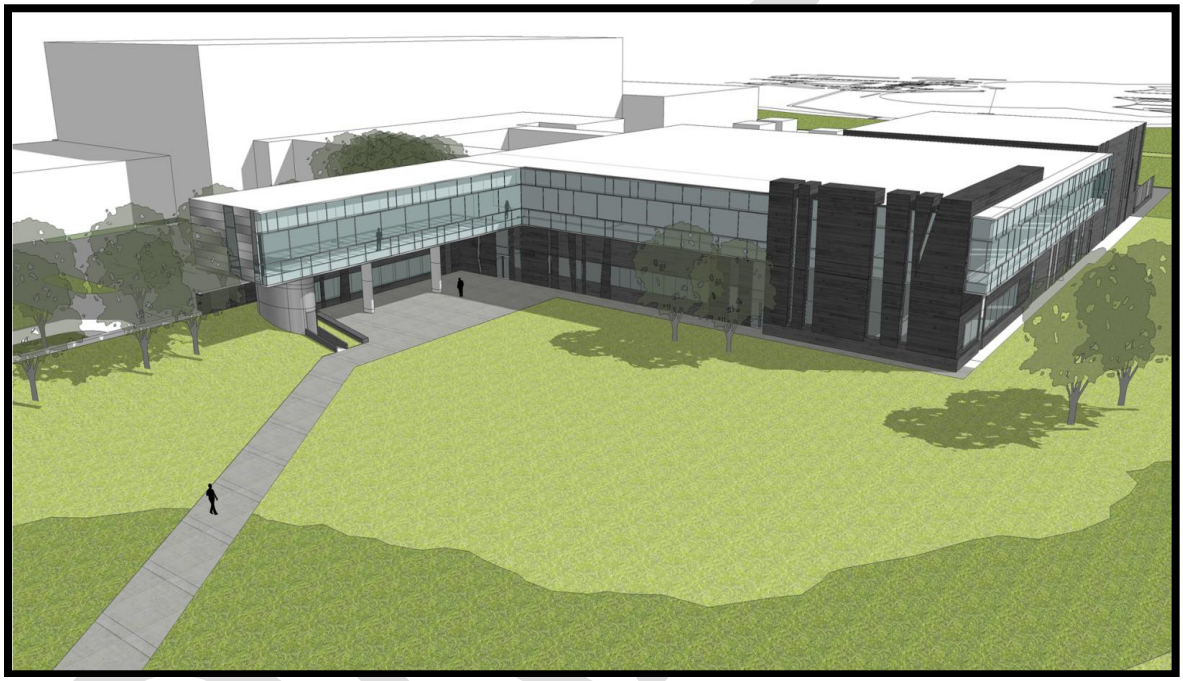
Jefferson Science Associates, LLC



Project Closeout Report

Technology and Engineering Development Facility

At

Thomas Jefferson National Accelerator Facility
January 2012

Draft Project Closeout Report
Technology and Engineering Development Facility (TEDF)
Thomas Jefferson National Accelerator Facility

Submitted by:

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ACRONYMS

BORE	Beneficial Occupancy Readiness Evaluation
CD	Critical Decision
CX	Categorical Exclusion
DOE	U.S. Department of Energy
EAC	Estimate at Complete
EDIA	Engineering, Design, Inspection and Acceptance
ES&H	Environment, Safety & Health
FPD	Federal Project Director
GC	General Contractor
gsf	gross square feet
IPT	Integrated Project Team
ISM	Integrated Safety Management
JSA	Jefferson Science Associates
KPP	Key Performance Parameters
PEP	Project Execution Plan
SC	DOE Office of Science
SCMS	DOE Office of Science Management System
TEDF	Technology and Engineering Development Facility
TJNAF	Thomas Jefferson National Accelerator Facility
TJSO	Thomas Jefferson Site Office
TPC	Total Project Cost

EXECUTIVE SUMMARY

The goal of the Technology Engineering Development Facility (TEDF) project was to design, construct and commission a new 65,000 to 80,000 square foot Technology and Engineering Development (TED) building, a new 25,000 to 40,000 square foot addition to the Test Lab (TLA), and renovation of the existing Test Lab building (approximately 90,000 gsf). The project also included demolition of 7,000 to 10,000 gsf of inadequate and obsolete in and adjacent to the Test Lab building and 2,000 to 12,000 gsf of dilapidated trailers. Key requirements for CD-4a will be completed by March 2012. The requirements for CD-4a were not only met but exceeded with construction of a 71,000 gsf TED building and 45,000 gsf TLA. The project expects to obtain CD-4B by March 2013 which is 12 months ahead of schedule with an EAC of $73.1M.

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INTRODUCTION

This Draft Project Closeout Report for the Technologies and Engineering Development Facility Project at Thomas Jefferson National Accelerator Facility (TJNAF) was developed in support of approval of Critical Decision (CD)-4a "Approve Start of Operations – New Construction. This document was completed in January 2012. This draft report will be updated in support of CD-4b scheduled for March 2014. The Initial Closeout Report is due within 90 days of CD-**4B** approval and the Final is due after all financial and contract closeout is complete.

Per the Project Execution Plan, this project was managed in accordance with the principles in Department of Energy (DOE) Order 413.3A "*Program and Project Management for the Acquisition of Capital Assets*" as defined in the approved Project Execution Plan and the management systems and subject areas contained in the DOE Office of Science (SC) Management System (SCMS).

ACQUISITION APPROACH

DOE acquired the project through the M&O contractor Jefferson Science Associates (JSA) who had the ultimate responsibility to successfully execute the project. JSA hired Ewing Cole Architects-Engineers through full and open procurement to prepare construction plans and specifications for the project.

Construction was also based on full and open competition to pre-qualify offerors using a fixed price contract.

Miscellaneous equipment was purchased by JSA for outfitting of the project.

Commissioning of mechanical systems was performed by Cornerstone Commissioning under contract to JSA.

PROJECT ORGANIZATION

The roles and responsibilities of the project participants defined in the Project Execution Plan (PEP) and Integrated Project Team (IPT) Charter. The IPT members are identified below and in the Project Organization Chart in Figure 1.

Core Members:

DOE TJSO Federal Project Director – Richard Korynta
JLab Project Director – Rusty Sprouse

JLab Project Manager – Keith Royston

Members

DOE TJSO Contracting Officer – Wayne Skinner
DOE TJSO Site Manager (Observer) – Joe Arango
DOE TJSO Deputy Site Manager (Observer) – Scott Mallette
JLab Subcontracting Officer – Mark Waite
JLab Environmental Health and Safety Rep – Dick Owen
JLab Environmental Specialist – Scott Conley
JLab Engineering Support
- Carroll Jones – Mechanical
- Paul Powers – Electrical
- David Kausch – Fire Protection and Plumbing

JLab Project Management Office – Claus Rode
JLab Chief Operating Officer (Observer) – Mike Dallas
JLab Tenant Committee Chair – Evelyn Akers

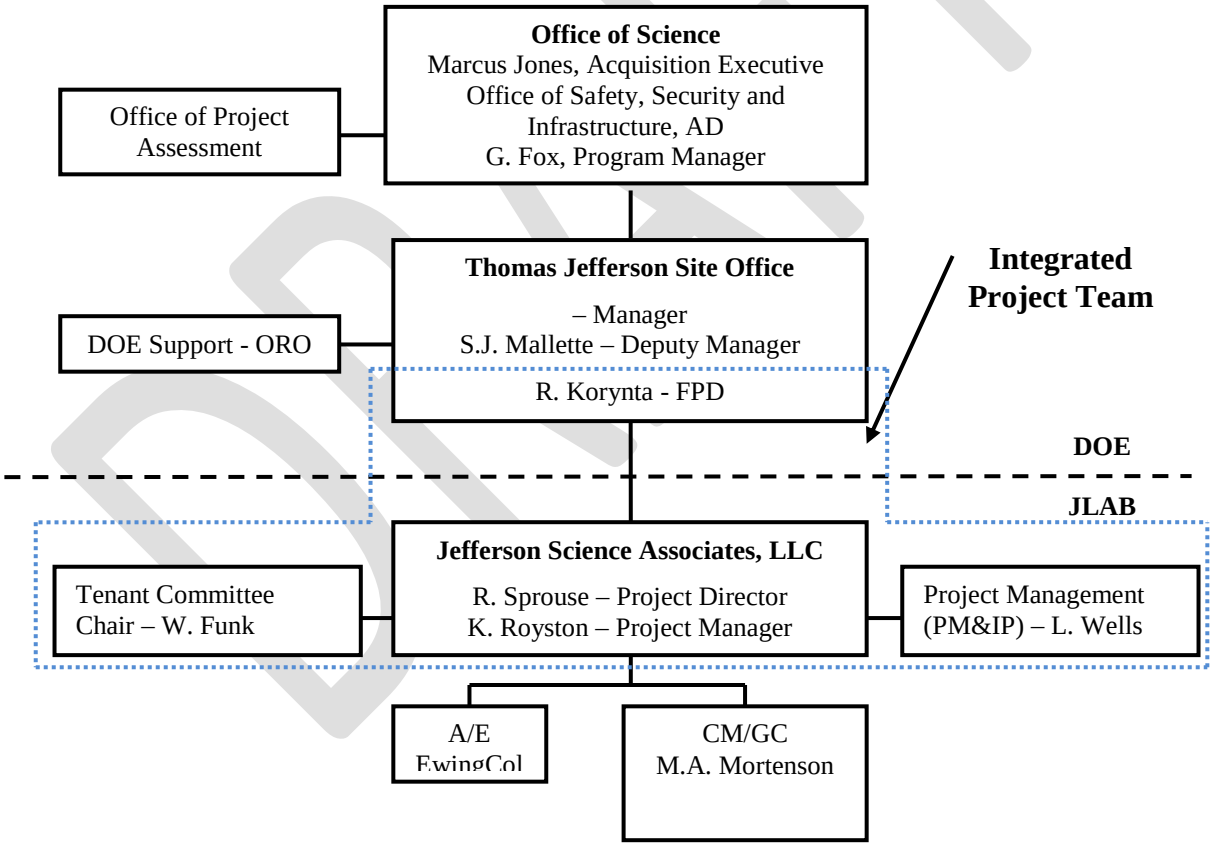

Figure 1 – Project Organization Chart

The only changes were that the original Site Office Manager left TJNAF and was replaced by Joe Arango, JLab Environmental Health and Safety Representative was reassigned and replaced by Dick Owen, the JLab Environmental Specialist left TJNAF and was replaced by Scott Conley, and

JLab Tenant Committee Chair left TJNAF and was replaced by Evelyn Akers, the Accelerator Division Facility Coordinator.

PROJECT BASELINE

This section describes the project Performance Baseline (PB) that consists of the scope, cost (Total Project Cost or TPC), schedule (Critical Decision, funding profile, and other information approved at CD-2 and what will be achieved at CD-4b.

Scope Baseline and Key Performance Parameters

This section documents the project scope and Key Performance Parameters (KPPs) that were approved at CD-2 and the KPPs achieved at CD-4b.

The project located at Thomas Jefferson National Accelerator Facility designed and constructed new general office, technical, and research and development space plus the renovation of an existing building. The project also demolished space to in part meet the one-for-one space requirements.

The planned and actual threshold KPPs of the project are:

Description of Scope	CD-2 Threshold KPP	KPP Achieved at CD-4	CD-2 Threshold KPP Met or Exceeded?
New Facilities Size	90,000 SF	122,950 SF	Exceeded
Demolition	9,000 SF	24,400 SF	Exceeded
LEED Certification TED	Gold	Gold	Met
LEED Certification TL	Gold	Gold	Met

Cost Baseline

The Total Project Cost at CD-2 was $73.2M, which included $12.79M of contingency. Table __ shows the planned cost, the actual cost expected at CD-4b. The current project risk registry is included as Appendix E, which shows the identified risks.

Overall, overruns on engineering support were offset by under runs in Project Management. the project is expected to finished within one percent of the baseline budget at CD-4b. The current baseline change log and Risk Registry is contained in Appendix C.

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Table __ - Work Breakdown Structure

WBS	Description	Total ($K) at CD-2	Actual ($K)
1.1	Project Planning	$ 1,000	
1.1.1	Conceptual Planning	$ 800	
1.1.2	Planning	$ 200	
1.2	**Engineering and Design**	$ 3,350	
1.2.01	Design Services	$ 2,791	
1.2.02	Pre-Construction Services	$ 422	
1.2.03	Pre-Construction Project Management	$ 137	
1.3	**Construction**	$ 56,672	
1.3.1	Conventional Facilities Construction	$ 47,723	
1.3.1.1	Civil/Site and Early Procurements	$ 4,411	
1.3.1.2	TED Building Construction	$ 19,005	
1.3.1.3	TL Building Construction	$ 16,444	
1.3.1.4	TL Renovation	$ 7,863	
1.3.2	Furnished Furniture/Equipment	$ 1,966	
1.3.2.1	TED Furniture/Equipment	$ 1,038	
1.3.2.2	TL Furniture/Equipment	$ 290	
1.3.2.3	TL Ren Furniture/Equipment	$ 638	
1.3.3	Construction Management Services	$ 6,258	
1.3.3.1	Construction Management	$ 5,716	
1.3.3.1.1	TED Construction Management	$ 2,759	
1.3.3.1.2	TL Construction Management	$ 1,891	
1.3.3.1.3	TL Ren Construction Management	$ 1,066	
1.3.3.2	Commissioning	$ 240	
1.3.3.2.1	TED Commissioning	$ 99	
1.3.3.2.2	TL Commissioning	$ 65	
1.3.3.2.3	TL Ren Commissioning	$ 76	
1.3.3.3	A/E Support	$ 302	
1.3.3.3.1	TED A/E Support	$ 122	
1.3.3.3.2	TL A/E Support	$ 80	
1.3.3.3.3	TL Ren A/E Support	$ 100	
1.3.4	Project Management	$ 726	
	TEC Subtotal	$ 60,022	
	PED Contingency (10.5)	$ 350	
	Construction Contingency (20.9)	$ 11,828	
	TEC Contingency (20.3%)	$ 12,178	
	Total TEC	$ 72,200	72,143
	Other Project Costs	$ 1,000	
	Total Project Costs ($K)	$ 73,200	73,143

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Table __ - EDIA Cost Compared to Construction (as of _____)

EDIA as a % of Construction Cost	*10%*	*0%*	
Cost Categories	*Project $(K)*	*Non-Project $(K)*	*Comments*
Engineering	***$3,477***		
	6%		
Design (A/E, tech specs.; conceptual, preliminary, and final design; as-built drawings, etc.)	*Yes*	*Yes*	*Bldg Occupant Reps participated in scoping at no cost to project*
Value Engineering	*Yes*	*No*	
Design Reviews	*Yes*	*Yes*	*Bldg Occupant Reps participated in project review at no cost to project*
Design Support (i.e., soil testing, vibration testing, seismic analysis, etc., needed for design)	*Yes*	*No*	
Other (specify)	*No*	*No*	
Management	***$2,311***		
	4%		
Design Management	*Yes*	*No*	
Construction Management	*Yes*	*No*	
Project Management (cost estimating, scheduling, project controls, risk assessment, etc.)	*Yes*	*No*	
QA/Inspection/testing/acceptance/etc.	*Yes*	*No*	
Procurement and Contracting	*No*	*Yes*	*Procurement is treated as overhead*
Legal, Accounting, Real Estate	*No*	*Yes*	*Legal and accounting are treated as overhead*
Other (specify)	*No*	*No*	
ES&H			
Environmental Permitting	*No*	*Yes*	*EH&S support is treated as overhead*
Safety documentation	*Yes*	*No*	*Part of management*
Safety Inspection	*Yes*	*No*	*Part of management*
Security	*No*	*Yes*	*Charged via overhead on direct costs*
Other (specify)	*No*	*No*	
Construction/Fabrication	***$56,285***		
Building	*Yes*	*No*	*Land is DOE property, no project cost.*
Special Equipment (i.e., microscopes, probes, instruments, detectors, etc.)	*No*	*No*	
Standard Equipment (i.e., furniture, office equipment, benches, kitchen equipment, audio/visual, etc)	*Yes*	*No*	
Demolition/Disposal	*Yes*	*No*	
R&D	*No*	*No*	
Commissioning	*Yes*	*No*	
Other (specify)	*No*	*No*	
Contingency	***$11,127***		
Total Project Cost	***$73,200***	***$0***	

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The project contingency usage history as a function of time is shown below

Date of end of FY	% Project Complete	TPC ($K)	Actual Costs to Date ($K)	Contingency ($K) Remaining	Estimate to Complete ($K)
FY 10	18.8%	$73,200	$ 11,154	$ 11,077	$ 50,969
FY11	67.3%	$73,200	$ 46,144	$ 4,257	$ 22,799
FY12		$73,200			
FY13		$73,200			

Schedule Baseline

The following tables list the planned key schedule milestones verses actual completion dates.

Table __ Level 1 Milestones

	Schedule at CD-2	***Actual***
CD-0, Approve Mission Need	*9/18/07*	*9/18/07*
CD-1, Approve Alternative Selection and Cost Range	*9/23/08*	*9/23/08*
CD-2, Approve Performance Baseline	*1st Qtr FY10*	*11/12/09*
CD-3a, Approve Start of Early procurement Package	*2nd Qtr FY10*	*3/26/2010*
CD-3b, Approve Start of Construction	*4th Qtr FY10*	*8/4/2010*
CD-4a, Approve Start of Operation - New Construction	*2nd Qtr FY12*	*TBD*
CD-b4, Approve Project Completion	*2nd Qtr FY14*	*TBD*

Table __ Level 2 Milestones

	Planned Schedule	***Actual***
NEPA Documentation Approved	5/29/09	5/29/09
DOE Approved CM/GC Solicitation	5/29/09	5/29/09
DOE Approved CM/GC Subcontract	6/26/09	6/26/09
Complete Early Procurement Package Design	2nd Qtr FY10	Mar 10
Start Early Procurement Package Construction	2nd Qtr FY10	May 10
Complete Final Design	3rd Qtr FY10	May 10
Start New Construction	4th Qtr FY10	Aug 10
Complete New Construction	4th Qtr FY11	Feb 12
Start Renovation Construction	1st Qtr FY12	Sep 11
Approve Start of Operation – New Construction	1st Qtr FY12	Mar 11
Building Renovation Complete	4th Qtr FY12	

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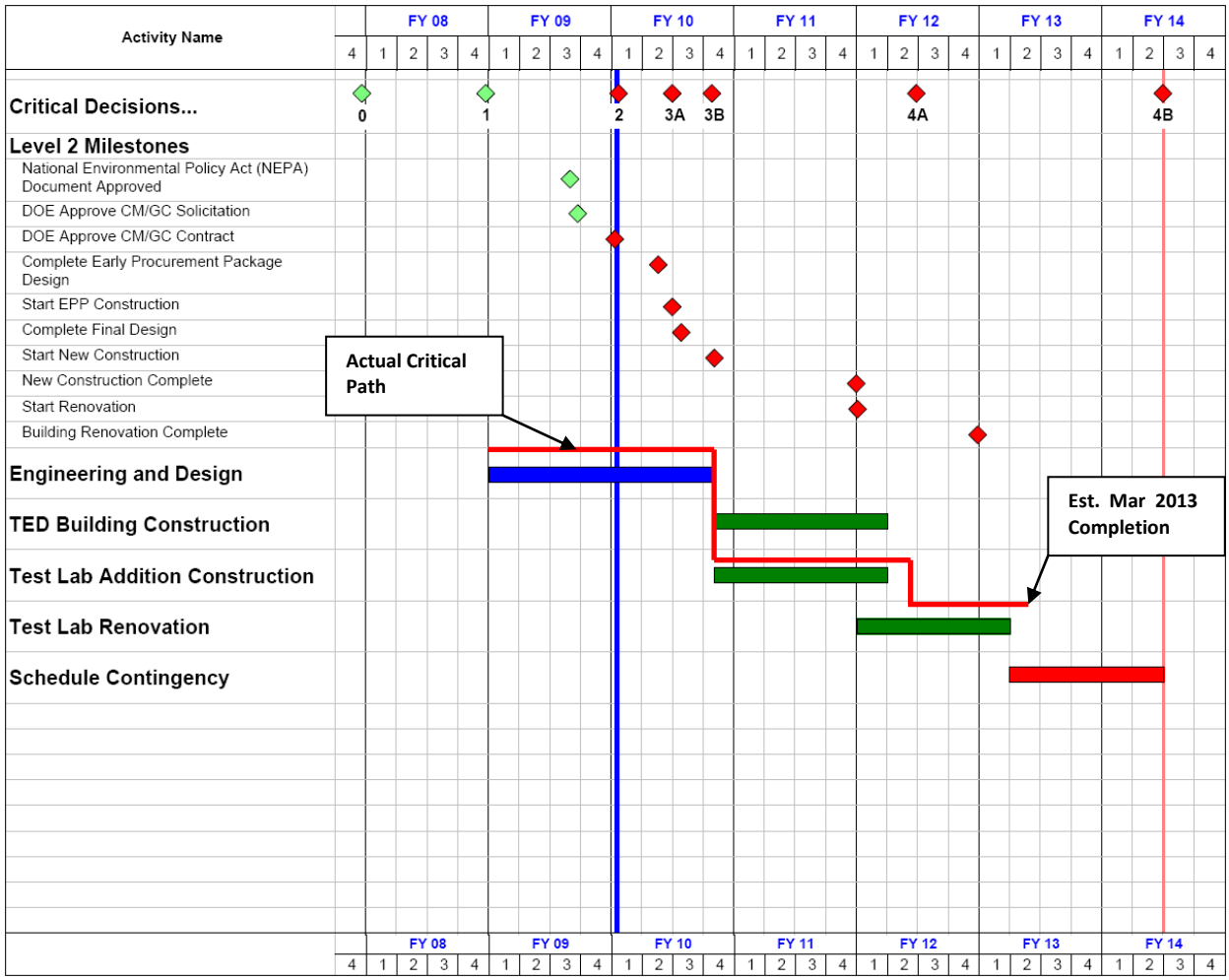
Figure XX is the summary schedule with major milestones and activities, durations that was planned at CD-2 and the actual critical path.

Figure XX – Summary Project Schedule



Work Breakdown Structure

The final WBS at level 2 is defined as shown figure XX below. Level 3 dictionary is included as Appendix D.

Table XX – WBS Level 2

WBS #	*WBS Title*	*WBS Description*
Total Estimated Cost (TEC)		
1.2	*Engineering and Design*	Preliminary and final design, preconstruction construction management services, and project oversight
1.3	*Experimental Facilities*	*Construction of conventional facilities, furnishings/equipment, and construction management services*
Other Project Cost (OPC)		
1.1	*Project Planning*	JLab Facilities Management Division (Labor/Materials/Other Costs/Overhead, Miscellaneous

Funding Profile

Table XX and XX represents the funding profile approved at CD-2 and actual funds received by the project.

Table X—Funding Profile Approved at CD-2

Fiscal Year	*FY08*	*FY09*	*FY10*	*FY11*	*FY12*	*FY13*	*FY14*	*Total($M)*
OPC	***$0.3***	***$0.7***						***$1***
R&D and Design	*$0.3*	*$0.7*						*$1*
TEC		***$3.7***	***$27.7***	***$20.8***	***$20***			***$72.2***
PED		*$3.7*						*$3.7*
Construction			*$27.7*	*$20.8*	*$20*			*$68.5*
Total Project Cost ($M)	*$0.3*	*$4.4*	*$27.7*	*$20.8*	*$20*			*$73.2*

Table X—Actual Funds Received

Fiscal Year	*FY08*	*FY09*	*FY10*	*FY11*	*FY12*	*FY13*	*FY14*	*Total ($M)*
OPC	***$0.3***	***$0.7***						***$1***
R&D and Design	*$0.3*	*$0.7*						*$1*
TEC		***$3.7***	***$27.7***	***$28.4***	***$12.3***			***$72.1***
PED		*$3.7*						*$3.7*
Construction			*$27.7*	*$28.4*	*$12.3*			*$68.4*
Total Project Cost ($M)	*$0.3*	*$4.4*	*$27.7*	*$28.4*	*$12.3*			*$73.1*

Environmental Requirements/Permits

The environmental impacts associated with the construction of the TEDF Project were addressed in the appropriate National Environmental Policy Act (NEPA) documentation as determined by

the TJSO NEPA Compliance Officer. The NEPA documentation provided a comprehensive review of the impacts associated with the execution of the TEDF Project. There were no significant impacts identified during the review and a Categorical Exclusion (CX) was granted on May 29, 2009. The current project scope was reviewed during preparations for CD-2 in November 2009.

Safety Record

Table XX summarizes the yearly project safety record . See Appendix for the specific injury data.

Table __ - Summary of Project Safety Record

Org	FTY	Hours Worked	Recordable Cases	Recordable Rate	Recordable Target	DART Cases	DART Rate	DART Target
Lab	FY09	4,080	0	0	0.65	0	0	0.25
	FY10	6,240	0	0	0.65	0	0	0.25
	FY11	8,320	0	0	0.65	0	0	0.25
	FY12				0.65	0	0	0.25
	FY13				0.65	0	0	0.25
Contractors	FY10	33,898	1	5.9	0.65	0	0	0.25
	FY11	273,705	1	0.73	0.65	0	0	0.25
	FY12		2		0.65	0	0	0.25
	FY13				0.65			0.25

Note: Construction industry average is TRC= 4.0, DART = 2.1

CLOSEOUT STATUS

As of the end of _____, the following is the status of closeout activities

Activity and Description	***Complete—Yes or No?***	***Planned Completion Date?***	***Planned Remaining Costs ($K)?***
Completion of punch list items	*No*		
Complete Environmental Permitting	*Yes*		
Equipment Disposition	*Yes*		
Administrative Closeout—Cost associated with contract and financial closeout activities.	*No*		
Contract Closeout—there is a claim for $500K by the Construction Contractor	*No*		
Financial Closeout—will be closed after contract closeout is complete	*No*		
TOTAL:			

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LESSONS LEARNED

The purpose of lessons learned is to share and use knowledge derived from experience to: 1) promote the recurrence of desirable outcomes, or 2) preclude the recurrence of undesirable outcomes.
The lessons learned in this report have been categorized and sorted into Technical; Cost, Schedule, and Funding; Safety and Quality; Operations and Commissioning Planning and Readiness; and Management.

Technical

- Caution should be exercised during review of the early designs to avoid architectural features that may be extremely difficult to implement during construction, thereby contributing to cost and schedule risk. This is often difficult to determine when there is a genuine desire by all participants involved in the project execution phase of the project to produce exceptional products.

- During GC value engineering a suggested design feature was changed from precast concrete to traditional stick built construction methods. This was supposed to save the project cost and have no schedule impact. However, due to the highly technical nature of the feature, the practical implementation has taken longer than scheduled and is impacting the overall building schedule. The cost saving was realized by the project; however additional costs have been incurred by the GC.

- The use of the construction contractor Disruption Avoidance Planning (DAP) meetings greatly facilitated coordination with ongoing lab operations in this highly integrated project and has promoted overall support for the project by all organizations at the laboratory.

Cost, Schedule, and Funding

- Program improvement of the project funding profile greatly reduced project risk and improved project performance, saving a year on the construction schedule.

- Project funding needs to be significantly front end loaded to allow use of a CM/GC construction delivery method. It is essential that for the CM/GC acquisition approach to be most effective, the CM/GC be brought onboard at the beginning of the design to take ownership of the project. In order to do this it is necessary to have sufficient funding to support the early award of the CM/GC contract.

- If the project includes a renovation portion with new construction to an existing building, caution should be exercised to integrate the schedule for both portions of the project.

Safety and Quality

- The cool roof systems on the TED building and Test Lab Addition tend to stay wet and are slippery.

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This becomes an even greater concern during cold weather when ice forms. Emphasis is needed during design on cool roofing systems to reduce slip hazards particularly in damp climates. The increased risk of slip and fall on these roofing systems is greatest during construction because typically when construction work is completed walking pads are installed for maintenance access.

Operations and Commissioning Planning and Readiness

- Lab management involvement is key to engaging customers in planning for relocation to new facilities. Complex systems require extensive planning when being relocated. Customers for the new construction may be excited about moving into the new space but will find it hard to devote the time to planning for relocation unless management makes it a priority.

Management

- Ensure customer buy-in (ownership) early in project design and throughout the design process. When there are highly specialized systems needed in a facility it is essential for the customers who will be using those systems to take "ownership" of the design of those systems early. They are the most knowledgeable individuals on the use of the systems and on subtleties in design requirements. If this is not done it is highly likely that additional costs will be incurred by the project to address design deficiencies.

- Give preference in the General Contractor (GC) selection process to local contractors. Even if a GC is highly recognized in the industry for strong performance and has extensive experience on the type of facility being constructed there are subtleties in the local crafts market that make it more difficult for them to perform if they are not familiar with local crafts. Also, the cost of changes increased with the use of non-local specialty contractors, due to the costs associated with paying per diem.

- If the Acquisition Strategy is to use a CM/GC approach, ensure that all elements in the approval chain for the contract are on-board with that approach and understand the nature of the CM/GC contracting mechanism as early as possible in the development of the acquisition strategy.

- If a CM/GC contract is determined to be the most advantageous construction delivery method for the project, ensure that the CM/GC is onboard at the beginning of preliminary design to ensure ownership of the design by all parties.

- Consider design-build in the acquisition strategy unless there is a compelling reason not to.

- It is critical that, whichever construction delivery method is selected, the contracting officer and acquisition personnel involved in the contract approval process are fully versed and supportive of the method selected.

- A realistic staffing approach needs to be considered with all construction projects at this lab. This will ensure the sanity of the project personnel.

- The project established a policy not to react to any complaint regarding the relocation of the accelerator entrance until after a 21 day 'waiting' period. This allowed acceptance of the changed conditions and essentially eliminated the need to address complaints. This same policy will be used for the remainder of the project.

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PROJECT PHOTOGRAPHS

Place holder for photos from initial stages to project completion. Include date and description

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PROJECT DOCUMENT ARCHIVES AND LOCATIONS

Project documents are archived at (indicate location)

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Appendix A – Detailed WBS Dictionary

Appendix B – Detailed Technical Performance Achieved

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Appendix C - Major External Reviews

Independent Project Review for Critical Decision – 2 "Approve Project Baseline"

The purpose of the Independent Project Review (IPR) was to determine the readiness of the TEDF Project to establish a performance baseline, and for approval of Critical Decision – 2. The IPR Committee reviewed all available project documentation and assessed the readiness of the project team. The Committee agreed that the project is ready for CD-2 once the recommendations of the committee were addressed. The recommendations are indicated below. All pre-CD-2 recommendations were complete and CD-2 was approved.

Fill in

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Independent Project Review for Critical Decision – 3

The purpose of this IPR was to determine the readiness of the TEDF Project to start construction, and approve Critical Decision – 3 (CD-3). The IPR Committee reviewed all available project documentation that is required for CD-3 approval and assessed the readiness of the project team. The Committee agreed that the project is ready for CD-3 once the recommendations of the committee were addressed. The recommendations are indicated below. All pre-CD-3 recommendations were completed and CD-3 was approved.

Fill in

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Appendix D – Summary of Project Injuries

Date	Event	Injury	Body Part	Classification	Formal Investigation	Cause
9/28/2010	Subcontractor was pushing down a rebar cage with his foot when his foot slipped causing him to cut his right leg on something in the ground.	Laceration	leg	Recordable	Yes	Recognition of hazard LTA
11/10/2010	leak occurred on Glycol system and subcontractor forearms were hit with propylene glycol	chem exp	arm	First Aid		
1/17/2011	While connecting a piece of steel, bar slipped and employee fell off beam. Fall was arrested.	strain	ankle	First Aid	Yes	Energy Displacement
6/20/2011	Subcontract employee was tilting a duct jack upwards when he felt sudden pain in his upper back	strain	back	First Aid		
7/20/2011	During pre shift stretching activity, experienced episode of low back discomfort	strain	back	First Aid		
7/22/2011	After working several hours in the TLA building subcontract employee began to experience symptoms of heat exhaustion	Exposure	whole body	First Aid		
8/2/2011	Subcontract employee was pulling in a 2" screw pipe using two pipe wrenches. Holding the pipe with one wrench and pulling with the other, he felt a pop in his right shoulder.	Strain	Shoulder	First Aid		
8/15/2011	Subcontract employee was moving a ladder when it poked his upper lip	Laceration	Face	First Aid		
9/15/2011	Subcontract employee was struck on back of hard hat by a wooden board which caused his head to go forward hitting his mouth on a metal pipe	chipped	tooth	Recordable	Yes	Tools for job LTA
11/2/2011	Crushed left hand between a active and stationary duct.	Contusion	hand	First Aid		
11/25/2011	Fell hitting the back of his head on the roof deck.	Concussion	Head	Recordable	Yes	Recognition of hazard LTA
12/1/2011	Pinched hand between wrench and machinery.	Laceration	hand	First Aid		
12/2/2011	Ladder shifted while painting causing fall.	Contusion	back	First Aid		
12/27/2011	Glove got caught in drill bit.	Dislocation	finger	Recordable	Yes	Tools for job (Drill/gloves) LTA
12/28/2011	Slipped while on scaffold.	Strain	ankle	First Aid		

Appendix E – Project Risk Registry

No.	Potential Risk	Potential Problem	Major WBS Phase(s) Affected	Likelihood of Event (Ref. Risk Probability Table)	Risk Probability % (ref. Tab 1)	Impact (Ref. Tab 2)	Risk Level Category (Ref Tab 3)	Risk Handling Approach (Aviod, Control, Transfer, Accept)	Handling Plan, Steps and Schedule	Responsible Person	When to reduce or Retire Risk	Assumptions for Cost and Schedule Estimates	Likely Sch
													O
WBS 1.0 - General Project Risks													
~~0.1~~	~~Subcontract award review~~	~~If review of subcontract~~	~~General~~	~~Moderate~~	~~0%~~	~~High~~	~~High~~	~~Control~~	~~Perform close coordination~~	~~FPD~~	~~At CD-3 Approvals~~	$50/month LOE, $280/month GC general conditions, $250K/mo escalation	~~0~~
~~0.2~~	~~Increase in Escalation~~	~~The actual material and~~	~~General~~	~~Low~~	~~0%~~	~~Moderate~~	~~Low~~	~~Accept/ Control~~	~~Award construction~~	~~PM~~	~~Upon last Construction~~	Assumes over estimate of 1%, 2%, 3% of construction ($43.5M)	~~0~~
0.3	DOE/JLAB Directives-	If DOE/TJNAF directives	General	Low	10%	Low	Low	Accept	Project planning to	FPD	At Project Completion	$50/month LOE, $280/month GC general conditions	0
0.4	Personnel Change	If there is a change in	General	Low	25%	Moderate	Low	Accept/ Control	Add Facilities Construction	PM	At Project Completion	Inefficiency during perios of replacement and due to loss of project knowledge ($40k/month)	0
WBS 1.2 - Project Engineering & Design (PED)													
~~2.1~~	~~High Bids~~	~~If the CM/GC bids come in~~	~~Design~~	~~Moderate~~	~~0%~~	~~High~~	~~Moderate~~	~~Accept/ Control~~	~~Ensure a realistic~~	~~FPD/PM~~	~~Upon last Construction~~	Assumes bids exceed cost est. 5%, 10%, 15% of construction ($43.5M)	~~0.5~~
2.2	Escalation due to	If the project completion	Design/ Const.	Low	20%	High	Moderate	Control	Provide project	PM	At Construction	$50/month LOE, $280/month GC general conditions, $250K/mo escalation	0
~~2.3~~	~~TJNAF does NOT exercise~~	~~CM performance~~	~~Design.~~	~~Low~~	~~0%~~	~~Moderate~~	~~Low~~	~~Control~~	~~Monitor CM work.~~	~~PM~~	~~At renovation substantial~~	Allowance for additional costs ($250/$500/$1000)	~~0~~
2.4	~~Final Design Cost~~	~~If 100% design~~	~~Design~~	~~Low~~	~~0%~~	~~Moderate~~	~~Low~~	~~Control~~	~~Validate cost estimates.~~	~~PM~~	~~At Design Completion~~	Assumes over estimate of 2.5%, 5%, 10% of construction ($43.5M)	~~0.5~~
2.5	~~Scope Creep~~	~~If special design~~	~~Design~~	~~Low~~	~~0%~~	~~Moderate~~	~~Low~~	~~Accept/ Reduce~~	~~Thorough 30/60/100%~~	~~PM~~	~~At Design Completion~~	Assumes scope creep of 2%, 4% & 8% of construction ($43.5M)	~~0.5~~
WBS 1.3 - Construction													
3.1	Errors & Omissions in	If there are errors &	Const.	Moderate	25%	Moderate	Moderate	Control	Thorough 35/60/100%	PM	At Substantial Construction	$25/month LOE, $250K/mo escalation	0.5
3.2	Significant Injury/Safety	If contractors do not	Const.	Low	5%	High	Moderate	Control/ Avoid	EMR criterion in contractor	PM	At subcontract completion	$50/month LOE, $280/month GC general conditions	0
3.3	Interface Issues - New	If TJNAF site operational	Const.	Moderate	15%	Moderate	Moderate	Control	Monitor changes and	PM	At New Construction	$50/month LOE, $280/month GC general conditions, $250K/mo escalation	0
3.4	Interface Issues - SRF -	If TJNAF site operational	Const.	Moderate	40%	Moderate	Moderate	Control	Monitor SRF activities and	PM	At Renovation Completion	$50/month LOE, $280/month GC general conditions, $250K/mo escalation	1
3.5	~~Funding Delay due to~~	~~If Funding Authorizatio~~	~~Const.~~	~~Moderate~~	~~0%~~	~~Low~~	~~Low~~	~~Accept~~	~~Issue a BCP to modify~~	~~FPD~~	~~FY09 BA Issue~~	$50/month LOE, $280/month GC general conditions, $250K/mo escalation	~~0~~
3.6	System Performance	If HVAC, Electrical,	Const.	Moderate	25%	Moderate	Moderate	Transfer	Thorough design	PM	At Project Closeout	Additional cost to correct system and recommission ($100/$400/$800).	0
3.7	Act of God (e.g.	If a seismic activity or	Const.	Moderate	10%	Moderate	Moderate	Accept	Include contingency.	PM.	At "Substantial	$50/month LOE, $280/month GC general conditions	0.5
3.8	Construction in Occupied	Construciton Impacts	Const.	Moderate	20%	Moderate	Moderate	Control/ Avoid	Monitor operations.	CM/GC's	At renovation completeion	Allowance for additional costs ($200/$400/$800)	0
3.9	Transition to Operations	If transition to	Const.	Low	10%	Moderate	Low	Control	FM&Q Personnel	PM	After Commissionin	$50/month LOE, $250K/mo escalation	0
3.10	Submittal of Contractor	If the contract	Const.	Low	25%	Moderate	Low	Control	Provide quality	PM/PD	At Construction	Based on 1%, 2.5% &5% of Construction Cost	0
3.11	~~Lower Tier Subcontractor~~	~~If the subcontracto~~	~~Const.~~	~~Low~~	~~0%~~	~~Moderate~~	~~Low~~	~~Accept~~	~~Subcontractors will be~~	~~PM~~	~~At Construction~~	Premium for subcontractors of (2.5%, 5% & 10%)	~~0~~
3.12	~~Permit Delays~~	~~If permits are not~~	~~Const.~~	~~Low~~	~~0%~~	~~Moderate~~	~~Low~~	~~Avoid~~	~~Identify permits early~~	~~PM~~	~~At "Substantial~~	$50/month LOE, $280/month GC general conditions	~~0.5~~
3.13	Contractor selected	If an inexperience	Const.	Low	10%	Moderate	Low	Avoid	Evaluated Procurement	FPD/PM	At "Substantial	$50/month LOE, $280/month GC general conditions, $250/month escalation	0
~~3.14~~	~~Unforeseen/Undocumented~~	~~If unforeseen~~	~~Const.~~	~~Low~~	~~0%~~	~~Moderate~~	~~Low~~	~~Control~~	~~Thorough site assessments,~~	~~PM~~	~~At site/foundatio~~	$50/month LOE, $280/month GC general conditions	~~0~~

No.	Potential Risk	Potential Problem	Major WBS Phase(s) Affected	Likelihood of Event (Ref. Risk Probability Table)	Risk Probability % (ref. Tab 1)	Impact (Ref. Tab 2)	Risk Level Category (Ref Tab 3)	Risk Handling Approach (Aviod, Control, Transfer, Accept)	Handling Plan, Steps and Schedule	Responsible Person	When to reduce or Retire Risk	Assumptions for Cost and Schedule Estimates	Likely Sch
													O
~~3.15~~	~~Geotechnical Complications~~	~~If unforeseen~~	~~Const.~~	~~Low~~	~~0%~~	~~Moderate~~	~~Low~~	~~Control~~	~~Early Geotech investigation~~	~~PM~~	~~At site/foundatio~~	Additional construction costs.	~~0~~
3.16	Significant loss of a JLAB	If the contractor	Const.	Low	10%	Moderate	Low	Transfer/ Avoid	Thorough evaluation	FM&L	At Project Closeout	$50/month LOE, $280/month GC general conditions $200 restart	0
3.17	Encountering of	If contractors encounter	Const.	Low	25%	Moderate	Low	Avoid	Thorough assessments,	CM/GC's	At Substantial Construction	$50/month LOE, $280/month GC general conditions $100 additional cost	0
3.18	Water Pollution	If storm water	Const.	Low	10%	Low	Low	Control	Review requirements	PM	At "Substantial	Cleanup costs plus costs to mitigate and delays. $50/month LOE, $280/month	0
3.19	Project Deliverables	If quality of deliverables	Const.	Low	10%	Moderate	Low	Avoid	Upfront high level buy-in;	PM	At "Substantial	$50/month LOE, $280/month GC general conditions, $250/month escalation	0
3.20	LEED	General LEED requirement	Const.	Low	10%	Low	Low	Control/ Accept	Continue to work with A-E	PM	At Project Closeout	Additional design costs ($100/$200/$400)	0
3.21	Relocation of SRF staff from	Building occupants	Const.	Low	20%	Moderate	Low	Control/ Accept	Advanced planning,	PM	At renovation completion	$50/month LOE, $280/month GC general conditions	0.5
~~3.22~~	~~Concrete conta~~	~~Concrete Mass to be~~	~~Const.~~	~~Low~~	~~0%~~	~~Moderate~~	~~Low~~	~~Control/ Accept~~	~~Testing of concrete~~	~~PM~~	~~Removal of concrete~~	$50/month LOE, $280/month GC general conditions	~~0~~
~~3.23~~	~~Construction de~~	~~New construction~~	~~Const.~~	~~Low~~	~~0%~~	~~High~~	~~Moderate~~	~~Control/ Accept~~	~~Continue to work with A-E~~	~~CM/GC / PM~~	~~Completion of New~~	$50/month LOE, $280/month GC general conditions	~~3~~
3.24	Unforseen conditions	During the renovation	Const.	Moderate	15%	Moderate	Moderate	Control/ Accept	Continue to work with A-E	CM/GC / PM	At renovation completion	$50/month LOE, $280/month GC general conditions	0
~~3.25~~	~~Funding uncertainity~~	~~Funding not provided by~~	~~Const.~~	~~High~~	~~0%~~	~~Med~~	~~High~~	~~Accept~~	~~Issue a BCP to modify~~	~~FPD~~	~~FY11 Budget Approved~~	$50/month LOE, $280/month GC general conditions, $250K/mo escalation	~~1~~
~~3.26~~	~~Funding uncertainity~~	~~Funding either not~~	~~Const.~~	~~High~~	~~0%~~	~~High~~	~~High~~	~~Accept~~	~~Issue a BCP to modify~~	~~FPD~~	~~FY12 Budget Approved or CR~~	$50/month LOE, $280/month GC general conditions, $250K/mo escalation	~~0~~

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