.00	0.00	0.00	0.00	0.00	0.00	797068.97	23443.21
STORAGE CELL SHIELD HATCH	1	EA	511.00	200.00	54000.00	0.00	0.00	0.00	0.00	54711.00	50711.00
HIGH LEVEL CANISTER MACHINE 10 TON BR	1	EA	8518.00	4000.00	0.00	0.00	0.00	0.00	0.00	12518.00	12518.00
SHIELDED POWER FEED & EMERGENCY CAB	1	EA	7227.00	200.00	0.00	0.00	0.00	0.00	0.00	7427.00	7427.00
SHIELD HATCH 10' X 10' MAINTENANCE CELL	1	EA	2044.00	750.00	32400.00	0.00	0.00	0.00	0.00	35194.00	32794.00
BRIDGE CRANE 7-12 TON 40' SPAN 30' HOIST	1	EA	8518.00	4000.00	0.00	0.00	0.00	0.00	0.00	12518.00	12518.00
PARKING/SFREET/AREA LIGHTING,POLES,	10	EA	0.00	0.00	0.00	27500.00	0.00	0.00	0.00	27500.00	27500.00
RECEIVING BAY 70 TON CRANE	1	EA	10354.00	0.00	10800.00	0.00	0.00	0.00	0.00	21154.00	20354.00
ROLLING GATE TRANSFER CANISTER MACHI	1	EA	10354.00	0.00	10800.00	0.00	0.00	0.00	0.00	21154.00	20354.00
DECON CELL CANISTER TRANSFER CRANE 1	2	EA	6902.00	0.00	4320.00	0.00	0.00	0.00	0.00	11222.00	5451.00
ENTRY TUNNEL CANISTER TRANSFER MACH	1	EA	3451.00	0.00	2160.00	0.00	0.00	0.00	0.00	5611.00	5451.00
CRANE MAINTENANCE CELL 7-1/2 TON	1	EA	3451.00	0.00	2160.00	0.00	0.00	0.00	0.00	5611.00	5451.00
STORAGE CELL TRANSFER CRANE, 10 TON	1	EA	1726.00	0.00	1080.00	0.00	0.00	0.00	0.00	2806.00	2726.00
STORAGE TUNNEL CANISTER TRTRANSFER M	1	EA	0.00	0.00	0.00	7000.00	0.00	0.00	0.00	7000.00	3500.00
POWER CONTROL SYSTEM FOR STORAGE C	2	EA	0.00	0.00	0.00	5000.00	0.00	0.00	0.00	5000.00	2500.00
POWER CONTROL SYSTEM FOR STORAGE C	2	EA	0.00	0.00	0.00	6000.00	0.00	0.00	0.00	6000.00	3000.00
POWER CONTROL SYSTEM FOR STORAGE C	2	EA	0.00	0.00	0.00	5000.00	0.00	0.00	0.00	5000.00	2500.00
POWER CONTROL SYSTEM FOR STORAGE C	3	EA	0.00	0.00	0.00	6600.00	0.00	0.00	0.00	6600.00	2200.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	2800	SF	0.00	0.00	0.00	47600.00	0.00	0.00	0.00	47600.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	1900	SF	0.00	0.00	0.00	32300.00	0.00	0.00	0.00	32300.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	750	SF	0.00	0.00	0.00	12750.00	0.00	0.00	0.00	12750.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	1400	SF	0.00	0.00	0.00	23800.00	0.00	0.00	0.00	23800.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	1000	SF	0.00	0.00	0.00	17000.00	0.00	0.00	0.00	17000.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	200	SF	0.00	0.00	0.00	3400.00	0.00	0.00	0.00	3400.00	17.00
RECEPTACLES 4 EA/1000 SF MAINTENANC	1900	SF	0.00	0.00	0.00	5700.00	0.00	0.00	0.00	5700.00	3.00
RECEPTACLES 10 EA/1000 SF MAINTENANC	750	SF	0.00	0.00	0.00	3750.00	0.00	0.00	0.00	3750.00	5.00
RECEPTACLES 4 EA/1000 SF DECON CELL	1400	SF	0.00	0.00	0.00	4200.00	0.00	0.00	0.00	4200.00	3.00
RECEPTACLES 4 EA/1000 SF ENTRY TUNNE	1000	SF	0.00	0.00	0.00	3000.00	0.00	0.00	0.00	3000.00	3.00
RECEPTACLES 4 EA/1000 SF TRANSFER TU	200	SF	0.00	0.00	0.00	600.00	0.00	0.00	0.00	600.00	3.00

SECURITY SYST. W/EQUIP/CONDUIT/WIRING	1	LOT	0.00	0.00	0.00	0.00	50000.00	50000.00
FIRE ALLARM & DETECTION. W/EQUIP/COND	1	LOT	0.00	0.00	0.00	0.00	25000.00	25000.00
EQUIPMENT GROUNDING	1	LOT	3451.00	0.00	0.00	0.00	3829.00	3801.00
Construction Management	405667	DOLLARS	0.00	0.00	0.00	513168.76	513168.76	1.00
PROJECT INTEGRATION	1	LS	0.00	0.00	0.00	0.00	2388000.00	2388000.00
OTHER PROJECT COST	1	LS	0.00	0.00	0.00	0.00	#####	#####

RPP-6970 REV 0

- [-] [58,902,587.95] FMEF OPTION FOR HLW STORAGE OPTION "C"
 - [-] [4,473,454.00] DESIGN
 - [-] [2,085,454.00] PRELIMINARY DESIGN
 - [-] [2,388,000.00] DEFINITIVE DESIGN
 - [-] [3,039,272.00] E & I DURING CONSTRUCTION
 - [-] [3,039,272.00] E & I DURING CONSTRUCTION
 - [-] [26,973,000.00] CHG PROCUREMENT
 - [-] [12,123,000.00] CHG PROCUREMENT- RECEIVING BAY
 - [-] [6,210,000.00] CHG PROCUREMENT- DECON CELL
 - [-] [8,370,000.00] CHG PROCUREMENT- STORAGE CELL
 - [-] [270,000.00] CHG PROCUREMENT- MAINT. AREA
 - [-] [9,654,681.95] CONSTRUCTION
 - [-] [400,250.00] SITEWORK
 - [-] [30,250.00] SITE PREPARATION
 - [-] [370,000.00] ROADS & RAILROADS
 - [-] [655,800.00] RECEIVING BAY MODS
 - [-] [128,000.00] DEMOLITION
 - [-] [27,000.00] PRE - FAB BUILDINGS
 - [-] [500,000.00] SASH, DOORS, LOUVERS, GLAZING
 - [-] [800.00] INTERIOR COVERINGS & FINISHINGS
 - [-] [6,605,806.98] MODIFICATIONS TO FMEF FACILITY
 - [-] [75,060.00] EQUIPMENT STRUCTURES
 - [-] [1,030,000.00] SASH, DOORS, LOUVERS, GLAZING
 - [-] [5,260,545.00] INTERIOR COVERINGS & FINISHINGS
 - [-] [240,201.98] HVAC
 - [-] [523,243.00] RECEIVING BAY - EQUIPMENT
 - [-] [523,243.00] MACHINERY & EQUIPMENT
 - [-] [142,913.00] DECON CELL - EQUIPMENT
 - [-] [142,913.00] MATERIAL HANDLING EQUIPMENT
 - [-] [20,945.00] ENTRY TUNNEL- EQUIPMENT
 - [-] [20,945.00] MATERIAL HANDLING EQUIPMENT
 - [-] [820,157.97] STORAGE CELL - EQUIPMENT
 - [-] [820,157.97] MATERIAL HANDLING EQUIPMENT
 - [-] [74,656.00] CANISTER TRANSFER - EQUIPMENT
 - [-] [74,656.00] MATERIAL HANDLING EQUIPMENT
 - [-] [47,712.00] MAINTENANCE CRANE CELL - EQUIPMENT
 - [-] [47,712.00] MATERIAL HANDLING EQUIPMENT
 - [-] [27,500.00] ACCESS ELECTRICAL
 - [-] [27,500.00] ELECTRICAL SYSTEM ACCESSORIES
 - [-] [335,698.00] FMEF FACILITY ELECTRICAL
 - [-] [102,769.00] MAJOR ELECTRICAL EQUIPMENT
 - [-] [229,100.00] ELECTRICAL SYSTEM ACCESSORIES
 - [-] [3,829.00] GROUNDING & CATHODIC PROTECTION
 - [-] [405,667.00] Construction Management
 - [-] [2,388,000.00] PROJECT INTEGRATION
 - [-] [2,388,000.00] OTHER COST AND FEES
 - [-] [12,374,180.00] OTHER PROJECT COST
 - [-] [12,374,180.00] OTHER COST AND FEES

- [-] [54,510,618] FMEF OPTION FOR HLW STORAGE OPTION "C"
 - [-] [5,368,145] DESIGN
 - [-] [2,502,545] PRELIMINARY DESIGN
 - [-] [2,865,600] DEFINITIVE DESIGN
 - [-] [3,039,272] E & I DURING CONSTRUCTION
 - [-] [3,039,272] E & I DURING CONSTRUCTION
 - [-] [22,923,000] CHG PROCUREMENT
 - [-] [8,343,000] CHG PROCUREMENT- RECEIVING BAY
 - [-] [6,210,000] CHG PROCUREMENT- DECON CELL
 - [-] [8,370,000] CHG PROCUREMENT- STORAGE CELL
 - [-] [0] CHG PROCUREMENT- MAINT. AREA
 - [-] [8,418,021] CONSTRUCTION
 - [-] [30,250] SITEWORK
 - [-] [30,250] SITE PREPARATION
 - [-] [0] ROADS & RAILROADS
 - [-] [655,800] RECEIVING BAY MODS
 - [-] [128,000] DEMOLITION
 - [-] [27,000] PRE - FAB BUILDINGS
 - [-] [500,000] SASH, DOORS, LOUVERS, GLAZING
 - [-] [800] INTERIOR COVERINGS & FINISHINGS
 - [-] [5,910,427] MODIFICATIONS TO FMEF FACILITY
 - [-] [68,100] EQUIPMENT STRUCTURES
 - [-] [630,000] SASH, DOORS, LOUVERS, GLAZING
 - [-] [4,972,125] INTERIOR COVERINGS & FINISHINGS
 - [-] [240,202] HVAC
 - [-] [370,091] RECEIVING BAY - EQUIPMENT
 - [-] [370,091] MACHINERY & EQUIPMENT
 - [-] [142,913] DECON CELL - EQUIPMENT
 - [-] [142,913] MATERIAL HANDLING EQUIPMENT
 - [-] [20,945] ENTRY TUNNEL - EQUIPMENT
 - [-] [20,945] MATERIAL HANDLING EQUIPMENT
 - [-] [820,158] STORAGE CELL - EQUIPMENT
 - [-] [820,158] MATERIAL HANDLING EQUIPMENT
 - [-] [74,656] CANISTER TRANSFER - EQUIPMENT
 - [-] [74,656] MATERIAL HANDLING EQUIPMENT
 - [-] [35,194] MAINTENANCE CRANE CELL - EQUIPMENT
 - [-] [35,194] MATERIAL HANDLING EQUIPMENT
 - [-] [27,500] ACCESS ELECTRICAL
 - [-] [27,500] ELECTRICAL SYSTEM ACCESSORIES
 - [-] [330,087] FMEF FACILITY ELECTRICAL
 - [-] [97,158] MAJOR ELECTRICAL EQUIPMENT
 - [-] [229,100] ELECTRICAL SYSTEM ACCESSORIES
 - [-] [3,829] GROUNDING & CATHODIC PROTECTION
 - [-] [405,667] Construction Management
 - [-] [2,388,000] PROJECT INTEGRATION
 - [-] [2,388,000] OTHER COST AND FEES
 - [-] [12,374,180] OTHER PROJECT COST
 - [-] [12,374,180] OTHER COST AND FEES

W46444H2 8-10-2000

Project Name
Project Number
Lucas Inc Estimating Log Number
Estimate File Number

RPP-6970 REV 0

ZERO COST DETAILS ITEMS

Reported From:
FMEF OPTION FOR HLW STORAGE OPTION "C"

Code	Description	Qty	UM	Hours		Unit Cost	Total
				Unit	Total		
201100	CHG PROCUREMENT- RECEIVING BAY						
4800120	ROLLING GATE CANISTER	0.00	EA	0.00	0	\$0.00	\$0
201400	CHG PROCUREMENT- MAINT. AREA						
4800110	BRIDGE CRANE 7-1/2 TON	0.00	EA	0.00	0	\$0.00	\$0
321100.05	ROADS & RAILROADS						
0500002	RAIL ROAD TRACKS TO	0.00	LF	0.00	0	\$0.00	\$0
0500004	RAIL ROAD SWITCH	0.00	EA	0.00	0	\$0.00	\$0
321402.24	EQUIPMENT STRUCTURES						
2400012	MAINTENANCE CELL RAIL	0.00	LF	0.00	0	\$0.00	\$0
321402.36	INTERIOR COVERINGS & FINISHINGS						
3600029	ADD SHIELDING @ ENTRY	0.00	SF	0.00	0	\$0.00	\$0
3600030	ADD SHIELDING @ ENTRY	0.00	SF	0.00	0	\$0.00	\$0
321540.40	MACHINERY & EQUIPMENT						
4000008	INSTALL ROLLING GATE	0.00	EA	0.00	0	\$0.00	\$0
4000014	CASK IMPACT ABSORBER	0.00	EA	0.00	0	\$0.00	\$0
321590.48	MATERIAL HANDLING EQUIPMENT						
4800210	BRIDGE CRANE 7-1/2 TON	0.00	EA	0.00	0	\$0.00	\$0
321920.61	MAJOR ELECTRICAL EQUIPMENT						
6160030	CRANE MAINTENANCE CELL 7-	0.00	EA	0.00	0	\$0.00	\$0

DELETED ITEMS

LUCAS INCORPORATED

8/10/00

Success Estimating and Cost Management System
A-20

Page No. 1

WBS (ITEM) DESCRIPTION	WBS QTY	UOM	LABOR COST	EQP COST	MATERIAL COST	OTHER1 COST	OTHER2 COST	OTHER3 COST	TOTAL COST	UNIT COST
PRELIMINARY DESIGN	1	LS	0.00	0.00	0.00	1302544.80	0.00	0.00	1302544.80	1085454.00
ALLOWANCE FOR DESIGN RECONSTITUTION	1	LS	0.00	0.00	0.00	1200000.00	0.00	0.00	1200000.00	1000000.00
DEFINITIVE DESIGN	1	LS	0.00	0.00	0.00	2865600.00	0.00	0.00	2865600.00	2388000.00
E & I DURING CONSTRUCTION	1	LS	0.00	0.00	0.00	3039272.00	0.00	0.00	3039272.00	3039272.00
CASK LID FLASK ASSY	1	EA	0.00	0.00	0.00	3780000.00	0.00	0.00	3780000.00	3500000.00
BRIDGE CFRANE 70 TON 80' SPAN	1	EA	0.00	0.00	0.00	2160000.00	0.00	0.00	2160000.00	2000000.00
CANISTER GUIDE	1	EA	0.00	0.00	0.00	1728000.00	0.00	0.00	1728000.00	1600000.00
YOKE FOR 70 TON CRANE	1	EA	0.00	0.00	0.00	108000.00	0.00	0.00	108000.00	100000.00
REMOTE/AUTOMATIC BOLTING MACHINE(IHL	2	EA	0.00	0.00	0.00	108000.00	0.00	0.00	108000.00	100000.00
CCTV SECURITY/MONITORING	1	EA	0.00	0.00	0.00	378000.00	0.00	0.00	378000.00	175000.00
CASK RECEIVING HATCH SUPORT & GUIDE A	1	EA	0.00	0.00	0.00	3726000.00	0.00	0.00	3726000.00	3450000.00
BRIDGE CRANE 10 TON 40' SPAN, 25 FT HOIS	1	EA	0.00	0.00	0.00	135000.00	0.00	0.00	135000.00	125000.00
GRAPPLE FOR HLW (DCTC)	2	EA	0.00	0.00	0.00	1512000.00	0.00	0.00	1512000.00	700000.00
TUNNEL TRANSPORTER, 10 TON (FRECEIVIN	1	EA	0.00	0.00	0.00	1620000.00	0.00	0.00	1620000.00	750000.00
SHIELDED POWER FEED AND EMERGENCY	1	EA	0.00	0.00	0.00	540000.00	0.00	0.00	540000.00	500000.00
CCTV SECURITY/MONITORING AND CONTRO	1	EA	0.00	0.00	0.00	54000.00	0.00	0.00	54000.00	50000.00
BRIDGE CRANE 10 TON 40' SPAN, 25 FT HOIS	1	EA	0.00	0.00	0.00	2484000.00	0.00	0.00	2484000.00	2300000.00
GRAPPLE FOR HLW (SCTC)	1	EA	0.00	0.00	0.00	756000.00	0.00	0.00	756000.00	700000.00
TUNNEL TRANSPORTER, 10 TON (DECON TO	1	EA	0.00	0.00	0.00	810000.00	0.00	0.00	810000.00	750000.00
SHIELDED POWER FEED AND EMERGENCY	2	EA	0.00	0.00	0.00	540000.00	0.00	0.00	540000.00	500000.00
STORAGE RACKS 982 STANDARD HLW CANI	34	EA	0.00	0.00	0.00	108000.00	0.00	0.00	108000.00	50000.00
CCTV SECURITY/MONITORING AND CONTRO	1	EA	0.00	0.00	0.00	3672000.00	0.00	0.00	3672000.00	100000.00
BRIDGE CRANE 7-1/2 TON 40' SPAN, 30 FT H	1	EA	0.00	0.00	0.00	2484000.00	0.00	0.00	2484000.00	2300000.00
GRADING 6" CRUSHED ROCK, 3" CL-B ASPHA	15000	SF	0.00	0.00	0.00	270000.00	0.00	0.00	270000.00	250000.00
DRAINAGE ALLOW	1	LS	0.00	0.00	0.00	20250.00	0.00	0.00	20250.00	1.35
RAIL ROAD TRACKS TO SWITCH COMPLETE	2000	LF	0.00	0.00	0.00	10000.00	0.00	0.00	10000.00	10000.00
RAIL ROAD SWITCH	1	EA	0.00	0.00	0.00	320000.00	0.00	0.00	320000.00	160.00
DEMO AND REMOVE EXISTING RECEIVING B	1	LS	0.00	0.00	0.00	50000.00	0.00	0.00	50000.00	50000.00
DEMO AND REMOVE EXISTING RECEIVING B	1	LS	0.00	0.00	0.00	120000.00	0.00	0.00	120000.00	120000.00
MANIFEST STATION FOR SHIPPING & RECEI	120	SF	0.00	0.00	0.00	8000.00	0.00	0.00	8000.00	8000.00
RECEIVING AREA SECURITY CRASH GATE	1	EA	0.00	0.00	0.00	27000.00	0.00	0.00	27000.00	225.00
PAINT CRASH GATE	1	EA	0.00	0.00	0.00	500000.00	0.00	0.00	500000.00	500000.00
ENTRY TUNNEL RAIL	295	LF	0.00	0.00	0.00	800.00	0.00	0.00	800.00	800.00
TRANSFER TUNNEL RAIL	100	LF	0.00	0.00	0.00	17700.00	0.00	0.00	17700.00	60.00
DECON CELL RAIL	160	LF	0.00	0.00	0.00	6000.00	0.00	0.00	6000.00	60.00
STORAGE CELL RAIL	420	LF	0.00	0.00	0.00	9600.00	0.00	0.00	9600.00	60.00
MAINTENANCE CELL RAIL	116	LF	0.00	0.00	0.00	25200.00	0.00	0.00	25200.00	60.00
RECEIVING CELL RAIL	160	LF	0.00	0.00	0.00	6960.00	0.00	0.00	6960.00	60.00
SHIELDED VEWING WINDOWS	5	EA	0.00	0.00	0.00	9600.00	0.00	0.00	9600.00	60.00
SHIELDED MANDLOOR, FRAME & HARDWARE	4	EA	0.00	0.00	0.00	1000000.00	0.00	0.00	1000000.00	200000.00
			0.00	0.00	0.00	30000.00	0.00	0.00	30000.00	7500.00

INSTALL CADK LID FLASK AAY.	1	EA	18545.00	4000.00	3240.00	0.00	0.00	0.00	0.00	25785.00	25545.00
ROLLING SEAL HATCH	1	EA	0.00	0.00	0.00	125000.00	0.00	0.00	0.00	125000.00	125000.00
CASK IMPACT ABSORBER	1	EA	0.00	0.00	0.00	110000.00	0.00	0.00	0.00	110000.00	110000.00
CASK SUPPORT & GUIDES ECT.	1	EA	0.00	0.00	0.00	120000.00	0.00	0.00	0.00	120000.00	120000.00
REMOTE AUTOMATIC BOLTING MACHINE (IH	2	EA	2044.00	300.00	0.00	0.00	0.00	0.00	0.00	2344.00	1172.00
DECON CELL SHIELD HATCH W/ENTRY PLUG	1	EA	2044.00	750.00	54000.00	0.00	0.00	0.00	0.00	56794.00	52794.00
STORAGE CELL SHIELD HATCH	1	EA	2044.00	750.00	54000.00	0.00	0.00	0.00	0.00	56794.00	52794.00
CANISTER TRANSFER CRANE 10 TON 40' SP	2	EA	17036.00	8000.00	0.00	0.00	0.00	0.00	0.00	25036.00	12518.00
GRAPLE FOR HLW	2	EA	4089.00	200.00	0.00	0.00	0.00	0.00	0.00	4289.00	2144.50
CANISTER TRANSFER MACHINE 10 TON (ET	1	EA	8518.00	5000.00	0.00	0.00	0.00	0.00	0.00	13518.00	13518.00
SHIELDED POWER FEED & EMERGENCY CAB	1	EA	7227.00	200.00	0.00	0.00	0.00	0.00	0.00	7427.00	7427.00
CANISTER TRANSFER MACHINE 10 TON (SC	1	EA	8518.00	5000.00	0.00	0.00	0.00	0.00	0.00	13518.00	13518.00
SHIELDED POWER FEED & EMERGENCY CAB	1	EA	7227.00	200.00	0.00	0.00	0.00	0.00	0.00	7427.00	7427.00
GRAPLE FOR HLW	1	EA	2044.00	100.00	0.00	0.00	0.00	0.00	0.00	2144.00	2144.00
STORAGE RACKS IN GROUPS OF 30 POSITIO	34	EA	695068.97	102000.00	0.00	0.00	0.00	0.00	0.00	797068.97	23443.21
STORAGE CELL SHIELD HATCH	1	EA	511.00	200.00	54000.00	0.00	0.00	0.00	0.00	54711.00	50711.00
HIGH LEVEL CANISTER MACHINE 10 TON BR	1	EA	8518.00	4000.00	0.00	0.00	0.00	0.00	0.00	12518.00	12518.00
SHIELDED POWER FEED & EMERGENCY CAB	1	EA	7227.00	200.00	0.00	0.00	0.00	0.00	0.00	7427.00	7427.00
SHIELD HATCH 10' X 10' MAINTENANCE CELL	1	EA	2044.00	750.00	32400.00	0.00	0.00	0.00	0.00	35194.00	32794.00
BRIDGE CRANE 7-1/2 TON 40' SPAN 30' HOIST	1	EA	8518.00	4000.00	0.00	0.00	0.00	0.00	0.00	12518.00	12518.00
PARKING/SFREET/AREA LIGHTING, POLES,	10	EA	0.00	0.00	0.00	27500.00	0.00	0.00	0.00	27500.00	27500.00
RECEIVING BAY 70 TON CRANE	1	EA	10354.00	0.00	10800.00	0.00	0.00	0.00	0.00	21154.00	20354.00
ROLLING GATE TRANSFER CANISTER MACHI	1	EA	10354.00	0.00	10800.00	0.00	0.00	0.00	0.00	21154.00	20354.00
DECON CELL CANISTER TRANSFER CRANE 1	2	EA	6902.00	0.00	4320.00	0.00	0.00	0.00	0.00	11222.00	5451.00
ENTRY TUNNEL CANISTER TRANSFER MACH	1	EA	3451.00	0.00	2160.00	0.00	0.00	0.00	0.00	5611.00	5451.00
CRANE MAINTENANCE CELL 7-1/2 TON	1	EA	3451.00	0.00	2160.00	0.00	0.00	0.00	0.00	5611.00	5451.00
STORAGE CELL TRANSFER CRANE, 10 TON	1	EA	3451.00	0.00	2160.00	0.00	0.00	0.00	0.00	5611.00	5451.00
STORAGE TUNNEL CANISTER TRTRANSFER M	1	EA	1726.00	0.00	1080.00	0.00	0.00	0.00	0.00	2806.00	2726.00
POWER CONTROL SYSTEM FOR STORAGE C	2	EA	0.00	0.00	0.00	7000.00	0.00	0.00	0.00	7000.00	3500.00
POWER CONTROL SYSTEM FOR STORAGE C	2	EA	0.00	0.00	0.00	5000.00	0.00	0.00	0.00	5000.00	2500.00
POWER CONTROL SYSTEM FOR STORAGE C	2	EA	0.00	0.00	0.00	6000.00	0.00	0.00	0.00	6000.00	3000.00
POWER CONTROL SYSTEM FOR STORAGE C	2	EA	0.00	0.00	0.00	5000.00	0.00	0.00	0.00	5000.00	2500.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	3	EA	0.00	0.00	0.00	6600.00	0.00	0.00	0.00	6600.00	2200.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	2800	SF	0.00	0.00	0.00	47600.00	0.00	0.00	0.00	47600.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	1900	SF	0.00	0.00	0.00	32300.00	0.00	0.00	0.00	32300.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	750	SF	0.00	0.00	0.00	12750.00	0.00	0.00	0.00	12750.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	1400	SF	0.00	0.00	0.00	23800.00	0.00	0.00	0.00	23800.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	1000	SF	0.00	0.00	0.00	17000.00	0.00	0.00	0.00	17000.00	17.00
LIGHTING SYSTEM LOW BAY, 100FC W/COND	200	SF	0.00	0.00	0.00	3400.00	0.00	0.00	0.00	3400.00	17.00
RECEPTACLES 4 EA/1000 SF MAINTENANC	1900	SF	0.00	0.00	0.00	5700.00	0.00	0.00	0.00	5700.00	3.00
RECEPTACLES 10 EA/1000 SF MAINTENANC	750	SF	0.00	0.00	0.00	3750.00	0.00	0.00	0.00	3750.00	5.00
RECEPTACLES 4 EA/1000 SF DECON CELL	1400	SF	0.00	0.00	0.00	4200.00	0.00	0.00	0.00	4200.00	3.00
RECEPTACLES 4 EA/1000 SF ENTRY TUNNE	1000	SF	0.00	0.00	0.00	3000.00	0.00	0.00	0.00	3000.00	3.00
RECEPTACLES 4 EA/1000 SF TRANSFER TU	200	SF	0.00	0.00	0.00	600.00	0.00	0.00	0.00	600.00	3.00

74	CY	0.00	0.00	0.00	0.00	148000.00	0.00	148000.00	2000.00
27	EA	0.00	0.00	0.00	0.00	405000.00	0.00	405000.00	15000.00
28	EA	0.00	0.00	0.00	0.00	420000.00	0.00	420000.00	15000.00
1	LS	0.00	0.00	0.00	0.00	500000.00	0.00	500000.00	50000.00
1	LS	0.00	0.00	0.00	0.00	250000.00	0.00	250000.00	25000.00
27	CY	0.00	0.00	0.00	0.00	405000.00	0.00	405000.00	15000.00
1	LS	0.00	0.00	0.00	0.00	250000.00	0.00	250000.00	25000.00
9	EA	0.00	0.00	0.00	0.00	2700.00	0.00	2700.00	300.00
1800	SF	0.00	0.00	0.00	0.00	9000.00	0.00	9000.00	5.00
1	LS	0.00	0.00	0.00	0.00	7000.00	0.00	7000.00	7000.00
1	LS	0.00	0.00	0.00	0.00	100000.00	0.00	100000.00	100000.00
79	CY	0.00	0.00	0.00	0.00	197500.00	0.00	197500.00	2500.00
3500	SF	0.00	0.00	0.00	0.00	262500.00	0.00	262500.00	75.00
576	SF	0.00	0.00	0.00	0.00	25920.00	0.00	25920.00	45.00
756	SF	0.00	0.00	0.00	0.00	113400.00	0.00	113400.00	150.00
500	SF	0.00	0.00	0.00	0.00	87500.00	0.00	87500.00	175.00
57	RISERS	0.00	0.00	0.00	0.00	12825.00	0.00	12825.00	225.00
1	LS	0.00	0.00	0.00	0.00	50000.00	0.00	50000.00	50000.00
1	LS	0.00	0.00	0.00	0.00	1500000.00	0.00	1500000.00	1500000.00
1	LS	0.00	0.00	0.00	0.00	125000.00	0.00	125000.00	125000.00
2	EA	0.00	0.00	0.00	0.00	30000.00	0.00	30000.00	15000.00
1	LS	0.00	0.00	0.00	0.00	30000.00	0.00	30000.00	30000.00
1	EA	0.00	0.00	0.00	0.00	30000.00	0.00	30000.00	30000.00
1	LS	0.00	0.00	0.00	0.00	200000.00	0.00	200000.00	200000.00
62	CY	0.00	0.00	0.00	0.00	99200.00	0.00	99200.00	1600.00
3	EA	10432.98	750.00	2430.00	0.00	0.00	0.00	13612.98	4477.66
1	LS	5216.00	500.00	1080.00	0.00	0.00	0.00	6796.00	6716.00
1	LS	3478.00	500.00	2700.00	0.00	0.00	0.00	6678.00	6478.00
1	LS	13910.00	1500.00	3240.00	0.00	0.00	0.00	18650.00	18410.00
1	LS	10433.00	1500.00	2160.00	0.00	0.00	0.00	14093.00	13933.00
1	LS	26082.00	2500.00	36450.00	0.00	0.00	0.00	65032.00	62332.00
1	LS	17388.00	2500.00	37800.00	0.00	0.00	0.00	57688.00	54888.00
1	LS	5216.00	1500.00	5400.00	0.00	0.00	0.00	12116.00	11716.00
2	EA	1043.00	300.00	0.00	0.00	0.00	0.00	1343.00	671.50
2	EA	2087.00	200.00	0.00	0.00	0.00	0.00	2287.00	1143.50
2	EA	1043.00	200.00	0.00	0.00	0.00	0.00	1243.00	621.50
2	EA	1043.00	200.00	0.00	0.00	0.00	0.00	1243.00	621.50
2	EA	696.00	200.00	0.00	0.00	0.00	0.00	896.00	448.00
4	EA	4173.00	1000.00	1080.00	0.00	0.00	0.00	6253.00	1543.25
1	LS	10433.00	500.00	5400.00	0.00	0.00	0.00	16333.00	15933.00
1	LS	10868.00	750.00	4320.00	0.00	0.00	0.00	15938.00	15618.00
1	EA	44508.00	8000.00	10800.00	0.00	0.00	0.00	63308.00	62508.00
1	EA	22254.00	6000.00	5400.00	0.00	0.00	0.00	33654.00	33254.00
1	EA	29672.00	7000.00	6480.00	0.00	0.00	0.00	43152.00	42672.00

SECURITY SYST. W/EQUIP/CONDUIT/WIRING	1	LOT	0.00	0.00	0.00	0.00	0.00	50000.00	50000.00
FIRE ALLARM & DETECTION. W/EQUIP/COND	1	LOT	0.00	0.00	0.00	0.00	0.00	25000.00	25000.00
EQUIPMENT GROUNDING	1	LOT	3451.00	0.00	0.00	0.00	0.00	3829.00	3801.00
Construction Management	405667	DOLLARS	0.00	0.00	0.00	513168.76	513168.76		1.00
PROJECT INTEGRATION	1	LS	0.00	0.00	0.00	0.00	2388000.00	2388000.00	
OTHER PROJECT COST	1	LS	0.00	0.00	0.00	0.00	0.00	0.00	#####

RPP-6970 REV 0

08/30/00	Summary ¹		
	Mod1	Mod*	Mod**
Procurement	69,061	54,632	27,459
Construction	82,445	57,861	39,779
Escalation	83,616	62,085	37,109
Contingency	44,172	32,309	19,820
Total Cost	279,294	206,887	124,168
Capacity	2,640	1,658	982

¹Summary costs are in thousands of dollars.

RPP-6970 REV 0

Mod 1	08/30/00						
	Estimate	Adders	Direct	Escalation	SubTot	Contingency	Total
Special Equip	12954029		12954029	7149329	20103358	3015504	23118861
Onsite Transport Equip	11813976		11813976	6520133	18334109	2750116	21084226
HVAC	173576		173576	95797	269373	40406	309778
Electrical Distr	1130507		1130507	623927	1754434	263165	2017599
DCS	1097877		1097877	605918	1703795	255569	1959365
HP	3103989		3103989	1713092	4817081	722562	5539643
Tubes, Plugs, etc.	36612494	2174416	38786910	21406496	60193406	12038681	72232087
Procurement	66,886,448	2,174,416	69,060,864	38,114,691	107,175,555	19,086,004	126,261,558
Site Prep	654370	131528	785898	433737	1219636	304909	1524545
Load-in/load-out Concr	1689606	339611	2029217	1119925	3149142	629828	3778970
Load-in/load-out Struct	2593833	521360	3115193	1719275	4834469	966894	5801362
Overpack pit	427617	85951	513568	283438	797006	199252	996258
Special Equip	162278	32618	194896	107563	302459	45369	347828
Mud Mat& Slab	4637010	932039	5569049	3073558	8642607	1728521	10371129
Insul Concrete	6298560	1266011	7564571	4174886	11739457	2347891	14087348
Ext Vault Walls	5089473	1022984	6112457	3373465	9485922	1422888	10908810
Int Vault Walls	2695113	541718	3236831	1786407	5023238	753486	5776723
Vault Iso Walls	346442	69635	416077	229633	645710	96856	742566
Vault Rebar	749010	150551	899561	496468	1396029	209404	1605433
Oper Deck	13832971	3280427	17113398	9444884	26558283	5311657	31869939
Deck Embed Install	7067982	178325	7246307	3999237	11245544	2249109	13494653
Vault Superstruct	15354971	911932	16266903	8977704	25244606	5048921	30293528
Special Equip	36405	7317	43722	24130	67853	13571	81423
Support Bldg Concrete	389769	78344	468113	258351	726464	145293	871757
Support Bldg Superstru	4701029	944907	5645936	3115992	8761928	1752386	10514313
Site Work	1144753	230095	1374848	758779	2133627	533407	2667034
Temp Power	10500	2111	12611	6960	19570	3914	23484
Admin Bldg	793686	159531	953217	526080	1479297	369824	1849122
Maint Bldg	619725	124565	744290	410773	1155063	288766	1443829
Constuct Probates	1780742	357929	2138671	1180333	3319004	663801	3982804
Construction	71,075,845	11,369,488	82,445,333	45,501,579	127,946,913	25,085,946	153,032,859
Total	137,962,293	13,543,904	151,506,197	83,616,270	235,122,467	44,171,950	279,294,417

Notes:

1. Mod1 cost estimate is based on Module 1 cost estimate as reflected in the multi-year work plan.
2. Adders are 20.1% of construction estimate and 5.9% of procurement estimate.
3. Escalation is 55.19% of direct.
4. Contingency applied to each item is identical to that applied in the Module 1 estimate.

RPP-6970 REV 0

Mod*	08/30/00						
	Estimate	Adders	Direct	Escalation	SubTot	Contingency	Total
Special Equip	12954029		12954029	7149329	20103358	3015504	23118861
Onsite Transport Equip	11813976		11813976	6520133	18334109	2750116	21084226
HVAC	173576		173576	95797	269373	40406	309778
Electrical Distr	1130507		1130507	623927	1754434	263165	2017599
DCS	1097877		1097877	605918	1703795	255569	1959365
HP	3103989		3103989	1713092	4817081	722562	5539643
Tubes, Plugs, etc.	22992646	1365533	24358179	13443279	37801459	7560292	45361751
Procurement	53,266,600	1,365,533	54,632,133	30,151,474	84,783,608	14,607,614	99,391,222
Site Prep	410944	82600	493544	272387	765931	191483	957414
Load-in/load-out Concr	1689606	339611	2029217	1119925	3149142	629828	3778970
Load-in/load-out Struct	2593833	521360	3115193	1719275	4834469	966894	5801362
Overpack pit	427617	85951	513568	283438	797006	199252	996258
Special Equip	162278	32618	194896	107563	302459	45369	347828
Mud Mat& Slab	2912042	585320	3497363	1930195	5427557	1085511	6513069
Insul Concrete	3955496	795055	4750550	2621829	7372379	1474476	8846855
Ext Vault Walls	3196189	642434	3838623	2118536	5957159	893574	6850733
Int Vault Walls	1692531	340199	2032730	1121864	3154593	473189	3627782
Vault Iso Walls	217566	43731	261296	144209	405506	60826	466332
Vault Rebar	470378	94546	564924	311782	876706	131506	1008212
Oper Deck	8687106	2246108	10933214	6034041	16967255	3393451	20360706
Deck Embed Install	4438693	111988	4550681	2511521	7062202	1412440	8474642
Vault Superstruct	9642922	572693	10215615	5637998	15853613	3170723	19024335
Special Equip	36405	7317	43722	24130	67853	13571	81423
Support Bldg Concrete	389769	78344	468113	258351	726464	145293	871757
Support Bldg Superstru	4701029	944907	5645936	3115992	8761928	1752386	10514313
Site Work	718905	144500	863405	476513	1339918	334979	1674897
Temp Power	10500	2111	12611	6960	19570	3914	23484
Admin Bldg	793686	159531	953217	526080	1479297	369824	1849122
Maint Bldg	619725	124565	744290	410773	1155063	288766	1443829
Constuct Probates	1780742	357929	2138671	1180333	3319004	663801	3982804
Construction	49,547,961	8,313,417	57,861,378	31,933,695	89,795,073	17,701,054	107,496,127
Total	102,814,562	9,678,950	112,493,512	62,085,169	174,578,681	32,308,668	206,887,350

Notes:

1. Mod1 cost estimate is based on Module 1 cost estimate as reflected in the multi-year work plan.
2. Adders are 20.1% of construction estimate and 5.9% of procurement estimate.
3. Escalation is 55.19% of direct.
4. Contingency applied to each item is identical to that applied in the Module 1 estimate.

RPP-6970 REV 0

Mod*	Mod1	Reduction	Reduction	Adjusted
	Estimate	Factor	Allowance	Estimate
Special Equip	12954029	1.000	0	12954029
Onsite Transport Equip	11813976	1.000	0	11813976
HVAC	173576	1.000	0	173576
Electrical Distr	1130507	1.000	0	1130507
DCS	1097877	1.000	0	1097877
HP	3103989	1.000	0	3103989
Tubes, Plugs, etc.	36612494	0.628	0	22992646
Procurement				
Site Prep	654370	0.628	0	410944
Load-in/load-out Concr	1689606	1.000	0	1689606
Load-in/load-out Struct	2593833	1.000	0	2593833
Overpack pit	427617	1.000	0	427617
Special Equip	162278	1.000	0	162278
Mud Mat& Slab	4637010	0.628	0	2912042
Insul Concrete	6298560	0.628	0	3955496
Ext Vault Walls	5089473	0.628	0	3196189
Int Vault Walls	2695113	0.628	0	1692531
Vault Iso Walls	346442	0.628	0	217566
Vault Rebar	749010	0.628	0	470378
Oper Deck	13832971	0.628	0	8687106
Deck Embed Install	7067982	0.628	0	4438693
Vault Superstruct	15354971	0.628	0	9642922
Special Equip	36405	1.000	0	36405
Support Bldg Concrete	389769	1.000	0	389769
Support Bldg Superstru	4701029	1.000	0	4701029
Site Work	1144753	0.628	0	718905
Temp Power	10500	1.000	0	10500
Admin Bldg	793686	1.000	0	793686
Maint Bldg	619725	1.000	0	619725
Constuct Probates	1780742	1.000	0	1780742
Construction				
Total				

RPP-6970 REV 0

Mod**	08/30/00						
	Estimate	Adders	Direct	Escalation	SubTot	Contingency	Total
Special Equip	6477015		6477015	3574664	10051679	1507752	11559431
Onsite Transport Equip	0		0	0	0	0	0
HVAC	173576		173576	95797	269373	40406	309778
Electrical Distr	1130507		1130507	623927	1754434	263165	2017599
DCS	1097877		1097877	605918	1703795	255569	1959365
HP	3103989		3103989	1713092	4817081	722562	5539643
Tubes, Plugs, etc.	14608385	867592	15475977	8541192	24017169	4803434	28820603
Procurement	26,591,349	867,592	27,458,941	15,154,589	42,613,530	7,592,888	50,206,418
Site Prep	261094	52480	313573	173061	486635	121659	608293
Load-in/load-out Concr	844803	169805	1014608	559962	1574571	314914	1889485
Load-in/load-out Struct	1296917	260680	1557597	859638	2417234	483447	2900681
Overpack pit	213809	42976	256784	141719	398503	99626	498129
Special Equip	81139	16309	97448	53782	151229	22684	173914
Mud Mat& Slab	1850167	371884	2222051	1226350	3448400	689680	4138080
Insul Concrete	2513125	505138	3018264	1665780	4684043	936809	5620852
Ext Vault Walls	2030700	408171	2438870	1346013	3784883	567732	4352615
Int Vault Walls	1075350	216145	1291495	712776	2004272	300641	2304913
Vault Iso Walls	138230	27784	166015	91623	257638	38646	296284
Vault Rebar	298855	60070	358925	198091	557015	83552	640568
Oper Deck	5519355	1609390	7128746	3934355	11063101	2212620	13275721
Deck Embed Install	2820125	71152	2891277	1595696	4486972	897394	5384367
Vault Superstruct	6126633	363861	6490494	3582104	10072598	2014520	12087118
Special Equip	18203	3659	21861	12065	33926	6785	40712
Support Bldg Concrete	389769	78344	468113	258351	726464	145293	871757
Support Bldg Superstru	4701029	944907	5645936	3115992	8761928	1752386	10514313
Site Work	456756	91808	548564	302753	851317	212829	1064147
Temp Power	10500	2111	12611	6960	19570	3914	23484
Admin Bldg	793686	159531	953217	526080	1479297	369824	1849122
Maint Bldg	619725	124565	744290	410773	1155063	288766	1443829
Constuct Probates	1780742	357929	2138671	1180333	3319004	663801	3982804
Construction	33,840,712	5,938,697	39,779,409	21,954,256	61,733,665	12,227,522	73,961,187
Total	60,432,060	6,806,289	67,238,350	37,108,845	104,347,195	19,820,410	124,167,605

Notes:

1. Mod1 cost estimate is based on Module 1 cost estimate as reflected in the multi-year work plan.
2. Adders are 20.1% of construction estimate and 5.9% of procurement estimate.
3. Escalation is 55.19% of direct.
4. Contingency applied to each item is identical to that applied in the Module 1 estimate.

RPP-6970 REV 0

Mod**	Mod1 Estimate	Reduction Factor	Reduction Allowance	Adjusted Estimate
Special Equip	12954029	0.500	0	6477015
Onsite Transport Equip	11813976	0.000	0	0
HVAC	173576	1.000	0	173576
Electrical Distr	1130507	1.000	0	1130507
DCS	1097877	1.000	0	1097877
HP	3103989	1.000	0	3103989
Tubes, Plugs, etc.	36612494	0.399	0	14608385
Procurement				
Site Prep	654370	0.399	0	261094
Load-in/load-out Concr	1689606	0.500	0	844803
Load-in/load-out Struct	2593833	0.500	0	1296917
Overpack pit	427617	0.500	0	213809
Special Equip	162278	0.500	0	81139
Mud Mat& Slab	4637010	0.399	0	1850167
Insul Concrete	6298560	0.399	0	2513125
Ext Vault Walls	5089473	0.399	0	2030700
Int Vault Walls	2695113	0.399	0	1075350
Vault Iso Walls	346442	0.399	0	138230
Vault Rebar	749010	0.399	0	298855
Oper Deck	13832971	0.399	0	5519355
Deck Embed Install	7067982	0.399	0	2820125
Vault Superstruct	15354971	0.399	0	6126633
Special Equip	36405	0.500	0	18203
Support Bldg Concrete	389769	1.000	0	389769
Support Bldg Superstru	4701029	1.000	0	4701029
Site Work	1144753	0.399	0	456756
Temp Power	10500	1.000	0	10500
Admin Bldg	793686	1.000	0	793686
Maint Bldg	619725	1.000	0	619725
Constuct Probates	1780742	1.000	0	1780742
Construction				
Total				

COST CODE	DESCRIPTION	ESCALATED TOTAL COST	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
460	IMPROVEMENTS TO LAND	1,900,000	25	470,000	2,370,000
501	BUILDINGS	89,660,000	19	17,320,000	106,980,000
700	SPECIAL EQUIP/PROCESS SYSTEMS (ADJUSTED TO MEET DOE 5100.4)	143,570,000 -30,000	18	26,380,000 30,000	169,950,000 0
PROJECT TOTAL					
		235,100,000	19	44,200,000	279,300,000

TYPE OF ESTIMATE	ROM ESTIMATE	DECEMBER 6, 1996	REMARKS:
ARCHITECT ENGINEER			PROCUREMENT & CONSTRUCTION ONLY MODULE 1
OPERATING CONTRACTOR			
(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)			

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	SUB TOTAL	CONTINGENCY %	TOTAL DOLLARS
460 IMPROVEMENTS TO LAND								
310001	SITE PREP	654370	131528	785898	55.19	433737	25	1524545
370010	SITE WORK	363984	73161	437145	55.19	241260	25	848006
TOTAL 460	IMPROVEMENTS TO LAND	1018354	204689	1223043	55.19	674997	25	2372551
501 BUILDINGS								
320010	STRUCTURE	1689606	339611	2029217	55.19	1119925	20	3778970
321010	STRUCTURE LOAD IN-LOAD OUT	2593833	521361	3115194	55.19	1719275	20	5801363
321020	OVER PACK PIT	78457	15770	94227	55.19	52004	25	182788
330001	VAULT MUD MAT & SLAB	4637010	932039	5569049	55.19	3073558	20	10371129
330010	VAULT INSULATING CONCRETE	6298560	1266011	7564571	55.19	4174887	20	14087348
331010	EXT VAULT WALLS	5089473	1022984	6112457	55.19	3373465	15	1422888
332010	INT VAULT WALLS	2695113	541718	3236831	55.19	1786407	15	5776723
333010	VAULT ISOLATION WALLS	346442	69635	416077	55.19	229633	15	742566
334010	VAULT REBAR	749010	150551	899561	55.19	496468	15	209404
336010	OPERATING DECK	13832971	3280427	17113398	55.19	9444884	20	5311657
339010	STRUCTURE	5268759	1059021	6327780	55.19	3492303	20	1964016
340010	STRUCTURE	389769	78343	468112	55.19	258351	20	145293
341010	STRUCTURE	872633	175399	1048032	55.19	578410	20	1951730
341040	FIRE PROTECTION	57229	11503	68732	55.19	37933	20	21333
370000	BACKFILL	780769	156935	937704	55.19	517519	25	363806
375000	TEMPORARY POWER	10500	2111	12611	55.19	6960	20	23484
380001	ADMINISTRATION BLDG.	793686	159531	953217	55.19	526080	25	369824
381001	MAINTENANCE SHOP	619725	124565	744290	55.19	410773	25	288766
390000	CRAFT TRAINING	273576	54989	328565	55.19	181335	20	101980
390010	CONSTRUCTION PRORATES	610485	122707	733192	55.19	404649	20	227568
TOTAL 501	BUILDINGS	47687606	10085211	57772817	55.19	31884819	19	17315771
700 SPECIAL EQUIP/PROCESS SYSTEMS								
220710	SPECIAL EQUIPMENT	12954029	0	12954029	55.19	7149329	15	3015504
220720	CASK TRANSPORTER EQUIPMENT	11813976	0	11813976	55.19	6520133	15	2750116
240050	HVAC	173576	0	173576	55.19	95797	15	40406
240320	ELECTRICAL DISTRIBUTION	1130507	0	1130507	55.19	623927	15	263165

FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN HANFORD CORP.
JOB NO. Z442SAF1/FOEML5
FILE NO. Z442SAF1

** TEST - INTERACTIVE ESTIMATING **
HIGH LEVEL WASTE STORAGE & DISPOSAL - MODULE 1
ROUGH ORDER OF MAGNITUDE
DOE_R04 - COST CODE ACCOUNT SUMMARY

PAGE 8 OF 12
DATE 12/06/96 08:06:39
BY CDL/BJS

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	SUB TOTAL	CONTINGENCY		TOTAL DOLLARS
							%	TOTAL	
240610	DCS	1097877	0	1097877	55.19	605918	15	255569	1959365
240620	HEALTH PHYSICS SYSTEM	3103989	0	3103989	55.19	1713092	15	722562	5539643
321020	OVER PACK PIT	349160	70181	419341	55.19	231434	25	162694	813469
321710	SPECIAL EQUIPMENT	162278	32617	194895	55.19	107563	15	45368	347827
337010	DECK EMBED INSTALLATION	7067982	178335	7246317	55.19	3999243	20	2249112	13494671
339010	STRUCTURE	46698706	2027329	48726035	55.19	26891898	20	15123587	90741519
339710	SPECIAL EQUIPMENT	36405	7317	43722	55.19	24130	20	13571	81423
341050	HVAC	1318544	265028	1583572	55.19	873973	20	491508	2949053
341320	ELECTRICAL DISTRIBUTION	1282523	257787	1540310	55.19	850098	20	478082	2868489
341410	INSTRUMENT AIR	218383	43895	262278	55.19	144751	20	81406	488435
341490	SANITARY WATER SYSTEM	9878	1986	11864	55.19	6548	20	3683	22093
341500	RAW WATER & FIREWATER	47144	9476	56620	55.19	31249	20	17574	105442
341610	DCS	29268	5883	35151	55.19	19400	20	10910	65461
341620	HEALTH PHYSICS SYSTEM	183407	36865	220272	55.19	121568	20	68368	410208
341650	COMMUNICATIONS	120813	24283	145096	55.19	80079	20	45035	270210
341670	INSTRUMENT & CONTROL	561207	112803	674010	55.19	371986	20	209199	1255195
390995	MOBILIZATION/DEMOLITION	682763	137235	819998	55.19	452557	20	254511	1527067
390999	CONSTRUCTION ACCEPTANCE TESTING	213918	42998	256916	55.19	141792	20	79741	478449
TOTAL 700	SPECIAL EQUIP/PROCESS SYSTEM	89256333	3254018	92510351	55.19	51056465	18	26381671	169948484

PROJECT TOTAL

137,962,293 13,543,918 151,506,211 83,616,281 235,122,488 44,171,952 279,294,439

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APPENDIX B
LIFE-CYCLE COST ESTIMATE

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8/30/00 10:44	CSB Retrofit	FMEF Retrofit		New Construction		Mod1
		Lower	Upper	Lower	Upper	
PRESENT VALUE						
Conceptual Design	0	738	738	789	789	789
Total Project Cost	79,325	44,134	50,029	51,783	92,082	192,151
Active Receipt O&M	7,733	3,638	3,638	3,638	3,599	4,639
Passive Storage O&M	2,888	4,542	4,542	4,542	4,416	4,099
D&D	0	327	327	818	818	818
Total Present Value	89,945	53,378	59,274	61,570	101,704	202,496
Capacity	880	982	982	982	982	2,640
Unit Cost	102	54	60	63	104	77
CONSTANT DOLLAR						
Conceptual Design	0	1,000	1,000	1,000	1,000	1,000
Total Project Cost	103,740	86,561	97,874	100,099	175,481	365,082
Active Receipt O&M	17,125	10,383	10,383	10,383	10,272	13,696
Passive Storage O&M	19,200	33,425	33,425	33,425	32,500	31,200
D&D	0	6,000	6,000	15,000	15,000	15,000
Total Constant Dollar	140,064	137,369	148,682	159,907	234,253	425,978
Capacity	880	982	982	982	982	2,640
Unit Cost	159	140	151	163	239	161

Notes:

1. All costs are in thousands of dollars.
2. Present value indexed to the start of fiscal year 2001.

	Start Year				Duration				Mid-Point Year			
	1		2		1		2		1		2	
	CSB	FMEF	NC	ModI	CSB	FMEF	NC	ModI	CSB	FMEF	NC	ModI
8/29/00 10:29												
Conceptual Design	0.00	4.00	3.00	3.00	0.00	1.00	1.00	1.00	0.00	4.50	3.50	3.50
Engineering												
Preliminary Design	0.75	6.75	5.75	5.75	1.25	1.00	1.50	1.50	1.38	7.25	6.50	6.50
Detail Design	2.25	7.75	7.25	7.25	1.50	1.75	2.00	2.00	3.00	8.63	8.25	8.25
Title III	2.25	8.75	8.25	8.25	4.25	4.00	4.75	4.75	4.38	10.75	10.63	10.63
Procurement	2.25	8.75	8.25	8.25	3.25	1.75	1.75	1.75	3.88	9.63	9.13	9.13
Construction	3.75	9.25	8.75	8.75	2.75	1.75	2.50	2.50	5.13	10.13	10.00	10.00
Other Project Cost	0.00	6.75	5.75	5.75	7.50	9.00	10.00	10.00	3.75	11.25	10.75	10.75
Operating Period												
(Active Receipt)	9.25	14.00	14.00	14.00	5.00	3.00	3.00	4.00	11.75	15.50	15.50	16.00
Operating Period												
(Passive Storage)	14.00	17.00	17.00	18.00	28.00	25.00	25.00	24.00	28.00	29.50	29.50	30.00
D&D	42.00	42.00	42.00	42.00	2.00	2.00	2.00	2.00	43.00	43.00	43.00	43.00
Discount Rate									7%	7%	7%	7%

	1		2		
CSB	FMEF Retrofit	New Const	Mod1		
	Lower	Upper	Lower	Upper	
INITIAL COST¹					
Conceptual Design	0	1,000	1,000	1,000	1,000
Engineering	16,140	11,436	13,523	14,849	56,819
Preliminary Design	4,519	3,202	3,786	4,158	15,909
Detail Design	5,165	3,659	4,327	4,752	18,182
Title III	6,456	4,574	5,409	5,940	22,728
Procurement	36,970	41,286	48,552	11,326	124,884
Construction	22,330	15,892	17,443	37,967	149,087
Infrastructure	0	0	0	10,104	10,122
Other Project Cost	28,300	17,947	18,356	25,853	24,169
Total Project Cost	103,740	86,561	97,874	100,099	365,082
ANNUAL COST					
O&M (Active Receipt)	3,424	3,424	3,424	3,424	3,424
Electrical (Active Receipt)	1	37	37	0	0
Active Receipt Total	3,425	3,461	3,461	3,424	3,424
O&M (Passive Storage)	685	1,300	1,300	1,300	1,300
Electrical (Passive Storage)	1	37	37	0	0
Passive Storage Total	686	1,337	1,337	1,300	1,300
D&D	0	6,000	6,000	15,000	15,000

Notes:

1. All costs are in thousands of dollars.
2. Initial costs are fully burdened (i.e., includes prorated escalation, contingency, site allocation, and project integration).
3. Mod1 represents module 1 as reflected in the multi-year work plan.

	CSB	1		2	
		FMEF Retrofit		New Const	
PRESENT VALUE		Lower	Upper	Lower	Upper
Conceptual Design	0	738	738	789	789
Engineering	13,136	6,212	7,346	8,292	14,715
Preliminary Design	4,118	1,961	2,318	2,678	4,753
Detail Design	4,216	2,042	2,414	2,719	4,825
Title III	4,802	2,210	2,614	2,894	5,136
Procurement	28,444	21,527	25,316	6,109	26,791
Construction	15,787	8,011	8,792	19,301	36,580
Infrastructure	0	0	0	5,590	5,602
Other Project Cost	21,958	8,384	8,574	12,492	8,395
Total Project Cost	79,325	44,134	50,029	51,783	92,082
Initial Cost	79,325	44,871	50,766	52,572	92,871
Active Receipt O&M	7,733	3,638	3,638	3,638	3,599
Passive Storage O&M	2,888	4,542	4,542	4,542	4,416
D&D	0	327	327	818	818
Total Present Value	89,945	53,378	59,274	61,570	101,704
Capacity	880	982	982	982	982
Unit Cost	102	54	60	63	104

	CSB	1		2		Mod1
		FMEF Retrofit Lower	Upper	New Const Lower	Upper	
CONSTANT DOLLAR						
Conceptual Design	0	1,000	1,000	1,000	1,000	1,000
Total Project Cost	103,740	86,561	97,874	100,099	175,481	365,082
Active Receipt O&M	17,125	10,383	10,383	10,383	10,272	13,696
Passive Storage O&M	19,200	33,425	33,425	33,425	32,500	31,200
D&D	0	6,000	6,000	15,000	15,000	15,000
Total Constant Dollar	140,064	137,369	148,682	159,907	234,253	425,978
Capacity	880	982	982	982	982	2,640
Unit Cost	159	140	151	163	239	161

APPENDIX C
PROJECT EXPENDITURE PROFILE

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Element	FMEF Stand alone	FMEF & Mod* ³ Staggered	FMEF & Mod* ⁴ Staggered	FMEF & Mod* Parallel	Mod1 Stand alone	FMEF & Mod1 Staggered
Capacity	982	2,640	2,640	2,640	2,640	3,622
Total project cost	97,874	375,007	375,007	375,007	365,082	462,955
Unit total project cost	100	142	142	142	138	128
Present value cost	67,906	222,366	224,300	244,296	235,162	270,859
Unit present value cost	69	84	85	93	89	75

Notes:

1. All costs are in thousands of dollars.
2. Present value indexed to the start of conceptual design.
3. FMEF construction completed before Mod* procurement initiated.
4. FMEF procurement completed before Mod* procurement initiated.

Expenditure Profile

Expenditure Profile

Conceptual Design
Engineering

Conceptual Design
 Engineering
 Procurement
 Construction
 Project Integration
 Other Project Costs

Total

Expenditure Profile
Year

Year

FMEF Standalone
FMEF

MEF/Mod* Staggered
MEF/Mod* Staggered
MEF/Mod* Parallel

C-6

Year

EMEF Standard

MEF/Mod* S*

MEF/Mod* Stagger

MEF/Mod* Pass.11.

parallel

(IEF/Mod1 Staggered

Notes:

1. All costs are in thousands of dollars.
2. Present value indexed to 1990.
3. Present value indexed to 1990.

3. Project costs are fully burdened (i.e., including project integration).

4. FMEF (Finite Element Method for Error Estimation).

5. FMEFF procurement completed before Mod* procurement initiated

procurement initiated.
completed before Mod* program.

Procurement initiated.

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Conceptual Design
Engineering
Procurement
Construction
Project Integration
Other Project Costs

Total

Expenditure Profile

Year	10	11	12	13	14	Total
FMEF Standalone	337	0	0	0	0	98,874
FMEF/Mod* Staggered	46,152	28,066	2,485	1,742	0	377,007
FMEF/Mod* Staggered	43,548	28,066	2,485	1,742	0	377,007
FMEF/Mod* Parallel	4,346	1,731	0	0	0	377,007
Mod1 Standalone	2,859	1,987	0	0	0	366,081
FMEF/Mod1 Staggered	63,023	38,370	2,857	2,003	0	464,955
Present Value						
Year	10	11	12	13	14	Total
FMEF Standalone	171	0	0	0	0	67,906
FMEF/Mod* Staggered	23,462	13,334	1,103	723	0	222,366
FMEF/Mod* Staggered	22,138	13,334	1,103	723	0	224,300
FMEF/Mod* Parallel	2,209	822	0	0	0	244,296
Mod1	1,453	944	0	0	0	235,162
FMEF/Mod1 Staggered	32,038	18,229	1,269	831	0	270,859

Notes:

1. All costs are in thousands
2. Present value indexed to th
3. Project costs are fully burd and project integration).
4. FMEF construction compl
5. FMEF procurement compl

Project Sequence

ID	Task Name	Cost	Details	'00	'01	'02	'03	'04	'05	'06	'07
1	2nd/3rd Generation	\$377,007.00	Cost	\$500.00	\$500.00	\$631.58	\$5,823.72	\$7,218.62	\$39,645.46	\$52,382.46	\$25,332.61
2	FMEF Retrofit	\$98,874.00	Cost	\$500.00	\$500.00		\$5,455.30	\$7,218.62	\$29,038.60	\$38,524.25	\$11,421.10
3	Project Definit	\$1,000.00	Cost	\$500.00	\$500.00						
4	Conceptu	\$1,000.00	Cost	\$500.00	\$500.00						
5	Funding A	\$0.00	Cost								
6	Project Execu	\$97,874.00	Cost				\$5,455.30	\$7,218.62	\$29,038.60	\$38,524.25	\$11,421.10
7	Design	\$13,523.00	Cost				\$3,432.76	\$4,542.34	\$4,507.67	\$1,040.23	
8	Procurem	\$48,552.00	Cost						\$21,875.08	\$26,676.92	
9	Constructi	\$17,443.00	Cost							\$8,151.25	\$8,755.04
10	Startup	\$0.00	Cost								
11	Project Int	\$2,969.00	Cost				\$327.14	\$432.88	\$429.57	\$429.57	\$431.22
12	Other Proj	\$15,387.00	Cost				\$1,895.40	\$2,243.40	\$2,226.28	\$2,226.28	\$2,234.84
13	Operations	\$0.00	Cost								
14	New Construction	\$278,133.00	Cost			\$631.58	\$368.42		\$10,606.86	\$13,858.21	\$13,911.51
15	Project Definit	\$1,000.00	Cost			\$631.58	\$368.42				
16	Conceptu	\$1,000.00	Cost			\$631.58	\$368.42				
17	Funding A	\$0.00	Cost								
18	Project Execu	\$277,133.00	Cost						\$10,606.86	\$13,858.21	\$13,911.51
19	Design	\$42,685.00	Cost						\$8,712.12	\$11,382.67	\$11,426.45
20	Procurem	\$98,736.00	Cost								
21	Constructi	\$114,689.00	Cost								
22	Startup	\$0.00	Cost								
23	Project Int	\$9,523.00	Cost						\$858.28	\$1,121.37	\$1,125.68
24	Other Proj	\$11,500.00	Cost						\$1,036.46	\$1,354.17	\$1,359.38
25	Operations	\$0.00	Cost								

Project Sequence

ID	Task Name	Details	'08	'09	'10	'11	'12	'13	'14	'15	'16
1	2nd/3rd Generation	Cost	\$64,011.66	\$102,514.99	\$46,152.48	\$28,066.01	\$2,485.06	\$1,742.40			
2	FMEF Retrofit	Cost	\$3,212.99	\$2,666.06	\$337.09						
3	Project Definit	Cost									
4	Conceptu	Cost									
5	Funding A	Cost									
6	Project Execu	Cost	\$3,212.99	\$2,666.06	\$337.09						
7	Design	Cost									
8	Procurem	Cost									
9	Constructi	Cost	\$536.71								
10	Startup	Cost									
11	Project Int	Cost	\$432.88	\$431.22	\$54.52						
12	Other Proj	Cost	\$2,243.40	\$2,234.84	\$282.57						
13	Operations	Cost									
14	New Construction	Cost	\$60,798.67	\$99,848.93	\$45,815.39	\$28,066.01	\$2,485.06	\$1,742.40			
15	Project Definit	Cost									
16	Conceptu	Cost									
17	Funding A	Cost									
18	Project Execu	Cost	\$60,798.67	\$99,848.93	\$45,815.39	\$28,066.01	\$2,485.06	\$1,742.40			
19	Design	Cost	\$11,163.77								
20	Procurem	Cost	\$39,494.40	\$56,637.57	\$2,604.03						
21	Constructi	Cost	\$7,645.93	\$40,726.30	\$40,726.30	\$25,590.47					
22	Startup	Cost									
23	Project Int	Cost	\$1,129.99	\$1,125.68	\$1,125.68	\$1,121.37	\$1,125.68	\$789.27			
24	Other Proj	Cost	\$1,364.58	\$1,359.38	\$1,359.38	\$1,354.17	\$1,359.38	\$953.13			
25	Operations	Cost

FMEF/Mod* Staggered

ID	Task Name	Cost	Details	'00	'01	'02	'03	'04	'05	'06	'07
1	2nd/3rd Generation	\$377,007.00	Cost	\$500.00	\$1,131.58	\$368.42	\$5,455.30	\$17,878.78	\$42,896.81	\$52,382.46	\$77,418.31
2	FMEF Retrofit	\$98,874.00	Cost	\$500.00	\$500.00		\$5,455.30	\$7,218.62	\$29,038.60	\$38,524.25	\$11,421.10
3	Project Definit	\$1,000.00	Cost	\$500.00	\$500.00						
4	Conceptu	\$1,000.00	Cost	\$500.00	\$500.00						
5	Funding A	\$0.00	Cost								
6	Project Execu	\$97,874.00	Cost				\$5,455.30	\$7,218.62	\$29,038.60	\$38,524.25	\$11,421.10
7	Design	\$13,523.00	Cost				\$3,432.76	\$4,542.34	\$4,507.67	\$1,040.23	
8	Procurem	\$46,552.00	Cost						\$21,875.08	\$26,676.92	
9	Constructi	\$17,443.00	Cost							\$8,151.25	\$8,755.04
10	Startup	\$0.00	Cost								
11	Project Int	\$2,969.00	Cost				\$327.14	\$432.88	\$429.57	\$429.57	\$431.22
12	Other Proj	\$15,387.00	Cost				\$1,995.40	\$2,243.40	\$2,226.28	\$2,226.28	\$2,234.84
13	Operations	\$0.00	Cost								
14	New Construction	\$278,133.00	Cost		\$631.58	\$368.42		\$10,660.16	\$13,858.21	\$13,858.21	\$65,997.21
15	Project Definit	\$1,000.00	Cost		\$631.58	\$368.42					
16	Conceptu	\$1,000.00	Cost		\$631.58	\$368.42					
17	Funding A	\$0.00	Cost								
18	Project Execu	\$277,133.00	Cost					\$10,660.16	\$13,858.21	\$13,858.21	\$65,997.21
19	Design	\$42,685.00	Cost					\$8,755.90	\$11,382.67	\$11,382.67	\$11,163.77
20	Procurem	\$98,736.00	Cost								\$44,702.45
21	Constructi	\$114,689.00	Cost								\$7,645.93
22	Startup	\$0.00	Cost								
23	Project Int	\$9,523.00	Cost					\$862.59	\$1,121.37	\$1,121.37	\$1,125.68
24	Other Proj	\$11,500.00	Cost					\$1,041.67	\$1,354.17	\$1,354.17	\$1,359.38
25	Operations	\$0.00	Cost								

FMEF/Mod* Staggered

ID	Task Name	Details	'08	'09	'10	'11	'12	'13	'14	'15	'16
1	2nd/3rd Generation	Cost	\$100,623.45	\$45,877.42	\$28,256.58	\$2,475.54	\$1,742.40				
2	FMEF Retrofit	Cost	\$3,212.99	\$2,666.06	\$337.09						
3	Project Definit	Cost									
4	Conceptu	Cost									
5	Funding A	Cost									
6	Project Execu	Cost	\$3,212.99	\$2,666.06	\$337.09						
7	Design	Cost									
8	Procurem	Cost									
9	Constructi	Cost	\$536.71								
10	Startup	Cost									
11	Project Int	Cost	\$432.88	\$431.22	\$54.52						
12	Other Proj	Cost	\$2,243.40	\$2,234.84	\$282.57						
13	Operations	Cost									
14	New Construction	Cost	\$97,410.46	\$43,211.36	\$27,919.49	\$2,475.54	\$1,742.40				
15	Project Definit	Cost									
16	Conceptu	Cost									
17	Funding A	Cost									
18	Project Execu	Cost	\$97,410.46	\$43,211.36	\$27,919.49	\$2,475.54	\$1,742.40				
19	Design	Cost									
20	Procurem	Cost	\$54,033.55								
21	Constructi	Cost	\$40,882.34	\$40,726.30	\$25,434.43						
22	Startup	Cost									
23	Project Int	Cost	\$1,129.99	\$1,125.68	\$1,125.68	\$1,121.37	\$789.27				
24	Other Proj	Cost	\$1,364.58	\$1,359.38	\$1,359.38	\$1,354.17	\$953.13				
25	Operations	Cost

Project Sequence

ID	Task Name	Cost	Details	'00	'01	'02	'03	'04	'05	'06	'07
1	2nd/3rd Generation	\$377,007.00	Cost	\$1,000.00	\$1,000.00		\$11,904.77	\$21,184.96	\$42,189.03	\$114,917.35	\$96,591.63
2	FMEF Retrofit	\$98,874.00	Cost	\$500.00	\$500.00		\$1,350.05	\$7,218.62	\$13,139.15	\$37,210.02	\$26,253.47
3	Project Definit	\$1,000.00	Cost	\$500.00	\$500.00						
4	Conceptu	\$1,000.00	Cost	\$500.00	\$500.00						
5	Funding A	\$0.00	Cost								
6	Project Execu	\$97,874.00	Cost				\$1,350.05	\$7,218.62	\$13,139.15	\$37,210.02	\$26,253.47
7	Design	\$13,523.00	Cost				\$949.52	\$4,542.34	\$4,507.67	\$3,623.47	
8	Procurem	\$48,552.00	Cost						\$5,975.63	\$27,744.00	\$14,832.37
9	Constructi	\$17,443.00	Cost							\$3,186.70	\$8,755.04
10	Startup	\$0.00	Cost								
11	Project Int	\$2,969.00	Cost				\$80.96	\$432.88	\$429.57	\$429.57	\$431.22
12	Other Proj	\$15,387.00	Cost				\$419.57	\$2,243.40	\$2,226.28	\$2,226.28	\$2,234.84
13	Operations	\$0.00	Cost								
14	New Construction	\$278,133.00	Cost	\$500.00	\$500.00		\$10,554.72	\$13,966.34	\$29,049.88	\$77,707.33	\$70,338.16
15	Project Definit	\$1,000.00	Cost	\$500.00	\$500.00						
16	Conceptu	\$1,000.00	Cost	\$500.00	\$500.00						
17	Funding A	\$0.00	Cost								
18	Project Execu	\$277,133.00	Cost				\$10,554.72	\$13,966.34	\$29,049.88	\$77,707.33	\$70,338.16
19	Design	\$42,685.00	Cost				\$8,668.34	\$11,470.23	\$11,382.67	\$11,163.77	\$27,125.27
20	Procurem	\$98,736.00	Cost						\$15,190.15	\$56,420.57	\$40,726.30
21	Constructi	\$114,689.00	Cost							\$7,645.93	
22	Startup	\$0.00	Cost								
23	Project Int	\$9,523.00	Cost				\$855.13	\$1,131.53	\$1,122.89	\$1,122.89	\$1,127.21
24	Other Proj	\$11,500.00	Cost				\$1,031.25	\$1,364.58	\$1,354.17	\$1,354.17	\$1,359.38
25	Operations	\$0.00	Cost								

Project Sequence

ID	Task Name	Details	'08	'09	'10	'11	'12	'13	'14	'15	'16
1	2nd/3rd Generation	Cost	\$51,555.98	\$30,587.08	\$4,345.68	\$1,730.52					
2	FMEF Retrofit	Cost	\$8,177.53	\$2,666.06	\$1,859.09						
3	Project Definit	Cost									
4	Conceptu	Cost									
5	Funding A	Cost									
6	Project Execu	Cost	\$8,177.53	\$2,666.06	\$1,859.09						
7	Design	Cost									
8	Procurem	Cost									
9	Constructi	Cost	\$5,501.25								
10	Startup	Cost									
11	Project Int	Cost	\$432.88	\$431.22	\$300.70						
12	Other Proj	Cost	\$2,243.40	\$2,234.84	\$1,558.39						
13	Operations	Cost									
14	New Construction	Cost	\$43,378.45	\$27,921.02	\$2,486.59	\$1,730.52					
15	Project Definit	Cost									
16	Conceptu	Cost									
17	Funding A	Cost									
18	Project Execu	Cost	\$43,378.45	\$27,921.02	\$2,486.59	\$1,730.52					
19	Design	Cost									
20	Procurem	Cost									
21	Constructi	Cost	\$40,882.34	\$25,434.43							
22	Startup	Cost									
23	Project Int	Cost	\$1,131.53	\$1,127.21	\$1,127.21	\$777.39					
24	Other Proj	Cost	\$1,364.58	\$1,359.38	\$1,359.38	\$953.13					
25	Operations	Cost

Project Sequence

ID	Task Name	Cost	Details	'00	'01	'02	'03	'04	'05	'06	'07
1	New Construction	\$366,081.00	Cost	\$500.00	\$500.00		\$13,707.50	\$18,138.21	\$37,212.67	\$99,684.59	\$93,703.21
2	Project Definition	\$1,000.00	Cost	\$500.00	\$500.00						
3	Conceptual De	\$1,000.00	Cost	\$500.00	\$500.00						
4	Funding Author	\$0.00	Cost								
5	Project Execution	\$365,081.00	Cost				\$13,707.50	\$18,138.21	\$37,212.67	\$99,684.59	\$93,703.21
6	Design	\$56,819.00	Cost				\$11,538.63	\$15,268.29	\$15,151.73	\$14,860.35	
7	Procurement	\$124,884.00	Cost						\$19,212.92	\$71,362.29	\$34,308.79
8	Construction	\$159,209.00	Cost							\$10,613.93	\$56,535.44
9	Startup	\$0.00	Cost								
10	Project Integrat	\$12,669.00	Cost				\$1,137.62	\$1,505.34	\$1,493.85	\$1,493.85	\$1,499.60
11	Other Project C	\$11,500.00	Cost				\$1,031.25	\$1,364.58	\$1,354.17	\$1,354.17	\$1,359.38
12	Operations	\$0.00	Cost								

Project Sequence

ID	Task Name	Details	'08	'09	'10	'11	'12	'13	'14	'15	'16
1	New Construction	Cost	\$59,621.97	\$38,166.55	\$2,858.98	\$1,987.33					
2	Project Definition	Cost									
3	Conceptual De	Cost									
4	Funding Author	Cost									
5	Project Execution	Cost	\$59,621.97	\$38,166.55	\$2,858.98	\$1,987.33					
6	Design	Cost									
7	Procurement	Cost									
8	Construction	Cost	\$56,752.05	\$35,307.57							
9	Startup	Cost									
10	Project Integrat	Cost	\$1,505.34	\$1,499.60	\$1,499.60	\$1,034.20					
11	Other Project C	Cost	\$1,364.58	\$1,359.38	\$1,359.38	\$953.13					
12	Operations	Cost

Project Sequence

ID	Task Name	Cost	Details	'00	'01	'02	'03	'04	'05	'06	'07
1	2nd/3rd Generation	\$464,955.00	Cost	\$500.00	\$500.00	\$631.58	\$5,823.72	\$7,218.62	\$42,813.78	\$56,521.97	\$29,488.05
2	FMEF Retrofit	\$98,874.00	Cost	\$500.00	\$500.00		\$5,455.30	\$7,218.62	\$29,038.60	\$38,524.25	\$11,421.10
3	Project Definit	\$1,000.00	Cost	\$500.00	\$500.00						
4	Conceptu	\$1,000.00	Cost	\$500.00	\$500.00						
5	Funding A	\$0.00	Cost								
6	Project Execu	\$97,874.00	Cost								
7	Design	\$13,523.00	Cost								
8	Procurem	\$48,552.00	Cost								
9	Constructi	\$17,443.00	Cost								
10	Startup	\$0.00	Cost								
11	Project Int	\$2,969.00	Cost								
12	Other Proj	\$15,387.00	Cost								
13	Operations	\$0.00	Cost								
14	New Construction	\$366,081.00	Cost								
15	Project Definit	\$1,000.00	Cost			\$631.58	\$368.42		\$13,775.18	\$17,997.72	\$18,066.95
16	Conceptu	\$1,000.00	Cost			\$631.58	\$368.42				
17	Funding A	\$0.00	Cost								
18	Project Execu	\$365,081.00	Cost								
19	Design	\$56,819.00	Cost								
20	Procurem	\$124,884.00	Cost								
21	Constructi	\$159,209.00	Cost								
22	Startup	\$0.00	Cost								
23	Project Int	\$12,669.00	Cost								
24	Other Proj	\$11,500.00	Cost								
25	Operations	\$0.00	Cost								
									\$1,141.82	\$1,491.82	\$1,497.56
									\$1,036.46	\$1,354.17	\$1,359.38

Project Sequence

ID	Task Name	Details	'08	'09	'10	'11	'12	'13	'14	'15	'16
1	2nd/3rd Generation	Cost	\$81,508.75	\$133,695.20	\$63,023.11	\$38,370.18	\$2,856.94	\$2,003.14			
2	FMEF Retrofit	Cost	\$3,212.99	\$2,666.06	\$337.09						
3	Project Definit	Cost									
4	Conceptu	Cost									
5	Funding A	Cost									
6	Project Execu	Cost	\$3,212.99	\$2,666.06	\$337.09						
7	Design	Cost									
8	Procurem	Cost									
9	Construct	Cost	\$536.71								
10	Startup	Cost									
11	Project Int	Cost	\$432.88	\$431.22	\$54.52						
12	Other Proj	Cost	\$2,243.40	\$2,234.84	\$282.57						
13	Operations	Cost									
14	New Construction	Cost	\$78,295.76	\$131,029.14	\$62,686.02	\$38,370.18	\$2,856.94	\$2,003.14			
15	Project Definit	Cost									
16	Conceptu	Cost									
17	Funding A	Cost									
18	Project Execu	Cost	\$78,295.76	\$131,029.14	\$62,686.02	\$38,370.18	\$2,856.94	\$2,003.14			
19	Design	Cost	\$14,860.35								
20	Procurem	Cost	\$49,953.60	\$71,636.76	\$3,293.64						
21	Construct	Cost	\$10,613.93	\$56,535.44	\$56,535.44	\$35,524.19					
22	Startup	Cost									
23	Project Int	Cost	\$1,503.30	\$1,497.56	\$1,497.56	\$1,491.82	\$1,497.56	\$1,050.01			
24	Other Proj	Cost	\$1,364.58	\$1,359.38	\$1,359.38	\$1,354.17	\$1,359.38	\$953.13			
25	Operations	Cost									

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